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Waterway Sediment Operable Unit Harbor Island Superfund Site

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## TRIBUTYLTIN IN MARINE SEDIMENTS AND THE BIOACCUMULATION OF TRIBUTYLTIN: COMBINED DATA REPORT

PREPARED FOR: PREPARE Port of Seattle EVS SOBUTIONS Seattle, Washington Seattle, Washington 12368

Waterway Sediment Operable Unit Harbor Island Superfund Site

## TRIBUTYLTIN IN MARINE SEDIMENTS AND THE BIOACCUMULATION OF TRIBUTYLTIN: COMBINED DATA REPORT

**Prepared for** 

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Prepared by

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For submittal to

U.S. Environmental Protection Agency Region 10

ESI Project No.

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## LIST OF ACRONYMS

AOC	Administrative Order on Consent
Battelle	Battelle Marine Sciences Laboratory
CAS	Columbia Analytical Services
COC	chain of custody
DGPS	differential global positioning system
DOC	dissolved organic carbon
ESI	EVS Solutions, Inc.
GPS	global positioning system
HDPE	high-density polyethylene
HSP	health and safety plan
Lockheed	Lockheed Martin Corporation
MSS	Marine Sampling Systems
РСВ	polychlorinated biphenyl
Port	Port of Seattle
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
Rosa	Rosa Environmental and Geotechnical Laboratory
RPD	relative percent difference
SAP	sampling and analysis plan
SOP	standard operating procedure
SOW	statement of work
SSOU	Shipyard Sediment Operable Unit
Todd	Todd Shipyards Corporation
тос	total organic carbon
TBT	tributyltin
USEPA	U.S. Environmental Protection Agency
WSOU	Waterway Sediment Operable Unit

## 1.0 INTRODUCTION

The Port of Seattle (Port), Lockheed Martin Corporation (Lockheed), and Todd Shipyards Corporation (Todd) voluntarily entered into an Administrative Order on Consent (AOC) with the U.S. Environmental Protection Agency (USEPA; May 14, 1998). The objective of the AOC and attached Statement of Work (SOW) was to evaluate risks to human health and the environment associated with the bioaccumulation of polychlorinated biphenyls (PCBs), tributyltin (TBT), and mercury at the Harbor Island Superfund Site, Waterway Sediment Operable Unit (WSOU). The SOW outlines specific tasks designed to address the importance of PCBs, TBT, and mercury concentrations within the WSOU. The WSOU is located in the West Waterway, a navigable channel of the Duwamish River on the west side of Harbor Island, and is adjacent to the Lockheed and Todd Shipyards Sediment Operable Units (SSOUs). The data and subsequent interpretation resulting from this study are expected to be useful in defining future activities regarding the SSOUs.

This report, *Tributyltin in Marine Sediments and the Bioaccumulation of Tributyltin: Combined Data Report*, fulfills Tasks 2 and 3 of the SOW. These tasks examined the ecological impacts associated with exposure to TBT within the WSOU. The two main objectives of these tasks are:

- Analyze TBT in bulk sediment and filtered and unfiltered porewater of surface sediments collected from 30 stations within the WSOU (Task 2 of the SOW)
- Conduct laboratory bioaccumulation testing for TBT using sediments selected from the same 30 stations (Task 3 of the SOW)

This report presents an assessment of the predictive relationships between concentrations of TBT in tissue and those in bulk sediment and filtered and unfiltered porewater, based on the results of the chemical analyses and bioaccumulation tests. The relationships are then used to identify areas of the West Waterway with porewater or sediment concentrations of TBT that could potentially result in tissue concentrations exceeding the TBT tissue trigger concentration. This proposed trigger concentration was established based on the results of a literature review conducted under Task 1.

#### (ESI 1999a)

Sediment was collected by EVS Solutions, Inc. (ESI); Blue Water Engineering, Seattle, WA; and Marine Sampling Systems (MSS), Burley, WA. Sediment bioaccumulation testing was conducted by Battelle Marine Science Laboratory (Battelle), Sequim, WA.

Porewater extraction and grain-size determinations were provided by Rosa Environmental & Geotechnical Laboratory (Rosa), Seattle, WA. Chemical analyses of sediment, porewater, and tissue samples were conducted by Columbia Analytical Services (CAS), Kelso, WA.

At the request of Todd Shipyards, four stations located on the Todd SSOU were added to the study (Stations TBT-31 to TBT-34). These stations and the resulting analyses and data related to them are considered for comparative purposes only; this study primarily addresses TBT contamination within the WSOU. Results from these four stations may be used for future evaluations of the adjacent SSOUs.

The rest of this document is organized as follows: Section 2.0 of this report presents the study design and methods for sample collection; porewater extraction; bioaccumulation testing; and the chemical analysis of sediment, porewater, and tissues. The results and data quality summaries for the analytical and bioaccumulation testing are presented in Section 3.0. The analysis, discussion, and trigger value comparison for TBT concentrations in tissue are presented in Section 4.0. Section 5.0 contains the references used for this report. Appendix A is the navigation report from the data collection effort. Appendices B, C, D, and E contain detailed results of sediment chemistry analyses, porewater chemistry analyses, bioaccumulation testing, and subsequent tissue chemistry analyses, respectively. Appendix F contains data validation reports, and Appendix G contains field logs. The final version of the Task 1 report, *Review of Tissue Residue Effects Data for Tributyltin, Mercury, and Polychlorinated Biphenyls*, is available as a separate document (ESI 1999a).

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#### 2.0 METHODS

To determine the concentrations of TBT (ion) in bulk sediment and the porewater of sediments from the WSOU, bulk sediment and porewater samples were withdrawn from surficial sediment samples (0 - 10 cm) which had been collected from 30 stations in the WSOU and 4 stations in the Todd SSOU (Figure 2-1 and Table 2-1). Samples of filtered and unfiltered porewater and bulk sediment were analyzed for TBT ion and ancillary parameters.

To determine the extent to which TBT in sediments from the WSOU accumulates in marine benthic species, bioaccumulation tests were conducted using 20 of the 30 samples collected from the WSOU during the field survey from which porewater samples were obtained. Twenty was determined to be an adequate number of stations to provide sufficient spatial distribution and to represent the range of porewater concentrations. The 20 samples selected were those having measured TBT concentrations in porewater greater than 0.05  $\mu$ g/L TBT ion, as stipulated in the SOW (Figure 2-2). A discussion of the procedure used to select stations for bioaccumulation testing is presented in Section 2.2.3.

Bioaccumulation testing was performed by exposing *Macoma nasuta*, a suspension-feeding/filter-feeding bivalve, and *Nephtys caecoides*, a burrowing deposit-feeding polychaete, to the sediment samples for 45 days.

The bioaccumulation data, together with the sediment and porewater data, were used to evaluate the site-specific relationship between concentrations of TBT in tissue and in porewater.

#### 2.1 STATION LOCATIONS

Stations were originally selected for this study based on historical TBT measurements and spatial coverage of the WSOU. Stations were located using a differential global positioning system (DGPS). At the start and end of each sampling day the sampling vessel was positioned at a calibration point located at the south end of the Fisher Mills dock in the West Waterway (FM-4). The GPS antenna on the sampling vessel was positioned as close to the surveyed calibration point as possible. A visual estimate of the range and bearing from the monument to the GPS antenna was made and compared to the range and bearing displayed of the screen to confirm the accuracy of the positioning system.

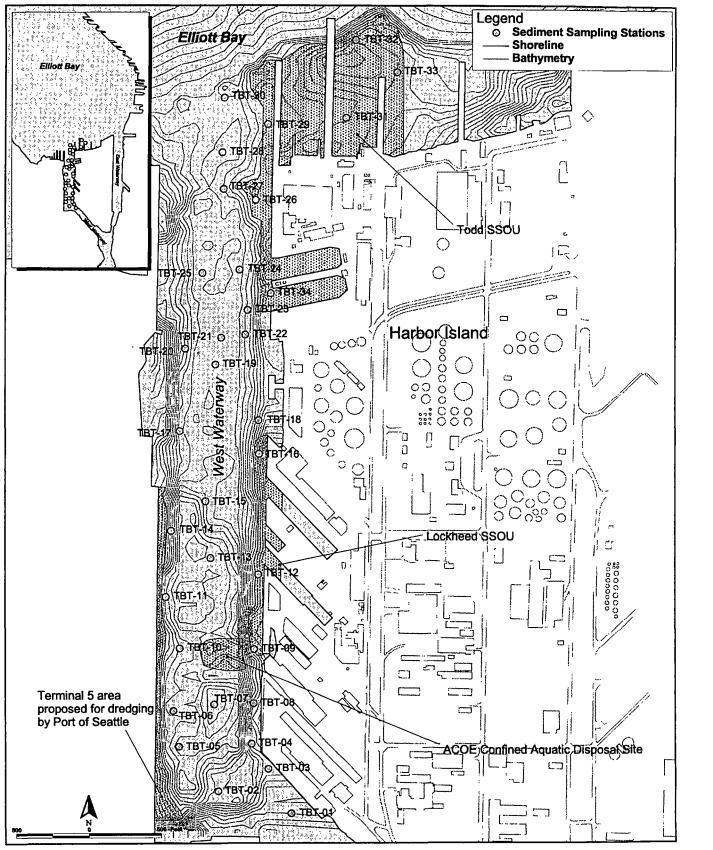


Figure 2-1. Station locations for sediment collection

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STATION ID	LONGITUDE	LATITUDE
WSOU Stations		
TBT-001	122°21′27.00041″	47°34′27.26951″
TBT-002	122°21′34.46864″	47°34′28.74578″
TBT-003	122°21′29.43603″	47°34′30.39172″
TBT-004	122°21′31.25884″	47°34′32.21222″
TBT-005	122°21′38.54895″	47°34′31.88535″
TBT-006	122°21′39.18205″	47°34′34.37133″
TBT-007	122°21′35.07712″	47°34′34.87263″
TBT-008	122°21′31.09806″	47°34′34.99019″
TBT-009	122°21'31.10402"	47°34'38.72936"
TBT-010	122°21′38.64838″	47°34′38.70608″
TBT-011	122°21′40.13763″	47°34′42.22889″
TBT-012	122°21′30.81096″	47°34′43.86440″
TBT-013	122°21′35.82178″	47°34′44.94618″
TBT-014	122°21′39.74881″	47°34′46.77689″
TBT-015	122°21′36.33728″	47°34′48.84435″
TBT-016	122°21′31.00066″	47°34′52.18238″
TBT-017	122°21′39.09707″	47°34′53.65213″
TBT-018	122°21′31.09299″	47°34′54.48708″
TBT-019	122°21′35.58952″	47°34′58.27063″
TBT-020	122°21′38.67584″	47°34′59.33478″
TBT-021	122°21'35.06927"	47°35′00.12730″
TBT-022	122°21′32.61894″	47°35′00.35800″
TBT-023	122°21′32.45611″	47°35'02.05538″
TBT-024	122°21′33.36100"	47°35′04.79369″
TBT-025	122°21′37.12887″	47°35′04.53276″
TBT-026	122°21′31.84589″	47°35′09.60663″
TBT-027	122°21′35.14700″	47°35′10.32717″
TBT-028	122°21′35.36021″	47°35′12.84633″
TBT-029	122°21′30.77453″	47°35′14.84144″
TBT-030	122°21′35.26061″	47°35′16.59007″
Todd SSOU Station	IS	
TBT-031	122°21′22.84361″	47°35′15.38659″
TBT-032	122°21′22.09038″	47°35′20.75216″
TBT-033	122°21′17.80420″	47°35′18.60318″
TBT-034	122°21′30.12346″	47°35′03.23608″

## Table 2-1. TBT study station locations

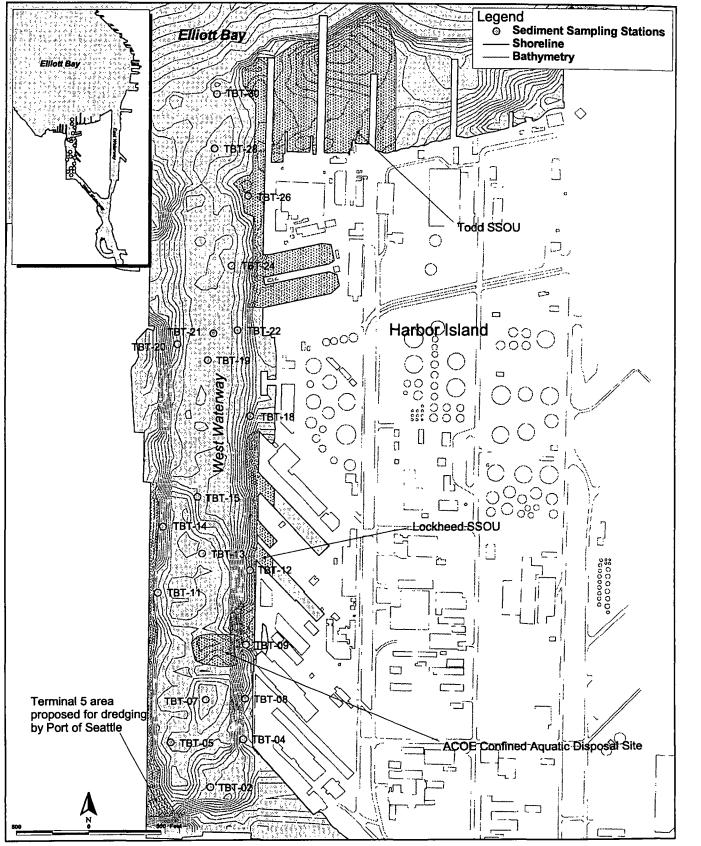
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NOTE: Survey datum = NAD83



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Figure 2-2. Stations for sediment bioaccumulation testing

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The actual station locations sampled and positions recorded are presented in Figure 2-1 and Table 2-1. Locations are accurate to within  $\pm 1$  m. The complete navigation report in contained in Appendix A.

#### 2.2 SEDIMENT SAMPLES

Sediment collection field activities took place from Wednesday, July 15 through Friday, July 17, 1998. The R/V *Nancy Anne*, provided by MSS, served as the sampling platform. There were no substantial deviations from the sampling and analysis plan (SAP; EVS 1998).

#### 2.2.1 Field Methods

Surface sediment samples (0-10 cm) were collected from 30 stations in the WSOU and 4 stations in the Todd SSOU using a modified, hydraulic-assisted, stainless-steel van Veen grab sampler. Sediment was removed from the sampler using stainless steel spoons and placed into a 10-gallon high-density polyethylene (HDPE) bucket for homogenization. Successive grabs were taken until a sufficient quantity of sediment for all analyses was obtained. The sediment was then homogenized using a handheld power drill with a stainless steel mixing paddle. Aliquots of sediment were then transferred to the appropriate sample containers. Sediment collected for porewater extraction and bioaccumulation analysis was stored under anaerobic conditions, maintained by flooding the headspace of the sample containers with nitrogen. More detailed information on the methodology used for sample collection can be found in Section 3.4.2 of the SAP (EVS 1998).

Three types of field quality assurance samples were collected during surface sediment sampling as specified in the quality assurance project plan (QAPP; EVS 1998): four field homogenate replicates, two cross contamination blanks of the compositing equipment, and a filter blank. Field homogenate replicates were collected at Stations TBT-02, TBT-07, TBT-14, and TBT-28 and were submitted blind, as separate samples, to the laboratories for analysis.

#### 2.2.2 Chemical Analyses

Bulk sediment samples were analyzed by CAS for TBT (reported as  $\mu g/kg$  ion) and total organic carbon (TOC). Grain-size analyses were conducted by Rosa. Methods, holding times, target detection limits, method detection limits, and quality assurance/quality control (QA/QC) samples are discussed in Section 7.0 of the QAPP (EVS 1998). A laboratory audit conducted by Bruce Woods of USEPA on July 22, 1998, indicated that

there were no significant deviations in the laboratory's procedures that adversely affected the data quality. Detailed results of chemical analyses of bulk sediment are provided in Appendix B.

#### 2.2.3 Bioaccumulation Testing

The selection of sediments for bioaccumulation testing was based on the sediment and porewater concentrations of TBT. The concentrations were ranked from lowest to highest for sediment, filtered porewater, and unfiltered porewater (Table 2-2). Three stations that had porewater concentrations below  $0.05 \ \mu g/L$  TBT (TBT-01, TBT-10, and TBT-17) and the four stations that were sampled from the Todd SSOU were not considered for bioaccumulation testing. Station TBT-29 was not selected for testing because the measured TBT concentrations appeared to be outliers when compared to the complete dataset. The final selection of the stations for testing provided a representative range of TBT concentrations and a geographical distribution throughout the WSOU. Sediments recommended for testing were presented to USEPA for approval in a meeting on August 19, 1998. The stations selected and subsequently tested for bioaccumulation are presented in Figure 2-2. Results of the chemical analyses of porewater are summarized in Section 3.2 of this report and presented in Appendix C.

Bioaccumulation testing was performed by Battelle with 20 of the 30 samples collected in the WSOU using *M. nasuta* and *N. caecoides*. The two species were tested together in the same aquaria. To avoid having to extrapolate standard 28-day bioaccumulation testing results to theoretical steady-state conditions, the test was extended to a maximum of 45 days to provide a better experimental estimate of steady-state tissue concentrations (EVS 1996). Sediment additions were performed in accordance with discussions with USEPA (Boese 1998) and USEPA guidance (USEPA 1993).

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Only one replicate was tested for 17 of the 20 test sediments. For the remaining three test sediments, five replicate aquaria were used to provide a measure of potential variations in tissue concentrations associated with West Waterway sediments. The replicated test sediments were selected from four randomly determined stations from which extra sediment was collected during the field survey.

The bioaccumulation data are being used to delineate areas of the West Waterway which have porewater TBT concentrations high enough to result in tissue TBT concentrations that may exceed the trigger value established as part of Task 1 of the SOW. The bioaccumulation tests for all 20 samples were not replicated, because single measurements of tissue concentration are sufficient for the purpose of establishing areas that exceed the trigger concentration.

	BULK SEDIMENT <sup>®</sup> TBT		FILTERED POREWATER <sup>b</sup> TBT		UNFILTERED POREWATER <sup>b</sup> TBT
STATION	( <i>µ</i> g/kg)	STATION	(µg/L)	STATION	(µg/L)
TBT-10	8	TBT-10	0.01	TBT-10	0.01
TBT-01	31	TBT-01	0.02	TBT-17	0.02
TBT-1,1	130	TBT-17	0.02	TBT-01	0.06
TBT-18	210	TBT-18	0.06	TBT-18	0.08
TBT-25	310	TBT-19	0.06	TBT-19	0.08
TBT-30	310	TBT-11	0.07	TBT-11	0.1
TBT-04	330	TBT-22	0.09	TBT-26	0.17
TBT-22	350	TBT-06	0.11	TBT-07℃	0.21
TBT-08	400	TBT-15	0.13	TBT-05	0.22
TBT-19	450	TBT-26	0.13	TBT-15	0.24
TBT-23	510	TBT-23	0.14	TBT-23	0.24
TBT-15	530	TBT-24	0.14	TBT-09	0:27
<b>T</b> BT-03	540	TBT-04	0.15	TBT-04	0.29
TBT-17	560	TBT-05	0.16	TBT-22	0.29
TBT-24	570	TBT-07°	0.16	TBT-06	0.3
TBT-21	610	TBT-08	0.21	TBT-24	0.33
TBT-06	660	TBT-09	0.21	TBT-16	0.36
TBT-28°	670	TBT-12	0.24	TBT-02℃	0.38
TBT-05	. 680	TBT-25	0.26	(TBT-08	0.38
TBT-02℃	690	TBT-02°	0.265	TBT-25	0.44
TBT-27	730	TBT-13	0.37	TBT-13	0.47
твт-09	800	TBT-21	0.38	TBT-03	0.51
TBT-07°	820	TBT-20	0.41	TBT-12	0.51
TBT-12	830	TBT-16	0.44	TBT-21	0.51
TBT-14°	1050	TBT-14°	0.445	TBT-28℃	0.69
TBT-13	1100	TBT-03	0.45	TBT-14°	0.715
TBT-26	1100	TBT-28°	0.575	TBT-30	0.9
TBT-16	1200	TBT-27	0.71	TBT-27	0.97
TBT-20	3500	TBT-30	0.76	TBT-20	1.01
TBT-29	6200	TBT-29	1.29	TBT-29	1.87

# Table 2-2. Rankings by TBT concentration of stationsselected for bioaccumulation testing

NOTE: Shaded area represents stations selected for bioaccumulation testing

<sup>a</sup> Complete data results for sediment are presented in Table 3-1.

<sup>b</sup> Complete data results for filtered and unfiltered porewater are presented in Table 3-2.

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<sup>c</sup> Mean of two replicates.

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Bioaccumulation tests followed standard QA/QC procedures, including the use of negative controls, positive controls, replicates (for three test sediments), and water quality measurements as described in Section 8.0 of the QAPP (EVS 1998). The QA/QC data and the results of the QA/QC procedures are summarized in Section 3.3.1 and presented in Appendix D of this report.

## 2.3 **POREWATER SAMPLES**

#### 2.3.1 Extraction Methods

Two gallons of sediment from each of the 34 locations was sent to Rosa for porewater extraction. Sediment samples were transported in HDPE buckets with nitrogen-purged headspace. The porewater extraction was performed under anaerobic conditions in a nitrogen atmosphere. Sediment samples were double-centrifuged at 4°C: first at 3,000 rpm (2,700 G) for 30 min; the resulting supernatant was removed and centrifuged again at 9,000 rpm (14,300 G) for 30 min.<sup>1</sup> One half (approximately 500 mL) of the supernatant from the second centrifugation was then filtered through a 0.45- $\mu$ m silver filter. The filtered and unfiltered porewater samples were acidified with HCl for preservation until analysis of TBT. A separate extraction was performed for the unfiltered dissolved organic carbon (DOC) and filtered DOC analyses. The porewater samples were then shipped to CAS for TBT and organic carbon analysis. The Rosa case narrative with details of the extraction methodology is presented in Appendix C.

#### 2.3.2 TBT Analysis

CAS performed all chemical analyses conducted on the porewater samples. Methods, holding times, target detection limits, method detection limits, and QA/QC controls are discussed in Section 7.0 of the QAPP and in Appendix D of the SAP (EVS 1998). The results of the porewater analyses are discussed in Section 3.2 and Appendix C of this report.

## 2.4 TISSUE SAMPLES

At the completion of the 45-day bioaccumulation testing and 24-hr depuration period in clean flowing seawater, tissue samples were collected from *M. nasuta* and *N. caecoides*. A total of 37 samples was collected for each species, including 17 samples from the single replicate treatments, 15 samples from the three treatments with five replicates, and 5 replicate samples from the control treatments. Because of reduced survival and consequent low tissue volumes for the *N. caecoides* samples, tissues from the surviving

<sup>1.</sup> The laboratory inadvertently centrifuged the sample at 9,000 rpm rather the 9,000 g specified in the QAPP. It is uncertain what effect, if any, this may have had on the resulting supernatant.

organisms in the control replicates were composited and split into five replicates for analysis at CAS. All tissue samples were frozen immediately and stored at temperatures below -20°C. Samples were shipped by overnight courier to CAS for analysis of TBT and percent lipids.

CAS performed all chemical analyses on tissue samples. The data are considered usable as qualified. Methods, holding times, target detection limits, method detection limits, and QA/QC controls are discussed in Section 7.0 of the QAPP (EVS 1998). The results of the tissue analyses are discussed in Section 3.4 and Appendix E of this report.

## 2.5 DATA EVALUATION

Exploratory data analysis was used to determine evidence of linear relationships between sediment, porewater, and tissue TBT concentrations. Linear regressions were applied to pairs of variables that had evidence of a linear relationship in linear or log (base 10) units. The relative strengths of these relationships were described by the magnitude of R<sup>2</sup>. All statistical analyses were conducted using S-PLUS<sup>TM</sup> statistical software (version 4.5, MathSoft, Inc.).

#### 3.1 SEDIMENT SAMPLES

#### 3.1.1 Data Summary

The bulk sediment TBT concentrations (as TBT ion) ranged from a minimum of 8  $\mu$ g/kg dry weight at Station TBT-10 to a maximum of 6,600  $\mu$ g/kg dry weight at Station TBT-31 (Table 3-1). The concentrations of TBT in sediment ranged over 3 orders of magnitude. When the two lowest and two highest concentrations are excluded, the range from lowest to highest is only 30-fold. The variability of TBT concentrations measured among field homogenization replicates ranged from 6 to 31 percent for the four replicates tested. With the exception of Station TBT-01, there was a general trend of decreasing TOC and fractions of fine-grained material approaching the mouth of the waterway. Sediments collected adjacent to Harbor Island tended to be richer in organic material and finer than sediments collected from middle channel or east side stations. Overall, the TBT and organic carbon concentrations and grain-size characteristics were consistent with the sediments collected from previous studies in the West Waterway (EVS and Hart Crowser 1995).

Concentrations of TOC in bulk sediment (percent of dry weight) ranged from a minimum of 0.5 percent for Station TBT-10 to a maximum of 4.24 percent at Station TBT-34. Sediment grain-size analysis showed a minimum of 10.16 percent fines at Station TBT-01 and a maximum of 77.19 percent fines at Station TBT-12. As expected, sediment TOC correlated positively with percent fines. The sediment sample from Station TBT-34 was an exception to this correlation, having a high concentration of organic carbon and a low fraction of fine-grained material.

#### 3.1.2 Data Quality

All analyses were performed in a manner consistent with the methods and guidelines stated in the QAPP. No substantial deviations from the QAPP occurred. All recommended holding times were met for the sediment sample analyses. The results of all laboratory analyses including the case narrative, test sediments, and QA/QC samples are presented in Appendix B. The chemistry data were independently reviewed and validated by Quality by Design. The data are considered usable as reported and qualified. The complete data validation report is presented in Appendix F.

		TOTAL ORGANIC	TOTAL					
STATION	TBT Ion (µg/kg)	CARBON (%)	SOLIDS (%)	GRAVEL	SAND (%)		CLAY	FINES
TBT-01	<u>(49/19)</u> 31	0.58	74.3	<u>(%)</u> 11.8	78.0	<u>(%)</u> 6.48	<u>(%)</u> 3.68	<u>(%)</u>
TBT-02	730	2 09	54 8	0 17	33.6	45.7	20.6	10.2
TBT-03	540	2.03	53.5	5.40	30 9	45.7 39.8	20.0	66.3 63.7
TBT-04	330	1.10	64 2	1.11	58.4	25.3	23.9 15 2	40.5
TBT-05	680	1.83	52 6	0 00	32 6	44.0	23 4	40.5 67.4
TBT-06	660	1.80	52 0 53 9	0.05	35 2	41.2	23.6	64.8
TBT-07	670	1.66	52.8	0.16	38.2	42.1	19.6	6 <b>1</b> .7
TBT-08	400	3.25	48.4	4.17	39.9	35.4	20.5	56.0
TBT-09	800	2.02	49.6	1.43	27.2	46.6	24.8	71.4
TBT-10	8	0.50	72 5	0 73	75.9	18.2	5.18	23.4
TBT-11	130	0.75	67 0	0.73	70.0	22.0	7.19	29.2
TBT-12	830	2.30	51.7	2.47	20.3	49.1	28.1	77.2
TBT-13	1,100	1.31	59.1	2.11	52.3	29.4	16.2	45.6
TBT-14	1,100	1.03	60.4	8.72	52.5	25.2	13.6	38.8
TBT-15	530	1.35	63.2	5.39	56.0	26.4	12.2	38.6
TBT-16	1,200	2.07	52.7	0.70	37.9	37.2	24.2	61.4
TBT-17	560	0.86	66.6	0.06	71.4	22.2	6.37	28.5
TBT-18	210	1.15	77.7	0.66	70.8	18 3	10.2	28.6
TBT-19	450	1.22	60.5	2.34	44.4	37.7	15.5	53.2
TBT-20	3,500	1.60	56.5	3.44	44.5	33.3	18.8	52.1
TBT-21	610	1.23	61 1	1.17	52.2	33.9	12.8	46.6
TBT-22	350	0.94	64.8	0.13	61.5	27 8	10.5	38.3
TBT-23	510	0.93	65 5	0.03	61.6	27.7	10.6	38.3
TBT-24	570	1.27	60.0	0.13	50.9	34.6	14.4	49.0
TBT-25	310	1.12	63.6	0.85	44.7	42.4	12.0	54.4
TBT-26	1,100	1.21	60.0	1.14	70.6	19.0	9.25	28.3
TBT-27	730	1.45	63.4	10.5	54.1	24.6	10.8	35.5
TBT-28	690	1 22	60.0	0.08	52.0	35.5	12.4	47.9
TBT-29	6,200	2 41	46 3	1.21	53.5	30 7	14.6	45.3
ТВТ-30	310	1.28	61.2	1.17	42.6	42.1	14.2	56.3
TBT-31	6,600	1 70	51.0	5.09	58.7	25.2	11.1	36.3
TBT-32	2,200	0.99	61.8	0.33	67.6	22.0	10.1	32.1
твт-33	1,000	1.25	61 1	0.59	80.9	12.8	5.70	18.5
TBT-34	850	4.24	51.6	27 3	42.8	18.7	11.2	29.9
TBT-35*	650	1.89	55.6	0 00	33.2	44.9	22.0	66.8
TBT-36⁵	970	1 71	54.1	0 53	40.2	39.6	19.6	59.3
TBT-37°	1,000	1.22	63.2	9.68	51.1	25 9	13.3	39.2
TBT-38⁴	650	1 40	61.3	0.48	51.4	36 0	12 1	48.2

1

#### Table 3-1. Sediment chemistry and conventional parameters

\* Homogenate replicate collected at station TBT-02.

<sup>b</sup> Homogenate replicate collected at station TBT-07.

<sup>c</sup> Homogenate replicate collected at station TBT-14.

<sup>d</sup> Homogenate replicate collected at station TBT-28

#### 3.2 **POREWATER SAMPLES**

#### 3.2.1 Data Summary

TBT concentrations (as TBT ion) in unfiltered porewater ranged from a minimum of 0.01  $\mu$ g/L at Station TBT-10 to a maximum of 1.87  $\mu$ g/L at Station TBT-31 (Table 3-2). TBT concentrations (as TBT ion) in filtered porewater ranged from a minimum of 0.01  $\mu$ g/L at Station TBT-10 to a maximum of 1.49  $\mu$ g/L at Station TBT-31.

DOC concentrations in unfiltered porewater ranged from a minimum of 7.8 mg/L at Station TBT-10 to a maximum of 39.9 mg/L at Station TBT-25. DOC concentrations in filtered porewater ranged from a minimum of 6.3 mg/L at Station TBT-33 to a maximum of 32.9 mg/L at Station TBT-25 (Table 3-2).

The effect of filtering the samples can be evaluated by comparing the TBT concentrations in unfiltered and filtered porewater, as well as the differences between unfiltered DOC and filtered DOC concentrations. In general, the filtered samples had lower TBT concentrations than the unfiltered samples, although one sample had a filtered concentration that was 22 percent higher than the unfiltered concentration. The greatest loss of TBT was 69 percent of the unfiltered concentration. The mean change in concentration over all porewater samples was a loss of 30 percent of the initial or unfiltered TBT concentrations. In general, the filtered DOC concentrations were less than the corresponding unfiltered DOC concentrations, although one sample, TBT-27, had a DOC concentration that was 107 percent of the unfiltered DOC concentration. The greatest loss was 42 percent of the unfiltered DOC concentration. The greatest loss was a loss of 7 percent of the unfiltered DOC concentration. If sample TBT-27 is excluded from the mean, the mean was a loss of 10 percent of the unfiltered DOC concentration.

There was no consistent relationship between the concentration of TBT in unfiltered and filtered samples and the difference between the unfiltered DOC and filtered DOC concentrations. The samples with the greatest loss of TBT did not correspond to the samples with the greatest difference between their unfiltered DOC and filtered DOC concentrations. Most of the differences were within the range of analytical uncertainty.

The homogenate replicate relative percent differences (RPDs) for TBT and DOC measured in filtered porewater ranged from 23 to 87 percent and 12 to 73 percent, respectively. The homogenate replicate RPDs for TBT and DOC measured in unfiltered porewater ranged from 14 to 53 percent and 2 to 78 percent, respectively.

	•			
STATION	TBT-Filtered (μg/L)	FILTERED DISSOLVED ORGANIC CARBON (mg/L)	TBT-UNFILTERED	UNFILTERED DISSOLVED ORGANIC CARBON (mg/L)
TBT-01	0.02	10.2	0.06	13.8
TBT-02	0.38	8.7	0.48	10.5
TBT-03	0.45	19.7	0.51	24.7
TBT-04	0.15	17.2	0.29	19.6
TBT-05	0.16	12.9	0.22	14.8
TBT-06	0.11	14.0	0.30	15.9
TBT-07	0.13	12.5	0.16	11.0
TBT-08	0.21	14.3	0.38	15.2
TBT-09	0.21	12.7	0.27	12.6
TBT-10	0.01	7.6	0.01	7.8
TBT-11	0.07	12.2	0.10	21.2
TBT-12	0.24	17.4	0.51	18.9
TBT-12R <sup>a</sup>	0.37	nr	0.46	nr
TBT-13	0.37	7.4	0.47	8.8
TBT-14	0.31	16.3	0.58	16.9
TBT-15	0.13	11.4	0.24	13.3
TBT-16	0.44	15.3	0.36	15.0
TBT-17	0.02	8.9	0.02	8.4
TBT-18	0.06	14.6	0.08	15.4
TBT-19	0.06	7.7	0.08	8.5
TBT-20	0.41	14.3	1.01	16.6
TBT-21	0.38	13.8	0.51	15.7
TBT-22	0.09	24.7	0.29	32.7
TBT-23	0.14	14.1	0.24	14.6
TBT-24	0.14	17.0	0.33	18.7
TBT-25	0.26	32.9	0.44	39.9
TBT-26	0.13	13.1	0.17	13.3
TBT-27	0.71	29.6	0.97	14.3
TBT-28	0.64	17.4	0.74	18.5
TBT-29	1.29	9.4	1.87	10.7
TBT-30	0.76	30.0	0.90	22.4
TBT-31	1.49	14.5	1.50	15.1
TBT-32	0.28	16.4	0.35	18.7
TBT-33	0.09	6.3	0.11	8.0
TBT-34	0.14	14.4	0.19	18.6
TBT-35⁵	0.15	18.6	0.28	24.0
TBT-36°	0.19	11.1	0.26	11.2
TBT-37₫	0.58	19.8	0.85	24.3
TBT-38°	0.51	22.4	0.64	28.0

Table 3-2. Filtered and unfiltered pore	ewater chemistry
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NOTE: nr - not reported

Homogenate replicate collected at station TBT-07.

\* Reanalyzed sample.

Homogenate replicate collected at station TBT-14.

<sup>b</sup> Homogenate replicate collected <sup>e</sup> at station TBT-02.

Homogenate replicate collected at station TBT-28.

c

đ

The difference in measurements between the replicates can be attributed to analytical variability, matrix complexity, and sediment heterogeneity.

#### 3.2.2 Data Quality

All analyses were performed in a manner consistent with the methods and guidelines of the QAPP with the following exceptions:

- The recommended holding time of 7 days, which included collection, extraction, and analysis, was met for 64 of the 76 porewater samples. However, the filtered and unfiltered porewater samples from Stations TBT-15, TBT-16, TBT-17, TBT-18, TBT-19, and TBT-20, were mishandled at the analytical laboratory and had to be re-extracted from the bulk sediment and reanalyzed. The re-extraction was performed 12 days after the samples were collected. An additional sample from Station TBT-12 was also re-extracted and re-analyzed to provide a basis for comparing samples that met their holding times with samples that did not. The results from the second analysis of TBT-12 were within 35 percent and 11 percent of the initial results for filtered and unfiltered porewater, respectively. These measurements are within the data quality objectives for precision of  $\pm$  40 percent as outlined in the QAPP (EVS 1998). Therefore, all data are considered usable as reported and qualified.
- The laboratory inadvertently performed the centrifugation at speeds in rpms rather than in Gs. This resulted in the second centrifugation being performed at the higher rate of 14,300 G (9,000 rpm) rather than the recommended 9,000 G.

The results of all laboratory analyses, including the case narrative and results for porewater and QA/QC samples, are presented in Appendix C. The chemistry data were independently reviewed and validated by Quality by Design. The complete data validation report is presented in Appendix F.

#### 3.3 BIOACCUMULATION TESTING

Survival in the native control sediments was 95 percent for *M. nasuta* and 66 percent for *N. caecoides*. If an outlier *N. caecoides* replicate which had 33 percent survival is removed, mean survival in control sediments was 74 percent for *N. caecoides*. Both a low TOC content of 0.07 percent in the control sediment and the extended exposure

period may have been contributing factors to reduced survival.<sup>2</sup> Survival of *M. nasuta* in test sediments ranged from 93.3 percent to 100 percent, with a mean survival of 97.1 percent. Survival of *N. caecoides* in test sediments ranged from 64.4 percent to 95.6 percent, with a mean survival of 83.96 percent. The relative good health of *N. caecoides* in the test treatments suggests that this organism's poor survival in control sediment was not the result of a weak strain of test organism or due solely to the duration of the test.

All water quality parameters were within acceptable ranges throughout the test. The water-only reference toxicant tests using copper resulted in an LC50 of 2.05 mg/L Cu for M. nasuta, which is within the laboratory acceptable range of 0.28 mg/L - 2.8 mg/L Cu; and an LC50 of 0.10 mg/L Cu for N. caecoides, which is within literature reported values 0.09 mg/L to 0.16 mg/L Cu (Appendix D). Based on the results of the organism survival, reference toxicant tests, and water quality observations, the bioaccumulation tests are considered acceptable. Table 3-3 presents the survival data for M. nasuta and N. caecoides. The complete case narrative for the bioaccumulation tests, including water quality observations and reference toxicant results, is found in Appendix D.

<sup>2.</sup> The supplier of *N. caecoides* (John Brezina and Associates, Dillon Beach, CA) collects the organisms and the control sediment from two nearby, but slightly different sites. The organisms are collected from an area of high population density and high amount of organic debris. In previous studies at several laboratories the organic debris has interfered with the use of the sediment at this site as a negative control, because of the effects of organic debris decaying during sediment holding. Therefore, control sediments have intentionally been collected from a nearby site with less organic debris, where *N. caecoides* is present at lower population densities. It is possible that the TOC content of the control sediment collected for this study was too low to support the required number of organisms for the extended duration (45 days) of the test, despite periodic sediment replenishment (Gardiner pers. comm. 1999b).

	N. CAEC	OIDES	M. NASUTA		
TREATMENT	MEAN PERCENT SURVIVAL	STANDARD DEVIATION	MEAN PERCENT SURVIVAL	STANDARD DEVIATION	
Native Control	65 8	25.1	95.3	4.5	
TBT-02	95 6	na	100.0	na	
TBT-04	88.9	na	96.7	na	
TBT-05	88.9	na	96.7	na	
TBT-07	88.9	na	96.7	na	
TBT-08	68.9	na	100.0	na	
TBT-09	86.7	na	100.0	na	
TBT-11	82.2	na	100.0	na	
TBT-12	88.9	na	93.3	na	
TBT-13	87.1	7.4	93.3	7.8	
TBT-14	88.9	na	96.7	na	
TBT-15	64.4	na	96.7	na	
TBT-18	88.9	na	96.7	na	
TBT-19	87.6	80	98.0	3.0	
TBT-20	68.9	na	96.7	na	
TBT-21	77.8	na	93.3	na	
TBT-22	64.4	na	93.3	. na	
TBT-24	91.1	na	100.0	na	
TBT-26	91.1	na	100.0	na	
TBT-28	91.1	na	96.7	na	
TBT-30	88.9	4.2	96.7	5.8	

# Table 3-3. Summary of survival of *M. nasuta* and*N. caecoides* in 45-day bioaccumulation tests

NOTE: na - not applicable; one replicate

#### 3.4 TISSUE SAMPLES

#### 3.4.1 Data Summary

TBT concentrations in *M. nasuta* ranged from a minimum of  $4 \mu g/kg$  wet weight at Station TBT-08 to a maximum of  $380 \mu g/kg$  wet weight at Station TBT-20 (Table 3-4). The percent lipids in *M. nasuta* ranged from a minimum of 2.86 percent dry weight at Station TBT-07 to a maximum of 5.26 percent dry weight at Station TBT-28.

		M. NASUTA			N. CAECOIDES	1
STATION	TBT (µg/kg wet wt)	LIPIDS (% dry wt)	TOTAL SOLIDS (%)	TBT (µg/kg wet wt)	Lipids (% dry wt)	TOTAL SOLIDS (%)
TBT-00°	2 O U	4.66	16 6	20 U	6.23	19.9
TBT-02	21	4.05	16.3	118	6.07	11 7
ТВТ-04	99	4.30	15.8	92	6.71	15 8
TBT-05	15	4.76	14 7	117	7 78	18 0
ТВТ-07	52	2.86	15 4	129	8.82	14.4
твт-08	4 0	4.53	15 0	15	6 59	17 0
ТВТ-09	18	4.31	16.0	114	5 35	21.3
TBT-11	13	4 23	15 6	101	5.78	18 5
TBT-12	25	4.83	14.7	134	6.97	16.5
TBT-13ª	177	4.02	15 2	211	5.79	19.1
TBT-14	94	4.88	16 6	192	5.96	17 8
TBT-15	9.0	3.67	15.0	131	4 94	17.2
TBT-18	25	3.46	15.9	90	5.82	17.7
TBT-19ª	30	5.22	15 2	68	5 51	16.3
TBT-20	376	4.15	14.7	384	5.70	16.5
TBT-21	14	4.11	15.1	120	7.43	14.4
TBT-22	10	3.95	15.2	89	6 80	16.9
TBT-24	11	4.81	15.8	104	5.96	19.3
TBT-26	195	4 39	15.5	359	5.30	16.4
TBT-28	43	5.26	15.4	130	8.00	14.5
TBT-30⁴	47	4 13	15.1	66	8.95	15.9

#### Table 3-4. Tissue chemistry for M. nasuta and N. caecoides

NOTE: U - not detected at detection limit shown

Mean of five replicates.

a

TBT concentrations in *N. caecoides* ranged from a minimum of 15  $\mu$ g/kg wet weight at Station TBT-08 to a maximum of 380  $\mu$ g/kg wet weight at Station TBT-20. The percent lipids in *N. caecoides* ranged from a minimum of 4.94 percent dry weight at Station TBT-15 to a maximum of 8.95 percent dry weight at Station TBT-30.

The relationships among porewater, sediment, and tissue TBT concentrations are analyzed and discussed in Section 4.3.

The mean, standard deviation, and coefficient of variation (standard deviation/mean) of TBT concentrations for the bioaccumulation replicates are presented in Table 3-5.

	STATION			
	TBT-13	TBT-19	TBT-30	
M. nasuta				
Mean ( $\mu$ g/kg wet wt)	177	29.8	47.4	
Standard deviation ( $\mu$ g/kg wet wt)	102	21.8	36.9	
Coefficient of variation	57.7%	73.2%	77.9%	
N. caecoides				
Mean ( $\mu$ g/kg wet wt)	211	67.8	65.6	
Standard deviation ( $\mu$ g/kg wet wt)	17.4	7.16	10.1	
Coefficient of variation	8.3%	10.6%	15.3%	

# Table 3-5. Tributyltin concentrations forreplicated bioaccumulation tests

This table clearly shows that results for *M. nasuta* were more variable than results for *N. caecoides*. The difference in variability between the tissue values in *M. nasuta* and *N. caecoides* is possibly due to the inherent variability of feeding regimes of the two species. *N. caecoides* is a mobile sediment deposit feeder whose feeding activities result in a greater integration of sediment within the aquaria. *M. nasuta* is a more stationary organism that feeds on surface sediments and filters overlying water. Greater variability in *M. nasuta* tissue concentrations may be due to the fact that feeding is limited to sediment in the organism's immediate vicinity. Any heterogeneity in sediment TBT concentrations. The coefficients of variation are highly consistent across replicates for intraspecies comparisons.

From a statistical standpoint, the fit of a regression line can be evaluated using  $R^2$  values defined as the percent of total variability in tissue concentrations "explained" by the regression model. The residual, or "unexplained" variance can be broken down into pure error, or the intrinsic variability among replicates as shown in Table 3-5, plus the lack-of-fit error associated with deviations from the linear model. While the absolute magnitude of the replicate variability for *M. nasuta* is larger than that for *N. caecoides*, what is relevant is whether the ratio of replicate variability to residual variance is greater for one species than for the other. For a fixed  $R^2$  value, if the replicate variability for one species makes up a greater proportion of the residual variance, this suggests a better linear fit because it means that the lack-of-fit error makes up a smaller proportion of the residual variance. However, neither of the regression models is subsequently used, because of poor overall fit; whether the source of this poor fit is intrinsic variability in the test or a poor linear fit is irrelevant.

#### 3.4.2 Data Quality

All analyses were performed consistent with the methods and guidelines as stated in the QAPP. All recommended holding times were met for the tissue sample analyses. Because of an error in initial extraction of the sample for the lipid analysis, CAS re-extracted and analyzed the samples for lipids using the method in Bligh and Dyer (1959) referenced in the QAPP. The re-analysis occurred within the recommended holding time of 1 year. For the *N. caecoides* control samples, the sample quantity available limited re-analysis to one sample replicate. Since the replicate sample was created from a composite, the lipid result should be considered representative of each of the replicates originally tested. The data are considered usable as reported and qualified. The results of all laboratory analyses, including the case narrative, test tissues, and QA/QC samples, are presented in Appendix E. The chemistry data were independently reviewed and validated by Quality by Design. The complete data validation report is presented in Appendix F.

At the completion of the test, lipid contents were within the range expected for healthy organisms based on the mean values from previous studies—M. nasuta 1.4 to 6.3 percent; polychaetes 5.0 to 16.7 percent; no specific data for N. caecoides (Gardiner pers. comm. 1999a). The range for M. nasuta was 2.86 to 5.26 percent dry weight and the range for N. caecoides was 4.94 to 8.95 percent dry weight.

### 4.0 DISCUSSION

The bioavailability of sediment contaminants has been shown to be affected both by the chemical and environmental speciation of the contaminant, and by the behavior and physiology of the organisms. The two primary routes of exposure for organisms in sediments are transport of dissolved contaminants in sediment porewater across biological membranes and the ingestion of contaminated sediment particles. Exposure to dissolved contaminant concentrations in sediment porewaters appears to be the predominant route of exposure for many benthic organisms (Muir et al. 1985; Oliver 1987; Shaw and Connell 1987). However, exposure from sediment ingestion may be an important route of exposure for some species (Landrum 1989; Harkey et al. 1994; Meador et al. 1995).

TBT in marine sediments can exist in a variety of different forms, including TBT sorbed to sediment particles, and, in sediment porewaters, free ions, inorganic TBT complexes, and TBT associated with organic colloids. TBT has a relatively high affinity for organic carbon, reflected in the measured octanol-water partition coefficient (log  $K_{ow}$ ) for this compound of 4.41 (Arnold et al. 1998). Several studies have shown that the distribution of TBT between sediment particles and porewater can be related to the organic carbon content of the sediment (Harris and Cleary 1987; Meador et al.1997). TBT sorption has also been related to the clay content of sediments (Dooley and Homer 1983). Several authors have suggested that the presence of TBT associated with paint chips in the sediment can influence the bioavailability of the compound in the field (Parametrix 1995; Weston 1996).

During this study, the second centrifugation of the porewater samples that was conducted for 30 minutes at 9,000 rpm removed suspended particulate material and a substantial fraction of the large colloidal material. The remaining samples were then analyzed directly or filtered through a 0.45 micron filter and analyzed. Both the filtered and unfiltered porewater samples contained dissolved TBT and possibly TBT associated with colloidal organic macromolecules that were not removed during the centrifugation of the sample.

The TBT concentrations measured in *N. caecoides* are compared with the bulk sediment and porewater concentrations measured for the same samples used in the bioaccumulation testing in Table 4-1 and Figure 4-1.

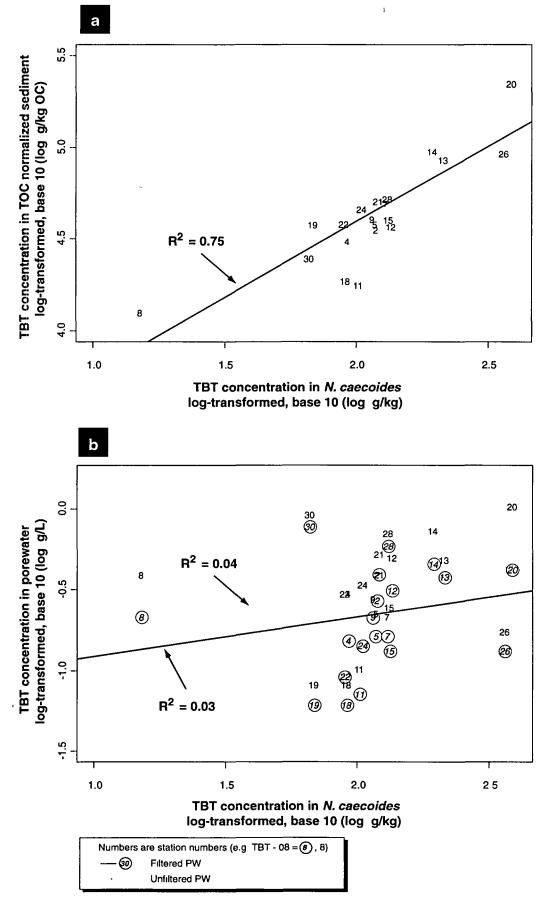
	N. CAECOIDES (µg/kg)			Sediment (µg/kg)		Porewater (µg/L)	
	WET	DRY					
Rank <sup>®</sup>	WEIGHT	WEIGHT	STATION	BULK	TOC-NORMALIZED	FILTERED	UNFILTERED
1	15.0	88.0	TBT-08	400	12,300	0.21	0.38
2	65.6 <sup>⊳</sup>	417	TBT-30	310	24,200	0.76	0.90
3	<b>67.8</b> ⁵	416	TBT-19	450	36,900	0.06	0.08
4	89.0	527	TBT-22	350	37,200	0.09	0.29
5	90.0	508	TBT-18	210	18,300	0.06	0.08
6	92.0	582	TBT-04	330	30,000	0.15	0.29
7	101	546	TBT-11	130	17,300	0.07	0.10
8	104	539	TBT-24	570	44,900	0.14	0.33
9	114	535	TBT-09	800	39,600	0.21	0.27
10	117	650	TBT-05	680	37,200	0.16	0.22
11	118	1,010	TBT-02℃	690	34,700	0.27	0.38
12	120	833	TBT-21	610	49,600	0.38	0.51
13	129	896	TBT-07°	820	48,700	0.16	0.21
14	130	897	TBT-28°	670	51,100	0.57	0.69
15	131	762	TBT-15	530	39,300	0.13	0.24
16	134	812	TBT-12	830	36,100	0.30	0.48
17	192	1,080	TBT-14 <sup>c</sup>	1,050	93,300	0.45	0.71
18	211 <sup>b</sup>	1,140	TBT-13	1,100	84,000	0.37	0.47
19	359	2,190	TBT-26	1,100	90,900	0.13	0.17
20	384	2,330	TBT-20	3,500	219,000	0.41	1.01

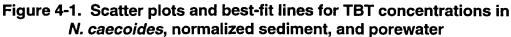
#### Table 4-1. TBT concentrations in *N. caecoides*, sediment, and porewater

<sup>a</sup> Rank order determined by TBT concentration in *N. caecoides* (wet weight).

<sup>b</sup> Average of 5 replicate bioassays.

<sup>c</sup> Sediment concentrations at these stations are means of two homogenate replicates (see Table 3-1).





ENTERPRISE\ESI\8/203-16.3\DELIVER\GRAPHICS\FIG.4-1

The relationship between the *N. caecoides* tissue concentrations and the organic carbonnormalized sediment concentrations appears to be stronger than the relationship with the filtered and unfiltered porewater concentrations. These relationships will be explored in more detail in the following sections.

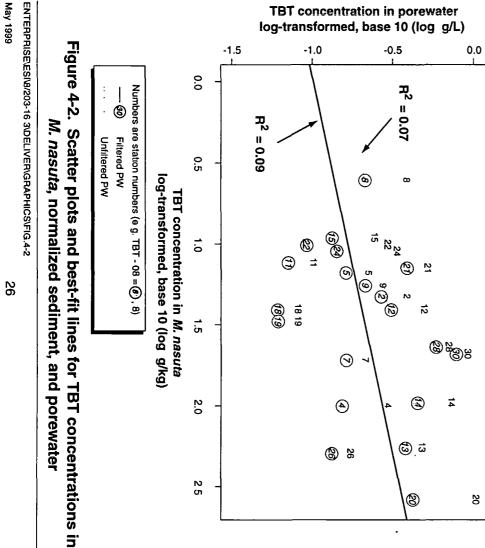
The TBT concentrations measured in *M. nasuta* are compared with the sediment and porewater TBT concentrations in Table 4-2 and Figure 4-2. In general, the *M. nasuta* tissue concentrations are lower than the corresponding *N. caecoides* tissue concentrations. As was observed with the *N. caecoides* tissue concentrations, the relationship between tissue concentrations and the organic carbon-normalized sediment concentrations is stronger than the relationship between the tissue concentrations and the porewater concentrations.

M. nasuta (μg/kg)			SEDIMENT (µg/kg)		POREWATER (µg/L)		
RANK <sup>a</sup>	WET WEIGHT	DRY WEIGHT	STATION	BULK	TOC-NORMALIZED	FILTERED	UNFILTERED
1	4.0	24.0	TBT-08	400	12,300	0.21	0.38
2	9.0	52.0	TBT-15	530	39,300	0.13	0 24
3	10.0	59.0	TBT-22	350	37,200	0.09	0 29
4	11.0	57.0	TBT-24	570	44,900	0.14	0 33
5	13.0	70.0	TBT-11	130	17,300	0.07	0.10
6	14.0	97.0	TBT-21	610	49,600	0.38	0.51
7	15.0	83.0	TBT-05	680	37,200	0.16	0.22
8	18.0	85.0	TBT-09	800	39,600	0.21	0.27
9	21.0	179	TBT-02	690	34,700	0.27	0 38
10	25.0	152	TBT-12	830	36,100	0.30	0.48
11	25.0	141	<b>TBT-18</b>	210	18,300	0.06	0.08
12	<b>29.8</b> ⁵	195	TBT-19	450	36,900	0.06	0.08
13	43.0	297	TBT-28	670	51,100	0.57	0.69
14	47.4 <sup>b</sup>	321	<b>TBT-30</b>	310	24,200	0.76	0.90
15	52 0	361	TBT-07	820	48,700	0 16	0 21
16	94.0	528	TBT-14	1,050	93,300	0.45	0 71
17	99.0	627	TBT-04	330	30,000	0.15	0 29
18	177 <sup>⊳</sup>	911	TBT-13	1,100	84,000	0.37	0 47
19	195	1,190	TBT-26	1,100	90,900	0.13	0.17
20	376	2,280	TBT-20	3,500	219,000	0.41	1.01

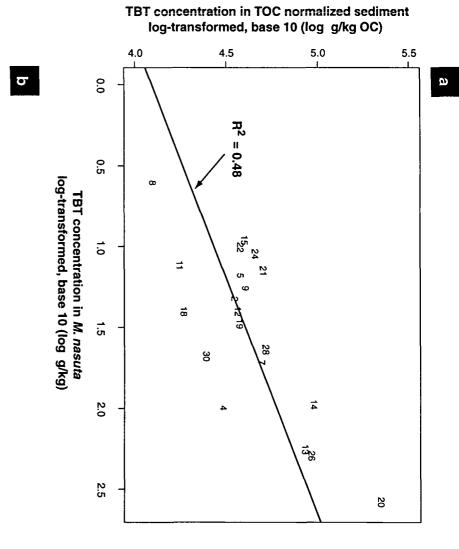
#### Table 4-2. TBT concentrations in *M. nasuta*, sediment, and porewater

<sup>a</sup> Rank order determined by TBT concentration in *M. nasuta* (wet weight).

<sup>b</sup> Average of 5 replicate bioassays



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## 4.1 COMPARISON WITH TRIGGER VALUES

None of the measured tissue concentrations exceeded the USEPA Superfund site-specific tissue trigger value of  $0.6 \,\mu g/g$  wet weight ( $3.0 \,\mu g/g$  dry weight) (ESI 1999). The highest measured tissue concentrations were  $0.376 \,\mu g/g$  wet weight for *M. nasuta* and  $0.384 \,\mu g/g$  wet weight for *N. caecoides*, both measured in the test conducted with sediment from Station TBT-20.

The measured tissue concentrations of TBT for both *N. caecoides* and *M. nasuta* were low, despite the presence of TBT in both the bulk sediment and porewaters. The relationship between the measured tissue concentrations and the sediment and porewater concentrations of TBT is explored in detail in Section 4.3.

## 4.2 DELINEATION OF WSOU

The results of the bioaccumulation testing did not identify any of the areas tested as being of concern due to the bioaccumulation of TBT from the sediments.

## 4.3 COMPARISON OF TISSUE, SEDIMENT, AND POREWATER TBT CONCENTRATIONS

Sediment bioaccumulation testing was conducted using *M. nasuta* and *N. caecoides*, as described in Section 2.2.3. In the following sections, the measured TBT concentrations in tissue for these species are compared with the measured concentrations of TBT in bulk sediment, organic carbon-normalized sediments, and porewater.

For each comparison, exploratory data analyses were used to determine whether there was any evidence of a linear relationship in the original or log-transformed units. Linear regressions were applied to those pairs of variables which had evidence of a linear relationship on some scale. Standard residual diagnostic techniques were used to determine whether the fit of the linear model could be improved by transformation. All statistical analyses were conducted using S-PLUS<sup>™</sup> statistical software (Version 4.0, MathSoft, Inc.).

Correlation and regression analyses can be very sensitive to the data distribution, and to outliers (recorded measurements far from the trend of the bulk of the data). For this reason, the data were transformed or outliers were removed in order to assess the impact of outliers on the linear relationship. These actions were intended to result in the most accurate measure of linear association between the two variables, and did not always result in the highest correlation or  $R^2$  value. The parameter estimates displayed in the figures and tables represent the best linear fit for each hypothesized relationship.

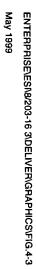
It is important to note that  $R^2$  is a descriptive measure of the linear association between the dependent and independent variables in each model. Intercept and slope estimates are given for completeness. The presentation of these estimates does not imply that adequate or meaningful predictions can be made on exact bioaccumulation values using this model. Unbiased calculation of parameter estimates and confidence intervals relies on the assumption that the measurements of the independent variable are obtained without error, or at least that the measurement error is small when compared to the measurement error on the dependent variable (bioaccumulation). For most of these regressions, the independent variable was subject to random measurement error which may or may not be smaller in magnitude than the measurement error in the dependent variable. Hypothesis tests and confidence intervals were intentionally not calculated, since the intercept and slope estimates are likely to be biased.

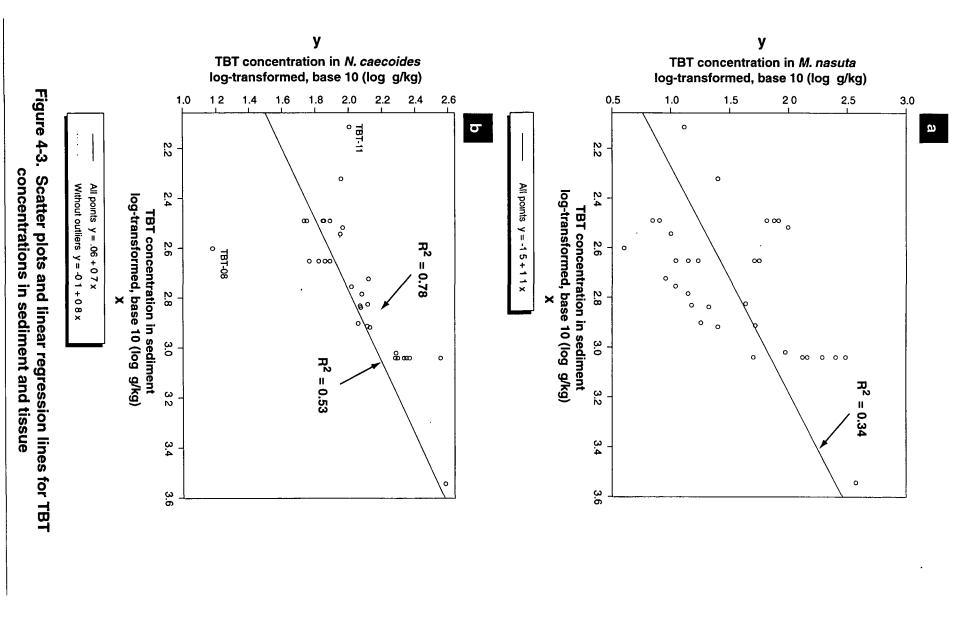
#### 4.3.1 Comparison of Tissue Concentrations and Sediment Concentrations

A comparison was made between TBT concentrations in tissue and those in bulk sediment (Figure 4-3). A stronger relationship was observed between TBT concentrations in sediment and the tissue concentrations for *N. caecoides* than for *M. nasuta*, which is reflected in  $\mathbb{R}^2$  values for each of the regressions (Table 4-3). In addition, the relationship between the tissue concentrations and the organic carbon-normalized sediment TBT concentrations was examined (Figure 4-4). For the complete dataset, the relationship between the tissue concentrations and the organic carbon-normalized sediment concentrations was stronger for both *M. nasuta* and *N caecoides* than the relationship between the tissue concentrations and the bulk sediment concentrations (Table 4-3). When potential outliers are removed, the  $\mathbb{R}^2$  values are similar (Table 4-3).

## Table 4-3. Relationship between tissue concentrations and bulk and organic carbon-normalized sediment concentrations

ÎNDEPENDENT VARIABLE	Log TRANSFORMED?	DEPENDENT VARIABLE	Log Transformed?	R²	POTENTIAL OUTLIERS	R <sup>2</sup> WITH OUTLIERS EXCLUDED
Sediment concentration	Yes	<i>M. nasuta</i> tissue conc.	Yes	0.34		
Sediment concentration	Yes	<i>N. caecoides</i> tissue conc.	Yes	0.53	TBT-08, TBT-11	0.78
Sediment TOC-normalized	Yes	<i>M. nasuta</i> tissue conc.	Yes	0.48		
Sediment <u>TOC-normalized</u>	Yes	N. caecoides tissue conc.	Yes	0.75	TBT-08	0.74





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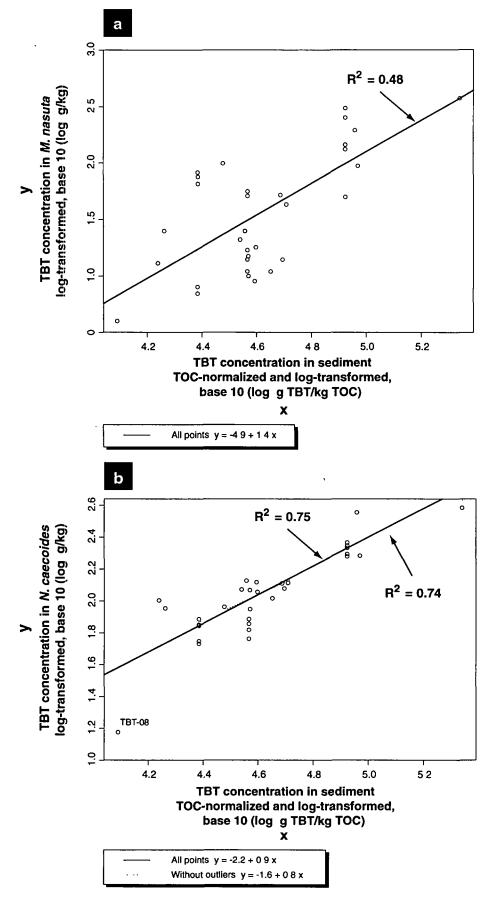
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# Figure 4-4. Scatter plots and linear regression lines for TOC-normalized TBT concentrations in sediment and TBT concentrations in tissues

## 4.3.2 Comparison of Tissue Concentrations and Porewater Concentrations

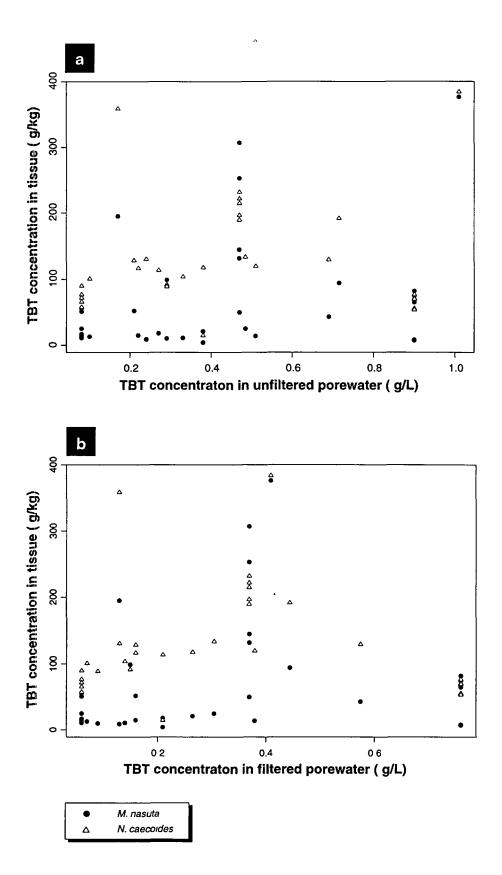
An initial comparison of TBT concentrations in tissue with TBT concentrations in unfiltered and filtered porewater revealed no relationship between the concentrations in tissue and the concentrations in porewater measured by either method (Figure 4-5).

Concentrations in tissue were then compared to concentrations in porewater normalized for their organic content. TBT concentrations in tissue measured in both species were compared to TBT concentrations measured in unfiltered porewater and normalized to the DOC content of the porewater samples (Figure 4-6). The linear regressions between the tissue concentrations and the porewater concentrations are weak for both species. The equations for the regression lines and the  $R^2$  values are presented in Table 4-4.

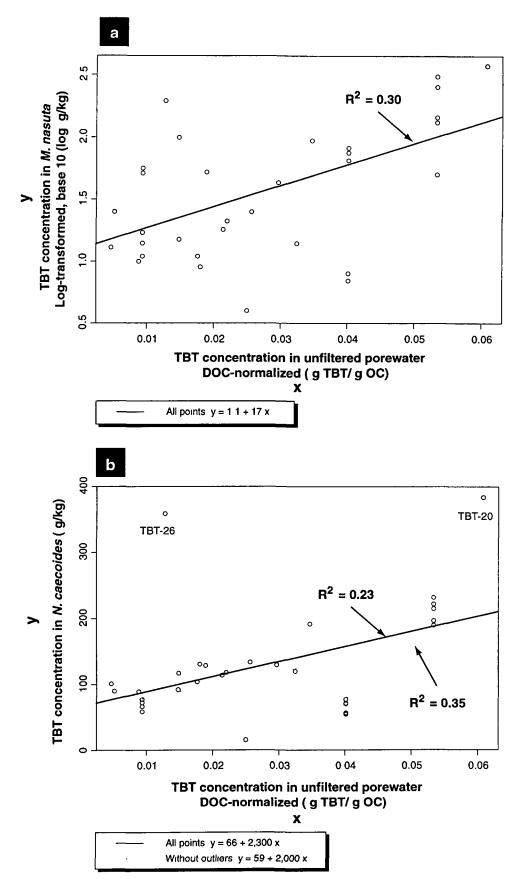
# Table 4-4. Relationship between tissue TBT concentrations and porewater TBT concentrations

INDEPENDENT VARIABLE	DEPENDENT VARIABLE	R²	POTENTIAL OUTLIERS	R <sup>2</sup> WITH OUTLIERS EXCLUDED
Unfiltered conc./DOC	<i>M. nasuta</i> tissue	0.30		
Unfiltered conc. /DOC	N. caecoides tissue	0.23	TBT-20, TBT-26	0.35
Filtered conc./DOC	<i>M. nasuta</i> tissue	0.31		
Filtered conc/DOC	N. caecoides tissue	0.21	TBT-20, TBT-26	0 55
Dissolved conc.	<i>M. nasuta</i> tissue	0.48		
Dissolved conc.	N. caecoides tissue	0.75	TBT-08	0.74

TBT concentrations measured in filtered porewater and normalized to the DOC concentrations measured in the porewater samples are compared to TBT concentrations in tissue in Figure 4-7. The relationship between the normalized TBT concentrations in filtered porewater and the concentrations in tissue are similar to those seen between normalized TBT concentrations in unfiltered porewater and the concentrations in tissue. The R<sup>2</sup> values presented in Table 4-3 reflect the variability of the data.

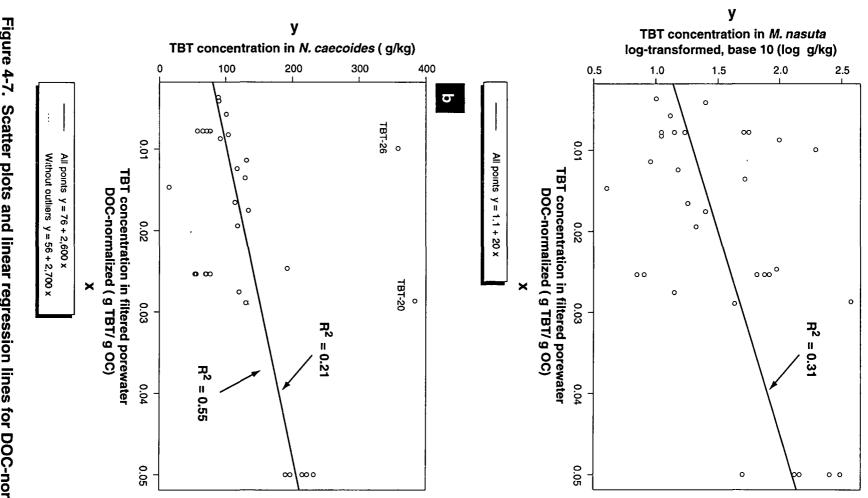








ENTERPRISE\ES\\8/203-16 3\DELIVER\GRAPHICS\FIG 4-7 May 1999



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# Figure 4-7. TBT concentrations in filtered porewater and tissue Scatter plots and linear regression lines for DOC-normalized

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## 4.4 SEDIMENT-POREWATER RELATIONSHIP

The sediment and the corresponding unfiltered and filtered porewater TBT concentrations are compared in Figure 4-8. The correlations between sediment and both the filtered and unfiltered porewater TBT concentrations were weak (Figure 4-8, Table 4-5). Station 17 was identified as a potential outlier in both plots. Station 10 was identified as a potential outlier in the plot of sediment vs. unfiltered porewater concentrations.

# Table 4-5. Relationship between bulk sediment concentrations of TBT and those in filtered and unfiltered porewater

INDEPENDENT VARIABLE	Log Transformed?	DEPENDENT VARIABLE	LOG TRANSFORMED?	R²	POTENTIAL OUTLIERS	R <sup>2</sup> WITH OUTLIERS EXCLUDED
Sediment concentration	Yes	Filtered porewater	Yes	0.56	TBT-17	0.64
Sediment concentration	Yes	Unfiltered porewater	Yes	0.52	TBT-10, TBT-17	0.44

Distribution coefficients ( $K_d$ ) can be calculated to express the relationship between measured sediment and porewater concentrations.

$$K_{d} = \frac{C_{sed}}{C_{pw}}$$

where:

 $C_{sed}$  = sediment concentration  $C_{nw}$  = porewater concentration

For organic contaminants, organic carbon-normalized distribution or partition coefficients  $(K_{\infty})$  are calculated using the following equation:

$$K_{oc} = \frac{K_d}{f_{oc}}$$

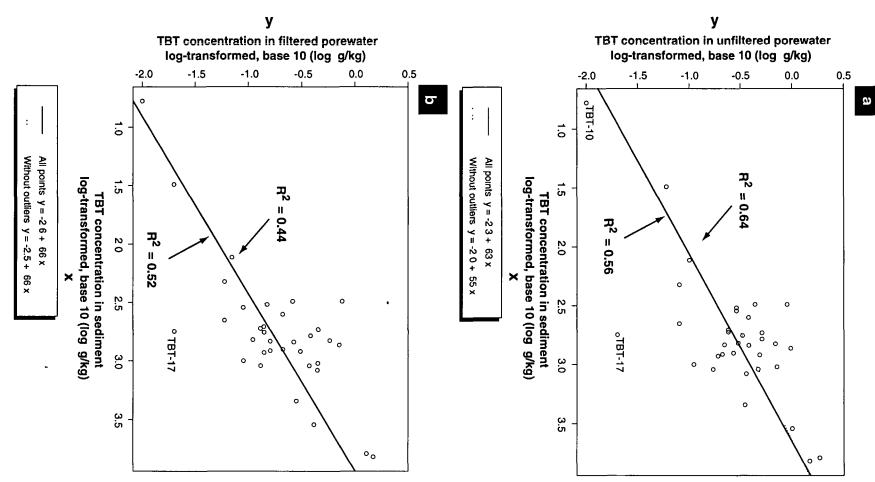
where:

 $f_{oc}$  = sediment fraction organic carbon

The calculation of  $K_{\infty}$  values is based on the assumption that the sediment organic carbon is controlling the distribution of the contaminant between the sediment and porewater.

ENTERPRISE/ESI/8/203-16 3/DELIVER/GRAPHICS/FIG.4-8 May 1999

Figure 4-8. Scatter plots and linear regression lines for TBT concentrations in sediment and porewater



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The mechanisms controlling the distribution of TBT in sediments are not well understood. In addition to the sediment fraction organic carbon, the chemical characteristics of the sedimentary organic matter, sediment mineralogy, and other sediment properties may influence the sorption behavior of TBT (Unger et al. 1996). Therefore, more variability may be expected in the calculation and use of  $K_{\infty}$  values for TBT relative to nonpolar organic compounds such as polychlorinated biphenyls.

Two  $K_{oc}$  values were calculated for each sediment sample, using the TBT concentrations in unfiltered and filtered porewater. The calculated distribution coefficients ranged over two orders of magnitude. The log  $K_{oc}$  values calculated using the unfiltered porewater concentrations ranged from 4.43-6.51. A similar range of values was calculated using the filtered porewater concentrations (log  $K_{oc}$ : 4.5-6.51).

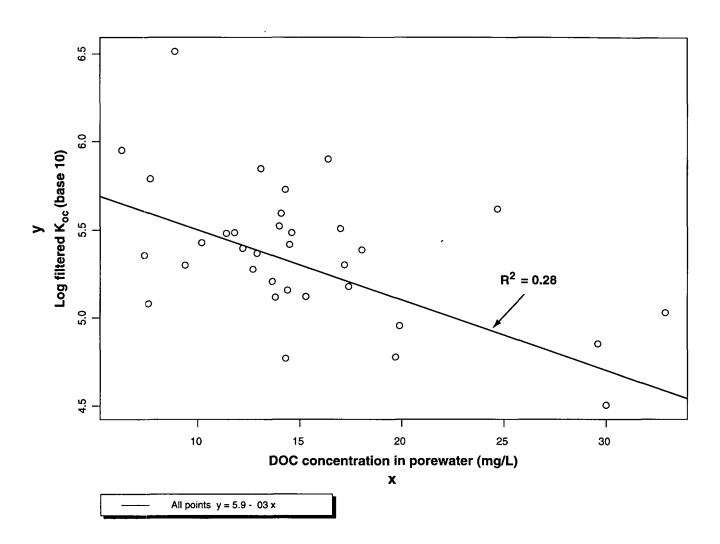
The relationship between the measured log  $K_{\infty}$  values and the measured DOC concentrations in the filtered porewater samples is illustrated in Figure 4-9. There is a trend of decreasing log  $K_{\infty}$  values with increasing DOC. However, the relationship between the two variables is weak ( $R^2 = 0.28$ ). Therefore, the presence of DOC does not appear to be contributing to the variability seen in the measured log  $K_{\infty}$  values.

## 4.5 SUMMARY AND CONCLUSIONS

Bioaccumulation testing was conducted with two species, *N. caecoides* and *M. nasuta*. None of the measured concentrations of TBT in tissue exceeded the USEPA Superfund site-specific tissue trigger value of  $0.6 \ \mu g/g$  wet weight  $(3 \ \mu g/g)$  dry weight) or the Respondents' trigger value of  $1.0 \ \mu g/g$  wet weight  $(5 \ \mu g/g)$  dry weight) (ESI 1999). Therefore, none of the areas sampled were identified as areas of concern on the basis of TBT bioaccumulation testing.

Further investigation into the relationships between the measured tissue concentrations and sediment and porewater TBT concentrations revealed that the strongest relationships were observed between tissue concentrations and bulk sediment and organic carbonnormalized sediment concentrations. The relationships between the tissue concentrations and the porewater concentrations were weak. In addition, a strong relationship was not observed between measured sediment and porewater TBT concentrations.

The effect of filtering the porewater samples can be evaluated by comparing the filtered and unfiltered porewater samples. Both the TBT and DOC concentrations were generally lower in the filtered porewater samples relative to the unfiltered samples. The greatest loss of TBT was 69 percent of the unfiltered concentration. The mean change in





concentration for all porewater samples was a loss of 30 percent of the unfiltered concentration. The greatest loss of DOC was a loss of 42 percent of the unfiltered DOC concentration. The mean difference for all porewaters was a loss of 7 percent of the unfiltered DOC concentration. There was no consistent relationship between the loss of TBT and the loss of DOC as a result of filtering. It is important to note that all the porewater samples were subject to ultrafiltration. Therefore, the unfiltered porewater DOC concentrations are not representative of the DOC concentrations that would be expected in the undisturbed porewater samples

A complete discussion of the uncertainties associated with the study design, study execution, and data analysis is contained in a separate technical memorandum (ESI 1999b).

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## **APPENDIX A**

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Navigation Report

## **BLUE WATER ENGINEERING**



4019 Phinney Ave. N. • Seattle, WA 98103 U.S.A. • Phone/Fax (206) 633-5567 • bluewater@seanet.com

July 19, 1998

Mr. Tim Hammermeister EVS Environment Consultants, Inc. 200 West Mercer, Suite 403 Seattle, WA 98117

Subject: West Waterway Sediment Operable Unit Sediment Sampling Positioning Report

Dear Tim:

Enclosed please find:

- 1. a final positioning report on the sediment sampling project and
- 2. a final invoice for the work.
- I will e-mail you the report text and the table of coordinates.

If you have any questions please call me at (206) 633-5567.

Best regards,

Tony Petrillo, P.E. BLUE WATER ENGINEERING

Enclosures





# **BLUE WATER ENGINEERING**

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## FINAL REPORT

POSITIONING METHODS AND COORDINATES FOR THE WEST WATERWAY SEDIMENT OPERABLE UNIT PROJECT, SEATTLE, WASHINGTON

Prepared for:

EVS Environment Consultants 200 West Mercer Street, Suite 403 Seattle, WA 98119

Prepared by:

Blue Water Engineering 4019 Phinney Avenue North Seattle, WA 98103 (206) 633-5567

July 1998

Seabed Survey • Positioning • Physical Oceanography • Coastal Engineering • Permitting Assistance Outfall Monitoring • Numerical Modeling • Analytical Computation • Programming • Special Projects



#### 1.0 INTRODUCTION

Blue Water Engineering of Seattle, WA was contracted by EVS Environment Consultants, Inc. to provide sampling vessel positioning services for the West Waterway Sediment Operable Unit Project near Harbor Island at the mouth of the Duwamish River in Seattle, WA. A positioning system was installed on the R/V Nancy Anne operated by Marine Sampling Systems of Burley, WA on Tuesday, July 14<sup>th</sup>. The sampling was conducted on Wednesday, July 15<sup>th</sup> through Friday, July 17<sup>th</sup>.

#### 2.0 STATION POSITIONING METHODOLOGY

#### 2.1 Differential Global Positioning System (DGPS)

Global positioning system (GPS) navigation was used to position the sampling vessel during the project. GPS is a satellite-based positioning system that receives positioning data from multiple satellites of known positions in space at 1 second intervals. The position of the GPS receiver, located on sampling vessel, is accurate to about + 50 meters in stand-alone mode. Sub-meter accuracies may be obtained by applying differential corrections to the standard GPS positioning data. This is known as DGPS. During this project differential corrections were applied by receiving GPS error corrections on the sampling vessel from the Coast Guard beacon differential corrections system.

This method utilizes differential corrections generated and transmitted by U.S. Coast Guard installations. The U.S. Coast Guard beacon transmits differential corrections data from a fixed position (in the Seattle area, on Vashon Island or Whidbey Island). The Coast Guard uses a high quality GPS receiver, such as a Trimble or Ashtech system, to generate differential corrections. The resultant accuracy of the combined system is better than + 1 meter.

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On the sampling vessel the GPS receiver sends differentially corrected positioning data to an integrated navigation software package called HYPACK. The GPS receiver displays and transmits data to the computer in North American Datum 1983 (NAD 83) geographic coordinates (latitude /longitude). HYPACK converts the NAD 83 geographic coordinates to NAD 83 Washington state plane - north zone coordinates. HYPACK, acting as a data manager, shows the vessel's position relative to a proposed sampling location in plan view to a video screen. The resultant pictorial screen presentation, as well as numeric navigation data including range and bearing to the target sampling location, assist the vessel operator in approaching and maintaining station while sampling.

#### 2.2 Mobilization

The Nancy Anne was mobilized on July 14<sup>th</sup> at Harbor Island Marina (HIM). The sampling vessel, used for hydraulic power-assisted sediment grab sampling, has the cabin aft and an A-frame on the bow. It was set up with the GPS antenna mounted vertically atop the A-frame as positioned during sampling. The GPS antenna cable was run from the top of the A-frame down the port side aft into the cabin. The GPS receiver, the Coast Guard beacon, and the laptop computer were located in the cabin. The video screen for the computer was oriented to allow the vessel operator to observe on-screen positioning data and maintain station.

2.3 Daily Sediment Sampling Positioning Activities

The routine for each day's positioning activities on the sampling vessel was similar. Once the GPS and computer equipment was operating properly the vessel left the dock for the calibration point located at the south end of the Fisher Mills dock in the west waterway (FM-4). The GPS antenna on the sampling vessel was positioned as close to the surveyed calibration point as possible. A visual estimate of the range and bearing from the monument to the GPS antenna was made and compared to the range and bearing displayed of the screen to confirm the accuracy of the positioning system. This was done at the start and end of each day.

The coordinates for the calibration point at FM-4 were determined by surveying in a point based on established coordinates located around Harbor Island. These coordinates were obtained from a 1992 USACE bathymetry map. All coordinates were originally surveyed in North American Datum (NAD) 1927 in Washington state plane coordinates - north zone. The coordinates were converted from NAD 1927 to NAD 1983 using the USACE coordinate conversion software package "CORPSCON" (version 4.01).

Once the positioning system calibration was complete the sampling vessel proceeded to a sample station location selected by the sampling party chief. The sample location was selected from a number of pre-chosen sample locations entered into a data base in HYPACK. Upon selection the positioning data was displayed on the CRT to assist the operator in proceeding to and maintaining station during the sampling event. A confirmed position was recorded electronically each time the sampling device impacted the bottom. Accepted and rejected grabs were both recorded in the positioning logbook. Samples were taken generally within 10 ft of the target position.

Upon recovery the sample position northing (y) and easting (x) was read from the electronic file and recorded by hand in the positioning log along with time, water depth, and predicted and/or measured tide. Ancillary information recorded in the positioning log included personnel on board, weather, type of

sampling activity, and time of arrival and departure from HIM.

A daily activities log is provided as an appendix for Wednesday, July 15<sup>th</sup> to Friday, July 17<sup>th</sup>.

2.4 Vertical Control

Water depth and stage of the tide were recorded for each sampling event. Water depth was determined using the sampling vessel depth sounder located near the bow. These depths were recorded manually in the log.

To reduce measured depths to the MLLW vertical datum the stage of the tide was recorded at the time of sample recovery. The tide was determined by one of two methods. The first method was to use an estimate of the tide height using an electronic tidal prediction from a commercially available software package. The second method was to call a telephone number maintained by National Oceanic and Atmospheric Administration. The telephone number announces the elevation of the water at the Colman Dock on the Seattle Waterfront.

The predicted tide was used only to confirm the relative accuracy of the measured tide. The measured tide was then subtracted from the recorded depth and a mean lower low water (MLLW) tide was recorded in the logbook.

#### 3.0 POSITIONING DATA

The positioning data acquired during sediment sampling from the Nancy Anne is presented in Table 1.

