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Technical Support Document For the Marine Ecological Risk Assessment

Old Fire Fighting Training Area
Naval Station - Newport
Newport, Rhode Island

Northern Division
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298
Contract Task Order 0269

December 1998

TETRA TECH NUS, INC.

W5298201

TECHNICAL SUPPORT DOCUMENT
FOR THE
MARINE ECOLOGICAL RISK ASSESSMENT

OLD FIRE FIGHTING TRAINING AREA
NAVAL STATION - NEWPORT
NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION - NAVY (CLEAN) CONTRACT

Submitted to:
Northern Division
Environmental Branch, Code 1812
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop # 82
Lester, Pennsylvania 19113-2090

Submitted by:
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Contract Number N62472-90-D-1298
"CLEAN" Contract Task Order 0269

December 1998

332

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KING OF PRUSSIA, PENNSYLVANIA

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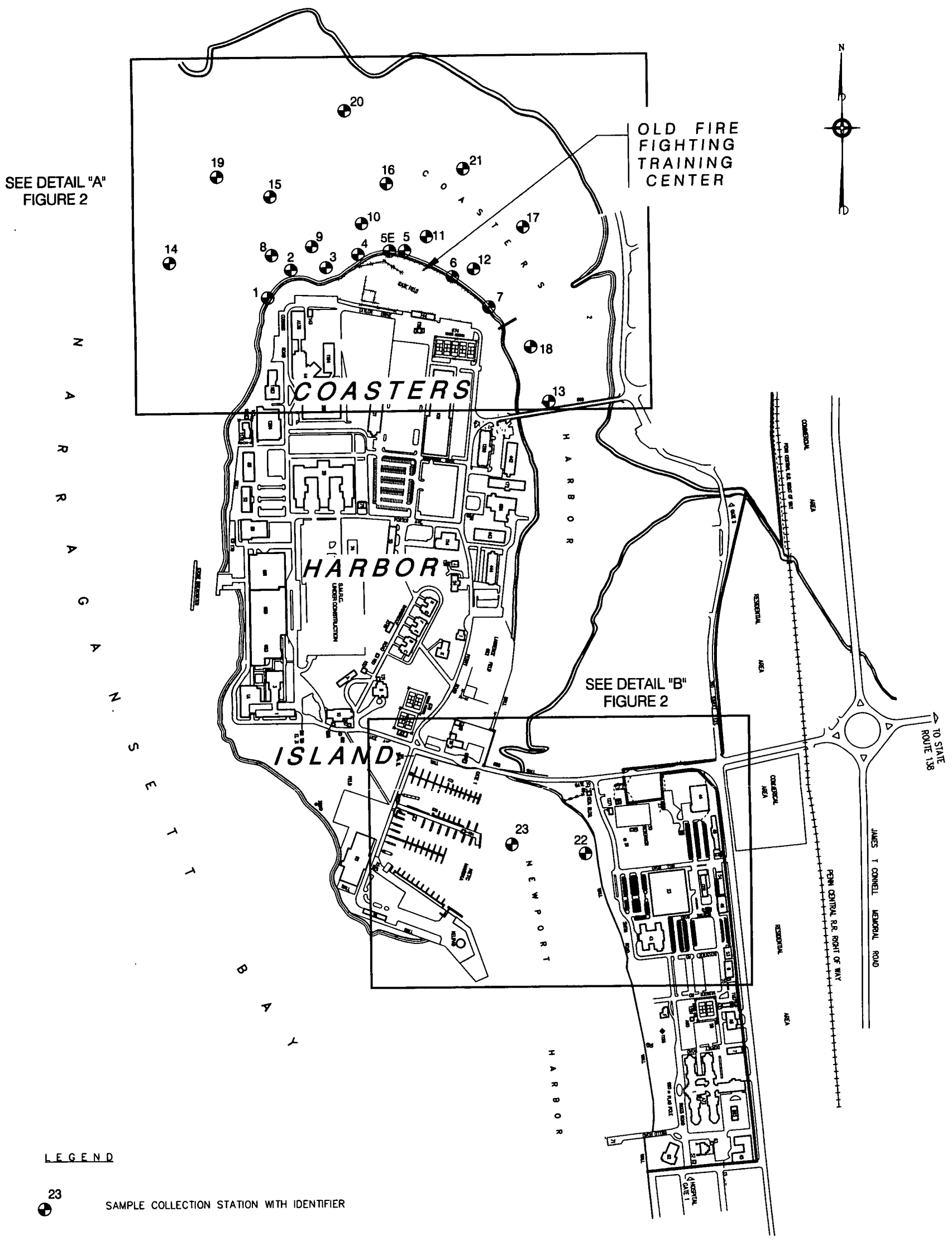
FOREWORD

This technical support document has been prepared to present data that will be used to prepare the Marine Ecological Risk Assessment for The Old Fire Fighting Training Area (Site 09) at the Naval Station – Newport at Coasters Harbor and Coasters Harbor Island in Newport Rhode Island. This document has been prepared as stand-alone material that can be used for reference by authors and reviewers both during the development and completion of the ERA and the RIFS for this site.

Included in this Technical Support Document are validated results from chemical analysis of bulk sediment, porewater extracted from sediment and elutriate prepared from sediment. Results from chemical analysis of biota tissue (blue mussels, hard shell clams, and lobster muscle) are provided as well, although these data have not been validated as of the date of this document. Validation is in progress, and a supplement to this document will be provided prior to December 31, 1998. Copies of the data validation memoranda are also included.

Also included in this Technical Support Document are separate reports for each of the effects endpoints that were scoped for the ecological risk assessment for this site. Each report provides an overview of the field and lab activities involved in the process, the data collected, and a summary of the findings prepared by the scientists that performed the work. These effects test results are provided in Appendix B. Minimal interpretations have been included in the summaries of the effects tests, as this is more appropriate for the ecological risk assessment itself.

A base map is provided in a map pocket. This map presents the major features of the site, the shoreline, and sample stations. The different types of samples collected and/or tests that were performed at each of the stations are also depicted on this figure.