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Table 1 West Waterway Sediment Operable Unit Grab Sampling Locations - July 15-17, 1998

#### Wednesday, July 15th Station

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Station		WA State Plane		Raw	Tidal	MLLW	Geographic P	
Name	Time	Easting	Northing	Depth	Ht.	Depth	Latitude	Longitude
	(hh:mm:ss)	(fi)	(ft)	(ft)	(ft)	(ft)	dd mm ss.sssss	ddd mm ss.sssss
FM-4	"08:40:54"	1,264,417.9	213,150.9	Po	ositioning C	heck	47 34 26.90770	122 21 24.09278
TBT-001	"09:00:21"	1,264,219.3	213,191.5	42.5	8.7	33.8	47 34 27.26951	122 21 27.00041
TBT-002	"09:54:01"	1,263,710.3	213,351.2	58.1	8.9	49.2	47 34 28,74578	122 21 34.46864
TBT-003	"10:41:50"	1,264,058.6	213,511.1	45.6	8.6	37.0	47 34 30.39172	122 21 29.43603
TBT-004	"11:22:31"	1,263,937.3	213,698.0	48.0	7.9	40.1	47 34 32.21222	122 21 31.25884
TBT-005	"12:01:35"	1,263,436.9	213,674.8	68.0	7.0	61.0	47 34 31.88535	122 21 38.54895
TBT-006	"13:49:56"	1,263,398.5	213,927.5	62.4	3.8	58.6	47 34 34.37133	122 21 39.18205
TBT-007	"14:31:05"	1 <b>,263</b> ,680.9	213,972.7	68.8	2.6	66.2	47 34 34.87263	122 21 35.07712
TBT-008a	"15:30:10"	1,263,953.9	213,979.2	36.5	1.8	34.7	47 34 34.99019	122 21 31.09806
TBT-008b	"15:53:45"	1,263,956.6	213,978.0	39.5	1.6	37.9	47 34 34.97888	122 21 31.05834
TBT-009	"16:53:44"	1,263,961.0	214,358.0	31.5	2.3	29.2	47 34 38.72936	122 21 31.10402
FM-4	"17:05:39"	1,264,413.8	213,159.3	Po	ositioning C	heck	47 34 26.98978	122 21 24.15499
Thursday,	July 16th							
Thursday, Station	July 16th	State Pla	ne	Raw	Tidal	MLLW	Geographic P	Position
•	July 16th Time	State Pla Easting	ne Northing	Raw Depth	Tidal Ht.	MLLW Depth	Geographic P Latitude	Position Longitude
Station	•		-				• .	
Station	Time	Easting	Northing	Depth (ft)	Ht.	Depth (ft)	Latitude	Longitude
Station Name	Time (hh:mm:ss)	Easting (ft)	Northing (ft)	Depth (ft)	Ht. (ft)	Depth (ft)	Latitude dd mm ss.sssss	Longitude ddd mm ss.sssss
Station Name FM-4	Time (hh:mm:ss) "08:34:10"	Easting (ft) 1,264,418.7	Northing (ft) 213,154.6	Depth (ft) Po	Ht. (ft) ositioning C	Depth (ft) Check	Latitude dd mm ss.sssss 47 34 26.94436	Longitude ddd mm ss.sssss 122 21 24.08219
Station Name FM-4 TBT-010	Time (hh:mm:ss) "08:34:10" "08:44:12"	Easting (ft) 1,264,418.7 1,263,443.8	Northing (ft) 213,154.6 214,365.9	Depth (ft) 62.4	Ht. (ft) ositioning C 6.4	Depth (ft) Check 56.0	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838
Station Name FM-4 TBT-010 TBT-011	Time (hh:mm:ss) "08:34:10" "08:44:12" "09:18:27" "10:32:30"	Easting (ft) 1,264,418.7 1,263,443.8 1,263,348.8	Northing (ft) 213,154.6 214,365.9 214,724.8	Depth (ft) 62.4 63.0	Ht. (ft) ositioning C 6.4 7.1	Depth (ft) Check 56.0 55.9	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608 47 34 42.22889	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838 122 21 40.13763
Station Name FM-4 TBT-010 TBT-011 TBT-012	Time (hh:mm:ss) "08:34:10" "08:44:12" "09:18:27" "10:32:30" "11:19:31"	Easting (ft) 1,264,418.7 1,263,443.8 1,263,348.8 1,263,991.4	Northing (ft) 213,154.6 214,365.9 214,724.8 214,877.8	Depth (ft) 62.4 63.0 35.0	Ht. (ft) ositioning C 6.4 7.1 8.4	Depth (ft) Check 56.0 55.9 26.6	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608 47 34 42.22889 47 34 43.86440 47 34 44.94618 47 34 44.95353	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838 122 21 40.13763 122 21 30.81096
Station Name FM-4 TBT-010 TBT-011 TBT-012 TBT-013a	Time (hh:mm:ss) "08:34:10" "08:44:12" "09:18:27" "10:32:30" "11:19:31"	Easting (ft) 1,264,418.7 1,263,443.8 1,263,348.8 1,263,991.4 1,263,650.1	Northing (ft) 213,154.6 214,365.9 214,724.8 214,877.8 214,994.2	Depth (ft) 62.4 63.0 35.0 68.4	Ht. (ft) 6.4 7.1 8.4 8.5	Depth (ft) Check 56.0 55.9 26.6 59.9	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608 47 34 42.22889 47 34 43.86440 47 34 44.94618	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838 122 21 40.13763 122 21 30.81096 122 21 35.82178
Station Name FM-4 TBT-010 TBT-011 TBT-012 TBT-013a TBT-013b TBT-014 TBT-015	Time (hh:mm:ss) "08:34:10" "08:44:12" "09:18:27" "10:32:30" "11:19:31" "11:41:45" "13:06:39" "13:50:05"	Easting (ft) 1,264,418.7 1,263,443.8 1,263,348.8 1,263,991.4 1,263,650.1 1,263,657.4 1,263,384.6 1,263,622.6	Northing (ft) 213,154.6 214,365.9 214,724.8 214,877.8 214,994.2 214,994.8 215,185.0 215,389.8	Depth (ft) 62.4 63.0 35.0 68.4 67.5 64.4 58.8	Ht. (ft) 5.4 7.1 8.4 8.5 8.4 7.2 6.4	Depth (ft) Check 56.0 55.9 26.6 59.9 59.1 57.2 52.4	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608 47 34 42.22889 47 34 43.86440 47 34 44.94618 47 34 44.95353 47 34 46.77689 47 34 48.84435	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838 122 21 40.13763 122 21 30.81096 122 21 35.82178 122 21 35.71550
Station Name FM-4 TBT-010 TBT-011 TBT-012 TBT-013b TBT-013b TBT-014 TBT-015 TBT-016	Time (hh:mm:ss) "08:34:10" "08:44:12" "09:18:27" "10:32:30" "11:19:31" "11:41:45" "13:06:39" "13:50:05" "14:23:45"	Easting (ft) 1,264,418.7 1,263,443.8 1,263,348.8 1,263,991.4 1,263,650.1 1,263,657.4 1,263,384.6 1,263,622.6 1,263,995.1	Northing (ft) 213,154.6 214,365.9 214,724.8 214,877.8 214,994.2 214,994.8 215,185.0 215,389.8 215,720.7	Depth (ft) 62.4 63.0 35.0 68.4 67.5 64.4 58.8 36.5	Ht. (ft) 5:itioning C 6.4 7.1 8.4 8.5 8.4 7.2 6.4 5.7	Depth (ft) Check 56.0 55.9 26.6 59.9 59.1 57.2 52.4 30.8	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608 47 34 42.22889 47 34 43.86440 47 34 44.94618 47 34 44.95353 47 34 46.77689 47 34 48.84435 47 34 52.18238	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838 122 21 40.13763 122 21 30.81096 122 21 35.82178 122 21 35.71550 122 21 39.74881 122 21 36.33728 122 21 31.00066
Station Name FM-4 TBT-010 TBT-011 TBT-012 TBT-013a TBT-013b TBT-014 TBT-015 TBT-016 TBT-017	Time (hh:mm:ss) "08:34:10" "08:44:12" "09:18:27" "10:32:30" "11:19:31" "11:41:45" "13:06:39" "13:50:05" "14:23:45" "14:59:33"	Easting (ft) 1,264,418.7 1,263,443.8 1,263,348.8 1,263,991.4 1,263,650.1 1,263,657.4 1,263,384.6 1,263,622.6 1,263,995.1 1,263,443.1	Northing (ft) 213,154.6 214,365.9 214,724.8 214,877.8 214,994.2 214,994.8 215,185.0 215,389.8 215,720.7 215,880.6	Depth (ft) 62.4 63.0 35.0 68.4 67.5 64.4 58.8 36.5 53.9	Ht. (ft) 5.4 7.1 8.4 8.5 8.4 7.2 6.4 5.7 4.8	Depth (ft) Check 56.0 55.9 26.6 59.9 59.1 57.2 52.4 30.8 49.1	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608 47 34 42.22889 47 34 42.22889 47 34 43.86440 47 34 44.94618 47 34 44.95353 47 34 44.95353 47 34 46.77689 47 34 48.84435 47 34 52.18238 47 34 53.65213	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838 122 21 40.13763 122 21 30.81096 122 21 35.82178 122 21 35.71550 122 21 39.74881 122 21 36.33728 122 21 31.00066 122 21 39.09707
Station Name FM-4 TBT-010 TBT-011 TBT-012 TBT-013a TBT-013b TBT-014 TBT-015 TBT-016 TBT-017 TBT-018	Time (hh:mm:ss) "08:34:10" "08:44:12" "09:18:27" "10:32:30" "11:19:31" "11:41:45" "13:06:39" "13:50:05" "14:23:45"	Easting (ft) 1,264,418.7 1,263,443.8 1,263,348.8 1,263,991.4 1,263,650.1 1,263,657.4 1,263,384.6 1,263,622.6 1,263,995.1	Northing (ft) 213,154.6 214,365.9 214,724.8 214,877.8 214,994.2 214,994.8 215,185.0 215,389.8 215,720.7	Depth (ft) 62.4 63.0 35.0 68.4 67.5 64.4 58.8 36.5	Ht. (ft) 5:itioning C 6.4 7.1 8.4 8.5 8.4 7.2 6.4 5.7	Depth (ft) Check 56.0 55.9 26.6 59.9 59.1 57.2 52.4 30.8	Latitude dd mm ss.sssss 47 34 26.94436 47 34 38.70608 47 34 42.22889 47 34 43.86440 47 34 44.94618 47 34 44.95353 47 34 46.77689 47 34 48.84435 47 34 52.18238	Longitude ddd mm ss.sssss 122 21 24.08219 122 21 38.64838 122 21 40.13763 122 21 30.81096 122 21 35.82178 122 21 35.71550 122 21 39.74881 122 21 36.33728 122 21 31.00066

TBT-019b	<b>"16:26:10</b> "	1,263,693.4	216,347.6	54.6	3.4	51.2	47 34 58.30923	122 21 35.58190
TBT-020	"17:36:58"	1,263,483.4	21 <b>6,45</b> 5.7	49.0	3.7	45.3	47 34 59.33478	122 21 38.67584
FM-4	"17:49:36"	1,264,416.3	213,158 1	Po	sitioning C	Check	47 34 26 97843	122 21 24.11819
Friday, Ju	ily 17th			-			_	
Station		State Pla		Raw	Tidal	MLLW	Geographic F	
Name	Time	Easting	Northing	Depth	Ht.	Depth	Latitude	Longitude
	(hh:mm:ss)	(ft)	(ft)	(ft)	(ft)	(ft)	dd mm ss.sssss	ddd mm ss.sssss
	100.40.04"	4 004 404 0	040 450 0	De	allianing C	)h e el:	47 04 00 00707	400.04.04.04505
FM-4	"08:18:01"	1,264,421.2	213,152.8		sitioning C		47 34 26.92737	122 21 24.04595
TBT-021	"08:31:29"	1,263,732.2	216,531.1	54.4	3.5	50.9	47 35 00.12730	122 21 35.06927
TBT-022	"08:57:53"	1,263,900.6	<b>216,551</b> .1	52.8	4.2	48.6	47 35 00.35800	122 21 32.61894
TBT-023	<b>"</b> 09:40:13"	1,263,915.2	216,722.9	54.4	5.4	49.0	47 35 02.05538	122 21 32.45611
TBT-024	"10:23:00"	1,263,858.7	217,001.5	57.6	6.6	51.0	47 35 04 79369	122 21 33.36100
TBT-025	"10:48:17"	1,263,599.9	216,980.2	58.4	7.2	51.2	47 35 04,53276	122 21 37.12887
TBT-026	"11:23:39"	1,263,972.2	217,487.0	48.0	7.9	40.1	47 35 09.60663	122 21 31.84589
TBT-027	"11:54:35"	1,263,747.4	217,564.5	52.5	8.3	44.2	47 35 10.32717	122 21 35.14700
TBT-028	<b>"12</b> :31:2 <b>3</b> "	1,263,737.8	217,820.0	58.8	8.5	50.3	47 35 12.84633	122 21 35.36021
TBT-034	"13:16:40"	1,264,077.4	216,839.3	31.5	8.4	23.1	47 35 03,23608	122 21 30.12346
TBT-032	"13:48:27"	1,264,663.1	218,602.8	50.4	8.2	42.2	47 35 20.75216	122 21 22.09038
TBT-031	"14:29:05"	1,264,600.7	218,060.3	53.9	7.8	46.1	47 35 15.38659	122 21 22.84361
TBT-033	"15:08:01"	1,264,952.6	218,379.3	46.8	7.2	39.6	47 35 18.60318	122 21 17.80420
TBT-029	"15:48:17"	1,264,056.1	218,015.8	48.0	6.4	41.6	47 35 14.84144	122 21 30.77453
TBT-030a		1,263,752.2	218,199.1	56.0	5.8	50.2	47 35 16,59007	122 21 35,26061
TBT-030		1,263,756.2	218,194 8	56 0	5.4	50.6	47 35 16,54814	122 21 35.20014
FM-4	"17:02:54"	1,264,418.2	213,154 8	Po	sitioning C		47 34 26.94614	122 21 24.08924

Appendix

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Day:	WED .	_	1	. 7	Survey	Vessel & Scientif	ic Party		
Date:	7/15/98	3 Ρε	ige	of Z	R/ Nan	icy Anne	STEPHAN	J WODZICIKI-EVS	
Naviga	ator:	Tony Pe	trillo		4	Dale Dickinson - MSS LISA MILL - EVS			
Naviga	ation Syste	m: Trimble	4000 DS	S	Tony Pe	etrillo - BWE			1
Differe	ntial Sourc	e: CG Bea	1009		TIMH	AMMARMEISI		T	
Local Time	I.D.	Number	Hedan Heene	Boat Z	H.	Easting (x)	Northing (y)	Activity	
0795		ANO	HANB	ar 15	man	VA . FINISI	1 MOB		
0815		SAFET	Y MUER	שאת					
0830		ulu	Frum	n (t.	i. M.				
840		CIL PT	OFISI	en M	sus	~ 3' 70	SW.	FISHORMIUS 4	
						1,264,418	213,151		
084+		APPNOX	cue	mo	TBT-	DOA. OK			
0900	TET-001	1	8.3	47.5	34.2	1,264,219	213, 191		
09.17		TELLEPI	tine T	DE, =	\$.7	PRO0= 8.4	ATIDE -	2 = 0.3	TELE
0954	137-002	l •	8.5	28.1	49.2	1,263,710	213,351		8.
1041	TET-003	1	8.1	45.6	37.0	1,264,059	213 511		8.
1122	TBT-004	<u> </u>	6.7	48.0	40.3	1263,937	213.698		<b>ERS</b>
1201	TBT-005	1	۵.۵	68.0	61.0	1,263, 437	213,675		7.0
1218		7160	UPO	HIM	70	officiany si	MPCS. WA	IT FOR RR BRUDG	ς LιF
1319		RR BR	IDGE L	IFT					
1320		ulw	TO SI	ne					

4019 Phinney Avenue N., Seattle, WA 98103 (206) 633-5567 イリルのになり TTOと Я.

SEN 1700 749-9218

	-	WBS 7 /15 /91	9 Ps	age <u>2</u>	of Z	Survey	Vessel & Scien	tific Party		
F		1 110 10		.go	<u> </u>	R/V Nan	icy Anne	SAME		
N	aviga	itor:	Tony Pe	trillo			kinson - MSS	- / 10 - 1		
	-	tion Syste			3	Tony Pe	trillo - BWE			
		ntial Sourc	e: CG Bea	r	r		r		T	ļ
1	ocal		Al	Pred	Boat		Easting	Northing	Activity	
<u> </u>	me	I.D.	Number	Tide	Z	mu	(X)	W) BUCKLE		TELE. NOC
Ē	339	TBT-006	NIG	3.8	.62.4		IN JAC		~65'636	4.1
1	349	TV3T-006		3.5	62.4			213,927		3.8
			CONTRI	JER SH	IP 'W	STW VOD	BELINDA	Proposes	SITE	
14	431	TBT-007	1	2.6	68.8	66.2	1,263,681	213,973		2,6
19	522	TBT-008	NG	1.7	37.5		OVERAZIVE	TUTUT		1,8
15	530	TUT-008	1	1.7	36.5	34.7	1,263,954	213,979		1.8
IS	53	TBT-008	2	1.7	39.5	∰3°	1,9 1,263,957	213,978		1.6
16	,53	TBT-009	١	2.4	31.5	29.2	1,263,961	214,358		2.3
17	105		NAVC	hech	OF:	scher	MIUS (F	1-4). OK		
11	25		TIED	UPG	HIN	. OFF	Lams (DOI	ens		
17	SD		VWTO	Burs						
18	60		ANO	BWE						
			WEAT	·m:	cure	14, IN	TEUWILL	NT RMN, L	TWIND	
						· ·				
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Blue Water Engineering, 4019 Phinney Avenue N., Seattle, WA 98103 (206) 633-5567

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West Waterway TBT Study - EVS Environment Consultants										_
	-	THUPS				Survey \	lessel & Scientif	ic Party		
	Date:	7/16/98	Β Ρε	<u>ige   (</u>	of 2					
						R/V Nan	cy Anne	LISAMI		
	Naviga	itor:	Tony Pe	trillo		Dale Dic	kinson - MSS	stothan h	10121CKI - EVS	
	} -	tion Syste			3	Tony Pe	trillo - BWE	DENHIS 1	JANZUCK-EVS	
	}	ntial Sourc	ce: CG Bea						· · · · · · · · · · · · · · · · · · ·	
	Local			Pred	Boat	欭	Easting	Northing	Activity	
	Time	I.D.	Number	Tide	Z		(x)	(y)		
	0800		MVO	HIM	•	MUW				
	0826		VWT	SITE						
	0834		NNC	EUC	FM	4.	OK			TELOPHUNE TIN
1	0844	TBT-010	1	6.2	62.4	56.0'	1,263,444	214,366		6.4
	0913	NDT-011	RES	6.9	6.3,0	is∎0	TURNBUCKLE	ROO IN JAN		7.1
2	0918	TBT-011	(	6.9	63.0	55.9	1,263,349	214,725		7.1
	0947	TBT-DIZ	Res	7.5	37.5	29,8	NOT ENOU	on Penetru	NI ZUME. JUNE	7.7
•	0953	TBT-0(2	RIST	7,6	35,5	27.7	NOT ENOUGH	PENE MATIN	PEBAIS IN , JAWS	7.8
	1001	TBT-012	REJ	7.8	37.1		BUCKET EM	GAT TN GAT	20' NORTH AT PROPUSED LOCATION	ADD WEIGHT.
	f024	TOT-012	RUJ		42.0		RUBBER GASILE SAND BUST CRI		CKET	
3	1032	TBF-OCZ	1	8.1	35.0	26.6	1,263,991	214,878		8.4
	1105		Paur SI	nt contr	16 m	TRUMB	VER BOAT	GPS's.		
	1114		SYSTEM	UP, S	SATS					
4	1119	TBT-013	1	8.2	68.4	59,9	263650	214,994		8.5
	1141	TBT-014	2.	8.1	67.5	59.1	1,263,657	214,995		8.4
	Blue W		neering, 40	)19 Phinn		Je N., Se	attle, WA' 98103	3 (206) 633-556	7	

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1220 BRICHK FUR LUNCH

DECON GRAB 1250

		Naterway Tribula	TBT Study	- EVS Er	wironme	Y					<u>با</u>
	1 .	7/16/9	8 Ps	age Z	of Z	Survey	Vessel & Scienti	fic Party			
	0 0.0.	11010		<u></u>		R/V Nar	icy Anne	SAM	ىت		•
	Naviga		Tony Pe		·	4	ckinson - MSS				
	-	ation Syste			9	Tony Pe	trillo - BWE				,
	Local	ntial Sourc		Pred	Boat	++	Easting	Northing	Activity		
	Time	I.D.	Number	1	Z	ŧ	(x)	(y)	,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,		~~~
			WEAR	ver: S	MAN	WIN	D 10-12 KT	5		TELEPIton	
5	1306	TBT-014		6.9			1,263,385			7.2	ç
6	1350	TBT-OLS	1	6.2	58.8	52.4	į 263, 623	215, 390		6.4	$\sim$
7	1423	TBT-016		5,3	36.5	30,8	1,263,995	215,721		5.7	, ,
8	1459	TBT-017	1	À.4	53.9	A9,1	1,263 443	215,881		4.8	·
<b>~</b>	1525		SATE	LITE C	onster	UTTIN	DWN. BO	TA GPS'S II	JOPENNBUE		
	1540		CONST	ELAN	N BAC	KUP.	* *				F
٩	1543	TBT-018	1	3.6	38.4	34.6	1,263,993	215,954		3.8	,
io	1609	TBT-019	1	3.4	SA.L	51.1	1,263,693	216,344		3.5	,
	1626	TBT-019	2	3.2			1,263,693	216, 348		3.4	~
4	1721	136-020	Re J	<i>3.</i> 4	49.7	46.3	HUNG ON CA	eve on bot	ом.	3,4	~
736	1136	1BT-020	1	3,5	49.0	4,91,0	1,263,483	216 456		3.7	
	1749		NNC	K @	FM-	4.	WIN 3				~
	1757		TIED	UP	@ H.I	. M,	OFFLOWS	covers		_	
1	1845		VIWTO					2 (006) 622 556	7		<b>ر</b>
-	19.00		PU Br		ey Avent	19 IV., 58	attle, WA 9810	5 (200) 033-350	<i>)</i> /		í s

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Day:	Vaterway 7 FrLl	Brotady	- LVO EII			Vessel & Scientil	ic Party		
	7 / 17 /98	3 Pa	ige I	of <u>Z</u>		cy Anne	STEPHAN	WODZICKI - CUS	
Naviga		Tony Pe			1	Dale Dickinson - MSS TIM HAMMER MEISTER - C			
	ation Syste			S	Tony Pe	trillo - BWE			
Local	ntial Sourc	e: CG Bea	Pred	Boat	161	Easting	Northing	Activity	
Time	I.D.	Number	Tide	Z		(X)	(y)	Addivity	
0700		MVO	H.I.A	٨.	Millo				
0810		0/W70	SITE	(wlo	LISA	MILL)			
0818		NNO	NECK	-0 F1	٨-4.	WIN 4			TREPH
0831	T6T-021	1	3,4	54.4	50.9	1,263,732	216 531		3,5
0857	TBr-022	1	4.2	52.8	48.6	1,263,901	216, 551		4.2
		BARCIL	70 Oo	UC TO	Plu	ice			
0940	TBT-023	l	5,3	54.4	49.0	1,263,915	210 723		5.4
1000		TIED.	vPO H	·1. M.	710	DISTURN	MOR, LISA	MIL	
1006		UWTO	SITE						
1023	T6T-024	1	6.5	57.6	SI.O	1,263,859	217,001		6.6
1048	TBT-025	1	7.1	58.4	51.2	1,263,600	, ·		7.2
1123	TBT-026	1	7.7	48,0	40.1	1,263,972	217,487		7,9
1154	TBT-027	1	8.1	44.2	52.5	1,263,747	217,565		8.3
1231	TBT-02B	1	8.3	58.8	50,3	1,263,738	217,820		8.5
1250		TUN	UP@)	7700	Enn	INC DOCK			

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West Waterway TBT Study - EVS Environment Consultants

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Blue Water Engineering, 4019 Phinney Avenue N., Seattle, WA 98103 (206) 633-5567

	West	Naterway <sup>-</sup>	TBT Study	- EVS En	vironme	nt Consu	Itants				~
	Day:	FRU			. 7	Survey	Vessel & Scienti	fic Party			, .
	Naviga		Tony Pe			Dale Dic	cy Anne ckinson - MSS	SAME	N/ PETE TRUDE, VANON		ŗ
		ation Syste Intial Sourc			3	Tony Pe	trillo - BWE				يەم م
	Local Time	1.D.	Number	Pred Tide	Boat Z	H W	Easting (x)	Northing (y)	Activity		
	1300		Plu pg	TG RU	୦ଟ @	TOPD	FLOMING		WTOSITE	TELEP#mer TTDE	
9	1316	TBT-034	1	8,2	31.5	23.1	1,264,077	216,839	SUOPE 1:5	8.4	
10	1348	TIST-032	1	7,9	50,4	42.2	1,264,663	218,603		8.Z	$\sim$
	1412	1BT-031	7455	7.6	53.2	45,2	OUTEREN	ETTATION		8.0	~~
0	1429	TBT-031	1	7.4	53.9	46.1	1 764,600	218,060		7.8	·
		চ্চা-033		7.0	46.2	38.9	TOW CABLE	IN JAWS. S	MAPLE WASKING	7.3	<b>م</b> بم
		TBT-033		6.9	46.2	38.9	UBLE IN	Jows. Sh	MPLE WASHED MOULDERST		, Per
12	1508	1157-083	1	6.7	46.8	39.6	1,264,953	218,379	TO OBTIMN SAMPLE	7.2	*
	1515		Pete	rune	DISEN	BATHL	þ				
	1535-	137-029	REI		51,0				LE WASHED	6.7	, <b></b>
13	1548	TBT-029	1	6.0	-	41.6	1,264,056	218,016	· · · · · · · · · · · · · · · · · · ·	6.4	~
14	1622	<u>18T-030</u>	l	5,4	56.0		1,263,752			5.8	<i></i>
	1645	TBT-030	2	<u>S.</u> 0	56.0	50.6	1,263,756	218, 195		5.4	
	[r20		VW	TONA		{					/
	1702			<u></u>			. WIN	3 05 TC	<u> </u>	J	, en
-	Blue V ITC		neering, 40	UP	ey Aven ) H 、 I	ue N., Se \. M.	attle, WA 9810	3 (206) 633-556	57		: 

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## **APPENDIX B**

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# Sediment Chemistry Results

This appendix contains the sediment chemistry data as reported by the analytical laboratory. The data are grouped by analytical batches. Case narratives, when produced by the laboratory, are included for each batch.

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Client:EVS ConsultantsProject:WSOU TBT StudySample Matrix:Sediment

Service Request No.: K9804715 Date Received: 7/17/98

#### CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch:

The Matrix Spike (MS) recovery of TBT for sample TBT-06-S was not calculated. The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Date 8/5/98 (Ar

#### Analytical Report

	ent: ject: aple Matrix:	EVS Environment Co WSOU TBT Study Sediment	onsultants		Service Request: Date Collected: Date Received:	7/15/98
				Total Solids		
Ana	o Method Ilysis Method I Notes	NONE 160 3M			Units Basis	PERCENT Wet
				Date		Result
San	iple Name		Lab Code	Analyzed	Result	Notes
TBT	-01-S		K9804715-001	7/22/98	74 3	
TBT	-02 <b>-</b> S		K9804715-002	7/22/98	54 8	
TBT	-35-S		K9804715-003	7/22/98	55 6	
TBT	-03-S		K9804715-004	7/22/98	53 5	
TBT	-04-S		K9804715-005	7/22/98	64 2	
TBT	-05-S		K9804715-006	7/22/98	52 6	
TBT	-06-S		K9804715-007	7/22/98	53 9	
TBT	-07-S		K9804715-008	7/22/98	52.8	

7/22/98

7/22/98

7/22/98

K9804715-009

K9804715-012

K9804715-013

Approved By \_\_\_\_\_ TSOLIDS XLT\_Sample/01071998a

TBT-36-S

TBT-08-S

TBT-09-S

04715TS AB1 - 013 7/23/98

Date 7/24/25

54 1

48 4

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0000<sup>Page No</sup>

#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Sediment

Service Request: K9804715 Date Collected: 7/15/98 Date Received: 7/17/98 Date Extracted: NA Date Analyzed: 7/28/98

Carbon, Total Organic ASTM D4129-82M Units PERCENT Dry Weight Basis

Sample Name	Lab Code	MRL	Result
TBT-01-S	K9804715-001	0 05	0.58
TBT-02-S	K9804715-002	0.05	2 09
TBT-35-S	K9804715-003	0.05	1 89
TBT-03-S	K9804715-004	0 05	2 01
TBT-04-S	K9804715-005	0 05	1 10
TBT-05-S	K9804715-006	0 05	1.83
TBT-06-S	K9804715-007	0 05	1.81
TBT-07-S	K9804715-008	0.05	1.66
TBT-36-S	K9804715-009	0.05	1.71
TBT-08-S	K9804715-012	0.05	3.25
TBT-09-S	K9804715-013	0.05	2.02
Method Blank	K9804715-MB	0 05	ND

Modified

Approved By: \_

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IAMRL/102594 04715WET LJ1 - TOCS 7/31/98 Date: 7/3119

 $00005^{\text{Age No}}$ 

#### Analytical Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Sediment

Service Request:	K9804715
Date Collected:	7/15/98
Date Received:	7/17/98
Date Extracted:	7/21/98

Butyltins\* Units: ug/Kg (ppb) Dry Weight Basis

Analyte <sup>.</sup>	Tributyltin
Method Reporting Limit.	1

Sample Name	Lab Code	Date Analyzed	
TBT-01-S	K9804715-001	7/29/98	31
TBT-02-S	K9804715-002	7/29/98	730
TBT-35-S	K9804715-003	8/4/98	650
TBT-03-S	K9804715-004	7/29/98	540
TBT-04-S	K9804715-005	7/29/98	330
TBT-05-S	K9804715-006	7/29/98	680
TBT-06-S	K9804715-007	7/29/98	660
TBT-07-S	K9804715-008	7/29/98	670
TBT-36-S	K9804715-009	7/29/98	970
TBT-07-FB	K9804715-010	7/29/98	<3(G)
TBT-07-CB	K9804715-011	7/29/98	ND
TBT-08-S	K9804715-012	7/29/98	400
TBT-09-S	K9804715-013	7/29/98	800
Method Blank	K980721-SB	7/29/98	ND

Methodology based on C.A.Krone, et al, "A Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound," National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Scattle, WA, November 1988. Butyltins are reported as the cations

G

The MRL is elevated because an insufficient sample quantity was available for optimum analysis

Approved By 3ADA/101194

04715SVG VN1 - Butylin 8/4/98

Date <u>8-4-98</u>

Page No

00006

## APPENDIX A

## LABORATORY QA/QC RESULTS

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				QA/QC Re	port				
	Client: Project: Sample Matrix:	EVS Environme WSOU TBT Stu Sediment					Date	ce Request: Collected: e Received:	7/15/98
8				Duplicate Su	mmary				
				Total Sol	ıds				
	Prep Method Analysis Method Test Notes	NONE 160 3M						Units Basis	PERCENT Wet
	Sample Name		Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
	TBT-01-S		K9804715-001DUP	7/22/98	74 3	75 3	74 8	1	ï

Approved By \_\_\_\_\_\_ INOLIDS XLT\_DUP/010719984

04715TS ABL- DUP 7/23/98

Date 7/24/2 r

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## QA/QC Report

Client: Project: Sample Matrix:	WSOU TB	onment Consultants T Study				Service Request: Date Collected: Date Received: Date Analyzed:	7/15/98 7/17/98		
			Carbon, Tota ASTM D4 Units PEI	129-82M					
LABORATORY	LABORATORY CONTROL SAMPLE								
			True Value		Measured Valuc		Percent Recovery		
Source:	ERA 542 #	01125	0 62		0 63		102		
CALIBRATION VERIFICATION STANDARD									
			True Value		Measured Value		Percent Recovery		
CCV 3 Result CCV 4 Result CCV 5 Result			20.0 20.0 20.0		197 197 190		98 98 95		
LABORATORY	BLANK		MRL		Blank Value				
CCB 3 Result CCB 4 Result CCB 5 Result			0 05 0 05 0 05		ND ND ND				
<b>DUPLICATE A</b> Sample Name		Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference		
TBT-01-S		K9804715-001D	0 05	0 58	0 69	0 64	17		
MATRIX SPIKI Sample Name		IS Lab Code	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery		
TBT-01-S		K9804715-001MS	0 05	3 66	0 58	4 26	100		

Approved By \_\_\_\_\_\_ Date \_\_\_\_\_ 7/31/4 F COMBOQCD/042695 \_\_\_\_\_\_ Date \_\_\_\_\_ 7/31/4 F 00009 Page No . ~ **~~**~  $\widehat{}$ 

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#### QA/QC Report

#### **EVS Environment Consultants Client:** WSOU TBT Study **Project:** Sample Matrix: Sediment

Service Request: K9804715 Date Collected: 7/15/98 Date Received: 7/17/98 Date Extracted: 7/21/98 Date Analyzed: 7/29/98

## Surrogate Recovery Summary **Butyltins**

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
TBT-01-S	K9804715-001	68	80
TBT-02-S	K9804715-002	83	71
TBT-35-S	K9804715-003	114	93
TBT-03-S	K9804715-004	63	48
TBT-04-S	K9804715-005	80	66
TBT-05-S	K9804715-006	85	62
TBT-06-S	K9804715-007	85	80
TBT-07-S	K9804715-008	72	61
TBT-36-S	K9804715-009	94	48
TBT-07-FB	K9804715-010	63	79
TBT-07-CB	K9804715-011	65	86
TBT-08-S	K9804715-012	64	44
TBT-09-S	K9804715-013	105	85
TBT-06-S	K9804715-007MS	85	55
TBT-06-S	K9804715-007DMS	93	55
Lab Control Sample	K980721-SL	64	79
Method Blank	K980721-SB	73	93

CAS Acceptance Limits:

20-195

20-172

Approved By SUR2/102194

04715SVG VNI - SURR 7/30/98

\_\_\_\_ Date: 7- 31.98

Page No

## QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Sediment

 Service Request:
 K9804715

 Date Collected:
 7/15/98

 Date Received:
 7/17/98

 Date Extracted:
 7/21/98

 Date Analyzed:
 7/29/98

## Matrix Spike/Duplicate Matrix Spike Summary Butyltins Units<sup>.</sup> ug/Kg (ppb) Dry Weight Basis

Sample Name <sup>.</sup>	TBT-06-S
Lab Code:	K9804715-007MS, K9804715-007DMS

		Percent						Recovery	
								CAS	Relative
	Spike	Level	Sample	Spike	Result			Acceptance	Percent
Analyte	MS	DMS	Result	MS	DMS	MS	DMS	Limits	Difference
Tributyltin	10	10	660	NA	NA	NC	NC	20-200	NC

NA

Not Applicable; see case narrative.

.

Approved By: DMS150TS/060194 04715SVG VN1 - DMS 7/30/91 Date 7. 31-98

Page No

## QA/QC Report

Client: Project: LCS Matrix:	EVS Environment Consultat WSOU TBT Study Sediment	nts		Service Request: Date Collected: Date Received: Date Extracted: Date Analyzed:	NA NA 7/21/98
		B	rol Sample Summary utyltins ug/Kg (ppb)		
Analyte		True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Analyte		v aluc	Result	Recovery	Lanits
Tributyltin		5	6	120	20-164

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Approved By LCSOTS/121594 04715SVG VNI - LCS 7/30/98 \_\_\_\_ Date: \_\_\_\_ **7-31-98** 

Page No 00012

## QA/QC Report

Client:EVS Environment ConsultantsProject:WSOU TBT Study

Service Request: K9804715 Calibration Date: 7/28/98 Date Analyzed: 7/29/98

#### Continuing Calibration Verification (CCV) Summary Butyltins Units. µg/L (ppb)

Analyte	True Value				Percent Recovery		Percent Recovery
Tributyltın	500	565	113	560	112	576	115

Approved By: \_\_\_\_\_\_ Date \_\_\_\_\_ Date \_\_\_\_\_ 8-4-98

04715SVG VNI - CCV 1-4 7/30/98

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Page No

## QA/QC Report

Client:EVS Environment ConsultantsProject:WSOU TBT Study

Service Request: K9804715 Calibration Date: 8/1/98 Date Analyzed: 8/4/98

## Continuing Calibration Verification (CCV) Summary Butyltins Units: µg/L (ppb)

Analyte	True Value	CCV1 Result	Percent Recovery	_	Percent Recovery
Tributyltin	500	503	101	513	103

Date: <u>8-4-98</u>



## QA/QC Report

Client: Project:	EVS Environment Consultants WSOU TBT Study	Service Request: Calibration Date: Date Analyzed:	7/28/98			
Continuing Calibration Blank (CCB) Summary Butyltins Units µg/Kg (ppb)						
Analyte	MRL	CCB1 Result	CCB2 Result	CCB3 Result		
Tributyltin	1	ND	ND	ND		

Approved By:	Jey	 	Date _	8-4.98
CCB4SMRL/120594	0			

04715SVG VNI - CCB 1-4 7/30/98

**.** 

## QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study

Service Request: K9804715 Calibration Date: 8/1/98 Date Analyzed: 8/4/98

Continuing Calibration Blank (CCB) Summary Butyltins Units µg/Kg (ppb)

Analyte	MRL	CCB1 Result	CCB2 Result
Tributyltın	1	ND	ND

Approved By \_ CCB4SMRL/120594

8-4-98 Date \_\_\_\_

Page No 00016

04715SVG VNI - CCB 1-4 (2) 8/4/98

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Client: EVS Project: WSC Sample Matrix: Sedic

EVS Environmental Consultants WSOU TBT Study Sediemnt Service Request No.:K9804761Date Received:7/18/98

#### CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS) and Laboratory Control Sample (LCS)

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch.

The surrogate recoveries for TBT in samples TBT-12, 13, 14, 37, 16 and 20 were not calculated. The analysis of this sample required a dilution which resulted in a surrogate concentration below the Method Reporting Limit (MRL). No further corrective action was taken

The Matrix Spike (MS) recovery of TBT for sample TBT-15-S was not calculated The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

My\_Date\_ 8/6/98\_

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Approved by\_

Client:	EVS Environment Consultants	Service Request:	-
Project:	WSOU TBT Study	Date Collected:	
Sample Matrix:	Sediment	Date Received:	7/18/98

## Total Solids

Prep Method Analysis Method Test Notes	NONE 160 3M			Units Basis	
		Date	<b>N</b>		Result

Sample Name	Lab Code	Analyzed	Result	Notes
TBT-10-S	K9804761-001	7/23/98	72 5	
TBT-11-S	K9804761-002	7/23/98	67 0	
TBT-12-S	K9804761-003	7/23/98	51 7	
TBT-13-S	K9804761-004	7/23/98	59 1	
TBT-14-S	K9804761-005	7/23/98	60 4	
TBT-37-S	K9804761-006	7/23/98	63 2	
TBT-15-S	K9804761-007	7/23/98	63 2	
TBT-16-S	K9804761-008	7/23/98	52 7	
TBT-17-S	K9804761-009	7/23/98	66 6	
TBT-18-S	K9804761-010	7/23/98	77 7	
TBT-19-S	K9804761-011	7/23/98	60 5	
TBT-20-S	K9804761-012	7/23/98	56 5	

Approved By \_\_\_\_\_\_ TSOLIDS XLT\_Sample/01071998a

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\_\_\_\_\_ Date 7127198

#### Analytical Report

# Client:EVS Encironment ConsultantsProject:WSOU TBT StudySample Matrix:Sediment

Service Request:	K9804761
Date Collected:	7/16/98
Date Received:	7/18/98
Date Extracted:	NA
Date Analyzed:	8/1/98

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Carbon, Total Organic ASTM D4129-82M Units: PERCENT Dry Weight Basis

Sample Name	e Lab Code		Result
TBT-10-S	K9804761-001	0 05	0 50
TBT-11-S	K9804761-002	0.05	0 75
TBT-12-S	K9804761-003	0.05	2 30
TBT-13-S	K9804761-004	0.05	1 31
TBT-14-S	K9804761-005	0.05	1 03
TBT-37-S	K9804761-006	0 05	1.22
TBT-15-S	K9804761-007	0 05	1.35
TBT-16-S	K9804761-008	0.05	2 07
TBT-17-S	K9804761-009	0.05	0 86
TBT-18-S	K9804761-010	0.05	1 15
TBT-19-S	K9804761-011	0 05	1.22
TBT-20-S	K9804761-012	0 05	1.60
Method Blank	K9804761-MB	0 05	ND

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Modified for analysis of soil

813/98 Date \_ Approved By IAMRL/102594 04761WET LJI - TOCS 8/3/98

## Analytical Report

Butyltıns* Unıts <sup>.</sup> ug/Kg (ppb) Dry Weight Basıs Analyte <b>Tributyltin</b> Method Reporting Lımıt <sup>.</sup> 1	
Date Sample Name Lab Code Analyzed	
TBT-10-S K9804761-001 8/1/98 6	
TBT-11-S K9804761-002 8/1/98 130	
TBT-12-S K9804761-003 8/1/98 830	
TBT-13-S K9804761-004 8/1/98 1100	
TBT-14-S K9804761-005 8/1/98 1100	
TBT-37-S K9804761-006 8/1/98 1000	
TBT-15-S K9804761-007 8/1/98 530	
TBT-16-S K9804761-008 8/1/98 1200	
TBT-17-S K9804761-009 8/1/98 560	
TBT-18-S K9804761-010 8/1/98 210	
TBT-19-S K9804761-011 8/1/98 450	
TBT-20-S K9804761-012 8/1/98 3500	
Method Blank K980725-SB 8/1/98 ND	

Methodology based on C.A.Krone, et al, "A Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound," National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Seattle, WA, November 1988 Butyltins are reported as the cations.

Approved By 3ADA/101194 04761SVG JG1 - Butylun K/4/9(

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## APPENDIX A

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## LABORATORY QA/QC RESULTS

			QA/QC Rep	ort					
Client: Project: Sample Matrix:	EVS Environment Consult WSOU TBT Study Sediment	ants				Date	e Request: Collected: Received:	7/16/98	
			Duplicate Sum	umary					
			Total Solic	ls					
Prep Method Analysis Method Test Notes:	NONE 160 3M						Units Basis	PERCENT Wet	
Sample Name	Lab Co	de	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes	
TBT-10-S	K980476	1-001DUP	7/23/98	72 5	71 7	72 1	1.		

Approved By \_\_\_\_\_

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\_\_\_\_\_ Date 1127148

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## QA/QC Report

Client: Project: Sample Matrix:	EVS Encironment Consultants WSOU TBT Study Scdiment		Service Request: Date Collected: Date Received: Date Analyzed:	7/16/98 7/18/98		
		arbon, Tota ASTM D4 Units PE	129-82M			
LABORATORY	CONTROL SAMPLE	True		Measured		Percent
		Value		Value		Recovery
Source <sup>.</sup>	ERA 542 Lot #01125	0.62		0 62		100
CALIBRATION	VERIFICATION STANDARD					
		True Value		Measured Value		Percent Recovery
CCV 1 Result		20 0		20.6		103
CCV 2 Result CCV 3 Result		20.0 20 0		19 4 19 2		97 96
CCV 4 Result		20 0		192		90 99
CCV 5 Result		20 0		19 4		97
LABORATORY	( BLANK	MRL		Blank Value		
CCB 1 Result		0 05		ND		
CCB 2 Result		0 05		ND		
CCB 3 Result		0 05 0 05		ND ND		
CCB 4 Result CCB 5 Result		0.05		ND		
DUPLICATE A	NALYSIS		Samel	Duplicate		Relative Percent
Sample Name	Lab Code	MRL	Sample Result	Sample Result	Average	Difference
TBT-10-S	K9804761-001D	0 05	0 50	0 45	0 48	10
MATRIX SPIK	E ANALYSIS				Spiked	_
Sample Name	Lab Code	MRL	Spike Level	Sample Result	Sample Result	Percent Recovery
TBT-10-S	K9804761-001MS	0 05	3 30	0 50	3 82	100
						2
Approved By		<		Dat		<u>x</u> 00009

COMBOOCD/042695 04761WET L/I - D\_COMBOQC B/3/98

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Page No

## QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Sediment

 Service Request:
 K9804761

 Date Collected:
 7/16/98

 Date Received:
 7/18/98

 Date Extracted:
 7/25/98

 Date Analyzed:
 8/1/98

## Surrogate Recovery Summary Butyltins

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
		_	
TBT-10-S	K9804761-001	73	74
TBT-11-S	K9804761-002	75	83
TBT-12-S	K9804761-003	NA	NA
TBT-13-S	K9804761-004	NA	NA
TBT-14-S	K9804761-005	NA	NA
TBT-37-S	K9804761-006	NA	NA
TBT-15-S	K9804761-007	79	60
TBT-16-S	K9804761-008	NA	NA
TBT-17-S	K9804761-009	73	69
TBT-18-S	K9804761-010	74	64
TBT-19-S	K9804761-011	70	59
TBT-20-S	K9804761-012	NA	NA
TBT-15-S	K9804761-007MS	82	70
TBT-15-S	K9804761-007DMS	79	77
Lab Control Sample	K980725-SL	81	74
Method Blank	K980725-SB	94	84

CAS Acceptance Limits:

20-195

20-172

NA

Not Applicable; see case narrative

Approved By: SUR2/102194 04761SVG JG1 - SURR 8/4/98

Date: 8-4-98

00010 Page No

## QA/QC Report

<b>EVS Environment Consultants</b>
WSOU TBT Study
Sediment

 Service Request:
 K9804761

 Date Collected:
 7/16/98

 Date Received:
 7/18/98

 Date Extracted:
 7/25/98

 Date Analyzed:
 8/1/98

Matrix Spike/Duplicate Matrix Spike Summary Butyltins Units. ug/Kg (ppb) Dry Weight Basis

 Sample Name:
 TBT-15-S

 Lab Code:
 K9804761-007MS, K9804761-007DMS

						Perc	ent R	ecovery			
									CAS	Relative	
		Spike	e Level	Sample	Spike	Result			Acceptance	Percent	
Analyte	,	MS	DMS	Result	MS	DMS	MS	DMS	Limits	Difference	
Tributyltin		8	8	530	NA	NA	NC	NC	20-200	-	

NA

Not Applicable, see case narrative

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Approved By: \_\_\_\_\_ DMS1SOTS/060194 04761SVG JG1 - DMS 8/4/98

Date 8-4-98

00011 Page No

## QA/QC Report

Client: Project: LCS Matrix:	EVS Environment Consultants WSOU TBT Study Scdiment		Service Request: Date Collected: Date Received: Date Extracted: Date Analyzed:	NA NA 7/25/98
	Labo	oratory Control Sample Summary Butyltins Units <sup>.</sup> ug/Kg (ppb)		CAS Percent
Analyte	True Value		Percent Recovery	Recovery Acceptance Limits
Tributyltin	5	5	100	20-164

Approved By: \_

LCSOTS/121594 04761SVG JG1 - LCS 8/4/98

Date: 8-4-98

00012 Page No

## QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study

Service Request: K9804761 Calibration Date: 8/1/98 Date Analyzed: 8/1/98

## Continuing Calibration Verification (CCV) Summary Butyltins Units: µg/L (ppb)

Analyte	Truc Valuc	CCV1 Result	Percent Recovery		Percent Recovery	
Tributyltın	500	496	99	476	95	

Approved By	() Hy	 Date	8-4-98
CCV 1-4/042795	0		
04761SVG JG1 - CCV 1	-4 K/4/98		

00013 Page No

## QA/QC Report

Client: Project:	EVS Environment Consultants WSOU TBT Study			Service Request: Calibration Date: Date Analyzed:	8/1/98
	Continuing C	Calibration Blank ( Butyltins Units µg/Kg (pp			
Analyte	MRL	CCB1 Result	CCB2 Result		
Tributyltin	1	ND	ND		

Approved By	_
CCB4SMR1/120594	

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047615VG JG1 - CCB T 4 8/4/98

Date 2.4.98

00014 Page No

Client: Project: Sample Matrix:

**EVS Environmental Consultants** WSOU TBT Study Soil, Wipe

Service Request No.: Date Received:

Date 8/10/43

K9804795 7/21/98

**C** 

#### **CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch.

The surrogate recoveries for TBT in all samples except TBT-25-CB were not calculated. The analysis of these samples required a dilution which resulted in a surrogate concentration below the Method Reporting Limit (MRL). No further corrective action was taken

The Tripenyltin surrogate recovery for TBT in the Method Blank (MB) was outside normal CAS control limits. The Tripropyltin surrogate recovery associated with the TBT Method Blank analysis of these samples was within normal CAS control limits, so no further corrective action was taken.

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Approved by

Analytical Report	ort	Rep	ytical	Ana
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Client: Project: Sample I		EVS Environment Cor WSOU TBT Study Soil	nsultants		Service Request: Date Collected: Date Received:	7/17/98
				Total Solids		
Prep Met Analysis Test Note	Method	NONE 160 3M			Units <sup>.</sup> Basis	PERCENT Wet
				Date		Result
Sample	Name		Lab Code	Analyzed	Result	Notes
TBT-21-S TBT-22-S TBT-23-S TBT-24-S TBT-25-S TBT-26-S TBT-26-S TBT-27-S TBT-28-S TBT-38-S TBT-34-S TBT-31-S TBT-31-S TBT-33-S TBT-29-S TBT-30-S			K9804795-001 K9804795-002 K9804795-003 K9804795-004 K9804795-005 K9804795-007 K9804795-008 K9804795-009 K9804795-010 K9804795-011 K9804795-012 K9804795-013 K9804795-014 K9804795-015 K9804795-016	7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98 7/27/98	61 1 64.8 65.5 60 0 63 6 60 0 63 4 60 0 61 3 51 6 61 8 51 0 61 1 46 3 61 2	

Approved By: \_\_\_\_\_\_ TSOLIDS XLT\_Sample/01071998a

04795TS AB1 - 016 7/28/98

\_\_\_\_\_ Date \_7/30/88

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#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Soil

Scrvice Request: K9804795 Date Collected: 7/17/98 Date Received: 7/21/98 Date Extracted: NA Date Analyzed: 8/1/98 -

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Carbon, Total Organic ASTM D4129-82M Units PERCENT Dry Weight Basis

Sample Name	Lab Code	MRL	Result
TBT-21-S	K9804795-001	0 05	1 23
TBT-22-S	K9804795-002	0 05	0.94
TBT-23-S	K9804795-003	0 05	0.93
TBT-24-S	K9804795-004	0 05	1 27
TBT-25-S	K9804795-005	0.05	1 12
TBT-26-S	K9804795-007	0 05	1.21
TBT-27-S	K9804795-008	0.05	1.45
TBT-28-S	K9804795-009	0.05	1 22
TBT-38-S	K9804795-010	0 05	1.40
TBT-34-S	K9804795-011	0 05	4.24
TBT-32-S	K9804795-012	0.05	0 99
TBT-31-S	K9804795-013	0 05	1.7
TBT-33-S	K9804795-014	0.05	1 25
TBT-29-S	K9804795-015	0 05	2.41
TBT-30-S	K9804795-016	0 05	1 28
Method Blank	K9804795-MB	0 05	ND

Modified for analysis of soil

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Approved By		Date	813197
IAMRI/102594 04795WET LJI - TOCS 8/3/98	<u> </u>		

00005 Page No

#### Analytical Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Soil

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 Service Request:
 K9804795

 Date Collected:
 7/17/98

 Date Received:
 7/21/98

 Date Extracted:
 8/1/98

Butyltins\* Units ug/Kg (ppb) Dry Weight Basis

Analyte	Tributyltin
Method Reporting Limit.	1

		Date	
Sample Name	Lab Code	Analyzed	
TBT-21-S	K9804795-001	8/5/98	610
TBT-22-S	K9804795-002	8/5/98	350
TBT-23-S	K9804795-003	8/5/98	510
TBT-24-S	K9804795-004	8/5/98	570
TBT-25-S	K9804795-005	8/5/98	310
TBT-26-S	K9804795-007	8/5/98	1100
TBT-27-S	K9804795-008	8/5/98	730
TBT-28-S	K9804795-009	8/6/98	690
TBT-38-S	K9804795-010	8/6/98	650
TBT-34-S	K9804795-011	8/5/98	850
TBT-32-S	K9804795-012	8/6/98	2200
TBT-31-S	K9804795-013	8/6/98	6600
TBT-33-S	K9804795-014	8/6/98	1000
TBT-29-S	K9804795-015	8/6/98	6200
TBT-30-S	K9804795-016	8/6/98	310
Method Blank	K980801-SB	8/6/98	ND

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Methodology based on C.A.Krone, et al., "A Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound," National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Seattle, WA, November 1988. Butyltins are reported as the cations

Approved By \_\_\_\_

3ADA/101194 04795SVG JG1 - Butylin 8/7/98

\_\_\_\_ Date: <u>8 - 7-98</u>



#### Analytical Report

Client: Project: Sample Matrix:	EVS Environment Consultants WSOU TBT Study Wipc			Service Request: Date Collected: Date Received: Date Extracted:	7/17/98 7/21/98
		Butyltins* ug/WIPE			
	Method	Analyte: Reporting Limit	<b>Tributyltin</b> 0.01		
Sample Name	Lab Code	Date Analyzed			
TBT-25-CB Method Blank	K9804795-006 K980801-SB	8/6/98 8/6/98	ND ND		

Methodology based on C A.Krone, et al, "A Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound," National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Seattle, WA, November 1988. Butyltins are reported as the cations.

Acuncker 8-7-98 Date Approved By

3ADA/101194 04795SVG JGI - Butylin (2) 8/7/98

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## APPENDIX A

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## LABORATORY QA/QC RESULTS

	, ,			QA/QC Re	eport				
Í	Client: Project: Sample Matrix:	EVS Environment WSOU TBT Study Soil	-				Date	ce Request: Collected: Received:	7/17/98
				Duplicate Su	mmary				
				Total Sol	ıds		•		
	Prep Method. Analysis Method	NONE 160 3M						Units Basis	PERCENT Wet
	Test Notes. Sample Name	L	ab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
	TBT-21-S	К	9804795-001DUP	7/27/98	61 1	60.7	60 9	<1	

04795TS AB1 - DUP 7'28/98

\_ Date: \_7/3c/97\_



## QA/QC Report

Client: Project: Sample Matrix:	WSOU TH	ronment Consultants 3T Study				Service Request: Date Collected: Date Received: Date Analyzed:	7/17/98 7/21/98
			Carbon, Tota ASTM D4 Units: PE	129 <b>-8</b> 2M			
LABORATORY	CONTRO	L SAMPLE					
			True Value		Measured Value		Percent Recovery
Source:	ERA Cat#	542 Lot# 01125	0.62		0.62		100
CALIBRATION VERIFICATION STANDARD							
			True Value		Measured Value		Percent Recovery
CCV 3 Result CCV 4 Result CCV 5 Result CCV 6 Result			20.0 20.0 20.0 20.0		19.8 19.4 19.6 19.7		99 97 98 98
LABORATORY	BLANK		MRL		Blank Value		
CCB 3 Result CCB 4 Result CCB 5 Result CCB 6 Result			0.05 0 05 0.05 0.05		ND ND ND ND		
<b>DUPLICATE A</b> Sample Name	NALYSIS	Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
TBT-21-S		K9804795-001	0.05	1 23	1.17	1.20	5
MATRIX SPIK	E ANALYS	Lab Code	MRL	Spike Level	Sample Result 1 23	Spiked Sample Result 7.15	Percent Recovery 95
TBT-21-S		K9804795-001	0 05	6.22	1 23	7.13	22

(m) Date 8/10/47 00010 r Approved By

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COMBOQCD/042695

04795WET LJI - D\_COMBOQC 8/10/98

#### QA/QC Report

#### **EVS Environment Consultants Client:** WSOU TBT Study **Project:** Sample Matrix: Soil, Wipe

Service Request: K9804795 Date Collected: 7/17/98 Date Received: 7/21/98 Date Extracted: 8/1/98 Date Analyzed: 8/5-6/98

### Surrogate Recovery Summary **Butyltins**

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
TBT-21-S	K9804795-001	NA	NA
TBT-22-S	K9804795-002	NA	NA
TBT-23-S	K9804795-003	NA	NA
TBT-24-S	K9804795-004	NA	NA
TBT-25-S	K9804795-005	NA	NA
TBT-25-CB	K9804795-006	70	73
TBT-26-S	K9804795-007	NA	NA
TBT-27-S	K9804795-008	NA	NA
TBT-28-S	K9804795-009	NA	NA
TBT-38-S	K9804795-010	NA	NA
TBT-34-S	K9804795-011	NA	NA
TBT-32-S	K9804795-012	NA	NA
TBT-31-S	K9804795-013	NA	NA
TBT-33-S	K9804795-014	NA	NA
TBT-29-S	K9804795-015	NA	NA
TBT-30-S	K9804795-016	NA	NA
Lab Control Sample	K980801-SL	75	77
Method Blank	K980801-SB	40	17(A)

CAS Acceptance Limits.

20-195

\_\_\_\_ Date: <u>8 - 7 - 98</u>

20-172

Α NA Outside acceptance limits; see case narrative Not Applicable; see case narrative.

rda Neuneker Approved By.

SUR2/102194 04795SVG JG1 - SURR 8/7/98

00011 Page No

## QA/QC Report

Client: Project: LCS Matrix:	EVS Environment Consultant WSOU TBT Study Soil	s		Service Request: Date Collected: Date Received: Date Extracted: Date Analyzed:	NA NA 8/1/98
	La	aboratory Control Sam Butyltins Units ug/Kg (j			
	Т	nuc		Percent	CAS Percent Recovery Acceptance
Analyte	Va	lue	Result	Recovery	Limits
Tributyltin		5	4	80	20-164

Jorda Neuneker Date: 8-7-98 Approved By.

LCSOTS/121594 04795SVG JG1 - LCS 8/7/98 00012

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## QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study

Service Request: K9804795 Calibration Date: 8/1/98 Date Analyzed: 8/5-6/98

#### Continuing Calibration Verification (CCV) Summary Butyltins Units: µg/L (ppb)

Analyte	Truc Value		Percent Recovery						Percent Recovery
Tributyltın	500	489	98	504	101	517	103	509	102

onda Meuneker Approved By.

Date: 8-7-98

CCV 1-4/042795 04795SVG JG1 - CCV 1-4 8/7/98 00013 Page No

## QA/QC Report

Client:EVS Environment ConsultantsProject:WSOU TBT Study

Service Request: K9804795 Calibration Date: 8/1/98 Date Analyzed: 8/6/98

Continuing Calibration Verification (CCV) Summary Butyltins Units. µg/L (ppb)

Analyte	True	CCV5	Percent
	Value	Result	Recovery
Tributyltın	500	466	93

nda Neuneker Approved By:

CCV 5-8/042795 04795SVG JGI - CCV 5-8 8/7/98

00014 Page No

\_Date: <u>8-7-98</u>

## QA/QC Report

Client: Project:	EVS Environment Consultants WSOU TBT Study			Service Request: Calibration Date: Date Analyzed:	8/1/98
	Continuing C	Calibration Blank ( Butyltins Units: µg/Kg (pp			
Analyte	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Tributyltın	1	ND	ND	ND	ND

Ionda Neuneker Date <u>8-7-98</u> Approved By.

CCB4SMR1/120594 04795SVG JG1 - CCB 1-4 (2) 8/7/98

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## QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study

Service Request: K9804795 Calibration Date: 8/1/98 Date Analyzed: 8/6/98

Continuing Calibration Blank (CCB) Summary Butyltins Units µg/Kg (ppb)

Analyte	MRL	CCB5 Result
Tributyltin	1	ND

Approved By:

vonda Meuneker Date 8-7-98 CCB4SMRL/120594 04795SVG JG1 - CCB I-4 (3) 8/7/98

	CHAII	N-OF-CUSTODY/	EST REC	UES									
fudy <del>Glient</del> Name <sup>.</sup>	WS		Ship to: C.A.S. 1317 S. 1314 AVE K9804715 Kelse, WA 98626 willbolzick; Attn Lynda Huckestu'n Shipping Date: 07-16-98										
Contact Name	Tion HAU	AMMERMEISTER LI		ton like	lzicki I	Attn 🛴	Kels ynda	o W Hudrey	A '	9864 Ship	pping Date: <u>Ø</u> ·7	-16-98	
Tuny	<u>e fetrill</u>	of Pale Diction	<u>son</u>	<u></u>							1		
Sample Collection Date (d/m/y)	Tıme (am/pm)	Sample Identification	Volume of Sample/# of Containers	Bulk TBT		) Heques	ted (check	test(s) ret	quired)		Comments/Instructions		
7/15/98	0902	TBT-01-5	1602/1	X	$\succ$					<u></u>	#400		
	0955	TBT-02-5	/1	$\succ$	$\times$						\$4006		
/	11	TBT-35-5	(1	$\left \right>$	$\times$						#4011		
11	1045	TBT-03-5	('	$\succ$	$\times$						#4014		
11	1124	TBT-04-5	IT .	$\succ$	$\succ$	_					#4019		
۲(	1205	TBT-05-5	11	$\searrow$	$\succ$	)					F4024		
11	1355	TBT-06-5	11	$\mathbf{i}$	$\succ$						# 4029		
11	1435	TBT-07-5	11	$\mathbf{X}$	$\sim$						*4034		
ti	1435	TBT-36-5	(c	$\mathbf{\mathbf{X}}$	$\mathbf{X}$					# 4039			
11	• 11	TBT-07-FB	1	$\mathbf{\mathbf{\hat{N}}}$					± 4042			۷	
1) Released by.	c.A		Julignalle	viu	3) Relea	sed by:	<u></u>		To be co	mpleted t	y EVS Laboratory	upon sample receipt.	
Date/Time: 7/16/98 1330 Date/Time: 7-16 18 18					Date/Time				EVS Project #			EVS W O. #	
1) Rec'd by: Julian liverand 2) Rec'd by from lar 13) Rec'd by											Time of receipt		
Date/Time: 7-16-48 1330 Date/Time 7/17/48 600 Date/Time								Condition	Condition Upon Receipt. Received by.				

Instructions for completion of Chain-of-Custody/Test Request Form on back
 Distribution White and yellow copies accompany shipment, pink-consignor's copy, white-consignee return with results; yellow-consignee's copy



- 195 Pemberton Avenue North Vancouver, B.C. Canada, V7P 2R4 Tel: (604) 986-4331 Fax (604) 662-8548
- 200 West Mercer Street Suite 403 Seattle, WA 98119 Tel<sup>-</sup> (206) 217-9337 Fax (206) 217-9343

	CHAIN	N-OF-CUSTODY/	<b>FEST REC</b>	UEST	<b>FOR</b>	M FO	R SED	IMENT		WAT	ER SAMPL	.E(S)*	n <
fudy Dirent Name. WSOV TBT Study					S	Ship to <sup>.</sup> (	C.A.S. Kelsur yada b	Avi	F9X0'	41			
Contact Name Tim Hammer meister						-	Kels (	WA	6	<u>ہ</u>			
Sampled By	T. HAMMU Petillo	, D. Dickanson	ill, SWodr,	<u>icki,</u>	<i></i>	Attn: Z	ynda k	fuckest	<u>ein</u>	Ship	oping Date <u>07-</u>	16-98	
		/			Test(s	) Reques	ted (check						
Sample Collection Date (d/m/y)	Time (am/pm)	Sample Identification	Volume of Sample/# of Containers	Bulk 787	700						Comments/Instru	uctions	
7/15/98		TBT-07-CB	1602/1	$\mathbf{\succ}$					<u> </u>	<u></u>	±4043		
	1535	TBT-08-5	(1	$\geq$	X						#4044		
11	655	TBT-09-5	u	$\succ$	$\geq$						4037	<u> </u>	
					<u> </u>								
l/						·	_		l			/	
												/	
		/											
			「					$\checkmark$	[				
									To be completed by EVS Laboratory upon sample receipt.				
Date/Time 7/16 98 1330 Date/Time 7-16 18 335 Date/Time								EVS Project # EVS W O. #					
						I) Rec'd by. Date of Receipt					Time of receipt:	:	
Date/Time.	-16 48	1330 Date/Time	Mirlas	1000	Date/	lime.			Conditio	n Upon R	eceipt	Received by	

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• 195 Pemberton Avenue North Vancouver, B.C. Canada, V7P 2R4 Tel: (604) 986-4331 Fax: (604) 662-8548

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• 200 West Mercer Street Suite 403 Seattle, WA 98119 Tel: (206) 217-9337 Fax: (206) 217-9343

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Chent Name. Contact Name Sampled By	CHAI WSOL A. May	N-OF-CUSTODY/ A.T.B.T. Study Augslick ik, S. Wodzicki, J	TEST REG		5	Ship to <sup>.</sup>	Columbia	ENT c (l ruth keste	13th AVE	ER SAMPL	
					Test	s) Reques	ted (check test	t(s) regi	uired)		
Sample Collection Date (d/m/y)	Time (am/pm)	Sample Identification	Volume of Sample/# of Containers	1737/						Comments/Instru	uctions
				Toc							
07-16-98	0845	TBT-10-5 -	160/1	$\times$						4062	
11	0920	TBT-11-5 -	1 1	$\overrightarrow{X}$						4067	
<b> </b>	1035		168/1	V V						4072	
<b> </b> ── <del>−</del>	<b>'</b>		1			···				4077	
	1120	TBT-13-5 -	16 -8/	$ X_{-} $				——		<i>b</i>	
	1310	181-14-5 v		X_			 			4090	
	1320	TOT-37-5 -	- 11	<u>    X</u>						4093	
	1355	TOT-15-5 -	4	$\mathbf{X}$						4098	
	1430	TBT-16-5 -	11	X						4103	
	1500	TBT-17-5 -		X		f				4108	······································
$\nabla$	1545	TOT-18-5 .	/ 11	X						4113	
1) Released by	<u> </u>	Hanglick 2) Released by?	Julian la	121500	3) Relea	sed by.	A.,		To be completed b	by EVS Laboratory u	pon sample receipt
Date/Time	1-17-98	1030 Date/Time 2	/	ix 34.	Date/	lime			EVS Project #		EVSWO #
1) Rec'd by	ilva no-l	LIVE 2) Rec'd by	u= k.++		3) Rec'd	by.			Date of Receipt		Time of receipt
Date/Time. L	7-17-96	クレビラビ Date/Time:	(13-K 18 J	luc-98	Date/	lime <sup>.</sup>		_	Condition Upon Re	eceipt:	Received by

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- 200 West Mercer Street Suite 403 Seattle, WA 98119 Tel<sup>.</sup> (206) 217-9337 Fax. (206) 217-9343

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Grent Name Contact Name Sampled By	WSC		ST Ha	rest rec d i Mi		S	M FOI				ligher	ER SAMPI	
Sample Collection Date (d/m/y)	Time (am/pm)	Sample Iden	tification	Volume of Sample/# of Containers	TBITAC	Test(s	s) Reques	ted (check	test(s) rec	quired)		Comments/Inst	ructions
7-16-98 7-16-98	1645 1730	TBT-:	-19-5- 20-5-	163/1	X X							2123	4123 4131
1) Released by: Date/Time: 1) Rec'd by. Date/Time: k	7-17-98	1030 Vivero	2) Released by Date/Time 2) Rec'd by ( Date/Time.	1/45 18 JI		3) Relea Date/ 3) Rec'd Date/	Time. by.			EVS Pro	oject # Receipt:	y EVS Laboratory	upon sample receipt EVS W O # Time of receipt. Received by

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	CHAII	N-OF-CUSTODY/	TEST REQ	UEST	FOR	M FO	R SED	IMENT	AND	WAT	ER SAMPL	
Study Ghent Name Contact Name Sampled By T. P.F.	Ting H Tillamin	U TBT Study AMMERMETSTER ermeister, S. Woo D. Dickenson	1 12; dk.; L. 1	<u>Mill</u> ,		Ship to:	Colu 1317 Yudu	11 1		lyfi Aveshi	ical Servi Kelso, Wi oping Date:	C 43 A 98626
Sample Collection Date (d/m/y)	Time (am/pm)	Sample Identification	Volume of Sample/# of Containers	787	Test(s	s) Reques	ted (chec)	< test(s) red	quired)		Comments/Instr	ructions
7/17/98	1316	TBT-34-5	1602	$\mathbf{X}$	$\times$	 		<u> </u>			#4180	
<u> </u>	1351	TBT-32-5	ι(	$\ge$	$\times$						+ <u>+</u> 418	4
(1	1429	TBT-31-5	(1	$\times$	X						#418	7
11	1508	TBT-33-5	((		$\mathbf{\times}$						# 419	0
V	1548	TBT-79-5	U	$\overrightarrow{\times}$	$\times$						¥419	3
	1622	TBT-30-5	11		$\sim$						±419	2
				$\sim$	<u> </u>							2
/												
-/												
							<u>\</u>					
1) Released by.	1-11- 1-1-198	2) Released by: //30 Date/Time	<u></u>		3) Relea	•	<u>1</u>	<u> </u>			by EVS Laboratory u	ipon sample receipt. EVS W.O. #
Date/Time·	Bejah	2) Rec'd by		····	Date/				EVS Pro	-		Time of receipt
Date/Time: 7		): 3000 Date/Time			Date/	•				n Upon R	eceipt:	Received by

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### CHAIN-OF-CUSTODY/TEST REQUEST FORM FOR SEDIMENT AND WATER SAMPLE(S)\*

Stient Name		TBT Study			S		bin An	Ave Ke	<u>ervilus</u> Iso, WA 98	2620 2620
Contact Name Sampled By	Hammen etillo,	meister, S. Wedzick Dickenson	:, L. M. l,	/		<u>1317</u> .ttn <u>Lynde</u>	Juckeste	<u>y'a</u> Shippi	ng Date	
Sample Collection Date (d/m/y)	Time (am/pm)	Sample Identification	Volume of Sample/# of Containers	T&T	Test(s	) Requested (che	ck test(s) rec		Comments/Instru	
7/17/98	0831	TBT-21-5	1602/1	$\ge$	$\left  \times \right $				# 4136	
11	0857	TBT-22-5	1(	$\times$	$\times$				# 4141	
(1	0940	TBT-23-5	((	$\succ$	$\mathbf{X}$				# 4146	
10	1023	TBT-24-5	11	$\times$	$\left \right>$				# 4151	
11	1048	TBT-25-5	((	$\times$	$\mathbf{\hat{\times}}$				#4156	
(1	• 11	TBT-25-CB	(/	$\mathbf{\times}$					#4161	
11	1123	TBT-26-5	(1	$\mathbf{i}$	$\succ$				*4162	
(I	1154	TBT-27-5	/1	$\sum$	$\mathbf{X}$	-			#416	7
11	1231	TBT-28-5	11	$\mathbf{\Sigma}$	$\succ$				# 4172	
{\	[]	TBT-38-5	11	$\times$	$\mathbf{\mathbf{\Sigma}}$				#4177	
1) Released by	1 / 1	2) Released by.	<u> </u>	· · ·	3) Relea	sed by		To be completed by	EVS Laboratory up	on sample receipt
Date/Time					Date/1			EVS Project #		EVSWO #
1) Rec'd by. Č					3) Rec'd	•		Date of Receipt.		Time of receipt.
Date/Time·7	2198	1:30pm Date/Time	<u></u>		Date/	Ime		Condition Upon Rec	eipt	Received by

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#### Rosa Environmental Geotechnical Laboratory, LLC

#### EVS Consultants

Project. WSOU TBT Study

#### Table 1 Apparent Grain Size Distribution Summary Percent Finer Than Indicated Size

Sample No		Gravel		Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand		s	alt		С	lay
Phi Size	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Sleve Size (microns)	3/8*	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)	31 00	15 60	7 80	3.90	2.00	1.00
TBT-01-S	100 0	89.0	88 2	86.6	823	53 5	14 1	10.2	89	72	57	37	27	18
TBT-02-S	100 0	100.0	99.8	99 1	98.0	94.2	80 9	66 3	54 6	42.2	29 1	20.6	13.2	10.1
TBT-03-S	100 0	97 9	94.6	93 1	911	85 0	738	637	577	46 4	34.8	23.9	165	115
TBT-04-S	100 0	99.6	98 9	98.3	92 5	66 8	48 4	40 5	35 8	29 4	217	15.2	10.8	76
TBT-05-S	100.0	100.0	100 0	99.9	96 0	88.3	77 4	67 4	58 4	46.6	33.8	23.4	16 5	11.3
TBT-06-S	100 0	100.0	99 9	99 7	98.1	88 1	74.1	64.8	57.4	45.4	33 3	23.6	16 5	11.7
TBT-07-S	100 0	100.0	99 8	99.1	96,8	87.6	74.4	61.7	52 3	40.6	27.5	196	14.4	9,5
TBT-08-S	100 0	97 8	95 6	92 5	87.4	757	64 6	56 0	419	34.7	28 0	20 5	146	9.6
TBT-09-S	100 0	100.0	98 6	97 0	94.4	89.5	81.5	71.4	62 5	50.0	36.7	24 8	180	12 1
TBT-10-S	100 0	99 5	99 3	98 2	92 9	62 3	30 4	23.4	18.3	11.7	77	5.2	3.4	2.3
T8T-11-S	100 0	100 0	99 3	97 7	92 3	68 6	41.2	29.2	_ 20 8	14,5	10 4	7.2	5.2	3.6
TBT-12-S	100.0	99 4	97.5	95 9	94.1	90.7	85 6	77.2	68 0	54.4	40.4	28 1	19 3	13 3
TBT-13-S	100 0	100 0	97 9	96 1	917	767	59 1	45.6	36 4	29.5	22.4	16.2	118	79
TBT-13-S-2	100 0	98 3	96.8	95 1	89 8	75 5	57 8	44 4	37 6	28 8	216	15.2	10 9	7.1
TBT-13-S-3	100 0	100 0	98 4	96 7	92.3	76 8	58 7	44 5	36 9	29.2	21.9	15.7	115	78
TBT-14-S	100 0	93,4	91 3	89 6	85 6	69.8	50.2	38.8	33,1	25 7	19.3	13.6	99	68
	100.0	97.4	94.6	916	83 4	60 5	45.8	38,6	34 1	26.3	17 5	12.2	87	59
TBT-16-S	100 0	99 6	99 3	97 2	93 3	86 7	75.2	61 4	32.3	43.7	33 4	24.2	16.4	116
TBT-17-S	100 0	100 0	99 9	99 6	96 4	74.2	47.4	28 5	15.1	12.8	91	64	44	3.0
TBT-18-S	100 0	100.0	99 3	98 8	95 4	72 3	40.0	28 6	21.3	16.3	130	10.2	67	4.5
T8T-19-S	100 0	99 7	97 7	96 1	90.8	76 4	64.1	53.2	42 0	31.1	22.2	15 5	10 7	72
TBT-20-S	100 0	97.6	96 6	95 4	93.3	86 8	69 6	52.1	43.8	34.1	26 3	18 8	12 8	90
TBT-21-S	100,0	100.0	98 8	97.2	91.2	76-9	60 4	46 6	35.9	25.3	18.2	12.8	94	6.2
TBT-22-S	100 0	100,0	<del>9</del> 9 9	99 4	98.2	85 6	59 0	38 3	26 3	19.2	14.4	10.5	78	5.2
TBT-23-S	100 0	100 0	100.0	99.6	98 2	89 6	66 6	38.3	26 6	193	14.9	10.6	74	50
TBT-24-S	100 0	100 0	99 9	99 1	97 2	87 5	68 8	49.0	36 7	26.8	20 1	14 4	10 3	68
T8T-25-S	100 0	100 0	99 1	96 3	90.8	79 2	66 6	54 4	38 7	24 6	17.0	12 0	86	63
TBT-26-S	100 0	99 9	98 9	96.8	90 2	65 0	42.2	28 3	22 2	17.1	12 9	9.2	67	46
TBT-27-S	100.0	90 6	89 5	87 4	80.8	64 6	486	35 4	27 5	20 3	15 1	10.8	77	5.3
TBT-28-S	100 0	100 0	99 9	99 0	96 2	85 3	67.1	47 9	34 1	23 8	17.2	12.4	87	63
TBT-28-S-2	100 0	100 0	100 0	99 4	95 9	85 6	67 4	48 3	33.8	23 7	17 6	12.4	91	66
TBT-28-S-3	100 0	100.0	99.8	99 0	95 9	85.2	67 2	48.2	34 0	23 9	17.3	12.5	9.2	64
TBT-29-S	100 0	99 5	98.8	98 0	95 4	88.8	67.5	45.3	34 5	27.4	20 6	14 6	10.8	74
TBT-30-S	100 0	99.4	98.8	98 5	96.3	88 0	74 1	56.2	39.9	27 5	20.3	14.2	10.2	7.3
TBT-31-S	100.0	96.9	94 9	89.8	76.8	60 0	44 5	36.2	31.4	24.0	156	11 1	85	60
TBT-32-S	100 0	100 0	99 7	. 99 1	96.8	84 1	52 7	32_1	22 3	16.6	130	10 1	72	49
TBT-32-S [2]	100.0	99 5	99.2	98 7	96.4	83 5	51 1	29 3	21.4	16.2	12.6	95	69	48
T8T-33-S	100.0	997	99.4	98.8	93 2	64 6	33.2	18.5	13.5	9.8	7.6	5.7	41	27
TBT-34-S	100.0	94.3	72.7	62 7	55 7	46 0	36 3	29.9	25 0	20.8	157	11.2	7.9	54
TBT-35-S	100 0	100.0	100 0	100 0	99 0	94 8	81.6	66 8	563	44.0	31.5	21.9	160	10.6
TBT-36-S	100 0	100.0	99 5	98 7	96.6	86 8	72.8	59 3	50 4	40.6	28.2	19.6	14 0	9.3
TBT-37-S	100.0	93.3	903	88.5	847	69.8	50.5	39.2	33.8	25.7	190	13.3	9.5	6.3
TBT-38-S	100.0	100 0	99 5	98 4	94.B	84.9	66.9	48.2	32.9	23.2	17.2	12 1	85	5.8

Notes to the Testing

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1. Apparent grain size distributions according to PSEP protocols

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#### Rosa Environmental and Geotechnical Laboratory, LLC

#### QA SUMMARY

PROJECT	EVS Consultants	Project .	WSOU TBT Study	
REGL Triplicate Sample ID	98671	Batch No	1022-001-01	
Client Triplicate Sample ID	TBT-28-S	Page <sup>.</sup>	1 of 1	

					Rela	ative Standa	ard Deviatio	n, By Phi Si	ze					
Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
TBT-28-S	-	100 0	99.9	99 0	96 2	85 3	67.1	47 9	34.1	23 8	17.2	12.4	8.7	63
TBT-28-S-2	-	100 0	100 0	99.4	95 9	85 6	674	48.3	33.8	23 7	176	12.4	91	66
TBT-28-S-3	-	100.0	99,8	99 0	95 9	85.2	67.2	48.2	34 0	23,9	17.3	12.5	92	6.4
AVE	NA	100 00	99.89	99.15	95 98	85.37	67.20	48.14	33.99	23.80	17.39	12.45	9.01	6.42
STDEV	NA	0.00	0.10	0.21	0 20	0.19	0.17	0.18	0.14	0.11	0.20	0 07	0.28	0.14
%RSD	NA	0.00	0.10	0.21	0.20	0.22	0.25	0 37	0.43	0.47	1.14	0.56	3 10	2.23

Duplicate Analysis,	By Phi Size
Duplicate / alarysis,	- Oy 1 11 OLO

Sample ID	•3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
TBT-32-S	100 0	100.0	99 7	99 1	96 8	84.1	52 7	32 1	22 3	16 6	13 0	10 1	72	4.9
TBT-32-S [2]	100 0	99 5	99.2	98 7	96 4	83 5	51.1	29.3	214	16.2	126	95	69	4.8
AVE	NA	99.74	99 44	98 87	96 63	83.7 <del>9</del>	51 90	30.72	21 81	16.40	12.82	9.81	7 04	4.83

#### The Triplicate Applies To The Following Samples

REGL ID	Client ID	Date Sampled	Date Extracted	Date Complete	QA*
98607	TBT-01-S	7/15/98	7/23/98	7/25/98	1 00
98611	TBT-05-S	7/15/98	7/23/98	7/25/98	1 01
98647	TBT-06-S	7/15/98	7/23/98	7/25/98	1.00
98652	TBT-10-S	7/16/98	7/23/98	7/25/98	1 02
98656	TBT-14-S	7/16/98	7/23/98	7/25/98	0.99
98659	TBT-16-S	7/16/98	7/23/98	7/25/98	1.01
98660	TBT-17-S	7/16/98	7/23/98	7/25/98	1.03
98664	TBT-21-S	7/17/98	7/23/98	7/25/98	1 00
98667	TBT-24-S	7/17/98	7/23/98	7/25/98	1.01
98668	TBT-25-S	7/17/98	7/23/98	7/25/98	1 02 .
98669	TBT-26-S	7/17/98	7/23/98	7/25/98	1.00
98671	TBT-28-S	7/17/98	7/23/98	7/25/98	1.02
98676	TBT-29-S	7/17/98	7/23/98	7/25/98	1 01
98677	TBT-30-S	7/17/98	7/23/98	7/25/98	1.04
98674	TBT-31-S	7/17/98	7/23/98	7/25/98	1 00
98673	TBT-32-S	7/17/98	7/23/98	7/25/98	1 02
98675	TBT-33-S	7/17/98	7/23/98	7/25/98	1 00
98672	TBT-34-S	7/17/98	7/23/98	7/25/98	1.02
98612	TBT-35-S	7/15/98	7/23/98	7/25/98	1 00

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\* QA limits = 95-105%

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#### Notes to the Testing

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1 Sample TBT-32-S was accidentally extracted and run twice The resulting data is reported above

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Rosa Environmental and Geotechnical Laboratory, LLC

PROJECT EVS	Consultants Project :	WSOU TBT Study
		-
REGL Triplicate Sample ID: 9	B655 Batch No.:	1022-001-02
Client Triplicate Sample ID: TBT-	13-S Page:	1 of 1

					17610	live Stanue	aru Deviatio	п, бу глі б	120					
Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
TBT-13-S	100.0	100.0	97.9	96.1	91.7	76.7	59.1	45.6	36.4	29.5	22.4	16.2	11.8	7.9
TBT-13-S-2	100.0	98.3	96.8	95.1	89.8	75.5	57.8	44.4	37.6	28.8	21.6	15.2	10.9	7.1
TBT-13-S-3	100.0	100.0	98.4	96.7	92.3	76.8	58.7	44.5	36.9	29.2	21.9	15.7	11.5	7.8
AVE	NA	99.43	97.71	95.95	91.23	76.32	58.51	44.83	36.95	29.19	21.95	15.69	11.38	7.58
STDEV	NA	0.99	0.82	0.81	1.28	0.69	0.63	0.64	0.63	0.38	0.40	0.47	0.45	0.46
%RSD	NA	1.00	0.84	0.84	1.40	0.90	1.08	1.42	1.69	1.29	1.84	2.97	3.91	6.02

#### The Triplicate Applies To The Following Samples

REGL ID	Client ID	Date Sampled	Date Extracted	Date Complete	QA*
98608	TBT-02-S	7/15/98	7/24/98	7/26/98	0.98
98609	TBT-03-S	7/15/98	7/24/98	7/26/98	0.99
98610	TBT-04-S	7/15/98	7/24/98	7/26/98	1.00
98648	TBT-07-S	7/15/98	7/24/98	7/26/98	1.00
98650	TBT-08-S	7/15/98	7/24/98	7/26/98	1.16
98651	TBT-09-S	7/15/98	7/24/98	7/26/98	1.00
98653	TBT-11-S	7/16/98	7/24/98	7/26/98	1.02
98654	TBT-12-S	7/16/98	7/24/98	7/26/98	1.00
98655	TBT-13-S	7/16/98	7/24/98	7/26/98	1.02
98658	TBT-15-S	7/16/98	7/24/98	7/26/98	1.00
98661	TBT-18-S	7/16/98	7/24/98	7/26/98	1.02
98662	TBT-19-S	7/16/98	7/24/98	7/26/98	1.00
98663	TBT-20-S	7/16/98	7/24/98	7/26/98	1.00
98665	TBT-22-S	7/17/98	7/24/98	7/26/98	1.01
98666	TBT-23-S	7/17/98	7/24/98	7/26/98	1.04
98670	TBT-27-S	7/17/98	7/24/98	7/26/98	0.98
98649	TBT-36-S	7/15/98	7/24/98	7/26/98	1.02
98657	TBT-37-S	7/16/98	7/24/98	7/26/98	0.97
98678	TBT-38-S	7/17/98	7/24/98	7/26/98	1.03

\* QA limits = 95-105%

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## **APPENDIX C**

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## Porewater Chemistry Results

This appendix contains the porewater chemistry data as reported by the analytical laboratory. The data are grouped by analytical batches. Case narratives, when produced by the laboratory, are included for each batch. The last letters of the porewater sample IDs indicate the extraction method, where -PT represents unfiltered porewater and -PD represents filtered porewater. لنتغ

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Client: EVS Consultants, Inc.REGL Project No.: 1022-001Client Project : WSOU TBT StudySample Batch Nos.: 1022-001-01 and 02

#### Case Narrative

- 1. Samples for pore water extraction and grain size analysis were received as follows; eleven received July, 15, twelve received July, 16, and fifteen received July, 17, 1998. The samples consisted of one, 2 gallon bucket, and one, 16 oz jar. The bucket samples had been packed in coolers for shipment. Two pieces of duct tape were fixed to the outer side of each bucket's lid. When lifted, each piece of tape revealed a hole approximately 1/4 inch in diameter. Duct tape can be permeable to oxygen. Being exposed to the atmosphere may have effected the quality of the samples in the buckets.
- 2. The samples were extracted starting on July 16, 1998, for the TBT portion of the project. The extraction was performed under anaerobic conditions in a nitrogen atmosphere. The buckets were opened, centrifuge bottles packed and decanted all under nitrogen. Sediment was placed in 1,000 ml polycarbonate centrifuge bottles. The bottles were placed in a centrifuge maintained at 4 C. The bottles were spun at 3,000 rpm for 30 minutes. They were then removed from the centrifuge and the free water was pipetted into 500 ml polycarbonate centrifuge bottles. In some cases where an odd number of centrifuge bottles were packed with sediment, a centrifuge bottle was spun twice in order to provide a balance for the odd bottle. Half the sample was pipetted un-filtered into HCl preserved polycarbonate bottles, the other half was filtered over .45 micron silver membranes. The filtered portion was sent in HCl preserved polycarbonate bottles as well.
- A separate extraction for TOC and DOC was performed. The extraction for TOC and DOC was conducted under anaerobic conditions in a nitrogen atmosphere, beginning July 20, 1998. The extraction procedure was exactly as for TBT extraction, except the filtered and unfiltered portions were sent in Sulfuric Acid preserved 4 ounce amber glass bottles.
- 4. Re-extraction for TBT analysis began July 28, 1998, on request. Samples TBT-15-S, TBT-16-S, TBT-17-S, TBT-18-S, TBT-19-S, and TBT-20-S were re-extracted as per the original procedure. Due to the drier nature of sample TBT-17-S, a larger volume was required; this was obtained from Battelle July 28, 1998. Sample TBT-12-S was also re-extracted as a QC duplicate.
- 5. A blank was prepared on July 16, 1998 from deionized water and was run through the entire extraction process. The blank was assigned REG number 98626.
- 6. A laboratory control sample was prepared on July 19, 1998 from deionized water. It was spiked with 50 ul of TBT solution #660-02, prepared with 4.35 ug/ml TBT. This sample was run through the entire extraction process, and was labeled according to the SOW.
- 7. Enough pore water was extracted for the laboratory to prepare MS/MSDs on TBT-17-S, TBT-32-S and TBT-34-S
- 8 Pore water extraction was initiated within the 48 hour holding time on all samples.

9. Sample TBT-08-S had large quantities of 1x2 mm oval shaped, black objects in it, many of which floaled. The objects appeared to be seeds of some sort. They were not seen in any other sample.

10. Samples TBT-25-S and TBT-27-S had several Sea Cucumbers buried in the sediment. They ranged from 1 to 4 inches in length.

11. The grain size analysis was started on July 23, 1998. The samples were tested for grain size distribution according to PSEP methods. The samples were run in two batches. A triplicate was run on one sample in each batch, and is reported in the attached QA summary. Sample TBT-32-S was accidentally extracted twice, and was run as part of the first batch, results are reported in the attached QA summary as well.

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Approved by: Title:

2<u>enn</u> Laboratory Manager

Date: 🎒

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ſ	Sample No.	Date/Time Sampled	Date/Time Extracted
ł	TBT-01-S		7/15/98 14:50
ł		7/15/98 9:02	7/15/98 14:50
ł	TBT-02-S	7/15/98 9:55	
ł	TBT-03-S	7/15/98 10:45	7/16/98 10:50
	TBT-04-S	7/15/98 11:24	7/16/98 13:10
ļ	TBT-05-S	7/15/98 12:05	7/16/98 13:50
	TBT-06-S	7/15/98 13:55	7/16/98 17:20
	TBT-07-S	7/15/98 14:35	7/16/98 18:45
	TBT-08-S	7/15/98 15:35	7/16/98 17:00
	TBT-09-S	7/15/98 16:55	7/17/98 8:35
	TBT-10-S	7/16/98 8:45	7/17/98 9:15
ļ	TBT-11-S	7/16/98 9:20	7/17/98 10:25
	TBT-12-S	7/16/98 10:35	7/17/98 12:50
	TBT-13-S	7/16/98 11:40	7/17/98 13:25
1	TBT-14-S	7/16/98 13:10	7/17/98 16:40
	TBT-15-S	7/16/98 13:55	7/17/98 17:00
	TBT-16-S	7/16/98 14:30	7/17/98 20:50
	TBT-17-S	7/16/98 15:00	7/17/98 19:30
	TBT-18-S	7/16/98 15:45	7/18/98 9:40
	TBT-19-S	7/16/98 16:45	7/17/98 20:15
	TBT-20-S	7/16/98 16:45	7/17/98 10:50
	TBT-21-S	7/17/98 8:31	7/18/98 8:55
	TBT-22-S	7/17/98 8:57	7/18/98 10:00
	TBT-23-S	7/17/98 9:40	7/18/98 12:00
	TBT-24-S	7/17/98 10:23	7/18/98 13:30
	TBT-25-S	7/17/98 10:48	7/18/98 16:00
	TBT-26-S	7/17/98 11:23	7/18/98 16:45
	TBT-27-S	7/17/98 11:54	7/18/98 16:10
	TBT-28-S	7/17/98 12:31	7/18/98 16:10
	TBT-29-S	7/17/98 15:48	7/19/98 9:45
	TBT-30-S	7/17/98 16:22	7/19/98 8:20
	TBT-31-S	7/17/98 14:29	7/19/98 13:00
	TBT-32-S	7/17/98 13:51	7/19/98 11:30
	TBT-33-S	7/17/98 15:08	7/19/98 13:50
	TBT-34-S	7/17/98 13:16	7/19/98 11:50
	TBT-35-S	7/15/98 9:55	7/16/98 8:25
	TBT-36-S	7/15/98 14:35	7/16/98 17:30
	TBT-37-S	7/16/98 13:20	7/17/98 15:55
	TBT-38-S	7/17/98 12:30	7/19/98 12:10
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#### QA Summary, TBT Extractions

Notes: All samples extracted within 48 hours of sampling.