LEGEND

23 SAMPLE COLLECTION STATION WITH IDENTIFIER

GRAPHIC SCALE

0' 600' 1200'

1 INCH = 600 FEET

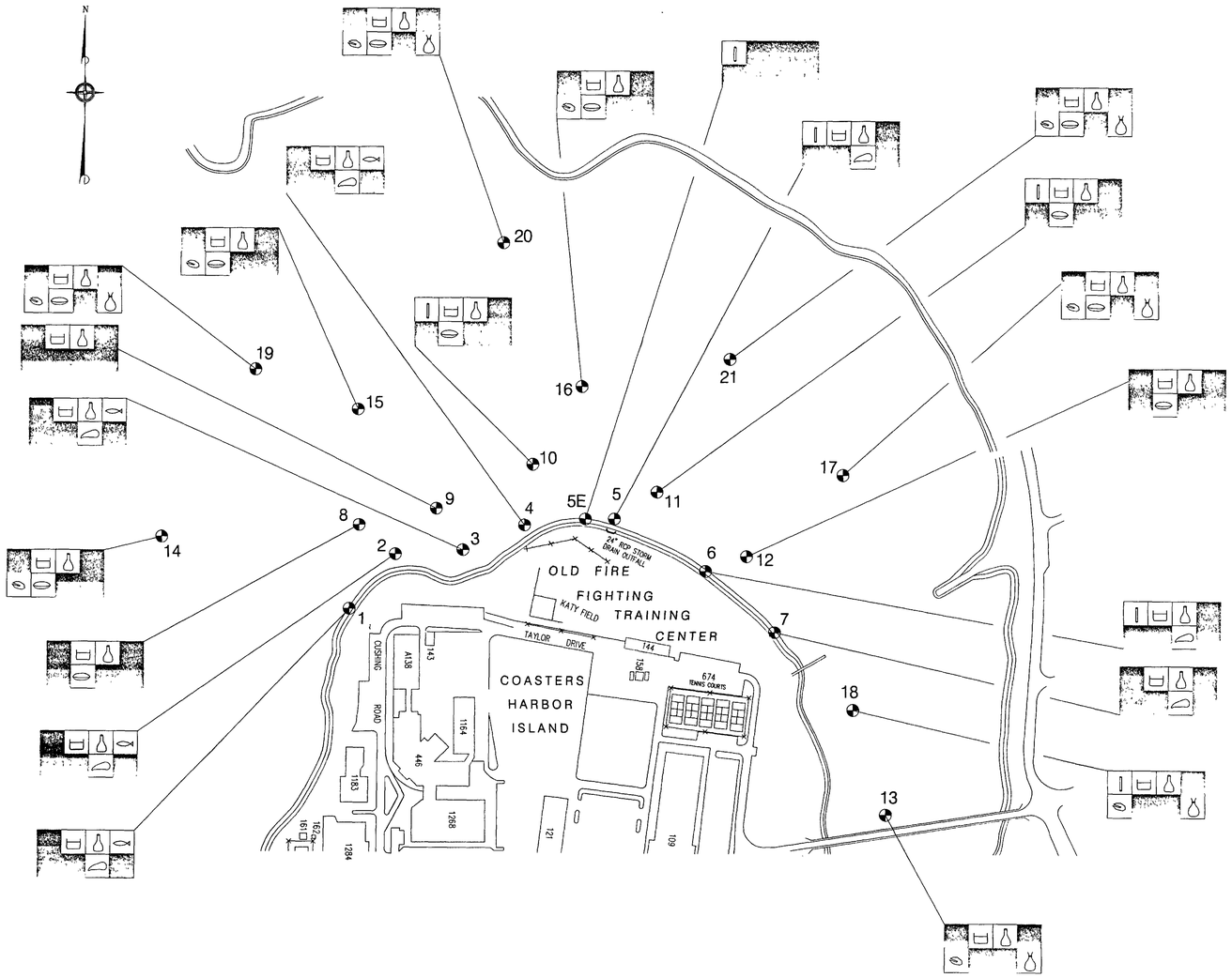
NOTES:

1 PLAN BASED ON "COASTERS HARBOR AND NAVAL HOSITAL EXISTING CONDITIONS MAP", DEPT. OF THE NAVY, DEPT. OF THE NAVY, NAVAL FACILITIES ENGINEERING COMMAND, NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND, LAST REVISION DATE: 9/98

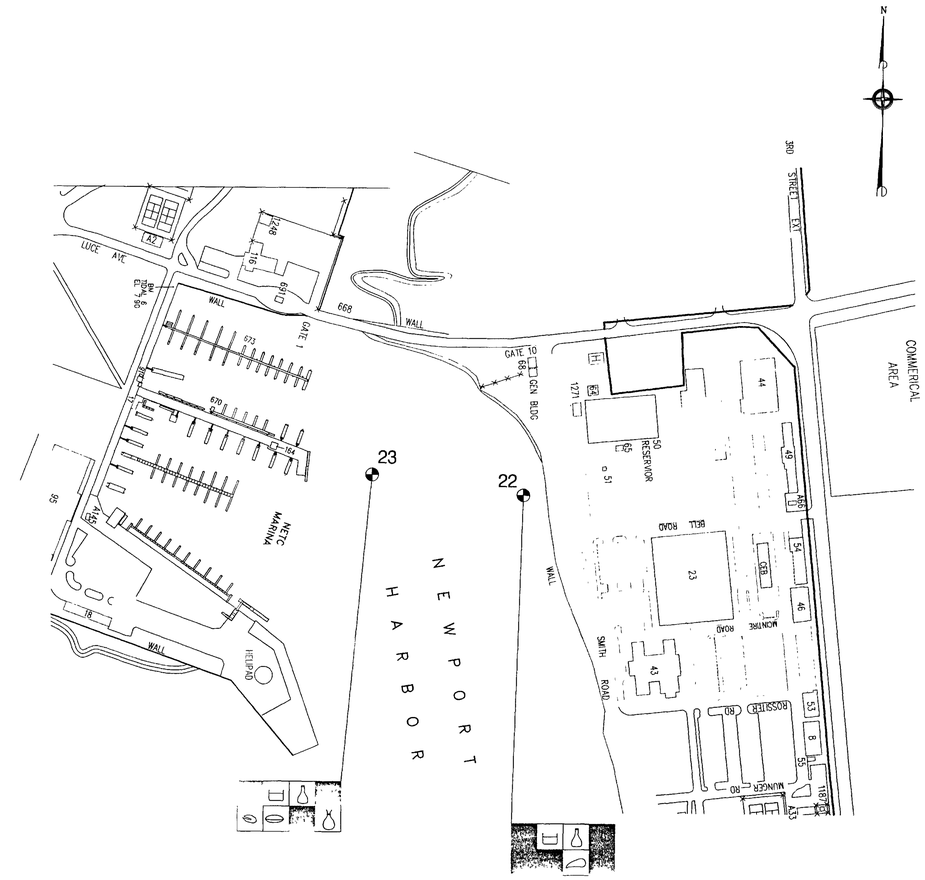
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.