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Comple Ma	Dete/Time Ormal 1	Dete The a Table 1
Sample No.	Date/Time Sampled	Date/Time Extracted
TBT-01-S	7/15/98 9:02	7/21/98 9:10
TBT-02-S	7/15/98 9:55	7/21/98 10:25
TBT-03-S	7/15/98 10:45	7/21/98 9:45
TBT-04-S	7/15/98 11:24	7/21/98 10:20
TBT-O5-S	7/15/98 12:05	7/21/98 10:35
TBT-06-S	7/15/98 13:55	7/21/98 11:00
TBT-07-S	7/15/98 14:35	7/21/98 10:10
TBT-08-S	7/15/98 15:35	7/21/98 9:30
TBT-09-S	7/15/98 16 <sup>.</sup> 55	7/21/98 10:50
TBT-10-S	7/16/98 8:45	7/21/98 9:45
TBT-11-S	7/16/98 9:20	7/21/98 8:55
TBT-12-S	7/16/98 10:35	7/21/98 8:30
TBT-13-S	7/16/98 11:40	7/21/98 8:35
TBT-14-S	7/16/98 13:10	7/21/98 10:45
TBT-15-S	7/16/98 13:55	7/21/98 8:45
TBT-16-S	7/16/98 14:30	7/21/98 8:40
TBT-17-S	7/16/98 15:00	7/20/98 11:35
TBT-18-S	7/16/98 15:45	7/21/98 10:45
TBT-19-S	7/16/98 16:45	7/21/98 9:00
TBT-20-S	7/16/98 16:45	7/21/98 10:45
TBT-21-S	7/17/98 8:31	7/22/98 9:20
TBT-22-S	7/17/98 8:57	7/22/98 9:10
TBT-23-S	7/17/98 9:40	7/22/98 9:00
TBT-24-S	7/17/98 10:23	7/22/98 9:20
TBT-25-S	7/17/98 10:48	7/22/98 8:45
TBT-26-S	7/17/98 11.23	7/22/98 8:50
TBT-27-S	7/17/98 11:54	7/22/98 9:20
TBT-28-S	7/17/98 12:31	7/22/98 9:40
TBT-29-S	7/17/98 15:48	7/22/98 10:20
TBT-30-S	7/17/98 16:22	7/22/98 8:30
TBT-31-S	7/17/98 14:29	7/22/98 9:40
TBT-32-S	7/17/98 13:51	7/21/98 12:20
TBT-33-S	7/17/98 15:08	7/20/98 15:45
TBT-34-S	7/17/98 13:16	7/20/98 15:15
TBT-35-S	7/15/98 9:55	7/20/98 11:05
TBT-36-S	7/15/98 14:35	7/22/98 10:40
TBT-37-S	7/16/98 13:20	7/22/98 10:20
TBT-38-S	7/17/98 12:30	7/22/98 8:35

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### QA Summary, TOC/DOC Extractions

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Rosa Environmental and Geotechnical Laboratory, LLC

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Sample No.	Date/Time Sampled	Date/Time Extracted
TBT-12-S	7/16/98 10:35	7/30/98 9:20
TBT-15-S	7/16/98 13:55	7/28/98 12:55
TBT-16-S	7/16/98 14:30	7/28/98 14:10
TBT-17-S	7/16/98 15:00	7/29/98 14:50
TBT-18-S	7/16/98 15:45	7/29/98 10:20
TBT-19-S	7/16/98 16:45	7/29/98 9:45
TBT-20-S	7/16/98 16:45	7/29/98 14:00

#### QA Summary, TBT Re-extractions

1022-001

#### Analytical Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Water

Service Request:	K9804760
Date Collected:	7/15/98
Date Received:	7/18/98
Date Extracted:	7/21/98
Date Analyzed:	7/28/98

Butyltins in Porewater Units ug/L (ppb)

	Analyte Method Reporting Limit	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
TBT-01-PD	K9804760-001	0 02
98626	K9804760-002	ND
TBT-02-PT	K9804760-003	0.48
TBT-36-PD	K9804760-004	0.19
TBT-35-PD	K9804760-005	0 15
TBT-08-PT	K9804760-006	0 38
TBT-02-PD	K9804760-007	0.38
TBT-08-PD	K9804760-008	0.21
Method Blank	K980721-WB	ND

Approved By: 4A/120594 047605 VG VNI - 4A 7/30/98

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8-3.98 \_\_\_\_\_ Date \_\_\_\_

Page No 00003

#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

Service Request:	K9804760
Date Collected:	7/16/98
Date Received:	7/18/98
Date Extracted:	7/22/98
Date Analyzed:	7/29/98

#### Butyltins in Porewater Units ug/L (ppb)

	Analyte <sup>.</sup> Method Reporting Limit <sup>.</sup>	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
TBT-35-PT	K9804760-009	0.28
TBT-01-PT	K9804760-010	0.06
TBT-36-PT	K9804760-011	0.26
TBT-03-PD	K9804760-012	0.45
TBT-05-PD	K9804760-013	0.16
TBT-04-PD	K9804760-014	0.15
TBT-05-PT	K9804760-015	0.22
TBT-04-PT	K9804760-016	0.29
TBT-03-PT	K9804760-017	0.51
Method Blank	K980722-WB	ND

Approved By. \_\_\_\_\_\_ 4A/120594 047605 VG VN2 - 4A 7/30/98

8.3-98 Date \_\_\_\_



#### Analytical Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Water

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Service Request:	K9804760
Date Collected:	7/17/98
Date Received:	7/18/98
Date Extracted:	7/23/98
Date Analyzed:	7/29/98

Butyltins in Porewater Units ug/L (ppb)

	Analyte. Method Reporting Limit:	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
TBT-06-PT	K9804760-018	0.30
TBT-06-PD	K9804760-019	0.11
TBT-07-PT	K9804760-020	0.16
TBT-07-PD	K9804760-021	0.13
TBT-09-PT	K9804760-022	0.27
TBT-09-PD	K9804760-023	0.21
TBT-10-PT	K9804760-024	0 01
TBT-10-PD	K9804760-025	0 01
Method Blank	K980723-WB	ND

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8-3-98 Date \_\_\_



### APPENDIX A

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### LABORATORY QA/QC RESULTS

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#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804760

 Date Collected:
 7/15/98

 Date Received:
 7/18/98

 Date Extracted:
 7/21/98

 Date Analyzed:
 7/28/98

Surrogate Recovery Summary Butyltins in Porewater

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
TBT-01-PD	K9804760-001	53	60
98626	K9804760-002	61	75
TBT-02-PT	K9804760-003	57	47
TBT-36-PD	K9804760-004	64	75
TBT-35-PD	K9804760-005	57	58
TBT-08-PT	K9804760-006	61	47
TBT-02-PD	K9804760-007	54	50
TBT-08-PD	K9804760-008	63	52
TBT-35-PD	K9804760-005MS	62	60
TBT-35-PD	K9804760-005DMS	65	60
Lab Control Sample	K980721-WL	55	62
Method Blank	K980721-WB	50	65

CAS Acceptance Limits:

20-113

Date:

8.3.98

20-133

Approved By: \_\_\_\_\_

JR 2/102194 04760SVG VN1 - sur 7/30/98

Page No

#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804760

 Date Collected:
 7/16/98

 Date Received:
 7/18/98

 Date Extracted:
 7/22/98

 Date Analyzed:
 7/28-29/98

Surrogate Recovery Summary Butyltins in Porewater

		Percent Recovery	Percent Recovery
Sample Name	Lab Code	Tripropyltin	Tripentyltin
TBT-35-PT	K9804760-009	64	71
TBT-01-PT	K9804760-010	109	104
TBT-36-PT	K9804760-011	75	65
TBT-03-PD	K9804760-012	77	56
TBT-05-PD	K9804760-013	81	69
TBT-04-PD	K9804760-014	81	62
TBT-05-PT	K9804760-015	80	62
TBT-04-PT	K9804760-016	81	72
TBT-03-PT	K9804760-017	73	48
Lab Control Sample	K980722-WL	87	73
Lab Control Sample	K980722-WL2	86	75
Method Blank	K980722-WB	83	99

CAS Acceptance Limits:

20-113

Date:

20-133

SUR2/102194 04760SVG VN2 - sur 7/30/98

Approved By:

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8-3-98

#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804760

 Date Collected:
 7/17/98

 Date Received:
 7/18/98

 Date Extracted:
 7/23/98

 Date Analyzed:
 7/29/98

Surrogate Recovery Summary Butyltins in Porewater

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
<b>TB</b> T-06-PT	K9804760-018	52	62
TBT-06-PD	K9804760-019	33	57
TBT-07-PT	K9804760-020	56	70
TBT-07-PD	K9804760-021	54	55
TBT-09-PT	K9804760-022	60	55
TBT-09-PD	K9804760-023	78	61
TBT-10-PT	K9804760-024	58	58
TBT-10-PD	K9804760-025	60	60
Lab Control Sample	K980723-WL	52	68 '
Lab Control Sample	K980723-WL2	49	70
Method Blank	K980723-WB	47	61

CAS Acceptance Limits.

20-113 .

Date. \_ 8-3.98

20-133

Approved By: \_\_\_\_\_\_ SUR2/102194 04760SVG VN3 - 6U1 7/30/98 .

Page No 00009

#### QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Water

 Service Request:
 K9804760

 Date Collected:
 7/15/98

 Date Received:
 7/18/98

 Date Extracted:
 7/21/98

 Date Analyzed:
 7/28/98

#### Matrix Spike/Duplicate Matrix Spike Summary Butyltins in Porewater Units ug/L (ppb)

Sample Name. Lab Code:	TBT-35-PD K9804760-005									
							Perc	ent R	ecovery	
									CAS	Relative
		Spike	Level	Sample	Spike	e Result			Acceptance	Percent
Analyte		MS	DMS	Result	MS	DMS	MS	DMS	Limits	Difference
Tributyltin		0.25	0 25	0.15	0.40	0.47(A)	100	128	23-127	16

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Outside acceptance limits, see case narrative

Approved By DMSISOTS/060194 04760SVG VNI - dms 7/30/98

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8.3.98 Date: \_\_\_\_

Page No 00010

#### QA/QC Report

#### Service Request: K9804760 **EVS Environment Consultants Client:** Date Collected: NA **Project:** WSOU TBT Study Date Received: NA LCS Matrix: Water Date Extracted: 7/21/98 Date Analyzed: 7/28/98 Laboratory Control Sample Summary **Butyltins in Porewater** Units ug/L (ppb) CAS Percent Recovery True Percent Acceptance

Analyte	Value	Result	Recovery	Limits
Tributyltin	0.25	0.18	72	20-138

Approved By.

LCSOTS/060194 04760SVG VN1 - LCS 7/30/98

8.3.98 Date.



#### QA/QC Report

Client:	<b>EVS Environment Consultants</b>
Project:	WSOU TBT Study
LCS Matrix:	Water

 Service Request:
 K9804760

 Date Collected:
 NA

 Date Received:
 NA

 Date Extracted:
 7/22/98

 Date Analyzed:
 7/28/98

#### Laboratory Control Sample/Duplicate Laboratory Control Sample Summary Butyltins in Porewater Units: ug/L (ppb)

				Pere	cent Re				
	True	Value	Re	sult			CAS Acceptance	Relative Percent	
Analyte	LCS	DLCS	LCS	DLCS	LCS	DLCS	Limits	Difference	
Tributyltin	0.25	0.25	0.23	0.23	92	92	20-138	<1	

Approved By:	Jay	
DLCS/032395 04760SVG VN2 - DLCS 7/	130/98	

Date. 8-3-98

Page No 00012

### QA/QC Report

Client: Project: LCS Matrix:	EVS Environment Co WSOU TBT Study Water	onsultants				Da D Da	vice Request: ate Collected: ate Received: te Extracted: ate Analyzed:	NA NA 7/23/98
	Laboratory	Control San	Butyltin	cate Laborat ns in Porewa s. ug/L (ppb	ater	ol Sample S	ummary	
					Perc	cent Re	covery	
A a la ida		e Value DLCS		sult DLCS	LCS	DLCS	CAS Acceptance Limits	Relative Percent Difference
Analyte	LCS	DLCS	LCS	DLCS	LCS	DLCS	Limits	Difference
Tributyltin	0.25	0 25	0.17	0.18	68	72	20-138	6

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Approved By.	Juy
DLCS/032395 04760SVG VN3 - DLC	~ 7/30/9X

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Date 3.3.98

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#### QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study

Service Request: K9804760 Calibration Date: 7/28/98 Date Analyzed: 7/28-29/98

Continuing Calibration Verification (CCV) Summary Butyltins in Porewater Butyltins-GC Units. μg/L (ppb)				-					
Analyte	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery	CCV4 Result	Percent <b>C</b> Recovery
Tributyltin	500	536	107	572	114	571	114	584	117

Approved By <sup>.</sup>	Jung	Date: <u>8-3-98</u>
CCV 1-4/042795		

04760SVG VN3 - CCV 1-4 8/3/98

Page No 00014

### QA/QC Report

Client: Project:	EVS Environment Consultants WSOU TBT Study			Service Request: Calibration Date: Date Analyzed:	7/28/98
	0	Calibration Blank Butyltins in Porew Butyltins-GC Units: µg/L (pp)	vater		
Analyte	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Tributyltin	0.01	ND	ND	ND	ND

Approved By <sup>.</sup>	Jes	Date:	8-3-98
&CCBMRL/120594	0	-	

04760SVG VN3 - CCBMRL (1) 8/ V98

Page No

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**Client: EVS Environmental Consultants Project:** WSOU TBT Study Sample Matrix: Water

Service Request No.: K9804815 Date Received: 7/21/98

#### **CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch:

Due to an error during the sample preparation steps for the TBT analysis of samples TBT-15, 16, 17, 18, 19 and 20, the sample extracts were lost. Additional pore waters were received for these samples on 7/31/98 and will be reported under separate cover (K9805084).

The Matrix Spike (MS) recoveries of TBT for samples TBT-34-PT and TBT-32-PT were outside the normal CAS control limits because of suspected matrix interference. Recovery of TBT in the LCS was acceptable and all surrogate recoveries were within control limits indicating that the analysis was within control. No further corrective action was taken.

Att Date 8/6/92

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Approved by

#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804815

 Date Collected:
 7/17/98

 Date Received:
 7/21/98

 Date Extracted:
 7/23/98

 Date Analyzed:
 7/29/98

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#### Butyltins in Porewater Units ug/L (ppb)

	Analyte Method Reporting Limit.	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
<b>TBT-11-</b> PT	K9804815-001	0.10
TBT-11-PD	K9804815-002	0.07
TBT-12-PT	K9804815-003	0 51
TBT-12-PD	K9804815-004	0 24
TBT-13-PT	K9804815-005	0.47
TBT-13-PD	K9804815-006	0.37
TBT-14-PT	K9804815-007	0.58
TBT-14-PD	K9804815-008	0 31
TBT-37-PT	K9804815-009	0.85
TBT-37-PD	K9804815-010	0 58
Method Blank	K980723-SB	ND

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Approved By: \_\_\_\_\_

Date. 8-5-98

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#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

Service Request:	K9804815
Date Collected:	7/18/98
Date Received:	7/21/98
Date Extracted:	7/24/98
Date Analyzed:	7/30/98

#### Butyltins in Porewater Units<sup>-</sup> ug/L (ppb)

	Analyte. Method Reporting Limit	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
TBT-21-PT	K9804815-023	0 51
TBT-21-PD	K9804815-024	0.38
TBT-22-PT	K9804815-025	0.29
TBT-22-PD	K9804815-026	0.09
TBT-23-PT	K9804815-027	0.24
TBT-23-PD	K9804815-028	0.14
TBT-24-PT	K9804815-029	0.33
TBT-24-PD	K9804815-030	0 14
Method Blank	K980724-SB	ND

Approved By 4A/1284815SVG VNI - 4A 8/5/98

Date. 8-5-98

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#### Analytical Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Water

 Service Request:
 K9804815

 Date Collected:
 7/19/98

 Date Received:
 7/21/98

 Date Extracted:
 7/25/98

 Date Analyzed:
 7/30/98

Butyltins in Porewater Units' ug/L (ppb)

	Analyte: Method Reporting Limit:	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
TBT-25-PT	K9804815-031	0.44
TBT-25-PD	K9804815-032	0.26
TBT-26-PT	K9804815-033	0.17
TBT-26-PD	K9804815-034	0 13
TBT-27-PT	K9804815-035	0.97
TBT-27-PD	K9804815-036	0.71
TBT-28-PT	K9804815-037	0 74
TBT-28-PD	K9804815-038	0 64
TBT-34-PT	K9804815-039	0.19
TBT-34-PD	K9804815-040	0 14
TBT-32-PD	K9804815-042	0 28
TBT-31-PT	K9804815-043	1 50
TBT-31-PD	K9804815-044	1.49
TBT-33-PT	K9804815-045	0.11
TBT-33-PD	K9804815-046	0.09
TBT-29-PT	K9804815-047	1.87
Method Blank	K980725-SB	ND

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#### Analytical Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Water

Service Request:	K9804815
Date Collected:	7/19/98
Date Received:	7/21/98
Date Extracted:	7/26/98
Date Analyzed:	7/30-31/98

#### Butyltins in Porewater Units: ug/L (ppb)

	Analyte: Method Reporting Limit:	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
TBT-32-PT	K9804815-041	0.35
TBT-29-PD	K9804815-048	1.29
TBT-30-PT	K9804815-049	0.90
TBT-30-PD	K9804815-050	0.76
TBT-38-PT	K9804815-051	0.64
TBT-38-PD	K9804815-052	0.51
TBT-LCS-PT	K9804815-053	0.12
TBT-LCS-PD	K9804815-054	0.11
Method Blank	K980726-SB	ND

Approved By: \_\_\_\_\_ 4A/120594 048155VG VN3 - 4A 8/5/98 5

Date: 8-5-98

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### APPENDIX A

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### LABORATORY QA/QC RESULTS

#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804815

 Date Collected:
 7/17/98

 Date Received:
 7/21/98

 Date Extracted:
 7/23/98

 Date Analyzed:
 7/29/98

#### Surrogate Recovery Summary Butyltins in Porewater

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
TBT-11-PT	K9804815-001	71	65
TBT-11-PD	K9804815-002	62	60
TBT-12-PT	K9804815-003	63	53
TBT-12-PD	K9804815-004	60	65
TBT-13-PT	K9804815-005	56	53
TBT-13-PD	K9804815-006	58	47
TBT-14-PT	K9804815-007	59	52
TBT-14-PD	K9804815-008	52	52
TBT-37-PT	K9804815-009	58	47
TBT-37-PD	K9804815-010	79	71
Lab Control Sample	K980723-SL	52	68
Lab Control Sample	K980723-SL2	49	70
Method Blank	K980723-SB	47	61

CAS Acceptance Limits:

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Approved By:

SUR2/102194 04815SVO JG1 - sur 8/5/98

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#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804815

 Date Collected:
 7/18/98

 Date Received:
 7/21/98

 Date Extracted:
 7/24/98

 Date Analyzed:
 7/30/98

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#### Surrogate Recovery Summary Butyltins in Porewater

		<b>Percent Recovery</b>	Percent Recovery
Sample Name	Lab Code	Tripropyltin	Tripentyltin
	120004015 000	94	72
TBT-21-PT	K9804815-023	84	72
TBT-21-PD	K9804815-024	83	82
TBT-22-PT	K9804815-025	74	74
TBT-22-PD	K9804815-026	70	76
TBT-23-PT	K9804815-027	70	72
TBT-23-PD	K9804815-028	64	73
TBT-24-PT	K9804815-029	74	66
TBT-24-PD	K9804815-030	86	79
Lab Control Sample	K980724-SL	63	81
Method Blank	K980724-SB	70	73

CAS Acceptance Limits.

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Date:

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8-5-98

Approved By \_\_\_\_\_\_

#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804815

 Date Collected:
 7/19/98

 Date Received:
 7/21/98

 Date Extracted:
 7/25/98

 Date Analyzed:
 7/30/98

#### Surrogate Recovery Summary Butyltins in Porewater

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
TBT-25-PT	K9804815-031	87	56
TBT-25-PD	K9804815-032	41	51
TBT-26-PT	K9804815-033	59	63
TBT-26-PD	K9804815-034	62	66
TBT-27-PT	K9804815-035	91	59
TBT-27-PD	K9804815-036	67	59
TBT-28-PT	K9804815-037	83	56
TBT-28-PD	K9804815-038	94	64
TBT-34-PT	K9804815-039	77	67
TBT-34-PD	K9804815-040	53	61
TBT-32-PD	K9804815-042	83	75
TBT-31-PT	K9804815-043	84	69
TBT-31-PD	K9804815-044	91	86
TBT-33-PT	K9804815-045	97	90
TBT-33-PD	K9804815-046	91	89
TBT-29-PT	K9804815-047	77	80
TBT-34-PT	K9804815-039MS	70	90
TBT-34-PT	K9804815-039DMS	68	75
Lab Control Sample	K980725-SL	63	84
Method Blank	K980725-SB	46	60

CAS Acceptance Limits

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Approved By: \_\_\_\_\_ SUR2/102194 04815SVG VN2 - sur 8/5/98

Date 8-5-98

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#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804815

 Date Collected:
 7/19/98

 Date Received:
 7/21/98

 Date Extracted:
 7/26/98

 Date Analyzed:
 7/30-31/98

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Surrogate Recovery Summary Butyltins in Porewater

Sample Name	Lab Code	Percent Recovery Tripropyltın	Percent Recovery Tripentyltin	-
		<i>(</i> )	<i></i>	~
TBT-32-PT	K9804815-041	68	65	
TBT-29-PD	K9804815-048	64	72	
TBT-30-PT	K9804815-049	72	67	
TBT-30-PD	K9804815-050	70	59	
TBT-38-PT	K9804815-051	77	60	
TBT-38-PD	K9804815-052	93	61	
TBT-LCS-PT	K9804815-053	82	50	-
TBT-LCS-PD	K9804815-054	74	70	
TBT-32-PT	K9804815-041MS	72	81	
TBT-32-PT	K9804815-041DMS	70	80	~
Lab Control Sample	K980726-SL	47	57	
Method Blank	K980726-SB	76	70	
				_

CAS Acceptance Limits

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20-133

Approved By: \_\_\_\_\_\_ Date: \_\_\_\_\_ Date: \_\_\_\_\_ Date: \_\_\_\_\_ 9- 5-98

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## QA/QC Report

Client: Project: Sample Matrix:	EVS Environment Consultants WSOU TBT Study Water	Service Request: Date Collected: Date Received: Date Extracted: Date Analyzed:	7/19/98 7/21/98 7/25/98
	Matrix Spike/Duplicate Butyltıns ır Units: ug	Porewater	
Sample Name <sup>.</sup> Lab Code:	TBT-34-PT K9804815-039	Percent Recovery	

Analyte	<b>Spike</b> MS		Sample Result	Spike MS	<b>Result</b> DMS	MS	DMS	CAS Acceptance Limits	Relative Percent Difference
Tributyltin	0.29	0.29	0.19	0.68	0.78	169(A)	203(A)	23-127	14

Outside acceptance limits; see case narrative

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Approved By. \_\_\_\_\_ DMS1SOTS/060194 04815SVG VN2 - dms 8/5/98

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Date: 8-5-98

00013 Page No

#### QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study
Sample Matrix:	Water

Service Request:K9804815Date Collected:7/19/98Date Received:7/21/98Date Extracted:7/26/98Date Analyzed:7/31/98

#### Matrix Spike/Duplicate Matrix Spike Summary Butyltins in Porewater Units ug/L (ppb)

Sample Name <sup>.</sup> Lab Code	TBT-32-PT K9804815-041	l								
							Perc	ent R	ecovery	
									CAS	Relative
		Spike	e Level	Sample	Spike	Result			Acceptance	Percent
Analyte		MS	DMS	Result	MS	DMS	MS	DMS	Limits	Difference
Tributyltın		0.37	0.37	0.35	0.95	0 86	162(A)	138(A)	23-127	10

Α

Outside acceptance limits, see case narrative

Approved By. DMS1SOTS/060194 04815SVG VN3 - drns 8/5/98 Date 8-5-98 00014

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### QA/QC Report

Client: Project: LCS Matrix:	EVS Environment Cor WSOU TBT Study Water	nsultants				Da Da Da	vice Request: the Collected: ate Received: te Extracted: the Analyzed:	NA NA 7/23/98
	Laboratory C	Control Sam	Butyltin	cate Laborat as in Porewa a: ug/L (ppb	ater	ol Sample S	ummary	
	True	Value	Re	sult	Perc	ent Re	<b>c o v e r y</b> CAS Acceptance	Relative Percent
Analyte	LCS	DLCS	LCS	DLCS	LCS	DLCS	Limits	Difference
Tributyltin	0.25	0.25	0.17	0.18	68	72	20-138	6

Approved By:

DLCS/032395 04815SVG JGI - DLCS 7/29/98

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# QA/QC Report

Client: Project: LCS Matrix:	EVS Environment Consultants WSOU TBT Study Water		Service Request: Date Collected: Date Received: Date Extracted: Date Analyzed:	NA NA 7/24/98	<del>م</del> نځ
	Butyltir	ntrol Sample Summary as in Porewater :: ug/L (ppb)			<u>~</u> n
				CAS Percent Recovery	<del>e i</del> n
Analyte	True Value	Result	Percent Recovery	Acceptance Limits	<del>,</del>
Tributyltin	0.25	0.19	76	20-138	<b>•</b> ••1

Approved By:	
LCSOTS/060194	
04815SVG VN1 - LCS 8/5/98	

Date: 8-5-98

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# QA/QC Report

Client: Project: LCS Matrix:	EVS Environment Consultants WSOU TBT Study Water	Service Request: Date Collected: Date Received: Date Extracted: Date Analyzed:	NA NA 7/25/98
	Laboratory Control Sample Summar Butyltins in Porewater Units ug/L (ppb)	ry	
	Тгие	Percent	CAS Percent Recovery Acceptance

.

Analyte	True Value	Result	Percent Recovery	Recovery Acceptance Limits
Tributyltin	0.25	0.21	84	20-138

Approved By: LCSOTS/060194 048155VG VN2 - LCS 8/5/98 Ŋ

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Date: 8-5-98

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# QA/QC Report

Client:	EVS Environment Consultants	Service Request:	K9804815
Project:	WSOU TBT Study	Date Collected:	NA
LCS Matrix:	Water	Date Received:	NA
		Date Extracted:	7/26/98
		Date Analyzed:	7/30/98
	Laboratory Control Sample Summary Butyltins in Porewater Units: ug/L (ppb)		
			CAS Percent Recovery

Analyte	True Value	Result	Percent Recovery	Acceptance Limits
Tributyltin	0 25	0.12	48	20-138

Approved By:

Date: 8-5-98

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LCSOTS/060194 04815SVQ VN3 - LCS 8/5/98

#### QA/QC Report

**EVS Environment Consultants Client:** WSOU TBT Study **Project:** 

Service Request: K9804815 Calibration Date: 7/28/98 Date Analyzed: 7/29/98

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#### Continuing Calibration Verification (CCV) Summary Butyltins **Butyltins-GC** Units: µg/L (ppb)

Analyte		CCV1 Result					Percent Recovery		
Tri-n-butyltın	500	561	112	571	114	584	117	565	113

Approved By:

sonda Neuneker

Date: 8-5-98

CCV 1-4/042795

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### QA/QC Report

Client: Project:	EVS Environment Cor WSOU TBT Study	sultants			Service Request: Calibration Date: Date Analyzed:	7/28/98
		_	llıbratıon Blank ( Butyltins Butyltıns-GC Unıts <sup>-</sup> µg/L (ppb			
Analyte		MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Tributyltin		0 01	ND	ND	ND	ND

Approved By I&CCBMR1/120594

anda Aeunekes Date 8-5-98

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### QA/QC Report

Client:	EVS Environment Consultants
Project:	WSOU TBT Study

Service Request: K9804815 Calibration Date: 7/28/98 Date Analyzed: 7/30/98

#### Continuing Calibration Verification (CCV) Summary Butyltins Butyltins-GC Units: µg/L (ppb)

Analyte							Percent Recovery		
Tributyltın	500	568	114	601	120	611	122	598	120

Approved	By:	
CCV 1-4/042795		

\_\_\_\_\_ Date: \_\_\_\_\_\_ 8-5-98

04815SVG VN3 - CCV 1-4 8/5/98

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# QA/QC Report

Client: Project:	EVS Environment Cor WSOU TBT Study	isultants				Service Request: Calibration Date: Date Analyzed:	7/28/98
	C	Continuing	Bu Buty	Verification ityltins ltins-GC µg/L (ppb)	n (CCV) Sumn )	ıary	
Analyte	True Value	CCV5 Result	Percent Recovery	CCV6 Result	Percent Recovery		
Tributyltın	500	616	123	638	128		

Approved By: _	Jeys	Date <u>8-5-98</u>
CCV 5-8/042795	$\overline{\mathcal{T}}$	

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## QA/QC Report

Client: Project:	EVS Environment Consultants WSOU TBT Study			Service Request: Calibration Date: Date Analyzed:	7/28/98
	Continuing C	alibratıon Blank Butyltins Butyltıns-GC Unıts μg/L (pp			
Analyte	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Tributyltin	0.01	ND	ND	ND	ND

Approved By	Crys	
I&CCBMR1/120594		

Date. 8.5.98

04815SVG VN3 - CCBMRL (1) 8/5/98

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# QA/QC Report

Client: Project:	EVS Environment Consu WSOU TBT Study	iltants		•	Service Request: Calibration Date: Date Analyzed:	7/28/98	-
Continuing Calibration Blank (CCB) Summary Butyltins Butyltins-GC							
			Units µg/L (ppb)	)			-
Analyte		MRL	CCB5 Result	CCB6 Result			
Tributyltin		0 01	ND	ND			
							-

Approved By	Cris	Date: 8.5-98
I&CCBMR1/120594		

04815SVG VN3 - CCBMRL (2) 8/5/98

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#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

 Service Request:
 K9804937

 Date Collected:
 7/20-22/98

 Date Received:
 7/24/98

 Date Extracted:
 NA

 Date Analyzed:
 8/4/98

#### Carbon, Total Organic (TOC) EPA Method 415.1 Units mg/L (ppm)

Sample Name	Lab Code	MRL	Result
TBT-01-TOC	K9804937-001	0.5	13 8
TBT-02-TOC	K9804937-003	0.5	10 5
TBT-03-TOC	K9804937-005	0 5	24.7
TBT-04-TOC	K9804937-007	0 5	196
TBT-05-TOC	K9804937-010	05	14 8
TBT-06-TOC	K9804937-011	0 5	15.9
TBT-07-TOC	K9804937-013	0 5	11.0
TBT-08-TOC	K9804937-015	0 5	15 2
TBT-09-TOC	K9804937-017	05	12 6
TBT-10-TOC	K9804937-019	0 5	78
TBT-11-TOC	K9804937-021	0.5	21.2
TBT-12-TOC	K9804937-023	0.5	18.9
TBT-13-TOC	K9804937-025	0.5	· 8.8
TBT-14-TOC	K9804937-027	0 5	16 9
TBT-15-TOC	K9804937-029	0 5	13 3
TBT-16-TOC	K9804937-031	0 5	15 0
TBT-17-TOC	K9804937-033	05	84
TBT-18-TOC	K9804937-035	05	15 4
TBT-19-TOC	K9804937-037	0 5	8 5
TBT-20-TOC	K9804937-039	0.5	16 6
TBT-21-TOC	K9804937-041	0 5	15.7
TBT-22-TOC	K9804937-043	0 5	32 7
TBT-23-TOC	K9804937-045	0 5	14 6
TBT-24-TOC	K9804937-047	0 5	18.7
TBT-25-TOC	K9804937-049	0.5	39 9

8/10193 Date ン Approved By: IAMRL/102594 04937WET LJI TOCW 8/10/98

#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

Service Request:	K9804937
<b>Date Collected:</b>	7/20-22/98
Date Received:	7/24/98
Date Extracted:	NA
Date Analyzed:	8/4/98

#### Carbon, Total Organic (TOC) EPA Method 415 1 Units mg/L (ppm)

Sample Name	Lab Code	MRL	Result
TBT-26-TOC	K9804937-051	0.5	13 3
TBT-27-TOC	K9804937-053	0.5	14 3
TBT-28-TOC	K9804937-055	0.5	18 5
TBT-29-TOC	K9804937-057	0.5	10 7
TBT-30-TOC	K9804937-059	0.5	22 4
TBT-31-TOC	K9804937-061	0.5	15 1
TBT-32-TOC	K9804937-063	0.5	18 7
TBT-33-TOC	K9804937-065	0 5	8 0
TBT-34-TOC	K9804937-067	05	<b>18</b> 6
TBT-35-TOC	K9804937-069	05	24 0
TBT-36-TOC	K9804937-071	0 5	112
TBT-37-TOC	K9804937-073	0.5	24 3
TBT-38-TOC	K9804937-075	0 5	28 0
Method Blank-unfiltered	K9804937-078	05	18
Method Blank	K9804937-MB	0 5	ND

Approved By \_\_\_\_\_\_ IAMRL/102594 04937WET LJI - TOCW (2) 8/10/98

\_ Date \_\_\_\_\_ LA+

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#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

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Service Request: K9804937 Date Collected: 7/20-22/98 Date Received: 7/24/98 Date Extracted: NA Date Analyzed: 8/4/98

#### Carbon, Dissolved Organic (DOC) EPA Method 415 1 Units mg/L (ppm)

Sample Name	Lab Code	b Code MRL	
TBT-01-DOC	K9804937-002	0.5	10.2
TBT-02-DOC	K9804937-004	05	87
TBT-03-DOC	K9804937-006	0 5	19 7
TBT-04-DOC	K9804937-008	0.5	17 2
TBT-05-DOC	K9804937-009	0 5	12.9
TBT-06-DOC	K9804937-012	0.5	14 0
TBT-07-DOC	K9804937-014	0.5	12.5
TBT-08-DOC	K9804937-016	0 5	14.3
TBT-09-DOC	K9804937-018	0 5	12.7
TBT-10-DOC	K9804937-020	0 5	76
TBT-11-DOC	K9804937-022	0 5	12.2
TBT-12-DOC	K9804937-024	0.5	17.4
TBT-13-DOC	K9804937-026	0 5	74
TBT-14-DOC	K9804937-028	0 5	16 3
TBT-15-DOC	K9804937-030	05	114
TBT-16-DOC	K9804937-032	0 5	15 3
TBT-17-DOC	K9804937-034	0 5	89
TBT-18-DOC	K9804937-036	05	14 6
TBT-19-DOC	K9804937-038	0 5	7.7
TBT-20-DOC	K9804937-040	0 5	14.3
TBT-21-DOC	K9804937-042	05	13.8
TBT-22-DOC	K9804937-044	0 5	24.7
TBT-23-DOC	K9804937-046	05	14 1
TBT-24-DOC	K9804937-048	0.5	17 0
TBT-25-DOC	K9804937-050	0 5	32.9

8/16/93 Date. Approved By 1AMRL/102594 04937WET LJI - doc 8/10/98

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#### Analytical Report

# Client:EVS Environment ConsultantsProject:WSOU TBT StudySample Matrix:Water

Service Request:	K9804937
Date Collected:	7/20-22/98
Date Received:	7/24/98
<b>Date Extracted:</b>	NA
Date Analyzed:	8/4/98

#### Carbon, Dissolved Organic (DOC) EPA Method 415 l Units mg/L (ppm)

Sample Name	Lab Code	MRL	Result
TBT-26-DOC	K9804937-052	0 5	13 1
TBT-27-DOC	K9804937-054	0 5	29 6
TBT-28-DOC	K9804937-056	0 5	174
TBT-29-DOC	K9804937-058	0 5	94
TBT-30-DOC	K9804937-060	0 5	30 0
TBT-31-DOC	K9804937-062	0 5	14 5
TBT-32-DOC	K9804937-064	05	16 4
TBT-33-DOC	K9804937-066	05	63
TBT-34-DOC	K9804937-068	05	14 4
TBT-35-DOC	K9804937-070	05	18 6
TBT-36-DOC	K9804937-072	05	11 1
TBT-37-DOC	K9804937-074	05	198
TBT-38-DOC	K9804937-076	05	22 4
Method Blank-filtered	K9804937-077	05	16
Method Blank	K9804937-MB	0 5	ND

Approved By

Date \_\_\_\_\_ 3/10197

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# APPENDIX A

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# LABORATORY QA/QC RESULTS

# QA/QC Report

Client: Project: Sample Matrix:	EVS Environment Consultat WSOU TBT Study Water	Service Request: Date Collected: Date Received: Date Analyzed:	7/22/98 7/24/98			
		Carbon, Total O EPA Methe Units mg/	od 415.1	2)		
LABORATORY	CONTROL SAMPLE					
2.1201011011	0011110-01111-1-2	True		Measured		Percent
		Value		Value		Recovery
Source:	APG 1075 Lot #19321	48 0		48 4		101
	APG 1075 Lot #19321	48.0		49.3		103
	APG 1075 Lot #19321	48 0		49 6		103
CALIBRATION	VERIFICATION STANDA	ARD				
		True		Measured		Percent
		Value		Value		Recovery
CCV 1 Result		25.0		24.5		98
CCV 2 Result		25.0		24.9		100
CCV 3 Result		25.0		24.9		100
CCV 4 Result		25.0		24 7		99
CCV 5 Result		25 0		25 2		101
CCV 6 Result		25 0		24.8		99
LABORATORY	/ BLANK			Blank		
LADORATORA		MRL		Value		
CCB I Result		05		ND		
CCB 2 Result		05		ND		
CCB 3 Result		05		ND		
CCB 4 Result		05		ND		
CCB 5 Result		05		ND		
CCB 6 Result		05		ND		
<b>DUPLICATE A</b> Sample Name	NALYSIS Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Sample Name		IVULL	result	Result	. Merage	Smerenee
TBT-03-TOC	K9804937-005D	0 5	24 7	24.8	24.8	< 1
TBT-20-TOC	K9804937-039E		16.6	16 1	16 4	3
TBT-33-TOC	K9804937-065E	0 5	80	77	78	4
MATRIX SPIK	E ANALYSIS		Spike	Sample	Spiked Sample	Percent
Sample Name	Lab Code	MRL	Level	Result	Result	Recovery
TBT-03-TOC	K9804937-005N	AS 05	125	24 7	155	104
TBT-20-TOC	K9804937-039N		125	16.6	144	102
TBT-33-TOC	K9804937-065N		50 0	80	60.2	104

Approved By COMBOOCD/042695 04937WET LJ1 - loc\_qc 8/10/98

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8/10143

Date \_\_\_\_\_

# QA/QC Report

Client: Project: Sample Matrix:	EVS Environment Consultants WSOU TBT Study Water				Service Request: Date Collected: Date Received: Date Analyzed:	7/22/98 7/24/98
	Carbo	n, Dissolved EPA Meth Units mg		OC)		
LABORATORY	CONTROL SAMPLE					
		True Value		Measured Value		Percent Recovery
Source.	APG 1075 Lot #19321 APG 1075 Lot #19321 APG 1075 Lot #19321	48 0 48 0 48 0		48.1 49.7 49 1		100 104 102
CALIBRATION	VERIFICATION STANDARI	)				
		True Value		Measured Value		Percent Recovery
CCV 8 Result CCV 9 Result CCV 10 Result CCV 11 Result CCV 12 Result CCV 13 Result		25 0 25 0 25 0 25 0 25 0 25 0 25 0		25 3 24 5 25.1 25 0 25 2 24.8		101 98 100 100 101 99
LABORATORY	BLANK	MRL		Blank Value		
CCB 8 Result CCB 9 Result CCB 10 Result CCB 11 Result CCB 12 Result CCB 13 Result		0 5 0 5 0 5 0 5 0 5 0 5		ND ND ND ND ND		
DUPLICATE A	NALYSIS		<b>a</b>	Duplicate		Relative
Sample Name	Lab Code	MRL	Sample Result	Sample Result	Average	Percent Difference
TBT-02-DOC TBT-28-DOC TBT-33-DOC	K9804937-004D K9804937-056D K9804937-066D	05 05 05	87 174 63	90 179 62	8 8 17 6 6 2	3 3 2
MATRIX SPIKI			Spike	Sample	Spiked Sample	Percent
Sample Name	Lab Code	MRL	Level	Result	Result	Recovery
TBT-02-DOC TBT-28-DOC TBT-33-DOC	K9804937-004MS K9804937-056MS K9804937-066MS	05 05 05	125 50 0 50 0	8 7 17 4 6 3	138 69 4 58 6	103 104 105

Approved By COMBOOCD/042695 04937WET CJ1 - doc\_gc 8/10/98

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Date 8/10197

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#### Analytical Report

Client:	<b>EVS Environment Consultants</b>
Project:	WSOU TBT Study/1022-001
Sample Matrix:	Water

 Service Request:
 K9805084

 Date Collected:
 7/28/98

 Date Received:
 7/31/98

 Date Extracted:
 8/4/98

 Date Analyzed:
 8/8-9/98

Butyltins in Porewater Units ug/L (ppb)

	Analyte. Method Reporting Limit:	<b>Tributyltin</b> 0 01
Sample Name	Lab Code	
TBT-15-PT/Re-Extract	K9805084-001	0 24
TBT-15-PD/Re-Extract	K9805084-002	0.13
TBT-16-PT/Re-Extract	K9805084-003	0.36
TBT-16-PD/Re-Extract	K9805084-004	0.44
TBT-17-PT/Re-Extract	K9805084-005	0.02
TBT-17-PD/Re-Extract	K9805084-006	0 02
TBT-18-PD/Re-Extract	K9805084-007	0 06
TBT-18-PT/Re-Extract	K9805084-008	0.08
TBT-19-PT/Re-Extract	K9805084-009	0.08
TBT-19-PD/Re-Extract	K9805084-010	0.06
TBT-20-PT/Re-Extract	K9805084-011	1 01
TBT-20-PD/Re-Extract	K9805084-012	0 4 1
TBT-12-PT/Re-Extract	K9805084-013	0 46
TBT-12-PD/Re-Extract	K9805084-014	0 37
Method Blank	K980804-SB	ND

Approved By: \_\_\_\_\_\_

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\_ Date 8/12/29

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# APPENDIX A

# LABORATORY QA/QC RESULTS

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#### QA/QC Report

# Client:EVS Environment ConsultantsProject:WSOU TBT Study/1022-001Sample Matrix:Water

 Service Request:
 K9805084

 Date Collected:
 7/28/98

 Date Received:
 7/31/98

 Date Extracted:
 8/4/98

 Date Analyzed:
 8/8-9/98

Surrogate Recovery Summary Butyltins in Porewater

Sample Name	Lab Code	Percent Recovery Tripropyltin	Percent Recovery Tripentyltin
TBT-15-PT/Re-Extract	K9805084-001	80	, 68
TBT-15-PD/Re-Extract	K9805084-002	74	64
TBT-16-PT/Re-Extract	K9805084-003	75	62
TBT-16-PD/Re-Extract	K9805084-004	78	58
TBT-17-PT/Re-Extract	K9805084-005	80	80
TBT-17-PD/Re-Extract	K9805084-006	81	78
TBT-18-PD/Re-Extract	K9805084-007	84	74
TBT-18-PT/Re-Extract	K9805084-008	84	66
TBT-19-PT/Re-Extract	K9805084-009	84	72
TBT-19-PD/Re-Extract	K9805084-010	78	65
TBT-20-PT/Re-Extract	K9805084-011	81	94
TBT-20-PD/Re-Extract	K9805084-012	84	71
TBT-12-PT/Re-Extract	K9805084-013	82	71
TBT-12-PD/Re-Extract	K9805084-014	76	68
Lab Control Sample	K980804-LCS	93	72
Lab Control Sample	K980804-DLCS	87	84
Method Blank	K980804-SB	93	78

CAS Acceptance Limits.

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20-113

20-133

Approved By: SUR2/102194 05084SVG JGI - sur 8/12/98

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Date: 8/12/98 00005 Page No

# QA/QC Report

Client:	EVS Environment Consultants		Service Request:	K9805084
Project:	WSOU TBT Study/1022-001		Date Collected:	NA
LCS Matrix:	Water		Date Received:	NA
			Date Extracted:	8/4/98
			Date Analyzed:	8/8/98
	Laboratory Control Sample/Duplicate Laboratory C Butyltins in Porewater Units <sup>.</sup> ug/L (ppb)	Control Samj	ple Summary	
	E	Percent	Recovery	
			CAS	Relativa

	True	Value	ue Result				CAS Relative Acceptance Percent		
Analyte	LCS	DLCS	LCS	DLCS	LCS	DLCS	Limits	Difference	
Tributyltin	0.25	0.25	0 20	0 24	80	96	20-138	18	

Approved By: DLCS/032395 050845VG JGI - DLCS 8/12/98

Date: 8/12/94

00006 Page No

## QA/QC Report

Units µg/L (ppb)

CCB2

Result

ND

CCB3

Result

ND

CCB1

Result

ND

MRL

0.01

Client: Project:	EVS Environment Consultants WSOU TBT Study/1022-001	Service Request: Calibration Date: Date Analyzed:	8/1/98
	Continuing Calibration Blank (CCB) Summary Butyltins Butyltins-GC		

Approved By

Analyte

Tributyltin

050845VG JGI - CCBMRL (1) 8/12/98

Date 8/12/84 \_\_\_\_\_

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Page No

#### QA/QC Report

Client:EVS Environment ConsultantsProject:WSOU TBT Study/1022-001

Service Request: K9805084 Calibration Date: 8/1/98 Date Analyzed: 8/8-9/98

#### Continuing Calibration Verification (CCV) Summary Butyltins Butyltins-GC Units. µg/L (ppb)

Analyte	True Value		Percent Recovery				
Tributyltin	500	533	107	531	106	530	106

Approved By: CCV 1-4/042795

Date 8/12/28

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050845VG JG1 - CCV 1-4 8/12/98

# **CHAIN OF CUSTODY RECORD &** LABORATORY ANALYSIS REQUEST

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REGL Job ID //)22-(1)



Rosa Environmental & Geotechnical Laboratory, LLC

400 Ninth Avenue North, Suite B. Seattle, WA 98109 PH (206) 287-9122 FAX (206) 654-0540

Client Company: EVS COASUltiont	5	Sam	ple receipt		<u>.</u>	Analysis Requested					
Address: 200 W Memor St. 3012 Scottle Wa 18119	403	Shipped by:			_						
Sarttle N/a 98114	N	umber of coolers	•								(I)
		Custody seals pr									1
CONTACT: T: M Hammermeister			emperatures:								
Phone: (202) 217-4337		Bottle seals pr			1	Ð					vert
Project Name. W SUTBT Study Project Number PO#	[ <sup>U</sup>	lient contact w/di	screpancies:			+					
Sample ID	 Date	Time	Matrix	#Cont	ĹΑΒ#						Preservatic
1 TBT-CI-PD	71151	98 7:50 pm	Por Witer	۱		$\times$					7m]
2 98626		98 10.08 pm				$\prec$					7ml
3 TBT-02 - PT	71151	198 552pm	Porewater	i		$\times$					4ml
4 TBT-36-PD	7116/9	8 11:30pm	Pore Water			$\times$					7ml
5 TBT - 35 - PD	7/1619	18 1:50pm	Aure Water			_X					4m/
6 TBT-08-PT	7/161	48 8:00pm	PorceMater	1		X					21
7 IBT-02-PD	7/15/9	8 Siapm	Porewrite	- 1		X					
8 TBT-08-PD	71/619	18 11:35pm	Pore Water			X					
9 TOT-35-PT	711619	18 1:50 pm	Pore Wyter			Χ					[m]
10 TBT-01-PT	7/15/9	18 7:40 pm	Pore Whiter	)		X			<u> </u>		2m
	Re	lingushed by	1		Relinqu	ished by			Relinquished	by	
Turnaround requested Known hazardous content/rating	1	ALAMIN LI CY			Printed	name			Printed name	).	
	Co	Carmen En impany: REGIL	Der Ri		Compar	ıγ.			Company		
Special instructions/comments	Da	KEGIL	Time:		Date:		Time:	<del></del>	Date.	T	ime:
Volume preservative Listeel	7	117148				<u></u>					
	Re	ceived by:	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Receive	d by:			Received by.		
in last column	Pri					name:			Printed name	:	
	Co					Company:			Company:		
	Da	Date. Time: 10 Jul 9B 1000					Time:		Date:	Ti	ime.

Limits of Liability: REGL will perform requested services in accordance with appropriate methodology following Standard Operating Procedures, REGL Quality Assurance Program or REGL approved Project Quality Assurance Plans. The total liability of REGL, its members, employees or successors arising out of or in connection with the requested services shall not exceed the invoiced amount of said services. The acceptance by the CLIENT of a proposal for services by REGL releases REGL from any liability in excess thereof, not withstanding any provision to the REGU

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CHAIN OF CUSTODY RECORD & LABORATORY ANALYSIS REQUEST Date: 07: 1/98 Page: 2 of: 3	REGL	Job ID /022 -	$\infty$	. 40		nue North,	Suite B. Se	nical Laboratory, LLC eattle, WA 98109 -0540	
Client Company. EVS CONSULEINTS	Sarr	ple receipt		<b>.</b>		Analy	sis Requeste	d	
Address: 200 W Meror St. Surt 403 Saittle , Wa 48/19									
	Custody seals p	· · · · · · · · · · · · · · · · · · ·							
CONTACT Tim Nammiermeister	- ' '	emperatures:	_					11	
Phone: Q(6) 217-9337	Bottle seals p								
Project Name: WSOU TBT Study	Client contact w/d	iscrepancies:		01					
Project Number: PO# 0		••••••••••••••••••••••••••••••••••••••						Dreveructure	
Sample ID E	late Time	Matrix #Co	nt LAB#				L		
1 TBT-36-PT 67/16	0198 11:10 pm	Pore Water 1	ļ	$ \times $				2 2 11	
2 TBT-03-PD 07/10	· · · · · · · · · · · · · · · · · · ·	Pore Water 1		X				1/m	
		Pore Neiter 1		X				Im	
		Porchater 1		X				4m	
		Pore Water 1		X			<u> </u>		
							+	2m	
		Pore Vieter 1							
		PoreNuter 1					┢┈─┝───	/m	
		Porelater 1		X				/m	
9 TBT- 26 - PD 07/1	7/98 13:20	Porchater 1		X				4 ml	
10 TBT. 07 - PT 07/1	7/98 13:25	Reductor 1		X				/ nul	
	Relinquished by	his	Relinqu	iished by	·•		Relinquished b	γ	
Turnaround requested: Known hazardous content/rating	Printed name		Printed	name			Printed name		
	SD DUN	VIHOD					Company		
	Company. REGL	-	Compa	шү			Company		
Special instructions/comments:	Date.	Time.	Date.		Time.		Date.	Time	
Volume preservative listed	Received by:	T	Receiv	ed by:			Received by		
Volume preservative listed in last column	lunk.tt				·		1		
	Printed name: K. Hawn			Printed name			Printed name		
				Company			Company		
	Date 18-JUL9B	Time. 1000	Date		Time		Date.	Time	

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CHAIN OF CUSTODY RECORD & LABORATORY ANALYSIS REQUEST Date: 01/19 Page: 3 of: 3

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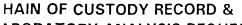
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Rosa Environmental & Geotechnical Laboratory, LLC

LABORATORY ANALYSIS REQU	UEST	REGL	(	40	0 Ninth A	venue North	n, Suite B.	Seattle, '	WA 98109	) .		
Date: <u>0/10/9j</u> Page: <u>3</u> of:						۲۴ 	1 (206) 28	7-9122 FA				
Client Company: EVS Consultan	ts		nple receipt					Analy	vsis Reques	ted	·····	f
Address: 200 WMereer St. Sui	tc 403	Shipped by			-							$\overline{\mathbf{x}}$
Seattle, Ny 98119			s in shipment:									(HCL)
			present/intact:		-							E
CONTACT Tim Hammer meist			temperatures:		-							<u> </u>
Phone: 206) 217 - 93.37			resent/intact:		-							3
Project Name. WSCILS TBT Stude Project Number: PO#			discrepancies:	·	-	181						NS(
Project Number: PO# Sample ID	Dăte	Time	Matrix	#Čön	t LAB#							Preservistic 1
1 TBT.07-PD	07/17/98	13:30	Perenativ	+		X						4ml
2 TBT-09 - PT		14.10	- Chung	1		X						Ind
3 TBT-09-PD		14:35		1		X						-4ml
4 TBT-10-PT		14:10		1		X						1ml
5 7BT-10-DD		14:15	þ	1		$\boldsymbol{\lambda}$						15 mA
6												
7												
8												
9												
10												
Turnaround requested:		ished by:			Relinqu	shed by			Relinquished	d by:		
Known hazardous content/rating.	I Printed	name:			Printed	name			Printed nam	e:		
	Compa	ny: REG	Converrá		Compar	ıy			Company			
Special instructions/comments:	Date:	17198	Time:		Date:		Time.		Date.		Time <sup>.</sup>	
Volume Preservative	Beceive	d by:			Receive	d by			Received by	/:		
listed in last		Printed name:							Printed name			
		Luo k HAnnal			Printed name:				<u> </u>			
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Limits of Liability: REGL will perform requested services in accordance with appropriate methodology following Standard Operating Procedures, REGL Quality Assurance Program or REGL approved Project Quality Assurance Plans. The total liability of REGL, its members, employees or successors arising out of or in connection with the requested services shall not exceed the invoiced amount of said services. The acceptance by the CLIENT of a proposal for services by REGL releases REGL from any liability in excess thereof, not withstanding any provision to the

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# Rosa Environmental & Geotechnical Laboratory, LLC

400 Ninth Avenue North, Suite B. Seattle, WA 98109 PH (206) 287-9122 FAX (206) 654-0540

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ent Company. EVS Consultants		Sar	nple receipt					Analys	sis Requested		
Idress 200 W Mercer Street		Shipped by			_						5
Faite 403		mber of coolers	in shipment	::	_						, H
Seatte, WA 98119	(	Custody seals p	resent/intact	::	-						1 3
INTACT Tim Hammer meist in		Cooler	temperatures	:	_			4			ET
ione (206) 217-2337		Bottle seals p	resent/intact	:: <u></u>	-						2
oject Name. WSOU TOT Study	Che	ent contact w/c	liscrepancies	·	-	13					J.
oject Number: PO#	/										Preserveture (HU)
Sample ID	Date	Time	Matrix	#Cont	LAB#						
1 TBT-11-PT	<u>y-/.;/?</u>	7 //9.33	Arcuater			K.					,'r.)
2 TET- 11- PD		16:05			<u> </u>	R					LAN
3 TBT -12 - PT		1810				$\times$					IND
4 TBT-12 PD		18.3,				ĸ					-1 m
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6 TBT-13- PD	Ļ	18-30				ĸ					4 05
7 TBT- 14 PT	が同意	12:00				ĸ					142
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urnaround requested nown hazardous content/rating	Prin				Printed	name			Printed name		
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	1	npany REC	·		Compa	ny			Company:		
pecial instructions/comments	Date	° 17/25/98	Time (2)	20	Date		Time		Date	Time	<u> </u>
loolev = (.1)	¥	Received by.				ed by:			Received by		
00	Prin	Printed name:				name			Printed name		
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Limits of Liability: REGL will perform requested services in accordance with appropriate methodology following Standard Operating Procedures, REGL Quality Assurance Program or REGL approved Project Quality Assurance Plans The total liability of REGL, its members, employees or successors arising out of or in connection with the requested services shall not exceed the invoiced amount of said services. The acceptance by the CLIENT of a proposal for services by REGL releases REGL from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order, or co-signed agreement between REGL and the CLIENT

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**ABORATORY ANALYSIS REQUEST** ate: 07/20/9 Page: 2 of: (0 REGL Job ID /022-001

#### Rosa Environmental & Geotechnical Laboratory, LLC

400 Ninth Avenue North, Suite B. Seattle, WA 98109 PH (206) 287-9122 FAX (206) 654-0540

ient Company: ES CUNSULTERTS	<u> </u>	San		Analysis Requested											
idress.		Shipped by:													
	Numb	er of coolers	in shipment	:					-						म
		tody seals p	resent/intact	:	_										T'S
INTACT: Tim Hammermeister		Cooler t	emperatures	:	_	1									Alexenter
ione.	В	ottle seals p	_	8.		ĺ							Aeu		
OJECT Name. WSOU TBT Study	Client	contact w/d	-												
oject Number: PO#J		<u> </u>		1									HCL		
Sample ID	Date	Time	Matrix	#Cont	LAB#							· · · ·			
1 TBT-15-PT (	87/18/98	13.10	PoreWater	1	 	x		[							m
2 TBT-15-PD	(	13:10	[			X									yn
3 TBT-16 - PT		14:00				x		 							Ind
4 TBT. 16. PD		14:00				X		 							5m
5 TBT-17-PT		12:20		-0		X									Ind
6 TBT-17-PD		12.20		3		X	(MS	MJI)	don	1 07/	20/9	8 15	(30)		4n
7 TBT-18- PT		JU: JD		1		X									Ind
8 TBT - 18- PD	-	14:00				X									1f.m
9 TBT-19-PT		14:55				×									12
10 TBT-19 - PD		14:55	V			X									4nd
	Relinqui	shed by:	IN THE		Relinqu	ished by	<i>.</i>				Relinqui	ished by			
urnaround requested: nown hazardous content/rating:	Printed		114.		Printed	name:					Printed	name:		<u></u>	
		Company: REGL				ny.			<u> </u>		Compar	אר. יאר:			
Decial instructions/comments:	ی ک	7/20/98	Time: 15.7	 20	Date:			Time:			Date <sup>.</sup>		T	ime.	
cooler = 0.7	Received	Received by:				Received by:					Receive	d by:	2		
	Printed	Printed name: UN K. Hawn				name.					Printed	name:			
00	Compar	Company. (AS-K				Company:					Company:				
0027	Date: 2(				Date:			Time:			Date:		Ť	ime:	

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ate: 07/20/98 Page: 3 of:		REGL	Job ID 102	2~ 00	<u> </u>			venue North 7-9122 FA		Seattle, WA 54-0540	. 98109
ient Company: EIS CMSultan	ts T	Sam	ple receipt	-	;			Analy	sis Reques	ted	
ddress:		Shipped by:			_						
	Numb	per of coolers	in shipment:								
	*·	stody seals pr	resent/intact:		-						
INTACT: TIM Hammer MRS			emperatures:		_						¥.
ione		Bottle seals pr			-	8					Unt
OJECT Name: WSOU TBT STUR	Client	contact w/d	iscrepancies:		-						Reservitive
oject Number: PO#		1	·····	<del></del>	<del></del>						$\cap_{\mathcal{S}}$
Sample ID	Date	Time	Matrix	#Cont	LAB#						
1 TBT-20. PT	7/17/92	1620	PoreWater								) ml
2 TBT-20PD	שזןרוןר	1650	11			$\left  \times \right $					44
3 TBT-21 - PT	7/13/98	1505	15			$ \times $					hru]
4 TBT- 21- PD	7/18/98	1505	1			X					4m/
5 TOT- 22- PT	7/19/90	755	<u>ار ا</u>			X					Zml
6 TBT-22-PD	7/19/98	8:20	<u>к</u>	1		X					Bml
7 TBT-23- PT	7/19/92	8:55	<u>ان</u>	1		X					Zu1
8 TBT- 23-PD	7/19/98	9:05	11			X					8m
9 TBT- 24- PT	7/19/98	910	I\		<u> </u>	X					2~n
10 TBT- 24- PD	7/19/92	11:00	1.			X					8.
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Limits of Liability: REGL will perform requested services in accordance with appropriate methodology following Standard Operating Procedures, REGL Quality Assurance Program or REGL approved Project Quality Assurance Plans. The total liability of REGL, its members, employees or successors arising out of or in connection with the requested services shall not exceed the invoiced amount of said services. The acceptance by the CLIENT of a proposal for services by REGL releases REGL from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order, or co-signed agreement between REGL and the CLIENT.

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## ABORATORY ANALYSIS REQUEST ate: 07/20/98 Page: 4 of: (

REGL Job ID /022-00/

### Rosa Environmental & Geotechnical Laboratory, LLC

400 Ninth Avenue North, Suite B. Seattle, WA 98109 PH (206) 287-9122 FAX (206) 654-0540

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Rosa Environmental & Geotechnical Laboratory, LLC

**ABORATORY ANALYSIS REQUEST** ate: 07/20/93\_Page: 6 of: 6

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REGL Job	ID	1022-001

400 Ninth Avenue North, Suite B. Seattle, WA 98109 PH (206) 287-9122 FAX (206) 654-0540

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Limits of Liability: REGL will perform requested services in accordance with appropriate methodology following Standard Operating Procedures, REGL Quality Assurance Program or REGL approved Project Quality Assurance Plans The total liability of REGL, its members, employees or successors arising out of or in connection with the requested services shall not exceed the invoiced amount of said services. The acceptance by the CLIENT of a proposal for services by REGL releases REGL from any liability in excess thereof, not withstanding any provision to the CLIEP

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#### **CHAIN OF CUSTODY RECORD &** LABORATORY ANALYSIS REQUEST Date: 7 35 98 Page: of: 2

Rosa Environmental & Geotechnical Laboratory, LLC

400 Ninth Avenue North, Suite B. Seattle, WA 98109 PH (206) 287-9122

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# APPENDIX D

# **Bioaccumulation Results**



Marine Sciences Laboratory 1529 West Sequim Bay Road Sequim, Washington 98382-9099 Telephone (206) 683-4151 Facsimile (206) 681-3699

November 23, 1998

Tim Hammermeister Solutions Inc. 200 West Mercer Street Suite 403 Seattle, WA 98119

Dear Tim:

Enclosed are the test results for the work performed under the TBT Bioaccumulation Testing project. Included are termination results of the sediment tests performed with the marine bivalve *Macoma nasuta* and marine polychaete, *Nephtys caecoides*, the daily observations, and water quality data. A brief description of the project, the methods used, and a semimary of test results follows. Also included in this packet is a copy of the raw data sheets, reference toxicant curves, and an electronic copy of the test data (IBM Excel 97).

#### **Project Plan**

The *M* nasuta/N. caecoides bioaccumulation test was used to estimate the TBT bioaccumulation potential of 17 marine sediments from Todd Shipyard in Elliot Bay, Washington. Three Puget Sound reference sediments were tested concurrently with the test sediments. The bioaccumulation test is typically performed as a 28-d exposure (EPA/USACE 1991). However, because TBT may not reach equilibrium in tissues within 28 days, the test period was extended to 45 days.

#### Methods

Sediment samples were collected from the Todd Shipyard by EVS Environmental Consultants personnel and delivered to the Battelle/Marine Sciences Laboratory (MSL) between July 15 and July 17, 1998. Macoma native control sediment was collected from Sequim Bay, Washington by MSL personnel. Nephtys native control sediment was collected from Dillon Beach, California by Brezina and Associates. Native control sediment was pressed-served through 1.0-mm Nytex mesh to remove large debris and potential competitors. All samples were received in good condition and were placed in a 4°C cold room until they were needed for testing.

The 45-d bioaccumulation test followed procedures outlined in Battelle SOP MSL-065-00 and EPA (1989) Tests were initiated on August 25, 1998 and included three Puget Sound reference sediments, a native sediment (negative) control and reference toxicant tests with copper (positive control).

The bivalve *M. nasuta* and the polychaete *N. caecoides* were used to evaluate the potential bioaccumulation of contaminants from dredged material. *N. caecoides* were supplied by John Brezina and Associates, Dillon Beach, California Upon receipt at the laboratory, *N. caecoides* were placed in holding trays of control sediment, and the trays were partially submerged on a holding table supplied with temperature-controlled seawater at approximately 15°C and 30‰. No temperature or salinity acclimation was necessary, since water quality at receipt was similar to test conditions. *N. caecoides* were held for 15 days before test initiation. *M. nasuta* were collected and held in flowing Discovery Bay seawater by Johnston and Gunstone, Port Townsend, Washington. Water quality (temperature, dissolved oxygen, pH, and salinity) was monitored throughout the holding period and test organisms were allowed to feed on sediment detritus during the holding period.

The bioaccumulation tests were 45-d flow-through exposures to sediment, followed by a 24-h depuration period that allowed the organisms to void their digestive tracts of sediment. *M. nasuta* and *N. caecoides* were tested together in 10-gal flow-through aquaria. Animals were exposed to one replicate of each sediment treatment, with the exception of three randomly selected treatments, as well as the native controls, were tested with five replicates. Each chamber contained 30 *M nasuta* and 45 *N. caecoides*. Water quality parameters (temperature, DO, pH, and salinity) were measured in all replicates at test initiation, in at least one replicate per treatment daily, and in all replicates at test termination. Water quality parameters for the two species were:

	<u>M. nasuta/N. caecoides</u>
Temperature	15°C±2°C
DO	> 60% saturation (5.0 mg/L @ 15°C, 30‰)
pН	7.8±0.5
Salinity	30‰±21
Flow Rate	125±10 mL/min

Aeration was provided to all test chambers to maintain consistency in DO concentrations among test chambers. Water quality, organism behavior (e.g., burrowing activity, feeding), and organism mortality were recorded daily. Dead organisms were removed daily. Flow rates were measured daily in all chambers. Once weekly, 175-mL of test or control sediment was added to each respective test chamber. The purpose of these supplements was to maintain potential contaminant doses and to provide additional nutrients during the 45-day test.

At the end of the 45-day testing period, *M. nasuta* and *N caecoides* were placed in clean, flowing seawater for 24 h, after which the tissues were transferred into the appropriate chemistry jars for analyses. All tissue samples were frozen immediately and stored at  $<-20^{\circ}$ C.

Water-only reference toxicant tests (96-h) were also performed using copper sulfate in six geometrically increasing concentrations plus control seawater. The exposures were conducted using a test volume of 5 L in static 9.5-L (2.5-gal) aquaria. One replicate of each concentration was tested, each containing 10 organisms. Water quality parameters were monitored at the same frequency and maintained within the same limits as the 45-d test, except that there were no flow rates. The *M. nasuta* reference toxicant test was conducted with treatments of 0, 0.31, 0.63, 1.25, 2.5, 5.0, and 10.0 mg/L Cu; the *N. caecoides* test was conducted with treatments of 0, 0.05, 0.075, 0.10, 0.20, 0.30, and 0.40 mg/L Cu.

#### Results

A summary of TBT Bioaccumulation Study test results and water quality observations are presented in Tables 1, 2, and 3. Termination results by replicate and daily observations are presented in Appendixes A and B. Reference toxicant test results and water quality observations are presented in Appendixes C and D.

Survival in the native-sediment controls for *M. nasuta* was 95%. Although there are no acceptability criteria for bioaccumulation-test controls, the control survival observed suggests that the test organisms were in good health throughout the test. Macoma survival was greater than 90% in all test treatments.

Mean survival in the *N. caecoides* native-control sediment was 66%. However, mean survival in the test treatments was generally greater than 80%. Thus, we feel that the *N. caecoides* the test treatments were in good health and that the poor survival observed in the native sediment was isolated to the controls.

The reduced mean survival in the controls may be due in part to poor survival in one replicate (Replicate 1: 33% survival). If this replicate is considered an outlier, mean control survival was 74%. However, survival in replicates 2 and 5 was 60% and 53%, respectively, suggesting that another factor may have influenced control survival. TOC quantity and quality in the native control sediment, combined with the extended exposure period, may have affected control survival. The native control sediment used in this study was a sandy sediment with a TOC content of 0.07%. Previous TOC-spiked sediment studies at the MSL (Pinza et al. 1996) determined a minimum optimal-TOC level for *N. caecoides* of 0.75% TOC. Below this value, survival was reduced (Figure 1). The TOC-content for the native control was well below the 0.75% threshold and was maintained for a longer exposure duration (45 days vs. 28 days). It is important to note that sufficient tissues for all treatments were obtained from the bioaccumulation exposures.

All water quality parameters were within acceptable ranges throughout the test. The water-only reference toxicant tests with copper resulted in an  $LC_{50}$  of 2.05 mg/L Cu for *M. nasuta*, which was within the controls limits established at the MSL (0.28 mg/L -2.8 mg/L Cu). The copper  $LC_{50}$  for *N. caecoides* was 0.10 mg/L Cu, which was similar to reported values [0.09 mg/L to 0.16 mg/L Cu (EPA 1984)].

If you have any further questions about this data report, please call me at (360) 681-3661.

William le Jennine Sincerely,

William W. Gardiner Research Scientist Marine Sciences Laboratory

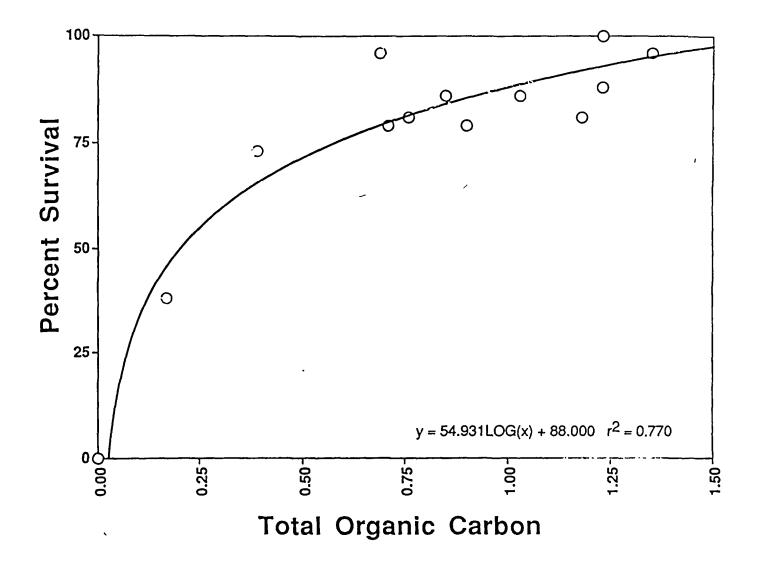


Figure 1. Nephthys caecoides survival in control sediment spiked with varying concentrations of TOC.

	Mean	
<b>T</b>	Percent	60
Treatment	Survival	SD
Macoma Control	95.3	4.5
TBT-2	100.0	NA
TBT-4	96.7	NA
TBT-5	96.7	NA
TBT-7	96.7	NA
TBT-8	100.0	NA
TBT-9	100.0	NA
TBT-11	100.0	NA
TBT-12	93.3	NA
TBT-13	93.3	7.8
TBT-14	96.7	NA
TBT-15	96.7	NA
TBT-18	96.7	NA
TBT-19	98.0	3.0
TBT-20	96.7	NA
TBT-21	93.3	NA
TBT-22	93.3	NA
TBT-24	100.0	NA
TBT-26	100.0	NA
TBT-28	96.7	NA
TBT-30	96.7	5.8

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Table 1. Summary of Survival of Macoma nasuta During 45-d TBT-Bioaccumulation Test

NA: Not applicable, one replicate.

	Mean	
Treatment	Percent Survival	SD
Nephtys Control	65.8	25.1
TBT-2	95.6	NA
TBT-4	88.9	NA
TBT-5	88.9	NA
TBT-7	88.9	NA
TBT-8	68.9	NA
TBT-9	86.7	NA
TBT-11	82.2	NA
TBT-12	88.9	NA
TBT-13	87.1	7.4
TBT-14	88.9	NA
TBT-15	64.4	NA
TBT-18	88.9	NA
TBT-19	87.6	8.0
TBT-20	68.9	NA
TBT-21	77.8	NA
TBT-22	64.4	NA
TBT-24	91.1	NA
TBT-26	91.1	NA
ТВТ-28	91.1	NA
твт-30	88.9	4.2

Table 2. Summary of Survival of Nephtys caecoides During 45-d TBT-Bioaccumulation Test

Not applicable. One replicate.

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	Tempe	rature			Disso Oxy		Salini	ity	
	(°(	C)	рН		(mg	/L)	(0/00)		
Treatment	Min	Max	Min	Мах	Min	Мах	Min	Max	
Acceptable Range	13ºC	17ºC	7.30	8.30	>4.0	NA	28.0	32.0	
Macoma Control	14.3	15.8	7.68	8.07	6.1	7.9	32.0	32.0	
Nephtys Control	14.4	15.7	7.70	8.09	6.3	8.3	32.0	32.0	
TBT-2	14.4	16.1	7.73	8.05	6.4	7.7	32.0	32.0	
TBT-4	14.4	15.7	7.70	8.06	6.0	8.0	32.0	32.0	
TBT-5	14.5	16.0	7.67	8.04	6.1	7.7	32.0	32.0	
TBT-7	14.4	15.8	7.70	8.06	6.3	8.0	32.0	32.0	
TBT-8	14.4	15.8	7.67	8.08	6.0	8.1	32.0	32.0	
TBT-9	14.5	15.9	7.74	8.06	6.4	7.7	32.0	32.0	
TBT-11	14.3	15.7	7.72	8.06	5.5	7.9	32.0	32.0	
TBT-12	14.3	15.9	7.70	8.06	6.0	7.8	32.0	32.0	
TBT-13	14.4	15.8	7.68	8.06	6.1	7.8	32.0	32.0	
TBT-14	14.4	15.7	7.70	8.05	6.8	7.8	32.0	32.0	
TBT-15	14.3	15.6	7.66	8.06	6.4	7.9	32.0	32.0	
TBT-18	14.4	15.9	7.70	8.06	6.6	7.8	32.0	32.0	
TBT-19	14.4	16.2	7.67	8.06	5.5	7.8	32.0	32.0	
TBT-20	14.4	15.6	7.68	8.06	6.4	7.9	32.0	32.0	
TBT-21	14.4	15.7	7.71	8.06	6.3	7.9	32.0	32.0	
TBT-22	14.4	15.7	7.67	8.07	6.2	8.1	32.0	32.0	
TBT-24	14.4	15.7	7.68	8.06	6.3	8.0	32.0	32.0	
TBT-26	14.4	15.8	7.69	8.06	6.3	7.8	32.0	32.0	
<b>TBT-28</b>	14.4	15.8	7.68	8.06	6.2	7.9	32.0	32.0	
<b>TBT-30</b>	14.3	15.9	7.70	8.06	6.3	7.9	32.0	32.0	

Table 3. Water Quality Summary for *M. nasuta* and *N. caecoides* 45-d TBT-Bioaccumulation Test

Appendix A1. Survival	of <i>Macoma nasuta</i> Du	ring 45-d TBT	-Bioaccumulat	tion Test
MSL	Number	Number Nur	nber Percent	Mean Percent

								Mean	
	MSL	<b>-</b>	<b>.</b>	Number	Number	Number	Percent	Percent	•-
Treatment	Code	Replicate			Dead	Missing	Survival	Survival	SD
Control	17	1	16	30	0	0	100.0		
Control	17	2	39	30	0	0	100.0		
Control	17	3	40	28	2	0	93.3		
Control	17	4	35	28	0	2	93.3		
Control	17	5	1	27	2	1	90.0	95.3	4.5
2	22	1	31	30	0	0	100.0	100.0	NA
4	18	1	19	29	1	0	96.7	96 7	NA
5	21	1	15	29	1	0	96.7	96.7	NA
7	2	1	27	29	0	1	96.7	96 7	NA
8	16	1	17	30	0	0	100.0	100.0	NA
9	7	1	30	30	0	0	100.0	100.0	NA
11	20	1	18	30	0	0	100.0	100.0	NA
12	1	1	13	28	0	2	93.3	93.3	NA
13	12	1	28	30	0	0	100.0		
13	12	2	22	24	1	5	80.0		
13	12	3	25	28	1	1	93.3		
13	12	4	2	29	1	0	96.7		
13	12	5	36	29	0	1	96.7	93.3	7.8
14	9	1	38	29	1	0	96.7	96.7	NA
15	13	1	3	29	1	0	96.7	96.7	NA
18	6	1	42	29	0	1	96.7	96.7	NA
19	14	1	10	30	0	0	100 0		
19	14	2	14	30	0	0	100 0		
19	14	3	29	28	1	1	93.3		
19	14	4	34	30	0	0	100 0		
19	14	5	32	29	0	1	96.7	98.0	3.0
20	10	1	4	29	1	0	96.7	96.7	NA
. 21	8	1	5	28	0	2	93.3	93.3	NA
22	15	1	7	28	0	2	93.3	93.3	NA
24	19	1	8	30	0	0	100.0	100.0	NA
26	3	1	37	30	0	0	100.0	100.0	NA
28	4	1	9	29	1	0	96.7	96.7	NA
30	5	1	11	30	0	0	100 0		
30	5	2	12	29	0	1	96.7		
30	5	3	23	30	0	0	100 0		
30	5	4	26	30	0	0	100.0		
30	5	5	20	26	1	3	86.7	<del>9</del> 6.7	5.8
1									

# Appendix B1. Survival of Nephtys caecoides During 45-d TBT-Bioaccumulation Test

Treatment	MSL Code	Replicate	Position	Number Surviving	Number Dead	Number Missing	Percent Survival	Mean Percent Survival	SD
Control	11	1	6	15	0	30	33.3		
Control	11	2	33	27	0	18	60.0		
Control	11	3	24	41	0	4	91.1		
Control	11	4	21	41	0	4	91 1	05.0	
Control	11	5	41	24	0	21	53 3	65.8	25 1
2	22	1	31	43	0	2	95 6	95 6	NA
4	18	1	19	40	1	4	88.9	88.9	NA
5	21	1	15	40	0	5	88.9	88.9	NA
7	2	1	27	40	0	5	88.9	88.9	NA
8	16	1	17	31	3	11	68.9	68.9	NA
9	7	1	30	39	0	6	86.7	86.7	NA
11	20	1	18	37	0	8	82.2	82.2	NA
	1	1	13	40	0	5			
12							88.9	88.9	NA
13	12	1	28	39	0	6	86.7		
13 13	12 12	2 3	22 25	43 41	0 0	2 4	95.6 91.1		
13	12	4	25	34	0	- <del>4</del> 11	75.6		
13	12	5	36	39	0	6	86.7	87.1	7.4
14	9	1	38	40	0	5	88.9	88.9	NA
15	13	1	3	29	0	16	64.4	64 4	
									NA
18	6	1	42	40	0	5	88.9	88 9	NA
19	14	1	10	42	0	3	93.3		
19	14	2	14	35	0	10	77.8		
19 10	14	3 4	29 34	42	0	3	93.3		
19 19	14 14	4 5	34 32	42 36	0 0	3 9	93.3 80.0	87.6	8.0
20	10	1		31		14	68.9		
			4		0			68.9	NA
21	8	1	5	35	0	10	77.8	77 8	NA
22	15	1	7	29	0	16	64.4	64.4	NA
24	19	1	8	41	0	4	91.1	91 1	NA
26	3	1	37	41	0	4	91.1	91.1	NA
28	4	1	9	41	0	4	91.1	91.1	NA
30	5	1	11	39	0	6	86.7		
30	5	2	12	42	õ	3	93.3		
30	5	3	23	39	0	6	86.7		
30	5	4	26	42	0	3	93.3		
30	5	5	20	38	0	7	84.4	88.9	4.2

NA. Not applicable, only one replicate

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 0							_
31	2	Sed - 22	1	15.7	7.80	6.4	32.0
19	4	Sed - 18	1	15.6	7.77	6.0	32.0
15	5	Sed - 21	1	15.6	7.77	6.1	32.0
27	7	Sed - 2	1	15.5	7.80	6.5	32.0
17	8	Sed - 16	1	15.6	7.82	6.0	32.0
30	9	Sed - 7	1	15.6	7.81	6.4	32.0
18	11	Sed - 20	1	15.6	7.77	6.3	32.0
13	12	Sed - 1	1	15.6	7.80	6.0	32.0
28	13	Sed - 12	1	15.6	7.80	6.4	32.0
22	13	Sed - 12	2	15.7	7.77	6.3	32.0
25	13	Sed - 12	3	15.5	7.81	6.6	32.0
2	13	Sed - 12	4	15.5	7.77	6.3	32.0
36	13	Sed - 12	5	15.6	7.79	6.1	32.0
38	14	Sed - 9	1	15.7	7.80	6.2	32.0
3	15	Sed - 13	1	15.5	7 77	6.4	32.0
42	18	Sed - 6	1	15.6	7.82	6.6	32.0
10	19	Sed - 14	1	15.6	7.74	6.3	32.0
14	19	Sed - 14	2	15.6	7.71	5.5	32.0
29	19	Sed - 14	3	15.6	7.79	6.4	32.0
32	19	Sed - 14	5	15.6	7.79	6.5	32.0
32 34	19	Sed - 14 Sed - 14	4	15.8	7.75	6.2	32.0
	20	Sed - 14 Sed - 10	1	15.6	7.77	6.4	32.0
4	20	Sed - 10 Sed - 8	1	15.6	7.76	6.3	32.0
5	21	Sed - 8 Sed - 15	1	15.5	7.78	6.3	32.0
7	22	Sed - 15 Sed - 19	1	15.6	7.77	6.3	32.0
8			1	15.7	7.82	6.3	32.0
37	26	Sed - 3 Sed - 4	1	15.7	7.62	6.3 6.2	32.0
9	28			15.7	7.79	6.2 6.3	32.0
11	30	Sed - 5	1	15.5	7.79	6.6	32.0
12	30	Sed - 5	2		7.81		32.0
23	30	Sed - 5	3	15.6 15.5		6.6	
26	30	Sed - 5	4	15.5	7.81	6.5	32.0
20	30	Sed - 5	5	15.7	7.80	6.4	32.0
16	Macoma Control	Sed - 17	1	15.6	7.80	6.2	32.0
39	Macoma Control	Sed - 17	2	15.7	7.82	6.3	32.0
40	Macoma Control	Sed - 17	3	15.6	7.83	6.5	32.0
35	Macoma Control	Sed - 17	4	15.6	7.81	6.1	32.0
1	Macoma Control	Sed - 17	5	15.5	7.74	6.2	32.0
6	Neanthes Control	Sed - 11	1	15.5	7.78	6.3	32.0
21	Neanthes Control	Sed - 11	4	15.7	7.81	6.3	32.0
24	Neanthes Control	Sed - 11	3	15.5	7.82	6.6	32.0
33	Neanthes Control	Sed - 11	2	15.6	7.82	6.3	32.0
41	Neanthes Control	Sed - 11	5	15.6	7 82	6.5	32.0 Page 1 & 2

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Desition	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity
Position	Treatment	MOL COUP	Keb	0.1 C	0.01 units	v. r mg/L	0.5 ppt
Acceptabl	e Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 1	_						_
31	2	Sed - 22	1	15.5	7.75	6.4	32.
19	4	Sed - 18	1	15.3	7.73	6.3	32.
15	5	Sed - 21	1	15.4	7.73	6.6	32
27	7	Sed - 2	1	15.4	7.74	66	32
17	8	Sed - 16	1	15.4	7.77	67	32
30	9	Sed - 7	1	15.3	7.78	69	32
18	11	Sed - 20	1	15.3	7.73	6.2	32
13	12	Sed - 1	1	15.3	7.76	6.6	32
28	13	Sed - 12	1	15.3	7.77	6.9	32
38	14	Sed - 9	1	15.3	7.76	6.8	32
3	15	Sed - 13	1	15.2	7.72	6.8	32
42	18	Sed - 6	1	15.3	7.77	6.9	32
10	19	Sed - 14	1	15.3	7.74	6.4	32
4	20	Sed - 10	1	15.2	7.75	6. <del>9</del>	32
5	21	Sed - 8	1	15.3	7.74	6.6	32
7	22	Sed - 15	1	15.3	7.74	6.2	32
8	24	Sed - 19	1	15.4	7.75	6.5	32
37	26	Sed - 3	1	15.3	7.77	6.7	32
9	28	Sed - 4	1	15.4	7.75	6.3	32
11	30	Sed - 5	1	15.4	7.75	6.5	32
16	Macorna Control	Sed - 17	1	15.4	7.76	6.7	32
6	Neanthes Control	Sed - 11	1	15.3	7.79	6.9	32
Day 2							
31	2	Sed - 22	1	15.3	7.78	6.7	32
15	5	Sed - 21	1	15.2	7.78	6.7	32
19	5	Sed - 21	1	15.1	7.77	6.4	32
27	7	Sed - 2	1.	15.2	7.78	6.7	32
17	8	Sed - 16	1	15.3	7.80	6.8	32
30	9	Sed - 7	1	15.2	7.81	6.9	32
18	11	Sed - 20	1	15.1	7.77	6.5	32
13	12	Sed - 1	1	15.1	7.79	6.7	32
22	13	Sed - 12	2	15.2	7.79	6.6	32
38	14	Sed - 9	1	15.2	7.80	6.7	32
3	15	Sed - 13	1	15.2	7.77	6.8	32
42	18	Sed - 6	1	15.2	7.81	68	32
42 14	19	Sed - 14	2	15.1	7.80	6.9	32
4	20	Sed - 14 Sed - 10	1	15.1	7.78	7.0	32
4 5	20	Sed - 10	1	15.2	7.78	6.9	32
5 7	22	Sed - 8 Sed - 15	1	15.2	7.77	6.3	32
	22	Sed - 15 Sed - 19	1	15.2	7.80	6.7	32
8 27	24 26	Sed - 19 Sed - 3	4	15.2	7.80	6.9	32
37			1				
9	28	Sed - 4	1	15.2	7.78	6.4 6.5	32
12	30 Magazina Cantral	Sed - 5	2	15.2	7.80	6.5	32
39	Macoma Control	Sed - 17	2	15.2	7.81	6.8	32
33	Neanthes Control	Sed - 11	2	15.1	7.85	7.0	Page 3 (

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 3				45.0			
31	2	Sed - 22	1	15.3	7.80	6.6	32.0
19	4	Sed - 18	1	15.0	7.80	6.4	32.0
15	5	Sed - 21	1	15.1	7.81	6.8	32.0
27	7	Sed - 2	1	15.1	7.83	6.9	32.0
17	8	Sed - 16	1	15.1	7.82	6.8	32.0
30	9	Sed - 7	1	15.2	7.81	6.5	32.0
18	11	Sed - 20	1	14.9	7.73	5.5	32.0
13	12	Sed - 1	1	15.1	7.82	7.0	32.0
25	13	Sed - 12	3	15.0	7.81	6.8	32 0
38	14	Sed - 9	1	15.0	7.81	6.6	32.0
3	15	Sed - 13	1	15.1	7.76	6.7	32.0
42	18	Sed - 6	1	15.0	7.83	7.0	32.0
29	19	Sed - 14	3	15.2	7.84	7.0	32.0
4	20	Sed - 10	1	15.0	7.80	7.0	32.0
5	21	Sed - 8	1	14.9	7.80	6.8	32.0
7	22	Sed - 15	1	15.0	7.80	6.5	32.0
8	24	Sed - 19	1	15.1	7.80	6.6	32.0
37	26	Sed - 3	1	15.1	7.83	6.7	32.0
9	28	Sed - 4	1	15.1	7.80	6.4	32.0
23	30	Sed - 5	3	15.1	7.83	6.9	32.0
40	Macoma Control	Sed - 17	3	15.0	7.84	6.9	32.0
24	Neanthes Control	Sed - 11	3	15.1	7.87	7.2	32.0
Day 4							
31	2	Sed - 22	1	15.2	7.81	7.0	32.0
1 <del>9</del>	4	Sed - 18	1	15.1	7.80	6. <del>9</del>	32.0
27	7	Sed - 2	1	15.0	7.81	7 1	32.0
15	8	Sed - 21	1	15.1	7.80	71	32.0
17	8	Sed - 16	1	15 1	7.82	7.2	32 0
30	9	Sed - 7	1	15 2	7.83	7.2	32.0
18	11	Sed - 20	1	15.1	7.81	7.2	32.0
13	12	Sed - 1	1	15.1	7.82	7.0	32.0
2	13	Sed - 12	4	15.1	7.79	6.9	32.0
38	14	Sed - 9	1	15.1	7.82	7.2	32.0
3	15	Sed - 13	1	15.0	7.81	7.2	32.0
42	18	Sed - 6	1	15.1	7.82	7.2	32.0
34	19	Sed - 14	4	15.2	7.84	7.2	32.0
4	20	Sed - 10	1	15.0	7.82	7.3	32.0
5	21	Sed - 8	1	15.0	7.80	7.0	32.0
7	22	Sed - 15	1	15.1	7.81	7.1	32.0
8	24	Sed - 19	1	15.1	7.81	6.9	32.0
37	26	Sed - 3	1	15.1	7.82	7.1	32.0
9	28	Sed - 4	1	15.2	7.82	6.9	32.0
26	30	Sed - 5	4	15.0	7.83	73	32.0
35	Macoma Control	Sed - 17	4	15.2	7.83	7.0	32.0
21	Neanthes Control	Sed - 11	4	15.0	7.86	7.2	32.0

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13°C-17°C	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 5							
31	2	Sed - 22	1	15.2	7.81	7.0	32
19	4	Sed - 18	1	15.1	7.80	6.8	32.
15	5	Sed - 21	1	15.2	7.81	7.0	32.
27	7	Sed - 2	1	15.1	7.81	7.0	32
17	8	Sed - 16	1	15.2	7.83	7.1	32.
30	9	Sed - 7	1	15.2	7.82	7.2	32.
18	11	Sed - 20	1	15.1	7.81	7.0	32
13	12	Sed - 1	1	15.2	7.82	7.0	32.
36	13	Sed - 12	5	15.3	7.81	7.2	32.
38	14	Sed - 9	1	15.2	7.82	7.1	32.
3	15	Sed - 13	1	15.1	7.83	7.2	32.
42	18	Sed - 6	1	15.1	7.83	7.2	32
32	19	Sed - 14	5	15.2	7.82	7.1	32
4	20	Sed - 10	1	15.1	7.83	7.3	32
5	21	Sed - 8	1	15.1	7.82	7.1	32
7	22	Sed - 15	1	15.1	7.83	7.1	32
8	24	Sed - 19	1	15.1	7.82	6.9	32
37	26	Sed - 3	1	15.3	7.82	7.1	32
9	28	Sed - 4	1	15.1	7.83	6.7	32
20	30	Sed - 5	5	15.1	7.84	7.2	32
1	Macoma Control	Sed - 17	5	15.0	7.83	7.0	32
41	Neanthes Control	Sed - 11	5	15.2	7.86	7.5	32
Day 6							
31	2	Sed - 22	1	15.2	7.85	7.1	32
19	4	Sed - 18	1	15.1	7.85	7.1	32
15	5	Sed - 21	1	15.2	7.85	7.2	32
27	7	Sed - 2	1	15.0	7.85	7.1	32
17	8	Sed - 16	1	15 1	7.87	7.3	32
10	9	Sed - 14	1	15.2	7.85	7.3	32
30	9	Sed - 7	1	15.1	7.87	7.3	32
18	11	Sed - 20	1	15.1	7.85	7.2	32
13	12	Sed - 1	1	15.2	7.86	7.3	32
28	13	Sed - 12	1	15.1	7.87	7.3	32
38	14	Sed - 9	1	15.1	7.85	7.0	32
3	15	Sed - 13	1	15.1	7.83	7.3	32
42	18	Sed - 6	1	15.1	7.85	7.2	32
4	20	Sed - 10	1	15.0	7.85	7.5	32
5	21	Sed - 8	1	15.0	7.85	7.3	32
7	22	Sed - 15	1	15.0	7.85	7.0	32
8	24	Sed - 19	1	15.1	7.85	7.1	32
37	26	Sed - 3	1	15.3	7.85	7.3	32
9	28	Sed - 4	1	15.2	7.86	7.3	32
11	30	Sed - 5	1	15.2	7.86	7.4	32
16	Macoma Control	Sed - 17	1	15.1	7.85	7.2	32
6	Neanthes Control	Sed - 11	1	15.1	7.88	7.5	32

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 7							
31	2	Sed - 22	1	15.4	7.92	7.4	32.0
19	4	Sed - 18	1	15.0	7.92	7.2	32.0
15	5	Sed - 21	1	15.2	7.91	7.1	32.0
27	7	Sed - 2	1	15.1	7.92	7.3	32.0
17	8	Sed - 16	1	15.1	7.93	7.3	32.0
30	9	Sed - 7	1	15.2	7.93	7.3	32.0
18	11	Sed - 20	1	15.0	7.92	7.2	32.0
13	12	Sed - 1	1	15.2	7.92	73	32.0
22	13	Sed - 12	2	15.1	7.93	7.3	32.0
38	14	Sed - 9	1	15.1	7.92	7.4	32.0
3	15	Sed - 13	1	15.2	7.95	7.5	32.0
42	18	Sed - 6	1	15.1	7.92	7.3	32.0
14	19	Sed - 14	2	15.3	7.94	7.3	32.0
4	20	Sed - 10	1	15.0	7.93	7.5	32.0
5	21	Sed - 8	1	15.0	7.94	7.5	32.0
7	22	Sed - 15	1	15.1	7.95	7.4	32.0
8	24	Sed - 19	1	15.1	7.93	7.3	32.0
37	26	Sed - 3	1	15.3	7.92	7.4	32.0
9	28	Sed - 4	1	15.2	7.94	7.4	32.0
12	30	Sed - 5	2	15.3	7.92	7.1	32.0
39	Macoma Control	Sed - 17	2	15.2	7.94	7.3	32.0
33	Neanthes Control	Sed - 11	2	15.3	7.98	7.7	32.0
Day 8							
31	2	Sed - 22	1	15.2	7.93	7.3	32.0
19	4	Sed - 18	1	15.0	7.93	7.3	32.0
15	5	Sed - 21	1	15.1	7.92	7.3	32.0
27	7	Sed - 2	1	15.1	7.93	7.3	32 0
17	8	Sed - 16	1	15 1	7.94	7.5	32.0
30	9	Sed - 7	1	15.2	7.94	7.5	32.0
18	11	Sed - 20	1	15.1	7.94	7.5	32.0
13	12	Sed - 1	1	15.1	7.94	7.4	32.0
25	13	Sed - 12	3	15.1	7.94	7.5	32.0
38	14	Sed - 9	1	15.1	7.92	7.4	32.0
3	15	Sed - 13	1	15.1	7.95	7.5	32.0
42	18	Sed - 6	1	15.1	7.93	7.5	32.0
29	19	Sed - 14	3	15.1	7.94	7.5	32.0
4	20	Sed - 10	1	14.9	7.95	7.6	32.0
5	21	Sed - 8	1	14.9	· 7.95	7.5	32.0
7	22	Sed - 15	1	15.0	7.94	7.3	32.0
8	24	Sed - 19	1	15.1	7.94	7.5	32.0
37	26	Sed - 3	1	15.2	7.93	7.4	32.0
9	28	Sed - 4	1	15.1	7.94	7.4	32 0
23	30	Sed - 5	3	15.1	7.95	7.9	32.0
40	Macoma Control	Sed - 17	3	15.1	7.94	7.6	32 0
24	Neanthes Control	Sed - 11	3	15.1	7.98	7.8	32.0

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range		<u> </u>	13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 9							
31	2	Sed - 22	1	16.1	7.97	7.7	32.
19	4	Sed - 18	1	15.7	7.97	8.0	32.
15	5	Sed - 21	1	16.0	7.96	7.7	32.
27	7	Sed - 2	1	15.8	7.99	8.0	32.
17	8	Sed - 16	1	15.8	7.98	7.7	32.
30	9	Sed - 7	1	15.9	7.97	7.7	32.
18	11	Sed - 20	1	15.7	7.99	7.9	32.
13	12	Sed - 1	1	15.9	7.97	7.8	32.
2	13	Sed - 12	4	15.8	7.97	7.3	32.
38	14	Sed - 9	1	15.7	7.97	7.8	32.
3	15	Sed - 13	1	15.6	7.98	7.7	32.
42	18	Sed - 6	1	15.9	7.97	7.8	32
34	19	Sed - 14	4	16.2	7.97	7.8	32
4	20	Sed - 10	1	15.6	7.97	7.7	32
5	21	Sed - 8	1	15.7	7.98	7.9	32
7	22	Sed - 15	1	15.7	8.00	8.1	32
8	24	Sed - 19	1	15.7	7.98	8.0	32
37	26	Sed - 3	1	15.8	7.97	7.8	32
9	28	Sed - 4	1	15.8	7.99	7.9	32
26	30	Sed - 5	4	15.9	7.98	7.9	32
35	Macoma Control	Sed - 17	4	15.8	7.99	7.9	32
21	Neanthes Control	Sed - 11	4	15.7	8.02	8.3	32
Day 10							
31	2	Sed - 22	1	15.1	8.01	7.5	32
19	4	Sed - 18	1	15.0	8.00	7.5	32
15	5	Sed - 21	1	15.1	8.00	7.5	32
27	7	Sed - 2	1	15 0	8 01	75	32
17	8	Sed - 16	1	15.0	8.02	7.5	32
30	9	Sed - 7	1	15 0	8.01	7.6	32
18	11	Sed - 20	1	15.0	8.01	7.5	32
13	12	Sed - 1	1	15.0	8.02	7.5	32
36	13	Sed - 12	5	15.2	8.01	7.8	32
38	14	Sed - 9	1	15.1	8.00	7.5	32
3	15	Sed - 13	1	14.9	8.01	7.6	32
42	18	Sed - 6	1	15.0	8.01	7.8	32
32	19	Sed - 14	5	15.2	8.01	7.6	32
4	20	Sed - 10	1	14.9	8.01	7.5	32
5	21	Sed - 8	1	14.9	8.01	7.7	32
7	22	Sed - 15	1	14.9	8.01	7.6	32
8	24	Sed - 19	1	15.0	8.02	7.7	32
37	26	Sed - 3	1	15.1	8.01	7.7	32
9	28	Sed - 4	1	15.0	8.01	75	32
20	30	Sed - 5	5	15.0	8.02	7.6	32
1	Macoma Control	Sed - 17	5	14.8	8.02	7.4	32
41	Neanthes Control	Sed - 11	5	15.0	8.05	7.9	32

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptabl	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 11			_			7.0	
31	2	Sed - 22	1	14.9	8.05	7.6	32.0
19	4	Sed - 18	1	14.8	8.06	7.7	32.0
15	5	Sed - 21	1	14.9	8.04	7.6	32.0
27	7	Sed - 2	1	14.8	8.06	7.8	32 (
17	8	Sed - 16	1	14.8	8.08	7.7	32.0
30	9	Sed - 7	1	14.9	8.06	7.7	32.0
18	11	Sed - 20	1	14.8	8.06	7.8	32.0
13	12	Sed - 1	1	14.9	8.06	7.8	32.0
28	13	Sed - 12	1	14.8	8.06	7.8	32.0
38	14	Sed - 9	1	14.9	8.05	7.7	32.0
3	15	Sed - 13	1	14.7	8.06	7.9	32.0
42	18	Sed - 6	1	14.8	8.06	7.8	32.0
10	19	Sed - 14	1	14.8	8.06	7.8	32.0
4	20	Sed - 10	1	14 7	8.06	7.9	32.0
5	21	Sed - 8	1	14.7	8.06	7.9	32.0
7	22	Sed - 15	1	14.8	8.07	8.0	32.0
8	24	Sed - 19	1	14.8	8.06	7.9	32.
37	26	Sed - 3	1	14.8	8.06	7.8	32.
9	28	Sed - 4	1	14.8	8.06	7.9	32.
11	30	Sed - 5	1	14.9	8.06	7.8	32.
16	Macoma Control	Sed - 17	1	14.8	8.07	7.8	32.0
6	Neanthes Control	Sed - 11	1	14 8	8.09	8 1	32.
Day 12							
31	2	Sed - 22	1	15.0	7.98	7.7	32.0
19	4	Sed - 18	1	14.9	7.97	7.4	32.0
15	5	Sed - 21	1	14.9	7.97	7.4	32.0
27	7	Sed - 2	1	15.0	7.97	74	32.0
17	8	Sed - 16	1	14.9	7.99	75	32.0
30	9	Sed - 7	1	15.0	7.98	7.6	32.0
18	11	Sed - 20	1	14.9	7.98	7.5	32.0
13	12	Sed - 1	1	14.8	7.99	7.6	32.
22	13	Sed - 12	2	14.9	7.97	7.5	32.
38	14	Sed - 9	1	14.9	7.97	7.6	32.
3	15	Sed - 13	1	14.8	7.98	7.6	32.
42	18	Sed - 6	1	14.9	7.97	7.6	32.
14	19	Sed - 14	2	14.8	7.98	7.7	32.
4	20	Sed - 10	1	14.8	7.98	76	32.
5	21	Sed - 8	1	14.8	7.98	7.6	32.
7	22	Sed - 15	1	14 8	7.98	7.6	32.
8	24	Sed - 19	1	14.8	7.97	7.5	32.
37	26	Sed - 3	1	15.0	7.98	7.6	32.
9	28	Sed - 4	1	14.9	7.98	75	32.
12	30	Sed - 5	2	14.8	7.97	7.5	32.
39	Macoma Control	Sed - 17	2	14.9	7.97	7.5	32.
33	Neanthes Control	Sed - 11	2	15.0	8.01	8.0	32

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptabl	e Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 13							
31	2	Sed - 22	1	15.2	7.96	7.5	32.
19	4	Sed - 18	1	15.0	7.95	7.2	32.
15	5	Sed - 21	1	15.1	7.95	72	32.
27	7	Sed - 2	1	15.0	7 95	7.2	32.
17	8	Sed - 16	1	15.1	7.97	7.2	32.
30	9	Sed - 7	1	15.1	7.97	7.5	32.
18	10	Sed - 20	1	15.0	7.95	7.2	32
13	12	Sed - 1	1	15.2	7.96	7.4	32.
25	13	Sed - 12	3	15.0	7.95	7.3	32.
38	14	Sed - 9	1	15.1	7.97	7.6	32
3	15	Sed - 13	1	15.0	7.96	7.4	32
42	18	Sed - 6	1	15.1	7.95	7.6	32
29	19	Sed - 14	3	15.1	7.96	7.4	32
4	20	Sed - 10	1	15.0	7.95	7.3	32
5	21	Sed - 8	1	15.0	7.95	7.4	32
7	22	Sed - 15	1	15.0	7.95	7.2	32
8	24	Sed - 19	1	15.1	7.95	7.3	32
37	26	Sed - 3	1	15.2	7.94	7.1	32
9	28	Sed - 4	1	15.1	7.95	7.2	32
23	30	Sed - 5	3	15.2	7.96	7.5	32
40	Macoma Control	Sed - 17	3	15.1	7.96	7.4	32
24	Neanthes Control	Sed - 11	3	15.1	7.98	7.6	32
Day 14							
31	2	Sed -22	1	15.0	7.88	7.1	32
19	4	Sed - 18	1	14.8	7.85	6.7	32
15	5	Sed - 21	1	14.9	7.87	6.9	32
27	7	Sed - 2	1	14.9	7.86	6.5	32
17	8	Sed - 16	1	14.9	7.89	7.0	32
30	9	Sed - 7	1	15.0	<b>7.9</b> 0 ·		32
18	11	Sed - 20	1	14.9	7.86	6.8	32
13	12	Sed - 1	1	14.9	7.89	7.1	32
2	13	Sed - 12	4	14.6	7.87	7.0	32
38	14	Sed - 9	1	14.8	7.87	7.0	32
3	15	Sed - 13	1	14.6	7.87	7.1	32
42	18	Sed - 6	1	14.8	7.87	7.0	32
34	19	Sed - 14	4	15.0	7.89	7.3	32
4	20	Sed - 10	1	14.7	7.88	7.3	32
5	21	Sed - 8	1	14.8	7.87	7.1	32
7	22	Sed - 15	1	14.8	7 86	6.9	32
8	24	Sed - 19	1	14.9	7.85	6.8	32
37	26	Sed - 3	1	14.8	7.87	6.9	32
9	28	Sed - 4	1	14.8	7.85	6.7	32
26	30	Sed - 5	4	14.8	7.87	7.0	32
35	Macoma Control	Sed - 17	4	15.0	7.87	6.3	32
21	Neanthes Control	Sed - 11	4	14.9	7.89	7.0	32 Page 15 & 1

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptabl	e Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 15							
32	2	Sed - 22	5	14.9	7.88	7.2	32.
19	4	Sed - 18	1	14.7	7.86	6.7	32.
15	5	Sed - 21	1	14.8	7.86	7.0	32.
30	7	Sed - 2	1	14.8	7.86	68	32.0
17	8	Sed - 16	1	14.8	7.87	7.0	32
31	9	Sed - 7	1	14.9	7.87	7.3	32.
18	11	Sed - 20	1	14.7	7.87	6.9	32.
13	12	Sed - 1	1	14.9	7.88	7.0	32.
1	13	Sed - 12	5	14.8	7.85	6.3	32.
41	14	Sed - 9	5	14.8	7.90	7.5	32.
3	15	Sed - 13	1	14.7	7.88	7.0	32.
42	18	Sed - 6	1	14.8	7.88	7.3	32.
36	19	Sed - 14	5	14.9	7.87	7.1	32.
4	20	Sed - 10	1	14.7	7.89	7.3	32.
5	21	Sed - 8	1	14.7	7.88	7.0	32.
7	22	Sed - 15	1	14.8	7.87	6.7	32.
8	24	Sed - 19	1	14.8	7.87	6.9	32.0
38	26	Sed - 3	1	14.8	7.87	7.0	32.0
9	28	Sed - 4	1	14.8	7.87	6.7	32.0
27	30	Sed - 5	1	14.8	7.90	7.2	32.0
37	Macoma Control	Sed - 17	1	14.8	7.87	7.1	32.0
20	Neanthes Control	Sed - 11	5	14.7	7.88	7.0	32.0
Day 16							
31	2	Sed - 22	1	15.0	7.86	6.9	32.0
19	4	Sed - 18	1	14.9	7.85	6.7	32.0
15	5	Sed - 21	1	15.0	7.86	7.1	32.
27	7	Sed - 2	1	14 9	7.85	6.7	32.0
17	8	Sed - 16	1	14.9	7.88	6.8	32.
30	9	Sed - 7	1	15 0	7.88	7.2	32.0
18	11	Sed - 20	1	14.9	7.86	6.9	32.0
13	12	Sed - 1	1	15.0	7.88	7.0	32.0
28	13	Sed -12	1	15.0	7.88	7.1	32.0
38	14	Sed - 9	1	15.0	7.86	7.0	32.0
3	15	Sed - 13	1	14.8	7.87	6.8	32.0
42	18	Sed - 6	1	15.0	7.88	7.0	32.0
10	19	Sed - 14	1	15.0	7.85	6.8	32.0
4	20	Sed - 10	1	14.9	7.88	7.1	32.
5	21	Sed - 8	1	14.9	7.87	6.9	32.
7	22	Sed - 15	1	15.0	7.86	6.8	32.0
8	24	Sed - 19	1	15.0	7.86	6.8	32.
37	26	Sed - 3	1	15.0	7.86	69	32.
9	28	Sed - 4	1	15.0	7.86	69	32.
11	30	Sed - 5	1	15.1	7.87	7.1	32.
16	Macoma Control	Sed - 17	1	15.0	7 87	6.9	32.
6	Neanthes Control	Sed -11	1	14.9	7 91	7.2	32.

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#### Dissolved Temperature pН Oxygen Salinity 0.1°C **Position Treatment** MSL Code Rep 0.01 units 0.1 mg/L 0.5 ppt 13°C-17°C Acceptable Range 7.30-8.30 >4.0 mg/L 28-32 ppt Day 17 7.85 14.9 7.0 1 2 Sed -22 32.0 31 14.9 7.84 4 Sed - 18 1 6.6 32.0 19 5 14.8 787 6.8 32.0 Sed - 21 1 15 7 14.8 7.84 32.0 6.6 27 Sed - 2 1 7.84 14.9 6.7 17 8 Sed - 16 1 32.0 30 9 Sed - 7 1 14.9 7.87 7.1 32 0 14.9 7.85 6.7 32.0 11 Sed - 20 1 18 14.8 7.87 6.9 12 1 32.0 13 Sed - 1 2 14.9 7.84 6.8 13 Sed - 12 32.0 22 14.8 7.86 7.0 32.0 38 14 Sed - 9 1 1 15.0 7.86 6.8 32.0 15 Sed - 13 3 14.8 7.86 7.2 1 32.0 42 18 Sed - 6 14 19 Sed - 14 2 14.8 7.86 7.1 32.0 7.87 20 Sed - 10 1 14.8 7.0 32.0 4 14.8 7.85 7.0 21 Sed - 8 1 32.0 5 7.84 22 Sed -15 1 14.9 6.5 32.0 7 14.8 7.84 6.7 32.0 24 Sed - 19 1 8 15.0 7.85 6.9 32.0 26 Sed - 3 1 37 14.9 7.79 6.2 32.0 9 28 Sed - 4 1 30 Sed - 5 2 15.0 7.84 6.4 32.0 12 7.87 7.1 39 Macoma Control Sed - 17 2 14.9 32.0 2 15.0 7.89 7.2 **Neanthes Control** Sed -11 32.0 33 **Day 18** Sed - 22 1 15.0 7.86 7.1 32.0 2 31 14.9 7.85 4 Sed - 18 6.9 32.0 1 19 14 9 7.86 69 5 Sed - 21 32 0 15 1 14.9 7.84 6.3 7 Sed - 2 32.0 27 1 15.0 7.87 6.9 32.0 8 Sed - 16 1 17 9 14.9 7.86 7.1 32.0 29 Sed - 14 3 15.0 7.88 7.3 32.0 30 9 Sed - 7 1 Sed - 20 14.9 7.87 7.2 32.0 18 11 1 14.9 7.87 32.0 12 Sed - 1 1 7.1 13 14.8 7.86 6.9 32.0 Sed - 12 3 25 13 70 32.0 14.9 7.86 38 14 Sed - 9 1 15 Sed - 13 15.1 7.87 7.1 32.0 3 1 7.86 32.0 18 Sed - 6 1 14.8 7.2 42 15.0 7.88 32.0 7.3 4 20 Sed - 10 1 5 21 Sed - 8 1 15.0 7.86 7.2 32.0 7 22 14.9 7.83 64 32.0 Sed -15 1 8 24 Sed - 19 1 14.9 7.84 6.8 32.0 14.9 7.86 7.1 32.0 26 1 37 Sed - 3 149 7.84 32.0 28 1 6.4 9 Sed - 4 7.4 23 30 Sed - 5 3 14 9 7.87 32.0 Sed - 17 3 14.9 7.88 7.4 32.0 40 Macoma Control 24 **Neanthes Control** Sed - 11 3 14.9 7.87 70 32 0

#### **Appendix C1. Water Quality Observations**

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				Tomporature		Dissolved	<b>A</b> 15 - 5
Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptabl	le Range			13°C-17°C	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 19				. – –			
31	2	Sed - 22	1	15.0	7.84	7.1	32.0
19	4	Sed - 18	1	14.8	7.82	6.8	32.0
15	5	Sed - 21	1	14.9	7.83	7.0	32.0
27	7	Sed - 2	1	14.8	7.84	7.2	32.0
17	8	Sed - 16	1	14.8	7.84	6.9	32.0
30	9	Sed - 7	1	14.9	7.85	7.3	32 (
18	11	Sed - 20	1	14 8	7.84	7.3	32.0
13	12	Sed - 1	1	14.9	7.84	7.2	32 (
2	13	Sed - 12	4	14.7	7.81	7.1	32 (
38	14	Sed - 9	1	14.9	7.84	7.1	32.0
3	15	Sed - 13	1	14.8	7.82	7.2	32.0
42	18	Sed - 6	1	14.9	7.84	7.2	32.0
34	19	Sed - 14	4	15.0	7.84	7.2	32.0
4	20	Sed - 10	1	14.8	7.82	7.3	32.0
5	21	Sed - 8	1	14.8	7.82	7.1	32.0
7	22	Sed - 15	1	14.9	7.83	7.2	32.0
<b>8</b> `	24	Sed - 19	1	14.9	7.82	6.9	32.0
37	26	Sed - 3	1	14.8	7.83	7.0	32.0
9	28	Sed - 4	1	14.9	7.82	7.0	32.0
26	30	Sed - 5	4	14.8	7.84	7.1	32.0
35	Macoma Control	Sed - 17	4	14.9	7.82	64	32.0
21	Neanthes Control	Sed - 11	4	14.9	7.85	7.2	32.
Day 20							
31	2	Sed - 22	1	15.0	7.75	6.9	32.
19	4	Sed - 18	1	14.8	7.73	6.7	32.
15	· 5	Sed - 21	1	14.9	7.74	6.9	32.
27	7	Sed - 2	1	14.9	7.74	7.0	32 (
17	8	Sed - 16	1	14.9	7.76	6.9	32 (
30	9	Sed - 7	1	15.0	7.78	7.3	32.0
18	11	Sed - 20	1	14.9	7.76	7.2	32.0
13	12	Sed - 1	1	14.9	7.75	7.0	32.0
36	13	Sed - 12	5	14.9	7.74	7.0	32.0
38	14	Sed - 9	1	14.9	7.74	6.9	32.
3	15	Sed - 13	1	14.8	7.74	6.9	32.
42	18	Sed - 6	1	14.9	7.74	7.1	32.
32	19	Sed - 14	5	15.0	7.75	7.2	32.
4	20	Sed - 10	1	14.8	7.76	7.2	32.
5	21	Sed - 8	1	14.8	7.74	7.0	32.
7	22	Sed - 15	1	14.8	7.74	69	32.
8	24	Sed - 19	1	14.9	7.73	6.8	32.
37	26	Sed - 3	1	15.0	7.74	7.0	32.
9	28	Sed - 4	1	15.0	7.71	6.8	32.
20	30	Sed - 5	5	14.9	7.74	71	32.
1	Macoma Control	Sed - 17	5	14.9	7.77	7.1	32
41	Neanthes Control	Sed - 11	5	14.9	7.77	7 2	32.

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13°C-17°C	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 21	-				7.05		
31	2	Sed - 22	1	14.8	7.85	7.2	32.
19	4	Sed - 18	1	14.7	7.83	6.9	32.
15	5	Sed - 21	1	14.7	7.83	7.1	32.
27	7	Sed - 2	1	14.8	7.84	7.1	32
17	8	Sed - 16	1	14.7	7.85	7.0	32
30	9	Sed - 7	1	14.8	7.87	7.4	32
18	11	Sed - 20	1	14.6	7.85	7.2	32
13	12	Sed - 1	1	14.6	7.86	7.4	32
28	13	Sed - 12	1	14.8	7.86	7.3	32
38	14	Sed - 9	1	14.7	7.84	7.2	32
3	15	Sed - 13	1	14.8	7.84	7.1	32
42	18	Sed - 6	1	14.7	7.83	7.2	32
10	19	Sed - 14	1	14.7	7.83	7.1	32
· 4	20	Sed - 10	1	14.7	7.86	7.3	32
5	21	Sed - 8	1	14.6	7.84	7.2	32
7	22	Sed - 15	1	14.8	7.84	7.2	32
8	24	Sed - 19	1	14.8	7.84	7.3	32
37	26	Sed - 3	1	14.8	7.83	7.2	32
9	28	Sed - 4	1	14.8	7.83	7.1	32
11	30	Sed - 5	1	14.7	7.84	7.2	32
16	Macoma Control	Sed - 17	1	14.8	7.83	6.9	32
6	Neanthes Control	Sed - 11	1	14.7	7.87	7.4	32
Day 22							
31	2	Sed - 22	1	14.8	7.83	7.3	32
19	4	Sed - 18	1	14.7	7.82	7.2	32
15	5	Sed - 21	1	14.8	7.81	7.2	32
27	7	Sed - 2	1	14.8	7.83	73	32
17	8	Sed - 16	1	14.8	7.83	72	32
30	9	Sed - 7	1	14.8	7.85	7.5	32
18	11	Sed - 20	1	14.7	7.85	7.4	32
13	12	Sed - 1	1	14.7	7.83	7.2	32
22	13	Sed - 12	2	14.8	7.83	7.1	32
38	14	Sed - 9	1	14.8	7.83	7.2	32
3	15	Sed - 13	1	14.7	7.85	7.2	32
42	18	Sed - 6	1	14.8	7.84	7.2	32
14	19	Sed - 14	2	14.7	7.83	7.3	32
4	20	Sed - 10	1	14.7	7.86	7.5	32
5	21	Sed - 8	1	14.8	7.85	7.4	32
7	22	Sed - 15	1	14.7	7.85	7.4	32
8	24	Sed - 19	1	14.8	7.85	7.3	32
37	26	Sed - 3	1	14.9	7.84	7.3	32
9	28	Sed - 4	1	14.8	7.85	7.4	32
12	30	Sed - 5	2	14.8	7.85		32
39	Macoma Control	Sed - 17	2	14.8	7.85		32
33	Neanthes Control	Sed -11	2	14.9	7.87	7.5	32

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 23							
31	2	Sed - 22	1	14.9	7.84	7.2	32.0
19	4	Sed - 18	1	14.7	7.85	7.2	32.0
15	5	Sed - 21	1	14.8	7.83	7.2	32.0
27	7	Sed - 2	1	14.8	7.84	7.2	32.0
17	8	Sed - 16	1	14.8	7.86	7.2	32.0
30	9	Sed - 7	1	14.9	7.87	75	32.0
18	11	Sed - 20	1	14.8	7.86	7.4	32.0
13	12	Sed - 1	1	14.8	7.85	7.4	32.0
25	13	Sed - 12	3	14 7	7.85	7.3	32.0
38	14	Sed - 9	1	14.8	7.85	7.2	32.0
3	15	Sed - 13	1	14.7	7.86	7.4	32.0
42	18	Sed - 6	1	.14.8	7.85	7.3	32.0
29	19	Sed - 14	3	14.8	7.85	7.5	32.0
4	20	Sed - 10	1	14.7	7.85	7.5	32.0
5	21	Sed - 8	1	14.8	7.84	7.3	32.0
7	. 22	Sed - 15	1	14.8	7.84	7.4	32.0
8	24	Sed - 19	1	14.8	7.84	7.3	32.0
37	26	Sed - 3	1	14.8	7.84	7.2	32.0
9	28	Sed - 4	1	14.8	7.84	7.4	32.0
23	30	Sed - 5	3	14.7	7.86	7.6	32.0
23 40	Macoma Control	Sed - 17	3	14.8	7.87	7.4	32 (
40 24	Neanthes Control	Sed - 17 Sed - 11	3	14.8	7.90	7.8	32.0
	Meanures Control	Seu - II	5	14.0	1.50	7.0	52.0
Day 24	C	Sed - 22	1	14.8	7.82	7.1	32 (
31	2	Sed - 22 Sed - 18	1	14.6	7.82	69	32.0
19	4		1	14.0	7.81	7.1	32.0
15	5	Sed - 21		14.7	7.82	7.1	
27	7	Sed - 2	1				32.0
17	8	Sed - 16	1	14 6	7.85	7.0	32.0
30	9	Sed - 7	1	14.7	7.85	7.2	32.0
18	11	Sed - 20	1	14.7	7.84	7.4	32.0
13	12	Sed - 1	1	14.7	7.83	73	32.0
2	13	Sed - 12	4	14.7	7.83	7.2	32.0
38	14	Sed - 9	1	14.7	7.82	7.0	32.0
3	15	Sed - 13	1	14.6	7.83	7.1	32.0
42	18	Sed - 6	1	14.8	7.83	7.2	32.0
34	19	Sed - 14	4	14.7	7.83	7.4	32.0
4	20	Sed - 10	1	14.7	7.84	7.3	32.0
5	21	Sed - 8	1	14.6	7.83	7.2	32.0
7	22	Sed - 15	1	14.7	7.83	7.2	32.0
8	24	Sed - 19	1	14.7	7.83	7.1	32.0
37	26	Sed - 3	1	14.7	7.82	7.1	32.0
9	30	Sed - 5	1	14.8	7.83	7.1	32.0
26	30	Sed - 5	4	14.7	7.82	7.3	32.0
35	Macoma Control	Sed - 17	4	14.7	7.83	7.3	32.0
21	Neanthes Control	Sed - 11	4	14.7	7.84	7.2	32.

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptabl	e Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 25							
31	2	Sed - 22	1	14.7	7.79	7.2	32.
19	4	Sed - 18	1	14.6	7.77	6.8	32.
15	5	Sed - 21	1	14.7	7.77	6.9	32.
27	7	Sed - 2	1	14.6	7.78	7.0	32.
17	8	Sed - 16	1	14.7	7.80	7.0	32
30	9	Sed - 7	1	14.7	7.81	7.3	32.
18	11	Sed - 20	1	14.6	7.80	7.2	32
13	12	Sed - 1	1	14 5	7.78	7 2	32.
36	13	Sed - 12	5	14.7	7.79	7.2	32
38	14	Sed - 9	1	14.7	7.78	7.0	32
3	15	Sed - 13	1	14.6	7.77	7.0	32
42	18	Sed - 6	1	14.7	7.79	7.1	32
32	19	Sed - 14	5	14.7	7.79	7.3	32
4	20	Sed - 10	1	14.5	7.79	7.3	32
5	21	Sed - 8	1	14.6	7.78	7.2	32
7	22	Sed - 15	1	14.6	7.78	7.1	32
8	24	Sed - 19	1	14.7	7.78	7.1	32
37	26	Sed - 3	1	14.7	7.78	7.0	32
9	28	Sed - 4	1	14.5	7.79	7.2	32
20	30	Sed - 5	5	14.6	7.79	7.3	32
1	Macoma Control	Sed - 17	5	14.6	7.78	7.0	32
41	Neanthes Control	Sed - 11	5	14.7	7.81	7.3	32
Day 26							
31	2	Sed - 22	1	14.7	7.79	7.2	32
19	4	Sed - 18	1	14.6	7.78	7.1	32
15	5	Sed - 21	1	14.5	7.80	71	32
27	7	Sed - 2	1	14.6	7.78	7.2	32
17	8	Sed - 16	1	14.6	7 81	7.1	32
30	9	Sed - 7	1	14 7	7.82	74	32
18	11	Sed - 20	1	14.5	7.81	7.3	32
13	12	Sed - 1	1	14.4	7.79	7.2	32
28	13	Sed - 12	1	14.6	7.81	7.4	32
38	14	Sed - 9	1	14.5	7.79	7.1	32
3	15	Sed - 13	1	14.6	7.78	7.2	32
42	18	Sed - 6	1	14.6	7.79	7.3	32
10	19	Sed - 14	1	14.5	7.78	7.0	32
4	20	Sed - 10	1	14.5	7.80	7.3	32
5	21	Sed - 8	1	14.4	7.78	7.2	32
7	22	Sed - 15	1	14.5	7.79	7.2	32
8	24	Sed - 19	1	14.6	7.78	7.2	32
37	26	<sup>-</sup> Sed - 3	1	14.6	7.78	7.3	32
9	28	Sed - 4	1	14.6	7.79	7.1	32
11	30	Sed - 5	1	14 5	7.79	7.3	32
16	Macoma Control	Sed - 17	1	14.6	7.78	6.9	32
6	Neanthes Control	Sed - 11	1	14.5	7.82	7.5	32

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						Dissolved	
Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 27							
31	2	Sed - 22	1	14.6	7.81	7.2	32.0
19	4	Sed - 18	1	14.4	7.79	6.8	32.0
15	5	Sed - 21	1	14.6	7.80	7.1	32.0
27	7	Sed - 2	1	14.5	7.80	70	32 (
17	8	Sed - 16	1	14.6	7.82	7.0	32.0
30	9	Sed - 7	1	14.6	7.84	7.3	32.0
18	11	Sed - 20	1	14.5	7.82	7.4	32.0
13	12	Sed - 1	1	14.4	7.81	72	32 (
22	13	Sed - 12	2	14.5	7.78	6.8	32.0
38	14	Sed - 9	1	14.5	7.79	6.9	32 (
3	15	Sed - 13	1	14.4	7.81	6.9	32.0
42	18	Sed - 6	1	14.5	7.81	7.2	32.0
14	19	Sed - 14	2	14.5	7.81	7.2	32 (
4	20 ·	Sed - 10	1	14.5	7.82	7.1	32.0
5	21	Sed - 8	1	14.5	7.81	7.2	32.0
7	22	Sed - 15	1	14.5	7.81	7.0	32.0
8	24	Sed - 19	1	14.5	7.80	7.1	32.0
37	26	Sed - 3	1	14.4	7.80	7.2	32.0
9	28	Sed - 4	1	14.5	7.80	7.1	32.0
12	30	Sed - 5	2	14.4	7.80	7.1	32.0
39	Macoma Control	Sed - 17	2	14.5	7.81	7.1	32.0
33	Neanthes Control	Sed - 11	2	14.4	7.83	7.3	32 (
Day 28	Meanures Control	060 - 11	2	14.4	1.00	7.0	02.0
31	2	Sed - 22	1	14.7	7.75	7.1	32 (
15	5	Sed - 22 Sed - 21	1	14.6	7.74	6.9	32.0
15	6	Sed - 21 Sed - 18	1	14.6	7.73	67	32 (
	7	Sed - 10 Sed - 2	1	14.0	7.74	69	32.0
27			1	14.0	7.77	6.8	32.0
17	8	Sed - 16	1	14 0	7.78	73	32 (
30	9	Sed - 7	1	14.6	7.77	7.1	32.0
18	11	Sed - 20		14.0	7.76	7.1	32.0
13	12	Sed - 1	1	14.7	7.75	7.0	32.0
25	13	Sed - 12	3				
38	14	Sed - 9	1	14.6	7.74	6.8	32.0 32.0
3	15	Sed - 13	1	14.6	7.74	7.0	
42	18	Sed - 6	1	14.6	7.75	7.0	32.0
29	19	Sed - 14	3	14.6	7.75	7.1	32.0
4	20	Sed - 10	1	14.5	7.76	7.2	32.0
5	21	Sed - 8	1	14.5	7.75	7.1	32
7	22	Sed - 15	1	14.6	7.74	7.0	32
8	24	Sed - 19	1	14.5	7.74	7.0	32.
37	26	Sed - 3	1	14.6	7.75	7.0	32.
9	28	Sed - 4	1	14.6	7.74	69	32
23	30	Sed - 5	3	14 5	7.75	72	32.
40	Macoma Control	Sed - 17	3	14.5	7.77	73	32.
24	Neanthes Control	Sed - 11	3	14.5	7.79	7.4	32

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 29							
31	2	Sed - 22	1	14.4	7.76	7.1	32.0
19	4	Sed - 18	1	14.4	7.74	6.7	32.0
15	5	Sed - 21	1	14.5	7.74	6.9	32.0
27	7	Sed - 2	1	14.5	7.76	6.9	32 0
17	8	Sed - 16	1	14.4	7.77	6.9	32.0
30	9	Sed - 7	1	14.5	7.79	7.2	32.0
18	11	Sed - 20	1	14.3	7.79	7.2	32.0
13	12	Sed - 1	1	14.3	7.77	7.1	32.0
2	13	Sed - 12	4	14.4	7.73	6.9	32 0
38	14	Sed - 9	1	14.4	7.75	6.8	32.0
3	15	Sed - 13	1	14.4	7.76	7.1	32.0
42	18	Sed - 6	1	14.4	7.76	6.9	32.0
34	19	Sed - 14	4	14.5	7.75	7.2	32.0
4	20	Sed - 10	1	14.4	7.77	7.3	32.0
5	21	Sed - 8	1	14.4	7.77	7.2	32.0
7	22	Sed - 15	1	14.4	7.77	7.1	32.0
8	24	Sed - 19	1	14.4	7.76	7.1	32.0
37	26	Sed - 3	1	14.4	7.75	7.0	32.0
9	28	Sed - 4	1	14.5	7.76	7.0	32.0
26	30	Sed - 5	4	14.3	7.76	6.8	32.0
35	Macoma Control	Sed - 17	4	14.4	7.77	7.1	32.0
21	Neanthes Control	Sed - 11	4	14.4	7.78	6.9	32.0
Day 30							
31	2	Sed - 22	1	14.7	7.75	7.1	32.0
19	4	Sed - 18	1	14.6	7.74	6.8	32.0
15	5	Sed - 21	1	14.6	7.73	6.9	32.0
27	7	Sed - 2	1	14.6	7.75	7.1	32 (
17	8	Sed - 16	1	14.6	7.77	68	32.0
30	9	Sed - 7	1	14.7	7.79	7.3	32.0
18	11	Sed - 20	1	14.6	7.77	7.3	32.0
13	12	Sed - 1	1	14.5	7.76	7.2	32.0
7	13	Sed - 15	1	14.6	7.75	6.9	32.0
36	13	Sed - 12	5	14.6	7.75	7.0	32.0
38	14	Sed - 9	1	14.5	7.75	6.8	32.0
3	15	Sed - 13	1	14.5	7.74	7.0	32.0
42	18	Sed - 6	1	14.6	7.76	7.0	32.0
32	19	Sed - 14	5	14.7	7.76	7.1	32.0
4	20	Sed - 10	1	14.5	7.76	7.2	32.0
5	21	Sed - 8	1	14.4	7.75	7.1	32.0
8	24	Sed - 19	1	14.6	7.75	6.9	32.0
37	26	Sed - 3	1	14.6	7.75	6.9	32.0
9	28	Sed - 4	1	14.6	7.75	6.9	32.0
20	30	Sed - 5	5	14.6	7.76	7.2	32.0
1	Macoma Control	Sed - 17	5	14.6	7.75	7.1	32.0
41	Neanthes Control	Sed - 11	5	14.6	7.79	7.3	32.

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt	
Day 31							
31	2	Sed - 22	1	14.7	7.74	6.8	32.0
19	4	Sed - 18	1	14.5	7.70	6.5	32.0
15	5	Sed - 21	1	14.7	7.67	6.4	32.0
27	7	Sed - 2	1	14 6	7.70	6.4	32 0
17	8	Sed - 16	1	14.6	7.72	6.6	32.0
30	9	Sed - 7	1	14.7	7.74	7.1	32.0
18	11	Sed - 20	1	14.5	7.72	6.9	32.0
13	12	Sed - 1	1	14.5	7.70	6.8	32.0
28	13	Sed - 12	1	14.7	7.72	6.9	32.0
38	14	Sed - 9	1	14.6	7.70	6.6	32.0
3	15	Sed - 13	1	14.6	7.66	6.8	32.0
42	18	Sed - 6	1	14.5	7.70	6.7	32.0
10	19	Sed - 14	1	14.5	7.67	6.6	32.0
4	20	Sed - 10	1	14.5	7.68	7.1	32.0
5	21	Sed - 8	1	14.5	7.76	6.9	32.0
7	22	Sed - 15	1	14.6	7.67	6.7	32.0
8	24	Sed - 19	1	14.6	7.68	6.8	32.0
37	26	Sed - 3	1	14.6	7.69	6.7	32.0
9	28	Sed - 4	1	14.6	7.68	6.7	32.0
11	30	Sed - 5	1	14.6	7.70	6.9	32.0
16	Macoma Control	Sed - 17	1	14.6	7.68	6.5	32.0
6	Neanthes Control	Sed - 11	1	14.5	7.70	7.1	32.0
Day 32							0210
31	2	Sed - 22	1	14.5	7.78	6.9	32.0
19	4	Sed - 18	1	14.4	7.76	6.6	32.0
15	5	Sed - 21	1	14.5	7.76	6.8	32.0
27	7	Sed - 2	1	14.5	7.77	6.9	32.0
17	8	Sed - 16	1	14.5	7.79	67	32 0
30	9	Sed - 7	1	14.5	7.82	7.2	32.0
18	11	Sed - 20	1	14.4	7.80	7.2	32.0
13	12	Sed - 1	1	14.3	7.78	6.9	32.0
22	13	Sed - 12	2	14.4	7.77	6.7	32.0
38	14	Sed - 9	1	14.4	7.77	6.7	32.0
3	15	Sed - 13	1	14.4	7.74	6.9	32.0
42	18	Sed - 6	1	14.5	7.78	6.9	32.0
42 14	19	Sed - 14	2	14.4	7.79	7.2	32.0
4	20	Sed - 10	1	14.4	7.77	7.2	32.0
4 5	20	Sed - 8	1	14.4	7.76	7.0	32.0
5 7	22	Sed - 15	1	14.4	7.78	7.0	32.0
8	24	Sed - 19	1	14.4	7.76	7.1	32.0
37	26	Sed - 3	1	14.4	7.77	6.9	32.0
37 9	28	Sed - 3 Sed - 4	1	14.4	7.77	6.8	32.0
9 12	30	Sed - 5	2	14.3	7.77	7.0	32.0
39	Macoma Control	Sed - 17	2	14.5	7.79	6.9	32.0
39	Neanthes Control	Sed - 11	2	14.4	7.80	7.1	32 0

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptabl	e Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 33	_			44.0		0.0	
31	2	Sed - 22	1	14.6	7.77	6.9	32.0
19	4	Sed - 18	1	14.5	7.75	6.8	32.0
15	5	Sed - 21	1	14 6	7.74	6.7	32.0
27	7	Sed - 2	1	14.4	7.76	6.9	32 0
17	8	Sed - 16	1	14.5	7 80	6.8	32.0
30	9	Sed - 7	1	14.5	7.81	7.2	32.0
18	11	Sed - 20	1	14.4	7.78	7.2	32.0
13 .	12	Sed - 1	1	14.3	7.77	70	32.0
25	13	Sed - 12	3	14.4	7.78	6.9	32.0
38	14	Sed - 9	1	14.4	7.76	6.8	32.0
3	15	Sed - 13	1	14.3	7.73	6.9	32 0
42	18	Sed - 6	1	14.4	7.78	7.0	32.0
29	19	Sed - 14	3	14.5	7.79	7.3	32.0
4	20	Sed - 10	1	14.4	7.76	7.2	32.0
5	21	Sed - 8	1	14.4	7.75	7.1	32.0
7	22	Sed - 15	1	14.4	7.75	7.0	32.0
8	24	Sed - 19	1	14.5	7.75	6.9	32.0
37	26	Sed - 3	1	14.4	7.78	6.9	32.0
9	28	Sed - 4	1	14.5	7.76	6.9	32.0
23	30	Sed - 5	3	14.5	7.78	7.2	32.0
40	Macoma Control	Sed - 17	3	14.3	7.79	7.1	32.0
24	Neanthes Control	Sed - 11	3	14.5	7.81	7.5	32.0
Day 34							
31	2	Sed - 22	1	14.5	7.80	7.0	32.0
19	4	Sed - 18	1	14.5	7.78	6.9	32.0
15	5	Sed - 21	1	14.6	7.78	70	32.0
27	7	Sed - 2	1	14.5	7 78	7.0	32 (
17	8	Sed - 16	1	14.5	7.82	69	32 (
30	9	Sed - 7	1	14.5	7.83	7.3	32.0
18	11	Sed - 20	1	14.5	7.81	7 2	32.0
13	12	Sed - 1	1	14.4	7.79	68	32 (
· 2	13	Sed - 12	4	14.4	7.77	6.8	32.0
38	14	Sed - 9	1	14.4	7.78	6.7	32.0
3	15	Sed - 13	1	14.4	7.77	69	32.0
42	18	Sed - 6	1	14.5	7.79	6.9	32.0
34	19	Sed - 14	4	14.4	7.81	7.0	32.0
4	20	Sed - 10	1	14.4	7.79	7.1	32.0
5	21	Sed - 8	1	14.4	7.78	7.1	32.0
7	22	Sed - 15	1	14.4	7.78	6.9	32.0
8	24	Sed - 19	1	14.4	7.78	6.9	32.0
37	26	Sed - 3	1	14.5	7.79	7.0	32.
9	28	Sed - 4	1	14.5	7.78	70	32.
26	30	Sed - 5	4	14.5	7.78	69	32.0
35	Macoma Control	Sed - 17	4	14.5	7.80	6.8	32.
21	Neanthes Control	Sed - 11	4	14.4	7.80	7.0	32 Page 35 & 36

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13°C-17°C	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 35							
31	2	Sed - 22	1	15.2	7.77	6.9	32.0
19	4	Sed - 18	1	14.9	7.76	6.8	32.0
15	5	Sed - 21	1	14.9	7.74	6.6	32 0
27	7	Sed - 2	1	15.0	7.77	6.8	32 0
17	8	Sed - 16	1	14.9	7.80	6.7	32.0
30	9	Sed -7	1	15.1	7.80	7.1	32.0
18	11	Sed - 20	1	14.9	7.79	7.1	32 0
13	12	Sed - 1	1	14.9	7.78	6.9	32 0
36	13	Sed - 12	5	15.2	7.77	6.9	32 0
38	14	Sed - 9	1	15.0	7.77	6.6	32.0
3	15	Sed - 13	1	14.9	7.72	6.9	32.0
42	18	Sed - 6	1	15.1	7.78	6.9	32 0
32	19	Sed - 14	5	15.3	7.76	6.8	32.0
4	20	Sed - 10	1	14.9	7.76	72	32 0
5	21	Sed - 8	1	14.9	7.75	70	32.0
7	22	Sed - 15	1	14.8	7.75	6.8	32 0
8	24	Sed - 19	1	14.8	7.75	6.8	32.0
37	26	Sed - 3	1	15.1	7.77	6.8	32.0
9	28	Sed - 4	1	14.8	7.76	6.9	32.0
20	30	Sed - 5	5	14.9	7.78	7.1	32.0
1	Macoma Control	Sed - 17	5	14.9	7.72	7.1	32 0
41	Neanthes Control	Sed - 11	5	15.0	7.80	7.1	32 0
Day 36	Realities control		Ŭ	10.0	1.00		02 0
31	2	Sed - 22	1	14.9	7.79	7.3	32.0
19	4	Sed - 18	1	14.7	7.78	68	32 0
15	5	Sed - 21	1	14.8	7.76	68	32 0
27	7	Sed - 2	1	14.0	7.78	7.0	32 0
17	8	Sed - 2 Sed - 16	1	14.7	7.79	6.9	32.0
30	8 9	Sed - 10 Sed - 7	1	14.7	7.81	7.4	32.0
	9 11	Sed - 7 Sed - 20	1	14.8	7.81	7.4	32.0
18				14.7	7.78	7.2	32.0
13	12	Sed - 1	1	14.0	7.80	7.1	32.0
28	13	Sed - 12	1	14.7	7.78	6.8	32.0
38	14	Sed - 9	1	14.7	7.76	6.9	32.0
3	15	Sed - 13	1	14.7	7.79	6.9 6.9	32.0
42	18	Sed - 6	1		7.79		32.0
10	19	Sed - 14	1	14.8		6.9 7 3	32.0
4	20	Sed - 10	1	14.8	7.78	7.3	
5	21	Sed - 8	1	14.7	7.78	7.4	32.0
7	22	Sed - 15	1	14.7	7.78	7.1	32.0
8	24	Sed - 19	1	14.8	7.78	7.2	32.0
37	26	Sed - 3	1	14.7	7.78	7.2	32 (
9	28	Sed - 4	1	14 8	7.78	7.1	32.0
11	30	Sed - 5	1	14.8	7.79	71	32 0
16	Macoma Control	Sed - 17	1	14.7	7.78	66	32 0
6	Neanthes Control	Sed - 11	1	14.7	7.80	73	32.0 Page 37 & 38

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#### Dissolved Temperature pН Oxygen Salinity 0.1°C **Position Treatment** MSL Code Rep 0.01 units 0.1 mg/L0.5 ppt 13°C-17°C 7.30-8.30 >4.0 mg/L Acceptable Range 28-32 ppt Day 37 Sed - 22 15.2 7.79 6.7 2 1 32.0 31 4 Sed - 18 15.0 7.79 6.8 19 1 32.0 6.9 5 Sed - 21 15.1 7.79 15 1 32.0 7 7.79 Sed - 2 1 15.0 6.6 32.0 27 15.0 7.83 6.7 17 8 Sed - 16 1 32.0 Sed - 14 2 15.0 7.80 7.0 9 32.0 14 Sed - 7 15.1 7.83 7.1 1 30 9 32.0 Sed - 20 15.0 7.82 7.1 32.0 18 11 1 Sed - 1 1 15.1 7.79 6.9 32.0 12 13 2 7.78 6.7 Sed - 12 15.0 32.0 22 13 7.78 Sed - 9 1 15.1 6.5 32.0 38 14 14.9 7.76 3 15 Sed - 13 1 7.1 32.0 15.0 7.80 6.7 32.0 Sed - 6 42 18 1 Sed - 10 72 4 20 1 15.0 7.79 32.0 21 Sed - 8 14.9 7.78 7.1 32 0 5 1 7.79 22 Sed - 15 15.0 6.8 32.0 7 1 6.9 15.0 7.79 32.0 8 24 Sed - 19 1 6.8 37 26 Sed - 3 1 15.0 7.79 32.0 Sed - 4 15.0 7.79 6.8 9 28 1 32.0 2 15.1 7.79 6.9 12 30 Sed - 5 32.0 Sed - 17 2 15.0 7.78 6.3 32.0 39 Macoma Control Neanthes Control Sed - 11 2 15.2 7.82 7.2 32.0 33 Day 38 Sed - 22 14.6 7.79 6.9 32.0 2 1 31 32.0 19 4 Sed - 18 1 14.6 7.77 6.7 5 Sed - 21 14.6 7.77 69 32.0 15 1 7 Sed - 2 14 5 7.79 6.8 32.0 27 1 Sed - 16 14.6 7.82 32.0 8 6.8 17 1 7.2 32.0 30 9 Sed - 7 14.7 7.83 1 Sed - 20 14.6 7.81 7.2 32.0 18 11 1 Sed - 1 14.5 7.79 68 32 0 12 1 13 14.6 7.0 32.0 25 13 Sed - 12 3 7.79 14 Sed - 9 14.6 7.78 6.7 32.0 38 1 15 Sed - 13 1 14.6 7.75 6.9 32.0 3 Sed - 6 14.6 7.80 6.9 32.0 42 18 1 Sed - 14 14.6 7.82 7.3 32.0 29 19 3 20 Sed - 10 14.6 7.78 7.1 32.0 4 1 14.6 5 21 Sed - 8 1 7.77 6.9 32.0 7 22 Sed - 15 1 14.6 7.77 6.8 32.0 14.6 32.0 8 24 Sed - 19 1 7.78 6.8 32.0 37 26 Sed - 3 1 14.6 7.79 6.9 Sed - 4 14.6 7.78 6.7 32.0 9 28 1 Sed - 5 3 14.6 7.81 7.3 32.0 23 30 146 72 32 0 Sed - 17 3 7.82 40 Macoma Control 3 14.6 7.85 7.6 32.0 24 Neanthes Control Sed - 11

#### Appendix C1. Water Quality Observations

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13°C-17°C	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 39							
31	2	Sed - 22	1	14.8	7.78	7.0	32.0
19	4	Sed - 18	1	14.7	7.77	6.7	32.0
15	5	Sed - 21	1	14.7	7.76	6.7	32.0
27	7	Sed - 2	1	14.6	7.78	6.8	32 0
17	8	Sed - 16	1	14.7	7.82	6.8	32.0
30	9	Sed - 7	1	14.7	7.83	7.2	32.0
34	9	Sed - 14	4	14.8	7.81	7.3	32.0
18	11	Sed - 20	1	14.6	7.81	7.1	32.0
13	12	Sed - 1	1	14.7	7.79	6.8	32.0
<b>2</b> ·	13	Sed - 12	4	14.6	7.78	7.0	32.0
38	14	Sed - 9	1	14.7	7.78	6.7	32.0
3	15	Sed - 13	1	14.6	7.78	6.9	32.0
42	18	Sed - 6	1	14.6	7.90	6.9	32.0
4	20	Sed - 10	1	14.6	7.80	7.1	32 0
5	21	Sed - 8	1	14.6	7.78	7.1	32 0
7	22	Sed - 15	1	14.7	7.78	6.8	32.0
8	24	Sed - 19	1	14.7	7.78	6.9	32.0
37	26	Sed - 3	1	14.7	7.78	6.9	32.0
9	28	Sed - 4	1	14.6	7.77	6.8	32.0
26	30	Sed - 5	4	14.6	7.78	6.7	32.0
35	Macoma Control	Sed - 17	4	14.7	7.78	6. <del>9</del>	32.0
21	Neanthes Control	Sed - 11	4	14.6	7.79	6.9	32.0
Day 40							
31	2	Sed - 22	1	14.8	7.76	6.9	32.0
19	4	Sed - 18	1	14.6	7.73	6.6	32 0
15	5	Sed - 21	1	14.6	7 74	7.0	32 0
27	7	Sed - 2	1	14.6	7.75	6.8	32 0
17	8	Sed - 16	1	14.7	7.77	67	32 0
30	9	Sed - 7	1	14.8	7.79	7.1	32.0
18	11	Sed - 20	1	14 6	7.77	7.1	32.0
13	12	Sed - 11	1	14.6	7.76	6.9	32 0
36	13	Sed - 12	5	14.7	7.76	7.0	32.0
38	14	Sed - 9	1	14.6	7.74	6.6	32.0
3	15	Sed - 13	1	14.5	7.72	6.8	32.0
42	18	Sed - 6	1	14.7	7.76	6.8	32.0
32	19	Sed - 14	5	14.8	7.75	6.8	32.0
4	20	Sed - 10	1	14.6	7.75	7.1	32.0
5	21	Sed - 8	1	14.6	7.73	6.9	32 0
7	22	Sed - 15	1	14.7	7.73	6.9	32.0
8	24	Sed - 19	1	14.7	7.73	6.8	32.0
37	26	Sed - 3	1	14.6	7.75	6.8	32.0
9	28	Sed - 4	1	14 7	7 73	68	32.0
20	30	Sed - 5	5	14.5	7.76	7.2	32 0
1	Macoma Control	Sed - 17	5	14.5	7.71	69	32.0
41	Neanthes Control	Sed - 11	5	14.6	7.78	70	32.0 Page 41 & 42

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 41							
31	2	Sed - 22	1	15.0	7.74	6.8	32.
19	4	Sed - 18	1	14.8	7.72	6.6	32.
15	5	Sed - 21	1	14.8	7.71	6.4	32.
27	7	Sed - 2	1	14.9	7.73	6.6	32.
17	8	Sed - 16	1	14.8	7.76	6.6	32.
30	9	Sed - 7	1	14.9	7.78	7.1	32.
18	11	Sed - 20	1	14.8	7.77	7.0	32.
13	12	Sed - 1	1	14.8	7.75	68	32.
28	13	Sed - 12	1	14.8	7.75	6.9	32.
38	14	Sed - 9	1	14.8	7.73	6.4	32.
3	15	Sed - 13	1	14.9	7.69	6.8	32.
42	18	Sed - 6	1	14.9	7.74	6.7	32
10	19	Sed - 14	1	15.0	7.72	6.6	32
4	20	Sed - 10	1	14.8	7.73	7.1	32
5	21	Sed - 8	1	14.9	7.71	6.8	32
7	22	Sed - 15	1	14.9	7.71	6.7	32
8	24	Sed - 19	1	14.9	7.71	6.6	32
37	26	Sed - 3	1	14.9	7.74	6.7	32
9	28	Sed - 4	1	15.0	7.72	6.6	32
11	30	Sed - 5	1	15.0	7.73	6.7	32
16	Macoma Control	Sed - 17	1	14.9	7.71	6.3	32
6	Neanthes Control	Sed - 11	1	14.8	7.74	7.1	32
Day 42							
31	2	Sed - 22	1	14.8	7.74	6.7	32
19	4	Sed - 18	1	14.6	7.71	6.5	32
15	5	Sed - 21	1	14.7	7.71	6.5	32
27	7	Sed - 2	1	14.6	7.72	6.6	32
17	8	Sed - 16	1	14.7	7.75	66	32
30	9	Sed - 7	1	14.8	7.77	7.0	32
18	11	Sed - 20	1	14.6	7.75	7.1	32
13	12	Sed - 1	1	14.7	7.73	6.8	32
22	13	Sed - 12	2	14.6	7.71	6.3	32
38	14	Sed - 9	1	14.6	7.72	6.5	32
3	15	Sed - 13	1	14.5	7.70	6.6	32
42	18	Sed - 6	1	14.6	7.74	6.9	32
14	19	Sed - 14	2	14.6	7.73	6.8	32
4	20	Sed - 10	1	14.4	7.73	6.9	32
5	21	Sed - 8	1	14.5	7.71	6.7	32
7	22	Sed - 15	1	14.6	7.71	6.6	32
8	24	Sed - 19	1	14.6	7.71	6.6	32
37	26	Sed - 3	1	14.6	7.73	6.7	32
9	28	Sed - 4	1	14.7	7.72	6.5	32
12	30	Sed - 5	2	14.7	7.71	67	32
39	Macoma Control	Sed - 17	2	14.6	7.76	7.2	32
33	Neanthes Control	Sed - 11	2	14.8	7.75	6.8	32

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptab	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 43						<b></b>	
31	2	Sed - 22	1	15.0	7.74	7.0	32.0
19	4	Sed - 18	1	14.7	7.73	7.3	32.0
15	5	Sed - 21	1	14.8	7.71	6.8	32.0
27	7	Sed - 2	1	14.8	7.74	7.0	32.0
17	8	Sed - 16	1	14.8	7 73	7.0	32.0
30	9	Sed - 7	1	14.9	7.78	7.5	32.0
18	11	Sed - 20	1	14.7	7.76	7.2	32.0
13	12	Sed - 1	1	14.8	7 71	6.8	32.0
<b>2</b> 5	13	Sed - 12	3	14.8	7.74	6.8	32.0
38	14	Sed - 9	1	14.8	7.73	6.8	32.0
3	15	Sed - 13	1	14.7	7.71	7.3	32.0
42	18	Sed - 6	1	14.8	7.75	7.2	32.0
29	19	Sed - 14	3	14.8	7.77	7.5	32.0
4	20	Sed - 10	1	14.7	7.74	7.4	32.0
5	21	Sed - 8	1	14.7	7.73	7.3	32.0
7	22	Sed - 15	1	14.7	7.73	7.3	32.0
8	24	Sed - 19	1	14.8	7.73	7.2	32.0
37	26	Sed - 3	1	14.8	7.74	7.1	32.0
9	28	Sed - 4	1	14.8	7.74	7.2	32.0
23	30	Sed - 5	3	14.9	7.76	7.5	32.0
40	Macoma Control	Sed - 17	3	14.8	7.77	7.2	32.0
24	Neanthes Control	Sed - 11	3	14.9	7.81	7.8	32.0
Day 44							
31	2	Sed - 22	1	14.9	7.73	6.7	32.0
19	4	Sed - 18	1	14.6	7.72	6.5	32.0
15	5	Sed - 21	1	14.8	7 69	64	32.0
27	7	Sed - 2	1	14.8	7 72	66	32 0
17	8	Sed - 16	1	14.7	7.74	6.5	32.0
30	9	Sed - 7	1	14.8	7.76	6.9	32.0
18	11	Sed - 20	1	14.6	7.75	70	32 0
13	12	Sed - 1	1	14.7	7.71	6.6	32.0
2	13	Sed - 12	4	14.7	7.68	6.6	32.0
36	13	Sed - 12	5	14.8	7.72	6.5	32.0
38	14	Sed - 9	1	14.7	7.72	6.4	32.0
3	15	Sed - 13	1	14.6	7.69	6.5	32.0
42	18	Sed - 6	1	14.8	7.73	6.7	32.0
32	19	Sed - 14	5	14.8	7.72	6.6	32.0
34	19	Sed - 14	4	14.8	7.74	6.8	32.0
4	20	Sed - 10	1	14.6	7.72	7.0	32.0
5	21	Sed - 8	1	14.7	7.71	6.7	32.0
7	22	Sed - 15	1	14.7	7.71	6.6	32.0
8	24	Sed - 19	1	14.8	7 70	6.5	32 0
37	26	Sed - 3	1	14.8	7.72	64	32.0
9	28	Sed - 4	1	14.8	7 71	66	32.0
20	30	Sed - 5	5	14.6	7.76	7.1	32.0
26	30	Sed - 5	4	14.7	7.71	6.3	32.0
1	Macoma Control	Sed - 17	5	14.7	7.68	6.8	32.0
35	Macoma Control	Sed - 17	4	14.8	7.72	6.4	32.0
21	Neanthes Control	Sed - 11	4	14.6	7.74	66	32.0
41	Neanthes Control	Sed - 11	5	14.7	7 75	6.8	32.0 Page 45 & 46

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Position	Treatment	MSL Code	Rep	Temperature 0.1°C	pH 0.01 units	Dissolved Oxygen 0.1 mg/L	Salinity 0.5 ppt
Acceptabl	le Range			13ºC-17ºC	7.30-8.30	>4.0 mg/L	28-32 ppt
Day 45							
31	2	Sed - 22	1	14.8	7.75	6.6	32.0
19	4	Sed - 18	1	14.6	7.73	6.4	32.0
15	5	Sed - 21	1	14.8	7.72	6.4	32.0
27	7	Sed - 2	1	14.6	7.73	6.4	32.0
17	8	Sed - 16	1	14.6	7.76	6.4	32.0
30	9	Sed - 7	1	14.8	7.78	6.7	32.0
18	11	Sed - 20	1	14.6	7.77	7.0	32.0
13	12	Sed - 1	1	14.7	7.73	6.4	32.0
28	13	Sed - 12	1	14.7	7.76	6.7	32.0
22	13	Sed - 12	2	14.6	7.74	6.3	32.0
25	13	Sed - 12	3	14.7	7.75	6.7	32.0
2	13	Sed - 12	4	14.6	7.71	6.6	32.0
36	13	Sed - 12	5	14.6	7.75	6.4	32.0
38	14	Sed - 9	1	14.7	7.74	6.4	32.0
3	15	Sed - 13	1	14.6	7.72	6.5	32.0
42	18	Sed - 6	1	14.7	7.75	6.6	32.0
10	19	Sed - 14	1	14.6	7.72	63	32.0
14	19	Sed - 14	2	14.7	7.75	6.8	32.0
29	19	Sed - 14	3	14.7	7.76	6.8	32.0
34	19	Sed - 14	4	14.8	7.75	6.7	32.0
32	19	Sed - 14	5	14.7	7.75	6.6	32.0
4	20	Sed - 10	1	14.6	7.75	6.9	32.0
5	21	Sed - 8	1	14.6	7.73	6.7	32.0
7	22	Sed - 15	1	14.6	7.73	6.6	32.0
8	24	Sed - 19	1	14.7	7.72	6.4	32.0
37	26	Sed - 3	1	14.6	7.74	6.3	32.0
9	28	Sed - 4	1	14.0	7.72	6 5	32 0
11	30	Sed - 5	1	14.6	7.74	6.6	32 0
12	30	Sed - 5	2	14.7	7.73	6 5	32 0
23	30	Sed - 5	3	14.8	7.76	6.9	32.0
26	30	Sed - 5	4	14.7	7.73	63	32.0
20	30	Sed - 5	5	14.6	7.76	6.8	32.0
16	Macoma Control	Sed - 17	1	14.7	7.74	6.2	32.0
39	Macoma Control	Sed - 17	2	14.6	7.79	7.1	32 0
40	Macoma Control	Sed - 17	3	14.7	7.78	6.9	32.0
35	Macoma Control	Sed - 17 Sed - 17	4	14.7	7.74	6.4	32 0
1	Macoma Control	Sed - 17	5	14.6	7.73	6.9	32.0
6	Neanthes Control	Sed - 11	1	14.6	7.76	7 0	32.0
33	Neanthes Control	Sed - 11	2	14.0	7.76	6.7	32.0
24	Neanthes Control	Sed - 11	3	14.8	7.81	7.2	32.0
24	Neanthes Control	Sed - 11	4	14.6	7.75	6.6	32.0
41	Neanthes Control	Sed - 11 Sed - 11	5	14.0	7.77	68	32.0

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# Appendix C.2. Daily Observations for M. nasuta, Dead and Removed During 45-Day Test

																						t Rij	151	
Rosition			}2	<b>⊳3</b> ∖⊳	4	25	6	7	8	<b>:19</b> ]7	10	11,	120	134	14	15	16	217	<b>.18</b>	19	20	21	122;	23
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16	0	0	0	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0.	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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26	0	0	-	0.	0	0	0	0°	0	<u> </u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0 0	0	0	0 0	0 0	0 0	0	0 0	0 0	0 0	0 0
28	0	0	0	0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	0	0 0	0 1	0	0	0	0	0	0	0	ol
29 30	0	0	0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ol
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40	0	0	0	0	0	0	0	0	0	0	0	0;	0	0	0	0		0	0	0	0	0	0	0
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#### Appendix C.2.

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1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	ຼຸ	0	0	0	0	0	0	_0	0	0	0	0	0	0
5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
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10	0	0	0	0	0	_0	0	0	0	0	0	0	0	_0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<b>)</b>			0	;
12	0	0.	- 1	0	0	0	0	_0	0	0	0	0	1	0	0	0	•	• •			<b>.</b>
13	1	0	0	0	0	0	0	0	h	0	0	0	0	0	0	0	* * **		0		0
14	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	·	0	Ö	0	0
15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	<u> </u>	0	0	0	0	0	0	0		0	•		0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21		NA			NA		NA			NA		NA					NA			NA	NA
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26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0
27	0			0	0	····· ···	0	0	0	0	0	0	0	0	0	0	0	0		0	1
28		0		_0	0		0		t	0	0	0	0	0	0	0	1 -		0		
29	0	0		0	i i		0	0	0	$-\frac{0}{0}$	0 0	0	0	0 0	0 0	0			0		
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35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	- 0		in a Ta
36	0	0	0	0	Ō	0		0	0	0	0	0	0	0	0	0	4		•••	0	}• •
37	- 0	0	0	0	0	0	0	Ō	0	0	$-\frac{0}{0}$	Ō	0	0	0	0	- O	0	0	0	0
38		0	0	0	0	<del>0</del>		0	0	0	0		0	0	0			0	0		0
39		0		0	0	0			0	0	0	0	0	0	0	0		0	0	<u> </u>	
40	ŏ	0		0	0		ō	ŏ		Ō	Ō	0	0	0	0	0	1 0	Ō	Ō		1
41	NĂ	ŇĂ	•	ŇĂ	NA	NĂ	NĂ	ŇĂ	NĂ	ŇĂ	NĂ	ŇĂ	NĂ	NA	NĂ		i	ŇĂ	i i	NĂ	NA
42	0	0	0	0	0	0	0	0	· · ·	0	0	0	0	0	0	0	0	0	0	0	1 0

NA - Not Applicable: This replicate contained Nephtys only.

(jen al and a second		HI/		4. <sup>1</sup> 11	UN A	<b>1</b>	<b>a</b> S	yar		2404L	1941	TE	STID	AY	ia) (				bi e	સંભ				<u>ল ন</u>	Nort
Position	0.	<b>換1</b> 章	<b>2</b> .0	23	<b>\$4</b> #	¥53	存6	<b>殿7</b> 論	<b>派8</b> 員	善9號	-10	11	12,	13,	<u>,</u> 14,	15	16	317	18	<i>-</i> 19	÷20	21	÷22÷	23	24
																						=			
1	NA	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	0	0	0	2	0	2	1	0	1	0	_2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
3	0	0	0	3	0	1	0	0	1	2	1	1	0	0	0	0	0	0	0	0	_0	0	0	0	0
4	0	0	0	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	_0	0	2	0	2	0	0	1	0	1	0	1	0	0	0	0	0	0	_0	0	0	0	0	_ 0
6	0	0	0	2	2	3	1	0	0	0	1	0	2	0	3	1	1	3	1	0	0	0	2	0	0
7	0	0	0	3	0	1	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_0	0	0	0	0
9	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	· · · · · ·	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0		0	0	0	0	_0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16								_										_	_			NA			NA
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	1	0	0	0	0	0	0	0	_0	0	0	0	0	0	0	0	0	0	0	0	0	_0
20	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
23	0	0	0	1	0	0	1	0	0	0	0	1	0	_0	0	0	0	0	0	_0	0	_	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_0	0
25	0	0	0		0				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26	0	0	0	0 1	0	0	0	0	0	0	0	-0	0	0	0	-0	0	0	0	0	0	0	0	0	0
27	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	2	1	0	0	0	0	0	0	0	-0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	1	0	0	, 0 0	0	0	0	0	0	0	0	0	0	-0	0	0	0	-0	0	0	0	0	0
31	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0
33	0		0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0	2	-0	1	0	0
34	0		0	0	0	0	0		0	- 0	0	0	0	0	0	1	0	- 2	0	0		0	0	0	0
35	_		NĂ	-			-		NĂ	-		-					•		-			-	-	-	NA
36		0	2	0	0	0	0	0	<u> </u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37				0	0	0	0			0	0	0	Ō	Ō	0	ō	0	0		Ő	Ō		0		ō
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39	NA		NĂ			NA	NA		<u> </u>	NĂ	-		NĂ	-	NĂ		-	-	NĂ		-	NĂ		-	NA
40	<u> </u>	· · ·	NA				NA								_	_		_		_		NA			NA
41	0	0	Ō	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
42				1		0	Ō	0	Ō	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
44		<u> </u>	L	L	<u> </u>	ι			<u> </u>		. <u> </u>		Ľ	, ¥,	, <u> </u>	~~~	-	, v	<u> </u>	I	<u> </u>	<u> </u>	<u> </u>	<u> </u>	

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# Appendix C.3. Daily Observations for N. caecoides, Dead and Removed During 45-Day Test

# Appendix C.3.

		fz k	stri i	1.5	<b>济</b> 長		с		ал.	EST	ЮA	Cert.	्रत्	Д			4. <u>115</u> 7.5399	U) (	É ni	5 AF
Position	25	26	27	28	29)	30	134	32	33	134	85	36)	37	38	39.	40	Хя)	約2	43	:44
1		NA	_					_												
2	0	0	0	0	0	0	_0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13		-				_	0	_	-	-					-		-			0
14 15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	NA		NA	Ť				NA	NA		NA	-	_	NA	_	NA	-		NA	-
17		0		0				0	0		0			0					0	
18			0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0
19		0	0	0	0		0	0	0	0	0	0	0	0	1 o	0	0	0	0	0
20		0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20			0	0	0	0	0	0	Ō	0	1 0	0	0	0	0	<del>-</del>	0	0	0	0
22			0	0	0	0	0	0	0	0		0	0	0	ō	0	0	0	0	0
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24	<del>ا م</del>	ō	ŤŎ	Ō	Ō	ō		0	0	0	Ō		0	0	0	Ō	Ō	0	Ō	0
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26	Ō	Ō	Ō	Ō	0	Ō	Ō	0	0	0	Ō	0	0	0	0	0	0	Ō	Ō	Ō
27	0	Ö	Ō	0	0	0	0	0	0	0	Ō	Ō	0	0	Ö	Ō	0	Õ	0	Ō
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ō	0	0	0
29	Ō	Ō	Ō	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	1	0	0	0	0	0	0	0	0	Ō	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	Ö	0	0	0	0	0	_ 0	0	0	0	0	0	0	0	0
35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ŇΑ
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0				0	-	· · · · ·	0	0	0		-	0	0	0	0	0	0	0	
38	0	0	÷	0	0			0	0	Ő		0	0	0	0	0	Ô	0	0	0
39	NA			NA		NA						NA				_		NA		NA
40	NA		NA		NA		NA	NA	NA	NA		<u> </u>	NA	· · · ·	NA		NA	NA	NA	NA
41	0	-		0	0		0	1	0	0		0	2	0	2	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Coppers 25.01		et Dead on the second	Area
IGEIAIC/ENIOIAE/IMAIO/AE/E	UNEIG)	State Sive Single State	CALCULATION STATES
0	10	0	1.00
0.312	10	0	1.00
0.625	10	0	1.00
1.25	10	0	1.00
2.5	3	7	0.30
50	3	7	0.30
10.0	3	7	0.30

#### TABLE D1. Test Results for 96-Hour M. nasuta Copper Reference Toxicant Test

(a) Survival based on initial exposure of 10 organisms per replicate

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Page 1 of 1

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Copper	(°C)		рН		(mg/L)		(0/00)	
Concentration (mg/L)	Mine:	Max	×, / Min /	Max	Min 1	Max	• Min	Ма
Acceptable Range	13 0	170	73	8.3	50	NA (a)	28 0	32
0	15 2	154	776	8 01	72	8.1	32 0	32
0 312	15 1	154	7 77	8 02	74	80	32 0	32
0 625	15 1	154	769	8 02	69	82	32 0	32
1 25	16 0	16 3	7 77	791	71	83	32 0	32
25	16 0	163	7 53	7.91	74	83	32 0	32
50	15 1	155	752	8 04	59	83	32 0	32
10 0	15 9	163	751	8 04	54	82	32 0	32

TABLE D2 Water Quality Summary for 96-Hour *M* nasut a Copper Reference Toxicant Test

(a) NA Not applicable

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(b) Data point out of range

Copper Concentration (mg/L)		Dead or Missing	Proportion Surviving
0 000	10	0	1 00
0 050	9	1	0 90
0 075	10	0	1 00
0 100	4	6	0 40
0 200	0	10	0 00
0 300	0	10	0 00
0 400	0	10	0 00

# TABLE D3 Test Results for 96-Hour N. caecoides Copper Reference Toxicant Test

(a) Survival based on initial exposure of 10 organisms per replicate

TABLE D4. Water Quality Summary for 96-Hour N. caecoides Copper Reference Toxicant Test

	ା ିମିଲ୍ଲୋଡ୍ଡାମ୍ବ	MC			S-1-10XXV1200.		Selfatt	。海洋
States Copper a state	RON (RON		<b>D</b> ZA PH		s in molule		(0/00)	rsi ir
Concentration (Ing/L)	Min	Maxies	Min A	Max	会运送 Mint 95	Maxee	A Miner	<u>_</u> Ma
Acceptable Range	13.0	17.0	7.3	8.3	5.0	NA (a)	28.0	32
0.000	15.1	15.5	7.80	8.06	7.6	8.0	32.0	32
0 050	15.1	15.4	7.80	8.04	7.4	8.1	32.0	32
0 075	15.1	15.4	7.80	8.03	7.5	8.2	32.0	32
0 100	15 1	154	7.82	8.07	7.7	8.2	32.0	32
0 200	15.1	15.6	7.81	8.04	69	8.0	32.0	32
0.300	15.1	15.4	7.82	8 06	60	8.2	32.0	30
0 400	15 1	15 3	7.70	8.06	53	8.1	32 0	30

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(a) NA Not applicable

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# **APPENDIX E**

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# Tissue Chemistry Results

This appendix contains the tissue chemistry data as reported by the analytical laboratory. The data are grouped by analytical batches. Case narratives, when produced by the laboratory, are included for each batch. It is important to note that the tissue sample IDs do not correspond to the station IDs where the initial sediment was collected for testing. The table on the following page provides the conversion key. The numbers under the column "Position" were used for tissue sample IDs, whereas the corresponding numbers under the "Treatment" column represents the station ID from which the sediments were collected.

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# Test treatment codes for TBT-Bioaccumulation Tests

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iorted by treatment			
Treatment	MSL Code	Replicate	Position
Macoma Control	17	1	16
Macoma Control	17	2	39
Macoma Control	17	3	40
Macoma Control	17	4	35
Macoma Control	17	5	1
Nephtys Control	11	1	6
Nephtys Control	11	2	33
Nephtys Control	11	3	24
Nephtys Control	11	4	21
Nephtys Control	11	5	41
2	22	1	31
4	18	1	19
5	21	1	15
7	2	1	27
8	16	1	17
9	7	1	30
11	20	1	18
12	1	1	13
13	12	1	28
13	12	2	22
13	12	3	25
13	12	4	2
13	12	5	36
14	9	1	38
15	13	1	3
18	6	1	42
19	14	1	10
19	14	2	14
19	14	3	29
19	14	4	34
19	14	5	32
20	10	1	4
21	8	1	5
22	15	1	7
24	19	1	8
26	3	1	37
28	4	1	9
30	5	1	11
30	5	2 .	12 1
30	5	3	23
30	5	4	26
30	5	5	20

orted by po	osition		
Position	Treatment	MSL Code	Replicate
1	Macoma Control	17	5
2	13	12	4
3	15	13	1
4	20	10	1
5	21	8	1
6	Nephtys Control	11	1
7	22	15	1
8	24	19	1
9	28	4	1
10	19	14	1
11	30	5	1
12	30	5	2
13	12	1	1
14	19	14	2
15	5	21	1
16	Macoma Control	17	1
17	8	16	1
18	11	20	1
19	4	18	1
20	30	5	5
21	Nephtys Control	11	4
22	13	12	2
23	30	5	3
24	Nephtys Control	11	3
25	13	12	3
26	30	5	4
27	7	2 -	1
28	13	12	1
29	19	14	3
30	9	7	1
31	2	, 22	1
32	19	14	5
33	Nephtys Control	11	2
33 34	19	14	4
34 35	Macoma Control	17	4
36	13	12	4 5
30	26	3	1
38	14	9	1
39	Macoma Control	17	2
40	Macoma Control	17	3
41	Nephtys Control	11	5
42	18	6	1

Client: **EVS Environmental Consultants** TBT Bioaccumulation **Project:** Sample Matrix: Tissue

Service Request No.: K9807071 Date Received: 10/13/98

#### **CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

Results for Tri-n-butyltin have been reported as the cation.

The following difficulties were experienced during analysis of this batch.

The Tri-n-pentyltin surrogate recovery for Butyltins in the LCS was outside normal CAS control limits The Trin-butyltin recovery in the LCS was low but within control limits. The surrogate recoveries in all of the samples and the recoveries in the MS/MSD were within control limits indicating that the low recoveries in the LCS were likely isolated to the LCS and did not affect the other samples in the batch. No further corrective action was taken.

The Matrix Spike (MS) recoveries of Tri-n-butyltin for samples EVS-Mac-TBT-4 and EVS-Mac-TBT-25 were not calculated The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery

The surrogate recoveries for Butyltins in the DMS were low. Since the surrogate recoveries in the MS and sample were within control limits, no further corrective action was taken.

The closing CCV for Tri-n-butyltin performed on 11/14/98 was below CAS control limits. The cause of the low recovery was determined to be due to a previously run extract, from a sample unrelated to this service request, that impacted the recovery of Tri-n-butyltin in the CCV. No further corrective action taken.