3. PLAN NOT TO BE USED FOR DESIGN

SITE & REFERENCE COLLECTION STATIONS		FIGURE 1
MARINE ECOLOGICAL RISK ASSESSMENT		TETRA TECH NUS, INC.
OLD FIRE FIGHTER TRAINING AREA – NAVAL STATION – NEWPORT, RI		55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY R G DEWSNAP	REV. 0	
CHECKED BY S PARKER	DATE. 02 DEC 98	
SCALE 1" = 600'	FILE NO. \DWG\NAVY\OFFTC\SED_SAMP DWG	



DETAIL "A"
Scale: 1"=200'



DETAIL "B"
Scale: 1"=200'

LEGEND

- SAMPLE STATION LOCATION
- SURFACE SEDIMENT (0-15 cm)
- DEEP SEDIMENT (VARIOUS - SEE TEXT)
- SEDIMENT ELUTRIATE AND PORE WATER
- FINFISH
- LOBSTER
- HARD CLAMS
- BLUE MUSSELS
- DEPLOYED MUSSELS
- SAMPLES NOT DEPICTED INDICATES SAMPLES NOT COLLECTED FOR THIS MEDIA

GRAPHIC SCALE

200' 0' 200' 400'

1 INCH = 200 FEET
FOR DETAILS "A" & "B"

NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE
2. PLAN NOT TO BE USED FOR DESIGN
3. SAMPLE STATIONS LOCATED BY GPS, DONE BY URI IN APRIL, 1998
4. LOCATION OF SHORELINE IS APPROXIMATE MHW; SAMPLE STATIONS 1 - 7 WERE LOCATED AT ACTUAL LOW TIDE LINE AS DEFINED BY URI MARINE SCIENTISTS IN APRIL, 1998
5. LOCATION OF 24" RCP CULVERT NEAR STATION 5 BY VISUAL INSPECTION; LOCATION TO BE CONSIDERED APPROXIMATE

DRAWN BY: R G DEWSNAP	TITLE: DETAILS A AND B MARINE ECOLOGICAL RISK ASSESSMENT OLD FIRE FIGHTER TRAINING AREA - NAVAL STATION - NEWPORT, RI
PREPARED BY: S PARKER	SOURCE: DEPT OF THE NAVY, NAVAL FACILITIES ENGINEERING COMMAND, NAVAL STATION NEWPORT, PLAN ENTITLED " COASTERS HARBOR AND NAVAL HOSPITAL EXISTING CONDITIONS"
CHECKED BY: S. PARKER	SCALE: 1" = 200' / DATE: 08 DEC 1998 / PROJ. NO: 7397 CTO: 269
PROJECT MANAGER: S. PARKER	DRAWING NO: 2 / ACFILE NAME: \DWG\NAVY\OFFTC\SED_DETL.DWG / REV. 0
PROGRAM MANAGER: J TREPANOWSKI	

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APPENDIX A
ANALYTICAL CHEMISTRY RESULTS

APPENDIX A-1
RESULTS OF SEDIMENT CHEMICAL ANALYSES: ORGANIC, INORGANICS, SEM/AVS, TOC, GRAIN-SIZE

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-SD-0015		OFF-2-SD-0015		OFF-3-SD-0015		OFF-4-SD-0015		OFF-5-SD-0015		OFF-5-SD-2025	
Sample Location	OFF-1		OFF-2		OFF-3		OFF-4		OFF-5		OFF-5	
Date Sampled	3/27/98		3/27/98		3/27/98		3/27/98		3/27/98		4/27/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Polyaromatic Hydrocarbons (PAH) (UG/KG)												
1-Methylnaphthalene	14.8	J	52.4	J	62.2	J	35 8	J	278	J	35	
1-Methylphenanthrene	132		364		539		282		1460		121	
2,3,5-Trimethylnaphthalene	7.7	J	45 2	J	22	J	22.6	J	121	J	13	
2,6-Dimethylnaphthalene	18.9	J	103	J	66.9	J	53.5	J	476	J	30.3	
2-Methylnaphthalene	26	J	77.6	J	89 2	J	38.1	J	330	J	42.5	
Acenaphthene	23		88.1		371		54		966		132	J
Acenaphthylene	93		488		350		424		509		144	
Anthracene	255	J	1100	J	1460	J	774	J	2810	J	380	
Benzo(a)anthracene	100		3600		5690		2280		9300		882	
Benzo(a)pyrene	595		2410		3450	J	2090		4830		973	
benzo(b,j,k)fluoranthene	2780		7710		17300	J	3500		25000		1610	
benzo(e)pyrene	910	J	2370	J	5250	J	1310	J	7590	J	616	
Benzo(g,h,i)Perylene	876	J	2520	J	5370	J	1290	J	5990	J	547	
Biphenyl	7 2		22.1		38 6		6.6		151		8.9	J
chrysene/triphenylene	790		2340		4560		1850		7300		790	J
Dibenzo(a,h)Anthracene	441	J	1290	J	2810	J	352	J	3410	J	345	
Fluoranthene	1950		8350		14600		5580		19200		2300	
Fluorene	40 3	J	303	J	598	J	177	J	1360	J	124	J
Indeno(1,2,3-cd)pyrene	1010		3070		6560	J	1200		7390		524	
Naphthalene	31.9		171		149		136		258		88.3	
Perylene	225		818		1490	J	607		1460		262	
Phenanthrene	1060		5610		10700		3030		14600		1440	
Pyrene	1780		6750		10700		4810		16900		2090	
Sum PAHs (6 High Molecular Weight)	6660		24700		41800		16700		60900		7370	
Sum PAHs (7 Low Molecular Weight)	1530		7830		13700		4640		20800		2350	
Sum PAHs (NOAA Status &Trends)	14200		49600		92100		29900		132000		13500	
PCB Cong./Organochlorine Pesticides (UG/KG)												
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0 6	U	0.6	U	0 6	U	0.6	U	0 6	U	0.6	U
2,4'-DDE	0 5	U	0 8	U	0 8	U	0.8	U	0.8	U	0 8	U
2,4'-DDT	1.1		1 8		0 7	J	2 6		1.7		1	U
4,4'-DDD	3	J	1 4	J	1 8	J	2.4	J	2	J	1.1	
4,4'-DDE	2.5	U	2 5	U	2.2	U	2	U	3	U	1 1	U
4,4'-DDT	4.3		10		4		11.5		11 3		1 8	J
Aldrin	0 7	U	0 7	U	0 7	U	0.7	U	0.7	U	0.7	U
alpha-Chlordane	0 8		0 7	J	0 7	J	1 2		1.4		0 8	U
Heptachlor	0 5	U	0.5	U	0 5	U	1.4	U	0.5	U	0 5	U
Heptachlor Epoxide	0 5	U	0.5	U	0.5	U	0 6	J	0.5	U	0 7	

U - Not detected, UJ - DL approximate; J - Quantitation approximate,
* - From dilution analysis, R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-SD-0015		OFF-2-SD-0015		OFF-3-SD-0015		OFF-4-SD-0015		OFF-5-SD-0015		OFF-5-SD-2025	
Sample Location	OFF-1		OFF-2		OFF-3		OFF-4		OFF-5		OFF-5	
Date Sampled	3/27/98		3/27/98		3/27/98		3/27/98		3/27/98		4/27/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Hexachlorobenzene	0.4	U	0.4	U	0.4	U	0.4	U	0.5	U	0 4	U
Mirex	0 3	J	0.6	U	0.6	U	0.6	U	0.6		0 6	U
PCB 101/90	1.2	U	2 1	U	2.4	U	2 9		2 2	U	4 6	
PCB 105	0 6	U	1.2	U	1 4	U	0.7	U	1 7	J	1.1	U
PCB 118	0 7	J	2.1		1 8		1 3		1.1		3 6	
PCB 126	0 5	U	0 9	J	1.3	J	1.7	J	2.5	J	1	J
PCB 128	0 6		0 6	J	0 8	J	2.1		0.9	J	1 4	
PCB 138/163/164	1.9		10.7	J	11 2	J	11.4		16 2	J	7.2	
PCB 153	1 5		2.5		2 5		1.9		4		3 6	J
PCB 170	0 9	U	0.7	U	0.7	U	1.8		1 8		1 1	
PCB 18	1 3	J	0.7	U	1.7		0.7	U	1.4		0.7	U
PCB 180	1 1		1 5		2.4		2		3 9		1 1	
PCB 187/182/159	0 6		0 7		0.6		2 8		1.6		1	
PCB 188	0.6	U	0 6	U	0 8		0.6	U	1.3		0 6	
PCB 195	0 5	U	0.6	U	0 6	U	1 2		3.5		0 7	J
PCB 200	0 3	J	1.2		1		1 8		2		0 5	U
PCB 206	0 5	U	0 5	U	0.5	U	2.4	U	0 6	U	0.8	U
PCB 209	0 5	U	0.5	U	0 5	U	0.5	U	0.7	U	0 6	U
PCB 28/50	0.7		0.7	U	0 6	J	0.7	U	1.8		1.2	
PCB 29	0.7	U	0.7	U	0 7	U	0.7	U	0.7	U	0.7	U
PCB 44	0 6	J	0.4	J	1 4	J	1 4	J	1.4	J	1 2	
PCB 50	0 5	U	0 5	U	0 5	U	0.5	U	0 5	U	0 5	U
PCB 52	0 8	U	0 7	U	1	U	1 4	J	1.8	J	2.8	
PCB 66/95	1 1		1 4		2		1.7		3.9		4 2	
PCB 8	8 5	J	0 3	U	0.9	J	0.3	U	0 3	U	0.7	J
PCB 87	0 6	UJ	0.9	J	0 8	J	0.7	J	0 8	J	1	
Sum of PCB Congeners	18 9		22 9		29.8		36.1		51 6		37	
Sum of PCB Congeners X 2	37 8		45.8		59 6		72.2		103.2		74	
trans-Nonachlor	0.6	J	0 8	U	0.7	J	0 8	U	1 3		0 8	U
Metals (MG/KG)												
Aluminum	21671.8	J	26983 7	J	23218 6	J	16491.8	J	16256 3	J	25226 7	J
Arsenic	6 3	J	8	J	3 6	J	4.3	J	3 6	J	4 9	J
Cadmium	0 31		0.14		0.18		0 06		0 23		0 55	
Chromium	31 1		36.6		26.5		24.3		27 4		17 6	
Copper	58 3		23 7		12 3		31.4		16 9		13 5	
Iron	24310	J	29486.5	J	22871.7	J	22907 6	J	17649 2	J	21741.8	J
Lead	131.4		90.2		60.1		95 5		138 7		59 8	
Manganese	353 6		302 2		387.4		369		166 8		282	

U - Not detected; UJ - DL approximate, J - Quantitation approximate;
* - From dilution analysis; R - Rejected, B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-SD-0015		OFF-2-SD-0015		OFF-3-SD-0015		OFF-4-SD-0015		OFF-5-SD-0015		OFF-5-SD-2025	
Sample Location	OFF-1		OFF-2		OFF-3		OFF-4		OFF-5		OFF-5	
Date Sampled	3/27/98		3/27/98		3/27/98		3/27/98		3/27/98		4/27/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Mercury	0.371		0 081		0.05	U	0 05	U	0.05	U	0.071	
Nickel	34		26.2		22.2		20.2		19		22 8	
Silver	0.46	J	0.13	UJ	0.13	UJ	0.13	UJ	0 13	UJ	0.13	UJ
Zinc	156 4		314.8		100 8	U	106		79.8	U	105 2	U
AVS/SEM (µMOLE/GRAM DRY WT)												
Acid Volatile Sulfide	0.1	U	0.1	U	0 23		0.1	U	23.82			NA
Cadmium	0.001		0.001		0 001		0		0 002			NA
Copper	0.341		0.117	U	0 108	U	0.413		0.156	U		NA
Lead	0.505		0.215		0.119		0.507		0 386			NA
Nickel	0 052	U	0.04	U	0.036	U	0.126		0.152			NA
SEM-AVS		NA		NA	0 562	J		NA	-22 144	J		NA
SEM/AVS		NA		NA	3.442	J		NA	0 07	J		NA
Zinc	0.407		0 549		0 527		0.517		0 982			NA
Total Organic Carbon (PERCENT)												
% Water	32		19.4		20		20 1		26.2		17.3	
Loss on Ignition	4.1		2 5		2 2		2.1		2.4		1.9	
Total Organic Carbon	1.8		1.1		0 9		0.9		1		0 8	
Grain Size (PERCENT)												
CLAY	0 2		0.1		0 2		0.1		0.3		0 3	
SAND	96		97.1		95.2		98.5		97.1		91.4	
SILT	3.9		2 8		4 6		1.5		2 6		8.3	