Approved by

Uni Date 11 23/93

#### Analytical Report

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Client: Project: Sample Matrix:	EVS Environ TBT Bioacci Tissue	nment Consultants umulation		Service Request: Date Collected: Date Received:	8/26/98
			Total Solids (%)		
Prep Method:	NONE			Units	PERCENT
Analysis Method	Freeze Dry			Basis	Wet
Test Notes					
			Date		Result
Sample Name		Lab Code	Analyzed	Result	Notes
Rep1-EVS-TBT-Mad	coma Bkgd	K9807071-001	11/1/98	16 2	
Rep2-EVS-TBT-Mad	coma Bkgd	K9807071-002	11/1/98	16 6	
Rep3-EVS-TBT-Mad	coma Bkgd	K9807071-003	11/1/98	16 5	
Rep4-EVS-TBT-Mad	coma Bkgd	K9807071-004	11/1/98	16.7	
Rep5-EVS-TBT-Mac	coma Bkgd	K9807071-005	11/1/98	17 1	
EVS-Mac-TBT-2		K9807071-006	11/1/98	15 5	
EVS-Mac-TBT-3		K9807071-007	11/1/98	15 0	
EVS-Mac-TBT-4		K9807071-008	11/1/98	14 7	
EVS-Mac-TBT-5		K9807071-009	11/1/98	15 1	
EVS-Mac-TBT-7		K9807071-010	11/1/98	15 2	
EVS-Mac-TBT-8		K9807071-011	11/1/98	15 8	
EVS-Mac-TBT-9		K9807071-012	11/1/98	15 4	
EVS-Mac-TBT-10		K9807071-013	11/1/98	15 8	
EVS-Mac-TBT-11		K9807071-014	11/1/98	14 7	
EVS-Mac-TBT-12		K9807071-015	11/1/98	15 9	
EVS-Mac-TBT-13		K9807071-016	11/1/98	14 7	
EVS-Mac-TBT-14		K9807071-017	11/1/98	14 5	
EVS-Mac-TBT-15		K9807071-018	11/1/98	14 7	
EVS-Mac-TBT-17		K9807071-019	11/1/98	15 0	
EVS-Mac-TBT-18		K9807071-020	11/1/98	15 6	

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#### Approved By:

070711CP JC1 - Sample 11/2/98

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#### Analytical Report

Client: Project: Sample Matrix:	EVS Environment Consultants TBT Bioaccumulation Tissue		Service Request: Date Collected: Date Received:	10/10/98
		Total Solids (%)		
Prep Method: Analysis Method: Test Notes:	NONE Freeze Dry		Units. Basis	PERCENT Wet
Sample Name	Lab Code	Date Analyzed	Result	Result Notes
EVS-Mac-TBT-19	K9807071-021	11/1/98	15.8	
EVS-Mac-TBT-20	K9807071-022	11/1/98	14 9	
EVS-Mac-TBT-22	K9807071-023	11/1/98	15.1	
EVS-Mac-TBT-23	K9807071-024	11/1/98	15 2	
EVS-Mac-TBT-25	K9807071-025	11/1/98	15 1	
EVS-Mac-TBT-26	K9807071-026	11/1/98	14 9	
EVS-Mac-TBT-27	K9807071-027	11/1/98	15.4	
EVS-Mac-TBT-28	K9807071-028	11/1/98	15 4	
EVS-Mac-TBT-29	K9807071-029	11/1/98	15 1	
EVS-Mac-TBT-30	K9807071-030	11/1/98	16 0	
EVS-Mac-TBT-31	K9807071-031	11/1/98	16 3	
EVS-Mac-TBT-32	K9807071-032	11/1/98	15 0	
EVS-Mac-TBT-34	K9807071-033	11/1/98	15 8	
EVS-Mac-TBT-36	K9807071-034	11/1/98	15 0	
EVS-Mac-TBT-37	K9807071-035	11/1/98	15 5	
EVS-Mac-TBT-38	K9807071-036	11/1/98	16 6	
EVS-Mac-TBT-42	К9807071-037	11/1/98	15 9	
EVS-NEP-TBT-2	K9807071-038	11/1/98	173	
EVS-NEP-TBT-3	K9807071-039	11/1/98	17.2	
EVS-NEP-TBT-4	K9807071-040	11/1/98	16 5	

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Date 11/2/98

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Approved By:

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# Analytical Report

	Client: Project: Sample Matrix:	EVS Environment Consultants TBT Bioaccumulation Tissue		Service Request: Date Collected: Date Received:	10/10/98
			Total Solids (%)		
	Prep Method:	NONE		Units	PERCENT
	Analysis Method	Freeze Dry		Basis	Wet
	Test Notes.				
			Date		Result
ļ	Sample Name	Lab Code	Analyzed	Result	Notes
	EVS-NEP-TBT-5	K9807071-041	11/1/98	14 4	
	EVS-NEP-TBT-7	K9807071-042	11/1/98	16 9	
	EVS-NEP-TBT-8	K9807071-043	11/1/98	19.3	
	EVS-NEP-TBT-9	K9807071-044	11/1/98	14.5	
	EVS-NEP-TBT-10	K9807071-045	11/1/98	18 9	
	EVS-NEP-TBT-11	K9807071-046	11/1/98	17.7	
	EVS-NEP-TBT-12	K9807071-047	11/1/98	16 6	
	EVS-NEP-TBT-13	K9807071-048	11/1/98	16 5	
	EVS-NEP-TBT-14	K9807071-049	11/1/98	16 9	
	EVS-NEP-TBT-15	K9807071-050	11/1/98	18.0	
	EVS-NEP-TBT-17	K9807071-051	11/1/98	170	
ļ	EVS-NEP-TBT-18	K9807071-052	11/1/98	18 5	
	EVS-NEP-TBT-19	K9807071-053	11/1/98	15 8	
Ì	EVS-NEP-TBT-20	K9807071-054	11/1/98	15 3	
,	EVS-NEP-TBT-22	K9807071-055	11/1/98	26 8	
-	EVS-NEP-TBT-23	K9807071-056	11/1/98	17 5	
1	EVS-NEP-TBT-25	K9807071-057	11/1/98	16 8	
	EVS-NEP-TBT-26	K9807071-058	11/1/98	12 3	
	EVS-NEP-TBT-27	K9807071-059	11/1/98	14 4	
	EVS-NEP-TBT-28	K9807071-060	11/1/98	17 9	

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Approved By: \_

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\_ Date. \_//2/78\_\_\_\_

#### Analytical Report

Client: Project: Sample Matrix:	EVS Enviror TBT Bioaccu Tissue	nment Consultants umulation		Service Request: Date Collected: Date Received:	10/10/98	_
			Total Solids (%)			<b>س</b>
Prep Method. Analysis Method Test Notes	NONE Freeze Dry		·	Units Basis	PERCENT Wet	
			Date		Result	
Sample Name		Lab Code	Analyzed	Result	Notes	$\sim$
EVS-NEP-TBT-29		K9807071-061	11/1/98	13 3		
EVS-NEP-TBT-30		K9807071-062	11/1/98	21 3		$\sim$
EVS-NEP-TBT-31		K9807071-063	11/1/98	117		
EVS-NEP-TBT-32		K9807071-064	11/1/98	16 0		
EVS-NEP-TBT-34		K9807071-065	11/1/98	16 5		<b>(</b>
EVS-NEP-TBT-36		K9807071-066	11/1/98	16 6		
EVS-NEP-TBT-37		K9807071-067	11/1/98	16 4		
EVS-NEP-TBT-38		K9807071-068	11/1/98	178		$\sim$
EVS-NEP-TBT-42		K9807071-069	11/1/98	177		
Rep1-EVS-TBT-Nep	othys Bkgd	K9807071-070	11/1/98	192		
Rep2-EVS-TBT-Nepthys Bkgd		K9807071-071	11/1/98	19 9		~
Rep3-EVS-TBT-Nepthys Bkgd		K9807071-072	11/1/98	19 3		
Rep4-EVS-TBT-Nep	othys Bkgd	K9807071-073	11/1/98	197		
Rep5-EVS-TBT-Nep	othys Bkgd	K9807071-074	11/1/98	19 4		, <b></b> 7

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#### Analytical Report

Client:	EVS Environment Consultants
Project:	TBT Bioaccumulation
Sample Matrix:	Tissue

Service Request:	K9807071
<b>Date Collected:</b>	8/26/98
Date Received:	10/13/98
Date Extracted:	11/3/98
Date Analyzed:	11/17/98

Lipids Gravimetric Units Percent (%) As Received Basis

Sample Name	Lab Code	Result
Rep1-EVS-TBT-Macoma Bkgd	K9807071-001	0.28
Rep2-EVS-TBT-Macoma Bkgd	K9807071-002	0 04
Rep3-EVS-TBT-Macoma Bkgd	K9807071-003	0.27
Rep4-EVS-TBT-Macoma Bkgd	K9807071-004	0.03
Rep5-EVS-TBT-Macoma Bkgd	K9807071-005	0.68
EVS-Mac-TBT-2	K9807071-006	0.05
EVS-Mac-TBT-3	K9807071-007	0.13
EVS-Mac-TBT-5	K9807071-009	0.40
EVS-Mac-TBT-7	K9807071-010	<0 03
EVS-Mac-TBT-8	K9807071-011	0 12
EVS-Mac-TBT-9	K9807071-012	0.12
EVS-Mac-TBT-10	K9807071-013	0.23
EVS-Mac-TBT-11	K9807071-014	0 03
EVS-Mac-TBT-12	K9807071-015	0 08
EVS-Mac-TBT-13	K9807071-016	<0.03
EVS-Mac-TBT-14	K9807071-017	0.14
EVS-Mac-TBT-15	K9807071-018	0 10
EVS-Mac-TBT-17	K9807071-019	0 30
EVS-Mac-TBT-18	K9807071-020	0 05

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07071SVG PJ4 - TSolids 11/18/98 υ

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Date: <u>11-20.98</u>

Page No 00008

#### Analytical Report

#### **Client: EVS Environment Consultants Project: TBT Bioaccumulation** Sample Matrix: Tissue

Service Request:	K9807071
<b>Date Collected:</b>	10/10/98
Date Received:	10/13/98
Date Extracted:	11/5/98
Date Analyzed:	11/17/98

#### Lipids Gravimetric Units Percent (%) As Received Basis

Sample Name	Lab Code	Result
EVS-Mac-TBT-4	K9807071-008	0 65
EVS-Mac-TBT-19	K9807071-021	0.42
EVS-Mac-TBT-20	K9807071-022	0.40
EVS-Mac-TBT-22	· K9807071-023	0.52
EVS-Mac-TBT-23	K9807071-024	0.38
EVS-Mac-TBT-25	K9807071-025	0.36
EVS-Mac-TBT-26	K9807071-026	0.37
EVS-Mac-TBT-27	K9807071-027	0 25
EVS-Mac-TBT-28	K9807071-028	0 30
EVS-Mac-TBT-29	K9807071-029	0 32
EVS-Mac-TBT-30	K9807071-030	0 18
EVS-Mac-TBT-31	K9807071-031	0 25
EVS-Mac-TBT-32	K9807071-032	0 34
EVS-Mac-TBT-34	K9807071-033	0.17
EVS-Mac-TBT-36	K9807071-034	0.37
EVS-Mac-TBT-37	K9807071-035	0.48
EVS-Mac-TBT-38	K9807071-036	0 2 1
EVS-Mac-TBT-42	K9807071-037	0 07
EVS-NEP-TBT-2	K9807071-038	0 83
EVS-NEP-TBT-3	К9807071-039	0 61

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#### Analytical Report

Client:	<b>EVS Environment Consultants</b>
Project:	TBT Bioaccumulation
Sample Matrix:	Tissue

 Service Request:
 K9807071

 Date Collected:
 10/10/98

 Date Received:
 10/13/98

 Date Extracted:
 11/10/98

 Date Analyzed:
 11/18/98

#### Lipids Gravimetric Units. Percent (%) As Received Basis

Sample Name	Lab Code	Result
EVS-NEP-TBT-4	K9807071-040	0.88
EVS-NEP-TBT-5	K9807071-041	1.05
EVS-NEP-TBT-7	K9807071-042	0.74
EVS-NEP-TBT-8	K9807071-043	1.04
EVS-NEP-TBT-9	K9807071-044	1.24
EVS-NEP-TBT-10	K9807071-045	1 24
EVS-NEP-TBT-11	K9807071-046	1.02
EVS-NEP-TBT-12	K9807071-047	0.89
EVS-NEP-TBT-13	K9807071-048	0.93
EVS-NEP-TBT-14	K9807071-049	1 14
EVS-NEP-TBT-15	K9807071-050	1 20
EVS-NEP-TBT-17	K9807071-051	1 17
EVS-NEP-TBT-18	K9807071-052	1 03
EVS-NEP-TBT-19	K9807071-053	0.87
EVS-NEP-TBT-20	K9807071-054	0.96
EVS-NEP-TBT-22	K9807071-055	I 11
EVS-NEP-TBT-23	K9807071-056	1.02
EVS-NEP-TBT-25	K9807071-057	1.01
EVS-NEP-TBT-26	K9807071-058	0 79
EVS-NEP-TBT-27	K9807071-059	1.07
EVS-NEP-TBT-28	K9807071-060	1.19

Data Validated-EPA Level I Quality by Design 70) 12/21/98

Approved By: \_\_\_\_

1A/102094 07071SVG PJ3 - TSobds 11/18/98 Date: 11- 20-98



# Analytical Report

Client:	EVS Environment Consultants
Project:	TBT Bioaccumulation
Sample Matrix:	Tissue

Service Request:	K9807071
Date Collected:	10/10/98
Date Received:	10/13/98
Date Extracted:	11/13/98
Date Analyzed:	11/19/98

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Lipids Gravimetric Units Percent (%) As Received Basis

Sample Name	Lab Code	Result
	K0007071 0/1	0.75
EVS-NEP-TBT-29	K9807071-061	
EVS-NEP-TBT-30	K9807071-062	0 88
EVS-NEP-TBT-31	K9807071-063	0 96
EVS-NEP-TBT-32	K9807071-064	0 84
EVS-NEP-TBT-34	K9807071-065	1.02
EVS-NEP-TBT-36	K9807071-066	1 53
EVS-NEP-TBT-37	K9807071-067	1.00
EVS-NEP-TBT-38	K9807071-068	1 15
EVS-NEP-TBT-42	K9807071-069	1 46
Rep1-EVS-TBT-Nepthys Bkgd	K9807071-070	1 45
Rep2-EVS-TBT-Nepthys Bkgd	K9807071-071	1 08
Rep3-EVS-TBT-Nepthys Bkgd	K9807071-072	1 18

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Approved By 1A/102094 07071SVG PJ5 - TSolids 11/20/98

Date. 11-20-98

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		А	nalytical Rep	port				
Client: Project: Sample Matrix:	ect: TBT Bioaccumulation							
			Butyltins					
Sample Name Lab Code Test Notes	Rep1-EVS-TBT-1 K9807071-001	Macoma Bkgd					Units Basis	ug/Kg (ppb) Wet
Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Tri-n-butyltin	Method	Butyltins-GC	2	1	11/3/98	11/6/98	ND	

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07071SVG BJ2 - 1 11/17/98

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#### Analytical Report

Client: Project: Sample Matrix:	EVS Environment TBT Bioaccumula Tissue					Date C	ollected:	K9807071 8/26/98 10/13/98	
			Butyltins						
Sample Name Lab Code Test Notes	Rep2-EVS-TBT-N K9807071-002	lacoma Bkgd					Units Basis	ug/Kg (ppb) Wet	,
Analyte	Prep Method	Analysis Method	MRL	Dilution Factor		Date Analyzed	Result	Result Notes	•
Tn-n-butyltın	Method	Butyltins-GC	2	i	11/3/98	11/6/98	ND		,

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|   |                                                    |                                              | А                  | nalytical Repo | ort                |                   |                  |                 |                                 |
|---|----------------------------------------------------|----------------------------------------------|--------------------|----------------|--------------------|-------------------|------------------|-----------------|---------------------------------|
|   | Client:<br>Project:<br>Sample Matrix:              | EVS Environment<br>TBT Bioaccumula<br>Fissue |                    |                |                    |                   | Date C           | ollected:       | K9807071<br>8/26/98<br>10/13/98 |
| Î |                                                    |                                              |                    | Butyltins      |                    |                   |                  |                 |                                 |
|   | Sample Name<br>Lab Code <sup>.</sup><br>Test Notes | Rep3-EVS-TBT-N<br>K9807071-003               | lacoma Bkgd        |                |                    |                   |                  | Units<br>Basis: | ug/Kg (ppb)<br>Wet              |
|   | Analyte                                            | Prep<br>Method                               | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                 |
|   | Trı-n-butyltın                                     | Method                                       | Butyltins-GC       | 2              | 1                  | 11/3/98           | 11/6/98          | ND              |                                 |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | TBT Bioaccumulation Date Col   |                    |           |                    |                   |                  |                | K9807071<br>8/26/98<br>10/13/98 | • |
|---------------------------------------|--------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|---------------------------------|---|
|                                       |                                |                    | Butyltins |                    |                   |                  |                |                                 |   |
| Sample Namc<br>Lab Code<br>Test Notes | Rep4-EVS-FBT-N<br>K9807071-004 | lacoma Bkgd        |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet              | - |
| Analyte                               | Prep<br>Method                 | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                 |   |
| Tri-n-butyltin                        | Method                         | Butyltins-GC       | 2         | 1                  | 11/3/98           | 11/6/98          | ND             |                                 | ٠ |

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|---|---------------------------------------|----------------------------------------------|--------------------|----------------|--------------------|-------------------|------------------|----------------|---------------------------------|
| Î | Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumula<br>Tissue |                    |                |                    |                   | Date C           | ollected:      | K9807071<br>8/26/98<br>10/13/98 |
| Î | Sample Name<br>Lab Code               | Rep5-EVS-TBT-N<br>K9807071-005               | lacoma Bkgd        | Butyltins      |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet              |
|   | Test Notes Analyte                    | Prep<br>Method                               | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                 |
| J | Tri-n-butyltin                        | Method                                       | Butyltins-GC       | 2              | 1                  | 11/3/98           | 11/6/98          | ND             |                                 |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    |                   | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 | <b>ده</b>  |
|---------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|------------|
|                                       |                                               |                    | Butyltins |                    |                   |                  |                |                                  | **         |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-2<br>K9807071-006                 |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               | فسو        |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  | , <b>-</b> |
| Tri-n-butyltin                        | Method                                        | Butyltins-GC       | 2         | 1                  | 11/3/98           | 11/7/98          | 50             |                                  |            |

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| Î | Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |                | ollected:          | K9807071<br>10/10/98<br>10/13/98 |                  |                |                    |
| Í |                                       |                                               |                    | Butyltins      |                    |                                  |                  |                |                    |
| Ĵ | Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-3<br>K9807071-007                 |                    |                |                    |                                  |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Î | Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted                | Date<br>Analyzed | Result         | Result<br>Notes    |
|   | Tri-n-butyltin                        | Method                                        | Butyltins-GC       | 2              | 1                  | 11/3/98                          | 11/7/98          | 9              |                    |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    | K9807071<br>10/10/98<br>10/13/98 |                  |                 |                    |
|---------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|----------------------------------|------------------|-----------------|--------------------|
|                                       |                                               |                    | Butyltins |                    |                                  |                  |                 |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-4<br>K9807071-008                 |                    |           |                    |                                  |                  | Units.<br>Basis | ug/Kg (ppb)<br>Wct |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor |                                  | Date<br>Analyzed | Result          | Result<br>Notes    |
| Trı-n-butyltın                        | Method                                        | Butyltins-GC       | 20        | 10                 | 11/5/98                          | 11/13/98         | -380-           | 376                |

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|---|---------------------------------------|--------------------------------------------------|--------------|----------------|----------|-----------|----------|-----------|----------------------------------|
| İ | Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |              |                |          |           | Date Co  | ollected: | K9807071<br>10/10/98<br>10/13/98 |
| Í |                                       |                                                  |              |                |          |           |          |           |                                  |
| 6 |                                       |                                                  |              | Butyltins      |          |           |          |           |                                  |
|   |                                       |                                                  |              |                |          |           |          |           |                                  |
|   | Sample Name                           | EVS-Mac-TBT-5                                    |              |                |          |           |          | Units     | ug/Kg (ppb)                      |
|   | Lab Code<br>Test Notes                | K9807071-009                                     |              |                |          |           |          | Basıs     | Wet                              |
| Î |                                       | Prep                                             | Analysis     |                | Dilution | Date      | Date     |           | Result                           |
|   | Analyte                               | Method                                           | Method       | MRL            | Factor   | Extracted | Analyzed | Result    | Notes                            |
|   | Trı-n-butyltın                        | Method                                           | Butyltins-GC | 2              | 1        | 11/3/98   | 11/7/98  | 14        |                                  |

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|---------------------------------------|-------------------------------------------------|--------------------|-----------|--------------------|-------------------|----------------------------------|----------------|--------------------|
|                                       |                                                 |                    | Butyltins |                    |                   |                                  |                |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-7<br>K9807071-010                   |                    |           |                    |                   |                                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                  | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed                 | Result         | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                          | Butyltins-GC       | 2         | 1                  | 11/3/98           | 11/7/98                          | 10             |                    |

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|---------------------------------------|-----------------------------------------------|--------------------|---------------|--------------------|-------------------|------------------|------------------------------------------|----------------------------------|
| Client:<br>Project:<br>Sample Matrix  | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |               |                    |                   | Date C           | ollected:                                | K9807071<br>10/10/98<br>10/13/98 |
| l<br>L                                |                                               |                    | Butyltins     |                    |                   |                  |                                          |                                  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-8<br>K9807071-011                 |                    |               |                    |                   |                  | Units <sup>.</sup><br>Basis <sup>.</sup> | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                                   | Result<br>Notes                  |
| Tn-n-butyltin                         | Method                                        | Butyltins-GC       | 2             | 1                  | 11/3/98           | 11/7/98          | 11                                       |                                  |

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| Client:<br>Project:<br>Sample Matrix: |                               | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |           |                    |                   | Service Request:<br>Date Collected:<br>Date Received: |                |                    |  |
|---------------------------------------|-------------------------------|--------------------------------------------------------------|-----------|--------------------|-------------------|-------------------------------------------------------|----------------|--------------------|--|
|                                       |                               |                                                              | Butyltins |                    |                   |                                                       |                |                    |  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-9<br>K9807071-012 |                                                              |           |                    |                   |                                                       | Units<br>Basis | ug/Kg (ppb)<br>Wet |  |
| Analyte                               | Prep<br>Method                | Analysis<br>Method                                           | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed                                      | Result         | Result<br>Notes    |  |
| Trı-n-butyltın                        | Method                        | Butyltins-GC                                                 | 2         | 1                  | 11/3/98           | 11/7/98                                               | 43             |                    |  |

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|---------------------------------------|--------------------------------------------------|--------------------|---------------|--------------------|-------------------|------------------|-----------------------------------|--------------------|
| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulat:<br>Tissue |                    |               |                    |                   | Date Co          | Request:<br>ollected:<br>eceived: |                    |
|                                       |                                                  |                    | Butyltins     |                    |                   |                  |                                   |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-10<br>K9807071-013                   |                    |               |                    |                   |                  | Units<br>Basis                    | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                            | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 2             | 1                  | 11/3/98           | 11/7/98          | 11                                |                    |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                    |           |                    | Service Request:<br>Date Collected:<br>Date Received: |                  |                | 10/10/98           |
|---------------------------------------|--------------------------------------------------------------|--------------------|-----------|--------------------|-------------------------------------------------------|------------------|----------------|--------------------|
|                                       |                                                              |                    | Butyltins |                    |                                                       |                  |                |                    |
| Sample Namc<br>Lab Code<br>Test Notes | EVS-Mac-TBT-11<br>K9807071-014                               |                    |           |                    |                                                       |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                               | Analysis<br>Method | MRL       | Dilution<br>Factor |                                                       | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tn-n-butyltin                         | Method                                                       | Butyltins-GC       | 2         | 1                  | 11/3/98                                               | 11/7/98          | 7              |                    |

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|---------------------------------------|----------------------------------------------------------------------------------------------|--------------------|---------------|--------------------|-------------------|------------------|----------------|--------------------|--|
| Client:<br>Project:<br>Sample Matrix: | EVS Environment ConsultantsService RequeTBT BioaccumulationDate CollectorTissueDate Received |                    |               |                    |                   |                  | ollected:      | : 10/10/98         |  |
|                                       |                                                                                              |                    | Butyltins     |                    |                   |                  |                |                    |  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-12<br>K9807071-015                                                               |                    |               |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |  |
| Analyte                               | Prep<br>Method                                                                               | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |  |
| Tn-n-butyltın                         | Method                                                                                       | Butyltins-GC       | 2             | 1                  | 11/3/98           | 11/7/98          | 8              |                    |  |

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| Client:<br>Project:<br>Sample Matrix: |                                | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |           |                    |                   | Service Request:<br>Date Collected:<br>Date Received: |                |                    |  |
|---------------------------------------|--------------------------------|--------------------------------------------------------------|-----------|--------------------|-------------------|-------------------------------------------------------|----------------|--------------------|--|
|                                       |                                |                                                              | Butyltins |                    |                   |                                                       |                |                    |  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-13<br>K9807071-016 |                                                              |           |                    |                   |                                                       | Units<br>Basis | ug/Kg (ppb)<br>Wet |  |
| Analyte                               | Prep<br>Method                 | Analysis<br>Method                                           | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed                                      | Result         | Result<br>Notes    |  |
| Trı-n-butyltın                        | Method                         | Butyltins-GC                                                 | 2         | 1                  | 11/3/98           | 11/7/98                                               | 25             | -                  |  |

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|---------------------------------------|-----------------------------------------------------|--------------------|-----------------|--------------------|-------------------|------------------|----------------|----------------------------------|
| Client:<br>Project:<br>Sample Matrix: | EVS Environment Co<br>TBT Bioaccumulation<br>Tissue |                    |                 |                    |                   | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-14<br>K9807071-017                      |                    | Butyltins       |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                      | Analysis<br>Method | MRL             | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |

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Butyltins-GC

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:              | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    |                   | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 | , |
|----------------------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|---|
|                                                    |                                               |                    | Butyltins |                    |                   |                  |                |                                  |   |
| Sample Name<br>Lab Code <sup>.</sup><br>Test Notes | EVS-Mac-TBT-15<br>K9807071-018                |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wct               |   |
| Analyte                                            | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  | F |
| Tri-n-butyltin                                     | Method                                        | Butyltins-GC       | 2         | 1                  | 11/3/98           | 11/7/98          | 15             |                                  |   |

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|----------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|
| Client:<br>Project:<br>Sample Matrix:  | EVS Environment C<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |                   | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|                                        |                                                  |                    | Butyltins |                    |                   |                  |                |                                  |
| Sample Name<br>Lab Code<br>Test Notes. | EVS-Mac-TBT-17<br>K9807071-019                   |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                                | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Trı-n-butyltın                         | Method                                           | Butyltins-GC       | 2         | 1                  | 11/3/98           | 11/7/98          | 4              |                                  |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    |                   | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 | ~ |
|---------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|---|
|                                       |                                               |                    | Butyltins |                    |                   |                  |                |                                  |   |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-1BT-18<br>K9807071-020                |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wct               | ( |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  | ~ |
| Trı-n-butyltın                        | Method                                        | Butyltins-GC       | 2         | 1                  | 11/3/98           | 11/7/98          | 13             |                                  | ~ |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |                   | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|
|                                       |                                                  |                    | Butyltins |                    |                   |                  |                |                                  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-19<br>K9807071-021                   |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Trı-n-butyltın                        | Method                                           | Butyltins-GC       | 2         | 1                  | 11/5/98           | 11/11/98         | 99             |                                  |

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Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    |                   | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|---------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|
|                                       |                                               |                    | Butyltins |                    |                   |                  |                |                                  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-ТВГ-20<br>К9807071-022                |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Tri-n-butyltin                        | Method                                        | Butyltins-GC       | 2         | 1                  | 11/5/98           | 11/11/98         | 82             |                                  |

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|   | Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulati<br>Tissue |                    |                |                    |                   | Date C           | ollected:       | K9807071<br>10/10/98<br>10/13/98 |
|   |                                       |                                                  |                    | Butyltins      |                    |                   |                  |                 |                                  |
| ļ | Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-22<br>K9807071-023                   |                    |                |                    |                   |                  | Units:<br>Basis | ug/Kg (ppb)<br>Wet               |
|   | Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                  |
|   | Trı-n-butyltın                        | Method                                           | Butyltins-GC       | 20             | 10                 | 11/5/98           | 11/13/98         | <del>310-</del> | 307                              |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |         | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|---------|------------------|----------------|----------------------------------|
|                                       |                                                  |                    | Butyltins |                    |         |                  |                |                                  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-23<br>K9807071-024                   |                    |           |                    |         |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor |         | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 2         | 1                  | 11/5/98 | 11/11/98         | 65             |                                  |

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|---|---------------------------------------|---------------------------------------------------|--------------------|----------------|--------------------|-------------------|------------------|----------------|----------------------------------|
|   | Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulatic<br>Tissue |                    |                |                    |                   | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|   |                                       |                                                   |                    | Butyltins      |                    |                   |                  |                |                                  |
|   | Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-25<br>K9807071-025                    |                    |                |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
|   | Analyte                               | Prep<br>Method                                    | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
| l | Тп-n-butyltın                         | Method                                            | Butyltins-GC       | 2              | 1                  | 11/5/98           | 11/11/98         | 132            |                                  |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:              | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |         | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|----------------------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|---------|------------------|----------------|----------------------------------|
|                                                    |                                                  |                    | Butyltins |                    |         |                  |                |                                  |
| Sample Name <sup>.</sup><br>Lab Code<br>Test Notes | EVS-Mac-TBT-26<br>K9807071-026                   |                    |           |                    |         |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                                            | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | _       | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Tri-n-butyltin                                     | Method                                           | Butyltins-GC       | 2         | i                  | 11/5/98 | 11/11/98         | 75             |                                  |

Data Validated-FPA Level I Quality by Design TP 12/24/98 , **19** 

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|-----------------------------------------|----------------------------------------------------|--------------------|----------------|--------------------|-------------------|------------------|----------------|----------------------------------|
| Client:<br>Project:<br>Sample Matrix:   | EVS Environment C<br>TBT Bioaccumulation<br>Tissue |                    |                |                    |                   | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|                                         |                                                    |                    | Butyltins      |                    |                   |                  |                |                                  |
| Sample Name<br>Lab Code:<br>Test Notes. | EVS-Mac-TBT-27<br>K9807071-027                     |                    |                |                    |                   |                  | Units<br>Basıs | ug/Kg (ppb)<br>Wet               |
| Analyte                                 | Prep<br>Method                                     | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Trı-n-butyltın                          | Method                                             | Butyltins-GC       | 2              | 1                  | 11/5/98           | 11/11/98         | 52             |                                  |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    | K9807071<br>10/10/98<br>10/13/98 |                  |                |                    |
|---------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|----------------------------------|------------------|----------------|--------------------|
|                                       |                                               |                    | Butyltuns |                    |                                  |                  |                |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-28<br>K9807071-028                |                    |           |                    |                                  |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted                | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                        | Butyltins-GC       | 2         | l                  | 11/5/98                          | 11/11/98         | 145            |                    |

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|---------------------------------------|--------------------------------------------------|--------------------|---------------|--------------------|-------------------|------------------|------------------------------------|--------------------|
| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |               |                    |                   | Date C           | Request:<br>ollected:<br>acceived: |                    |
|                                       |                                                  |                    | Butyltins     |                    |                   |                  |                                    |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-29<br>K9807071-029                   |                    |               |                    |                   |                  | Units<br>Basis                     | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                             | Result<br>Notes    |
| Trı-n-butyltın                        | Method                                           | Butyltins-GC       | 2             | 1                  | 11/5/98           | 11/11/98         | 51                                 |                    |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulat:<br>Tissue |                    |           |                    | Date C            | ollected:        | K9807071<br>10/10/98<br>10/13/98 |                    |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------------------------|--------------------|
|                                       |                                                  |                    | Butyltins |                    |                   |                  |                                  |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-30<br>K9807071-030                   |                    |           |                    |                   |                  | Units<br>Basis                   | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                           | Result<br>Notes    |
| Trı-n-butyltın                        | Method                                           | Butyltins-GC       | 2         | 1                  | 11/5/98           | 11/11/98         | 18                               |                    |

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|---------------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------|--------------------|-------------------|------------------|----------------|--------------------|
| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>FBT Bioaccumulati<br>Tissue | Service Request:<br>Date Collected:<br>Date Received: |               |                    |                   |                  |                |                    |
| )<br>I                                |                                                  |                                                       | Butyltins     |                    |                   |                  |                |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-31<br>K9807071-031                   |                                                       |               |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method                                    | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC                                          | 2             | ł                  | 11/5/98           | 11/11/98         | 21             |                    |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    | ollected:         | K9807071<br>10/10/98<br>10/13/98 |                |                      |
|---------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|-------------------|----------------------------------|----------------|----------------------|
|                                       |                                               |                    | Butyltins |                    |                   |                                  |                | ,                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-32<br>K9807071-032                |                    |           |                    |                   |                                  | Units<br>Basis | ug/Kg (ppb)<br>Wct , |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed                 | Result         | ,<br>Result<br>Notes |
| Tri-n-butyltin                        | Method                                        | Butyltins-GC       | 2         | 1                  | 11/5/98           | 11/12/98                         | 56             |                      |

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|----------------------------------------|--------------------------------|--------------------------------------------------------------|----------------|--------------------|-------------------|------------------|-----------------|----------------------------------|
| Client:<br>Project:<br>Sample Matrix:  | • •                            | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                |                    |                   |                  |                 | K9807071<br>10/10/98<br>10/13/98 |
|                                        |                                |                                                              | Butyltins      |                    |                   |                  |                 |                                  |
| Sample Name<br>Lab Code:<br>Test Notes | EVS-Mac-TBT-34<br>K9807071-033 |                                                              |                |                    |                   |                  | Units:<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                                | Prep<br>Method                 | Analysis<br>Method                                           | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                  |
| Tri-n-butyltin                         | Method                         | Butyltins-GC                                                 | 2              | 1                  | 11/5/98           | 11/12/98         | 14              |                                  |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |                   | Date C           | ollected:       | K9807071<br>10/10/98<br>10/13/98 |   |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|-----------------|----------------------------------|---|
|                                       |                                                  |                    | Butyltins |                    |                   |                  |                 |                                  |   |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-36<br>K9807071-034                   |                    |           |                    |                   |                  | Units<br>Basis  | ug/Kg (ppb)<br>Wet               |   |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                  | • |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 20        | 10                 | 11/5/98           | 11/13/98         | <del>~260</del> | 253                              | ľ |

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|---------------------------------------|--------------------------------------------------|--------------------|---------------|--------------------|-------------------|------------------|----------------------------------|--------------------|
| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |               |                    | Date Co           | ollected:        | K9807071<br>10/10/98<br>10/13/98 |                    |
|                                       |                                                  |                    | Butyltins     |                    |                   |                  |                                  |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-1BT-37<br>K9807071-035                   |                    |               |                    |                   |                  | Units<br>Basis                   | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                           | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 2             | 1                  | 11/5/98           | 11/12/98         | 195                              |                    |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:  | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    | Date Co   | K9807071<br>10/10/98<br>10/13/98 |                   |                  |                |                    |
|----------------------------------------|-----------------------------------------------|--------------------|-----------|----------------------------------|-------------------|------------------|----------------|--------------------|
|                                        |                                               |                    | Butyltins |                                  |                   |                  |                |                    |
| Sample Name.<br>Lab Code<br>Test Notes | EVS-Mac-TBT-38<br>K9807071-036                |                    |           |                                  |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wct |
| Analyte                                | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor               | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tri-n-butyltin                         | Method                                        | Butyltins-GC       | 2         | 1                                | 11/5/98           | 11/12/98         | 94             |                    |

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| Analytical Report                     |                                                  |                    |           |                    |                   |                  |                                  |                    |  |  |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------------------------|--------------------|--|--|
| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    | Date C            | ollected:        | K9807071<br>10/10/98<br>10/13/98 |                    |  |  |
|                                       |                                                  |                    | Butyltins |                    |                   |                  |                                  |                    |  |  |
| Sample Name<br>Lab Codc<br>Test Notes | EVS-Mac-TBT-42<br>K9807071-037                   |                    |           |                    |                   |                  | Units.<br>Basis                  | ug/Kg (ppb)<br>Wet |  |  |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                           | Result<br>Notes    |  |  |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 2         | 1                  | 11/5/98           | 11/12/98         | 25                               |                    |  |  |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment ConsultantsService Request:KTBT BioaccumulationDate Collected:1TissueDate Received:1 |                    |           |                    |                   |                  |                | 10/10/98           |
|---------------------------------------|------------------------------------------------------------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|--------------------|
|                                       |                                                                                                      |                    | Butyltins |                    |                   |                  |                |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-2<br>K9807071-038                                                                        |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                                                                       | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                                                                               | Butyltins-GC       | 2         | 1                  | 11/5/98           | 11/12/98         | 190            |                    |

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| Client:<br>Project:<br>Sample Matrix:               | EVS Environment (<br>TBT Bioaccumulati<br>Tissue | -                  |               |                    |                   | Date C           | ollected:        | K9807071<br>10/10/98<br>10/13/98 |
|                                                     |                                                  |                    | Butyltins     |                    |                   |                  |                  |                                  |
| Sample Name <sup>.</sup><br>Lab Code.<br>Test Notes | EVS-NEP-TBT-3<br>K9807071-039                    |                    |               |                    |                   |                  | Units:<br>Basis. | ug/Kg (ppb)<br>Wet               |
| Analyte                                             | Prep<br>Method                                   | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result           | Result<br>Notes                  |
| Tri-n-butyltın                                      | Method                                           | Butyltins-GC       | 2             | 1                  | 11/5/98           | 11/12/98         | 131              |                                  |

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Analytical Report

| Client:<br>Project:<br>Sample Matrix:                           | EVS Environment ConsultantsService Request:KTBT BioaccumulationDate Collected:8/TissueDate Received:16 |                    |           |                    |          |                  |                    | 8/26/98         |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------|-----------|--------------------|----------|------------------|--------------------|-----------------|
|                                                                 |                                                                                                        |                    | Butyltins |                    |          |                  |                    |                 |
| Sample Name <sup>.</sup><br>Lab Code <sup>.</sup><br>Test Notes |                                                                                                        |                    |           |                    |          |                  | ug/Kg (ppb)<br>Wct |                 |
| Analyte                                                         | Prep<br>Method                                                                                         | Analysis<br>Method | MRL       | Dilution<br>Factor |          | Date<br>Analyzed | Result             | Result<br>Notes |
| Tri-n-butyltin                                                  | Method                                                                                                 | Butyltins-GC       | 2         | 1                  | 11/13/98 | 11/19/98         | ND                 |                 |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:  | EVS Environment C<br>TBT Bioaccumulatio<br>Tissue |                    |           |                    | K9807071<br>8/26/98<br>10/13/98 |                  |                |                    |
|----------------------------------------|---------------------------------------------------|--------------------|-----------|--------------------|---------------------------------|------------------|----------------|--------------------|
|                                        |                                                   |                    | Butyltins |                    |                                 |                  |                |                    |
| Sample Name<br>Lab Code.<br>Test Notes | Rep5-EVS-TBT-Ne<br>K9807071-074                   | pthys Bkgd         |           |                    |                                 |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                                | Prep<br>Method                                    | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted               | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tri-n-butyltın                         | Method                                            | Butyltins-GC       | 2         | 1                  | 11/13/98                        | 11/19/98         | ND             |                    |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:   | EVS Environment<br>TBT Bioaccumula<br>Tissue |                    |           |                    | Request:<br>ollected:<br>acceived: |                  |                |                    |
|-----------------------------------------|----------------------------------------------|--------------------|-----------|--------------------|------------------------------------|------------------|----------------|--------------------|
|                                         |                                              |                    | Butyltins |                    |                                    |                  |                |                    |
| Sample Name.<br>Lab Code<br>Test Notes: | Method Blank<br>K981103-MB                   |                    |           |                    |                                    |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                                 | Prep<br>Method                               | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted                  | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tri-n-butyltin                          | Method                                       | Butyltins-GC       | 2         | 1                  | 11/3/98                            | 11/6/98          | ND             |                    |

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|---|----------------------------------------|-----------------------------------------------|--------------------|----------------|--------------------|-------------------|------------------|-----------------------------------|--------------------|
| Ï | Client:<br>Project:<br>Sample Matrix:  | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |                |                    |                   | Date Co          | Request:<br>ollected:<br>eceived: |                    |
|   |                                        |                                               |                    | Butyltins      |                    |                   |                  |                                   |                    |
|   | Sample Name<br>Lab Code.<br>Test Notes | Method Blank<br>K981105-MB                    |                    |                |                    |                   |                  | Units<br>Basis                    | ug/Kg (ppb)<br>Wet |
|   | Analyte                                | Prep<br>Method                                | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                            | Result<br>Notes    |
|   | Tri-n-butyltin                         | Method                                        | Butyltins-GC       | 20             | 10                 | 11/5/98           | 11/11/98         | ND                                |                    |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:  | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    |           |                    |                   | Service I<br>Date Co<br>Date R |                |                    |
|----------------------------------------|-----------------------------------------------|--------------------|-----------|--------------------|-------------------|--------------------------------|----------------|--------------------|
|                                        |                                               |                    | Butyltins |                    |                   |                                |                | ,                  |
| Sample Name<br>Lab Code<br>Test Notes. | Method Blank<br>K981110-MB                    |                    |           |                    |                   |                                | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                                | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed               | Result         | Result<br>Notes    |
| Trı-n-butyltın                         | Method                                        | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/13/98                       | ND             | ,                  |

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|-----------------------------------------------------|----------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|------------------------------------|--------------------|--|--|
| Client:<br>Project:<br>Sample Matrix:               | EVS Environment<br>TBT Bioaccumula<br>Tissue |                    |           |                    |                   | Date C           | Request:<br>ollected:<br>.cceived: |                    |  |  |
| 1                                                   |                                              |                    | Butyltins |                    |                   |                  |                                    |                    |  |  |
| Sample Name <sup>.</sup><br>Lab Code:<br>Test Notes | Method Blank<br>K981113-MB                   |                    |           |                    |                   |                  | Units<br>Basis                     | ug/Kg (ppb)<br>Wet |  |  |
| Analyte                                             | Prep<br>Method                               | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                             | Result<br>Notes    |  |  |
| Tri-n-butyltın                                      | Method                                       | Butyltins-GC       | 2         | 1                  | 11/13/98          | 11/18/98         | ND                                 |                    |  |  |

Data Validated-FPA Level 1 Quality by Design TP 12/21/98

Approved By \_\_\_\_\_

LADY Date 11/20/98

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#### APPENDIX A

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#### LABORATORY QA/QC RESULTS

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#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix:   | EVS Environment Consult<br>TBT Bloaccumulation<br>Tissue | ants               |                  |                               | Dat<br>Dat<br>Date | ice Request:<br>e Collected:<br>te Reccived:<br>e Extracted:<br>e Analyzed: | 8/26/98<br>10/13/98<br>NA |
|-----------------------------------------|----------------------------------------------------------|--------------------|------------------|-------------------------------|--------------------|-----------------------------------------------------------------------------|---------------------------|
|                                         |                                                          |                    | Duplicate Summar | у                             |                    |                                                                             |                           |
| Sample Name:<br>Lab Code:<br>Test Notes | EVS-Mac-TBT-15<br>K9807071-018                           |                    |                  |                               |                    | Units:<br>Basis:                                                            | PERCENT<br>Wet            |
| Analyte                                 | Prep<br>Method                                           | Analysis<br>Method | Sample<br>Result | Duplicate<br>Sample<br>Result | Average            | Relative<br>Percent<br>Difference                                           | Result<br>Notes           |
| Solid, Total                            | NA                                                       | Freeze Dry         | 14 7             | 14 8                          | 14.8               | <1                                                                          |                           |

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#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix:                           | EVS Environment Consult<br>TBT Bioaccumulation<br>Tissue | ants               |                                  |                               | Dat<br>Dat<br>Date | ice Request:<br>e Collected:<br>te Received:<br>e Extracted:<br>c Analyzed: | 8/26/98<br>10/13/98<br>NA |
|-----------------------------------------------------------------|----------------------------------------------------------|--------------------|----------------------------------|-------------------------------|--------------------|-----------------------------------------------------------------------------|---------------------------|
|                                                                 |                                                          |                    | Duplicate Summar<br>Total Metals | у                             |                    |                                                                             |                           |
| Sample Name<br>Lab Code <sup>.</sup><br>Test Notes <sup>.</sup> | EVS-Mac-TBT-15<br>K9807071-018                           |                    |                                  |                               |                    | Units<br>Basis <sup>.</sup>                                                 | PERCENT<br>Wet            |
| Analyte                                                         | Prep<br>Method                                           | Analysis<br>Method | Sample<br>Result                 | Duplicate<br>Sample<br>Result | Average            | Relative<br>Percent<br>Difference                                           | Result<br>Notes           |
| Solıd, Total                                                    | NA                                                       | Freeze Dry         | 14 7                             | 14 8                          | 14 8               | <1                                                                          |                           |

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#### QA/QC Report

| Cliei<br>Proj<br>Sam |                           | EVS Environment Consu<br>TBT Bioaccumulation<br>Tissue | ltants             | Dat<br>Da<br>Dat  | K9807071<br>8/26/98<br>10/13/98<br>NA<br>11/1/98 |         |                                   |                 |
|----------------------|---------------------------|--------------------------------------------------------|--------------------|-------------------|--------------------------------------------------|---------|-----------------------------------|-----------------|
|                      |                           |                                                        |                    | Duplicate Summary | 1                                                |         |                                   |                 |
| Lab                  | ple Name<br>Code<br>Notes | EVS-Mac-TBT-15<br>K9807071-018                         |                    |                   |                                                  |         | Units<br>Basis                    |                 |
| Ana                  | lyte                      | Prep<br>Method                                         | Analysis<br>Method | Sample<br>Result  | Duplicate<br>Sample<br>Result                    | Average | Relative<br>Percent<br>Difference | Result<br>Notes |
| Solid                | l, Total                  | NA                                                     | Freeze Dry         | 14 7              | 14 8                                             | 14 8    | <1                                |                 |

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#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix:                | EVS Environment Consult<br>TBT Bioaccumulation<br>Tissue |                    | Dat<br>Dat<br>Dat | ice Request:<br>e Collected:<br>te Received:<br>e Extracted:<br>e Analyzed: | 10/10/98<br>10/13/98<br>NA |                                   |                 |
|------------------------------------------------------|----------------------------------------------------------|--------------------|-------------------|-----------------------------------------------------------------------------|----------------------------|-----------------------------------|-----------------|
|                                                      |                                                          |                    | Duplicate Summar  | у                                                                           |                            |                                   |                 |
| Sample Name:<br>Lab Code:<br>Test Notcs <sup>.</sup> | EVS-Mac-TBT-26<br>K9807071-026                           |                    |                   |                                                                             |                            | Units:<br>Basis:                  | PERCENT<br>Wet  |
| Analyte                                              | Prep<br>Method                                           | Analysis<br>Method | Sample<br>Result  | Duplicate<br>Sample<br>Result                                               | Average                    | Relative<br>Percent<br>Difference | Result<br>Notes |
| Solid, Total                                         | NA                                                       | Freeze Dry         | 14.9              | 14 7                                                                        | 14 8                       | 1                                 |                 |

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|                                                     |                                                              |                    | QA/QC Report                      |                                                                                            |         |                                   |                            |
|-----------------------------------------------------|--------------------------------------------------------------|--------------------|-----------------------------------|--------------------------------------------------------------------------------------------|---------|-----------------------------------|----------------------------|
| Client:<br>Project:<br>Sample Matrix:               | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                    |                                   | Service Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: |         |                                   | 10/10/98<br>10/13/98<br>NA |
|                                                     |                                                              |                    | Duplicate Summary<br>Total Metals |                                                                                            |         |                                   |                            |
| Sample Name <sup>.</sup><br>Lab Code<br>Test Notes: | EVS-Mac-TBT-26<br>K9807071-026                               |                    |                                   |                                                                                            |         | Units<br>Basis                    | PERCENT<br>Wet             |
| Analyte                                             | Prep<br>Method                                               | Analysis<br>Method | Sample<br>Result                  | Duplicate<br>Sample<br>Result                                                              | Average | Relative<br>Percent<br>Difference | Result<br>Notes            |
| Solıd, Total                                        | NA                                                           | Freeze Dry         | 14 9                              | 14 7                                                                                       | 14 8    | 1                                 |                            |

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#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment ConsultantsService RequestTBT BioaccumulationDate CollectedTissueDate ReceivedDate ExtractedDate ExtractedDate AnalyzedDate Analyzed |                    |                  |                               |         | te Collected:<br>te Received:<br>e Extracted: | 10/10/98<br>10/13/98<br>NA |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------|-------------------------------|---------|-----------------------------------------------|----------------------------|
|                                       |                                                                                                                                                      | Du                 | plicate Summar   | У                             |         |                                               |                            |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-26<br>K9807071-026                                                                                                                       |                    |                  |                               |         | Units<br>Basis                                | PERCENT<br>Wet             |
| Analyte                               | Prep<br>Method                                                                                                                                       | Analysis<br>Method | Sample<br>Result | Duplicate<br>Sample<br>Result | Average | Relative<br>Percent<br>Difference             | Result<br>Notes            |
| Solid, Total                          | NA                                                                                                                                                   | Freeze Dry         | 14 9             | 14 7                          | 14 8    | 1                                             |                            |

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### QA/QC Report

| Client:<br>Project:<br>Sample Matrix:    | EVS Environment Consult<br>TBT Bioaccumulation<br>Tissue | ants               |                  | Dat<br>Dat<br>Date            | ice Request:<br>e Collected:<br>te Received:<br>e Extracted:<br>e Analyzed: | 10/10/98<br>10/13/98<br>NA        |                 |
|------------------------------------------|----------------------------------------------------------|--------------------|------------------|-------------------------------|-----------------------------------------------------------------------------|-----------------------------------|-----------------|
|                                          |                                                          |                    | Duplicate Summar | у                             |                                                                             |                                   |                 |
| Sample Name:<br>Lab Code:<br>Test Notes. | EVS-Mac-TBT-37<br>K9807071-035                           |                    |                  |                               |                                                                             | Units:<br>Basis <sup>.</sup>      | PERCENT<br>Wet  |
| Analyte                                  | Prep<br>Method                                           | Analysis<br>Method | Sample<br>Result | Duplicate<br>Sample<br>Result | Average                                                                     | Relative<br>Percent<br>Difference | Result<br>Notes |
| Solid, Total                             | NA                                                       | Freeze Dry         | 15 5             | 156                           | 156                                                                         | <1                                |                 |

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### QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consulta<br>TBT Bioaccumulation<br>Tissue | ants               |                                  |                               | Dat<br>Dat<br>Date | ice Request:<br>e Collected:<br>te Received:<br>e Extracted:<br>e Analyzed: | 10/10/98<br>10/13/98<br>NA |
|---------------------------------------|-----------------------------------------------------------|--------------------|----------------------------------|-------------------------------|--------------------|-----------------------------------------------------------------------------|----------------------------|
|                                       |                                                           |                    | Duplicate Summar<br>Total Metals | y                             |                    |                                                                             |                            |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-37<br>K9807071-035                            |                    |                                  |                               |                    | Units<br>Basis                                                              | PERCENT<br>Wet             |
| Analyte                               | Prep<br>Method                                            | Analysis<br>Method | Sample<br>Result                 | Duplicate<br>Sample<br>Result | Average            | Relative<br>Percent<br>Difference                                           | Result<br>Notes            |
| Solid, Total                          | NA                                                        | Freeze Dry         | 15 5                             | 156                           | 156                | <1                                                                          |                            |

#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consul<br>TBT Bioaccumulation<br>Tissue | tants              |                   | Dat<br>Da<br>Date             | ice Request:<br>ce Collected:<br>te Received:<br>e Extracted:<br>ce Analyzed: | 10/10/98<br>10/13/98<br>NA        |                 |
|---------------------------------------|---------------------------------------------------------|--------------------|-------------------|-------------------------------|-------------------------------------------------------------------------------|-----------------------------------|-----------------|
|                                       |                                                         |                    | Duplicate Summary |                               |                                                                               |                                   |                 |
| Sample Name<br>Lab Code<br>Test Notes | EVS-Mac-TBT-37<br>K9807071-035                          |                    |                   |                               |                                                                               | Units<br>Basis                    | PERCENT<br>Wet  |
| Analyte                               | Prep<br>Method                                          | Analysis<br>Method | Sample<br>Result  | Duplicate<br>Sample<br>Result | Average                                                                       | Relative<br>Percent<br>Difference | Result<br>Notes |
| Solid, Total                          | NA                                                      | Freeze Dry         | 15 5              | 15 6                          | 156                                                                           | <1                                |                 |

Approved By \_\_\_\_\_ Date \_\_\_\_

Date \_\_\_\_\_

# QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consulta<br>TBT Bioaccumulation<br>Tissue | nts                |                  |                               | Dat<br>Dat<br>Date | ice Request:<br>c Collected:<br>te Received:<br>e Extracted:<br>c Analyzed: | 10/10/98<br>10/13/98<br>NA | ŗ |
|---------------------------------------|-----------------------------------------------------------|--------------------|------------------|-------------------------------|--------------------|-----------------------------------------------------------------------------|----------------------------|---|
|                                       |                                                           |                    | Duplicate Summar | y                             |                    |                                                                             |                            |   |
|                                       |                                                           |                    |                  |                               |                    |                                                                             |                            | ~ |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-38<br>K9807071-068                            |                    |                  |                               |                    | Units:<br>Basis <sup>.</sup>                                                | PERCENT<br>Wet             | , |
| Analyte                               | Prep<br>Method                                            | Analysis<br>Method | Sample<br>Result | Duplicate<br>Sample<br>Result | Average            | Relative<br>Percent<br>Difference                                           | <b>Result</b><br>Notes     |   |
| Solid, Total                          | NA                                                        | Freeze Dry         | 17.8             | 18.0                          | 179                | 1                                                                           |                            | ' |

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|----------------|-------------------------|------------|-------------------|-----------|---------|--------------|----------|
| Client:        | EVS Environment Consult | ants       |                   |           | Servi   | ice Request: | K9807071 |
| Project:       | TBT Bioaccumulation     |            |                   |           | Dat     | e Collected: | 10/10/98 |
| Sample Matrix: | Tissue                  |            |                   |           | Dat     | te Received: | 10/13/98 |
|                |                         |            |                   |           | Date    | e Extracted: | NA       |
|                |                         |            |                   |           | Dat     | e Analyzed:  | 11/1/98  |
|                |                         |            | Duplicate Summary |           |         |              |          |
|                |                         |            | Total Metals      |           |         |              |          |
| Sample Name    | EVS-NEP-TBT-38          |            |                   |           |         | Units:       | PERCENT  |
| Lab Code       | K9807071-068            |            |                   |           |         | Basis:       | Wet      |
| Test Notes     |                         |            |                   |           |         |              |          |
|                |                         |            |                   | Duplicate |         | Relative     |          |
|                | Prep                    | Analysis   | Sample            | Sample    |         | Percent      | Result   |
| Analyte        | Method                  | Method     | Result            | Result    | Average | Difference   | Notes    |
| Solid, Total   | NA                      | Freeze Dry | 17 8              | 180       | 179     | 1            |          |

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### COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consul<br>TBT Bioaccumulation<br>Tissue | ltants             |                  |                               | Da<br>Da<br>Dat | rice Request:<br>te Collected:<br>ite Received:<br>te Extracted:<br>te Analyzed: | 10/10/98<br>10/13/98<br>NA | <u>ور</u>    |
|---------------------------------------|---------------------------------------------------------|--------------------|------------------|-------------------------------|-----------------|----------------------------------------------------------------------------------|----------------------------|--------------|
|                                       |                                                         |                    | Duplicate Summar | y                             |                 |                                                                                  |                            | Ĩ            |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-38<br>K9807071-068                          |                    |                  |                               |                 | Units<br>Basis                                                                   | PERCENT<br>Wet             | r.           |
| Analyte                               | Prep<br>Method                                          | Analysis<br>Method | Sample<br>Result | Duplicate<br>Sample<br>Result | Average         | Relative<br>Percent<br>Difference                                                | Result<br>Notes            | l            |
| Calud Tatal                           | N14                                                     | France Der         | 17 0             | 18.0                          | 17.0            | ,                                                                                |                            | <b>د</b> . ا |

NA

Freeze Dry 17.8 18.0 17.9 1

Approved By \_\_\_\_\_ Date \_\_\_\_\_ DUP/052595

#### QA/QC Report

| Client:                 | EVS Envi       | romnent Consultants | ;                  | Sei             | rvice Request: | K9807071        |
|-------------------------|----------------|---------------------|--------------------|-----------------|----------------|-----------------|
| Project:                | TBT Bioa       | ccumulation         |                    | D               | ate Collected: | 8/26 - 10/10/98 |
| Sample Matrix:          | Tissue         |                     |                    | E               | Date Received: | 10/13/98        |
|                         |                |                     |                    | Đ               | ate Extracted: | 11/3/98         |
|                         |                |                     |                    | D               | ate Analyzed:  | 11/6 - 7/98     |
|                         |                |                     | Surrogate Recovery | ' Summary       |                |                 |
|                         |                |                     | Butyltins          |                 |                |                 |
| Dren Mathad             | <b>b f f d</b> |                     |                    |                 | Linda          | DEDAENTE        |
| Prep Method             | Method         |                     |                    |                 | Units          | PERCENT         |
| Analysis Method Butylti |                | GC                  |                    |                 | Basis          | NA              |
|                         |                |                     | Test               | Percent         | Recovery       |                 |
| Sample Name             |                | Lab Code            | Notes              | Tr1-n-propyltin | Tri-n-pen      | ityltin         |
| Rep1-EVS-TBT-Mac        | oma Bkgd       | K9807071-001        |                    | 61              | 67             | ,               |
| Rep2-EVS-TBT-Mac        | oma Bkgd       | K9807071-002        |                    | 88              | 87             | ,               |
| Rep3-EVS-TBT-Mac        | oma Bkgd       | K9807071-003        |                    | 61              | 66             |                 |
| Rep4-EVS-TBT-Mac        | oma Bkgd       | K9807071-004        |                    | 63              | 56             |                 |
| Rep5-EVS-TBT-Mac        | oma Bkgd       | K9807071-005        |                    | 72              | 65             |                 |
| EVS-Mac-TBT-2           |                | K9807071-006        |                    | 84              | 61             |                 |

CAS Acceptance Limits

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59

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EVS-Mac-TBT-3

EVS-Mac-TBT-5

EVS-Mac-TBT-7

EVS-Mac-TBT-8

EVS-Mac-TBT-9

EVS-Mac-TBT-10

EVS-Mac-TBT-11

EVS-Mac-TBT-12

EVS-Mac-TBT-13

EVS-Mac-TBT-14

EVS-Mac-TBT-15

EVS-Mac-TBT-17

EVS-Mac-TBT-18

EVS-Mac-TBT-4

EVS-Mac-TBT-4

Method Blank

Lab Control Sample

Outside acceptance limits, see case narrative

K9807071-007

K9807071-009

K9807071-010

K9807071-011

K9807071-012

K9807071-013

K9807071-014

K9807071-015

K9807071-016

K9807071-017

K9807071-018

K9807071-019

K9807071-020

K981103-LCS

K981103-MB

K9807071-008MS

K9807071-008DMS

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Last Date 11/17/98

Approved By SUR2/111397p 07071SVG BJ2 - SUR2 11/17/98

### QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue | Surrogate Recover | y Summary       | Service Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 10/10/98<br>10/13/98<br>11/5/98 |
|---------------------------------------|--------------------------------------------------------------|-------------------|-----------------|--------------------------------------------------------------------------------------------|---------------------------------|
|                                       |                                                              | Butyltin          | S               |                                                                                            |                                 |
| Prep Method                           | Method                                                       |                   |                 | Units                                                                                      | PERCENT                         |
| Analysis Method                       | Butyltins-GC                                                 |                   |                 | Basis                                                                                      |                                 |
|                                       |                                                              | Test              | Deve            | - 4 D                                                                                      |                                 |
| Sample Name                           | Lab Code                                                     | Notes             | Tri-n-propyltin | nt Recovery<br>Tri-n-pen                                                                   | tvltm                           |
| <b>-</b>                              |                                                              |                   |                 |                                                                                            |                                 |
| EVS-Mac-TBT-4                         | K9807071-008                                                 |                   | 109             | 81                                                                                         |                                 |
| EVS-Mac-TBT-19                        | K9807071-021                                                 |                   | 118             | 82                                                                                         |                                 |
| EVS-Mac-TBT-20                        | K9807071-022                                                 |                   | 92              | 74                                                                                         |                                 |
| EVS-Mac-TBT-22                        | K9807071-023                                                 |                   | 118             | 80                                                                                         |                                 |
| EVS-Mac-TBT-23                        | K9807071-024                                                 |                   | 117             | 82                                                                                         |                                 |
| EVS-Mac-TBT-25                        | K9807071-025                                                 |                   | 82              | 67                                                                                         |                                 |
| EVS-Mac-TBT-26                        | K9807071-026                                                 |                   | 98              | 83                                                                                         |                                 |
| EVS-Mac-TBT-27                        | K9807071-027                                                 |                   | 85              | 62                                                                                         |                                 |
| EVS-Mac-TBT-28                        | K9807071-028                                                 |                   | 100             | 75                                                                                         |                                 |
| EVS-Mac-TBT-29                        | K9807071-029                                                 |                   | 90              | 72                                                                                         |                                 |
| EVS-Mac-TBT-30                        | K9807071-030                                                 |                   | 94              | 67                                                                                         |                                 |
| EVS-Mac-TBT-31                        | K9807071-031                                                 |                   | 83              | 71                                                                                         |                                 |
| EVS-Mac-TBT-32                        | K9807071-032                                                 |                   | 89              | 91                                                                                         |                                 |
| EVS-Mac-TBT-34                        | K9807071-033                                                 |                   | 83              | 67                                                                                         |                                 |
| EVS-Mac-TBT-36                        | K9807071-034                                                 |                   | 90              | 83                                                                                         |                                 |
| EVS-Mac-TBT-37                        | K9807071-035                                                 |                   | 82              | 67                                                                                         |                                 |
| EVS-Mac-TBT-38                        | K9807071-036                                                 |                   | 107             | 80                                                                                         |                                 |
| EVS-Mac-TBT-42                        | K9807071-037                                                 |                   | 102             | 81                                                                                         |                                 |
| EVS-NEP-TBT-2                         | K9807071-038                                                 |                   | 92              | 102                                                                                        |                                 |
| EVS-NEP-TBT-3                         | K9807071-039                                                 |                   | 102             | 111                                                                                        |                                 |
| EVS-Mac-TBT-25                        | K9807071-025MS                                               |                   | 103             | 86                                                                                         |                                 |
| EVS-Mac-TBT-25                        | K9807071-025DMS                                              |                   | 87              | 81                                                                                         |                                 |
| Lab Control Sample                    | K981105-LCS                                                  |                   | 69              | 37                                                                                         |                                 |
| Method Blank                          | K981105-MB                                                   |                   | 73              | 54                                                                                         |                                 |

CAS Acceptance Limits

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#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix:        | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue | Sumogoto Decessory                | Supprove        | Service Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 10/10/98<br>10/13/98<br>11/10/98 |
|----------------------------------------------|--------------------------------------------------------------|-----------------------------------|-----------------|--------------------------------------------------------------------------------------------|----------------------------------|
|                                              |                                                              | Surrogate Recovery S<br>Butyltins | Summary         |                                                                                            |                                  |
| Prep Method.<br>Analysis Method <sup>.</sup> | Method<br>Butyltins-GC                                       |                                   |                 | Units<br>Basis                                                                             | PERCENT<br>NA                    |
|                                              |                                                              | Test                              | Perce           | nt Recovery                                                                                |                                  |
| Sample Name                                  | Lab Code                                                     | Notes                             | Trı-n-propyltın | Tri-n-pent                                                                                 | tyltın                           |
| EVS-NEP-TBT-4                                | K9807071-040                                                 |                                   | 115             | 85                                                                                         |                                  |
| EVS-NEP-TBT-5                                | K9807071-041                                                 |                                   | 123             | 108                                                                                        |                                  |
| EVS-NEP-TBT-7                                | K9807071-042                                                 |                                   | 125             | 93                                                                                         |                                  |
| EVS-NEP-TBT-8                                | K9807071-043                                                 |                                   | 127             | 100                                                                                        |                                  |
| EVS-NEP-TBT-9                                | K9807071-044                                                 |                                   | 127             | 94                                                                                         |                                  |
| EVS-NEP-TBT-10                               | K9807071-045                                                 |                                   | 104             | 87                                                                                         |                                  |
| EVS-NEP-TBT-11                               | K9807071-046                                                 |                                   | 110             | 97                                                                                         |                                  |
| EVS-NEP-TBT-12                               | K9807071-047                                                 |                                   | 118             | 92                                                                                         |                                  |
| EVS-NEP-TBT-13                               | K9807071-048                                                 |                                   | 115             | 95                                                                                         |                                  |
| EVS-NEP-TBT-14                               | K9807071-049                                                 |                                   | 109             | 94                                                                                         |                                  |
| EVS-NEP-TBT-15                               | K9807071-050                                                 |                                   | 131             | 100                                                                                        |                                  |
| EVS-NEP-TBT-17                               | K9807071-051                                                 |                                   | 111             | 89                                                                                         |                                  |
| EVS-NEP-TBT-18                               | K9807071-052                                                 |                                   | 109             | 87                                                                                         |                                  |
| EVS-NEP-TBT-19                               | K9807071-053                                                 |                                   | 113             | 103                                                                                        |                                  |
| EVS-NEP-TBT-20                               | K9807071-054                                                 |                                   | 123             | 101                                                                                        |                                  |
| EVS-NEP-TBT-22                               | K9807071-055                                                 |                                   | 110             | 88                                                                                         |                                  |
| EVS-NEP-TBT-23                               | K9807071-056                                                 |                                   | 117             | 91                                                                                         |                                  |
| EVS-NEP-TBT-25                               | K9807071-057                                                 |                                   | 118             | 87                                                                                         |                                  |
| EVS-NEP-TBT-26                               | K9807071-058                                                 |                                   | 119             | 89                                                                                         |                                  |
| EVS-NEP-TBT-27                               | K9807071-059                                                 |                                   | 117             | 89                                                                                         |                                  |
| EVS-NEP-TBT-28                               | K9807071-060                                                 |                                   | 107             | 80                                                                                         |                                  |
| EVS-NEP-TBT-12                               | K9807071-047MS                                               |                                   | 94              | 84                                                                                         |                                  |
| EVS-NEP-TBT-12                               | K9807071-047DMS                                              |                                   | 110             | 81                                                                                         |                                  |
| Lab Control Sample                           | K981110-LCS                                                  |                                   | 51              | 11                                                                                         | A                                |
| Method Blank                                 | K981110-MB                                                   |                                   | 106             | 108                                                                                        |                                  |
|                                              | CA                                                           | S Acceptance Limits               | 13-176          | 32-16                                                                                      | 7                                |

Outside acceptance limits, see case narrative

Data Validated-EPA Level I Quality by Design TD 12/21/78 12/21/98 Unt Date 1/19/98

Approved By: \_

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SUR2/111397p 07071SVG JGI - SUR2 11/19/98

# QA/QC Report

|                                                | vironment Consultants<br>naccumulation | Surrogate Recover<br>Butyltır | I<br>D<br>ry Summary     | ervice Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 8/26 - 10/10/98<br>10/13/98<br>11/13/98 |
|------------------------------------------------|----------------------------------------|-------------------------------|--------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------|
| Prep Method Method<br>Analysis Method Butyltin | s-GC                                   |                               |                          | Units<br>Basis <sup>.</sup>                                                               | PERCENT<br>NA                           |
| Sample Name                                    | Lab Code                               | Test<br>Notes                 | Регсепt<br>Гн-n-propyltm | <b>R c c o v e r y</b><br>Tri-n-pen                                                       | tyltın                                  |
| EVS-NEP-TBT-29                                 | K9807071-061                           |                               | 105                      | 99                                                                                        |                                         |
| EVS-NEP-TBT-30                                 | K9807071-062                           |                               | 141                      | 113                                                                                       |                                         |
| EVS-NEP-TBT-31                                 | K9807071-063                           |                               | 119                      | 113                                                                                       |                                         |
| EVS-NEP-TBT-32                                 | K9807071-064                           |                               | 112                      | 105                                                                                       |                                         |
| EVS-NEP-TBT-34                                 | K9807071-065                           |                               | 130                      | 117                                                                                       |                                         |
| EVS-NEP-TBT-36                                 | K9807071-066                           |                               | 115                      | 97                                                                                        |                                         |
| EVS-NEP-TBT-37                                 | K9807071-067                           |                               | 123                      | 98                                                                                        |                                         |
| EVS-NEP-TBT-38                                 | K9807071-068                           |                               | 145                      | 114                                                                                       |                                         |
| EVS-NEP-TBT-42                                 | K9807071-069                           |                               | 118                      | 104                                                                                       |                                         |
| Rep1-EVS-TBT-Nepthys Bkgc                      | K9807071-070                           |                               | 119                      | 114                                                                                       |                                         |
| Rep2-EVS-TBT-Nepthys Bkgc                      | K9807071-071                           |                               | 127                      | 117                                                                                       |                                         |
| Rep3-EVS-TBT-Nepthys Bkgc                      | K9807071-072                           |                               | 123                      | 107                                                                                       |                                         |
| Rep4-EVS-TBT-Nepthys Bkgc                      | K9807071-073                           |                               | 117                      | 115                                                                                       |                                         |
| Rep5-EVS-TBT-Nepthys Bkgc                      | K9807071-074                           |                               | 117                      | 117                                                                                       |                                         |
| EVS-NEP-TBT-37                                 | K9807071-067MS                         |                               | 200                      | 87                                                                                        |                                         |
| EVS-NEP-TBT-37                                 | K9807071-067DMS                        |                               | 107                      | 79                                                                                        |                                         |
| Lab Control Sample                             | K981113-LCS                            |                               | 65                       | .32                                                                                       |                                         |
| Method Blank                                   | K981113-MB                             |                               | 102                      | 92                                                                                        |                                         |

CAS Acceptance Limits

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#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix:              | EVS Environn<br>TBT Bioaccun<br>Tissue           | nent Consultants<br>nulation | 5       |            |                |                       |                    |                      |                    | Dat<br>Da<br>Dat | ice Request:<br>te Collected:<br>te Received:<br>e Extracted:<br>te Analyzed: | 8/26/98<br>10/13/98<br>11/3/98    |                 |
|----------------------------------------------------|--------------------------------------------------|------------------------------|---------|------------|----------------|-----------------------|--------------------|----------------------|--------------------|------------------|-------------------------------------------------------------------------------|-----------------------------------|-----------------|
| -<br>1                                             |                                                  | М                            | atrix S | pıke/I     | -              | e Matrix S<br>tyltins | Spike Su           | mmary                |                    |                  |                                                                               |                                   |                 |
| Sample Name<br>Lab Code <sup>.</sup><br>Fest Notes | EVS-Mac-TBT-4<br>K9807071-008MS, K9807071-008DMS |                              |         |            |                |                       |                    | Units.<br>Basis.     | ug/Kg (ppb)<br>Wct |                  |                                                                               |                                   |                 |
| 1                                                  |                                                  |                              |         |            |                |                       |                    |                      | Pero               | c e n t          | Recover                                                                       |                                   |                 |
| Analyte                                            | Prep<br>Method                                   | Analysis<br>Method           | MRL     | Spik<br>MS | e Level<br>DMS | Sample<br>Result      | <b>Spike</b><br>MS | <b>Result</b><br>DMS | MS                 | DMS              | CAS<br>Acceptance<br>Limits                                                   | Relative<br>Percent<br>Difference | Result<br>Notes |
| Tri-n-butyltin                                     | Method                                           | Butyltins-GC                 | 2       | 50         | 50             | 380                   | 81                 | 101                  | NC                 | NC               | 10-206                                                                        | -                                 |                 |

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### QA/QC Report

| Client:<br>Project:<br>Sample Matrix:   |                           | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |          |        |                |                       |                    |               |      | Da<br>Da<br>Dat | ice Request:<br>te Collected:<br>te Received:<br>e Extracted:<br>te Analyzed: | 10/10/98<br>10/13/98<br>11/5/98 |                 |         |
|-----------------------------------------|---------------------------|--------------------------------------------------------------|----------|--------|----------------|-----------------------|--------------------|---------------|------|-----------------|-------------------------------------------------------------------------------|---------------------------------|-----------------|---------|
|                                         |                           | Μ                                                            | fatrix S | pıke/I | -              | e Matrix S<br>tyltins | pike Su            | mmary         |      |                 |                                                                               |                                 |                 |         |
| Sample Name:<br>Lab Code.<br>Test Notes | EVS-Mac-TB<br>K9807071-02 |                                                              | K9807    | 7071-0 | 25DMS          | 1                     |                    |               |      |                 | Units <sup>.</sup><br>Basis.                                                  | ug/Kg (ppb)<br>Wet              |                 |         |
|                                         | ,                         |                                                              |          |        |                |                       |                    |               | Pero | c e n t         | Recover:<br>CAS                                                               | y<br>Relative                   |                 | <b></b> |
| Analyte                                 | Prep<br>Method            | Analysis<br>Method                                           | MRL      | •      | e Level<br>DMS | Sample<br>Result      | <b>Spike</b><br>MS | Result<br>DMS | MS   | DMS             | Acceptance<br>Limits                                                          | Percent<br>Difference           | Result<br>Notes | -       |
| Trı-n-butyltın                          | Method                    | Butyltins-GC                                                 | 20       | 49     | 49             | 132                   | 130                | 183           | NC   | NC              | 10-206                                                                        | -                               |                 |         |

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#### QA/QC Report

| Client:                             | EVS Environn | nent Consultants | 5        |        |          |            |         |        |      | Serv | ice Request:  | K9807071    |        |
|-------------------------------------|--------------|------------------|----------|--------|----------|------------|---------|--------|------|------|---------------|-------------|--------|
| Project:                            | TBT Bioaccur | nulation         |          |        |          |            |         |        |      | Da   | te Collected: | 10/10/98    |        |
| Sample Matrix:                      | Tissue       |                  |          |        |          |            |         |        |      | Da   | te Received:  | 10/13/98    |        |
|                                     |              |                  |          |        |          |            |         |        |      | Dat  | e Extracted:  | 11/10/98    |        |
|                                     |              |                  |          |        |          |            |         |        |      | Da   | te Analyzed:  | 11/14/98    |        |
| -                                   |              | М                | latrix S | pike/I | Juplicat | e Matrix S | pike Su | mmary  |      |      |               |             |        |
|                                     |              |                  |          |        | But      | yltins     |         |        |      |      |               |             |        |
| Sample Name.                        | EVS-NEP-TB   | T-12             |          |        |          |            |         |        |      |      | Units:        | ug/Kg (ppb) |        |
| Lab Code <sup>.</sup><br>Test Notes | K9807071-04  | 7MS,             | K9807    | 7071-0 | 47DMS    |            |         |        |      |      | Basis:        | Wet         |        |
|                                     |              |                  |          |        |          |            |         |        | Pere | cent | Recover       | y           |        |
|                                     |              |                  |          |        |          |            |         |        |      |      | CAS           | Relative    |        |
|                                     | Ргер         | Analysis         |          | Spik   | e Level  | Sample     | Spike   | Result |      |      | Acceptance    | Percent     | Result |
| Analyte                             | Method       | Method           | MRL      | MS     | DMS      | Result     | MS      | DMS    | MS   | DMS  | Limits        | Difference  | Notes  |
| Trı-n-butyltın                      | Method       | Butyltins-GC     | 2        | 88     | 130      | 71         | 151     | 178    | 91   | 82   | 10-206        | 10          |        |

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LAL Date: 11/30/92

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Approved By<sup>.</sup>

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### QA/QC Report

| Client:<br>Project <sup>.</sup><br>Sample Matrix: | EVS Environr<br>TBT Bioaccur<br>Tissue | nent Consultant.<br>nulation | S        |        |                |                       |             |                      |      | Da<br>Da<br>Dat | tice Request:<br>te Collected:<br>te Received:<br>e Extracted:<br>te Analyzed: | 10/10/98<br>10/13/98                   |                 |   |
|---------------------------------------------------|----------------------------------------|------------------------------|----------|--------|----------------|-----------------------|-------------|----------------------|------|-----------------|--------------------------------------------------------------------------------|----------------------------------------|-----------------|---|
|                                                   |                                        | М                            | fatrıx S | pıke/I | -              | e Matrıx S<br>syltıns | pike Su     | mmary                |      |                 |                                                                                |                                        |                 | , |
| Sample Name<br>Lab Code<br>Test Notes             | EVS-NEP-TB<br>K9807071-06              |                              | K9807    | 071-0  | 67DMS          |                       |             |                      |      |                 | Units<br>Basis                                                                 | ug/Kg (ppb)<br>Wet                     |                 | • |
| Analyte                                           | Prep<br>Method                         | Analysis<br>Method           | MRL      | -      | e Level<br>DMS | Sample<br>Result      | Spike<br>MS | <b>Result</b><br>DMS | Perc | ent<br>DMS      | Recovery<br>CAS<br>Acceptance<br>Limits                                        | y<br>Relative<br>Percent<br>Difference | Result<br>Notes | , |
| Tri-n-butyltin                                    | Method                                 | Butyltins-GC                 | 2        | 410    | 410            | 359                   | 768         | 750                  | 100  | 95              | 10-206                                                                         | 2                                      |                 |   |

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### QA/QC Report

|   | Client:<br>Project:<br>LCS Matrix: | EVS Environment Co<br>TBT Bioaccumulation<br>Tissue |        |                 |           |           | Da<br>Da<br>Da | vice Request:<br>ate Collected:<br>ate Received:<br>te Extracted:<br>ate Analyzed: | NA<br>NA<br>11/3/98 |
|---|------------------------------------|-----------------------------------------------------|--------|-----------------|-----------|-----------|----------------|------------------------------------------------------------------------------------|---------------------|
|   |                                    |                                                     |        | Laboratory Cont | rol Sampl | e Summary |                |                                                                                    | 11.0.70             |
|   |                                    |                                                     |        | Bı              | utyltins  |           |                |                                                                                    |                     |
| • | Sample Name                        | Lab Control Sample                                  |        |                 |           |           |                | Units                                                                              | ug/Kg (ppb)         |
|   | Lab Code                           | K981103-LCS                                         |        |                 |           |           |                | Basis.                                                                             | Wet                 |
|   | Test Notes                         |                                                     |        |                 |           |           |                |                                                                                    |                     |
|   |                                    |                                                     |        |                 |           |           |                | <b>C</b> + C                                                                       |                     |
|   |                                    |                                                     |        |                 |           |           |                | CAS                                                                                |                     |
|   |                                    |                                                     |        |                 |           |           |                | Percent                                                                            |                     |
|   |                                    |                                                     | Prep   | Analysis        | True      |           | Percent        | Recovery<br>Acceptance                                                             | Result              |
|   | Analyta                            |                                                     | Method | Method          | Value     | Result    | Recovery       | Limits                                                                             | Notes               |
|   | Analyte                            | 1                                                   | ACTION | Methou          | v aluc    | result    | ACCOVET y      | Limits                                                                             | Notes               |
|   | Trı-n-butyltın                     |                                                     | Method | Butyltins-GC    | 63        | 37        | 59             | 17-185                                                                             |                     |

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### QA/QC Report

| Client:<br>Project:<br>LCS Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                 |           |          | Da<br>D<br>Da | vice Request:<br>ate Collected:<br>ate Received:<br>te Extracted:<br>ate Analyzed: | NA<br>NA<br>11/5/98 |
|------------------------------------|--------------------------------------------------------------|-----------------|-----------|----------|---------------|------------------------------------------------------------------------------------|---------------------|
|                                    | I                                                            | Laboratory Cont | rol Sampl | e Summar | У             | -                                                                                  |                     |
|                                    |                                                              | B               | utyltıns  |          |               |                                                                                    |                     |
| Sample Name:                       | Lab Control Sample                                           |                 |           |          |               | Units                                                                              | ug/Kg (ppb)         |
| Lab Code<br>Test Notes             | K981105-LCS                                                  |                 |           |          |               | Basis                                                                              | Wet                 |
|                                    | Prep                                                         | Analysis        | True      |          | Percent       | CAS<br>Percent<br>Recovery<br>Acceptance                                           | Result              |
| Analyte                            | Method                                                       | Method          | Value     | Result   | Recovery      | Limits                                                                             | Notes               |
| Tn-n-butyltin                      | Method                                                       | Butyltins-GC    | 54        | 27       | 50            | 17-185                                                                             |                     |

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### QA/QC Report

| Client:<br>Project:<br>LCS Matrix: | EVS Environment Cons<br>TBT Bioaccumulation<br>Tissue | sultants |                 |          |           | Da<br>Da<br>Da | vice Request;<br>ate Collected;<br>ate Received;<br>te Extracted;<br>ate Analyzed; | NA<br>NA<br>11/10/98 |
|------------------------------------|-------------------------------------------------------|----------|-----------------|----------|-----------|----------------|------------------------------------------------------------------------------------|----------------------|
|                                    |                                                       |          | Laboratory Cont | rol Samp | le Summar |                | te i mai j zeu:                                                                    | 11115/20             |
|                                    |                                                       |          | •               | utyltins |           | ,              |                                                                                    |                      |
| Sample Name:                       | Lab Control Sample                                    |          |                 |          |           |                | Units:                                                                             | ug/Kg (ppb)          |
| Lab Code:<br>Test Notes:           | K981110-LCS                                           |          |                 |          |           |                | Basis:                                                                             |                      |
|                                    | г                                                     | Prep     | Analysis        | True     |           | Percent        | CAS<br>Percent<br>Recovery<br>Acceptance                                           | Result               |
| Analyte                            |                                                       | ethod    | Method          | Value    | Result    | Recovery       | Limits                                                                             | Notes                |
| Tri-n-butyltın                     | М                                                     | lethod   | Butyltins-GC    | 50       | 14        | 28             | 17-185                                                                             |                      |

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#### QA/QC Report

| Client:<br>Project:<br>LCS Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                 |            |           | Da<br>Da | vice Request:<br>nte Collected:<br>ate Received:<br>te Extracted:<br>nte Analyzed: | NA<br>NA<br>11/10/98 |
|------------------------------------|--------------------------------------------------------------|-----------------|------------|-----------|----------|------------------------------------------------------------------------------------|----------------------|
|                                    |                                                              | Laboratory Cont | trol Sampl | le Summar | у        | •                                                                                  |                      |
|                                    |                                                              | B               | utyltins   |           |          |                                                                                    |                      |
| Sample Name                        | Lab Control Sample                                           |                 |            |           |          | Units                                                                              | ug/Kg (ppb)          |
| Lab Code<br>Test Notes:            | K981110-LCS                                                  |                 |            |           |          | Basis:                                                                             | Dry                  |
|                                    |                                                              |                 |            |           |          | CAS                                                                                |                      |
|                                    |                                                              |                 |            |           |          | Percent                                                                            |                      |
|                                    |                                                              |                 |            |           |          | Recovery                                                                           |                      |
|                                    | Prep                                                         | Analysis        | True       |           | Percent  | Acceptance                                                                         | Result               |
| Analyte                            | Method                                                       | Method          | Value      | Result    | Recovery | Limits                                                                             | Notes                |
| Tri-n-butyltın                     | Method                                                       | Butyltins-GC    | 50         | 14        | 28       | 17-185                                                                             |                      |

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### QA/QC Report

| Client:<br>Project:<br>LCS Matrix: | EVS Environment Consultan<br>TBT Bioaccumulation<br>Tissue | ts                 |               |           | D:<br>D<br>Da       | vice Request:<br>ate Collected:<br>ate Received:<br>ate Extracted:<br>ate Analyzed: | NA<br>NA<br>11/10/98 |
|------------------------------------|------------------------------------------------------------|--------------------|---------------|-----------|---------------------|-------------------------------------------------------------------------------------|----------------------|
|                                    |                                                            | Laboratory Con     | trol Samp     | le Summar |                     |                                                                                     |                      |
|                                    |                                                            | В                  | utyltins      |           |                     |                                                                                     |                      |
| Sample Name                        | Lab Control Sample                                         |                    |               |           |                     | Units                                                                               | ug/Kg (ppb)          |
| Lab Code                           | K981110-LCS                                                |                    |               |           |                     | Basis                                                                               | Wet                  |
| Test Notes                         | #REF!                                                      |                    |               |           |                     |                                                                                     |                      |
|                                    | Deve                                                       | Australia          | Ture          |           | Dereset             | CAS<br>Percent<br>Recovery                                                          | Decili               |
| Analyte                            | Prep<br>Method                                             | Analysis<br>Method | True<br>Value | Result    | Percent<br>Recovery | Acceptance<br>Limits                                                                | Result<br>Notes      |
| Tn-n-butyltin                      | Method                                                     | Butyltins-GC       | 50            | 14        | 28                  | 17-185                                                                              |                      |

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### QA/QC Report

| Client:<br>Project:<br>LCS Matrix:               | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                 |            |          | Da<br>Da | vice Request:<br>ate Collected:<br>ate Received:<br>te Extracted:<br>ate Analyzed: | NA<br>NA<br>11/13/98 |
|--------------------------------------------------|--------------------------------------------------------------|-----------------|------------|----------|----------|------------------------------------------------------------------------------------|----------------------|
|                                                  | I                                                            | Laboratory Cont | trol Sampl | e Summar |          |                                                                                    |                      |
|                                                  |                                                              | B               | utyltıns   |          |          |                                                                                    |                      |
| Sample Name                                      | Lab Control Sample                                           |                 |            |          |          | Units                                                                              | ug/Kg (ppb)          |
| Lab Code <sup>.</sup><br>Test Notes <sup>.</sup> | K981113-LCS                                                  |                 |            |          |          | Basis                                                                              | Wet                  |
|                                                  | Prep                                                         | Analysis        | True       |          | Percent  | CAS<br>Percent<br>Recovery<br>Acceptance                                           | Result               |
| Analyte                                          | Method                                                       | Method          | Value      | Result   | Recovery | Limits                                                                             | Notes                |
| Tri-n-butyltin                                   | Method                                                       | Butyltins-GC    | 240        | 147      | 61       | 17-185                                                                             |                      |

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#### QA/QC Report

| Client:  | EVS Environment Consultants |
|----------|-----------------------------|
| Project: | TBT Bioaccumulation         |

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Service Request: K9807071 Calibration Date: 9/17/98 Date Analyzed: 11/6-7/98

#### Continuing Calibration Verification (CCV) Summary Butyltins Units: µg/L (ppb)

| Analyte        | True<br>Value |     | Percent<br>Recovery |     |     |     |     |     | Percent<br>Recovery |
|----------------|---------------|-----|---------------------|-----|-----|-----|-----|-----|---------------------|
| Tri-n-butyltın | 500           | 500 | 100                 | 555 | 111 | 577 | 115 | 564 | 113                 |

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### QA/QC Report

| Client:<br>Project: | EVS Environment Cor<br>TBT Bioaccumulation                                         | isultants      |                     |                | Calibra             | e Request:<br>ation Date:<br>Analyzed: |                     |                | -                   |   |
|---------------------|------------------------------------------------------------------------------------|----------------|---------------------|----------------|---------------------|----------------------------------------|---------------------|----------------|---------------------|---|
|                     | Continuing Calibration Verification (CCV) Summary<br>Butyltins<br>Units µg/L (ppb) |                |                     |                |                     |                                        |                     |                |                     | - |
| Analyte             | Truc<br>Value                                                                      | CCV1<br>Result | Percent<br>Recovery | CCV2<br>Result | Percent<br>Recovery | CCV3<br>Result                         | Percent<br>Recovery | CCV4<br>Result | Percent<br>Recovery | _ |
| Tri-n-butyltin      | 500                                                                                | 583            | 117                 | 578            | 116                 | 547                                    | 109                 | 568            | 114                 |   |

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### QA/QC Report

**EVS Environment Consultants** Client: Project: **TBT Bioaccumulation** 

Service Request: K9807071 Calibration Date: 9/17/98 Date Analyzed: 11/13/98

Continuing Calibration Verification (CCV) Summary Butyltins Units µg/L (ppb)

| Analyte        | True<br>Value |     | Percent<br>Recovery |     | Percent<br>Recovery |
|----------------|---------------|-----|---------------------|-----|---------------------|
| Tri-n-butyltın | 500           | 596 | 119                 | 598 | 120                 |

|                                                         | Data Vahdated-EPA Level I<br>Quality by Design |
|---------------------------------------------------------|------------------------------------------------|
| Approved By:                                            | CAT Date. 1/20/98                              |
| CCV 1-4/042795<br>07071SVG BJ1 - CCV 1-4 (DIL) 11/20/98 | Page No                                        |

### QA/QC Report

| Client:  | EVS Environment Consultants |
|----------|-----------------------------|
| Project: | TBT Bioaccumulation         |

Service Request: K9807071 Calibration Date: 9/17/98 Date Analyzed: 11/13-14/98

| Continuing Calibration Verification (CCV) Summary |  |  |  |  |  |  |  |
|---------------------------------------------------|--|--|--|--|--|--|--|
| Butyltins                                         |  |  |  |  |  |  |  |
| Units: µg/L (ppb)                                 |  |  |  |  |  |  |  |

| Analyte        | True<br>Value | CCV1<br>Result |     |     |     |     | Percent<br>Recovery |     | Percent<br>Recovery |  |
|----------------|---------------|----------------|-----|-----|-----|-----|---------------------|-----|---------------------|--|
|                | -00           | 557            |     | 590 | 116 | 570 | 116                 | 326 | 65                  |  |
| Tri-n-butyltin | 500           | 556            | 111 | 582 | 116 | 578 | 110                 | 520 | 05                  |  |

Data Validated-EPA Level I Quality by Design TP 12/21/48

At Date. 11 20 GY

Approved By. CCV 1-4/042795

07071SVG JG4 - CCV 1-4 11/20/98

### QA/QC Report

| Client:  | EVS Environment Consultants |
|----------|-----------------------------|
| Project: | TBT Bioaccumulation         |

Service Request: K9807071 Calibration Date: 9/17/98 Date Analyzed: 11/17/98

#### Continuing Calibration Verification (CCV) Summary Butyltins Units: µg/L (ppb)

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| Analyte        | True<br>Value | CCV1<br>Result | Percent<br>Recovery |     | Percent<br>Recovery |
|----------------|---------------|----------------|---------------------|-----|---------------------|
| Tri-n-butyltın | 500           | 420            | 84                  | 468 | 94                  |

|             | Data Validated-EPA Level I<br>Quality by Design                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|             | TP 12/2/198                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Approved By | $Date - \frac{1}{2} \frac{1}{$ |

07071SVG JG4 - CCV 1-4 (2) 11/20/98

# QA/QC Report

| Client:<br>Project: | EVS Environment Consultants<br>TBT Bioaccumulation |                                                                        | Calibr                          | ce Request:<br>ation Date:<br>Analyzed: |                |                     | 1 |
|---------------------|----------------------------------------------------|------------------------------------------------------------------------|---------------------------------|-----------------------------------------|----------------|---------------------|---|
|                     | Continuing                                         | Calibration Verification<br>Butyltins<br>Units <sup>.</sup> µg/L (ppb) |                                 |                                         |                | ,                   | I |
| Analyte             | True CCV1<br>Value Result                          | Percent CCV2<br>Recovery Result                                        | Percent CCV3<br>Recovery Result | Percent<br>Recovery                     | CCV4<br>Result | Percent<br>Recovery | ( |
| Tri-n-butyltin      | 500 531                                            | 106 545                                                                | 109 570                         | 114                                     | 569            | 114                 | , |
|                     |                                                    |                                                                        |                                 |                                         |                |                     | ^ |
|                     |                                                    |                                                                        |                                 |                                         |                |                     | - |
|                     |                                                    |                                                                        |                                 |                                         |                |                     | - |
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|                     |                                                    |                                                                        |                                 |                                         |                |                     | ļ |
|                     |                                                    |                                                                        |                                 |                                         |                | ,                   | ^ |
|                     |                                                    |                                                                        |                                 |                                         |                |                     | - |
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|                     |                                                    |                                                                        |                                 |                                         |                | ,                   |   |

Data Validated-EPA Level I Quality by Design

TP 12/21/98

Page No

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Date 11 19 94 iAI

Approved By

CCV 1-4/042795

070718VG JJ3 - CCV 1-4 11/20/98

### QA/QC Report

| Client:<br>Project: | EVS Environment Consultants<br>TBT Bioaccumulation |                                                  |                | Service Request:<br>Calibration Date:<br>Date Analyzed: | 9/17/98        |
|---------------------|----------------------------------------------------|--------------------------------------------------|----------------|---------------------------------------------------------|----------------|
|                     | Continuing C                                       | Calibration Blank<br>Butyltins<br>Units µg/L (pp |                |                                                         |                |
| Analyte             | · MRL                                              | CCB1<br>Result                                   | CCB2<br>Result | CCB3<br>Result                                          | CCB4<br>Result |
| Tri-n-butyltin      | n 10                                               | ND                                               | ND             | ND                                                      | · ND           |

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Data Vahdated-EPA Level I Quality by Design

TD 12/21/98 LAL Date. UZOLAN

07071SVG BJ2 - CCBMRL (1) 11/20/98

# QA/QC Report

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|---------------------|----------------------------------------------|--------------|--------------------------------------------------|---------------------|---------------------------------------------------------|-------------------------------------------------------|
| Client:<br>Project: | EVS Environment Consu<br>TBT Bioaccumulation | iltants      |                                                  |                     | Service Request:<br>Calibration Date:<br>Date Analyzed: | 9/17/98                                               |
|                     |                                              | Continuing C | alibratıon Blank<br>Butyltıns<br>Units: µg/L (pp | (CCB) Summary<br>b) |                                                         |                                                       |
| Analyte             |                                              | MRL          | CCB1<br>Result                                   | CCB2<br>Result      | CCB3<br>Result                                          | CCB4<br>Result                                        |
| Trı-n-butyltın      |                                              | 10           | ND                                               | ND                  | ND                                                      | ND                                                    |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
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|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     |                                                         |                                                       |
|                     |                                              |              |                                                  |                     | Data V<br>Qua<br>79                                     | alidated-EPA Level I<br>Ility by Design<br>D 12/21/98 |
| Approved By         |                                              |              |                                                  | Uny Date            | 11/20/58                                                |                                                       |
| 1&CCBMR1/120594     | 4RL (1) 11/20/98                             |              |                                                  |                     | L L                                                     | Page No                                               |