U - Not detected, UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis, R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-5-SD-5560		OFF-6-SD-0015		OFF-6-SD-2025		OFF-6-SD-3540		OFF-7-SD-0015		OFF-8-SD-0015	
Sample Location	OFF-5		OFF-6		OFF-6		OFF-6		OFF-7		OFF-8	
Date Sampled	4/27/98		3/27/98		4/27/98		4/27/98		3/27/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Polyaromatic Hydrocarbons (PAH) (UG/KG)												
1-Methylnaphthalene	7.1	U	132	J	120		7 9		34.6		11	
1-Methylphenanthrene	6 2	U	680		185		9.8		104		22	
2,3,5-Trimethylnaphthalene	4 8	U	36 3	J	48 1		1.7	J	17.7		2 3	J
2,6-Dimethylnaphthalene	8.6	U	148	J	261		10		59 8		24.5	
2-Methylnaphthalene	3 6	U	170	J	280		9 6		54.9		14 4	
Acenaphthene	8.2	U	344		249	J	52 5	J	120		34	
Acenaphthylene	4.6	U	195		95 8		3 1	J	169		18.5	
Anthracene	8 4	U	1170	J	629		61 5		393		70.1	
Benzo(a)anthracene	8	U	4250		988		118		1160		214	
Benzo(a)pyrene	3	U	1990		1750		116		1330		218	
benzo(b,j,k)fluoranthene	9	U	9390		3580		237		2850		411	
benzo(e)pyrene	6	U	3270	J	1490		81.2		966		161	
Benzo(g,h,i)Perylene	2.2	J	2630	J	1260		74.3		1020		141	
Biphenyl	6.4	UJ	46.7		42	J	3	J	14 7		6.4	U
chrysene/triphenylene	10	U	3350		791	J	103	J	519	J	196	
Dibenzo(a,h)Anthracene	2 8	U	1390	J	357		22.3		293		41.5	
Fluoranthene	9	U	11200		2840		322		2190		455	
Fluorene	7	UJ	392	J	253	J	25.7	J	160		34 7	
Indeno(1,2,3-cd)pyrene	1 2	J	3030		1140		72.2		968		136	
Naphthalene	3.6	U	161		174		10		70		22.8	
Perylene	4 4	U	734		407		32.9		363		60.4	
Phenanthrene	10	U	9470		2040		249		1320		261	
Pyrene	8	U	9770		3340		286		2120		401	
Sum PAHs (6 High Molecular Weight)	9		32000		10100		966		7620		1530	
Sum PAHs (7 Low Molecular Weight)	1		11900		3720		412		2280		456	
Sum PAHs (NOAA Status &Trends)	27		64000		22300		1910		16300		2960	
PCB Cong./Organochlorine Pesticides (UG/KG)												
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0 6	U	0.8	J	0.6	U	0 6	U	0 2	J	0 3	J
2,4'-DDE	0.8	U	0.8	U	0.8	U	0 8	U	0.8	U	0 8	U
2,4'-DDT	1	U	1.4		1	U	1	U	1	U	1	U
4,4'-DDD	0.9	U	3.8	J	2 2		0 9	U	3 8		0 8	J
4,4'-DDE	0 9	U	3.8		3.1		0.9	U	3 1		0 7	J
4,4'-DDT	2	J	9 8		2 2	J	0 6	U	2.7		1.1	
Aldrin	0 7	U	0 7	U	0 7	U	0 7	U	0 7	U	0 1	J
alpha-Chlordane	0 8	U	0 6	J	0 8	U	0 8	U	0.7	J	0.1	J
Heptachlor	0.5	U	0 5	U	0 5	U	0 8	U	0.3	J	0.5	U
Heptachlor Epoxide	0.5	U	0.5	U	4 7		0 5	U	0.5	U	0 5	U

U - Not detected; UJ - DL approximate; J - Quantitation approximate,
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-5-SD-5560		OFF-6-SD-0015		OFF-6-SD-2025		OFF-6-SD-3540		OFF-7-SD-0015		OFF-8-SD-0015	
Sample Location	OFF-5		OFF-6		OFF-6		OFF-6		OFF-7		OFF-8	
Date Sampled	4/27/98		3/27/98		4/27/98		4/27/98		3/27/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Hexachlorobenzene	0.4	U	0.6	U	0.4	U	0.4	U	0.4	U	0.4	U
Mirex	0 6	U	0.5	J	0 6	U	0.6	U	0.4	J	0 6	U
PCB 101/90	0.6	U	2	U	3 3		0 6	U	2.7		1 1	U
PCB 105	0.6	U	0 7	U	2	J	0 6	U	1.3	UJ	0 6	U
PCB 118	0 7	U	1.6		3 1		0 7	U	2.3		1.1	
PCB 126	0 5	U	0.5	UJ	2	J	0 5	U	0.8	U	0.5	UJ
PCB 128	0 4	U	1.8	J	2.2		0.4	U	1		0 6	U
PCB 138/163/164	0.6	U	3	J	9.7		0.6		5 2		2 4	
PCB 153	0.4	UJ	2.7		3.6	J	0.4	UJ	3.5		2	
PCB 170	0 5	U	1 8	J	2 5		0.6	U	1.2	U	0.9	U
PCB 18	0 7	U	2.8		11.6		0.7	U	0 6	J	0.7	U
PCB 180	0 5	U	2.1	J	5 5		0.5	U	2 5		1 2	
PCB 187/182/159	0.5	U	1.9	J	4 3		0 6		1.6		0.9	U
PCB 188	0 6	U	2.6		0 7		0 6	U	0.7		0.5	J
PCB 195	0 6	U	0.6	UJ	0 6	U	0 6	U	0.6	U	0.6	U
PCB 200	0 5	U	1.1	J	1 2		0 5	U	0.4	J	0.4	J
PCB 206	0 7	U	0 6	UJ	2.7	U	0.7	U	0 6		0.8	
PCB 209	0 5	U	4.1	J	3.5		0 5	U	0 8		0.8	
PCB 28/50	0.7	U	2.7		20		1		1		0 3	J
PCB 29	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U
PCB 44	0 5	U	1.8	J	6 9		0.5		1 9		0 5	U
PCB 50	0 5	U	0 5	U	0.5	U	0.5	U	0 5	U	0.5	U
PCB 52	0 7	U	2.6	J	8.1		0 7	U	1 4		0.7	U
PCB 66/95	0.5	U	3 4		10.7		0 5	U	3.3		1.1	
PCB 8	0 3	U	0.6		4 4	J	0 3	U	0 3	U	0 3	U
PCB 87	0.6	U	1.6	J	1.6		0 6	U	1		0 6	U
Sum of PCB Congeners	3		38 2		106.9		2.7		30.5		10 6	
Sum of PCB Congeners X 2	5		76.4		213.8		5.4		61		21.2	
trans-Nonachlor	0 8	U	0 8	U	0.8	U	0 8	U	0.8		0 2	J
Metals (MG/KG)												
Aluminum	32802 5	J	22706 9	J	24964.6	J	26685.6	J	21885.3	J	27137	J
Arsenic	5 3	J	4 1	J	7.5	J	3.7	J	6.8	J	4 3	J
Cadmium	1.29		0 15		0 68		0.14		0.29		0 19	
Chromium	29.5		23		35.3		29.7		43 1		42 3	
Copper	5 7		11		42		6 6		32 8		11	
Iron	22845 6	J	19992.8	J	23113.2	J	18709	J	27506.2	J	21704.3	J
Lead	12.2		47 2		156.3		18.7		294		37 9	
Manganese	345		257.5		285.1		211 9		331.6		356.2	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
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Sample Number	OFF-5-SD-5560		OFF-6-SD-0015		OFF-6-SD-2025		OFF-6-SD-3540		OFF-7-SD-0015		OFF-8-SD-0015	
Sample Location	OFF-5		OFF-6		OFF-6		OFF-6		OFF-7		OFF-8	
Date Sampled	4/27/98		3/27/98		4/27/98		4/27/98		3/27/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Mercury	0.05	U	0.05	U	0.176		0.05	U	0.119		0.148	
Nickel	24.5		19.3		24.8		21 6		28.1		15.8	
Silver	0.13	UJ	0.13	UJ	0.19	J	0.13	UJ	0.18	J	0.17	J
Zinc	53.7	U	105 7	U	267.1		75 8	U	155.5		93.4	U
AVS/SEM (µMOLE/GRAM DRY WT)												
Acid Volatile Sulfide		NA	26 06			NA		NA	38 21		6 21	
Cadmium		NA	0.002			NA		NA	0 002		0.003	
Copper		NA	0.177	U		NA		NA	0.09	U	0 397	
Lead		NA	0 168			NA		NA	0 221		0 122	
Nickel		NA	0 077	U		NA		NA	0 068	U	0 065	U
SEM-AVS		NA	-24 841	J		NA		NA	-37.331	J	-4.647	J
SEM/AVS		NA	0.047	J		NA		NA	0.023	J	0 252	J
Zinc		NA	0 794			NA		NA	0 499		0 976	
Total Organic Carbon (PERCENT)												
% Water	19.4		31 7		22.5		18		34		34 9	
Loss on Ignition	1.6		4.2		3.1		1 7		4.5		3	
Total Organic Carbon	0.7		1.8		1 3		0 7		1.9		1 3	
Grain Size (PERCENT)												
CLAY	0 5		0.3		1		0 8		0.6		0 4	
SAND	89 6		94 2		81.8		90 6		86.7		72.8	
SILT	9 9		5 5		17.2		8 6		12.7		26 7	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
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Sample Number	OFF-9-SD-0015		OFF-10-SD-0015		OFF-10-SD-1520		OFF-10-SD-2530		OFF-11-SD-0015		OFF-11-SD-105110	
Sample Location	OFF-9		OFF-10		OFF-10		OFF-10		OFF-11		OFF-11	
Date Sampled	4/7/98		4/3/98		4/7/98		4/7/98		4/3/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Polyaromatic Hydrocarbons (PAH) (UG/KG)												
1-Methylnaphthalene	1.7	J	2.2	J	2.1	J	0.7	J	6.2	J	7.1	U
1-Methylphenanthrene	4.4	J	3	J	3.3	J	1.9	J	14 8		6.2	U
2,3,5-Trimethylnaphthalene	0.4	J	4.8	U	0.3	J	0.7	J	2	J	4 8	U
2,6-Dimethylnaphthalene	12.4		9	J	6.2	J	2 5	J	18 5	J	5	J
2-Methylnaphthalene	3.1	J	3.1	J	3	J	2 6	J	17.5	J	3 6	U
Acenaphthene	4.1	J	2.5	J	1 8	J	0.9	J	27.9		8 2	U
Acenaphthylene	5.7		4 1	J	3	J	2.1	J	9		4.6	U
Anthracene	11.3		9 8	J	8.9		3 5	J	64	J	0.4	J
Benzo(a)anthracene	57.3		35 2		23 4		15.5		168		8	U
Benzo(a)pyrene	76.1		45 1		31 3		19 8		148		3	U
benzo(b,j,k)fluoranthene	152		94 6		70.8		34 2		284		9	U
benzo(e)pyrene	58.4		41 3	J	31.2		16 5		107	J	6	U
Benzo(g,h,i)Perylene	52 5		40.5	J	31 8		18.6		95.2	J	1.8	J
Biphenyl	6 4	U	1.2	J	1.4	J	1.6	J	3.7	J	6.4	UJ
chrysene/triphenylene	59 6		31 8		31	J	15	J	117		10	U
Dibenzo(a,h)Anthracene	13.6	U	8 6	J	6.6		4 8		23.9	J	0.8	J
Fluoranthene	117		86 2		70.4		35 7		388		9	U
Fluorene	5 3	J	2 8	J	2	J	1 6	J	25.1	J	0 3	J
Indeno(1,2,3-cd)pyrene	48.1		35.3		26 9		14.8		86.3		1.5	J
Naphthalene	4.3		4		3 5	J	2.7	J	9 8		3.6	U
Perylene	21.4		12 8		8 9		6.3		34 8		6.4	
Phenanthrene	46.3		31 3		26 7		16.2		238		1	U
Pyrene	102		87 5		63.5		40.2		337		8	U
Sum PAHs (6 High Molecular Weight)	425		294		226		131		1180		6	
Sum PAHs (7 Low Molecular Weight)	80		58		49		30		391		1	
Sum PAHs (NOAA Status &Trends)	858		592		458		258		2230		25	
PCB Cong./Organochlorine Pesticides (UG/KG)												
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0.1	J	0 6	U	0.6	U	0.6	U	0 6	U	0.6	U
2,4'-DDE	0 8	U	0.8	U	0.8	U	0 8	U	0 8	U	0 5	U
2,4'-DDT	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDD	0.9	U	0.8	U	0 9	U	0 9	U	0 8	U	0.8	U
4,4'-DDE	0 9	U	0 9	U	0 9	U	0 9	U	0.9	U	1	U
4,4'-DDT	0.8		0 7		0.6	J	0 6	U	1.6		0 6	U
Aldrin	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U
alpha-Chlordane	0 1	J	0 8	U	0.8	U	0.8	U	0 8	U	0.8	U
Heptachlor	0.5	U	0.5	U	0.5	U	0.5	U	0 5	U	0.5	U
Heptachlor Epoxide	0.5	U	0.5	U	0 5	U	0 5	U	2.8	J	0 5	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-9-SD-0015		OFF-10-SD-0015		OFF-10-SD-1520		OFF-10-SD-2530		OFF-11-SD-0015		OFF-11-SD-105110	
Sample Location	OFF-9		OFF-10		OFF-10		OFF-10		OFF-11		OFF-11	
Date Sampled	4/7/98		4/3/98		4/7/98		4/7/98		4/3/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Hexachlorobenzene	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0 4	U
Mirex	0.6	U	0.6	U	0.6	U	0 6	U	0 6	U	0 6	U
PCB 101/90	0.6	U	0.7	U	0.6	U	0.6	U	2.2	U	0.6	U
PCB 105	0 6	U	0 3	U	0.6	U	0 6	U	1.3	U	0 6	U
PCB 118	0 5	J	0.7	J	0 6	J	0 7	U	2		0.7	U
PCB 126	0 5	U	0.5	U	0.5	U	0.5	U	0 7	J	0.5	U
PCB 128	0 4	UJ	0.5	U	0.4	U	0.4	U	0 6		0.4	U
PCB 138/163/164	1		1 2		1		0 6	U	3.5		0.6	
PCB 153	1		1 1		0 9	J	0 4	UJ	3 3		0 4	UJ
PCB 170	0.5	UJ	0.7	U	0 5	U	0.5	U	1.5		0 5	U
PCB 18	0 7	U	0.7	U	0.7	U	0.7	U	3.5		0.7	U
PCB 180	0 7		0.6		0 5	U	0 5	U	3.2		0.5	U
PCB 187/182/159	0 6	U	0.6		0 5	U	0 5	U	2		0.5	U
PCB 188	0 6	U	0.6	U	0 6	U	0 6	U	0.6	J	0.6	U
PCB 195	0 6	U	0.6	U	0.6	U	0 6	U	0.7		0.6	U
PCB 200	0 3	J	0.4	J	0.1	J	0 1	J	0.4	J	0.1	J
PCB 206	0 4	J	1.3	U	1	U	1 3	U	1.5	U	0.5	U
PCB 209	0 3	J	0 7	U	0.5	U	0.5	U	0.5	U	0 5	U
PCB 28/50	0.5	J	0 7	U	0 1	J	0 1	J	7 4		0.7	U
PCB 29	0.7	U	0 7	U	0.7	U	0 7	U	0.7	U	0.7	U
PCB 44	0 5	U	0 3	J	0.2	J	0.2	J	3.3	J	0.5	U
PCB 50	0.5	U	0 5	U	0 5	U	0.5	U	0.5	U	0.5	U
PCB 52	0 7	U	0.7	U	0 7	U	0 7	U	3 4	J	0.7	U
PCB 66/95	0.5	UJ	0 6		0 5	U	0 5	U	6.5		0.5	U
PCB 8	0 3	U	0.3	U	0 3	U	0.3	U	0 8		0.3	U
PCB 87	0.6	U	0.6	UJ	0 6	U	0.6	U	0 8	J	0.6	U
Sum of PCB Congeners	4 7		5 5		2 9		0.4		44.2		0.7	
Sum of PCB Congeners X 2	9 4		11		5 8		0 8		88.4		1 4	
trans-Nonachlor	0 1	J	0 8	U	0 8	U	0 8	U	0.8	U	0 8	U
Metals (MG/KG)												
Aluminum	26673 4	J	26243 8	J	28365 8	J	32370 2	J	19537.4	J	28758 7	J
Arsenic	4.3	J	3.4	J	2 9	J	3.3	J	2 7	J	4.7	J
Cadmium	0 11		0 15		0.18		0 07		0.22		0 2	
Chromium	38 6		32 1		30 1		39 2		30 2		231.7	
Copper	6 9		9 8		9		7 7		9 1		5 3	
Iron	24714	J	17984 9	J	18630 6	J	21863 5	J	14918 6	J	17217	J
Lead	25 2		27 3		17.1		16.9		38.7		12 7	
Manganese	515.8		357.1		409.5		252.6		331		290	