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### QA/QC Report

| Client:<br>Project: | EVS Environment Consultants<br>TBT Bioaccumulation |                                                   |                | Service Request:<br>Calibration Date:<br>Date Analyzed: | 9/17/98 |
|---------------------|----------------------------------------------------|---------------------------------------------------|----------------|---------------------------------------------------------|---------|
|                     | Continuing C                                       | alibration Blank<br>Butyltins<br>Units. μg/L (ppl |                |                                                         |         |
| Analyte             | MRL                                                | CCB1<br>Result                                    | CCB2<br>Result |                                                         |         |
| Trı-n-butyltin      | 10                                                 | ND                                                | ND             |                                                         |         |

Data Validated-EPA Level I Quality by Design  $T = \frac{12!2!}{98}$ Date:  $1 \sqrt{242!}$ 

Approved By \_\_\_\_\_

070718VG BJI - CCBMRL (DIL) 11/20/98

# QA/QC Report

| Client:<br>Project: | EVS Environment Con<br>TBT Bioaccumulation | sultants      |                                                     |                | Service Request:<br>Calibration Date:<br>Date Analyzed: | 9/17/98                                   |
|---------------------|--------------------------------------------|---------------|-----------------------------------------------------|----------------|---------------------------------------------------------|-------------------------------------------|
|                     |                                            | Continuing Ca | alibration Blank (<br>Butyltıns<br>Units: µg/L (ppl |                |                                                         |                                           |
| Analyte             |                                            | MRL           | CCB1<br>Result                                      | CCB2<br>Result | CCB3<br>Result                                          | CCB4<br>Result                            |
| Tri-n-butyltin      |                                            | 10            | ND                                                  | ND             | ND                                                      | ND                                        |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     |                |                                                         |                                           |
|                     |                                            |               |                                                     | /.             | Quality<br>TD                                           | ted-t:PA Level I<br>by Design<br>(2/2//78 |
| Approved By         |                                            |               |                                                     | Date.          |                                                         |                                           |
| 07071SVG JG4 - CCB  | MRL (1) 11/20/98                           |               |                                                     |                | (                                                       | 0 <b>0 1 1°6</b> ×°                       |

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### QA/QC Report

| Client:<br>Project: | EVS Environment Consultants<br>TBT Bioaccumulation                  | Service Request: K9807071<br>Calibration Date: 9/17/98<br>Date Analyzed: 11/17/98 |
|---------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|                     | Continuing Calibration Blank (CCE<br>Butyltins<br>Units: µg/L (ppb) | 3) Summary                                                                        |
| Analyte             | CCB1<br>MRL Result                                                  | CCB2<br>Result                                                                    |
| Trı-n-butyltın      | 10 ND                                                               | ND                                                                                |

Data Validated-EPA Level I Quality by Design  $TO \ 12/2/98$ LATAL Date:  $U \left( \frac{2}{2} \right) \left( \frac{2}{2} \right)$ 

Approved By. \_\_\_\_\_ i&CCBMRL/120594

07071SVG JG4 - CCEMRL (2) 11/20/98

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# QA/QC Report

| Client:<br>Project: | EVS Environment Cons<br>TBT Bioaccumulation | sultants     |                                 |                | Service Request:<br>Calibration Date:<br>Date Analyzed: | 9/17/98                                                 | [           |
|---------------------|---------------------------------------------|--------------|---------------------------------|----------------|---------------------------------------------------------|---------------------------------------------------------|-------------|
|                     |                                             | Continuing C | alibration Blank (<br>Butyltins |                |                                                         |                                                         |             |
|                     |                                             |              | Units: µg/L (ppb                | )              |                                                         |                                                         | -           |
| Analyte             |                                             | MRL          | CCB1<br>Result                  | CCB2<br>Result | CCB3<br>Result                                          | CCB4<br>Result                                          | _           |
| Tri-n-butyltin      |                                             | 10           | ND                              | ND             | ND                                                      | ND                                                      |             |
|                     |                                             |              |                                 |                |                                                         |                                                         | (           |
|                     |                                             |              |                                 |                |                                                         |                                                         |             |
|                     |                                             |              |                                 |                |                                                         |                                                         | , <b></b> - |
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|                     |                                             |              |                                 |                |                                                         |                                                         | -           |
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|                     |                                             |              |                                 |                |                                                         |                                                         | (           |
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|                     |                                             |              |                                 |                |                                                         |                                                         |             |
|                     |                                             |              |                                 |                |                                                         |                                                         |             |
|                     |                                             |              |                                 |                | Data<br>Qi                                              | Validated-EPA Level<br>uality by Design<br>TDB 12/21/98 |             |
| Approved By:        |                                             |              |                                 | Unit Date.     | 11/20/98                                                |                                                         | _           |
| &CCBMRL/120594      | MP1 (1) 11/70/08                            |              |                                 |                | l                                                       | Pags Non                                                |             |
| 07071SVG JJ3 - CCB  | MKL (I) [1/2W98                             |              |                                 |                |                                                         | 00118                                                   | -           |

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SAMPLE CUSTODY RECORD

Date 10/12/98

Page \_\_\_\_\_ of \_\_\_\_\_

Marine Sciences Laboratory 1529 West Sequim Bay Road Sequim, Washington 98382

| Project No                                                               |              |                 |        |      |                    | Testing Parameters |                        |               | ters |               | Lab <u>CAS</u><br>Address Kelso WA |                                                         |                                                                                                                                     |  |  |  |
|--------------------------------------------------------------------------|--------------|-----------------|--------|------|--------------------|--------------------|------------------------|---------------|------|---------------|------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| Project Name EVS-TBT Bioaccumulation                                     |              |                 |        |      |                    |                    |                        | Í             |      | ļ             |                                    | ainer                                                   | Address Kelso WA                                                                                                                    |  |  |  |
| Project Manager Bill Gardiner Phone (681-366)                            |              |                 |        |      |                    |                    |                        |               |      |               |                                    | L<br>Containers                                         | Attention Lynda Huckestein                                                                                                          |  |  |  |
| Lab No. Sample No. Collecti<br>Date<br>repl-EVS-TBT- Macoma Bkas 10/10/9 |              |                 |        |      | <u> </u>           | etrix              | TBT Analysis           |               |      |               |                                    | No. of                                                  | Observations, Instructions                                                                                                          |  |  |  |
|                                                                          | r.ls.TDT     | - M PV.         | 8      | 100  | Tics               | ue-Cla             | <u>     </u>           |               |      |               |                                    | 1                                                       |                                                                                                                                     |  |  |  |
|                                                                          | <u>EV-16</u> | 1 In Iacoma Dra | s - 12 | 10   | 11.22              | 1                  |                        |               |      |               |                                    |                                                         |                                                                                                                                     |  |  |  |
| 2 1422                                                                   |              |                 |        |      | 1                  |                    | ./                     |               |      | -+            |                                    | - <del>  ,</del>                                        |                                                                                                                                     |  |  |  |
|                                                                          |              |                 |        |      |                    |                    | 7                      | $\rightarrow$ |      |               |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| <u>у герч</u>                                                            |              |                 |        |      |                    |                    |                        |               |      |               |                                    | +                                                       |                                                                                                                                     |  |  |  |
| 5 rep5                                                                   | THE M        | ¥               | 10/    | Im   |                    |                    |                        | -             | -+   |               |                                    | +                                                       |                                                                                                                                     |  |  |  |
|                                                                          | EVJ-I        | lac-TBT-2       | 10/18  | 2748 |                    | · · · ·            |                        |               |      | $\rightarrow$ |                                    | ┼┼                                                      |                                                                                                                                     |  |  |  |
| 17                                                                       |              |                 |        |      | +                  |                    |                        | -             |      |               |                                    | $+\frac{1}{1}$                                          |                                                                                                                                     |  |  |  |
|                                                                          |              | <u> </u>        |        |      | ┼──┤               |                    |                        |               |      | $\rightarrow$ |                                    | +                                                       |                                                                                                                                     |  |  |  |
| 9                                                                        |              |                 |        |      |                    | <u></u>            |                        |               |      | -+            | +                                  | +                                                       |                                                                                                                                     |  |  |  |
| 10                                                                       |              |                 |        |      | $\left  \right $   | <u>.</u>           |                        |               |      | -+            |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| //                                                                       |              |                 |        |      | $\left\{ \right\}$ | <u> </u>           | $\square$              | .             |      |               | _                                  |                                                         |                                                                                                                                     |  |  |  |
| 12                                                                       |              | 9               |        |      | +                  |                    | $\square$              |               |      | $\rightarrow$ |                                    | - -                                                     |                                                                                                                                     |  |  |  |
| 1/3                                                                      |              | 10              |        |      |                    |                    |                        |               |      |               |                                    | 41                                                      |                                                                                                                                     |  |  |  |
| 14                                                                       |              | 11              |        |      |                    |                    | $\square$              |               |      | $\rightarrow$ |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| 15                                                                       |              | 12              |        |      | ┼──┤               |                    | $\square$              | _             |      |               |                                    | <u> </u>                                                |                                                                                                                                     |  |  |  |
| 1/ <i>4</i>                                                              |              | 13              |        |      |                    |                    | $\square$              |               |      | _             |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| 17                                                                       |              |                 | <br>   |      |                    |                    | $\square$              |               |      |               |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| 18                                                                       |              | 15              |        | ļ    |                    |                    | $\square$              |               |      |               |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| 19                                                                       |              | 17              |        | ļ    |                    |                    | $\square$              |               |      |               |                                    | -                                                       |                                                                                                                                     |  |  |  |
| AU                                                                       |              | 18              |        |      |                    |                    |                        |               |      |               |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| 21                                                                       |              | 19              |        |      |                    |                    |                        |               |      |               |                                    | 1                                                       |                                                                                                                                     |  |  |  |
| 22                                                                       |              | 20              |        |      |                    |                    |                        |               |      |               |                                    |                                                         |                                                                                                                                     |  |  |  |
| 23.                                                                      |              | 22              |        | ļ,   |                    |                    | (                      |               |      |               |                                    | 1                                                       | 1                                                                                                                                   |  |  |  |
| 24                                                                       |              | 1 23            | ۱ ا    | V    |                    | $V \angle$         | $\mathbf{b}_{2}$       | 0             |      |               |                                    | ł                                                       |                                                                                                                                     |  |  |  |
| Relinduished                                                             | •            | 10/12/98        | 400-   | Rec  | eived by           |                    | $\mathcal{V}_{\alpha}$ |               | 19/3 | 6F            | D5                                 | 52                                                      | Total No. of Containers                                                                                                             |  |  |  |
| 8ignature                                                                |              | Date T          | ime    | Sig  | hature             | T <sup>o</sup>     | 1                      |               | ate  |               | ime                                | _                                                       | npmant Method:                                                                                                                      |  |  |  |
| L. Niewolny<br>Printed Name                                              |              |                 |        | 0Ph  | nted Nar           |                    | AZ.                    | Ľ             |      |               |                                    |                                                         | pecial Requirements or Comments:                                                                                                    |  |  |  |
| Company                                                                  |              |                 |        |      | mpany              | U1                 | ر                      | _             |      |               |                                    |                                                         |                                                                                                                                     |  |  |  |
| Relinquished by:                                                         |              |                 |        |      | eived by           | :                  | -                      |               |      |               |                                    | D                                                       | STRIBUTION                                                                                                                          |  |  |  |
| Signature Date Time                                                      |              |                 |        | Sig  | gnature            |                    | Date Time              |               |      | ime           |                                    | 1. Provide white and yellow copies to the<br>Laboratory |                                                                                                                                     |  |  |  |
| Printed Nam                                                              | 10           |                 |        | Pri  | nted Nar           | ne                 |                        | -             |      |               |                                    |                                                         | <ol> <li>Return pink copy to Project file or to<br/>project manager.</li> <li>I shorelary to return exceed white copy to</li> </ol> |  |  |  |
| Company                                                                  |              |                 |        |      |                    |                    |                        |               |      |               |                                    |                                                         | 3. Laboratory to return signed white copy to<br>Battelle for project 100120                                                         |  |  |  |

#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:  | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |                   | K9807071<br>10/10/98<br>10/13/98 |                              |                    |
|----------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|----------------------------------|------------------------------|--------------------|
|                                        |                                                  |                    | Butyltins |                    |                   |                                  |                              |                    |
| Sample Name<br>Lab Code.<br>Test Notes | EVS-NEP-TBT-4<br>K9807071-040                    |                    |           |                    |                   |                                  | Units:<br>Basis <sup>.</sup> | ug/Kg (ppb)<br>Wet |
| Analyte                                | Prep<br>Method                                   | Analysis<br>Mcthod | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed                 | Result                       | Result<br>Notes    |
| Tn-n-butyltin                          | Method                                           | Butyltins-GC       | 20        | 10                 | 11/10/98          | 11/17/98                         | - <del>3</del> 80-           | 384                |

Data Validated-EPA Level I 🖚 Quality by Design 12/2/198 11/9/98 Art\_\_\_ Date: \_\_\_ TD/GBP

Approved By \_\_\_\_\_

07071SVG JGI - 1 11/19/98

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# Analytical Report

| Client:<br>Project:<br>Sample Matrix:  | EVS Environment C<br>TBT Bioaccumulatic<br>Tissue |                    |           | Date Co            | K9807071<br>10/10/98<br>10/13/98 |                  |                |                    |
|----------------------------------------|---------------------------------------------------|--------------------|-----------|--------------------|----------------------------------|------------------|----------------|--------------------|
|                                        |                                                   |                    | Butyltins |                    |                                  |                  |                |                    |
| Sample Name:<br>Lab Code<br>Test Notes | EVS-NEP-TBT-5<br>K9807071-041                     |                    |           |                    |                                  |                  | Units<br>Basıs | ug/Kg (ppb)<br>Wet |
| Analyte                                | Prep<br>Method                                    | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted                | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tn-n-butyltın                          | Method                                            | Butyltins-GC       | 2         | 1                  | 11/10/98                         | 11/13/98         | 120            |                    |

|                       |                   | Pata Validated-EPA Level I<br>Quality by Design<br>IP 12/24/43 |
|-----------------------|-------------------|----------------------------------------------------------------|
| Approved By           | (m) Date 10/19/92 |                                                                |
| 07071SVG3G1 211/19/98 |                   | 00052                                                          |

### Analytical Report

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| Client:<br>Project:<br>Sample Matrix:               | EVS Environment (<br>TBT Bioaccumulat<br>Tissue |                    |           | Service Request:<br>Date Collected:<br>Date Received: |                   |                  |                |                      |  |
|-----------------------------------------------------|-------------------------------------------------|--------------------|-----------|-------------------------------------------------------|-------------------|------------------|----------------|----------------------|--|
|                                                     |                                                 |                    | Butyltins |                                                       |                   |                  |                | ,                    |  |
| Sample Name<br>Lab Code.<br>Test Notes <sup>.</sup> | EVS-NEP-TBT-7<br>K9807071-042                   |                    |           |                                                       |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet   |  |
| Analyte                                             | Prep<br>Method                                  | Analysis<br>Method | MRL       | Dilution<br>Factor                                    | Date<br>Extracted | Date<br>Analyzed | Result         | ,<br>Result<br>Notes |  |
| Tn-n-butyltın                                       | Method                                          | Butyltins-GC       | 2         | 1                                                     | 11/10/98          | 11/13/98         | 89             | -                    |  |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:   | EVS Environment Co<br>TBT Bioaccumulatio<br>Tissue |                    |           |                    |                   | Date Co          | K9807071<br>10/10/98<br>10/13/98 |                    |
|-----------------------------------------|----------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------------------------|--------------------|
|                                         |                                                    |                    | Butyltins |                    |                   |                  |                                  |                    |
| Sample Name:<br>Lab Code:<br>Test Notes | EVS-NEP-TBT-8<br>K9807071-043                      |                    |           |                    |                   |                  | Units:<br>Basis:                 | ug/Kg (ppb)<br>Wet |
| Analyte                                 | Prep<br>Method                                     | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                           | Result<br>Notes    |
| Trı-n-butyltın                          | Method                                             | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/13/98         | 104                              |                    |

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| Client:<br>Project:<br>Sample Matrix:              | EVS Environment C<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |                   | Date Co          | ollected:       | K9807071<br>10/10/98<br>10/13/98 |   |
|----------------------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|-----------------|----------------------------------|---|
|                                                    |                                                  |                    | Butyltins |                    |                   |                  |                 |                                  |   |
| Sample Name <sup>.</sup><br>Lab Code<br>Test Notes | EVS-NEP-TBT-9<br>K9807071-044                    |                    |           |                    |                   |                  | Units<br>Basis. | ug/Kg (ppb)<br>Wet               |   |
| Analyte                                            | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                  | _ |
| Tn-n-butyltın                                      | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/13/98         | 130             |                                  |   |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:    | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    | Service Request: K980<br>Date Collected: 10/10<br>Date Received: 10/11 |                    |                   |                  |                |                    |
|------------------------------------------|--------------------------------------------------|--------------------|------------------------------------------------------------------------|--------------------|-------------------|------------------|----------------|--------------------|
|                                          |                                                  |                    | Butyltins                                                              |                    |                   |                  |                |                    |
| Sample Name:<br>Lab Code:<br>Test Notes: | EVS-NEP-TBT-10<br>K9807071-045                   |                    |                                                                        |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                                  | Prep<br>Method                                   | Analysis<br>Method | MRL                                                                    | Dilution<br>Factor | Datc<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tn-n-butyltın                            | Method                                           | Butyltins-GC       | 2                                                                      | 1                  | 11/10/98          | 11/13/98         | 77             |                    |

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| Client:<br>Project:<br>Sample Matrix:  | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |                   | Date Co          | ollected:                   | K9807071<br>10/10/98<br>10/13/98 |
|----------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|-----------------------------|----------------------------------|
|                                        |                                                  |                    | Butyltins |                    |                   |                  |                             |                                  |
| Sample Name.<br>Lab Code<br>Test Notes | EVS-NEP-TBT-11<br>K9807071-046                   |                    |           |                    |                   |                  | Units <sup>.</sup><br>Basis | ug/Kg (ppb)<br>Wet ,             |
| Analyte                                | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                      | Result<br>Notes                  |
| Trı-n-butyltın                         | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/13/98         | 54                          | •                                |

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|----------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|----------------------------------|------------------|----------------|--------------------|
| Client:<br>Project:<br>Sample Matrix:  | EVS Environment C<br>TBT Bioaccumulati<br>Tissue |                    |           |                    | K9807071<br>10/10/98<br>10/13/98 |                  |                |                    |
| 1                                      |                                                  |                    | Butyltins |                    |                                  |                  |                |                    |
| Sample Name.<br>Lab Code<br>Test Notes | EVS-NEP-TBT-12<br>K9807071-047                   |                    |           |                    |                                  |                  | Units<br>Basıs | ug/Kg (ppb)<br>Wet |
| Analyte                                | Prep<br>Method                                   | Analysis<br>Mcthod | MRL       | Dilution<br>Factor | Date<br>Extracted                | Date<br>Analyzed | Result         | Result<br>Notes    |
| Trı-n-butyltın                         | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98                         | 11/13/98         | 71             |                    |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulat<br>Tissue |                    |           |                    |          | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|---------------------------------------|-------------------------------------------------|--------------------|-----------|--------------------|----------|------------------|----------------|----------------------------------|
|                                       |                                                 |                    | Butyltins |                    |          |                  |                |                                  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-13<br>K9807071-048                  |                    |           |                    |          |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                  | Analysis<br>Method | MRL       | Dilution<br>Factor |          | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Tri-n-butyltin                        | Method                                          | Butyltins-GC       | 2         | l                  | 11/10/98 | 11/14/98         | 134            | ,                                |

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| Client:<br>Project:<br>Sample Matrix:              | EVS Environment C<br>TBT Bioaccumulati<br>Tissue |                    |           |                    | ollected:         | K 9807071<br>10/10/98<br>10/13/98 |                |                    |  |
|                                                    |                                                  |                    | Butyltins |                    |                   |                                   |                |                    |  |
| Sample Name<br>Lab Code <sup>.</sup><br>Test Notes | EVS-NEP-TBT-14<br>K9807071-049                   |                    |           |                    |                   |                                   | Units<br>Basis | ug/Kg (ppb)<br>Wet |  |
| Analyte                                            | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed                  | Result         | Result<br>Notes    |  |
| Trı-n-butyltın                                     | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/14/98                          | 72             |                    |  |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulat:<br>Tissue |                    |           |                    |          | Date Co          |                | K9807071<br>10/10/98<br>10/13/98 | - |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|----------|------------------|----------------|----------------------------------|---|
|                                       |                                                  |                    | Butyltins |                    |          |                  |                |                                  |   |
|                                       |                                                  |                    |           |                    |          |                  |                |                                  |   |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-15<br>K9807071-050                   |                    |           |                    |          |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               | _ |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor |          | Date<br>Analyzed | Result         | Result<br>Notes                  |   |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98 | 11/14/98         | 117            |                                  | _ |

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| Client:<br>Project:<br>Sample Matrix:  | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |                   | Date Co          | K9807071<br>10/10/98<br>10/13/98 |                    |
|----------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------------------------|--------------------|
|                                        |                                                  |                    | Butyltins |                    |                   |                  |                                  |                    |
| Sample Name.<br>Lab Code<br>Test Notes | EVS-NEP-TBT-17<br>K9807071-051                   |                    |           |                    |                   |                  | Units<br>Basis                   | ug/Kg (ppb)<br>Wet |
| Analyte                                | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                           | Result<br>Notes    |
| Tr1-n-butyltin                         | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/14/98         | 15                               |                    |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |           |                    |          | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 | - |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|----------|------------------|----------------|----------------------------------|---|
|                                       |                                                  |                    | Butyltins |                    |          |                  |                |                                  | ~ |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-18<br>K9807071-052                   |                    |           |                    |          |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               | _ |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor |          | Date<br>Analyzed | Result         | Result<br>Notes                  | _ |
| Trı-n-butyltın                        | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98 | 11/14/98         | 101            |                                  | - |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulati<br>Tissue | Date Co            | Request:<br>ollected:<br>eceived: |                    |                   |                  |                |                    |  |  |  |
|                                       |                                                  |                    | Butyltins                         |                    |                   |                  |                |                    |  |  |  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-19<br>K9807071-053                   |                    |                                   |                    |                   |                  | Units<br>Basıs | ug/Kg (ppb)<br>Wet |  |  |  |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL                               | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |  |  |  |
| Tri-n-butyltın                        | Method                                           | Butyltins-GC       | 2                                 | 1                  | 11/10/98          | 11/14/98         | 92             |                    |  |  |  |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    | Date Co   | ollected:          | K9807071<br>10/10/98<br>10/13/98 |                  |                 |                    |
|---------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|----------------------------------|------------------|-----------------|--------------------|
|                                       |                                                  |                    | Butyltins |                    |                                  |                  |                 |                    |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-20<br>K9807071-054                   |                    |           |                    |                                  |                  | Units<br>Basis: | ug/Kg (ppb)<br>Wct |
| Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted                | Date<br>Analyzed | Result          | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 2         | ]                  | 11/10/98                         | 11/14/98         | <b>7</b> 0      |                    |

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|----------------------------------------|--------------------------------------------------|--------------------|----------------------------------|--------------------|-------------------|------------------|----------------|--------------------|
| Client:<br>Project:<br>Sample Matrix:  | EVS Environment (<br>TBT Bioaccumulati<br>Tissue | Date Co            | K9807071<br>10/10/98<br>10/13/98 |                    |                   |                  |                |                    |
|                                        |                                                  |                    | Butyltins                        |                    |                   |                  |                |                    |
| Sample Name.<br>Lab Code<br>Test Notes | EVS-NEP-TBT-22<br>K9807071-055                   |                    |                                  |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                                | Prep<br>Method                                   | Analysis<br>Method | MRL                              | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |
| Trı-n-butyltın                         | Method                                           | Butyltins-GC       | 2                                | 1                  | 11/10/98          | 11/14/98         | 232            |                    |

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix: |                                | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |           |                    |                   |                  |                | K9807071<br>10/10/98<br>10/13/98 |
|---------------------------------------|--------------------------------|--------------------------------------------------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|
|                                       |                                |                                                              | Butyltins |                    |                   |                  |                | -                                |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-23<br>K9807071-056 |                                                              |           |                    |                   |                  | Units<br>Basis |                                  |
| Analyte                               | Prep<br>Method                 | Analysis<br>Method                                           | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Trı-n-butyltın                        | Method                         | Butyltins-GC                                                 | 2         | 1                  | 11/10/98          | 11/14/98         | 77             | -                                |

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| Client:<br>Project:<br>Sample Matrix: | TBT Bioaccumulation Date       |                    |           |                    |          |                  |                  | K9807071<br>10/10/98<br>10/13/98 |  |  |  |
|                                       |                                |                    | Butyltins |                    |          |                  |                  |                                  |  |  |  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-25<br>K9807071-057 |                    |           |                    |          |                  | Units:<br>Basis. | ug/Kg (ppb)<br>Wet               |  |  |  |
| Analyte                               | Prep<br>Method                 | Analysis<br>Method | MRL       | Dilution<br>Factor |          | Date<br>Analyzed | Result           | Result<br>Notes                  |  |  |  |
| Tn-n-butyltın                         | Method                         | Butyltins-GC       | 2         | 1                  | 11/10/98 | 11/14/98         | 222              |                                  |  |  |  |

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## Analytical Report

| Client:<br>Project:<br>Sample Matrix:   | EVS Environment (<br>TBT Bioaccumulati<br>Tissuc |                    |           |                    |                   | Date Co          | ollected:        | K9807071<br>10/10/98<br>10/13/98 |             |
|-----------------------------------------|--------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|------------------|----------------------------------|-------------|
|                                         |                                                  |                    |           |                    |                   |                  |                  |                                  | , <b></b> 7 |
|                                         |                                                  |                    | Butyltins |                    |                   |                  |                  |                                  | -           |
| Sample Name:<br>Lab Code<br>Test Notes: | EVS-NEP-TBT-26<br>K9807071-058                   |                    |           |                    |                   |                  | Units:<br>Basis: | ug/Kg (ppb)<br>Wet               | Ĩ           |
| Analyte                                 | Prep<br>Method                                   | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result           | Result<br>Notes                  | , <b></b>   |
| Tri-n-butyltin                          | Method                                           | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/14/98         | 56               |                                  | -           |

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## Analytical Report

|    | Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulatic<br>Tissue |                    |           |                    |                   | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|----|---------------------------------------|---------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|
|    |                                       |                                                   |                    | Butyltuns |                    |                   |                  |                |                                  |
|    | Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-27<br>K9807071-059                    |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| j, | Analyte                               | Prep<br>Method                                    | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
|    | Tri-n-butyltin                        | Method                                            | Butyltins-GC       | 2         | 1                  | 11/10/98          | 11/14/98         | 129            |                                  |

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| Client:                           |         | EVS Environment C              | ongultanta   |           |          |           | а.         | -                                  |                      |                |
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| Project:<br>Sample N              | Matrix: | TBT Bioaccumulatio             |              |           |          |           | Date C     | Request:<br>ollected:<br>Received: | K9807071<br>10/10/98 |                |
|                                   |         |                                |              |           |          |           | Dute       | ectiveu.                           | 10/13/98             |                |
|                                   |         |                                |              | Butyltins |          |           |            |                                    |                      | I              |
| Sample N<br>Lab Code<br>Test Note |         | EVS-NEP-TBT-28<br>K9807071-060 |              |           |          |           |            | Units<br>Basis                     | ug/Kg (ppb)<br>Wet   | I              |
|                                   |         | Prep                           | Analysis     |           | Dilution | Date      | Date       |                                    | Result               | Ţ              |
| Analyte                           |         | Method                         | Method       | MRL       |          | Extracted | Analyzed   | Result                             | Notes                | <del>, ,</del> |
| Tri-n-butyl                       | tın     | Method                         | Butyltins-GC | 2         | I        | 11/10/98  | 11/14/98   | 197                                |                      |                |
|                                   |         |                                |              |           |          |           |            |                                    |                      | Ĺ              |
|                                   |         |                                |              |           |          |           |            |                                    |                      | [              |
|                                   |         |                                |              |           |          |           |            |                                    |                      | ł              |
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|                                   |         |                                |              |           |          |           |            |                                    |                      | <b>{</b>       |
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| Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulatic<br>Tissue |                    |                |                    |                   | Date Co          | ollected:       | K9807071<br>10/10/98<br>10/13/98 |
|                                       |                                                   |                    | Butyltins      |                    |                   |                  |                 |                                  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-29<br>K9807071-061                    |                    |                |                    |                   |                  | Units.<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                    | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                  |
| Tri-n-butyltin                        | Method                                            | Butyltins-GC       | 2              | 1                  | 11/13/98          | 11/18/98         | 58              |                                  |

Data Validated-EPA Level I Quality by Design TD 12/2/198

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:  | EVS Environment (<br>TBT Bioaccumulat<br>Tissue |                    |           |                    |                   | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
|----------------------------------------|-------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|----------------------------------|
|                                        |                                                 |                    | Butyltins |                    |                   |                  |                |                                  |
| Sample Name<br>Lab Code<br>Test Notes. | EVS-NEP-TBT-30<br>K9807071-062                  |                    |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                                | Prep<br>Method                                  | Analysis<br>Mcthod | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
| Tri-n-butyltin                         | Method                                          | Butyltins-GC       | 2         | 1                  | 11/13/98          | 11/18/98         | 114            |                                  |

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulatic<br>Tissue |                    |           |                    |                   | Date Co          | ollected:       | K9807071<br>10/10/98<br>10/13/98 |
|---------------------------------------|---------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|-----------------|----------------------------------|
|                                       |                                                   |                    | Butyltins |                    |                   |                  |                 |                                  |
| Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-31<br>K9807071-063                    |                    |           |                    |                   |                  | Units.<br>Basis | ug/Kg (ppb)<br>Wet               |
| Analyte                               | Prep<br>Method                                    | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                  |
| Tri-n-butyltin                        | Method                                            | Butyltins-GC       | 2         | 1                  | 11/13/98          | 11/18/98         | 118             |                                  |

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### Analytical Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment<br>TBT Bioaccumulat<br>Tissue |                    | Date Co   | K9807071<br>10/10/98<br>10/13/98 |                   |                  |                |                    |
|---------------------------------------|-----------------------------------------------|--------------------|-----------|----------------------------------|-------------------|------------------|----------------|--------------------|
|                                       |                                               |                    | Butyltins |                                  |                   |                  |                |                    |
| Sample Name<br>Lab Code<br>Test Notcs | EVS-NEP-TBT-32<br>K9807071-064                |                    | ,         |                                  |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                               | Prep<br>Method                                | Analysis<br>Method | MRL       | Dilution<br>Factor               | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |
| Tri-n-butyltin                        | Method                                        | Butyltins-GC       | 2         | 1                                | 11/13/98          | 11/18/98         | 66             |                    |

Data Validated-EPA Level I Quality by Design TD 12/2/198

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|                                                    |                                | А                  | analytical Rep | ort                              |                   |                  |                |                    |
|----------------------------------------------------|--------------------------------|--------------------|----------------|----------------------------------|-------------------|------------------|----------------|--------------------|
| Client:<br>Project:<br>Sample Matrix:              |                                | Date Co            | ollected:      | K9807071<br>10/10/98<br>10/13/98 |                   |                  |                |                    |
| }                                                  |                                |                    | Butyltins      |                                  |                   |                  |                |                    |
| Sample Name <sup>.</sup><br>Lab Code<br>Test Notes | EVS-NEP-TBT-34<br>K9807071-065 |                    |                |                                  |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet |
| Analyte                                            | Prep<br>Method                 | Analysis<br>Method | MRL            | Dilution<br>Factor               | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes    |
| Trı-n-butyltin                                     | Method                         | Butyltins-GC       | 2              | 1                                | 11/13/98          | 11/18/98         | 66             |                    |

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## Analytical Report

| Client:<br>Project:<br>Sample Matrix:  | EVS Environment Consultants<br>TBT Bioaccumulation<br>x: Tissue |                    |           |                    |                   |                  |                 | K9807071<br>10/10/98<br>10/13/98 |  |
|----------------------------------------|-----------------------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|-----------------|----------------------------------|--|
|                                        |                                                                 |                    | Butyltins |                    |                   |                  |                 |                                  |  |
| Sample Name.<br>Lab Code<br>Test Notes | EVS-NEP-TBT-36<br>K9807071-066                                  |                    |           |                    |                   |                  | Units.<br>Basis | ug/Kg (ppb)<br>Wet               |  |
| Analyte                                | Prep<br>Method                                                  | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result          | Result<br>Notes                  |  |
| Trı-n-butyltın                         | Method                                                          | Butyltins-GC       | 2         | 1                  | 11/13/98          | 11/18/98         | 215             |                                  |  |

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|   |                                       |                                                  | А                  | nalytical Rep | oort               |                   |                  |                |                                  |
|---|---------------------------------------|--------------------------------------------------|--------------------|---------------|--------------------|-------------------|------------------|----------------|----------------------------------|
|   | Client:<br>Project:<br>Sample Matrix: | EVS Environment C<br>TBT Bioaccumulati<br>Tissue |                    |               |                    |                   | Date C           | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
| ۲ |                                       |                                                  |                    | Butyltins     |                    |                   |                  |                |                                  |
|   | Sample Name<br>Lab Code<br>Test Notes | EVS-NEP-TBT-37<br>K9807071-067                   |                    |               |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet               |
|   | Analyte                               | Prep<br>Method                                   | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
|   | Tri-n-butyltin                        | Method                                           | Butyltins-GC       | 2             | 1                  | 11/13/98          | 11/18/98         | 359            |                                  |

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Date 11/20/58

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## Analytical Report

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|-----------------------------------------|--------------------------------------------------|--------------------|---------------|--------------------|-------------------|------------------|-------------------------------------|------------------------------------------|
| Client:<br>Project:<br>Sample Matrix:   | EVS Environment (<br>TBT Bioaccumulati<br>Tissue |                    |               |                    |                   | Date (           | Request:<br>Collected:<br>Received: |                                          |
|                                         |                                                  |                    | Butyltins     |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
| Sample Name<br>Lab Code:<br>Test Notes: | EVS-NEP-TBT-38<br>K9807071-068                   |                    |               |                    |                   |                  | Units <sup>.</sup><br>Basis         | ug/Kg (ppb)<br>Wet                       |
| Analyte                                 | Prep<br>Method                                   | Analysis<br>Method | MRL           | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result                              | Result<br>Notes                          |
| Tri-n-butyltin                          | Method                                           | Butyltins-GC       | 2             | 1                  | 11/13/98          | 11/19/98         | 192                                 |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   |                  |                                     |                                          |
|                                         |                                                  |                    |               |                    |                   | 1                | Quality<br>TD 12                    | ated-LPA Level I<br>v by Design<br>24/98 |
|                                         |                                                  |                    |               |                    |                   | 23/58            |                                     |                                          |

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|   |                                                    |                                                   | А                  | nalytical Repo | rt                 |                   |                  |                |                                  |
|---|----------------------------------------------------|---------------------------------------------------|--------------------|----------------|--------------------|-------------------|------------------|----------------|----------------------------------|
|   | Client:<br>Project:<br>Sample Matrix:              | EVS Environment C<br>TBT Bioaccumulatio<br>Tissue |                    |                |                    |                   | Date Co          | ollected:      | K9807071<br>10/10/98<br>10/13/98 |
| Ĩ |                                                    |                                                   |                    | Butyltins      |                    |                   |                  |                |                                  |
|   | Sample Name <sup>-</sup><br>Lab Code<br>Test Notes | EVS-NEP-TBT-42<br>K9807071-069                    |                    |                |                    |                   |                  | Units<br>Basıs | ug/Kg (ppb)<br>Wet               |
| Ì | Analyte                                            | Prep<br>Method                                    | Analysis<br>Method | MRL            | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                  |
|   | Tri-n-butyltın                                     | Method                                            | Butyltins-GC       | 2              | 1                  | 11/13/98          | 11/19/98         | 90             |                                  |

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Data Vahdated-EPA Level I Quality by Design DD 12-121/98

CALL Date 11/23/10

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Analytical Report

| Client:<br>Project:<br>Sample Matrix: | TBT Bioaccumulation            |                    |           |                    |                   |                  |                | K9807071<br>8/26/98<br>10/13/98 |
|---------------------------------------|--------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|---------------------------------|
|                                       |                                |                    | Butyltins |                    |                   |                  |                | ,                               |
| Sample Name<br>Lab Code<br>Test Notes | Rep1-EVS-TBT-1<br>K9807071-070 | Vepthys Bkgd       |           |                    |                   |                  | Units<br>Basis | ug/Kg (ppb)<br>Wet              |
| Analyte                               | Prep<br>Method                 | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                 |
| Tr1-n-butyltin                        | Method                         | Butyltins-GC       | 2         | 1                  | 11/13/98          | 11/19/98         | ND             | ۲                               |

Data Vahdated-EPA Level I Quality by Design TP 12/24/95 An Date 11/25/51

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#### Analytical Report

| Client:<br>Project:<br>Sample Matrix:              | EVS Environment C<br>TBT Bioaccumulation<br>Tissuc |                    |           |                    |                   | Date Co          | ollected:      | K9807071<br>8/26/98<br>10/13/98 |
|----------------------------------------------------|----------------------------------------------------|--------------------|-----------|--------------------|-------------------|------------------|----------------|---------------------------------|
|                                                    |                                                    |                    | Butyltins |                    |                   |                  |                |                                 |
| Sample Name<br>Lab Code <sup>.</sup><br>Test Notes | Rep2-EVS-TBT-Ne<br>K9807071-071                    | pthys Bkgd         |           |                    |                   |                  | Units<br>Basıs | ug/Kg (ppb)<br>Wet              |
| Analyte                                            | Prep<br>Method                                     | Analysis<br>Method | MRL       | Dilution<br>Factor | Date<br>Extracted | Date<br>Analyzed | Result         | Result<br>Notes                 |
| Tri-n-butyltin                                     | Method                                             | Butyltins-GC       | 2         | 1                  | 11/13/98          | 11/19/98         | ND             |                                 |

Data Validated-EPA Level I Quality by Design DD 17/21/98

Uni Date 1/23/58

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Analytical Report

| Client:<br>Project:<br>Sample Matrix:                | EVS Environmen<br>TBT Bıoaccumula<br>Tıssuc |                    |           |                    |          | Date C           | Request:<br>ollected:<br>Received: |                    |  |
|------------------------------------------------------|---------------------------------------------|--------------------|-----------|--------------------|----------|------------------|------------------------------------|--------------------|--|
|                                                      |                                             |                    | Butyltins |                    |          |                  |                                    |                    |  |
| Sample Name:<br>Lab Code:<br>Test Notes <sup>-</sup> | Rep3-EVS-TBT-1<br>K9807071-072              | Nepthys Bkgd       |           |                    |          |                  | Units.<br>Basıs                    | ug/Kg (ppb)<br>Wet |  |
| Analyte                                              | Prep<br>Method                              | Analysis<br>Method | MRL       | Dilution<br>Factor |          | Date<br>Analyzed | Result                             | Result<br>Notes    |  |
| Tri-n-butyltın                                       | Method                                      | Butyltins-GC       | 2         | 1                  | 11/13/98 | 11/19/98         | ND                                 |                    |  |

Data Validated-LPA Level I Quality by Design TP 12/2/98

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SAMPLE CUSTODY RECORD

Date 10/12/98

Pacific Northwest Division Marine Sciences Laboratory 1529 West Sequim Bay Road Sequim, Washington 98382

| Brougst No                                                                             | Project No          |             |                    |               |                  |                    |      | ramet | ters          |     |                                 | Lab CAS                                                                                                                            |
|----------------------------------------------------------------------------------------|---------------------|-------------|--------------------|---------------|------------------|--------------------|------|-------|---------------|-----|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Project Name                                                                           | EUS-                | TBT Bizaccu | imilato            | <br>ר         | - [5]            |                    |      |       |               |     | ainer                           | Address Kelso WA                                                                                                                   |
| Project Mana                                                                           | Bill G              | andiner     | Phone              | 360/681-340   | Analysis         |                    |      |       |               |     | Containers                      | Attention Lynda Hurkestein                                                                                                         |
| Lab No.                                                                                |                     | nple No.    | Collection         | Matrix        | BT 6             |                    |      |       |               |     | No. of (                        | Observations, Instructions                                                                                                         |
| 00                                                                                     |                     |             | Date<br>Laludation |               | -1               |                    |      |       |               | -+  |                                 |                                                                                                                                    |
|                                                                                        | EVD-I               | AC-TBT-25   | 10/10/98           | Claim Tizou   | e/               | -+                 | -+   | -+    |               |     |                                 |                                                                                                                                    |
| de                                                                                     |                     | 26          |                    | +             |                  |                    |      | -+    | $\rightarrow$ | -+  | 1                               |                                                                                                                                    |
| 27                                                                                     |                     | 27          |                    | +             | +                |                    |      |       |               |     | <u> </u>                        |                                                                                                                                    |
| 28                                                                                     |                     | <u> 38</u>  |                    |               | +                |                    | -+   |       |               |     | 1                               |                                                                                                                                    |
| 29<br>30                                                                               |                     | 29          |                    | ╂             | <u> </u>         |                    | -+   | -+    | -+            |     | 1                               | ·····                                                                                                                              |
|                                                                                        |                     | 30          |                    | <u> </u>      |                  |                    |      | -+    |               | -+  |                                 |                                                                                                                                    |
| 3/                                                                                     |                     | 31          |                    |               | -+->             |                    | -+   |       | -             |     | +                               |                                                                                                                                    |
| 31<br>32<br>33<br>34<br>34<br>34<br>34<br>34<br>34<br>34<br>34<br>34<br>34<br>34<br>34 |                     | 32          |                    | ┼──┼──        | - <del> </del> / | $\left  - \right $ | -+   | -+    |               |     | <u> </u>                        | · · · · · · · · · · · · · · · · · · ·                                                                                              |
| 33                                                                                     |                     | 34          |                    |               | . /              |                    |      | +     |               |     | 1                               |                                                                                                                                    |
| 34                                                                                     |                     |             |                    |               |                  |                    |      | _+    | $\rightarrow$ |     | 1_                              | · · · · · · · · · · · · · · · · · · ·                                                                                              |
| 3                                                                                      |                     | 37          |                    |               | +                |                    |      |       |               |     | 1                               |                                                                                                                                    |
| 34                                                                                     |                     | 38          |                    |               |                  |                    |      | +     |               |     | (                               |                                                                                                                                    |
| <u>32</u>                                                                              |                     | k 42        |                    |               |                  |                    |      | _+    |               |     | 1                               | · · · · · · · · · · · · · · · · · · ·                                                                                              |
| 38                                                                                     | EVS-N               | VEP-TBT-2   |                    | Worm Tiss     | re (             |                    |      |       |               |     | l                               |                                                                                                                                    |
| 39                                                                                     |                     | 3           | <del> </del>       | ļļ            |                  |                    |      |       |               |     | l                               |                                                                                                                                    |
| 40                                                                                     |                     |             |                    | <u> </u>      |                  |                    |      |       | -+            |     | <u> </u>                        |                                                                                                                                    |
| 4/                                                                                     |                     | 5           |                    |               |                  |                    |      |       |               |     |                                 |                                                                                                                                    |
| 42                                                                                     |                     | 7           |                    |               |                  |                    |      |       |               |     | 1                               |                                                                                                                                    |
| 43                                                                                     |                     | 8           |                    |               |                  |                    |      |       |               |     |                                 |                                                                                                                                    |
| 44                                                                                     |                     | 9           |                    |               |                  |                    |      |       |               |     | 1                               |                                                                                                                                    |
| 45                                                                                     |                     | 10          |                    |               |                  |                    |      |       |               |     | 1                               |                                                                                                                                    |
| il.                                                                                    | <b></b>             | 11          |                    |               |                  |                    |      |       | $\square$     |     |                                 |                                                                                                                                    |
| 47                                                                                     | ļ                   | 12          |                    |               |                  |                    |      |       |               |     | 1                               |                                                                                                                                    |
| 48                                                                                     |                     | 13          | -                  | V/            | T/               | 2                  |      | _     |               |     | 1                               |                                                                                                                                    |
| Railarduished                                                                          | by:                 | - 10/12/98  | 1400 -             | eived by:     | <u>L</u>         | r                  | 9/B/ | 68    | 10            | Ð   | 24                              | Total No. of Containers                                                                                                            |
| Signature                                                                              |                     |             |                    | nature        | 9/2              | ~0;<br>~0;         | ete  | тт    | lime          | æ   | Shi                             | pment Method:                                                                                                                      |
| Printed Narr                                                                           |                     | - Fr        | nted Name          | 1 <u>0/11</u> | <u> </u>         |                    |      |       |               |     | acial Requirements or Comments: |                                                                                                                                    |
| Company                                                                                |                     | mpany       | <u> </u>           | _             |                  |                    |      |       |               |     |                                 |                                                                                                                                    |
| Relinquished                                                                           | by:                 |             | eived by:          | <del></del>   |                  |                    |      |       | -             | DIS | TRIBUTION:                      |                                                                                                                                    |
| Signature                                                                              | Signature Date Time |             |                    | gnature       |                  |                    | ato  |       | Fime          |     |                                 | . Provide white and yellow copies to the Laboratory                                                                                |
| Printed Name                                                                           |                     |             |                    | inted Name    |                  | _                  |      |       |               |     |                                 | <ul> <li>Return pink copy to Project file or to<br/>project manager.</li> <li>Laboratory to return signed white copy to</li> </ul> |
| Company Company                                                                        |                     |             |                    |               |                  |                    |      |       |               |     |                                 | Battelle for project dig 121                                                                                                       |

SAMPLE CUSTODY RECORD

K980707/ Bate 10/12/98 Page 3 of 3 Marine S 1529 Wee

Pacific Northwest Division Marine Sciences Laboratory 1529 West Sequim Bay Road Sequim Washington 98382

| Project No                                         |           |              |               |     |                  |                       | _ 4              | losting  | y Para             | meter                                                         | 9         | د        | Lab                                                  |
|----------------------------------------------------|-----------|--------------|---------------|-----|------------------|-----------------------|------------------|----------|--------------------|---------------------------------------------------------------|-----------|----------|------------------------------------------------------|
| Project Name EVS- IBT Bibaccumulation              |           |              |               |     |                  |                       |                  |          |                    | Containers                                                    | Address   |          |                                                      |
| Project Manager Bill Gardiner Phone Phone          |           |              |               |     | Analysis         |                       |                  |          |                    |                                                               | Attention |          |                                                      |
| Lab No.                                            | Sar       | mpie No.     | Collec<br>Dat |     | м                | atrix                 | 臣                | ,        |                    |                                                               |           | No. of   | Observations, Instructions                           |
| 49                                                 | EVS-      | NEP-TBT-14   | 10/10/        | 48  | Vorm             | Tissue                | 17               |          |                    |                                                               |           | 1        |                                                      |
| 58                                                 | ~~~       | 15           |               | 1   |                  | )                     | 7                |          |                    |                                                               |           | )        |                                                      |
| 51                                                 |           | 17           |               |     |                  |                       | $\square$        |          |                    |                                                               |           | 1        |                                                      |
| 52                                                 |           | 18           |               | _   |                  |                       | 1                |          |                    |                                                               |           | 1        |                                                      |
| 57<br>57<br>57<br>57<br>57<br>57<br>57<br>57<br>57 |           | 19           |               |     |                  |                       | 1                |          |                    |                                                               |           | 1        |                                                      |
| 54                                                 |           | 20           |               |     |                  |                       |                  |          |                    |                                                               |           | 1        |                                                      |
| 55                                                 |           | 22           |               |     |                  |                       |                  |          |                    |                                                               |           | 1        |                                                      |
| 5%                                                 |           | 23           |               |     |                  |                       | 11               |          |                    |                                                               |           | 1        |                                                      |
|                                                    |           | 24.          | 5             |     |                  |                       |                  |          |                    |                                                               |           | 1        |                                                      |
| 58                                                 |           | 26           |               |     |                  |                       |                  |          |                    |                                                               |           | ١        |                                                      |
| 59                                                 |           | 27           |               |     |                  |                       | $\left  \right $ |          |                    |                                                               |           | 1        |                                                      |
| LO                                                 |           | 28           |               |     |                  |                       | 1                |          |                    |                                                               |           | 1        |                                                      |
| 71                                                 |           | 29           |               |     |                  |                       | -                |          |                    |                                                               |           | ١        |                                                      |
| 7.2                                                |           | 30           |               |     |                  |                       | 1                |          |                    |                                                               |           | ١        |                                                      |
| 7.3                                                |           | 31           |               |     |                  |                       | 1                |          |                    |                                                               |           | 1        | ······································               |
| 64                                                 |           | 32           |               |     |                  |                       |                  |          |                    | ·                                                             |           | ١        |                                                      |
| 1.5                                                | 1         | 34           |               |     |                  |                       | 1                |          |                    |                                                               |           | 1        |                                                      |
| 11                                                 |           | 36           |               |     |                  |                       | 1                |          |                    |                                                               |           | 1        |                                                      |
| 1.7                                                |           | 37           |               |     |                  |                       | 1                |          |                    |                                                               |           | ١        | ,,                                                   |
| 1.8                                                |           | 38           | _             |     |                  |                       | -                |          |                    |                                                               |           | 1        |                                                      |
| 1.9                                                | 1 V       | 342          |               |     |                  |                       | 1                |          |                    |                                                               |           | 1        |                                                      |
|                                                    | FAUS-TRT- | Nepthys BKgd | 8/26          | 198 | $\left  \right $ |                       | 1                |          |                    |                                                               | 1         | 1        |                                                      |
| 7/ 1002                                            |           | v            | - <u>er:</u>  |     |                  |                       |                  |          |                    |                                                               |           | 1        |                                                      |
| 72-rug3                                            |           |              | V             |     | aV               | $\overline{\bigcirc}$ | 5                |          |                    |                                                               | 1         | 1        |                                                      |
| Relinquister                                       | by:       | INCOLOR      | HD            | - / | ved by           | 1                     |                  | N        | 265                | <u>- 10</u>                                                   | 122       | 24       | Total No. of Containers                              |
| Signature                                          |           |              | ime           | 810 | nature           | A                     | 42               | ∖Dat     | <u>) / 0</u><br>:0 | Time                                                          | <u>~</u>  |          |                                                      |
| L. Niewolny<br>Printed Name Printed Name           |           |              |               | ATA |                  |                       |                  |          |                    | cial Requirements or Comments:                                |           |          |                                                      |
| MSL                                                |           |              |               |     |                  | UA_                   | <u></u>          | -        |                    |                                                               |           |          | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~               |
| Company Company Relinquished by:                   |           |              | <u> </u>      |     |                  |                       |                  | DIS      | TRIBUTION:         |                                                               |           |          |                                                      |
|                                                    |           | <u> </u>     | <u> </u>      |     |                  |                       |                  |          |                    |                                                               |           |          | Provide white and yellow copies to the               |
| Signature                                          |           | Date T       | ime           | ]   | nature           |                       |                  | Dat<br>~ | 0                  | Time                                                          |           |          | Laboratory<br>Return pink copy to Project file or to |
| Printed Name Printed Name                          |           |              | me            |     | _                |                       |                  |          | 3.                 | project manager.<br>Laboratory to return signed white copy to |           |          |                                                      |
| Company                                            |           |              |               | Cor | mpany            |                       |                  |          |                    |                                                               |           | <u> </u> | Battelle for project filese                          |

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#### Analytical Report

| Client:        | EVS Environment Consultants |
|----------------|-----------------------------|
| Project:       | <b>TBT</b> Bioaccumulation  |
| Sample Matrix: | Tissue                      |

 Service Request:
 K9807071

 Date Collected:
 8/26/98

 Date Received:
 10/13/98

 Date Extracted:
 12/7/98

 Date Analyzed:
 12/8/98

Lipids Bligh & Dyer Units: Percent (%) As Received Basis

| Sample Name              | Lab Code     | Result |
|--------------------------|--------------|--------|
| Rep1-EVS-TBT-Macoma Bkgd | K9807071-001 | 0.77   |
| Rep2-EVS-TBT-Macoma Bkgd | K9807071-002 | 0.81   |
| Rep3-EVS-TBT-Macoma Bkgd | K9807071-003 | 0.75   |
| Rep4-EVS-TBT-Macoma Bkgd | K9807071-004 | 0.77   |
| Rep5-EVS-TBT-Macoma Bkgd | K9807071-005 | 0.77   |
| EVS-Mac-TBT-2            | K9807071-006 | 0.65   |
| EVS-Mac-TBT-3            | K9807071-007 | 0.55   |
| EVS-Mac-TBT-4            | K9807071-008 | 0.61   |
| EVS-Mac-TBT-5            | K9807071-009 | 0 62   |
| EVS-Mac-TBT-7            | K9807071-010 | 0.60   |
| EVS-Mac-TBT-8            | K9807071-011 | 0 76   |
| EVS-Mac-TBT-9            | K9807071-012 | 0.81   |
| EVS-Mac-TBT-10           | K9807071-013 | 0.67   |
| EVS-Mac-TBT-11           | K9807071-014 | 0.72   |
| EVS-Mac-TBT-12           | K9807071-015 | 0.41   |
| EVS-Mac-TBT-13           | K9807071-016 | 0 71   |
| EVS-Mac-TBT-14           | K9807071-017 | 1.12   |
| EVS-Mac-TBT-15           | K9807071-018 | 0.70   |
| EVS-Mac-TBT-17           | K9807071-019 | 0.68   |
| EVS-Mac-TBT-18           | K9807071-020 | 0 66   |
| EVS-Mac-TBT-19           | K9807071-021 | 0 68   |
| EVS-Mac-TBT-20           | K9807071-022 | 0 61   |

Data Validated-EPA Level I Quality by Design

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Approved By.

1A/102094 07071SVG PJ2 - TSobds 12/9/98

#### Analytical Report

## Client:EVS Environment ConsultantsProject:TBT BioaccumulationSample Matrix:Tissue

| Service Request: | K9807071 |
|------------------|----------|
| Date Collected:  | 10/10/98 |
| Date Received:   | 10/13/98 |
| Date Extracted:  | 12/7/98  |
| Date Analyzed:   | 12/8/98  |

Lipids Bligh & Dyer Units Percent (%) As Received Basis

| Sample Name    | Lab Code     | Result |  |
|----------------|--------------|--------|--|
| EVS-Mac-TBT-22 | K9807071-023 | 0.54   |  |
| EVS-Mac-TBT-23 | K9807071-024 | 0.72   |  |
| EVS-Mac-TBT-25 | K9807071-025 | 0.68   |  |
| EVS-Mac-TBT-26 | K9807071-026 | 0.65   |  |
| EVS-Mac-TBT-27 | K9807071-027 | 0.44   |  |
| EVS-Mac-TBT-28 | K9807071-028 | 0.52   |  |
| EVS-Mac-TBT-29 | K9807071-029 | 0.72   |  |
| EVS-Mac-TBT-30 | K9807071-030 | 0.69   |  |
| EVS-Mac-TBT-31 | K9807071-031 | 0.66   |  |
| EVS-Mac-TBT-32 | K9807071-032 | 0 73   |  |
| EVS-Mac-TBT-34 | K9807071-033 | 0 71   |  |
| EVS-Mac-TBT-36 | K9807071-034 | 0 67   |  |
| EVS-Mac-TBT-37 | K9807071-035 | 0.68   |  |
| EVS-Mac-TBT-38 | K9807071-036 | 0.81   |  |
| EVS-Mac-TBT-42 | K9807071-037 | 0.55   |  |
| EVS-NEP-TBT-2  | K9807071-038 | 1.09   |  |
| EVS-NEP-TBT-3  | K9807071-039 | 0.85   |  |
| EVS-NEP-TBT-4  | K9807071-040 | 0 94   |  |
| EVS-NEP-TBT-5  | K9807071-041 | 1 07   |  |
| EVS-NEP-TBT-7  | K9807071-042 | 1 15   |  |
| EVS-NEP-TBT-8  | K9807071-043 | 1 15   |  |
| EVS-NEP-TBT-9  | K9807071-044 | 1.16   |  |

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#### Analytical Report

## Client:EVS Environment ConsultantsProject:TBT BioaccumulationSample Matrix:Tissue

 Service Request:
 K9807071

 Date Collected:
 10/10/98

 Date Received:
 10/13/98

 Date Extracted:
 12/7/98

 Date Analyzed:
 12/8/98

#### Lıpıds Bligh & Dyer Units<sup>.</sup> Percent (%) As Received Basis

| Sample Name    | Lab Code     | Result |
|----------------|--------------|--------|
| EVS-NEP-TBT-10 | K9807071-045 | 1 13   |
| EVS-NEP-TBT-11 | K9807071-046 | 1 29   |
| EVS-NEP-TBT-12 | K9807071-047 | 2 37   |
| EVS-NEP-TBT-13 | K9807071-048 | 1.15   |
| EVS-NEP-TBT-14 | K9807071-049 | 1.13   |
| EVS-NEP-TBT-15 | K9807071-050 | 1 40   |
| EVS-NEP-TBT-17 | K9807071-051 | 1 12   |
| EVS-NEP-TBT-18 | K9807071-052 | 1.07   |
| EVS-NEP-TBT-19 | K9807071-053 | 1 06   |
| EVS-NEP-TBT-20 | K9807071-054 | 1 02   |
| EVS-NEP-TBT-22 | K9807071-055 | 0 98   |
| EVS-NEP-TBT-23 | K9807071-056 | 1 27   |
| EVS-NEP-TBT-25 | K9807071-057 | 1 12   |
| EVS-NEP-TBT-26 | K9807071-058 | 1 14   |
| EVS-NEP-TBT-27 | K9807071-059 | 1.27   |
| EVS-NEP-TBT-28 | K9807071-060 | 1 18   |
| EVS-NEP-TBT-29 | K9807071-061 | 0 83   |
| EVS-NEP-TBT-30 | K9807071-062 | 1.14   |
| EVS-NEP-TBT-31 | K9807071-063 | 0 71   |
| EVS-NEP-TBT-32 | K9807071-064 | 0 70   |
| EVS-NEP-TBT-34 | K9807071-065 | 0 70   |
| EVS-NEP-TBT-36 | K9807071-066 | 0 95   |

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07071SVG P14 - TSolids 12/9/98

## Analytical Report

| Client:        | EVS Environment Consultants |                    | Service Request: | K9807071 |
|----------------|-----------------------------|--------------------|------------------|----------|
| Project:       | TBT Bioaccumulation         |                    | Date Collected:  | 10/10/98 |
| Sample Matrix: | Tissue                      |                    | Date Received:   | 10/13/98 |
|                |                             |                    | Date Extracted:  | 12/7/98  |
|                |                             |                    | Date Analyzed:   | 12/8/98  |
|                |                             | Lipids             |                  |          |
|                |                             | Bligh & Dyer       |                  |          |
|                |                             | Units: Percent (%) |                  |          |
|                |                             | As Received Basis  |                  |          |
|                |                             |                    |                  |          |
|                |                             |                    |                  |          |

| Sample Name               | Lab Code     | Result |
|---------------------------|--------------|--------|
| EVS-NEP-TBT-37            | K9807071-067 | 0 87   |
| EVS-NEP-TBT-38            | K9807071-068 | 1.06   |
| EVS-NEP-TBT-42            | K9807071-069 | 1.03   |
| Rep2-EVS-TBT-Nepthys Bkgd | K9807071-071 | 1.24   |

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## QA/QC Report

| Client:<br>Project:       | EVS Environment Consultants<br>TBT Bioaccumulation |                                                                                        | Service Request:<br>Date Collected: |         |
|---------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------|---------|
| Sample Matrix:            |                                                    |                                                                                        | Date Received:                      | 0.20.70 |
|                           | 1.00.00                                            |                                                                                        | Date Extracted:                     | 12/7/98 |
|                           |                                                    |                                                                                        | Date Analyzed:                      | 12/8/98 |
|                           |                                                    | Duplicate Summary<br>Lipids<br>Blıgh & Dyer<br>Units: Percent (%)<br>As Received Basis |                                     |         |
| Sample Name:<br>Lab Code: | Rep1-EVS-TBT-Macoma Bkgd<br>K9807071-001DUP        |                                                                                        |                                     |         |

|         |        | Duplicate |         | Relative   |
|---------|--------|-----------|---------|------------|
|         | Sample | Sample    |         | Percent    |
| Analyte | Result | Result    | Average | Difference |
|         |        |           |         |            |
| Lipids  | 0.77   | 0.68      | 0.72    | 12         |
|         |        |           |         |            |

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# QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                                                                                        | Da<br>Da<br>Da                | vice Request:<br>the Collected:<br>ate Received:<br>te Extracted:<br>the Analyzed: | 8/26/98<br>10/13/98<br>12/7/98    |
|---------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------|-----------------------------------|
|                                       |                                                              | Duplicate Summary<br>Lipids<br>Bligh & Dyer<br>Units. Percent (%)<br>As Received Basis |                               |                                                                                    |                                   |
| Sample Name:<br>Lab Code.             | EVS-Mac-TBT-9<br>K980707-012DUP                              |                                                                                        |                               |                                                                                    |                                   |
| Analyte                               |                                                              | Sample<br>Result                                                                       | Duplicate<br>Sample<br>Result | Average                                                                            | Relative<br>Percent<br>Difference |
| Lipids                                |                                                              | 0 81                                                                                   | 0.76                          | 0 785                                                                              | 6                                 |

Data Validated-EPA Level 1 Quality by Design

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## QA/QC Report

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| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                                                                                        |                               | ervice Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 10/10/98<br>10/13/98<br>12/7/98   |
|---------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------|
|                                       |                                                              | Duplicate Summary<br>Lipids<br>Bligh & Dyer<br>Units: Percent (%)<br>As Received Basis |                               |                                                                                           |                                   |
| Sample Name.<br>Lab Code:             | EVS-Mac-TBT-22<br>K9807071-023DUP                            |                                                                                        |                               |                                                                                           |                                   |
| Analyte                               |                                                              | Sample<br>Result                                                                       | Duplicate<br>Sample<br>Result | Average                                                                                   | Relative<br>Percent<br>Difference |

Lipids

Data Validated-EPA Level I

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Approved By: \_ DUP1S/102194 07071SVG PJ3 - dup 12/9/98

## QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                                                                                       | Service Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 10/10/98<br>10/13/98<br>12/7/98 |
|---------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------|
|                                       |                                                              | Duplicate Summary<br>Lipids<br>Bligh & Dyer<br>Units Percent (%)<br>As Received Basis |                                                                                            |                                 |

Sample Name. EVS-Mac-TBT-31 Lab Code: K9807071-031DUP

|         | Sample | Duplicate<br>Sample |         | Relative<br>Percent |
|---------|--------|---------------------|---------|---------------------|
| Analyte | Result | Result              | Average | Difference          |
| Lipids  | 0 66   | 0.67                | 0 665   | 2                   |

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Data Validated-EPA Level 1 

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## QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                                                                                        | Service Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 10/10/98<br>10/13/98<br>12/7/98 |
|---------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------|
|                                       |                                                              | Duplicate Summary<br>Lipids<br>Bligh & Dyer<br>Units: Percent (%)<br>As Received Basis | ,                                                                                          |                                 |
| Sample Name.<br>Lab Code <sup>.</sup> | EVS-NEP-TBT-10<br>K9807071-045DUP                            |                                                                                        |                                                                                            |                                 |
|                                       |                                                              | Sample                                                                                 | Duplicate<br>Sample                                                                        | Relative<br>Percent             |

| Analyte | Sample<br>Result | Sample<br>Result | Average | Percent<br>Differencc |
|---------|------------------|------------------|---------|-----------------------|
| Lipids  | 1.13             | 1.19             | 1 16    | 5                     |

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Approved By

DUP1S/102194 07071SVG PJ4 - dup 12/9/98

(At Date 12/9/13 00111

## QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                                                                                       |                              | Service Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 10/10/98<br>10/13/98<br>12/7/98   |
|---------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------|
|                                       |                                                              | Duplicate Summary<br>Lipids<br>Bligh & Dyer<br>Units Percent (%)<br>As Received Basis |                              |                                                                                            |                                   |
| Sample Name<br>Lab Code:              | EVS-NEP-TBT-15<br>K9807071-050DUP                            |                                                                                       |                              |                                                                                            |                                   |
| Analyte                               |                                                              | Sample<br>Result                                                                      | Duplicat<br>Sample<br>Result |                                                                                            | Relative<br>Percent<br>Difference |

1 40

1.13

1.265

21

Lipids

Data Validated-EPA Level I Quality by Design TD 12/2//98

Approved By: \_\_\_\_\_ DUP15/102194 07071SVG PJ4 - dup (2) 12/9/98

CAL Date 12/9/91 00112

Page No

#### QA/QC Report

| Client:<br>Project:<br>Sample Matrix: | EVS Environment Consultants<br>TBT Bioaccumulation<br>Tissue |                                                                                        | Service Request:<br>Date Collected:<br>Date Received:<br>Date Extracted:<br>Date Analyzed: | 10/10/98<br>10/13/98<br>12/7/98 |
|---------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------|
|                                       |                                                              | Duplicate Summary<br>Lipids<br>Bligh & Dyer<br>Units: Percent (%)<br>As Received Basis |                                                                                            |                                 |
| Sample Name:<br>Lab Code:             | EVS-NEP-TBT-38<br>K9807071-068DUP                            |                                                                                        |                                                                                            |                                 |
|                                       |                                                              | Sample                                                                                 | Duplicate<br>Sample                                                                        | Relative<br>Percent             |

Result

1.06

Result

0.95

Data Vahdated-EPA Level I Quality by Design TD (2/2//98

Difference

11

Average

1.005

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Lipids

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# **APPENDIX F**

Data Validation Reports

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Quality By Design

2203152009 Disk 181

Laboratory Quality Assurance Consulting

97 Puhili Street Hilo, Hawaii 96720 Phone: (808) 969-9424 Fax: (808) 969-9094

# **EPA LEVEL II** DATA VALIDATION REPORT

Project Name: WSOU TBT Study Type of Samples: Sediments and Porewater Date of Sampling: July 15-28, 1998

Prepared for:

EVS Environmental Consultants, Inc. 200 West Mercer Street, Suite 403 Seattle, WA 98119

> Proposal No. 118 QBD Job No.: 133

Reviewed and Approved for Release:

Lorraine L. Davis, Owner

(6+ 13,1998

Prepared by:

Sherman McCutcheon



# **Table of Contents**

This data validation report consists of the following stand alone sections, each of which is formatted to follow Functional Guidelines but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Page No.

| Α. | Introduction                                 | 2  |
|----|----------------------------------------------|----|
| B. | Chain-of-Custody and Sample Receipt          |    |
| C. | Review of Tributyl Tin                       |    |
| D. | Review of Total and Dissolved Organic Carbon | 16 |
| E. | Data Qualifier Definitions                   | 19 |
| F. | Data Qualification Summary                   | 22 |

Attachment 1: Communications with the Laboratory Attachment 2: Revised Laboratory Reports



# A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design*, has completed an EPA Level II Data Validation on the submitted data packages in accordance with QBD Proposal No. 118 and EVS Purchase Order No. 97716.

The reporting format and criteria for recommending data qualifying flags for this data set are described in USEPA "Functional Guidelines for Evaluating Organics Analyses", "Functional Guidelines for Evaluating Inorganics Analyses", as revised, December, 1994, and "Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound", May 1997, or using criteria listed in the method referenced. Data may be qualified for any of several reasons:

- 1. By the laboratory prior to receipt by the reviewer;
- 2. Because of laboratory deviation from the designated method;
- 3. Because the data may not meet the criteria listed in the reference above; or
- 4. By the professional judgment of the reviewer.

The data set consists of seven data packages with a total of 1,206 pages from Columbia Analytical Services, Inc. in Kelso, Washington and contains data for the samples shown in Table 1.

| Sample Identification | Laboratory Identification | тос | DOC | TBT |
|-----------------------|---------------------------|-----|-----|-----|
| TBT-01-S              | K9804715-001              | х   |     | x   |
| TBT-02-S              | K9804715-002              | х   |     | x   |
| TBT-35-S              | K9804715-003              | x   |     | х   |
| TBT-03-S              | K9804715-004              | х   |     | x   |
| TBT-04-S              | K9804715-005              | x   |     | x   |
| TBT-05-S              | K9804715-006              | x   |     | x   |
| TBT-06-S              | K9804715-007              | x   |     | x   |
| TBT-07-S              | K9804715-008              | x   |     | x   |
| TBT-36-S              | K9804715-009              | x   |     | x   |
| TBT-07-FB             | K9804715-010              | 1   |     | x   |
| ТВТ-07-СВ             | K9804715-011              |     |     | x   |

 Table 1: Sample Identification and Analysis



| Sample Identification | Laboratory Identification | тос                                           | DOC       | твт |
|-----------------------|---------------------------|-----------------------------------------------|-----------|-----|
| TBT-08-S              | K9804715-012              | x                                             |           | x   |
| TBT-09-S              | K9804715-013              | x                                             |           | x   |
| TBT-01-PD             | K9804760-001              |                                               |           | x   |
| 98626                 | K9804760-002              | <u>                                      </u> |           | x   |
| TBT-02-PT             | K9804760-003              |                                               |           | x   |
| TBT-36-PD             | K9804760-004              |                                               |           | x   |
| TBT-35-PD             | K9804760-005              |                                               |           | x   |
| TBT-35-PD             | K9804760-005              |                                               | <u></u> - | x   |
| TBT-08-PT             | K9804760-006              |                                               |           | x   |
| TBT-02-PD             | K9804760-007              | <u> </u>                                      |           | x   |
| TBT-08-PD             | K9804760-008              |                                               |           | x   |
| TBT-35-PT             | K9804760-009              |                                               |           | x   |
| TBT-01-PT             | K9804760-010              |                                               |           | x   |
| TBT-36-PT             | K9804760-011              |                                               |           | x   |
| TBT-03-PD             | K9804760-012              |                                               |           | x   |
| TBT-05-PD             | K9804760-013              |                                               |           | x   |
| TBT-04-PD             | K9804760-014              |                                               |           | x   |
| TBT-05-PT             | K9804760-015              |                                               |           | x   |
| TBT-04-PT             | K9804760-016              |                                               |           | x   |
| TBT-03-PT             | K9804760-017              |                                               |           | x   |
| TBT-06-PT             | K9804760-018              |                                               |           | x   |
| TBT-06-PD             | K9804760-019              |                                               |           | x   |
| TBT-07-PT             | K9804760-020              |                                               |           | x   |
| TBT-07-PD             | K9804760-021              |                                               |           | x   |
| TBT-09-PT             | K9804760-022              | 1                                             |           | x   |
| TBT-09-PD             | K9804760-023              |                                               |           | x   |
| TBT-10-PT             | K9804760-024              |                                               | -         | x   |
| TBT-10-PD             | K9804760-025              |                                               |           | x   |
| TBT-10-S              | K9804761-001              | x                                             |           | x   |
| TBT-11-S              | K9804761-002              | x                                             |           | x   |
|                       |                           |                                               |           |     |

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J. Vivieros, EVS Environmental Consultants WSOU TBT Study Data Validation Sampling Dates: July 15-28, 1998 Page 4

|                       |                           | <u> </u> |      |     |
|-----------------------|---------------------------|----------|------|-----|
| Sample Identification | Laboratory Identification | тос      | DOC  | TBT |
| TBT-12-S              | K9804761-003              | x        |      | x   |
| TBT-13-S              | K9804761-004              | x        |      | x   |
| TBT-14-S              | K9804761-005              | X        |      | X   |
| TBT-37-S              | K9804761-006              | х        |      | x   |
| TBT-15-S ·            | K9804761-007              | x        |      | ¨ Χ |
| TBT-16-S              | K9804761-008              | x        |      | x   |
| TBT-17-S              | K9804761-009              | х        |      | x   |
| TBT-18-S              | K9804761-010              | x        | ···· | x   |
| TBT-19-S              | K9804761-011              | x        |      | x   |
| TBT-20-S              | K9804761-012              | x        |      | x   |
| TBT-32-S              | K9804795-012              | x        |      | x   |
| TBT-21-S              | K9804795-001              | x        |      | x   |
| TBT-22-S              | K9804795-002              | x        |      | x   |
| TBT-23-S              | K9804795-003              | x        |      | x   |
| TBT-24-S              | K9804795-004              | x        |      | x   |
| TBT-25-S              | K9804795-005              | x        |      | x   |
| TBT-25-CB             | K9804795-006              | x        |      | x   |
| TBT-26-S              | K9804795-007              | x        |      | х   |
| TBT-27-S              | K9804795-008              | x        |      | x   |
| TBT-28-S              | K9804795-009              | x        |      | x   |
| TBT-38-S              | K9804795-010              | x        |      | x   |
| TBT-34-S              | K9804795-011              | x        | 1    | x   |
| TBT-31-S              | K9804795-013              | x        |      | x   |
| TBT-33-S              | K9804795-014              | x        |      | x   |
| TBT-29-S              | K9804795-015              | x        |      | x   |
| TBT-30-S              | K9804795-016              | x        | 1    | x   |
| TBT-11-PT             | K9804815-001              |          |      | x   |
| TBT-11-PD             | K9804815-002              |          |      | x   |
| TBT-12-PT             | K9804815-003              |          |      | x   |
| TBT-12-PD             | K9804815-004              |          |      | x   |



| Sample Identification | Laboratory Identification | тос      | DOC | ТВТ |
|-----------------------|---------------------------|----------|-----|-----|
| TBT-13-PT             | K9804815-005              | <u> </u> |     | x   |
| TBT-13-PD             | K9804815-006              |          |     | · x |
| TBT-14-PT             | K9804815-007              |          |     | x   |
| TBT-14-PD             | K9804815-008              |          |     | x   |
| TBT-37-PT             | K9804815-009              |          |     | x   |
| TBT-37-PD             | K9804815-010              |          |     | x   |
| TBT-21-PT             | K9804815-023              |          |     | x   |
| TBT-21-PD             | K9804815-024              |          |     | x   |
| TBT-22-PT             | K9804815-025              |          |     | x   |
| TBT-22-PD             | K9804815-026              |          |     | x   |
| TBT-23-PT             | K9804815-027              |          |     | x   |
| TBT-23-PD             | K9804815-028              |          |     | x   |
| TBT-24-PT             | K9804815-029              |          |     | x   |
| TBT-24-PD             | K9804815-030              |          |     | x   |
| TBT-25-PT             | K9804815-031              |          |     | x   |
| TBT-25-PD             | K9804815-032              |          |     | x   |
| TBT-26-PT             | K9804815-033              |          |     | x   |
| TBT-26-PD             | K9804815-034              |          |     | x   |
| TBT-27-PT             | K9804815-035              |          |     | x   |
| TBT-27-PD             | K9804815-036              |          |     | x   |
| TBT-28-PT             | K9804815-037              |          |     | x   |
| TBT-28-PD             | K9804815-038              |          |     | x   |
| TBT-34-PT             | K9804815-039              |          |     | x   |
| TBT-34-PD             | K9804815-040              |          |     | x   |
| TBT-32-PT             | K9804815-041              |          |     | x   |
| TBT-32-PD             | K9804815-042              |          |     | x   |
| TBT-31-PT             | K9804815-043              |          |     | x   |
| TBT-31-PD             | K9804815-044              |          |     | x   |
| TBT-33-PT             | K9804815-045              |          |     | x   |
| TBT-33-PD             | K9804815-046              |          |     | x   |

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Quality By Design

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| Sample Identification | Laboratory Identification | тос | DOC | ТВТ |
|-----------------------|---------------------------|-----|-----|-----|
| TBT-29-PT             | K9804815-047              |     |     | Х   |
| TBT-29-PD             | K9804815-048              |     |     | x   |
| TBT-30-PT             | K9804815-049              |     |     | х   |
| TBT-30-PD             | K9804815-050              |     |     | Х   |
| TBT-38-PT             | K9804815-051              |     |     | х   |
| TBT-38-PD             | K9804815-052              |     |     | x   |
| TBT-LCS-PT            | K9804815-053              |     |     | x   |
| TBT-LCS-PD            | K9804815-054              |     |     | х   |
| TBT-01-TOC            | K9804937-001              | х   |     |     |
| TBT-01-DOC            | K9804937-002              |     | x   |     |
| TBT-02-TOC            | K9804937-003              | х   |     |     |
| TBT-02-DOC            | K9804937-004              |     | x   |     |
| TBT-03-TOC            | K9804937-005              | x   |     |     |
| TBT-03-DOC            | K9804937-006              |     | x   |     |
| TBT-04-TOC            | K9804937-007              | x   |     |     |
| TBT-04-DOC            | K9804937-008              |     | х   |     |
| TBT-05-DOC            | K9804937-009              |     | х   |     |
| TBT-05-TOC            | K9804937-010              | x   |     |     |
| TBT-06-TOC            | K9804937-011              | x   |     |     |
| TBT-06-DOC            | K9804937-012              |     | x   |     |
| TBT-07-TOC            | K9804937-013              | x   |     |     |
| TBT-07-DOC            | K9804937-014              |     | x   | -   |
| TBT-08-TOC            | K9804937-015              | x   |     |     |
| TBT-08-DOC            | K9804937-016              |     | x   |     |
| TBT-09-TOC            | K9804937-017              | x   |     |     |
| TBT-09-DOC            | K9804937-018              |     | x   |     |
| TBT-10-TOC            | K9804937-019              | x . |     | 1   |
| TBT-10-DOC            | K9804937-020              | x   |     |     |
| TBT-11-TOC            | K9804937-021              | x   |     |     |
| TBT-11-DOC            | K9804937-022              |     | x   |     |

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| Sample Identification | Laboratory Identification | тос | DOC | Трт   |
|-----------------------|---------------------------|-----|-----|-------|
| TBT-12-TOC            | K9804937-023              | x   | DOC | TBT   |
| TBT-12-DOC            | K9804937-024              |     | x   | · · · |
| ТВТ-13-ТОС            | K9804937-025              | x   |     |       |
| TBT-13-DOC            | K9804937-025              |     | x   |       |
| TBT-14-TOC            | K9804937-027              | x   |     |       |
| TBT-14-DOC            | K9804937-027              |     | x   |       |
|                       |                           | x   |     |       |
| TBT-15-TOC            | K9804937-029              | X   |     |       |
| TBT-15-DOC            | K9804937-030              |     | X   |       |
| TBT-16-TOC            | K9804937-031              | x   |     |       |
| TBT-16-DOC            | K9804937-032              |     | X   |       |
| TBT-17-TOC            | K9804937-033              | x   |     |       |
| TBT-17-DOC            | K9804937-034              |     | x   |       |
| TBT-18-TOC            | K9804937-035              | x   |     |       |
| TBT-18-DOC            | K9804937-036              |     | x   |       |
| TBT-19-TOC            | K9804937-037              | х   |     |       |
| TBT-19-DOC            | K9804937-038              |     | x   |       |
| TBT-20-TOC            | K9804937-039              | x   |     |       |
| TBT-20-DOC            | K9804937-040              |     | x   |       |
| TBT-21-TOC            | K9804937-041              | x   |     |       |
| TBT-21-DOC            | K9804937-042              |     | x   |       |
| TBT-22-TOC            | K9804937-043              | x   |     |       |
| TBT-22-DOC            | K9804937-044              |     | x   |       |
| TBT-23-TOC            | K9804937-045              | x   |     |       |
| TBT-23-DOC            | K9804937-046              | 1   | x   |       |
| TBT-24-TOC            | K9804937-047              | x   |     |       |
| TBT-24-DOC            | K9804937-048              | 1   | x   |       |
| TBT-25-TOC            | K9804937-049              | x   |     |       |
| TBT-25-DOC            | K9804937-050              |     | х   |       |
| TBT-26-TOC            | K9804937-051              | x   |     |       |
| TBT-26-DOC            | K9804937-052              |     | x   |       |

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| Sample Identification      | Laboratory Identification | тос           | DOC | ТВТ |
|----------------------------|---------------------------|---------------|-----|-----|
| TBT-27-TOC                 | K9804937-053              | х             |     |     |
| TBT-27-DOC                 | K9804937-054              |               | x   |     |
| TBT-28-TOC                 | K9804937-055              | x             |     |     |
| TBT-28-DOC                 | K9804937-056              |               | x   |     |
| TBT-29-TOC                 | K9804937-057              | x             |     |     |
| TBT-29-DOC                 | K9804937-058              |               | x   |     |
| TBT-30-TOC                 | K9804937-059              | х             |     |     |
| TBT-30-DOC                 | K9804937-060              |               | x   |     |
| TBT-31-TOC                 | K9804937-061              | x             |     |     |
| TBT-31-DOC                 | K9804937-062              |               | x   |     |
| TBT-32-TOC                 | K9804937-063              | х             |     |     |
| TBT-32-DOC                 | K9804937-064              |               | x   |     |
| TBT-33-TOC                 | K9804937-065              | x             |     |     |
| TBT-33-DOC                 | K9804937-066              |               | x   |     |
| TBT-34-TOC                 | K9804937-067              | x             |     |     |
| TBT-34-DOC                 | K9804937-068              |               | x   |     |
| TBT-35-TOC                 | K9804937-069              | x             |     |     |
| TBT-35-DOC                 | K9804937-070              |               | x   |     |
| TBT-36-TOC                 | K9804937-071              | x             |     |     |
| TBT-36-DOC                 | K9804937-072              |               | x   |     |
| TBT-37-TOC                 | K9804937-073              | x             |     |     |
| TBT-37-DOC                 | K9804937-074              | · · · · · · · | x   |     |
| TBT-38-TOC                 | K9804937-075              | x             |     |     |
| TBT-38-DOC                 | K9804937-076              |               | x   | -   |
| Method Blank Filtered      | K9804937-077              |               | x   |     |
| Method Blank<br>Unfiltered | K9804937-078              | x             |     |     |
| TBT-15-PT-RE               | K9805084-001              |               |     | x   |
| TBT-15-PD-RE               | K9805084-002              |               |     | x   |
| TBT-16-PT-RE               | K9805084-003              |               |     | x   |
| TBT-16-PD-RE               | K9805084-004              |               |     | x   |

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| Sample Identification | Laboratory Identification | тос          | DOC | TBT |
|-----------------------|---------------------------|--------------|-----|-----|
| TBT-17-PT-RE          | K9805084-005              | K9805084-005 |     | х   |
| TBT-17-PD-RE          | K9805084-006              |              |     | Х   |
| TBT-18-PD-RE          | K9805084-007              | K9805084-007 |     | Х   |
| TBT-18-PT-RE          | K9805084-008              |              |     | х   |
| TBT-19-PT-RE          | K9805084-009              |              |     | х   |
| TBT-19-PD-RE          | K9805084-010              |              |     | х   |
| TBT-20-PT-RE          | K9805084-011              |              |     | x   |
| TBT-20-PD-RE          | K9805084-012              |              |     | x   |
| TBT-12-PT-RE          | K9805084-013              |              |     | x   |
| TBT-12-PD-RE          | K9805084-014              |              |     | x   |

Key:

TOC=Total Organic CarbonDOC=Dissolved Organic CarbonTBT=Tributyltin

Each data set includes an analytical data package for each sample, copies of the completed chainof-custody forms, and a Quality Control (QC) Data Package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, the laboratory's name and address, and the client's services manager's signature. The custody forms include the receipt of the sample but not he laboratory's internal tracking. The QC Data Package includes a tabular listing of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data was provided which includes chromatograms, instrument print-outs, injection logs, digestion/preparation logs, and standard logs.

# B. Chain-of-Custody and Sample Receipt

The analytical plan and data packages were reviewed and compared against the Chain-of-Custody and other data. Except as noted below, no data is missing from the packages and no errors were found.

- Discussion: Several anomalies were noted with regards to the Chain-of-Custody, but were resolved after contact with Columbia Analytical Services (CAS). The items listed below were not resolved.
  - > CAS Service Request No. K9804760 had the following anomalies:

The temperature of the cooler at the time of receipt ranged from  $0.8^{\circ}$  to  $1.5^{\circ}$ C which is below the acceptance criteria of  $4^{\circ}\pm 2^{\circ}$ C.

There is no release time shown when Rosa Environmental and Geotechnical Laboratory, LLC (REGL) relinquished the samples to Columbia Analytical Services (CAS).

The temperature of the cooler at the time of receipt was  $0.5^{\circ}$ C which is below the acceptance criteria of  $4^{\circ}\pm 2^{\circ}$ C.

> CAS Service Request No. K9804761 had the following anomalies:

There is no time of sample receipt listed on the Chain-of-Custody.

Samples No. TBT-19-S and TBT-20-S were not relinquished by EVS.

> CAS Service Request No. K9804815 had the following anomalies:

The temperature of the coolers for samples received on July 21, 1998, at the time of receipt, ranged from  $-0.1^{\circ}$ C to  $1.1^{\circ}$ C which is below the acceptance criteria of  $4^{\circ}\pm 2^{\circ}$ C.

Samples were received at temperatures below the acceptance criteria of  $4^{\circ}\pm 2^{\circ}$ C. It is in the professional opinion of the reviewer that the lower temperatures do not impact the quality of the analysis and no data qualifier flags are recommended.



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Samples No. TBT-15-PT through TBT-20-PT and TBT-15-PD through TBT-20 PD were logged in under one Service Request Number but the extracts were lost. Sample re-extracts were submitted under another Service Request Number and results were reported under the new Service Request Number.



# C. Review of Tributyl Tin

Krone, et. al., 1988

# 1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the chain-ofcustody and other data. No data is missing and no errors were found.

## 2. Initial and Continuing Calibration

All initial and continuing calibration QC criteria were met. No Target Compound List (TCL) analytes had Percent Relative Standard Deviations greater than that allowed by the method.

Discussion: The continuing calibration verification (CCV) associated with Samples Nos. TBT-01-S, TBT-02-S, TBT-35-S, TBT-03-S, TBT-04-S, TBT-05-S, TBT-06-S and TBT-06-S MS was calculated using an average response factor whereas the sample concentration was calculated using linear regression. No data flags are recommended since the CCV calculated using linear regression falls within acceptance criteria.

## 3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

## 4. Surrogate Recovery

Except as noted below, surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within laboratory or method criteria.

Discussion: Surrogates were out of criteria in the blank associated with the data. No data flags are recommended because the surrogates were acceptable in the samples.



The laboratory calculated the surrogate Tripentyltin two different ways with no apparent pattern. One way was using the same calculation process used in determining the sample concentration (linear regression). On other samples, the laboratory used a "one-point" recalculation based on the daily continuing calibration verification (response factor). While this is an unacceptable practice, no data flags are recommended because in calculating the surrogate concentration using linear regression, the surrogate recoveries are within acceptance criteria.

#### 5. Matrix Spike/Matrix Spike Duplicate

Except as noted below, matrix spikes (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries (%Rec) and relative percent differences (RPD) were within laboratory or method criteria.

| Associated Samples | TCL Compound Affected | Type of Deviation | Flag   |
|--------------------|-----------------------|-------------------|--------|
| TBT-35-PD          | Tributyltin           | MSD               | 0.15 J |
| TBT-34-PT          | Tributyltin           | MSD               | 0.19 J |
| TBT-32-PT          | Tributyltin           | MSD               | 0.35 J |

Discussion: Tributyltin was out of criteria for both accuracy and precision for the MS/MSD pair. Samples No. TBT-35-PD, TBT-34-PT and TBT-32-PT have been flagged as "J" for estimated.

Matrix spike and matrix spike duplicate recoveries were out of criteria for samples associated with Sample No. TBT-06-S matrix spike due to high concentrations of analytes in the original sample. Since all other QC checks are in criteria, no data qualifier flags are recommended.

#### 6. Field Duplicates

No field duplicates were identified with this group of samples.



# 7. TCL Compound Identification

All TCL Compound identifications met the criteria for retention times and peak identification of the referenced material.