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ANALYTICAL RESULTS
LD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-9-SD-0015		OFF-10-SD-0015		OFF-10-SD-1520		OFF-10-SD-2530		OFF-11-SD-0015		OFF-11-SD-105110	
Sample Location	OFF-9		OFF-10		OFF-10		OFF-10		OFF-11		OFF-11	
Date Sampled	4/7/98		4/3/98		4/7/98		4/7/98		4/3/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Mercury	0.05	U	0.07		0.07		0.073		0.125		0 051	
Nickel	18 3		12.5		14.1		19.7		10.9	U	12.8	
Silver	0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	0.17	J	0.13	UJ
Zinc	79.9	U	53.3	U	60 6	U	48.5	U	55.5	U	26.3	U
AVS/SEM (µMOLE/GRAM DRY WT)												
Acid Volatile Sulfide	4 44		7 29			NA		NA	13 03			NA
Cadmium	0.001		0.002			NA		NA	0.002			NA
Copper	0.269		0 212			NA		NA	0.183	U		NA
Lead	0.061		0 079			NA		NA	0 094			NA
Nickel	0.049	U	0 062	U		NA		NA	0.066	U		NA
SEM-AVS	-3.624	J	-6 363	J		NA		NA	-12.018	J		NA
SEM/AVS	0 184	J	0 127	J		NA		NA	0.078	J		NA
Zinc	0.435		0 572			NA		NA	0.667			NA
Total Organic Carbon (PERCENT)												
% Water	28		31.4		17.1		15 2		33.4		33.6	
Loss on Ignition	2.7		2.5		1 6		1.9		2.4		3.7	
Total Organic Carbon	1 2		1.1		0 7		0.8		1 1		1.6	
Grain Size (PERCENT)												
CLAY	0 4		3.7		0 5		0 4		0.8		0.3	
SAND	88.1		85.7		89		94 3		87.8		49 8	
SILT	11.5		10 7		10 5		5 3		11 4		49.9	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-11-SD-5055		OFF-12-SD-0015		OFF-13-SD-0015		OFF-14-SD-0015		OFF-15-SD-0015		OFF-16-SD-0015	
Sample Location	OFF-11		OFF-12		OFF-13		OFF-14		OFF-15		OFF-16	
Date Sampled	4/7/98		4/3/98		4/3/98		4/7/98		4/7/98		4/3/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Polyaromatic Hydrocarbons (PAH) (UG/KG)												
1-Methylnaphthalene	7.1	U	78.8	J	43 2	J	9.4		4 6	J	17.6	J
1-Methylphenanthrene	7 9		220		177	J	20.1		11.4		43.6	J
2,3,5-Trimethylnaphthalene	1.8	J	20 8	J	12.9	J	2 6	J	0.8	J	6	J
2,6-Dimethylnaphthalene	15.9		88.9	J	55 2	J	15 6		7.3	J	37 8	J
2-Methylnaphthalene	3.6	U	117	J	65 6	J	15.5		9.5		23 9	J
Acenaphthene	13.4	J	321		110	J	11.4		5.1	J	37.6	J
Acenaphthylene	1.1	J	58.3		156	J	25.2		11.9		35.8	J
Anthracene	21.4		572	J	482	J	51.8		35		88	J
Benzo(a)anthracene	44.7		1200		1160	J	216		106		195	J
Benzo(a)pyrene	37 5		1420		1150	J	255		103		220	J
benzo(b,j,k)fluoranthene	71.1		2730		2430	J	457		366		435	J
benzo(e)pyrene	22 5		1080	J	939	J	213		140		187	J
Benzo(g,h,i)Perylene	25 2		815	J	744	J	195		100		181	J
Biphenyl	2.4	J	28 8		20.5	J	6 4	U	6 4	U	9.1	J
chrysene/triphenylene	44 2	J	998		774	J	190		87 3		151	J
Dibenzo(a,h)Anthracene	4 8		280	J	213	J	52.2		44		49 6	J
Fluoranthene	146		3120		2600	J	308		185		444	J
Fluorene	12	J	271	J	123	J	17.2		7.6		34.1	J
Indeno(1,2,3-cd)pyrene	23 1		777		646	J	172		116		156	J
Naphthalene	3.6	U	128		61.2	J	20 6		11 3		19 9	J
Perylene	40.2		257		253	J	79.4		32 9		62 9	J
Phenanthrene	136		2510		1440	J	130		87 4		331	J
Pyrene	125		3020		2530	J	344		187		513	J
Sum PAHs (6 High Molecular Weight)	402		10000		8430		1360		712		1570	
Sum PAHs (7 Low Molecular Weight)	184		3980		2440		271		168		570	
Sum PAHs (NOAA Status &Trends)	796		20100		16200		2800		1660		3280	
PCB Cong./Organochlorine Pesticides (UG/KG)												
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0 6	U	0 6	U	0 6	U	0 6	U	0.5	J	0 6	U
2,4'-DDE	0 8	U	0.9		0.8	U	0 8	U	0 8	U	0.8	U
2,4'-DDT	1	U	0.6	J	1 2		1	U	1	U	1 2	
4,4'-DDD	0 9	U	11 2	J	19.7	J	1 4		0 6	J	2 2	J
4,4'-DDE	0 9	U	6.2		10.8		0.9	J	0 5	J	1 8	U
4,4'-DDT	0 6	U	4 8		10 9		2		0 8		1 6	
Aldrin	0.7	U	0 7	U	0 7	U	0 7	U	0 7	U	0.7	U
alpha-Chlordane	0 8	U	1.2		1.4		0 2	J	0.1	J	0.9	
Heptachlor	0 5	U	0.5	U	1.3	U	0 2	J	0.1	J	0 5	U
Heptachlor Epoxide	0 5	U	2.4	J	1 1	J	0.5	U	0.5	U	0 5	U