## 8. Compound Quantitation and Reported Detection Limits

Except as noted below, quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Reporting limits have been correctly adjusted for dilutions and extraction amounts.

| Associated Samples | TCL Compound Affected | Type of Deviation | Flag |
|--------------------|-----------------------|-------------------|------|
| TBT-10-S           | Butyltin              | Calculation Error | 8    |

Discussion: A calculation error was found in determining the final result. The corrected value is listed in the summary table and on the laboratory final report form. The laboratory has been requested to reissue a revised report directly to EVS.

The laboratory utilized two different methods to quantitate Tributyltin. One set of sample results were calculated using a linear regression and another set of sample results were calculated using a response factor. No data flags are recommended since both methods are acceptable and both data sets were in criteria.

## 9. System Performance

The system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.



#### **10. Laboratory Contact**

The QBD project manager faxed Lynda Huckestein at CAS Laboratory during the data validation process so that the QBD project manager could request information regarding sample receipt and laboratory quality control limits. This fax and response is appended to this validation report.

#### 11. Other Comments

The laboratory's use of different equations in determining concentration indicates that the procedure has not been standardized at the laboratory. Although none of the calculations made the results "better," the inconsistency lends an appearance of "picking and choosing" and casts doubts on the laboratories quality policies.

#### 12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.



# D. Review of Total and Dissolved Organic Carbon

EPA Method 415.1

## 1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the chain-ofcustody and other data. Except as noted below, no data is missing from the packages and no errors in accuracy were found. All tests requested on the chain-of-custody were performed. All samples were analyzed within the technical holding times. There are no contractual holding time criteria that have been brought to the attention of the reviewer.

Discussion: There were several changes in raw data made without initial and dates.

The quality control page associated with Samples No. TBT-01-TOC through TBT-38-TOC and TBT-01-DOC through TBT-38-DOC was missing the Continuing Calibration Verification -7 and Continuing Calibration Blank -7 results. The laboratory has been contacted to revise and reissue the page directly to EVS.

# 2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met, including the number of standards used and correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

# 3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.



#### 4. Laboratory Control Standards

A Laboratory Control Standard was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

#### 5. Precision and Accuracy

Matrix spikes (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries (%Rec) and relative percent differences (RPD) were within laboratory or method criteria.

#### 6. Field Duplicates

No field duplicates were identified with this group of samples.

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#### 7. Sample Result Verification

The final reports were reviewed and compared against raw instrumental data and logs to check anomalies, data reduction/calculations, transcription, linear ranges, and dilutions. No errors in accuracy were found

#### 8. Laboratory Contact

The QBD project manager taxed Lynda Huckestein at CAS Laboratory during the data validation process so that the QBD project manager could request that the missing CCV and CCB data be added to the quality control report and the revision sent directly to EVS. A copy of the fax is appended to this validation report.

#### 9. Other Comments

None.



## 10. Data Use and Overall Assessment

The data is acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

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E. Data Qualifier Definitions



# **Data Qualifier Definitions**

#### Organics

- U = The analyte was analyzed for but not detected above the numerical quantitation limit.
- J = The analyte was analyzed for and was positively identified, but the associated numerical value is an estimated quantity. EPA Region X describes the data as able to be seriously considered for decision-making and useable for many purposes.

In EPA Region X, a subscript may be appended to the "J" that indicates which of the following control criteria were not met:

- 1 Blank contamination
- 2 Calibration range exceeded
- 3 Holding times not met
- 4 Other QC outside of criteria
- UJ = The analyte was analyzed for but was not detected above the reporting level, but the reporting level is an estimated level.
- R = The data are unusable for all purposes. The analyte was analyzed for, but the target analyte may or may not be present.
- N = The analysis indicates presumptive evidence of the presence of the analyte.
- NJ = The analysis indicates presumptive evidence of the presence of the analyte, but the numerical value is an estimated quantity.

In EPA Region X, a subscript may be appended to the "NJ" that indicates which of the following control criteria were not met:

- 1 DDT/Endrin breakdown evident
- 2 Interference from other sample components
- 3 Non-Target Compound List (TCL) compounds: Confirmation is necessary using specific methodology to accurately determine the concentration and identity of the detected compounds.
- 4 A confirmation analysis was missing or quality control criteria were not met for the confirmation analysis.



#### Inorganics

- U = The analyte was analyzed for but not detected above the numerical quantitation limit. The numerical value may be either a detection limit or a quantitation limit.
- J = The analyte was analyzed for and was positively identified, but the associated numerical value is an estimated quantity. EPA Region X describes the data as able to be seriously considered for decision making and useable for many purposes.

In EPA Region X, a subscript may be appended to the "J" that indicates which of the following control criteria were not met:

- 1 Blank contamination
- 2 Calibration range exceeded
- 3 Holding times not met
- 4 Other QC outside of criteria
- UJ = The analyte was analyzed for but was not detected above the reporting level, but the reporting level is an estimated level.
- R = The data are unusable for all purposes. The analyte was analyzed for, but the target analyte may or may not be present.



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# F. Data Qualification Summary



# **Data Qualification Summary**

EVS Environmental Consultants Project: WSOU TBT Study Type of Samples: Sediments and Porewater Dates of Sampling: July 15-28, 1998

| Associated Samples | TCL Compound Affected | Type of Deviation | Flag   |
|--------------------|-----------------------|-------------------|--------|
| TBT-35-PD          | Tributyltin           | MSD               | 0.15 J |
| TBT-34-PT          | Tributyltin           | MSD               | 0.19 J |
| TBT-32-PT          | Tributyltin           | MSD               | 0.35 J |
| TBT-10-S           | Butyltin              | Calculation Error | 8      |

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Laboratory Quality Assurance Consulting

97 Puhili Street Hilo, Hawaii 96720 Phone: (808) 969-9424 Fax: (808) 969-9094

# **DATA VALIDATION REPORT**

Project Name: Waterway Sediment Operable Unit, Harbor Island Superfund Site Type of Samples: Tissue Date of Sampling: October 10, 1998 EVS Project No.: 8/203-16.2

Prepared for:

EVS Solutions, Inc. 200 West Mercer Street, Suite 403 Seattle, WA 98119

Purchase Order No. P97733 QBD Job No. 151

Reviewed and Approved,

12/22/98 æ 2000 A Vian rul  $\mathcal{O}$ 

Lórraine L. Davis

Date

Prepared by,

Java 12/22/98

Thomas S. Davis

Date



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# **Table of Contents**

This data validation report consists of the following stand alone sections, each of which is formatted to follow Functional Guidelines but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

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# A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design*, has completed an EPA Level I Data Validation on the submitted data packages in accordance with Purchase Order No. P97733.

The reporting format and criteria for recommending data qualifying flags for this data set are described in USEPA "Functional Guidelines for Evaluating Organics Analyses", "Functional Guidelines for Evaluating Inorganics Analyses", as revised, December, 1994; and "Recommended Quality Assurance and Quality Control Guidelines for the Collection of Environmental Data in Puget Sound," April 1997, or using criteria listed in the method referenced. Data may be qualified for any of several reasons:

- 1. By the laboratory prior to receipt by the reviewer;
- 2. Because of laboratory deviation from the designated method;
- 3. Because the data may not meet the criteria listed in the reference above; or
- 4. By the professional judgment of the reviewer.

The data set consists of two data packages, from Columbia Analytical Services, Inc. in Kelso, Washington and from Rosa Environmental and Geotechnical Laboratory in Seattle, Washington and contain data for the samples shown in Table 1.

Each data set includes an analytical data package for each sample, copies of the completed chainof-custody forms, and a Quality Control (QC) Data Package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, the laboratory's name and address, and the client's services manager's signature. The custody forms include the receipt of the sample but not he laboratory's internal tracking. The QC Data Package includes a tabular listing of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data was provided which includes chromatograms, instrument print-outs, injection logs, digestion/preparation logs, and standard logs.



| Sample<br>Identification  | Laboratory<br>Identification | TBT | Total<br>Solids | Percent<br>Lipids | Percent<br>Lipids * |
|---------------------------|------------------------------|-----|-----------------|-------------------|---------------------|
| EVS-TBT-MAC<br>Bkgd rep 1 | K9807071-1                   | x   | x               | x                 | x                   |
| EVS-TBT-MAC<br>Bkgd rep 2 | K9807071-2                   | x   | x               | x                 | x                   |
| EVS-TBT-MAC<br>Bkgd rep 3 | K9807071-3                   | x   | х               | x                 | x                   |
| EVS-TBT-MAC<br>Bkgd rep 4 | K9807071-4                   | x   | x               | х                 | x                   |
| EVS-TBT-MAC<br>Bkgd rep 5 | K9807071-5                   | x   | x               | x                 | x                   |
| EVS-MAC-TBT-2             | K9807071-6                   | x   | x               | x                 | x                   |
| EVS-MAC-TBT-3             | K9807071-7                   | x   | x               | x                 | х                   |
| EVS-MAC-TBT-4             | K9807071-8                   | x   | x               | x                 | x                   |
| EVS-MAC-TBT-5             | K9807071-9                   | x   | x               | x                 | x                   |
| EVS-MAC-TBT-7             | K9807071-10                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-8             | K9807071-11                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-9             | K9807071-12                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-10            | K9807071-13                  | x   | x               | x                 | х                   |
| EVS-MAC-TBT-11            | K9807071-14                  | x   | x               | x                 | х                   |
| EVS-MAC-TBT-12            | K9807071-15                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-13            | K9807071-16                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-14            | K9807071-17                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-15            | K9807071-18                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-17            | K9807071-19                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-18            | K9807071-20                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-19            | K9807071-21                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-20            | K9807071-22                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-22            | K9807071-23                  | x   | x               | x                 | х                   |
| EVS-MAC-TBT-23            | K9807071-24                  | x   | x               | x                 | Х                   |
| EVS-MAC-TBT-25            | K9807071-25                  | х   | x               | x                 | x <sub>.</sub>      |
| EVS-MAC-TBT-26            | K9807071-26                  | x   | x               | x                 | x                   |

# Table 1: Sample Identification and Analysis

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| Sample<br>Identification | Laboratory<br>Identification | твт | Total<br>Solids | Percent<br>Lipids | Percent<br>Lipids * |
|--------------------------|------------------------------|-----|-----------------|-------------------|---------------------|
| EVS-MAC-TBT-27           | K9807071-27                  | x   | x               | х                 | x                   |
| EVS-MAC-TBT-28           | K9807071-28                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-29           | K9807071-29                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-30           | K9807071-30                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-31           | K9807071-31                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-32           | K9807071-32                  | x   | x               | x                 | х                   |
| EVS-MAC-TBT-34           | K9807071-33                  | x   | x               | x                 | х                   |
| EVS-MAC-TBT-36           | K9807071-34                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-37           | K9807071-35                  | x   | x               | x                 | X                   |
| EVS-MAC-TBT-38           | K9807071-36                  | x   | x               | x                 | x                   |
| EVS-MAC-TBT-42           | K9807071-37                  | x   | x               | x                 | х                   |
| EVS-NEP-TBT-2            | K9807071-38                  | x   | x               | x                 | Х                   |
| EVS-NEP-TBT-3            | K9807071-39                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-4            | K9807071-40                  | x   | x               | x                 | X                   |
| EVS-NEP-TBT-5            | K9807071-41                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-7            | K9807071-42                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-8            | K9807071-43                  | X   | x               | x                 | X                   |
| EVS-NEP-TBT-9            | K9807071-44                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-10           | K9807071-45                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-11           | K9807071-46                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-12           | K9807071-47                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-13           | K9807071-48                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-14           | K9807071-49                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-15           | K9807071-50                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-17           | K9807071-51                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-18           | K9807071-52                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-19           | K9807071-53                  | x   | x               | х                 | x                   |
| EVS-NEP-TBT-20           | K9807071-54                  | x   | х               | x                 | x                   |
| EVS-NEP-TBT-22           | K9807071-55                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-23           | K9807071-56                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-25           | K9807071-57                  | x   | x               | x                 | x                   |

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| Sample<br>Identification      | Laboratory<br>Identification | ТВТ | Total<br>Solids | Percent<br>Lipids | Percent<br>Lipids * |
|-------------------------------|------------------------------|-----|-----------------|-------------------|---------------------|
| EVS-NEP-TBT-26                | K9807071-58                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-27                | K9807071-59                  | x   | x               | x                 | х                   |
| EVS-NEP-TBT-28                | K9807071-60                  | x   | x               | x                 | х                   |
| EVS-NEP-TBT-29                | K9807071-61                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-30                | K9807071-62                  | x   | x               | x                 | · X                 |
| EVS-NEP-TBT-31                | K9807071-63                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-32                | K9807071-64                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-34                | K9807071-65                  | x   | x               | x                 | х                   |
| EVS-NEP-TBT-36                | K9807071-66                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-37                | K9807071-67                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-38                | K9807071-68                  | x   | x               | x                 | x                   |
| EVS-NEP-TBT-42                | K9807071-69                  | x   | x               | x                 | x                   |
| EVS-TBT-Nepthys<br>Bkgd rep 1 | K9807071-70                  | x   | x               | x                 | x                   |
| EVS-TBT-Nepthys<br>Bkgd rep 2 | K9807071-71                  | x   | x               | x                 | x                   |
| EVS-TBT-Nepthys<br>Bkgd rep 3 | K9807071-72                  | x   | x               | x                 |                     |
| EVS-TBT-Nepthys<br>Bkgd rep 4 | K9807071-73                  | X   | x               | x                 | X                   |
| EVS-TBT-Nepthys<br>Bkgd rep 5 | K9807071-74                  | x   | x               | x                 |                     |

Key:

TBT = Tributyltun \* = Reanalysis

= Reanalysis by method of Bligh and Dyer

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# B. Review of Tributyl Tin by Gas Chromatography Method Krone

#### 1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the chain-ofcustody and other data. Except as noted below, no data is missing from the packages and no errors in accuracy were found. All tests requested on the chain-of-custody were performed. All samples were analyzed within the technical holding times. There are no contractual holding time criteria that have been brought to the attention of the reviewer.

Discussion: The chain-of-custody (COC) had a gap between October 12, 1998 at 1400 and October 13, 1998 at 1030, during which time the samples were shipped to Columbia Analytical Services (CAS). CAS was contacted and requested to provide a copy of the waybill and/or the waybill tracer number. CAS responded verbally that this information had not been retained. No data qualifiers are recommended because the laboratory's cooler receipt form states that a cooler was received on October 13 and opened, and that the contents were in good condition.

The final two samples, Rep 4- and Rep 5-EVS-TBT-Nepthys-Bkgd were not received from Battelle Laboratory. These samples were prepared by homogenizing Rep 1-, Rep 2- and Rep 3-EVS-TBT-Nepthys-Bkgd and then preparing five aliquots. The sample preparation log states that this was done at the request of the client, but no communication logs or change order documentation was provided. All results were non-detect. The reviewer does not recommend any data qualifier flags, but if performing a statistical analysis, the data user should consider that the background population size was three.

Supporting data for the bioaccumulation phase of the study (e.g., conductivity, pH, ammonia) was not provided for review.

The raw data package was incomplete and each extraction/analysis batch was formatted differently. For example:

Some, but not all, instrumental sequence logs were provided with the injection logs.



- All of the extraction logs were provided at the beginning of the package but copies were also inserted into various parts of the data.
- An initial calibration data set was missing from the package but was faxed to the reviewer by the laboratory. A copy is attached to this report.
- Some reports utilized two significant figures and some three. Section 9 (Quantitation) identifies samples for which the report was changed to reflect the consistent use of significant figures.

#### 2. Initial and Continuing Calibration

Except as noted below, all initial and continuing calibration QC criteria were met. No Target Compound List (TCL) analytes had Percent Relative Standard Deviations (%RSD) greater than that allowed by the method.

Discussion: The closing continuing calibration check for the target compound Tri-n-butyltin on November 14, 1998 had a percent difference greater than the acceptance criteria. The laboratory's case narrative stated that the low recovery was due to the sample immediately prior to the CCV and that no corrective action was performed. Since this sample was not a project sample, this statement could not be verified or denied. However, because all other quality control checks (MS/MSD, LCS, surrogate) were acceptable, no data qualifier flags are recommended.

> The laboratory analyzed a pair of CCVs every ten samples but reported only one. Although in reviewing the raw data all CCVs were acceptable, this gives the appearance of picking and choosing results for acceptable quality control.

> The confirmatory column was calibrated using only a single point calibration. No data qualifier flags are recommended because all results were confirmed qualitatively by retention time and quantitated within  $\pm 40\%$  of the primary column. All quantitative results were reported from the primary column.

#### 3. Blanks and Checks for Contamination

Except as noted below, instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

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Discussion: The method blank for the November 5, 1998 extraction was analyzed at a ten-fold dilution, but no documentation was provided to explain the elevated reporting limit.

#### 4. Surrogate Recovery

Except as noted below, surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within laboratory criteria.

Discussion: Surrogates were out of criteria in a blank, an MSD, and a LCS. No data flags are recommended because the surrogates were acceptable in the samples.

#### 5. Laboratory Control Standards and Blank Spikes

Laboratory Control Standards were analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or QAPP criteria.

#### 6. Matrix Spike/Matrix Spike Duplicates

Except as noted below, matrix spikes (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries (%Rec) and relative percent differences (RPD) were within laboratory or QAPP criteria.

Discussion: Two of four matrix spike and matrix spike duplicate pairs were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks (surrogate, LCS and the other MS/MSD pairs) are in criteria, no data qualifier flags are recommended.

#### 7. Field Duplicates

Background replicates were identified and all were non-detects.

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#### 8. TCL Compound Identification

All TCL Compound identifications met the criteria for retention times, peak identification, and second column confirmation of the referenced method.

#### 9. Compound Quantitation and Reported Detection Limits

Except as noted below, quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Reporting limits have been correctly adjusted for dilutions and extraction amounts. The reporting limits meet requirements of the contract.

| Associated Samples | Analyte Affected | Type of Deviation   | Flag |
|--------------------|------------------|---------------------|------|
| EVS-MAC-TBT-4      | Tri-n-butyltin   | Significant Figures | 376  |
| EVS-MAC-TBT-22     | Tri-n-butyltin   | Transcription Error | 307  |
| EVS-MAC-TBT-36     | Tri-n-butyltin   | Transcription Error | 253  |
| EVS-NEP-TBT-4      | Tri-n-butyltin   | Significant Figures | 384  |

Discussion: Several samples contained target analytes which were quantitated at levels greater than the highest standard. These were diluted and the laboratory appropriately reported only a single value for the analysis.

Transcription errors were found in determining the final result from the amount extracted. Corrected values are listed in the summary table and on the laboratory final report forms for Sample Nos. EVS-MAC-TBT-22 and -36.

Sample No. EVS-MAC-TBT-4 had been spilled in a laboratory accident during processing. The remaining extract was analyzed and the sample was also reextracted. The results of both analyses were comparable. The laboratory reported the results of the first extraction. The reviewer concurs that this is appropriate because the surrogate recovery is higher and there are no signs of significant contamination on the chromatogram.

The laboratory reported TBT results to either three significant figures or to the decimal point. For example, the laboratory may have reported "129  $\mu$ g/Kg" as three significant figures. The laboratory also may have reported "8  $\mu$ g/Kg" and not "8.01  $\mu$ g/Kg" by rounding to the decimal point. However, at higher values,



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the laboratory inconsistently reported both 2 and 3 significant figures. Samples No. EVS-MAC-TBT-4 and EVS-NEP-TBT-4 have been revised from two to three significant figures to maintain consistently in reporting.

#### **10. System Performance**

The system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

### 11. Laboratory Contact

On November 30, 1998, the laboratory provided revised pages for the Duplicate Summaries for Total Solids for EVS-MAC-TBT-15, -26, -37, and -38. Revised pages were also received for the MS/MSD summary for Sample No. EVS-NEP-TBT-12 and the LCS associated with the November 10, 1998 extraction batch. The original pages of these revisions have been inserted into the data package and a copy is attached to the report.

The QBD project manager telephoned Lynda Huchestein at CAS during the data validation process so that the QBD project manager could request chromatograms for the initial calibration that was performed on September 17, 1998. This information was faxed to QBD on December 18 and 21.

#### 12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.



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# C. Review of Percent Moisture and Lipids Analyses of Tissues

#### 1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the chain-ofcustody and other data. No data is missing from the packages and no errors in accuracy were found. All tests requested on the chain-of-custody were performed. All samples were analyzed within the technical holding times and were preserved appropriately. There are no contractual holding time criteria that have been brought to the attention of the reviewer.

Discussion: The chain-of-custody (COC) had a gap between October 12, 1998 at 1400 and October 13, 1998 at 1030, during which time the samples were shipped to Columbia Analytical Services (CAS). CAS was contacted and requested to provide a copy of the waybill and/or the waybill tracer number. CAS responded verbally that this information had not been retained. No data qualifiers are recommended because the laboratory's cooler receipt form states that a cooler was received on October 13 and opened, and that the contents were in good condition.

The final two samples, Rep 4- and Rep 5-EVS-TBT-Nepthys-Bkgd were not received from Battelle Laboratory. These samples were prepared by homogenizing Rep 1-, Rep 2- and Rep 3-EVS-TBT-Nepthys-Bkgd and then preparing five aliquots. The sample preparation log states that this was done at the request of the client, but no communication logs or change order documentation was provided. All results were non-detect. The reviewer does not recommend any data qualifier flags, but if performing a statistical analysis, the data user should consider that the background population size was three.

The percent lipids results were questioned and the test was redone by the method of Bligh and Dyer. Results were comparable. Both sets of results were validated and included in this report.

#### 2. Initial and Continuing Calibration

Not applicable. These are gravimetric tests.



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#### 3. Blanks and Checks for Contamination

Method blank analyses were performed at the frequencies required in the referenced method and either no target analytes were detected or levels were used as a correction factor.

#### 4. Laboratory Control Sample (LCS) Analysis

Two Laboratory Control Standards were analyzed for the analysis of percent lipids by Bligh and Dyer and the percent recovery was within laboratory criteria. No LCS was analyzed for Total Solids or the original gravimetric Percent Lipids analysis.

#### 5. Duplicate Sample Analysis

Duplicates were analyzed as required by the referenced methods and all relative percent differences were within laboratory or QAPP criteria.

#### 6. Matrix Spike Analysis

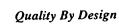
No matrix spikes (MS) were analyzed.

#### 7. Sample Result Verification

The final reports were reviewed and compared against raw data and logs to check anomalies, data reduction/calculations, transcription, and dilutions. No errors in accuracy were found.

#### 8. Field Replicates

No field replicates were identified with this group of samples, however, an evaluation of the background samples was performed by calculating the percent relative standard deviation of each set of 3-5 samples.



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|                               | % RSD   | % RSD            |
|-------------------------------|---------|------------------|
|                               | Macombs | Nepthys          |
| Total Solids                  | 1.9     | 1.5              |
| Percent Lipids (gravimetric)  | 101     | 15.5             |
| Percent Lipids (Bligh & Dyer) | 2.8     | No dup available |

#### 9. Laboratory Contact

There was no direct verbal or written communication with the laboratory during the validation of this section. Conversations, faxes, and e-mail were exchanged between EVS and QBD and between EVS and the laboratory regarding the analysis of lipids. Copies of these faxes and e-mail are attached to this report.

#### 10. Other Comments

None.

#### 11. Data Use and Overall Assessment

The data is acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.



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### D. Data Qualifier Definitions

#### Organics

- U = The analyte was analyzed for but not detected above the numerical quantitation limit.
- J = The analyte was analyzed for and was positively identified, but the associated numerical value is an estimated quantity. EPA Region X describes the data as able to be seriously considered for decision-making and useable for many purposes.

In EPA Region X, a subscript may be appended to the "J" that indicates which of the following control criteria were not met:

- 1 Blank contamination
- 2 Calibration range exceeded
- 3 Holding times not met
- 4 Other QC outside of criteria
- UJ = The analyte was analyzed for but was not detected above the reporting level, but the reporting level is an estimated level.
- R = The data are unusable for all purposes. The analyte was analyzed for, but the target analyte may or may not be present.
- N = The analysis indicates presumptive evidence of the presence of the analyte.
- NJ = The analysis indicates presumptive evidence of the presence of the analyte, but the numerical value is an estimated quantity.

In EPA Region X, a subscript may be appended to the "NJ" that indicates which of the following control criteria were not met:

- 1 DDT/Endrin breakdown evident
- 2 Interference from other sample components
- 3 Non-Target Compound List (TCL) compounds: Confirmation is necessary using specific methodology to accurately determine the concentration and identity of the detected compounds.
- 4 A confirmation analysis was missing or quality control criteria were not met for the confirmation analysis.

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#### Inorganics

- U = The analyte was analyzed for but not detected above the numerical quantitation limit. The numerical value may be either a detection limit or a quantitation limit.
- J = The analyte was analyzed for and was positively identified, but the associated numerical value is an estimated quantity. EPA Region X describes the data as able to be seriously considered for decision making and useable for many purposes.

In EPA Region X, a subscript may be appended to the "J" that indicates which of the following control criteria were not met:

- 1 Blank contamination
- 2 Calibration range exceeded
- 3 Holding times not met
- 4 Other QC outside of criteria
- UJ = The analyte was analyzed for but was not detected above the reporting level, but the reporting level is an estimated level.
- R = The data are unusable for all purposes. The analyte was analyzed for, but the target analyte may or may not be present.

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# E. Data Qualification Summary

EVS Environmental Consultants Project: WSOU TBT Study Type of Samples: Tissues Dates of Sampling: October 10, 1998

| Associated Samples | Analyte Affected | Type of Deviation   | Flag |
|--------------------|------------------|---------------------|------|
| EVS-MAC-TBT-4      | Tri-n-butyltin   | Significant Figures | 376  |
| EVS-MAC-TBT-22     | Tri-n-butyltin   | Transcription Error | 307  |
| EVS-MAC-TBT-36     | Tri-n-butyltin   | Transcription Error | 253  |
| EVS-NEP-TBT-4      | Tri-n-butyltin   | Significant Figures | 384  |

# **APPENDIX G**

Field Logs

EVS CONSULTANTS PROJECT #: 2/203-15.2

# SEDIMENT GRAB FIELD LOG

# WATERWAY SEDIMENT OPERABLE UNIT TBT STUDY

SAMPLING DATES: 7/15/98 TO: 7/17/98

| ENVIRONMENT<br>CONSULTANTS Date: 7/15/98 Station: 7BT-<br>Survey TBT Study Target Coordinates Start time 0902 Stop time |  |
|-------------------------------------------------------------------------------------------------------------------------|--|
| Weather Overcast, H. rain<br>Crew TJH, LMM, SAW, Tony Petrillo, DALE Dickerson                                          |  |
| crew TH, LMM, SHW, Tony Villillo, VALE Vickerson                                                                        |  |
| Comments:                                                                                                               |  |
|                                                                                                                         |  |
| Grab No: Bottom depth: Penetration depth: Time:                                                                         |  |
| Total Sulfides Sample: Y (Circle one) 34.2 GPS Coordinates:                                                             |  |
| Sediment type: Sediment color: Sediment odor: Comments:                                                                 |  |
| cobble D.O. none (H <sub>2</sub> S)                                                                                     |  |
| gravel gray slight Petroleum                                                                                            |  |
| sand O(M) f black fooderate Other:                                                                                      |  |
| silt clay brown strong                                                                                                  |  |

|     | ab No:            | Bottom               | depth: 42.     | 5 /4. Pen        | etration depth:  | Time:        | 0902 |
|-----|-------------------|----------------------|----------------|------------------|------------------|--------------|------|
| То  | tal Sulfides Sam  | ole: Y Circle one    | ) 34.          | 2                | GPS Coordinates: |              |      |
| Se  | ediment type:     | Sediment color:      | Sediment odor: |                  | Comments:        |              |      |
| 00  | bble              | D.O.                 | none           | H <sub>2</sub> S |                  |              |      |
| gra | avel              | gray                 | slight         | Petroleum        |                  |              |      |
| sa  | nd Q(M)F          | black                | noderate       | Other:           |                  |              |      |
| sit | t clay            | brown                | strong         |                  |                  |              |      |
| NL. | ood chips         | brown surface        | overwhelming   |                  |                  |              |      |
| sa  | ndblast grit      |                      |                |                  |                  |              |      |
| pa  | int chips         |                      |                |                  |                  |              |      |
| Gr  | ab No:            | Bottom               | depth:         | Pene             | etration depth:  | Time:        |      |
| То  | tal Sulfides Sam  | ole: Y N (circle one | )              |                  | GPS Coordinates: |              |      |
| Se  | ediment type: 🏼 👔 | Sediment color:      | Sediment odor: |                  | Comments:        |              | _    |
| œ   | bble /            | D.O.                 | none           | H <sub>2</sub> S |                  | )            |      |
|     | avel              | gray                 | slight         | Petroleum        |                  | [            |      |
| sa  | nd C M F          | black                | moderate       | Other:           |                  | /            |      |
| sil | t clay            | brown                | strong         |                  |                  |              |      |
|     | ood chips         | brown surface        | overwhelming   |                  |                  | l.           |      |
|     | ndblast grit      |                      |                |                  |                  |              |      |
| ра  | int chips         |                      |                |                  |                  | F            |      |
| G   | rab plo:          | Bottory              | depth:         | Pen              | etration depth:  | Time:        |      |
| То  | tal Sulfides Sam  | pie: Y N (circle one | )              |                  | GPS Coordinates: |              |      |
| Se  | ediment type:     | Sediment color:      | Sediment odor: |                  | Comments:        | $\Gamma$     | •    |
| ∞   | bble              | D.O.                 | none           | H <sub>2</sub> S |                  |              |      |
| gn  | ave               | gray                 | slight         | Petroleum        |                  |              |      |
| sa  | nd AM F           | black                | moderate       | Other:           |                  | $\mathbf{X}$ |      |
|     | t clay            | brown                | strong         |                  |                  |              |      |
|     | ood chips         | brown surface        | overwhelming   |                  |                  |              |      |
|     | ndblast grit      |                      |                |                  |                  |              | `.   |
| ра  | int chips         |                      | l              |                  |                  |              |      |

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|                      | ENVIRONME<br>CONSULTANTS |                                      | 7/15/98 Station: TBT-02<br>Area <u>W. Waferway</u><br>Start time <u>0955</u><br>Stop time |
|----------------------|--------------------------|--------------------------------------|-------------------------------------------------------------------------------------------|
| $\land$              | luce et                  |                                      |                                                                                           |
| Weather              | vercast                  |                                      |                                                                                           |
| Crew <               | 10 P9 (                  |                                      |                                                                                           |
|                      |                          |                                      |                                                                                           |
|                      | ·                        |                                      |                                                                                           |
| Comments:            |                          |                                      |                                                                                           |
|                      |                          |                                      |                                                                                           |
|                      |                          | ······                               |                                                                                           |
|                      |                          |                                      |                                                                                           |
|                      | 1                        | <u> </u>                             |                                                                                           |
| Grab No:             | Bottom                   |                                      |                                                                                           |
|                      | nple: Y Ccircle on       |                                      | GPS Coordinates:                                                                          |
| Sediment type:       | Sediment color:          | Sediment odor:                       | Comments:                                                                                 |
| cobbie               | D.O.                     | none (H2S)                           |                                                                                           |
| gravel               | (grav                    | slight Petroleum                     |                                                                                           |
| sand C M F           | black                    | moderate Other:                      |                                                                                           |
| siltclay             | brown                    | strong                               |                                                                                           |
| wood chips           | brown surface            | overwhelming                         |                                                                                           |
| sandblast grit       |                          |                                      |                                                                                           |
| paint chips          |                          |                                      |                                                                                           |
| Grab No:             | Bottom                   | depth: Pe                            | netration depth: Time:                                                                    |
|                      | nple: Y N (circle one    |                                      | GPS Coordinates:                                                                          |
| Sediment type:       | Sediment color:          | Sediment odor:                       | Comments:                                                                                 |
| cobble               | D.O.                     | none Hos                             |                                                                                           |
|                      |                          |                                      |                                                                                           |
| gravel<br>sand C N F | gray<br>black            | sfight Pletroleum<br>moderate Other: |                                                                                           |
| silt clay            | brown                    | strong                               |                                                                                           |
| wood chips           | brown surface            | overwhelming                         |                                                                                           |
| sandblast grit       | /                        |                                      |                                                                                           |
| paint chips          |                          |                                      |                                                                                           |
|                      |                          |                                      |                                                                                           |
| Grab No:             |                          | ·                                    | netration depth: Time:                                                                    |
|                      | npie: Y N (circle on     |                                      | GDS Coordinates:                                                                          |
| Sediment type:       | Sediment color:          | Sediment odor:                       | Comments:                                                                                 |
| cobble               | D.O.                     | none // H <sub>2</sub> S             |                                                                                           |
| gravel               | gray                     | slight Petroleum                     |                                                                                           |
| sand CMF             | black                    | moderate Other:                      |                                                                                           |
|                      | brown                    | strong                               |                                                                                           |
| silt clay            |                          |                                      |                                                                                           |
| wood chips           | brown surface            | overwhelming                         |                                                                                           |
| -                    |                          | overwhelming                         |                                                                                           |

Recorded by: \_\_\_\_

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|                                                                                                                | Station: $137-03$                      |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Survey WSON TBT Sfuly Area W. Wal                                                                              | termoso                                |
| Target Coordinates Start timeO 45                                                                              |                                        |
| One of the second s | ······································ |
|                                                                                                                |                                        |
| Weather Usercast                                                                                               |                                        |
| Weather Overcast<br>Crew See pal                                                                               |                                        |
|                                                                                                                |                                        |
| Comments:                                                                                                      |                                        |
|                                                                                                                |                                        |
|                                                                                                                |                                        |
|                                                                                                                |                                        |
| Grab No: Bottom depth: Penetration depth:(/                                                                    | Time:                                  |
| Total Sulfides Sample: Y N (circle one) GPS Coordinates:                                                       |                                        |
| Sediment type: Sediment color: Sediment odor: Comments:                                                        |                                        |
| cobble D.O. none H2S                                                                                           | 1 11                                   |
| gravel gray Slight Petroleum                                                                                   | halls                                  |
| sand C M F black moderate Other.                                                                               |                                        |
| silt clay? brown strong                                                                                        |                                        |
| wood chips brown surface overwhelming                                                                          |                                        |
| sandblast grit ulide dra's                                                                                     | <i>#</i> 5                             |
| paint chips                                                                                                    |                                        |
| Grab No: Bottom depth: Penetration depth:                                                                      | Time:                                  |
| Total Sulfides Sample: Y N (circle one) GPS Coordinates:                                                       | <u> </u>                               |
| Sediment type: Sediment color: Sediment odor: Comments:                                                        |                                        |
| cobble D.O. none H <sub>2</sub> S                                                                              |                                        |
| gravel / gray \ slight Petroleum /                                                                             |                                        |
| sand C M 🗲 black moderate Other.                                                                               |                                        |
| silt clay brown strong                                                                                         |                                        |
| wood chips brown surface overwhelming                                                                          |                                        |
| sandblast grit                                                                                                 |                                        |
| paint chips //                                                                                                 |                                        |
| Grab/No:Bottom depth:Penetration depth:                                                                        | Time:                                  |
| Total Sulfides Sample: Y N (circle one) / GPS Coordinates:                                                     |                                        |
| Sediment type: Sediment color: Sediment odor: Comments:                                                        |                                        |
| cobble D.O. none H <sub>2</sub> S                                                                              |                                        |
| gravel gray slight Petroleúm<br>sand C M F black moderate Other:                                               |                                        |
| sand C M P black moderate Other:                                                                               | er.                                    |
| wood chips brown surface overwhelming                                                                          | 1                                      |
| sandblast grit                                                                                                 |                                        |
| paint chips                                                                                                    | l                                      |

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| LYO                                             | ENVIRONME<br>CONSULTANTS |                                        | Date:               | 7/15/98                                                                                                         | f |
|-------------------------------------------------|--------------------------|----------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------|---|
| Survey                                          | TBT Stu                  | duy                                    |                     | Area W. Waterway                                                                                                |   |
| Target Coordinate                               |                          |                                        |                     | Start time                                                                                                      | - |
| Target Coordinate                               | ×                        |                                        |                     |                                                                                                                 | - |
|                                                 |                          |                                        |                     | Stop time                                                                                                       | _ |
| Weather                                         | vercost                  |                                        |                     |                                                                                                                 |   |
| Crew 5                                          | e pal                    |                                        |                     |                                                                                                                 | _ |
|                                                 | - 43                     |                                        |                     |                                                                                                                 | - |
| Comments:                                       |                          | ······································ |                     |                                                                                                                 | - |
|                                                 |                          | 10.                                    |                     |                                                                                                                 | ī |
| Grab No:                                        |                          | depth: <u>48'</u>                      | Pe                  | netration depth: 10" Time: 1127                                                                                 | - |
|                                                 | ple: Y N (circle one     |                                        |                     | GPS Coordinates:                                                                                                | 4 |
| Sediment type:                                  | Sediment color:          | Sediment odor:                         |                     | Comments:                                                                                                       |   |
| cobble                                          | D.O.                     | none                                   | H <sub>2</sub> S    |                                                                                                                 | ľ |
| sand CMF 2                                      | gray<br>blact            | slight<br>moderate                     | Petroleum<br>Other: |                                                                                                                 | 1 |
|                                                 | brown                    | strong                                 | Ouler.              |                                                                                                                 | ļ |
| wood chips                                      | brown surface            | overwhelming                           |                     |                                                                                                                 |   |
| sandblast grit                                  |                          | , erennen an                           |                     |                                                                                                                 |   |
| paint chips                                     | shew                     |                                        |                     |                                                                                                                 |   |
| Grab No:                                        | Bottom                   | depth:                                 |                     | netration depth: Time:                                                                                          | 1 |
|                                                 | ple: Y N (circle one     |                                        |                     | GPS Coordinates:                                                                                                | 1 |
| Sediment type:                                  | Sediment color:          | Sediment odor:                         |                     | Comments:                                                                                                       | 1 |
| cobble                                          | D.O.                     | none                                   | H <sub>2</sub> S    | 1                                                                                                               |   |
| gravel                                          | gray                     | slight                                 | Petroleum           |                                                                                                                 | Į |
| sand CMF                                        | black                    | vooderate                              | Other:              |                                                                                                                 | 1 |
| silt clay                                       | brown                    | strong                                 |                     |                                                                                                                 |   |
| wood chips                                      | brown surface            | overwhelming                           |                     |                                                                                                                 |   |
| sandblast grit                                  |                          |                                        |                     |                                                                                                                 |   |
| paint chips                                     | 1                        |                                        |                     | 1                                                                                                               | 1 |
| Grab No:                                        | Bottom                   | depth:                                 | Pe                  | netration depth:                                                                                                |   |
|                                                 | ple: Y N (circle one     | · · · · · · · · · · · · · · · · · · ·  | /                   | GPS Coordinates:                                                                                                | 1 |
| Sediment type:                                  | Sediment color:          | Sediment odor:                         |                     | Comments:                                                                                                       | 1 |
| cobble                                          | D.O.                     | none                                   | H <sub>2</sub> S    |                                                                                                                 | ł |
|                                                 | gray                     | slight                                 | Petroleum           | The second se | 1 |
| gravei                                          |                          | a -                                    | Other:              | <b>N</b> .                                                                                                      |   |
| •                                               | black                    | moderate                               | 04101.              |                                                                                                                 |   |
| sand C M F                                      | black<br>brown           | strong                                 |                     |                                                                                                                 |   |
| gravel<br>sand C M F<br>silt clay<br>wood chips |                          |                                        |                     |                                                                                                                 |   |
| sand C M F<br>silt clay                         | brown                    | strong                                 |                     |                                                                                                                 |   |

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|                           | NVIRONME             |                                          |                                       | / /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                        |                                       |
|---------------------------|----------------------|------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------|
|                           | ONSULTANTS           | 1                                        | Date:                                 | 115/98                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Station                                | : TBT-05                              |
| Survey                    | JSOU TP              | T Study                                  | /                                     | Area W.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Whate way                              |                                       |
| Terret Or and a st        |                      |                                          |                                       | Start time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 205                                    |                                       |
| Target Coordinate         | ×9                   | ···.                                     | <u> </u>                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-3                                    |                                       |
|                           |                      |                                          |                                       | Stop time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                        |                                       |
| Weather 🔿                 | recust 4             | . rah                                    |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| weather                   |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ······································ | · · · · · · · · · · · · · · · · · · · |
| Crew                      | _Ds_l                |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| •••                       | 13                   |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
|                           |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| Commențș:                 |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| · · · · ·                 |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
|                           |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        | · · · - ·                             |
| •                         |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
|                           |                      |                                          | /                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | /0 <sup>17</sup> Time:                 | ····                                  |
| Grab No:                  | Botton               | n depth:                                 | Per                                   | netration depth:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <u></u> Time:                          |                                       |
| Total Sulfides Sam        | ple: Y N (circle on  | e)                                       |                                       | GPS Coordinates:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                       |
| Sediment type:            | Sediment color:      | Sediment odor:                           |                                       | Comments:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                        |                                       |
| cobble 👫                  | D.O.                 | none                                     | H <sub>2</sub> S                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                       |
| gravel                    | gray                 | slight                                   | Petroleum                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| sand C M F                | Dias                 | moderate                                 | Other:                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| sitticlay                 | DIOWN                | strong                                   | Culoi.                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| wood chips                | brown surface        | overwhelming                             |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| sandblast grit            |                      | er e |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| -                         |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| paint chips               |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| Grab No:                  |                      | n depth:                                 | Pei                                   | netration depth:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Time:                                  |                                       |
| <b>Total Sulfides Sam</b> | nple: Y\N (circle on | e)                                       |                                       | _ GPS Coordinates:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                        |                                       |
| Sediment type:            | Sediment color:      | Sediment odor:                           |                                       | Comments:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                        |                                       |
| cobble                    | D.O.                 | none                                     | H <sub>2</sub> S                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | /                                      |                                       |
| gravel                    | gray                 | elight                                   | Petroleum                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| sand C M F                | black                | moderate                                 | Other:                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| silt day                  | brown                | strong                                   |                                       | 1 Martin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                        |                                       |
| wood chips                | brown surface        | overwhelming                             | $\searrow$                            | a for the second s |                                        |                                       |
| sandblast grit            |                      |                                          | $\sim$                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| paint chips               |                      |                                          | - 3 <sup>-1</sup>                     | $\mathbf{k}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                        |                                       |
|                           | <b>D</b> - 44        | adameter                                 |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| Grab No:                  |                      | n depth:                                 | Yei                                   | netration depth:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Time:                                  |                                       |
|                           | ple: Y N (circle on  |                                          | · · · · · · · · · · · · · · · · · · · | GPS Coordinates:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                       |
| Sediment type:            | Sediment color:      | Sediment odor:                           |                                       | Comments:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                        |                                       |
| copple                    | D.O.                 | none                                     | H <sub>2</sub> S                      | r `                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\mathbf{i}$                           |                                       |
| gravel                    | gray                 | slight                                   | Petroleum                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 7                                      |                                       |
| sand C M F                | black                | moderate                                 | Other:                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| silt clay                 | brown                | strong                                   |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| wood chips                | brown surface        | overwhelming                             |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| sandblast grit            |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |
| paint chips               |                      |                                          |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                       |

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| SurveyA        | ENVIRONMEI<br>CONSULTANTS<br>JSOU TB<br>S<br>JSOU TANTS | Date                                  | 7/15/98       Stat         Area       Wafer         Start time       350         Stop time | ion: <u>787-06</u><br>                |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------|
|                | Ve- /                                                                                                                                                                                                                                                                                                                                                                                                                                   | •                                     |                                                                                            |                                       |
| Crew           | to page /                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       |                                                                                            |                                       |
|                | 1 U '                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |                                                                                            |                                       |
| Commenter      |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
| Comments:      |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                         | · · · · ·                             |                                                                                            |                                       |
| Grab No:       | Bottom                                                                                                                                                                                                                                                                                                                                                                                                                                  | depth:                                | Penetration depth: T                                                                       | ime: 1350                             |
|                | pie: Y N (circle one                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       | GPS Coordinates:                                                                           |                                       |
| Sediment type: | Sediment color:                                                                                                                                                                                                                                                                                                                                                                                                                         | Sediment odor:                        | Comments:                                                                                  |                                       |
| cobble         | D.O.                                                                                                                                                                                                                                                                                                                                                                                                                                    | none HoS                              |                                                                                            | 6.0                                   |
| gravel         | gray                                                                                                                                                                                                                                                                                                                                                                                                                                    | slight Petrole                        | I Approximately                                                                            | 67                                    |
| sand CMF       | black                                                                                                                                                                                                                                                                                                                                                                                                                                   | moderate Other:                       |                                                                                            | inter due 1                           |
| silt clay      | brown                                                                                                                                                                                                                                                                                                                                                                                                                                   | strong                                | HOM NODOSOG 10                                                                             | cation one                            |
| wood chips     | brown surface                                                                                                                                                                                                                                                                                                                                                                                                                           | overwhelming T                        | um Approximately<br>From proposed to<br>to ship block                                      | - arrace                              |
| sandblast grit | 1 K E                                                                                                                                                                                                                                                                                                                                                                                                                                   | K VUU                                 | to ship block                                                                              | ing access                            |
| paint chips    | 1 1/2                                                                                                                                                                                                                                                                                                                                                                                                                                   | r                                     | Lamp foreign abi                                                                           | actin appl                            |
| <u> </u>       |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
| Grab No:       | Bottom                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |                                                                                            | ime: <u>/555</u>                      |
|                | ple: Y N (circle one                                                                                                                                                                                                                                                                                                                                                                                                                    | · · · · · · · · · · · · · · · · · · · | GPS Coordinates:                                                                           |                                       |
| Sediment type: | Sediment color:                                                                                                                                                                                                                                                                                                                                                                                                                         | Sediment odor:                        | Comments:                                                                                  |                                       |
| cobble         | D.O.                                                                                                                                                                                                                                                                                                                                                                                                                                    | none H <sub>2</sub> S                 | Comments:<br>Approx 69<br>proposed loc<br>Ship                                             | tran orig                             |
| gravel         | gray in the                                                                                                                                                                                                                                                                                                                                                                                                                             | slight Petrole                        |                                                                                            | , 1                                   |
| and MF         | black                                                                                                                                                                                                                                                                                                                                                                                                                                   | moderate Other:                       | A ADDOSA J LOC                                                                             | cofile -                              |
| silt clay      | brown                                                                                                                                                                                                                                                                                                                                                                                                                                   | strong SLe                            |                                                                                            | ا مل ر                                |
| wood chips     | brown surface                                                                                                                                                                                                                                                                                                                                                                                                                           | overwhelming                          | Ship.                                                                                      | ~ berth 1                             |
| sandblast grit |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
| paint chips    |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
| Grab No:       | Bottom                                                                                                                                                                                                                                                                                                                                                                                                                                  | depth:                                | Penetration depth: T                                                                       | ime:                                  |
|                | ple: Y N (circle one                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       | GPS Coordinates:                                                                           |                                       |
| Sediment type: | Sediment color:                                                                                                                                                                                                                                                                                                                                                                                                                         | Sediment odor:                        | Comments:                                                                                  |                                       |
| copble         | D.O.                                                                                                                                                                                                                                                                                                                                                                                                                                    | none H <sub>2</sub> S                 | $\neg$                                                                                     | I                                     |
| gravel         | gray                                                                                                                                                                                                                                                                                                                                                                                                                                    | slight Petrole                        | um 1                                                                                       | $\mathbf{I}$                          |
| sand C M F     | black                                                                                                                                                                                                                                                                                                                                                                                                                                   | moderate Other:                       |                                                                                            | $\searrow$ I                          |
| silt clay      | brown                                                                                                                                                                                                                                                                                                                                                                                                                                   | strong                                |                                                                                            | Vic                                   |
| wood chips     | brown surface                                                                                                                                                                                                                                                                                                                                                                                                                           | overwhelming                          |                                                                                            |                                       |
| sandblast grit |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            | · · · · · · · · · · · · · · · · · · · |
| paint chips    |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                            |                                       |
|                | •                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       |                                                                                            |                                       |

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| EVS ENVIRONMENT<br>CONSULTANTS | Date: 7/15/92 | Station: <u>TBT-07</u> |
|--------------------------------|---------------|------------------------|
| survey USOU TBT Study          | •             | Naterway               |
| Target Coordinates/            | Start time -2 | Till 1430              |
| d                              | Stop time     | •                      |
| Weather <u>Aucust</u>          |               |                        |
| crew <u>Sce pagel</u>          |               |                        |
|                                |               |                        |
|                                |               |                        |

Comments:

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|                            | -                    |                |                  |                  |              |
|----------------------------|----------------------|----------------|------------------|------------------|--------------|
| Grab No:                   | Bottom               | depth:         | Pen              | etration depth:  | Time:        |
| <b>Total Sulfides Samp</b> | le: Y N (circle one  | )              |                  | GPS Coordinates: |              |
| Sediment type:             | Sediment color:      | Sediment odor: |                  | Comments:        |              |
| cobble                     | D.O.                 |                | H <sub>2</sub> S |                  |              |
| gravel                     | gray                 | slight         | Petroleum        |                  |              |
| sand C M F                 | black                | moderate       | Other:           |                  |              |
| silt clay                  | brown                | strong         |                  |                  |              |
| wood chips                 | brown surface        | overwhelming   |                  |                  |              |
| sandblast grit             |                      |                |                  |                  |              |
| paint chips                |                      |                |                  |                  |              |
| Grab No:                   | Bottom               | depth:         | Pen              | etration depth:  | Time:        |
|                            | ole: Y N (circle one |                |                  | GPS Coordinates: |              |
| Sediment type:             | Sediment color:      | Sediment odor: |                  | Comments:        |              |
| cobble                     | D.O.                 | none           | H <sub>2</sub> S |                  |              |
| gravel                     | gray                 | slight         | Petroleum        |                  | $\mathbf{X}$ |
| sand CMF                   | black                | moderate       | Other:           |                  |              |
| silt clay                  | brown                | strong         |                  |                  |              |
| wood chips                 | brown surface        | overwhelming   |                  |                  |              |
| sandblast grit             |                      |                |                  |                  |              |
| paint chips                |                      |                |                  |                  |              |
| Grab No:                   | Bottom               | depth:         | Pen              | etration depth:  | Time:        |
| Total Sulfides Samp        | ole: Y N (circle one | )              | $\square$        | GPS Coordinates: |              |
| Sediment type:             | Sediment color:      | Sediment odgr: |                  | Comments:        |              |
| cobble                     | D.O.                 | none           | H <sub>2</sub> S |                  |              |
| gravel                     | gray                 | slight         | Petroleum        |                  |              |
| sand CMF                   | black                | moderate       | Other:           |                  |              |
| silt clay                  | brown                | strong         |                  |                  |              |
| wood chips                 | brown surface        | overwhelming   |                  |                  | $\mathbf{i}$ |
| sandblast grit             |                      |                |                  | 1                | د            |
| paint chips                |                      |                |                  |                  |              |

Recorded by:

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| Co                               | NVIRONMEI<br>ONSULTANTS | Date:                                   |                                                   | on: <u>787-08</u> |
|----------------------------------|-------------------------|-----------------------------------------|---------------------------------------------------|-------------------|
| Survey                           | 500 TBT                 | Shaly                                   | Area U. Chteter                                   | w                 |
| Target Coordinates               | ·                       |                                         | Start time 1535                                   | /                 |
| -                                |                         |                                         |                                                   |                   |
| Δ.                               |                         |                                         | oroh ruue                                         |                   |
| Weather                          | 4 2951                  |                                         |                                                   | <del>ٽ</del>      |
| Crew Ser                         | <u>ng</u>               |                                         | <u> </u>                                          | <u></u>           |
| Comments:                        | Sipoceum                | nlection R                              | plicate                                           |                   |
| Grab No:(<br>Total Sulfides Samp | le: Y N (circle one     |                                         | etration depth: <b>9</b> Time<br>GPS Coordinates: | e: 1575           |
| Sediment type:                   | Sediment color:         | Sediment odor:                          | Comments:                                         |                   |
| cobble                           | D.O.                    | none H2S                                |                                                   |                   |
| gravel                           | gray                    | slight Petroleum                        |                                                   | , <del>M</del>    |
| sand C M F                       | olack                   | proderate) Other.                       |                                                   |                   |
| silt clay<br>wood chips          | brown<br>brown surface  | strong<br>overwheiming                  |                                                   |                   |
| sandblast grit                   | Storm Sundos            |                                         |                                                   | بى (              |
| paint chips                      |                         | sheen                                   |                                                   |                   |
|                                  | 7 Bottom                | depth: Pen                              | etration depth: // Tim                            | e: 15 ~~          |
| J Total Sulfides Samp            |                         |                                         | GPS Coordinates:                                  |                   |
| Sediment type:                   |                         | Sediment odor:                          | Comments:                                         |                   |
| cobble                           | D.0                     | none H2S                                |                                                   |                   |
| gravel                           | gray Surface            | slight Petroleum                        |                                                   |                   |
| sand C M F                       | black                   | moderate Other:                         |                                                   |                   |
| silt day                         | brown                   | strong                                  |                                                   |                   |
| wood chips                       | brown surface           | overwhelming                            |                                                   |                   |
| sandblast grit                   |                         |                                         |                                                   |                   |
| paint chips                      |                         | <u>L</u>                                |                                                   | ~                 |
| Grab No:                         |                         |                                         | etration depth: Tim                               | e:                |
| Total Sulfides Samp              |                         |                                         | GPS Coordinates:                                  |                   |
| Sediment type:                   |                         | Sediment odor:                          | Comments:                                         | ~                 |
| cobble                           | D.Q.                    | none H <sub>2</sub> S                   |                                                   | , I               |
| gravel<br>sand C M F             | gray<br>black           | slight Petroleum /<br>moderate Other: / |                                                   | $\searrow$        |
| saild C M P                      | brown                   | strong                                  |                                                   |                   |
| wood chips                       | brown surface           | overwhelming                            |                                                   |                   |
| sandblast grit                   |                         |                                         |                                                   | Į                 |
| paint chips                      |                         |                                         | l                                                 |                   |

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|                               | ENVIRONMEI<br>CONSULTANTS      | Date                  |                                        | v. Waterwy                             |
|-------------------------------|--------------------------------|-----------------------|----------------------------------------|----------------------------------------|
|                               |                                |                       | Stop time                              |                                        |
| Weather C                     | Juccast                        |                       |                                        | · · · · · · · · · · · · · · · · · · ·  |
| weather                       | /04 1                          |                       |                                        |                                        |
| Crew                          | ec jagel                       |                       |                                        |                                        |
| Comments:                     |                                | v.                    |                                        |                                        |
|                               | Bottom<br>ple: Y N (circle one |                       | Penetration depth:<br>GPS Coordinate   | Time: <u>/655</u>                      |
| Sediment type:                | Sediment color:                | Sediment odor:        | Comments:                              |                                        |
| cobble                        | D.O.                           | none H <sub>2</sub> S |                                        |                                        |
| gravel                        | gray                           | (slight) (Petro       | eum                                    |                                        |
| sand (M F)                    | black                          | moderate Other        |                                        |                                        |
| silt day                      | brown                          | strong                |                                        |                                        |
| wood chips                    | brown surface                  | overwhelming          |                                        |                                        |
| sandblast grit<br>paint chips |                                | sheet                 |                                        |                                        |
|                               | Bottom                         | depth:                | Penetration depth:                     | Time:                                  |
|                               | nple: Y N (circle one          |                       | GPS Coordinate                         |                                        |
| Sediment type:                |                                | Sediment odor:        | Comments:                              | <u> </u>                               |
| cobble                        | D.O.                           | none H <sub>2</sub> S |                                        |                                        |
| gravel                        | gray                           | slight Petro          | eum /                                  |                                        |
| sand C M F                    | black \                        | moderate Other        | : /                                    |                                        |
| silt clay                     | brown                          | strong                | /                                      |                                        |
| wood chips                    | brown surface                  | overwhelming          | l'                                     |                                        |
| sandblast grit<br>paint chips |                                | \                     | /                                      |                                        |
|                               |                                |                       |                                        | ······································ |
| Grab No:                      | ple: Y N (circle one           | depth:                | Penetration depth:<br>/ GPS Coordinate | Time:                                  |
| Sediment type:                | Sediment color:                | Sediment odor:        | Comments:                              |                                        |
| cobble                        | D.O.                           | none H <sub>2</sub> S |                                        | $\mathbf{X}$                           |
| gravel                        | gray                           | slight Petro          | leum                                   | N.                                     |
| sand C M F                    | black                          | moderate Other        | / <b>·</b>                             |                                        |
| silt clay                     | brown                          | strong                |                                        |                                        |
| wood chips                    | brown surface                  | overwheiming          |                                        |                                        |
| sandblast grit                |                                |                       |                                        |                                        |
| paInt chips                   | T                              | 1                     |                                        |                                        |

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| EVSE                          | NVIRONME                       | NT                                    | deput H.I moun 4 0825                     |
|-------------------------------|--------------------------------|---------------------------------------|-------------------------------------------|
|                               | ONSULTANTS                     | Date:                                 | 1/16 98 Station: <u>TBT-/0</u>            |
| Survey                        | SOU TET                        | Athony                                | Area W. Withing                           |
| Target Coordinate             | •                              | -• <u>v</u>                           | Start time (1840                          |
|                               |                                |                                       |                                           |
| • 7                           | / / / - 2 0                    |                                       | Stop time                                 |
| Weather <u></u>               | ean, 65° f                     |                                       |                                           |
| Crew <u>A</u>                 | onspiel I.                     | mill, S. Wodzuki                      | J. Petrille, D. Sickerson                 |
|                               |                                |                                       |                                           |
| Comments:                     |                                | <u> </u>                              |                                           |
|                               |                                |                                       | ·                                         |
| <u></u>                       |                                | 56.0 HMLLW                            |                                           |
| Grab No:                      | Bottom                         | depth:                                | etration depth: 9 Time: 1840              |
|                               | ple: Y N (circle one           | ·                                     | GPS Coordinates:                          |
| Sediment type:                | Sediment color:                | Sediment odor:                        | Comments:                                 |
| cobble                        | D.O.                           | none H <sub>2</sub> S                 |                                           |
| gravel                        | gray                           | slight Petroleum                      | good greb                                 |
| sand CM F                     | black                          | moderate Other:                       |                                           |
| silt clay                     | brown                          | strong                                |                                           |
| wood chips                    | brown surface                  | overwhelming                          |                                           |
| sandblast grit                |                                |                                       |                                           |
| paint chips                   | <u>l</u>                       | <u> </u>                              |                                           |
| Grab No:                      | Bottom                         | depth: Pen                            | etration depth: Time:                     |
|                               | ple: Y N (circle one           |                                       | GPS Coordinates:                          |
| Sediment type:                | Sediment color:                | Sediment odor:                        | Comments:                                 |
| cobble                        | D.O.                           | none H <sub>2</sub> S                 |                                           |
| gravel .                      | gray                           | slight Petroleum                      |                                           |
| sand C M F                    | black                          | moderate Other:                       |                                           |
| silt clay                     | brown                          | strong                                |                                           |
| wood chips                    | brown surface                  | overwhelming                          |                                           |
| sandblast/grit<br>paint chips |                                |                                       |                                           |
| <u> </u>                      | <u> </u>                       |                                       |                                           |
| Grab No:                      | Bottom<br>ple: Y N (circle one | · · · · · · · · · · · · · · · · · · · | etration depth: Time:<br>GPS Coordinates: |
| Sediment type:                | Sediment color:                | Sediment odor:                        | Comments:                                 |
| cobble                        | D.O.                           | none H <sub>2</sub> S                 |                                           |
| gravel                        | gray                           | slight Petroleum                      | │ / · · · · · · · · · · · · · · · · · ·   |
| sand CMF                      | black                          | moderate Other.                       |                                           |
| silt clay                     | brown                          | strong                                |                                           |
| wood chips                    | brown surface                  | overwheiming                          |                                           |
| sandblast grit                | ]                              |                                       |                                           |
| paint chips                   |                                |                                       |                                           |
|                               |                                |                                       |                                           |

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Recorded by:

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| CONSOLIANIS         | Date: <u>7-16-98</u> | $\underline{\qquad} Station: \underline{TBT} - \underline{I} - \underline{S}$ |
|---------------------|----------------------|-------------------------------------------------------------------------------|
| survey WSOU TBT the | 4 Area               | Witney                                                                        |
| Target Coordinates  |                      | 910 V                                                                         |
| , <del></del>       | Stop time            |                                                                               |
| Weather             |                      |                                                                               |
| Crew <u>Aup 10</u>  |                      | ·                                                                             |
| I                   |                      |                                                                               |

Comments:

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| <b>-</b>                              |                      | nn             | 2                |                                                     |
|---------------------------------------|----------------------|----------------|------------------|-----------------------------------------------------|
| Grab No:                              | Bottom               | depth: <u></u> |                  | etration depth: Time: $0915$                        |
| Total Sulfides Sam                    | ple: Y N (circle one | )              |                  | GPS Coordinates:                                    |
| Sediment type:                        | Sediment color:      | Sediment odor: |                  | Comments:                                           |
| cobble                                | D.O.                 | none           | H <sub>2</sub> S | 104 Audi                                            |
| gravel                                | gray                 | slight         | Petroleum        | 10 ft metal rol in Jaws                             |
| sand C M F                            | black                | moderate       | Other:           |                                                     |
| silt clay                             | brown                | strong         |                  |                                                     |
| wood chips                            | brown surface        | overwhelming   |                  | 10 ft metal rod in just<br>rejected                 |
| sandblast grit                        |                      |                |                  |                                                     |
| paint chips                           |                      |                |                  |                                                     |
| Grab No:                              | Bottom               | depth:         | Pen              | etration depth: Time:0920                           |
| · · · · · · · · · · · · · · · · · · · | ple: Y N (circle one | )              |                  | GPS Coordinates:                                    |
| Sediment type:                        | Sediment color:      | Sediment odor: |                  | Comments:                                           |
| cobble                                | D.O.                 | none)          | H <sub>2</sub> S | comments:<br>a few 1-2" rocks a Top<br>of meterical |
| gravei                                | grav                 | slight         | Petroleum        | a few 1-2 hours and                                 |
| sand CM F                             | black                | moderate       | Other:           | 1 traid                                             |
| silt clay                             | brown                | strong         |                  | of marching                                         |
| wood chips                            | brown surface        | overwhelming   |                  |                                                     |
| sandblast grit                        |                      |                |                  |                                                     |
| paint chips                           |                      |                |                  |                                                     |
| Grab No:                              | Bottom               | depth:         | Pen              | etration depth: Time:                               |
| Total Sulfides Sam                    | ple: Y_N_(circle one | )              |                  | GPS Coordinates:                                    |
| Sediment type:                        | Sediment color:      | Sediment odor: |                  | Comments:                                           |
| cobble                                | D.O.                 | none           | H <sub>2</sub> S | $\backslash$                                        |
| gravel                                | gray                 | slight         | Petroleum        |                                                     |
| sand C/M F                            | black                | moderate       | Other:           |                                                     |
| slit clay                             | brown                | strong         |                  |                                                     |
| wood chips                            | brown surface        | overwhelming   |                  |                                                     |
| sandblast grit                        |                      |                |                  | ·                                                   |
| paint chips                           |                      |                |                  |                                                     |

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|                         |                          | NT                        | Mar 1 10                                                                                              |
|-------------------------|--------------------------|---------------------------|-------------------------------------------------------------------------------------------------------|
|                         | ENVIRONME<br>CONSULTANTS | 1                         | page / of 2                                                                                           |
|                         |                          | Date:                     | 7/16/98 Station: TBT-12-5                                                                             |
| 0                       | OU_TRT_A                 | 1+1                       | A. A.T.                                                                                               |
|                         |                          | May                       | Area <u>W. W//hury</u>                                                                                |
| Target Coordinate       | es                       | ·                         | Start time                                                                                            |
|                         |                          |                           | Stop time                                                                                             |
| Weather                 | 0 Vou                    |                           |                                                                                                       |
| <u></u>                 | 10                       |                           |                                                                                                       |
| Crew                    | Liep IV                  | ····                      |                                                                                                       |
|                         | ·                        |                           |                                                                                                       |
| Comments:               |                          |                           |                                                                                                       |
|                         |                          |                           |                                                                                                       |
|                         |                          |                           |                                                                                                       |
|                         | 1                        | ·····                     |                                                                                                       |
| Grab No:                | Botton                   | n depth:                  | Penetration depth: 10 m Time:                                                                         |
| Total Sulfides Sam      | ple: Y (N)(circle on     |                           | - GPS Coordinates:                                                                                    |
| Sediment type:          | Sediment color:          | Sediment odor:            | Comments: / The internet                                                                              |
| cobble                  | 0.0.                     | none H <sub>2</sub> S     | m rejected, insufficient                                                                              |
| gravel                  | gray                     | stight Petroleur          | m munitions many or and                                                                               |
| sand C M F<br>slit clay | black                    | moderate Other:           |                                                                                                       |
| wood chips              | brown surface            | overwheiming              | penerraria                                                                                            |
| sandblast grit          |                          |                           | 1                                                                                                     |
| paint chips             |                          | <u> </u>                  |                                                                                                       |
| Grab No:                | 2 Botton                 | n depth:                  | Penetration depth: 10 con Time:                                                                       |
|                         | ple: Y N (circle on      |                           | GPS Coordinates:                                                                                      |
| Sediment type:          | Sediment color:          | Sediment odor:            | Comments:                                                                                             |
| copple                  | D.O.                     | none H <sub>2</sub> S     |                                                                                                       |
| gravel                  | gray                     | slight Petroleur          | " rejected insufficient                                                                               |
| sand CMF                | black                    | moderate Other:           |                                                                                                       |
| silt clay<br>wood chips | brown<br>brown surface   | strong<br>overwhelming    | peretration                                                                                           |
| sandblast grit          |                          |                           | per                                                                                                   |
| paint chips             |                          |                           |                                                                                                       |
| Grab No:                | Botton                   | n depth:                  | Penetration depth: Time: _/005                                                                        |
|                         | ple: Y N (circle on      |                           | GPS Coordinates:                                                                                      |
| Sediment type:          | Sediment color:          | Sediment odor:            | Comments:                                                                                             |
| copple                  | D.O.                     | none H <sub>2</sub> S     | m proved 20 ft north                                                                                  |
| gravel                  | gray                     | slight Petroleu           |                                                                                                       |
| sand C M F<br>silt clay | black<br>brown           | moderate Other:<br>strong | rejected - appart   inch<br>Thick cases of And blustgrit                                              |
| wood chips              | brown surface            | overwhelming              | ischeren - ubbirt I puer                                                                              |
| sandblast grit          |                          |                           | Thick coust of And Mutant                                                                             |
| paint chips             | 1                        |                           |                                                                                                       |
| grab                    | 4 - ad                   | ded weight to a           | ampler Time 1025 - rejected - no<br>pe; so moving shoreward approx 10 ft, perhaps<br>and to melt page |
| V<br>A.                 | ~ wir over E             | drup off.                 |                                                                                                       |
| <i>ν</i> .              |                          |                           | go to neft page                                                                                       |
|                         |                          | An M                      |                                                                                                       |
| Recorded by             | r:                       | NY N                      | 12                                                                                                    |
| -                       |                          |                           |                                                                                                       |

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| EVS | ENVIRONMENT |
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|     | CONSULTANTS |

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| CONSOLIANIS             | Date:    | 7/16/98    | Station: <u></u>                      |
|-------------------------|----------|------------|---------------------------------------|
| survey W.SOU TBT Atuche |          | Area       | Waterway                              |
| Target Coordinates      |          | Start time | 1030                                  |
| <u> </u>                |          | Stop time  |                                       |
| Weather                 |          |            |                                       |
| Crew <u>sup</u> D       |          | <u> </u>   | · · · · · · · · · · · · · · · · · · · |
| comments: 4 failed a    | ttempts, |            |                                       |

| Grab No:           |                      | depth:         | Pen              | etration depth: $25cm$ Time: $1035$   |
|--------------------|----------------------|----------------|------------------|---------------------------------------|
| Total Sulfides Sam | ple: Y N (circle one | ī              |                  | GPS Coordinates:                      |
| Sediment type:     | Sediment color:      | Sediment odor: |                  | Comments:                             |
| copple             | D.O.                 | none           | H <sub>2</sub> S | mount topat                           |
| gravel             | gray                 | slight         | Petroleum        |                                       |
| sand C M(F)        | (black)              | moderate       | Other:           | <i>A</i>                              |
| siltclay           | brown                | strong         |                  |                                       |
| wood chips         | brown surface        | overwheiming   |                  |                                       |
| sandblast grit     |                      |                |                  |                                       |
| paint chips        |                      |                |                  | · · · · · · · · · · · · · · · · · · · |
| Grab No:           | Bottom               | depth:         | Pen              | etration depth: Time:                 |
| Total Sulfides Sam | ple: Y N (circle one | ;)             |                  | GPS Coordinates:                      |
| Sediment type:     | Sediment color:      | Sediment odor: |                  | Comments:                             |
| cobble             | D.O.                 | none           | H <sub>2</sub> S |                                       |
| gravel             | gray                 | slight         | Petroleum        |                                       |
| sand C M F         | black                | moderate       | Other.           |                                       |
| silt clay          | brown                | strong         |                  |                                       |
| wood chips         | brown surface        | overwhelming   |                  |                                       |
| sandblast grit     |                      |                |                  |                                       |
| paint chips        |                      | 1              |                  |                                       |
| Grab No:           | Bottom               | depth:         | Pen              | etration depth: Time:                 |
| Total Sulfides Sam | ple: Y N (circle one | :)             |                  | GPS Coordinates:                      |
| Sediment type:     | Sediment color:      | Sediment odor: |                  | Comments:                             |
| cobble             | D.O.                 | none           | H <sub>2</sub> S |                                       |
| gravel             | gray                 | slight         | Petroleum        | ſ                                     |
| sand C M F         | black                | moderate       | Other:           |                                       |
| silt clay          | brown                | strong         |                  |                                       |
| wood chips         | brown surface        | overwheiming   |                  |                                       |
| sandblast grit     |                      |                |                  |                                       |
| paint chips        | · /                  | 1              |                  |                                       |

Recorded by:

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| C C                                                                                                                                              | len, worm<br>rec. p. 10                                                                                         |                                                                                        | <u>7-16-98</u> Station: <u>TBT-13</u><br>Area <u>N. Milterway</u><br>Start time <u>1105</u><br>Stop time<br><u>Stop time</u>        |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Grab No:<br>Total Sulfides Sam<br>Sediment type:<br>cobble<br>gravel<br>sand C M (F)<br>silficlay<br>Wood chips<br>sandblast grit<br>paint chips | Bottom<br>ple: Y (V) (circle one<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown<br>brown<br>brown surface |                                                                                        | Penetration depth: <u>25 cm</u> Time: <u>1/20</u><br>GPS Coordinates:<br>Comments:<br>/st grab of 2 grabs for<br>browcan replicates |
| Grab No:                                                                                                                                         | Bottom                                                                                                          | depth:                                                                                 | Penetration depth: Time: 1140                                                                                                       |
|                                                                                                                                                  | ple: Y N (circle one                                                                                            | )                                                                                      | GPS Coordinates:                                                                                                                    |
| Sediment type:                                                                                                                                   | Sediment color:                                                                                                 | Sediment odor:                                                                         | Comments:                                                                                                                           |
| cobble<br>gravel<br>sand C M F<br>silticlay<br>wood chips<br>sandblast grit<br>paint chips                                                       | D.O.<br>grav<br>black<br>brown<br>brown surface                                                                 | none H <sub>2</sub> S<br>slight Petroleum<br>moderate Other:<br>strong<br>overwhelming | rylicite                                                                                                                            |
| Grab No:                                                                                                                                         |                                                                                                                 | •                                                                                      | Penetration depth: Time:                                                                                                            |
| Total Sulfides Sam                                                                                                                               | ple: Y N (oircle one                                                                                            |                                                                                        | GPS Coordinates:                                                                                                                    |
| Sediment type:                                                                                                                                   |                                                                                                                 | Sediment odor:                                                                         | Comments:                                                                                                                           |
| cobble                                                                                                                                           | D.O.                                                                                                            | none H <sub>2</sub> S                                                                  |                                                                                                                                     |
| gravel/<br>sand/CMF<br>silt clay<br>wood chips                                                                                                   | gray<br>black<br>brown<br>brown surface                                                                         | slight Petroleun<br>moderate Other:<br>strong<br>overwhelming                          |                                                                                                                                     |
| sandblast grit<br>paint chips                                                                                                                    |                                                                                                                 |                                                                                        |                                                                                                                                     |

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|                                | NVIRONMER<br>ONSULTANTS                                                                                                          |                     |                  | <u>-//, - 9'8</u> Station: <u>TBT- 14</u>        |  |  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------|--------------------------------------------------|--|--|
| Survey W/                      | SOU IB                                                                                                                           | T Duch              |                  | Area <u>W. Wderweg</u><br>Start time <u>1305</u> |  |  |
|                                |                                                                                                                                  | Č – Č               |                  |                                                  |  |  |
| Target Coordinates             | 5                                                                                                                                |                     |                  |                                                  |  |  |
|                                | - <del>7</del>                                                                                                                   |                     | {                | Stop time                                        |  |  |
| Weather                        | clen, was                                                                                                                        | A                   |                  |                                                  |  |  |
| Crew                           | nee no 1                                                                                                                         | D                   |                  |                                                  |  |  |
|                                | _na p                                                                                                                            |                     | Λ                | 1                                                |  |  |
| Comments:                      |                                                                                                                                  | De                  | plic             | ate TBT-37-S                                     |  |  |
| Creb Net                       | Battam                                                                                                                           | dorth.              | Bon              | etration depth: 25cm Time: 1310                  |  |  |
| Grab No:                       | ble: Y/N/circle one                                                                                                              | depth:              | ren              | GPS Coordinates:                                 |  |  |
| Sediment type:                 |                                                                                                                                  | )<br>Sediment odor: |                  | Comments:                                        |  |  |
| cobble                         | D.O.                                                                                                                             | none                | H <sub>2</sub> S |                                                  |  |  |
| gravel                         | grays                                                                                                                            | slight              | Petroleum        | good grad<br>replicate TBT-37-5                  |  |  |
| sand CM (F) (                  | black                                                                                                                            | moderate            | Other:           |                                                  |  |  |
| silf clay                      | brown                                                                                                                            | strong              |                  | Deplemente PRT-228                               |  |  |
| wood chips                     | brown surface                                                                                                                    | overwheiming        |                  | 1111-51-51-5                                     |  |  |
| sandblast grit                 |                                                                                                                                  |                     |                  | 1                                                |  |  |
| paint chips                    |                                                                                                                                  |                     |                  |                                                  |  |  |
| Grab No:                       | Bottom                                                                                                                           | depth:              | Pen              | etration depth: Time:                            |  |  |
| Total Sulfides Sam             | ple: Y N (circle one                                                                                                             | )                   | ····             | GPS Coordinates:                                 |  |  |
| Sediment type:                 | Sediment color:                                                                                                                  | Sediment odor:      |                  | Comments:                                        |  |  |
| cobble                         | D.O.                                                                                                                             | nône                | H <sub>2</sub> S |                                                  |  |  |
| gravel                         | gray                                                                                                                             | slight              | Petroleum        |                                                  |  |  |
| sand C M F                     | black                                                                                                                            | moderate            | Other:           |                                                  |  |  |
| silt clay                      | brown                                                                                                                            | strong              |                  |                                                  |  |  |
| wood chips                     | brown surface                                                                                                                    | overwhelming        |                  |                                                  |  |  |
| sandblast grit                 |                                                                                                                                  |                     |                  |                                                  |  |  |
| paint chips 🧳                  |                                                                                                                                  | └────┤─             |                  |                                                  |  |  |
| Grab No:<br>Total Sulfides Sam | Grab No:    Bottom depth:     Penetration depth;    Time:       Total Sulfides Sample:     Y N (circle one)     GPS Coordinates: |                     |                  |                                                  |  |  |
| Sediment type:                 | Sediment color:                                                                                                                  | Sediment odor       |                  | Comments:                                        |  |  |
| cobble _′                      | D.O.                                                                                                                             | none                | H <sub>2</sub> S | <b>)</b> /                                       |  |  |
| gravel /                       | gray                                                                                                                             | slight              | Petroleum        |                                                  |  |  |
| sand C M F                     | black                                                                                                                            | moderate            | Qther:           | /                                                |  |  |
| slit clay                      | brown                                                                                                                            | strong              |                  |                                                  |  |  |
| wood chips                     | brown surface                                                                                                                    | overwhelming        | ,<br>,           |                                                  |  |  |
| sandblast grit<br>paint chips  |                                                                                                                                  |                     | <u> </u>         | Í                                                |  |  |
|                                |                                                                                                                                  | 1 - A               |                  | DT JM C                                          |  |  |

Applicate 101-37-5 pt 1320

| C C                                               | NVIRONMEI<br>ONSULTANTS<br>/SOUT<br>*<br>Jean 80 * | Date:<br>BTAllidy                       | 7-16-98 Station: <u>TBT-15</u><br>Area <u>West Weterway</u><br>Start time <u>1350</u> |  |  |  |
|---------------------------------------------------|----------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------|--|--|--|
| Crew                                              | see to 17                                          |                                         | г                                                                                     |  |  |  |
|                                                   | ·+                                                 |                                         |                                                                                       |  |  |  |
| Comments:                                         |                                                    |                                         | ,                                                                                     |  |  |  |
|                                                   |                                                    |                                         | 77000-1200-1                                                                          |  |  |  |
|                                                   |                                                    |                                         | etration depth: <u>La CM</u> Time: <u>1.335</u>                                       |  |  |  |
|                                                   | ple: Y /N (circle one                              |                                         | GPS Coordinates:                                                                      |  |  |  |
| Sediment type:                                    | Sediment color:                                    | Sediment odor:<br>hone H <sub>2</sub> S | Comments:                                                                             |  |  |  |
| cobble                                            | D.O.                                               | ¥ ) –                                   | good grab                                                                             |  |  |  |
| gravel<br>sand C M                                | grav<br>black                                      | slight Petroleum moderate Other:        |                                                                                       |  |  |  |
| salid C M b                                       | brown -                                            | strong                                  | 1                                                                                     |  |  |  |
| wood chips                                        | brown surface                                      | overwhelming                            |                                                                                       |  |  |  |
| sandblast grit                                    |                                                    | -<br>-                                  |                                                                                       |  |  |  |
| paint chips                                       |                                                    |                                         |                                                                                       |  |  |  |
| Grab No:                                          | Bottom                                             | depth: Pen                              | etration depth: Time:                                                                 |  |  |  |
|                                                   | ple: Y N (circle one                               |                                         | GPS Coordinates:                                                                      |  |  |  |
| Sediment type:                                    | Sediment color:                                    | Sediment odor:                          | Comments:                                                                             |  |  |  |
| cobble                                            | D.O.                                               | none H <sub>2</sub> S                   |                                                                                       |  |  |  |
| gravel                                            | gray                                               | slight Petroleum                        |                                                                                       |  |  |  |
| sand CMF                                          | black                                              | moderate Other:                         |                                                                                       |  |  |  |
| silt clay                                         | brown                                              | strong                                  |                                                                                       |  |  |  |
| wood chips                                        | , brown surface                                    | overwhelming                            |                                                                                       |  |  |  |
| sandblast grit                                    |                                                    |                                         |                                                                                       |  |  |  |
| paint chips                                       | L                                                  | L                                       |                                                                                       |  |  |  |
| Grab No: Bottom depth: Penetration depth: / Time: |                                                    |                                         |                                                                                       |  |  |  |
|                                                   | pie: Y N (circle one                               |                                         | GPS Coordinates:                                                                      |  |  |  |
| Sediment type:                                    | Sediment color:                                    | Sediment odor:                          | Comments:                                                                             |  |  |  |
| cobble                                            | D.O.                                               | none H2S                                |                                                                                       |  |  |  |
| gravel                                            | gray                                               | slight Petroleum<br>moderate Other:     |                                                                                       |  |  |  |
| sançî C M F<br>silt <sub>i</sub> clay             | black<br>brown                                     | strong                                  |                                                                                       |  |  |  |
| wood chips                                        | brown sufface                                      | overwhelming                            |                                                                                       |  |  |  |
| sandblast grit                                    |                                                    |                                         |                                                                                       |  |  |  |
| paint chips                                       | Į                                                  |                                         |                                                                                       |  |  |  |
|                                                   |                                                    |                                         |                                                                                       |  |  |  |

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|-------------------------|----------------------|------------------------|---------------------------------------|---------------------------------------|
| EVS E                   | NVIRONME             | T                      |                                       |                                       |
| C C                     | ONSULTANTS           |                        | (                                     | $T / AR \rightarrow TR T - //$        |
|                         | -                    | ۱<br>۸                 |                                       | <u>7-16-98</u> Station: <u>TB1-16</u> |
|                         | sou Tr               | T study                |                                       | Area W, Waterway                      |
|                         |                      |                        |                                       | Start time 1420                       |
| Target Coordinate       | <u> </u>             | 0                      |                                       |                                       |
|                         |                      |                        |                                       | Stop time                             |
| Weather                 | 80° clea             | <b>\</b>               |                                       |                                       |
|                         | Aee 4                |                        |                                       |                                       |
| Crew                    |                      |                        |                                       |                                       |
|                         | ·                    |                        |                                       |                                       |
| Comments:               |                      | ;                      |                                       |                                       |
|                         |                      |                        |                                       |                                       |
|                         |                      |                        |                                       |                                       |
|                         | <u> </u>             |                        |                                       |                                       |
| Grab No:                | Bottom               | depth:                 | Pen                                   | etration depth: <u>27 com</u> Time:   |
|                         | ple: Y N (circle one | -                      |                                       | GPS Coordinates:                      |
| Sediment type:          | Sediment color:      | Sediment odor:         |                                       | Comments:                             |
| cobble                  | D.O.                 | none                   | H <sub>2</sub> S                      |                                       |
| gravel                  | grav                 | slight                 | Petroleum                             | good grab                             |
| sand C M                | black                | moderate               | Other:                                |                                       |
| siliciay                | brown                | strong                 |                                       |                                       |
| wood chips              | brown surface        | overwhelming           |                                       |                                       |
| sandblast grit          |                      |                        |                                       |                                       |
| paint chips             |                      |                        |                                       |                                       |
| Grab No:                | Bottom               | depth:                 | Pen                                   | etration depth: Time:                 |
|                         | ple: Y N (circle one |                        |                                       | GPS Coordinates:                      |
| Sediment type:          | Sediment color:      | Sediment odor:         |                                       | Comments:                             |
| cobble                  | D.O.                 | none                   | H <sub>2</sub> S                      |                                       |
| gravel                  | gray                 | slight                 | Petroleum                             |                                       |
| sand CMF                | black                | moderate               | Other:                                |                                       |
| silt clay               | brown                | strong                 |                                       |                                       |
| wood chips              | brown surface        | overwhelming           |                                       |                                       |
| sandblast grit          |                      |                        |                                       |                                       |
| paint chips             |                      |                        |                                       |                                       |
| Grab No:                | Bottom               | depth:                 | Pen                                   | etration depth: Time:                 |
|                         | ple: Y N (circle one | •                      |                                       | GPS Coordinates:                      |
| Sediment type:          | Sediment color:      | Sediment odor:         | · · · · · · · · · · · · · · · · · · · | Comprents:                            |
| cobble                  | D.O.                 | none                   | H <sub>2</sub> S                      |                                       |
| gravel                  | gray                 | slight                 | Petroleum                             |                                       |
| sand CMF                |                      | moderate               | Other:                                |                                       |
|                         | black                |                        |                                       |                                       |
| silt clay               | brown                | strong                 |                                       |                                       |
| silt clay<br>wood chips |                      | strong<br>overwhelming |                                       |                                       |
| -                       | brown                |                        |                                       |                                       |

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| Survey<br>Target Coordinate | NVIRONMEI<br>ONSULTANTS<br>SOU TE<br>s<br>clour 83° | T Atidy            |                    | 1       7-16-92       Area       Area       Averts       Waterway       Start time       1455 |
|-----------------------------|-----------------------------------------------------|--------------------|--------------------|-----------------------------------------------------------------------------------------------|
|                             | 6                                                   |                    |                    | / <sup></sup>                                                                                 |
|                             |                                                     |                    |                    | etration depth: 27 cm Time: 1.500                                                             |
| Grab No:                    |                                                     | depth:             | Per                |                                                                                               |
|                             | ple: Y N (circle one<br>Sediment color:             | 1                  | ·····=             | GPS Coordinates:                                                                              |
| Sediment type:              | D.O.                                                | Sediment odor:     | H <sub>2</sub> S   | Comments:                                                                                     |
|                             |                                                     |                    | Petroleum          | Darp and                                                                                      |
| gravel<br>sand C M F        | dray<br>black                                       | slight             | Other:             | good grab                                                                                     |
| silt clay                   | brown                                               | strong             |                    |                                                                                               |
| wood chips <                | brown surfage                                       | overwhelming       |                    |                                                                                               |
| sandblast grit              |                                                     |                    |                    |                                                                                               |
| paint chips                 |                                                     |                    |                    |                                                                                               |
| Grab No:                    | Bottom                                              | depth:             | Per                | etration depth: Time:                                                                         |
|                             | ple: Y N (circle one                                |                    |                    | GPS Coordinates:                                                                              |
| Sediment type:              |                                                     | Sediment odor:     |                    | Comments:                                                                                     |
| cobble                      | D.O.                                                | none               | H <sub>2</sub> S   |                                                                                               |
| gravel                      | gray                                                | slight             | Petroleum          |                                                                                               |
| sand CMF                    | black                                               | moderate           | Other:             |                                                                                               |
| silt clay                   | brown                                               | strong             |                    |                                                                                               |
| wood chips /                | brown surface                                       | overwhelming       | ł                  |                                                                                               |
| sandblast grit              |                                                     |                    | ,<br>              |                                                                                               |
| paint chips                 | L                                                   |                    |                    |                                                                                               |
| Grab No:                    | Bottom                                              |                    | Per                | etration depth: Time:                                                                         |
|                             | ple: Y N (circle one                                |                    |                    | GPS Coordinates:                                                                              |
| Sediment type:              | Sediment color:                                     | Sediment odor:     |                    | Comments:                                                                                     |
| cobble                      | D.O.                                                | none               | H <sub>2</sub> S / | $\langle \rangle$                                                                             |
| gravel                      | gray                                                | slight             | Petroleum          |                                                                                               |
| sand CMF                    | black                                               | moderate<br>strong | Other:/            |                                                                                               |
| silt clay<br>wood chips     | brown<br>brown surface                              | overwhelming       |                    |                                                                                               |
| sandblast grit              |                                                     |                    |                    |                                                                                               |
| paint chips                 |                                                     | 1                  |                    | ~~                                                                                            |
|                             |                                                     |                    |                    |                                                                                               |

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Recorded by:

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|                              |                                | :                      |          |                                     |                                       |
|------------------------------|--------------------------------|------------------------|----------|-------------------------------------|---------------------------------------|
| C                            | NVIRONMEN<br>ONSULTANTS        |                        | e:       |                                     | ation: <u>TBT - /8</u>                |
| Survey/                      | SOU TH                         | 21 Ality               | /        | Area _ Ment We                      | teruray                               |
| Target Coordinates           | s                              | V                      | s        | tart time <u>1535</u>               | <u> </u>                              |
| -                            |                                |                        | s        | top time                            |                                       |
|                              | No. 85                         |                        |          |                                     |                                       |
| Weather                      | MAL 00                         | 1.                     |          |                                     |                                       |
| Crew                         | e p 10_                        |                        | <u> </u> |                                     |                                       |
|                              | U                              |                        |          |                                     |                                       |
| Comments:                    |                                |                        |          |                                     |                                       |
|                              | ·····                          |                        |          |                                     |                                       |
| ·                            | ······                         |                        |          |                                     | <u> </u>                              |
|                              | <u>;</u>                       | ·····                  |          |                                     |                                       |
| Grab No:                     |                                | depth:                 | Pene     | etration depth: <u>28 cm</u>        | Time: 1545                            |
|                              | ole: Y(N)(circle one           |                        |          | GPS Coordinates:                    |                                       |
| Sediment type:               | Sediment color:                | Sediment odor:         |          | Comments:                           | · · · · · · · · · · · · · · · · · · · |
| cobbie                       | D.O.                           | none H <sub>2</sub> s  | 5        |                                     |                                       |
| gravel                       | alax,                          | l v                    | roleum   |                                     |                                       |
| sand C MF (                  | black                          | moderate Oth           | er:      |                                     |                                       |
| silf/clay<br>wood chips      | brown<br>brown surface         | strong<br>overwhelming |          |                                     |                                       |
| sandblast grit               | DIOWN SUNACE                   | overwheitting          |          |                                     | :                                     |
| paint chips                  |                                |                        |          |                                     |                                       |
|                              | Bottom                         | depth:                 | Pene     | etration depth:                     | Time:                                 |
|                              | ble: Y_N (circle one           | -                      |          | GPS Coordinates:                    |                                       |
| Sediment type:               | Sediment color:                | ,<br>Sędiment odor:    |          | Comments:                           | <u> </u>                              |
| cobble                       | D.O.                           | none H <sub>2</sub> s  | S        |                                     |                                       |
| gravel                       | gray                           | slight Pet             | roleum   | ;                                   | ,<br>,                                |
| sand C M F                   | black                          | moderate Oth           | er:      |                                     | Y                                     |
| silt clay                    | brown                          | stronġ                 |          | í<br>L                              |                                       |
| wood chips<br>sandblast grit | brown surface                  | overwhelming           |          |                                     |                                       |
| paint chips                  |                                |                        |          |                                     |                                       |
|                              | l                              | •                      | <br>Dom  | • • •                               |                                       |
| Grab No:                     | Bottom<br>ple: Y N (circle one |                        | Pene     | etration depth:<br>GPS Coordinates: | Time:                                 |
| Sediment type:               | Sediment color:                | Sediment odor:         |          | Comments:                           | `,`,                                  |
| cobbie                       | D.O.                           | none H2                | s        | Continents.                         |                                       |
| gravel                       | gray                           | ι ( <sup>-</sup>       | roleum   |                                     |                                       |
| sand C M F                   | black                          | moderate Oth           |          |                                     |                                       |
| silt clay                    | brown                          | strong                 |          |                                     |                                       |
| wood chips                   | brown surface                  | overwhelming           |          |                                     |                                       |
| sandblast grit               |                                |                        |          |                                     |                                       |
|                              |                                |                        |          |                                     |                                       |

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|                                                                                                                                 | ENVIRONME                                                                 |                                                               |                                                                                                                                                                                                                                    | do 3rd broaccumulation rep                       |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
|                                                                                                                                 | CONSULTANTS                                                               | S D                                                           | ate:                                                                                                                                                                                                                               | 7-16-98 Station: TBT-19                          |
| - 1./*                                                                                                                          | SOU TB                                                                    | TH                                                            |                                                                                                                                                                                                                                    |                                                  |
| Survey W                                                                                                                        | SUN IB                                                                    | 1 Allen                                                       |                                                                                                                                                                                                                                    | Area W. Withurs                                  |
| Target Coordinat                                                                                                                | :es                                                                       |                                                               | <u> </u>                                                                                                                                                                                                                           | Start time                                       |
|                                                                                                                                 |                                                                           |                                                               |                                                                                                                                                                                                                                    | Stop time                                        |
| Weather (                                                                                                                       | clin 85°+                                                                 | F +                                                           | 7. 1.                                                                                                                                                                                                                              | pracumulation rep                                |
| Crew /                                                                                                                          | 10                                                                        | M                                                             | NO. N                                                                                                                                                                                                                              | 10,                                              |
|                                                                                                                                 | <u>ta p /</u>                                                             | Cariba .                                                      | 4                                                                                                                                                                                                                                  | ma an                                            |
|                                                                                                                                 |                                                                           | MAR                                                           | Z.                                                                                                                                                                                                                                 |                                                  |
| Comments:                                                                                                                       |                                                                           |                                                               |                                                                                                                                                                                                                                    | DO Duraco Aup                                    |
|                                                                                                                                 |                                                                           |                                                               | 14                                                                                                                                                                                                                                 | /                                                |
|                                                                                                                                 | 1                                                                         |                                                               |                                                                                                                                                                                                                                    |                                                  |
|                                                                                                                                 | 4                                                                         |                                                               | بر المراجع الم<br>مسجد مراجع مراجع المراجع | 0M 1/11                                          |
| Grab No:                                                                                                                        | nple: Y N/(circle on                                                      | m depth:                                                      | Pen                                                                                                                                                                                                                                | etration depth: <u>27cm</u> Time: <u>1615</u>    |
| Sediment type:                                                                                                                  | Sediment color:                                                           | Sediment odor:                                                |                                                                                                                                                                                                                                    | GPS Coordinates:                                 |
| cobble                                                                                                                          | D.O.                                                                      | · · · · · · · · · · · · · · · · · · ·                         | H <sub>2</sub> S                                                                                                                                                                                                                   | Comments:<br>first of 2 grabs for broace reption |
| gravel                                                                                                                          | gray                                                                      | N J                                                           | Petroleum                                                                                                                                                                                                                          | Isst of 2 grates for Noone report                |
| sand CM F                                                                                                                       | black                                                                     |                                                               | Other:                                                                                                                                                                                                                             | J                                                |
| sil) clay                                                                                                                       | brown                                                                     | strong                                                        |                                                                                                                                                                                                                                    |                                                  |
| wood chips                                                                                                                      | brown surface                                                             | overwhelming                                                  |                                                                                                                                                                                                                                    |                                                  |
| sandblast grit                                                                                                                  |                                                                           |                                                               |                                                                                                                                                                                                                                    |                                                  |
| paint chips                                                                                                                     | <u></u>                                                                   | <u></u>                                                       |                                                                                                                                                                                                                                    | 9/10/                                            |
| Grab No:                                                                                                                        |                                                                           | n depth:                                                      | Pen                                                                                                                                                                                                                                | etration depth: <u>26 c/m</u> Time: <u>1626</u>  |
| Sediment type:                                                                                                                  | nple: Y (N)(circle on<br>Sediment color:                                  | Sediment odor:                                                |                                                                                                                                                                                                                                    | GPS Coordinates:                                 |
| cobble                                                                                                                          | D.O.                                                                      |                                                               | H <sub>2</sub> S                                                                                                                                                                                                                   | Comments.                                        |
| gravel                                                                                                                          | gray                                                                      | 16 1                                                          | Petroleum                                                                                                                                                                                                                          |                                                  |
| sand CM F                                                                                                                       | black                                                                     |                                                               | Other:                                                                                                                                                                                                                             | 2and of 2 grabs for broace replie                |
| sillclay                                                                                                                        | brown                                                                     | strong                                                        |                                                                                                                                                                                                                                    |                                                  |
| wood chips                                                                                                                      | brown surface                                                             | overwhelming                                                  |                                                                                                                                                                                                                                    |                                                  |
| sandblast grit                                                                                                                  | +                                                                         |                                                               |                                                                                                                                                                                                                                    |                                                  |
| agint ching                                                                                                                     |                                                                           |                                                               |                                                                                                                                                                                                                                    |                                                  |
| paint chips                                                                                                                     |                                                                           |                                                               |                                                                                                                                                                                                                                    |                                                  |
| Grab No:                                                                                                                        |                                                                           | m depth:                                                      | Pen                                                                                                                                                                                                                                | etration depth: Time:                            |
| Grab No:<br>Total Sulfides San                                                                                                  | nple: Y-N (circle on                                                      | ne)                                                           | Pen                                                                                                                                                                                                                                | GPS Coordinates:                                 |
| Grab No:                                                                                                                        |                                                                           | ne)<br>Sediment odor:                                         |                                                                                                                                                                                                                                    |                                                  |
| Grab No:<br>Total Sulfides San<br>Sediment type: /                                                                              | nple:-Y-N (circle on<br>Sediment color:                                   | ne)<br>Sediment odor:<br>none                                 | Pen<br>H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                               | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble                                                                      | nple:-Y-N (circle on<br>Sediment color:<br>D.O.                           | ne)<br>Sediment odor:<br>none<br>slight                       | H <sub>2</sub> S                                                                                                                                                                                                                   | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay                                 | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips                   | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black          | ne)<br>Sediment odor:<br>none<br>slight<br>moderate           | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips<br>sandblast grit | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips                   | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips<br>sandblast grit | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips<br>sandblast grit | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips<br>sandblast grit | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips<br>sandblast grit | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips<br>sandblast grit | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |
| Grab No:<br>Total Sulfides San<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay<br>wood chips<br>sandblast grit | nple:-Y-N (circle on<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | ne)<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum                                                                                                                                                                                                      | GPS Coordinates:                                 |

| Survey                    |                      | thidy          | ;                | 7-16-98 Station: TBT-20<br>Area <u>Alfact Watnung</u><br>Start time <u>1710</u><br>Stop time |
|---------------------------|----------------------|----------------|------------------|----------------------------------------------------------------------------------------------|
| Weather d                 | clean, 84°           | F              |                  |                                                                                              |
| Crew                      | 1                    |                |                  |                                                                                              |
|                           | Aca -p 10            |                |                  | 4                                                                                            |
| Comments:                 |                      |                |                  |                                                                                              |
| Grab No:                  | Bottom               | depth:         | Pen              | netration depth: Time: 1726                                                                  |
| Total Sulfides Sam        | pie: Y N (circle one | ;)             |                  | GPS Coordinates:                                                                             |
| Sediment type:            | Sediment color:      | Sediment odor: |                  | Comments:                                                                                    |
| cobble                    | D.O.                 | none           | H <sub>2</sub> S | Commente:<br>rejected - cable from<br>bottom was clasped in gaves                            |
| gravel                    | gray                 | slight         | Petroleum        | /openal and                                                                                  |
| sand C M F                | black                | moderate       | Other:           | l'it al di action                                                                            |
| silt clay                 | brown                | strong         |                  | botton was chapled in grows                                                                  |
| wood chips                | brown surface        | overwhelming   |                  |                                                                                              |
| sandblast grit            |                      |                |                  |                                                                                              |
| paint chips               |                      |                |                  |                                                                                              |
| Grab No:                  | Bottom               | depth:         | Pen              | netration depth: <u>27 m</u> Time: <u>1740</u>                                               |
| Total Sulfides Sam        | ple: Y N (circle one | ;)             |                  | GPS Coordinates:                                                                             |
| Sediment type:            | Sediment color:      | Sediment odor: |                  | Comments:                                                                                    |
| cobble                    | D.O.                 | m              | H <sub>2</sub> S | -# 1                                                                                         |
| gravel                    | gray                 | slight         | Petroleum        | accepted                                                                                     |
| sand CM 🗗                 | gray<br>black        | moderate       | Other:           | 1 A II T and at                                                                              |
| <b>fitt</b> clay          | brown                | strong         |                  | depart for HI more at<br>1740                                                                |
| wood chips                | brown surface        | overwhelming   |                  | In In the                                                                                    |
| sandblast grit            |                      |                |                  |                                                                                              |
| paint chips               | <u> </u>             |                |                  |                                                                                              |
| Grab No:                  | Bottom               | depth:         | Pen              | netration depth: Time:                                                                       |
| <b>Total Sulfides Sam</b> | ple: Y N (circle one | )              |                  | GPS Coordinates:                                                                             |
| Sediment type:            | Sediment color:      | Sediment odor: |                  | Comments:                                                                                    |

| at | ĦT. | morina | 1755 |
|----|-----|--------|------|
| at | HL. | mound  | 1755 |

H<sub>2</sub>S

Petroleum

Other: -/

**Recorded by:** 

cobble

gravet /

silt clay

sand/C M F

wood chips

sandblast grit paint chips **D.O**.

gray

black

brown

brown surface

DA.

none

slight

strong

moderate

overwheiming

21

| C C                | <b>NVIRONMEI</b><br>ONSULTANTS | Date: <u>7</u>            | 17  98 Station: TBT-021                                          |
|--------------------|--------------------------------|---------------------------|------------------------------------------------------------------|
| Survey             | SOU TB                         | [ STUDY                   | Area WEST WATERWAY                                               |
| Target Coordinate  |                                |                           | Start time                                                       |
|                    | · · ·                          |                           |                                                                  |
|                    |                                |                           |                                                                  |
| Weather            | ANT CLEAN                      | 2,651,0010                | WODZICK, DALE DIGKINSON,                                         |
| Crew TM            | HAMMERNET                      | STOP STEPHINI             | WODZICH, DALE DIGKINSM,                                          |
| Comments:          |                                |                           |                                                                  |
|                    | Bottom                         | depth: <u>50,9 M</u> WPer | netration depth: <u>\0</u> Time: <u>0831</u><br>GPS Coordinates: |
| Sediment type:     | Sediment color:                | Sediment odor:            | Comments:                                                        |
| copple             | D.O.                           | none) H <sub>2</sub> S    |                                                                  |
| gravel             | gray                           | slight Petroleum          |                                                                  |
| Sand C MF          | black                          | moderate Other:           |                                                                  |
| silticlay          | brown                          | strong                    |                                                                  |
| wood chips         | brown surface                  | overwhelming              |                                                                  |
| sandblast grit     |                                |                           |                                                                  |
| paint chips        | l                              | l                         |                                                                  |
| Grab No:           | Bottom                         | depth: Per                | netration depth: Time:                                           |
| Total Sulfides Sam | ple: Y N (circle one           | <u>N</u>                  | GPS Coordinates:                                                 |
| Sediment type:     | Sediment color:                | Sediment odor:            | Comments:                                                        |
| copple             | D.O.                           | none H <sub>2</sub> S     |                                                                  |
| gravel             | gray                           | slight Petroleum          |                                                                  |
| sand C M F         | black                          | moderate Other:           |                                                                  |
| silt clay          | brown                          | strong                    |                                                                  |
| wood chips         | brown surface                  | overwhelming              |                                                                  |
| sandblast grit     |                                |                           |                                                                  |
| paint chips        |                                |                           |                                                                  |
| Grab No:           | Bottom                         | depth: Per                | netration depth: Time:                                           |
| Total Sulfides Sam | ple: Y N (circle one           | )                         | GPS Coordinates:                                                 |
| Sediment type:     | Sediment color:                | Sediment odor:            | Comments:                                                        |
| cobble             | D.O.                           | none H <sub>2</sub> S     | ``````````````````````````````````````                           |
| gravel             | gray                           | slight Petroleum          |                                                                  |
| sand C M F         | black                          | moderate Other:           | 1                                                                |
| silt clay          | brown                          | strong                    |                                                                  |
| wood chips         | brown surface                  | overwhelming              |                                                                  |
| sandblast grit     |                                |                           |                                                                  |
| paipt chips        | J                              | 1                         |                                                                  |

TP/BUS

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|                              | SOU                  |                     |                  | <u>M/17/98</u><br>Area W37 h    | Station: <u>TBT-022</u> |
|------------------------------|----------------------|---------------------|------------------|---------------------------------|-------------------------|
|                              | )                    |                     |                  |                                 |                         |
| Target Coordinate            | ×                    |                     |                  | Start time 0857                 |                         |
|                              |                      |                     |                  | Stop time                       |                         |
| Weather <u>St</u>            | EP622                |                     |                  |                                 |                         |
| crew Gt                      | x P6 22              |                     |                  |                                 |                         |
| Comments:                    |                      |                     |                  |                                 |                         |
| Orah Mar                     | Bottom               | donthe AV           | (a Ber           | netration depth: $11,5^{\circ}$ | H Time 08577            |
|                              | ple: Y Ν (circle one |                     | . <u>v</u> Per   | GPS Coordinates:                |                         |
|                              |                      | T T                 |                  | Comments:                       |                         |
| Sediment type:               | Sediment color:      | Sediment odor       |                  |                                 |                         |
| cobble                       | D.O.                 | $\sim$              | H <sub>2</sub> S | TUBE WORM                       | 5                       |
| gravel                       | gray                 | slight              | Petroleum        |                                 |                         |
| sand C M(F)                  | black                | moderate            | Other:           |                                 |                         |
| silt clay                    | brown surface        | strong overwhelming |                  |                                 |                         |
| wood chips<br>sandblast grit | DIOWITSUIIdoo        | Overwinding         |                  |                                 |                         |
| paint chips                  |                      | 1                   |                  |                                 |                         |
|                              |                      |                     |                  | <u> </u>                        |                         |
|                              | Bottom               | · · ·               | Per              | tetration depth:                | Time:                   |
|                              | ple: Y N (circle one |                     |                  | GPS Coordinates:                |                         |
| Sediment type:               | Sediment color:      | Sediment odor       |                  | Comments:                       | $\backslash$            |
| copple                       | D.O.                 | none                | H <sub>2</sub> S |                                 | N N                     |
| gravel                       | gray                 | slight              | Petroleum        |                                 | Ì                       |
| sand C M F                   | black                | moderate            | Other:           |                                 |                         |
| silt clay                    | brown                | strong              |                  | 1                               |                         |
| wood chips                   | brown surface        | overwhelming        |                  |                                 |                         |
| sandblast grit               |                      |                     |                  |                                 |                         |
| paint chips                  |                      |                     |                  |                                 |                         |
| Grab No:                     |                      | depth:              | Per              | netration depth:                | Time:                   |
|                              | nple: Y N (circle on |                     |                  | GPS Coordinates:                |                         |
| Sediment type:               | Sediment color:      | Sediment odor       |                  | Comments:                       | Ì                       |
| copple                       | D.O.                 | none                | H <sub>2</sub> S |                                 |                         |
| gravel                       | gray                 | slight              | Petroleum        | /                               | <b>,</b>                |
| sand C M F                   | black                | moderate            | Other:           | X                               |                         |
| silt clay                    | brown                | strong              | $\backslash$ /   | 1                               |                         |
| wood chips<br>sandblast grit | brown surface        | overwhelming        | $\searrow$       |                                 |                         |
|                              |                      |                     |                  |                                 |                         |

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| C C                     | NVIRONMEI<br>ONSULTANTS        |                        | te:             | 7/17/98 Station: TBT-023                                                                                          | ۲<br>ر |
|-------------------------|--------------------------------|------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------|--------|
| Survey                  | ISOU                           |                        |                 | Area UBST WMERUNY                                                                                                 |        |
| Target Coordinate       | ss                             |                        |                 | Start time 07.40                                                                                                  |        |
| . ager overande         | - <u></u>                      |                        |                 |                                                                                                                   | $\sim$ |
|                         | 0 0 2 2                        |                        | 8               | Stop time                                                                                                         |        |
| Weather                 | SET P622                       |                        |                 |                                                                                                                   | ~      |
| Crew                    | 0                              |                        |                 |                                                                                                                   | (      |
| Comments:               |                                |                        |                 |                                                                                                                   |        |
|                         |                                | depth: 49,7            |                 | etration depth: 9" Time: 0940                                                                                     |        |
| Grab No:                | Bottom<br>ble: Y N (circle one |                        |                 | etration depth: <u>9</u> <sup>(1)</sup> Time: <u>0</u> <sup>(1)</sup> <u>0</u> <sup>(1)</sup><br>GPS Coordinates: | _      |
| Sediment type:          |                                | Sediment odor:         |                 | Comments:                                                                                                         | ·      |
| cobble                  | D.O.                           | (none) H <sub>2</sub>  | s<br>S          | TUBE Warms                                                                                                        |        |
| gravel                  | gray                           | $\sim$                 | stroleum        | INDE MORANS                                                                                                       | ~~~    |
| (sand) C M (F)          | black)                         | l °                    | her:            |                                                                                                                   | ζ.     |
| Siltclay                | brown                          | strong                 |                 |                                                                                                                   |        |
| wood chips              | brown surface                  | overwhelming           |                 |                                                                                                                   |        |
| sandblast grit          |                                |                        |                 |                                                                                                                   | , -    |
| paint chips             |                                |                        |                 |                                                                                                                   | •      |
| Grab No:                | Bottom                         | depth:                 | Pene            | stration depth: Time:                                                                                             | ~~~    |
|                         | ole: Y N (circle one           |                        |                 | GPS Coordinates:                                                                                                  |        |
| Sediment type:          | Sediment color:                | Sediment odor:         |                 | Comments:                                                                                                         |        |
| cobble                  | D.Q.                           | none H <sub>2</sub>    | s               | $\mathbf{X}$                                                                                                      | ~      |
| gravel                  | gray \                         | l v                    | stroleym        | $\langle \rangle$                                                                                                 | ,      |
| sand CMF                | black \                        |                        | her:/           | $\lambda_{\rm c}$                                                                                                 | ·      |
| silt clay 🦯             | brown                          | strong                 | /               | $\mathbf{h}$                                                                                                      | ~      |
| wood chips              | brown surface                  | overwhelming           | /               |                                                                                                                   | ,      |
| sandblast grit          |                                |                        | [               |                                                                                                                   |        |
| paint chips/            |                                | <b> /</b>              |                 |                                                                                                                   | ,      |
| Grab No:                | Bottom                         |                        | Pene            | etration depth: Time:                                                                                             |        |
|                         | ple: Y N (circle one           | iii                    |                 | GPS Coordinates:                                                                                                  |        |
| Sediment type:          | Sediment color:                | Sediment odor:         |                 | Comments:                                                                                                         |        |
| cobble                  | D.O.                           | none (H2               | -               | :                                                                                                                 |        |
| gravel                  | gray                           | . •                    | etroleum<br>ber |                                                                                                                   |        |
| sand CMF                | black                          | moderate Oti<br>štrong | her:            |                                                                                                                   | $\sim$ |
| silt clay<br>wood chips | brown<br>brown surface         | overwhelming           |                 | · · · · · · · · · · · · · · · · · · ·                                                                             |        |
| sandblast grit          |                                |                        |                 |                                                                                                                   |        |
| paint chips             |                                |                        |                 |                                                                                                                   | ~      |
| paint on po             | L                              |                        |                 |                                                                                                                   |        |

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| EVS ENVIRONMENT<br>CONSULTANTS | Date:   | 7/17/98 Station: TBT-624           |
|--------------------------------|---------|------------------------------------|
| survey (2) 500                 |         | Area WESTWMERNM                    |
| Target Coordinates             |         | Start time 20 23                   |
|                                |         | Stop time                          |
| Weather SEL PG 22              |         |                                    |
| Crew TIM HMUMMMETSTER, 1       | LISAMIL | STEPHARD WODZICKI, DAUG DICHLINGON |
| Torn                           | 1 PETRU |                                    |
| Comments:                      |         |                                    |

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| Grab No:                  |                      | depth:{l       | . <u>()</u> Pen  |                   | Time: 1023 |
|---------------------------|----------------------|----------------|------------------|-------------------|------------|
| Total Sulfides Sam        | ole: Y N (circle one | )              |                  | GPS Coordinates:  |            |
| Sediment type:            | Sediment color:      | Sediment odor: |                  | Comments:         |            |
| cobble                    | D.O.                 |                | H <sub>2</sub> S |                   |            |
| gravel                    | gray                 | slight         | Petroleum        |                   |            |
| (sand) C M(F)             | black /              | moderate       | Other:           |                   |            |
| silt clay                 | brown                | strong         |                  |                   |            |
| wood chips                | brown surface        | overwhelming   |                  |                   |            |
| sandblast grit            |                      |                |                  |                   |            |
| paint chips               |                      |                |                  |                   |            |
| Grab No:                  | Bottom               | depth:         | Pen              | etration depth:   | Time:      |
| <b>Total Sulfides Sam</b> | ole: Y N (circle one | )              |                  | GPS Coordinates:  |            |
| Sediment type:            | Sediment color:      | Sediment odor: |                  | Comments:         |            |
| cobble                    | D.O.                 | none           | H <sub>2</sub> S |                   |            |
| gravel                    | gray                 | slight         | Petroleum        | $\langle \rangle$ |            |
| sand C M F                | black                | moderate       | Other:           |                   |            |
| silt clay                 | brown                | strong         |                  |                   |            |
| wood chips                | brown surface        | overwhelming   |                  |                   |            |
| sandblast grit /          | l ì                  | 1              |                  |                   | 1          |
| paint chips /             |                      |                |                  |                   |            |
| Grab No:                  | Bottom               | depth:         | Pen              | etration depth:   | Time:      |
| Total Sulfides Sam        | ple: Y N (circle one |                |                  | GPS Coordinates:  |            |
| Sediment type:            | Sediment color:      | Sediment odor: |                  | Comments:         |            |
| cobble                    | D.O.                 | none           | H <sub>2</sub> S |                   |            |
| gravel                    | gray                 | slight         | Petroleum        |                   |            |
| sand CMF                  | black                | moderate       | Other:           |                   |            |
| silt clay                 | brown                | strong         |                  |                   |            |
| wood chips                | brown surface        | overwhalming   | /                |                   |            |
| sandblast grit            |                      |                |                  |                   |            |
| paint chips               |                      |                |                  |                   |            |

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|                              | NVIRONMEI<br>ONSULTANTS |                    | Date:                                         | 7/17/98                                | Station: <u>TRT-025</u> |
|------------------------------|-------------------------|--------------------|-----------------------------------------------|----------------------------------------|-------------------------|
| Survey                       | INSO                    | U                  |                                               | Area MEST L                            | UMBRWAY                 |
| Target Coordinate            | S                       |                    |                                               |                                        | >48                     |
|                              |                         |                    |                                               |                                        |                         |
| Weather                      | SUL PG                  | 22                 |                                               |                                        |                         |
|                              | SISTE PG                |                    |                                               |                                        |                         |
| Crew                         | 766 10                  |                    |                                               |                                        |                         |
| Comments:                    |                         |                    |                                               | ······································ |                         |
| Grab No:                     | Bottom                  | depth: 51          | , 2 Pen                                       | etration depth: $(0)^{\prime\prime}$   | Time: (048              |
|                              | ple: Y N (circle one    |                    |                                               | GPS Coordinates:                       |                         |
| Sediment type:               | Sediment color:         | Sediment odor:     |                                               | Comments:                              |                         |
| copple                       | D.O.                    | none               | H <sub>2</sub> S                              | TUBE WOR                               | MS                      |
| gravel                       | gray                    | slight             | Petroleum                                     |                                        | 9                       |
| Sand C MF                    | black                   | moderate           | Other:                                        |                                        |                         |
| silt clay                    | brown<br>brown surface  | strong             |                                               |                                        |                         |
| wood chips<br>sandblast grit | DIOWIT SUITAGE          | - vermion my       |                                               |                                        |                         |
| paint chips                  |                         |                    |                                               |                                        | 1                       |
| Grab No:                     | Bottom                  | depth:             | Pen                                           | etration depth:                        | Time:                   |
|                              | ple: Y N (circle one    | · ·                |                                               | GPS Coordinates:                       |                         |
| Sediment type:               |                         | Sediment odor:     |                                               | Comments:                              |                         |
| cobble                       | D.O.                    | none               | H <sub>2</sub> S                              |                                        |                         |
| gravel                       | gray                    | slight             | Petroleum                                     |                                        |                         |
| sand CMF                     | black                   | moderate           | Other:                                        |                                        |                         |
| silt clay                    | brown                   | strong             |                                               | /                                      | I                       |
| wood chips                   | brown surface           | pverwhelming       | /                                             |                                        | 1                       |
| sandblast grit               |                         |                    | /                                             |                                        |                         |
| paint chips                  | l                       | <u> </u>           |                                               | <u></u>                                |                         |
| Grab No:                     | Bottom                  |                    | Pen<br>/                                      | etration depth:                        | Time:                   |
| ·····                        | ple: Y N (circle one    |                    | /                                             | GPS Coordinates:                       | ·                       |
| Sediment type:               | Sediment color:         | Sediment odor:     | <u>, , , , , , , , , , , , , , , , , , , </u> | Comments:                              |                         |
| cobbie                       | D.O.                    |                    | H <sub>2</sub> S                              |                                        |                         |
| gravel                       | gray                    | slight<br>moderate | Petroleum<br>Other:                           |                                        | x                       |
| sand C M F<br>silt clay      | black<br>brown          | strong             |                                               |                                        | · · · · · ·             |
| wood chips                   | brown surface           | overwhelming       |                                               |                                        |                         |
| sandblast grit               |                         |                    |                                               |                                        | 1                       |
| palnt chips                  |                         |                    |                                               |                                        |                         |
|                              |                         | <u> </u>           |                                               | · · · · · · · · · · · · · · · · · · ·  |                         |

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| EVS | ENVIRONMENT |
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|     | CONSULTANTS |

|                                                          | ONSULTANTS                                              | Da                                                      | ate: <u>7</u>                 | 1/17/98                          | Station: TBT-026 |  |  |  |  |
|----------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|-------------------------------|----------------------------------|------------------|--|--|--|--|
| Survey                                                   | 1500                                                    |                                                         | A                             | Irea <u>M</u> F                  | ST WATERWAY      |  |  |  |  |
| Target Coordinate                                        | s                                                       |                                                         | s                             | tart time                        | 1123             |  |  |  |  |
|                                                          |                                                         |                                                         | s                             | top time                         |                  |  |  |  |  |
| Weather BUS SING WSCHTERED CLOUDS, WIND 10-12KTSNNW 65°F |                                                         |                                                         |                               |                                  |                  |  |  |  |  |
|                                                          | 5 PG 25                                                 |                                                         |                               | •                                | I                |  |  |  |  |
| Comments:                                                | Comments:                                               |                                                         |                               |                                  |                  |  |  |  |  |
|                                                          |                                                         |                                                         |                               |                                  |                  |  |  |  |  |
| Grab No:                                                 | Bottom                                                  | depth: _40,                                             | Pene                          | etration depth:                  | 8,5" Time: 1123  |  |  |  |  |
|                                                          | Bottom<br>ple: Y N (circle one                          |                                                         | Pene                          | etration depth:<br>GPS Coordinat |                  |  |  |  |  |
|                                                          |                                                         |                                                         | Pene                          | -                                |                  |  |  |  |  |
| Total Sulfides Sam                                       | ple: Y N (circle one                                    | )<br>Sediment odor:                                     | Pene                          | GPS Coordinat                    |                  |  |  |  |  |
| Total Sulfides Sam<br>Sediment type:<br>cobble<br>gravel | ple: Y N (circle one<br>Sediment color:<br>D.O.<br>gray | )<br>Sediment odor:<br>none i<br>slight i               | H <sub>2</sub> S<br>Petroleum | GPS Coordinat                    |                  |  |  |  |  |
| Total Sulfides Sam<br>Sediment type:<br>cobble           | ple: Y N (circle one<br>Sediment color:<br>D.O.         | )<br>Sediment odor:<br>none 1<br>slight 1<br>moderate 0 | H <sub>2</sub> S              | GPS Coordinat                    |                  |  |  |  |  |

| sand C M (F)<br>sill clay<br>wood chips<br>sandblast grit<br>paint chips | black<br>brown<br>brown surface | moderate<br>strong<br>overwhelming | OLL ANIC           |                  |              |  |
|--------------------------------------------------------------------------|---------------------------------|------------------------------------|--------------------|------------------|--------------|--|
| Grab No:                                                                 |                                 | depth:                             | Pene               | etration depth:  | Time:        |  |
| Total Sulfides Sam                                                       | ple: Y N (circle one            | )                                  |                    | GPS Coordinates: | ·            |  |
| Sediment type:                                                           | Sediment color:                 | Sediment odor:                     |                    | Comments:        | <b>、</b>     |  |
| cobble                                                                   | D.O.                            | none                               | H <sub>2</sub> S   |                  | $\mathbf{i}$ |  |
| gravel                                                                   | gray                            | slight                             | Petroleum          | /                |              |  |
| sand CMF                                                                 | black                           | moderate                           | Other:             |                  |              |  |
| silt clay                                                                | brown                           | strong                             |                    | 1                |              |  |
| wood chips                                                               | brown surface                   | overwhelming                       |                    | <i>i</i>         |              |  |
| sandblast grit                                                           |                                 |                                    | /                  |                  |              |  |
| paint chips                                                              | <u> </u>                        |                                    | į.                 |                  | <u>\</u>     |  |
| Grab No:                                                                 | Bottom                          | depth:                             |                    | etration depth:  | Time:        |  |
| <b>Total Sulfides Sam</b>                                                | ple: Y N (circle one            | )                                  |                    | GPS Coordinates: |              |  |
| Sediment type:                                                           | Sediment color:                 | Sediment odor:                     |                    | Comments:        |              |  |
| cobble                                                                   | D.O.                            | none                               | H <sub>2</sub> S / |                  | :            |  |
| gravel                                                                   | gray                            | slight                             | Petroleum          |                  | l,           |  |
| sand C M F                                                               | black                           | moderate                           | Othér:             |                  | Ň.           |  |
| silt clay                                                                | brown                           | strong                             |                    |                  |              |  |
| wood chips                                                               | brown surface                   | overwhelming                       |                    |                  |              |  |
| sandblast grit                                                           |                                 | 1                                  |                    |                  |              |  |
| paint chips                                                              |                                 |                                    |                    |                  |              |  |

Recorded by:

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|                                |                                         | Date:                  |              | Area WSZ,THWY                                |
|--------------------------------|-----------------------------------------|------------------------|--------------|----------------------------------------------|
| Target Coordinate              | s                                       |                        |              | Start time                                   |
|                                |                                         |                        |              |                                              |
|                                | - 0, 57                                 | ····                   | <sup>`</sup> | Stop time                                    |
|                                | E P627                                  |                        |              |                                              |
| Crew 3                         | 75 1625                                 |                        |              |                                              |
| Comments:                      |                                         |                        |              |                                              |
| Creek No.                      |                                         | depth: 44.2            | Der          | etration depth: 10 <sup>°°</sup> Time: 1154  |
| Grab No:<br>Total Sulfides Sam | ple: Y N (circle one                    |                        | . Pen        | etration depth: Time: Time: GPS Coordinates: |
| Sediment type:                 | Sediment color:                         | Sediment odor:         |              | Comments:                                    |
| cobble                         | D.O.                                    | none) H <sub>2</sub> S |              | GOPPER CROWNING WIRE                         |
| gravel                         | gray                                    | slight Petrole         | лП           | TUBE WORMS                                   |
| Sand C MF                      | black                                   | moderate Other:        |              |                                              |
| silt clay                      | brown                                   | strong                 |              | LOTS OF CORPOR GROUNDING WIRE                |
| wood chips                     | brown surface                           | overwhelming           |              |                                              |
| sandblast grit                 |                                         |                        |              |                                              |
| paint chips                    | <u></u>                                 | 1                      |              |                                              |
| Grab No:                       |                                         | depth:                 | Pen          | etration depth: Time:<br>GPS Coordinates:    |
|                                | ple: Y N (circle one<br>Sediment color: | Sediment odor:         |              | Comments:                                    |
| Sediment type:<br>cobble       | D.O.                                    | none H <sub>2</sub> S  |              | Completios:                                  |
| gravel                         | gray                                    | slight Petrolec        | ım           |                                              |
| sand CMF                       | black                                   | moderate Other:        | /            |                                              |
| silt clay                      | brown                                   | strong                 |              |                                              |
| wood chips                     | brown surface                           | overwhelming           |              |                                              |
| sandblast grit                 | 1                                       |                        | 1            |                                              |
| paint chips                    | L                                       | L                      |              | <u></u>                                      |
| Grab No:                       |                                         | depth:                 | Pen          | etration depth: Time:                        |
|                                | ple: Y N (circle one                    |                        |              | GPS Coordinates:                             |
| Sediment type:                 | Sediment color:                         | Sediment odor: /       |              | Comments:                                    |
| copple                         | D.O.                                    | slight Petrole         | 100          |                                              |
| gravel<br>sand C M F           | gray<br>black                           | moderate Other:        | 4111         |                                              |
| silt clay                      | brown                                   | strong                 |              |                                              |
| wood chips                     | brown surface                           | overwhelming           |              | 1                                            |
| sandblast grit                 |                                         |                        |              |                                              |
| paint chips                    | L                                       | l                      | · · ·        |                                              |

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|           | CONSULTANTS | Date: | 7/17/16 Station: 18T-028 |
|-----------|-------------|-------|--------------------------|
| Survey    | WSOU        |       | Area WEST WINDRUMMY      |
| Target Co | ordinates   |       | Start time               |
|           |             |       | Stop time                |
| Weather   | SKE 1627    |       |                          |
| Crew      | SEE P625    |       |                          |
|           |             |       |                          |
| Comments  | s:          |       |                          |

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| Grab No:           | Bottom                | depth: <u>50</u> . | Z Ban              | etration depth:  | Ö " Time:                             | 12-31 |
|--------------------|-----------------------|--------------------|--------------------|------------------|---------------------------------------|-------|
|                    | nple: Y N (circle one |                    |                    | GPS Coordinates: | <u> </u>                              | 64-01 |
| Sediment type:     | Sediment color:       | Sediment odor:     | <u> </u>           | Comments:        |                                       | ····· |
| cobble             | D.O.                  | none               | H <sub>2</sub> S   | 1                |                                       |       |
| gravel             | gray                  | slight             | Petroleum          |                  |                                       |       |
| sand C MF          | black                 | moderate           | Other:             |                  |                                       |       |
| sliticlay          | (brown)               | strong             |                    |                  |                                       |       |
| wood chips         | brown surface         | overwhelming       |                    |                  |                                       |       |
| sandblast grit     |                       |                    |                    |                  |                                       |       |
| paint chips        |                       |                    |                    |                  |                                       |       |
| Grab No:           | Bottom                | depth:             | Pen                | etration depth:  | Time:                                 |       |
|                    | nple: Y N (circle one |                    |                    | GPS Coordinates: |                                       |       |
| Sediment type:     | Sediment color:       | Sediment odor:     | _                  | Comments:        | · · · · · · · · · · · · · · · · · · · |       |
| cobble             | D.O.                  | none               | H <sub>2</sub> S   |                  | Ň                                     |       |
| gravel             | gray                  | slight             | Petroleum          |                  | ,                                     |       |
| sand C M F         | black                 | moderate           | Other:             |                  | N.                                    |       |
| silt clay          | brown                 | strong             |                    |                  |                                       |       |
| wood chips         | brown surface         | overwhelming       |                    | /                | ï                                     |       |
| sandblast grit     |                       | :                  |                    |                  | ,                                     |       |
| paint chips        |                       |                    |                    | /                |                                       |       |
| Grab No:           | Bottom                | depth:             | Peri               | etration depth:  | Time:                                 |       |
| Total Sulfides San | nple: Y N (circle on  | e)                 | /                  | GPS Coordinates: |                                       |       |
| Sediment type:     | Sediment color:       | Sediment odor:     |                    | Comments:        |                                       |       |
| cobbie             | D.O.                  | none               | H <sub>2</sub> S / |                  |                                       |       |
| gravel             | gray                  | slight             | Petroleum          |                  |                                       |       |
| sand C M F         | black                 | moderate           | Other: /           |                  |                                       |       |
| silt clay          | brown                 | strong             | /                  |                  |                                       |       |
| wood chips         | brown surface         | overwhelming       | /                  |                  |                                       |       |
| sandblast grit     |                       | i î                |                    |                  |                                       |       |
| paint chips        |                       |                    | -                  |                  |                                       |       |

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|                                                                                                              | CONSULTANTS                                                        | Date:                                                                                       | 71/17/98.                                          | Station: <u>TBT-034</u> |
|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------|
| Survey                                                                                                       | WSO                                                                | 0                                                                                           | Area MIST WA                                       | TIPWMY                  |
| Target Coordinat                                                                                             | es                                                                 |                                                                                             | Start time                                         |                         |
|                                                                                                              | <u> </u>                                                           |                                                                                             | Stop time                                          |                         |
| Weather                                                                                                      |                                                                    | 627                                                                                         | <u></u>                                            |                         |
| Crew                                                                                                         | SUI P                                                              | 625 + PETE                                                                                  | ERUDE                                              |                         |
| Comments:<br>Grab No:                                                                                        | Bottom                                                             | depth: <u>23,1</u> Per                                                                      | netration depth: $8^{\eta}$                        | Time:                   |
|                                                                                                              | ple: Y N (circle one                                               | i                                                                                           | GPS Coordinates:                                   |                         |
| Sediment type:<br>cobble<br>gravel<br>sand C M P<br>silt clay<br>wood chips<br>sandblast grit<br>paint chips | Sediment color:<br>D.O.<br>gray<br>black<br>brown<br>brown surface | Sediment odor:<br>none H2S<br>elight Petroleum<br>moderate Other:<br>strong<br>overwhelming | Comments:<br>SHEU HASH<br>WORM TUBES<br>OILY SHEEN |                         |
| Grab No:                                                                                                     | Bottom                                                             | -depth: Per                                                                                 | netration depth:                                   | Time:                   |
| Total Sulfides San                                                                                           | ple: Y N (circle one                                               |                                                                                             | GPS Coordinates:                                   |                         |
| Sodimont type:                                                                                               | Sediment color:                                                    | Sediment odor:                                                                              | Commente                                           |                         |

| Grab No:                                                                             | Bottom                                                                    | -depth:                                                     | Pen                            | etration depth:                     | Time:  |  |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------|-------------------------------------|--------|--|
| Total Sulfides Samp                                                                  | ole: Y N (circle one                                                      | )                                                           | GPS Coordinates:               |                                     |        |  |
| Sediment type:                                                                       | Sediment color:                                                           | Sediment odor:                                              |                                | Comments:                           |        |  |
| cobble                                                                               | D.O.                                                                      | none                                                        | H <sub>2</sub> S               |                                     | N .    |  |
| gravel                                                                               | gray                                                                      | slight                                                      | Petroleum                      |                                     |        |  |
| sand CM F                                                                            | black                                                                     | moderate                                                    | Other:                         | 1                                   |        |  |
| silt clay                                                                            | brown                                                                     | strong                                                      |                                | . <i>t</i>                          |        |  |
| wood chips                                                                           | brown surface                                                             | overwhelming                                                |                                |                                     |        |  |
| sandblast grit                                                                       |                                                                           | 1                                                           |                                | í -                                 |        |  |
| paint chips                                                                          |                                                                           | i i                                                         | (                              | /                                   | \<br>\ |  |
| أبير مستعاد فنغني والمستخرين                                                         |                                                                           |                                                             |                                |                                     |        |  |
| Grab No:                                                                             | Bottom                                                                    | depth:                                                      | Pęn                            | etration depth:                     | Time:  |  |
| Grab No:<br>Total Sulfides Samp                                                      | Bottom<br>ble: Y N (circle one                                            |                                                             | Pęn                            | etration depth:<br>GPS Coordinates: | Time:  |  |
|                                                                                      | ole: Y N (circle one                                                      |                                                             | Pen                            | • •                                 | Time:  |  |
| Total Sulfides Samp                                                                  | ole: Y N (circle one                                                      | )                                                           | Pen<br>//<br>H <sub>2</sub> S  | GPS Coordinates:                    | Time:  |  |
| Total Sulfides Samp<br>Sediment type:                                                | ole: Y N (circle one<br>Sediment color:                                   | )<br>Sediment odor:                                         | /                              | GPS Coordinates:                    | Time:  |  |
| Total Sulfides Samp<br>Sediment type:<br>cobble                                      | ble: Y N (circle one<br>Sediment color:<br>D.O.                           | )<br>Sediment odor:<br>none                                 | H <sub>2</sub> S               | GPS Coordinates:                    | Time:  |  |
| Total Sulfides Samp<br>Sediment type:<br>cobble<br>gravel                            | ole: Y N (circle one<br>Sediment color:<br>D.O.<br>gray                   | )<br>Sediment odor:<br>none<br>slight                       | H <sub>2</sub> S<br>Petrolejum | GPS Coordinates:                    | Time:  |  |
| Total Sulfides Samp<br>Sediment type:<br>cobble<br>gravel<br>sand C M F              | ole: Y N (circle one<br><u>Sediment color:</u><br>D.O.<br>gray<br>black   | )<br>Sediment odor:<br>none<br>slight<br>moderate           | H <sub>2</sub> S<br>Petrolejum | GPS Coordinates:                    | Time:  |  |
| Total Sulfides Samp<br>Sediment type:<br>cobble<br>gravel<br>sand C M F<br>silt clay | ble: Y N (circle one<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown | )<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petrolejum | GPS Coordinates:                    | Time:  |  |

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| E          |             | <b>IRONMEN</b><br>SULTANTS | IT  | Date:  | 7/17/9     | 8 Station: TBT-032 |
|------------|-------------|----------------------------|-----|--------|------------|--------------------|
| Survey     | (           | <u>júsc</u> u              | )   |        | Area       | WERT TODD SHIPYARD |
| Target Cod | ordinates _ |                            |     |        | Start time | 134-8              |
|            | _           |                            |     |        | Stop time  | ·                  |
| Weather    | SUE         | P6 27                      |     |        |            |                    |
| Crew       | SOE         | PG 25                      | + P | ETE RU | JE         |                    |
| -          |             |                            |     | -      |            |                    |

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| Grab No:                  |                      | depth:4 2      | 2.2 Pen            | etration depth:            | 1/1 Time: <u>1348</u> |
|---------------------------|----------------------|----------------|--------------------|----------------------------|-----------------------|
| Total Sulfides Sam        | ple: Y N (circle one | )              |                    | GPS Coordinates:           |                       |
| Sediment type:            | Sediment color:      | Sediment odor: |                    | Comments:                  |                       |
| cobble                    | D.O.                 | none           | H <sub>2</sub> S   |                            |                       |
| gravel                    | gray                 | slight         | Petroleum          |                            |                       |
| Gand C M 🕑                | black                | moderate       | Other:             |                            |                       |
| silt clay                 | brown                | strong         |                    |                            |                       |
| wood chips                | brown surface        | overwhelming   |                    |                            |                       |
| sandblast grit            | DRAB OUVE            |                |                    |                            |                       |
| paint chips               |                      |                |                    | ·                          |                       |
| Grab No:                  | Bottom               | depth:         | Pen                | etration depth:            | Time:                 |
| <b>Total Sulfides Sam</b> | ple: Y N (circle one | 1              |                    | GPS Coordinates:           |                       |
| Sediment type:            | Sediment color:      | Sediment odor: |                    | Comments:                  |                       |
| cobble                    | D.O.                 | none           | H <sub>2</sub> S   |                            |                       |
| gravel                    | gray                 | slight         | Petroleum          | /                          | <u>.</u>              |
| sand CMF                  | black                | moderate       | Other:             | <i>, , , , , , , , , ,</i> |                       |
| silt clay                 | brown                | strong         |                    | ,                          |                       |
| wood chips                | brown surface        | overwhelming   |                    | /                          |                       |
| sandblast grit            |                      |                |                    |                            |                       |
| paint chips               |                      |                |                    |                            |                       |
| Grab No:                  | Bottom               | depth:         | Pen                | eration depth:             | Time:                 |
| Total Sulfides Sam        | ple: Y N (circle one |                |                    | GPS Coordinates:           |                       |
| Sediment type:            | Sediment color:      | Sediment odor: | /                  | Comments:                  |                       |
| cobble                    | D.O.                 | none           | H <sub>2</sub> S / |                            |                       |
| gravel                    | gray                 | slight         | Petroleum/         |                            |                       |
| sand C'MF                 | black                | moderate       | Other: /           |                            |                       |
| silt clay                 | brown                | strong         | /                  |                            |                       |
| wood chips                | brown surface        | overwhelming   |                    |                            |                       |
| sandblast grit            |                      |                |                    |                            |                       |
| paint chips               |                      |                |                    |                            |                       |

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|                               | <b>NVIRONMEI</b><br>ONSULTANTS |                                         | 7/17/98 Station: TBT -031                               |  |  |  |  |  |
|-------------------------------|--------------------------------|-----------------------------------------|---------------------------------------------------------|--|--|--|--|--|
| Survey                        | SOV                            |                                         | Area TODD SHIPYARD                                      |  |  |  |  |  |
| Target Coordinate             | s                              |                                         | Start time 1412-                                        |  |  |  |  |  |
|                               |                                |                                         | 1470                                                    |  |  |  |  |  |
| C.S.                          |                                |                                         | Stop time14 2 9                                         |  |  |  |  |  |
|                               | E P6 27                        |                                         |                                                         |  |  |  |  |  |
| Crew Str                      | ZH625.                         | + PETE RUDE                             | · · · · · · · · · · · · · · · · · · ·                   |  |  |  |  |  |
| Comments:                     |                                |                                         |                                                         |  |  |  |  |  |
| Grab No:                      | Bottom                         | depth: 45.2 Per                         | netration depth: Time: 1412                             |  |  |  |  |  |
|                               | ple: Y N (circle one           |                                         | GPS Coordinates:                                        |  |  |  |  |  |
| Sediment type:                | Sediment color:                | Sediment odor:                          | Comments:                                               |  |  |  |  |  |
| cobble                        | D.O.                           | none H <sub>2</sub> S                   | OWER PEWETRATION                                        |  |  |  |  |  |
| gravel                        | gray                           | slight Petroleum                        | UNICIONETIMINON                                         |  |  |  |  |  |
| sand C M F                    | black                          | moderate Other:                         |                                                         |  |  |  |  |  |
| silt clay                     | brown                          | strong                                  | Resea                                                   |  |  |  |  |  |
| wood chips                    | brown surface                  | overwhelming                            |                                                         |  |  |  |  |  |
| sandblast grit<br>paint chips | 1                              |                                         | ]                                                       |  |  |  |  |  |
|                               | 2 8000                         | depth: 46. Per                          | netration depth: 9.5' Time: 1429                        |  |  |  |  |  |
| Grab No:                      | Bottom<br>ple: Y N (circle one |                                         | netration depth: $9i5$ Time: $1421$<br>GPS Coordinates: |  |  |  |  |  |
| Sediment type:                | Sediment color:                | Sediment odor:                          | Comments:                                               |  |  |  |  |  |
| cobble                        | D.O.                           | none H <sub>2</sub> S                   | WORM TUBES                                              |  |  |  |  |  |
| gravel                        | grav                           | slight Petroleum                        | Monday 10083                                            |  |  |  |  |  |
| (sand)C M(F)                  | Clack NERM                     | moderate Other.                         |                                                         |  |  |  |  |  |
| silt day                      | brown                          | strong                                  |                                                         |  |  |  |  |  |
| wood chips                    | brown surface                  | overwhelming                            |                                                         |  |  |  |  |  |
| sandblast grit                |                                |                                         |                                                         |  |  |  |  |  |
| paint chips                   | l                              |                                         | 1                                                       |  |  |  |  |  |
| Grab No:                      | Bottom                         |                                         | netration depth: Time:                                  |  |  |  |  |  |
|                               | ple: Y N (circle one           |                                         | GPS Coordinates:                                        |  |  |  |  |  |
| Sediment type:                | Sediment color:                | Sediment odor: /                        | Comments:                                               |  |  |  |  |  |
| cobble                        | <b>D.Q</b> .                   | none H <sub>2</sub> S                   |                                                         |  |  |  |  |  |
| gravel<br>sand C M F          | gray                           | slight / Petroleum<br>moderate / Other: |                                                         |  |  |  |  |  |
| sand C M F<br>silt clay       | black<br>brown                 | moderate Other:                         |                                                         |  |  |  |  |  |
| wood chips                    | brown surface                  | overwheiming                            |                                                         |  |  |  |  |  |
| sandblast grit                |                                |                                         |                                                         |  |  |  |  |  |
| paint chips                   |                                | ľ                                       |                                                         |  |  |  |  |  |

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| E         |           | ' <b>IRON</b><br>SULTA | IMENT<br>ANTS |        | Date:_ | 7/17/98    | 3        | Station: TBT- | 033 |
|-----------|-----------|------------------------|---------------|--------|--------|------------|----------|---------------|-----|
| Survey    | <u> </u>  | <u>00</u>              |               |        |        | Area       | TODO SHI |               |     |
| Target Co | ordinates |                        |               |        |        | Start time | 1455     |               |     |
|           | _         |                        |               |        |        | Stop time  |          | <u> </u>      |     |
| Weather   | SUE       | 76                     | 27            |        |        |            |          |               |     |
| Crew      | SARE      | P6                     | 25 +          | - Pete | RUDE   |            |          |               |     |
|           |           | <u>.</u>               |               |        |        |            |          |               |     |

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| Grab No:                                                 | Bottom                                          | depth:                 |                     | etration depth: Time: 1455    |  |  |  |
|----------------------------------------------------------|-------------------------------------------------|------------------------|---------------------|-------------------------------|--|--|--|
| Total Sulfides Samp                                      | ole: Y N (circle one                            | ) <u> </u>             | 19                  | GPS Coordinates:              |  |  |  |
| Sediment type:                                           | Sediment color:                                 | Sediment odor:         |                     | Comments:                     |  |  |  |
| cobble                                                   | D.O.                                            | none                   | H <sub>2</sub> S    | TOW CAPLE IN JAWS.            |  |  |  |
| gravel<br>sand C M F                                     | gray<br>black                                   | slight<br>moderate     | Petroleum<br>Other: | SMOPLE WASHED.                |  |  |  |
| slit clay<br>wood chips<br>sandblast grit<br>paint chips | brown<br>brown surface                          | strong<br>overwhelming |                     | RESER                         |  |  |  |
| ······································                   |                                                 | <u> </u>               | 0                   |                               |  |  |  |
|                                                          | Grab No: Bottom depth: Penetration depth: Time: |                        |                     |                               |  |  |  |
| Total Sulfides Sam                                       | ple: Y N (circle one                            | <u>;)</u>              |                     | GPS Coordinates:              |  |  |  |
| Sediment type:                                           | Sediment color:                                 | Sediment odor:         |                     | Comments:                     |  |  |  |
| cobble                                                   | D.O.                                            | (pene)                 | H <sub>2</sub> S    | - TRUB-PLL                    |  |  |  |
| gravet                                                   | Gray DARK<br>black                              | slight<br>moderate     | Petroleum<br>Other: | SAME                          |  |  |  |
| silt clay                                                | brown                                           | strong                 |                     | 4.7.8-7.5                     |  |  |  |
| wood chips                                               | brown surface                                   | overwhelming           |                     | 14 SEC                        |  |  |  |
| sandblast grit                                           |                                                 |                        |                     |                               |  |  |  |
| paint chips                                              |                                                 |                        |                     |                               |  |  |  |
| Grab No: 3                                               | Bottom                                          | depth: 39              | , 6 Pen             | etration depth:(0`` Time:(508 |  |  |  |
| Total Sulfides Sam                                       | ple: Y N (circle one                            | 2)                     |                     | GPS Coordinates:              |  |  |  |
| Sediment type:                                           | Sediment color:                                 | Sediment odor:         |                     | Comments:                     |  |  |  |
| cobble                                                   | D.O                                             | none                   | H <sub>2</sub> S    | THIS OLLIF ON SUNFACE         |  |  |  |
| grave!<br>sand C M F                                     | gray DATUL<br>black                             | slight<br>moderate     | Petroleum<br>Other: | BUTCK BENEATH                 |  |  |  |
| silt clay                                                | brown                                           | strong                 |                     | works & work TUBES            |  |  |  |
| wood chips                                               | brown surface                                   | overwhelming           |                     |                               |  |  |  |
| sandblast grit                                           |                                                 |                        |                     |                               |  |  |  |
| paint chips                                              |                                                 |                        |                     |                               |  |  |  |

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Recorded by:

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| Comments:         Grab No:                 Total Sulfides Sample:       Y         Sediment type:       Sedi         cobble       D.O.         gravel       gray         sand C M F       black         sllt clay       brow         wood chips       brow         sandblast grit       paint chips         Grab No:       2 | iment color: S<br>r<br>s<br>< r<br>m s                 | Gediment odor:<br>none<br>slight                       | 3 Per<br>H2S<br>Petroleum<br>Other: | Stop time <u>1548</u>                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|-------------------------------------|--------------------------------------------------------|
| Comments:                                                                                                                                                                                                                                                                                                                   | Bottom d<br>N (circle one)<br>iment color: S           | Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum       | GPS Coordinates:<br>Comments:<br>(MSUE IN JAWS, SAMPLE |
| Grab No:<br>Total Sutfides Sample: Y<br>Sediment type: Sedi<br>cobble D.O.<br>gravel gray<br>sand C M F black<br>silt clay brow<br>wood chips brow<br>sandblast grit<br>paint chips<br>Grab No:                                                                                                                             | N (circle one)<br>Iment color: S<br>r<br>r<br>r<br>m s | Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum       | GPS Coordinates:<br>Comments:<br>(MSUE IN JAWS, SAMPLE |
| Total Sulfides Sample: Y         Sediment type:       Sedi         cobble       D.O.         gravel       gray         sand C M F       black         slit clay       brow         wood chips       brow         sandblast grit       paint chips         Grab No:       2-                                                 | N (circle one)<br>Iment color: S<br>r<br>r<br>r<br>m s | Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum       | GPS Coordinates:<br>Comments:<br>(MSUE IN JAWS, SAMPLE |
| Total Sulfides Sample: Y         Sediment type:       Sedi         cobble       D.O.         gravel       gray         sand C M F       black         slit clay       brow         wood chips       brow         sandblast grit       paint chips         Grab No:       2-                                                 | N (circle one)<br>Iment color: S<br>r<br>r<br>r<br>m s | Sediment odor:<br>none<br>slight<br>moderate<br>strong | H <sub>2</sub> S<br>Petroleum       | GPS Coordinates:<br>Comments:<br>(MSUE IN JAWS, SAMPLE |
| Sediment type:     Sedi       cobble     D.O.       gravel     gray       sand C M F     black       silt clay     brow       wood chips     brow       sandblast grit     paint chips       Grab No:     2_                                                                                                                | iment color: S<br>r<br>s<br>< r<br>m s                 | none<br>slight<br>moderate<br>strong                   | Petroleum                           | Comments:<br>MBUE IN JAWS, SAMPLE                      |
| cobble     D.O.       gravel     gray       sand C M F     black       silt clay     brow       wood chips     brow       sandblast grit     paint chips       Grab No:     2_                                                                                                                                              | r<br>s<br>m s                                          | none<br>slight<br>moderate<br>strong                   | Petroleum                           | CABLE IN JAWS, SAMPLE                                  |
| gravel gray<br>sand C M F black<br>silt clay brow<br>wood chips brow<br>sandblast grit<br>baint chips<br>Grab No:                                                                                                                                                                                                           | k r<br>m s                                             | slight<br>moderate<br>strong                           | Petroleum                           |                                                        |
| sand C M F black<br>slit clay brow<br>wood chips brow<br>sandblast grit<br>paint chips<br>Grab No:                                                                                                                                                                                                                          | k r<br>m s                                             | moderate<br>strong                                     |                                     | WASLARD.                                               |
| wood chips brow<br>andblast grit<br>waint chips<br>Grab No:                                                                                                                                                                                                                                                                 |                                                        |                                                        |                                     |                                                        |
| andblast grit<br>vaint chips<br>Grab No:                                                                                                                                                                                                                                                                                    | n surface                                              | overwhelming                                           |                                     |                                                        |
| Daint chips<br>Grab No: 2                                                                                                                                                                                                                                                                                                   |                                                        |                                                        |                                     | REJECT                                                 |
| Grab No: 2                                                                                                                                                                                                                                                                                                                  |                                                        |                                                        |                                     | 10000                                                  |
|                                                                                                                                                                                                                                                                                                                             |                                                        |                                                        |                                     |                                                        |
|                                                                                                                                                                                                                                                                                                                             | Bottom d                                               | lepth: 41,1                                            | 6 Pei                               | netration depth: 17" Time: 1549                        |
| Total Sulfides Sample: Y                                                                                                                                                                                                                                                                                                    |                                                        | •                                                      |                                     | GPS Coordinates:                                       |
|                                                                                                                                                                                                                                                                                                                             |                                                        | Sediment odor:                                         |                                     | Comments:                                              |
| cobble D.O.                                                                                                                                                                                                                                                                                                                 |                                                        |                                                        | H <sub>2</sub> S                    | OLLVE DRAB ON SULTIME, BLACK                           |
| gravel grav                                                                                                                                                                                                                                                                                                                 |                                                        |                                                        | Petroleum                           |                                                        |
| sand C M F black                                                                                                                                                                                                                                                                                                            |                                                        | •                                                      | Other:                              | BENEATH                                                |
| silt clay brow                                                                                                                                                                                                                                                                                                              | m s                                                    | strong                                                 |                                     |                                                        |
|                                                                                                                                                                                                                                                                                                                             | n surface 🤇                                            | overwhelming                                           |                                     |                                                        |
| sandblast grit                                                                                                                                                                                                                                                                                                              |                                                        |                                                        |                                     |                                                        |
| paint chips                                                                                                                                                                                                                                                                                                                 |                                                        |                                                        |                                     |                                                        |
| Grab No:                                                                                                                                                                                                                                                                                                                    | ``                                                     | lepth:                                                 | Per                                 | GPS Coordinates:                                       |
| Total Sulfides Sample: Y                                                                                                                                                                                                                                                                                                    |                                                        | Sediment adam                                          |                                     | Comments:                                              |
|                                                                                                                                                                                                                                                                                                                             |                                                        | Sediment odor:                                         | H-C                                 |                                                        |
| obble D.O.                                                                                                                                                                                                                                                                                                                  | N                                                      |                                                        | H <sub>2</sub> S                    |                                                        |
| gravel gray                                                                                                                                                                                                                                                                                                                 |                                                        |                                                        | Petroleum                           | $\backslash$                                           |
| sand C M F black<br>slit clay brow                                                                                                                                                                                                                                                                                          |                                                        | moderate<br>strong                                     | Other:                              | $\lambda$ · $\backslash$                               |
|                                                                                                                                                                                                                                                                                                                             |                                                        | overwhelming                                           |                                     |                                                        |
| sarjdblast grit                                                                                                                                                                                                                                                                                                             |                                                        |                                                        | /                                   |                                                        |
| paint chips                                                                                                                                                                                                                                                                                                                 |                                                        | · · · · ·                                              | •                                   |                                                        |

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|                                                                                                                                                                                                                                                                    | NVIRONMEN<br>ONSULTANTS<br>WSOU<br>27<br>25                                                                                                                                                                   |                                                                                                                                                            | {                                                                 |                                       |                               | Station: | TBT-030<br>NMY |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------|-------------------------------|----------|----------------|
| Comments:                                                                                                                                                                                                                                                          |                                                                                                                                                                                                               |                                                                                                                                                            |                                                                   |                                       |                               |          |                |
| Grab No:                                                                                                                                                                                                                                                           |                                                                                                                                                                                                               | depth: <u>50</u>                                                                                                                                           | 2 Pen                                                             | etration dep                          |                               | 11 Time: | (622           |
|                                                                                                                                                                                                                                                                    | ple: Y N (circle one                                                                                                                                                                                          |                                                                                                                                                            |                                                                   | GPS Coord                             |                               |          |                |
| Sediment type:<br>cobble<br>gravel<br>sand C M (F)<br>silt clay<br>wood chips<br>sandblast grit<br>paint chips<br>Grab No:<br>Total Sulfides Sam<br>Sediment type:<br>cobble<br>gravel<br>sand C M (F)<br>silt clay<br>wood chips<br>sandblast grit<br>paint chips | Sediment color:<br>D.O.<br>gray<br>black<br>brown<br>brown surface<br>DPUB OUVE<br>Z<br>Bottom<br>ple: Y N (circle one<br>Sediment color:<br>D.O.<br>gray<br>black<br>brown<br>brown surface<br>DPUNS<br>CUJE | Sediment odor:<br>none<br>slight<br>moderate<br>strong<br>overwhelming<br>depth:<br>Sediment odor:<br>none<br>slight<br>moderate<br>strong<br>overwhelming | H2S<br>Petroleum<br>Other:<br>, Pen<br>H2S<br>Petroleum<br>Other: | etration dep<br>GPS Coord<br>Comments | th:9 <sup>h</sup><br>dinates: | Time:    | 1645           |
| Grab No:                                                                                                                                                                                                                                                           | Bottom                                                                                                                                                                                                        | depth:                                                                                                                                                     | Pen                                                               | etration dep                          | th:                           | Time:    |                |
|                                                                                                                                                                                                                                                                    | ple: Y N (circle one                                                                                                                                                                                          |                                                                                                                                                            |                                                                   | GPS Coord                             | \ <del></del>                 |          |                |
| Sediment type:<br>cobble<br>gravel<br>sand C/ M F<br>silt clay<br>wood chips<br>sandblast grit<br>paint chips                                                                                                                                                      | Sediment color:<br>D.O.<br>gray<br>black<br>brown<br>brown surface                                                                                                                                            | Sediment odor:<br>none<br>slight<br>moderate<br>strong<br>overwhelming                                                                                     | H <sub>2</sub> S<br>Petroleum<br>Other:                           | Comments                              | <b>s:</b>                     |          |                |

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EVS CONSULTANTS PROJECT #: 2/203-15.2

## SAMPLE JAR FIELD LOG

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## WATERWAY SEDIMENT OPERABLE UNIT TBT STUDY

SAMPLING DATES: 7/15/98 TO: 7/1 1/98.



Date:7/15/98Station:787-01Survey:TBT StudyArea:West WaterwayTime:0902

| TAG #                                        | ID #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Analyses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Lab      |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 4001<br>4002<br>4003<br>4003<br>4004<br>4005 | TBT-01-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TOT/TOE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CAS      |
| 4002                                         | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Ginn Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ROSA     |
| 4003                                         | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Possuator Extr.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11       |
| 4004                                         | ()                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Grin Size<br>locuator Exte.<br>Bioaccumation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Battelle |
| 4005                                         | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ut       |
| X                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                                              | - Arter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | it is a second sec                                                                                                                                                                                                                                             |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | a strategie                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | and the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | e contraction of the second se |          |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | and the second sec                                                                                                                                                                                                                                             |          |
|                                              | and the second sec |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                                              | JAAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
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Comments:

Recorded by:



Date: 7/15/98 Station: TBT-02 Survey: TBT Study Area: W. Waterway Time: O955

TAG # ID # Analyses Lab CAS 4006 TBT-02-5 TOĈ ROSA 4007 11 Scala " Battelle 11 4008 nwater 4009 11 ccuml 400 11 TBT-35-5 CAS 3 UOII ROSA 4012 11 Size bre water 4013 11 11

Comments:

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chemistry/Grain Size replicate taken

Recorded by:

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Date: 7/15/98 Station: TBT-03 Survey: WSW TBT Study Area: W. Wate(way Time: 1045

| TAG #                | ID #     | Analyses,                                     | Lab      |
|----------------------|----------|-----------------------------------------------|----------|
| 4014                 | TBT-03-5 | TBT / TOC                                     | CAS      |
| 4015                 | 11       | Corn' Size                                    | Rosa     |
| 4017                 | ti       | Poremoter                                     |          |
| 4017<br>4018<br>4016 | 11       | Poremoter<br>Bioaccumulation<br>Sed Replenish | Battelle |
| 4016                 | (1       | Sed Replenish                                 | 1        |
|                      | 7        |                                               |          |
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Comments:

Recorded by:



Survey: WGU THE Study Area: W. Waterway Time: 1124

| TAG #         | ID #                                  | Analyses,                                           | Lab                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| 4019          | TBT-04-5                              | TBT/TOC                                             | CAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 4020          | 11                                    | Grain Size,                                         | CAS<br>ROSA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4022          | 11                                    | Poremater Extraction                                | <b>/</b> •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4 022<br>4023 | 4                                     | Grain Size,<br>PorematerExtended<br>Bisaccumule tim | Battelle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 4021          | 11                                    | 11                                                  | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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Recorded by:



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Survey: WSOU TBT Study Area: W. Waterway Time: 1205

Analyses ID # Lab TAG # TBT-05-5 ÇAS TRT TOC 4029 Rosa 402 S Grain 11 Poremoter Estadio 4028 11 11 BATTELLE Rivaccumul-him // // 1076 11 .. . ...

Comments:

Recorded by:



Date: 7/15/98 Station: TBT-06 Survey: WSW TBT Study Area: W. Waterway Time: 1355  $\left[ \right]$ 

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 4030         | 11                                    | Grain Size                                                      | ROSA                                   |
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| A Trans                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 4031         | 11                                    | 11                                                              | 11                                     |
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| and the second sec                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |                                       |                                                                 |                                        |
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| AUDAL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |              |                                       | _                                                               |                                        |
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Survey: WSOU 7BT Study Area: W. W. terway Time: 1435

Analyses ID # Lab .TAG # 5 CAS TBT-07-5 T3T TOP 4034 11 1035 Grain Size ROSA Poremuter 11 11 4037 Baffelle 4038 Bisaccunkl " ll 11 tr 4036 CAS 7BT-36-5 Tai RO'Fr 11 Groin Size 040 hierstur Ħ 4041 CAS TBT-07-FB TBT 4042 4043 TBT-07.CB 11

Comments:

Recorded by: Effer



15/98 Date: Survey: WSOU TBT Study Area: W. Waternay Time: 1535

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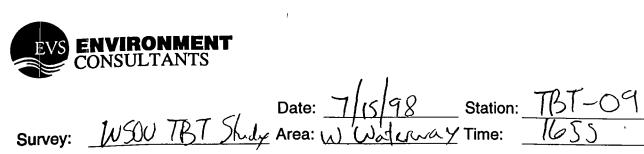
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| TAG #                | ID #     | Analyses                                              | Lab         |
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| 4044                 | TBT-08-5 | TBT/TOC                                               | CAS         |
| 4045                 | (/       | Grain Siza                                            | CAS<br>Rosa |
| 4046                 | 4        | Pore water                                            | (*          |
| 4047                 | ı/       | TBT/TOC<br>Grain Siza<br>fore water<br>Biaccumulation | "Battelle   |
| 4048                 | 4        | 7                                                     | 11          |
| 4049                 | 4        | 4                                                     | 4           |
| UPS0                 | 4        | 11                                                    | ۲,          |
| 4051                 | 11       | "                                                     | ••          |
| 4052                 | 11       | 4                                                     | 11          |
| 4053<br>4054<br>4055 | 1,       | 4                                                     | 11          |
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| 4055                 | ۰,       | 11                                                    | 1.          |
| 4056                 | ۰,       | ()                                                    | 4           |
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Comments:

Recorded by:



Analyses ID # Lab TAG # TBT-09-5 CAS TBT/ TOC 4057 ROSA rain Size 4058 e' premater 4060 11 11 Biaaccuralita BATTERE 4059 11 406 11

**Comments:** 

Recorded by:



|         |                  | Date:   | 7-16.98   | _ Station: | TOT-10-5 |
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| Survey: | WSOU TIST thinky | _ Area: | W. Wetury | Time:      | 0845     |

| TAG #                | ID #         | Analyses  | Lab               |
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| 4062                 | TBT-10-5     | TBT/TOE   | CAS               |
| 4063                 | 4            | pain size | Rosa              |
| 4066                 | ·            | porevoter | Rusia             |
| 4063<br>4066<br>4064 |              | proseum.  | Rizza<br>Bettille |
| 4065                 | $\checkmark$ | proseam.  | Batelle           |
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|         |            | Date: | 07-16-98   | Station: | TBT-11-5 |
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| Survey: | INSOU TIST | Area: | W. Metring | Time:    | 0920     |

|           | TAG # | ID #     | Analyses                                               | Lab                         |
|-----------|-------|----------|--------------------------------------------------------|-----------------------------|
|           | 4071  | TBT-11-5 | brockum                                                | Bellele<br>Bottetle<br>Rose |
| <u>.</u>  | 4069  |          | Inviccus                                               | Bottetle                    |
| 21.<br>   | 4070  |          | posenater extract                                      | Rosa                        |
|           | 4068  |          | grain egg                                              |                             |
|           | 4067  | ¥`       | processing<br>posewater entred<br>grain ist<br>TOT/TOC | CA5                         |
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|     |            |                                              |                                       | Date:    | 7-16-98                                | _ Stati      | on: <u>TBT-12-S</u><br>:: <u>1035</u> |
|-----|------------|----------------------------------------------|---------------------------------------|----------|----------------------------------------|--------------|---------------------------------------|
| (   | Survey:    | 4/504                                        | <u>IBT</u>                            | Area: /  | West Noterum                           | Time         | : 1035                                |
|     |            |                                              |                                       |          |                                        | _            |                                       |
|     | TAG #      |                                              | ID #                                  | <u> </u> | Analyses                               | <del>.</del> | Lab                                   |
|     | IAG #      | 2                                            | TBT-12                                | 2 -      | TBT/TOC                                |              |                                       |
| 105 | 401        | 2                                            | 101-12                                | <u>-</u> | IDIT JUC                               |              | CAS                                   |
|     | 40'        | 3                                            |                                       |          | gran sige                              | + +          | Rosa                                  |
|     | 40         | 16                                           |                                       |          | porevela eft                           | rect         | n-41                                  |
|     | 40         | 14 <u> </u>                                  |                                       |          | prosecum sed                           | sigt_        | Ballille                              |
|     | <u>40'</u> | 75                                           | <u> </u>                              |          | gran sur<br>poreveta est<br>brocam sul |              |                                       |
|     | <u>輕~</u>  |                                              | · · · · · · · · · · · · · · · · · · · |          |                                        |              |                                       |
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Comments:

Recorded by:



|         |               | Date: _' | 7-16-98     | Station | :TBT-13-5     |
|---------|---------------|----------|-------------|---------|---------------|
| Survey: | WSOU TRE Dudy | Area: /  | W. Waterway | Time:   | j1 <b>4</b> 0 |

| TAG # | ID #     | Analyses                              | Lab         |
|-------|----------|---------------------------------------|-------------|
| 4017  | TBT-13-5 | TRT/TOC                               | CAS<br>Rosa |
| 4078  |          | gran size                             | Rosa        |
| 4084  |          | gran size<br>porewater estrad         | 11          |
| 4079  |          | brown sed sept.                       | Bettelle    |
| 4080  |          | broaccum sed sept.<br>proaccumed sept | J 1         |
| 4081  |          | 11                                    | •           |
| 4082  |          |                                       |             |
| 408.3 |          | <i>j</i> )                            |             |
| 4085  |          | broken                                |             |
| 4086  |          | 11                                    |             |
| 4087  |          | //                                    |             |
| 4088  |          | <i>μ</i> 1                            |             |
| 4089  | Ψ        | 11                                    | V           |
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+ replicate TOT-37-5 []

Date: 7 - 16 - 98 Station: TBT - 14Survey: WSOUTBTAtudy Area: W. Witherway Time: 1310 and 1320

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|-------|----------|--------------------|---------|------------|
| TAG # | ID#      | Analyses           | Lab     |            |
| 4090  | TBT-14-S | TBT/TOC            | CAS     | _          |
| 4091  | 14       | grain pizz         | Rosa    |            |
| 4095  |          | porente extract    |         | 13101      |
| 4092  |          | brosecun sed sept. | Botteth |            |
| 4096  | V        | broaccum           | [1      | L.         |
| 4093  | TBT-37-S | TET/TOC            | CAS     | , <u>[</u> |
| 4094  |          | grain size         |         | 1320       |
| 4097  | .V       | porewater extract  | 11      |            |
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Comments:

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Survey: WSOUTBT

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Date: 7 - 16 - 98 Station:  $\overline{1355}$ Area: W. Watura Time: 1355-15 1355

| TAG #                                 | ID #     | Analyses         | Lab      |
|---------------------------------------|----------|------------------|----------|
| 4098                                  | TBT-15-5 | TBT/TOC          | CAS      |
| 4099                                  |          | grain size       | Rosa     |
| 4101                                  |          | pormater extract | Л        |
| 4100                                  | 1        | broice sed repl. | Battelle |
| 4102                                  | V        | bioaccumulation  | 1)       |
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Comments:

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Date: <u>7-16-98</u> Station: <u>TBT-16</u> Survey: <u>WSOU TBT Mudy</u> Area: <u>W. Wctoway</u> Time:

| TAĢ # | ID #     | Analyses                       | Lab      |
|-------|----------|--------------------------------|----------|
|       |          |                                |          |
| 4/03  | TBT-16-5 | TBT/TOC                        | CAS      |
| 4/04  |          | grainsize                      | Rosa     |
| 4106  |          | grainsize<br>poreuster extract | <i>n</i> |
| 4/05  |          | Grocecur sid pepl.             | Battelle |
| 4107  |          | prosecumentation               | 4        |
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Comments:

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Date: <u>7-16-98</u> Station: <u>TBT-17</u> Survey: <u>WSOU TBT Jurrey</u> Area: <u>W. Wyturry</u> Time:

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| TAG # | ID #     | Analyses           | Lab      |
|-------|----------|--------------------|----------|
| 4108  | TBT-17-5 | TBT/TOC            | CAS      |
| 4109  |          | gransise           | Roin     |
| 41)   |          | porcurtes          | ))       |
| 4110  |          | brosecus sed reply | Battelle |
| 4112  |          | brosecumulation    | 2)       |
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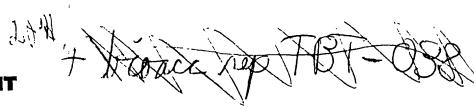
Recorded by:



Date: <u>7-16-98</u> Station: <u>TBT-18</u> Survey: <u>WSOUTBIAnd</u> Area: <u>WWatnum</u> Time: <u>1545</u>

| TAG #    | ID #     | Analyses           | Lab      |
|----------|----------|--------------------|----------|
| 4113     | TBT-18-5 | TBT/TOC            | CAS      |
| 4114     |          | grainerge.         | Rose     |
| 4116     |          | porente estract    | 17       |
| 4115     |          | broace. sed repl.  | Battelle |
| 4/17     | V        | bioacce. sed repl. | 4)       |
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Recorded by:





Date: 7-16-98 Station: TBT-19 Survey: W.SOU. TBT Hudy Area: N. Meterway Time: 1615, 1635 Collected 1645

|           | <u> </u>                              |                      | lected 1645 |
|-----------|---------------------------------------|----------------------|-------------|
| TAG #     | ID #                                  | Analyses             | Lab         |
| 4)23      | TOT-19-5                              | TBT/TOC              | CAS         |
| 4124      |                                       | grain size           | Rosa        |
| 4125      |                                       | porewater extract    | <i>p</i>    |
| : 4118    |                                       | broace sed nepla     | Battello    |
| 4126      | 92 V                                  | broccumulation       | A           |
| 4119      | TRIAN-S                               | - I bioace red sept. | 1)          |
| 4120      | · · · · · · · · · · · · · · · · · · · | 1                    |             |
| 4121      |                                       | 11                   |             |
| 4122      |                                       | 4                    |             |
| 4127      |                                       | pioaccumulation      |             |
| 14128     |                                       | II                   |             |
| 911 129 4 | 129                                   | 11                   |             |
| 4130      | V                                     | 11                   |             |
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Comments:

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Recorded by:



|              | Date:                                 | <u>7-16-98</u> Sta | ation: $TBT - 20$ |
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| Survey: WSCU | TBI study_ Area:                      | West Weterway Tin  | ne:               |
|              | с <u>ј</u>                            | Į.                 |                   |
| TAG #        | ID # _                                | Analyses           | Lab               |
| 413          | TBT= 20-5                             | TBT/TOC            | CAS               |
| 4132         | · · · · · · · · · · · · · · · · · · · | grain size         | Rosa              |
| 4134         |                                       | poreureter entrac  |                   |
| 4133         | · · · · · · · · · · · · · · · · · · · | friere sed repl.   | Battelle          |
|              | V                                     | prosecumulation    | <i>n</i>          |
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Recorded by:





Date: 7/17/98 Station: TBT-2) Survey: WSOU 7BT Study Area: W. Waterway Time: 0831

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| TAG #       | ID #     | Analyses             | Lab      |
|-------------|----------|----------------------|----------|
| 4136        | TBT-21-5 | TBT/TOP              | CAS      |
| 4137        | (1       | Grain Siza           | Rosa     |
| 4138        | 11       | Poremater Extraction |          |
| 4139        | 11       | Bisaccumber.         | Battelle |
| 4140        | 11       |                      | 11       |
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Comments:

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| WSCU<br>Survey: TBT         | Date:<br>Sfuly Area:                | 7/17/98 Stati<br>W. Watermay Time     | on: <u>TBT-22</u><br>:: 0857 |
| TAG #                       | /<br>ID #                           | Analyses                              | Lab                          |
| 1. 404 4141<br>7. 4042 4142 | TBT-22 <b>-5</b>                    | TBT/70C<br>Grain Size,                | CAS<br>Rosa                  |
| 4143<br>4143                | <i>11</i><br><i>11</i><br><i>11</i> | Porender Estracion<br>Bisaccumulation | Battelle                     |
| 1193                        |                                     |                                       |                              |
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|          | SURVEY WSON TH     | Date:     | 7/17/98 Station                                              | on: <u>157-C</u><br>: <u>0</u> 946 |
|          |                    |           |                                                              |                                    |
|          | TAG #              | ID #      | Analyses                                                     | Lab                                |
|          | 4146               | TBT-23-5  | TBT/TOC<br>Grain Siza<br>Poremater Edular<br>Bisaccamelation | CAS                                |
| 1151     | 4147               | 11        | Grain Szi                                                    | Rosa                               |
|          | 4150 4148 T.H.     | 11        | Poremater Educa-                                             |                                    |
| 3.854    | 4149<br>4148 HEATH | <b>F1</b> | Bi Dacunelation                                              | Buttelle                           |
|          | 4148 455 T.H       | 11        | (1                                                           | (7                                 |
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1000 March

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## Date: 7/17/98 Station: TBT-24 Study Area: W. Waterway Time: 1023 WSOU TBT Survey:

| TAG #                | ID #     | Analyses                                                        | Lab              |
|----------------------|----------|-----------------------------------------------------------------|------------------|
| 4151                 | TBT-24-5 | TBT/TOC                                                         | CAS              |
| 4151<br>4152<br>4153 | 11       | Grain Size                                                      | CAS<br>Rosa<br>" |
| 4153                 | · /1     | Prownter Extraction                                             | ()               |
| 4154                 | (1 .     | TBT/TOC<br>Grain Size<br>Brownter Extraction<br>Bioaccumulution | Battella         |
| 4155                 | 11       | 11                                                              | a                |
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Comments:

Recorded by: \_\_\_\_



Date: 7/17/98 Station: TB7-25 Survey: WSOJ TBT Study Area: W. Waterway Time: 1048

| TAG #                                 | ID #     | Analyses                                                     | Lab         |
|---------------------------------------|----------|--------------------------------------------------------------|-------------|
| 4156                                  | TBT-25-5 | TBT/TOC<br>Grain Size<br>Popervoter Educt<br>Bisoccumulatore | CAS<br>Rosa |
| 4157                                  |          | GrainSize                                                    | Rosa        |
| 4158                                  | 11       | Popervater Educt                                             | (1          |
| 4159<br>4160                          | 11       | Bisaccunulatore                                              | Batte/le    |
| 4160                                  | 1.       | 1.                                                           | r           |
| 4161                                  | 11       | TBT                                                          | CAS         |
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Comments:

Recorded by:



Date: 7/17/98 Station: TBT-26 Survey: WSOV TBT Study Area: W. Waterway Time: 1123

| TAG #                                        | ID #     | Analyses                                                     | Lab                                     |
|----------------------------------------------|----------|--------------------------------------------------------------|-----------------------------------------|
| 4162                                         | TBT-26-5 | TBT/TOC                                                      | CAS<br>Rosa                             |
| 4163                                         | · 1      | Grainsize                                                    | Rosa                                    |
| 4164                                         | 4        | Pose Water                                                   |                                         |
| 4165                                         | 4        | Bisoccumulation                                              | Battelle                                |
| 4162<br>4163<br>4169<br>4165<br>4165<br>4166 | ( '      | TBT/TOC<br>Grain Size<br>fore Water<br>Biooccamber for<br>11 | 11                                      |
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Comments:

Recorded by:



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Date: 7/17/98 Station: TBT-27 Survey: WSOU TBT Study Area: W. Waterway Time: 1154

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| TAG #        | ID #     | Analyses                              | Lab                                   |
| 4167<br>4168 | TBT-27-5 | TBT/TOC                               | CAS                                   |
| 4168         | / / /    | Grain Size                            | ROSA                                  |
| 4169         | 11       | Poremeter Extraction                  |                                       |
| 4170         | 11       | Disaccumulation                       | Battelle                              |
| 4171         | 1.       | 11                                    | 11                                    |
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Comments:

Recorded by:



|                        | Date: $7/17/98$   | Station <sup>.</sup> | TBT-28 |
|------------------------|-------------------|----------------------|--------|
| survey: WSOV TBT Study | Area: W. Waterway | Time:                | 1231   |

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| TAG # | ID #             | Analyses                                            | Lab      |
| 4172  | TBT-28-5         | TBT/TOC                                             | CAS      |
| 4173  | 11               | Glain Siza                                          | Basa     |
| 4174  | /1               | Porevator                                           | Kosa     |
| 4175  | 11               | TBT/TOC<br>Grain Sizo<br>Porevator<br>Bioaccupuldro | Battelle |
| 4176  | //               |                                                     | 11       |
| 4177  | "<br>TBT-38-5    | TBT /TOC                                            | CAS      |
| Ý178  | 11               | TBT/TOC<br>Grai-Size<br>Porewater                   | ROSA     |
| 4(79  | 11               | Porewater                                           | L/       |
|       |                  |                                                     |          |
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Survey: WSOU TBT Study Area: Told Shared Time: 1316

| TAG # | ID #     | Analyses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Lab         |
|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 4180  | TBT-34-5 | Analyses<br>TBT / TOC<br>Grain Sill<br>Porewater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CAS<br>Rosa |
| 4181  | 11       | Grain Sill                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ROSA        |
| 4182  | 17       | Porewater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 11          |
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Comments:

Recorded by:



Date: 7/17/98 Station: TBT-32 Survey: WSDU TBT Study Area: Todd Shipyands Time: 1351

| TAG #                        | ID #     | Analyses                              | Lab         |
|------------------------------|----------|---------------------------------------|-------------|
| 4184<br>4185<br>4185<br>4186 | TBT-32-S | TBT/TOC<br>Grain Size<br>Porewater    |             |
| 4185                         | 11       | Grain Size                            | CAS<br>RosA |
| 4186                         | /!       | Pore water                            | L.          |
| 1                            |          |                                       |             |
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Date: 7/17/98 Station: TBT-31 Survey: WSSU TBT Study Area: Tood Shipyards Time: 1429

| TAG #                                 | ID #     | Analyses                              | Lab  |
|---------------------------------------|----------|---------------------------------------|------|
| 4187                                  | TBT-31-5 | TBT/TOC                               | CAS  |
| 4188                                  | [1       | Grain Size                            | Rosa |
| 4189                                  | n        | Grain Size<br>Poremater               | 1    |
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| Date: 7/17/98 Station: TBT-33<br>Survey: WSOV TBT Study Area: Todd Shipyards Time: 1508 |          |                                         |                                       |  |
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| TAG #                                                                                   | ID #     | Analyses                                | Lab                                   |  |
| 4190                                                                                    | TBT-33-5 | TBT/TOC                                 | CAS                                   |  |
| 4191                                                                                    | t.       | Gray Size                               | ROSA                                  |  |
| 4192                                                                                    | 11       | Porcinator Extractor                    | 1'                                    |  |
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Survey: <u>TBT Survey</u> Area: W. Waterway Time: <u>1548</u>

| TAG # | ID #       | Analyses            | Lab                                   |
|-------|------------|---------------------|---------------------------------------|
| 4193  | TBT-29-5   | TBT/TOC             | CAS                                   |
| 4194  | <i>li</i>  | Grain Size          | ROSA                                  |
| 4195  | <i>l</i> ' | Perguater Extension | 11                                    |
| 4196  | 11         | Honcemelitin        | Battelle                              |
| 4197  | tr         | L!                  | 4                                     |
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Recorded by:



Date: 7/17/98 Station: TBT-30 Survey: WSOU TBT Study Area: W. Waterway Time: 1622

| TAG #                                                                        | ID #     | Analyses ,         | Lab        |
|------------------------------------------------------------------------------|----------|--------------------|------------|
| LIDO                                                                         | TBT-30-5 | TBT/TOC            | CAS        |
| 4199<br>4200<br>4201<br>4202<br>4203<br>4203<br>4204<br>4205<br>4206<br>4206 | 11       | Grain Size         | Rosa       |
| 47.00                                                                        | 11       | PornaterExtraction | 11         |
| 4201                                                                         | l'       | Bioncumulation     | Battelle   |
| 4202                                                                         | 1.       | u                  | 11         |
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| 4207<br>4208<br>4209<br>4210                                                 | 11       | 11                 | t t        |
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