U - Not detected; UJ - DL approximate, J - Quantitation approximate,
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-11-SD-5055		OFF-12-SD-0015		OFF-13-SD-0015		OFF-14-SD-0015		OFF-15-SD-0015		OFF-16-SD-0015	
Sample Location	OFF-11		OFF-12		OFF-13		OFF-14		OFF-15		OFF-16	
Date Sampled	4/7/98		4/3/98		4/3/98		4/7/98		4/7/98		4/3/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Hexachlorobenzene	0 4	U	0.8	U	0 4	U	0.4	U	0.4	U	0.4	U
Mirex	0 6	U	0.6	U	0 6	U	0 4	J	0.4	J	0.6	U
PCB 101/90	0 6	U	4 1		5 9		2 2		0 9	U	1 9	U
PCB 105	0 6	U	1.7	J	3 5	J	0.9	UJ	0 6	U	0.9	U
PCB 118	0.7	U	3 2		6.6		2.3		0 8		2.3	
PCB 126	0.5	U	1 8	J	4 9	J	1.1		0 5	UJ	1 2	J
PCB 128	0.4	U	1 8		4		0 8	U	0 4	UJ	1	
PCB 138/163/164	0 6	U	7 7		13 3		3.1		1.7		4 9	
PCB 153	0.4	UJ	5 4		9 3		3.4		1.7		3.3	
PCB 170	0 5	U	3.8		5 8		0 9	U	0 6	U	1.5	
PCB 18	0 7	U	2 4		0 5	J	1.1		0 7	U	0 3	J
PCB 180	0 5	U	6 4		9 3		1.6		1.1		1 7	
PCB 187/182/159	0 5	U	3 7		5.5		1.8		0.7	U	1.7	
PCB 188	0 6	U	1		1 6		0.8		0 6	U	1	
PCB 195	0.6	U	0.8	J	3 7		0 6	U	0.6	U	0.6	U
PCB 200	0 5	U	1 6		0 5	U	0 4	J	0.4	J	0.5	U
PCB 206	0 5	U	1.9	U	4		1		0.7		0 6	U
PCB 209	0 5	U	2 2		3		1 2		0.6		0 8	U
PCB 28/50	0 7	U	4.2		1 3		0 9		0.3	J	0.7	U
PCB 29	0.7	U	0.7	U	0 7	U	0.7	U	0.7	U	0.7	U
PCB 44	0 5	U	2	J	2 4	J	0.6		0.5	U	0.8	J
PCB 50	0 5	U	0 5	U	0.5	U	0.5	U	0.5	U	0 5	U
PCB 52	0.7	U	3.2	J	2 9	J	1.1		0.7	U	0 8	U
PCB 66/95	0 5	U	5		4 6		2 2		0.9	U	1.7	
PCB 8	0 3	U	1 5		0 9		0.5	U	0.3	U	0 6	
PCB 87	0 6	U	1.6	J	2 5	J	0.6	U	0 6	U	0.7	J
Sum of PCB Congeners	2		65.1		95 5		24 8		7.3		22 7	
Sum of PCB Congeners X 2	4		130 2		191		49 6		14.6		45 4	
trans-Nonachlor	0 8	U	0 6	J	1	J	0.4	J	0.2	J	0 8	U
Metals (MG/KG)												
Aluminum	25777.2	J	35681 1	J	40998 8	J	28275 6	J	26842 7	J	29666 5	J
Arsenic	5	J	5.2	J	6	J	8 5	J	3.7	J	5	J
Cadmium	0.27		0.53		0 8		0.12		0.18		0.36	
Chromium	32.1		58 6		73 7		44.9		41		48	
Copper	4.9		37		80 8		18.9		11.6		23 9	
Iron	20471.9	J	27717.3	J	33406.4	J	21879	J	21010.4	J	24706 3	J
Lead	11.6		114 2		201 9		44 6		33 1		61.2	
Manganese	364		368 1		335 9		324		366 5		341 6	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-11-SD-5055		OFF-12-SD-0015		OFF-13-SD-0015		OFF-14-SD-0015		OFF-15-SD-0015		OFF-16-SD-0015	
Sample Location	OFF-11		OFF-12		OFF-13		OFF-14		OFF-15		OFF-16	
Date Sampled	4/7/98		4/3/98		4/3/98		4/7/98		4/7/98		4/3/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Mercury	0 05	U	0 376		1.355		0.196		0.1		0.208	
Nickel	75 8		21.4		29.7		15 9		14 2		18.2	
Silver	0.13	UJ	0 48	J	1 06	J	0.23	J	0.19	J	0.44	J
Zinc	257.3		146 5		263 4		96.8	U	73.3	U	101.8	U
AVS/SEM (µMOLE/GRAM DRY WT)												
Acid Volatile Sulfide		NA	24.03		48 59		10.3		7.1		23.68	
Cadmium		NA	0 005		0 009		0 002		0.002		0.005	
Copper		NA	0.079	U	0 062	U	0.417		0 393		0 303	
Lead		NA	0.249		0.589		0 15		0 121		0 17	
Nickel		NA	0 041	U	0 132		0 108	U	0.071	U	0 053	U
SEM-AVS		NA	-23 024	J	-46 678	J	-8 347	J	-5 555	J	-22 058	J
SEM/AVS		NA	0 042	J	0.039	J	0.19	J	0.218	J	0 069	J
Zinc		NA	0 632		1.12		1.277		0.957		1.091	
Total Organic Carbon (PERCENT)												
% Water	28 7		48.9		60 2		41.6		32.3		49	
Loss on Ignition	3 1		5.7		9.3		4 5		2.8		5 9	
Total Organic Carbon	1 3		2 5		4		2		1.2		2 6	
Grain Size (PERCENT)												
CLAY	0.9		1		6.1		1 3		0.5		3.9	
SAND	79.8		44 2		14.5		59.1		87 3		3.3	
SILT	19 3		54.7		79 5		39 7		12.2		92 8	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-17-SD-0015		OFF-18-SD-0015		OFF-18-SD-105110		OFF-18-SD-5055		OFF-19-SD-0015		OFF-20-SD-0015	
Sample Location	OFF-17		OFF-18		OFF-18		OFF-18		OFF-19		OFF-20	
Date Sampled	4/3/98		4/3/98		4/7/98		4/7/98		4/7/98		4/3/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Polyaromatic Hydrocarbons (PAH) (UG/KG)												
1-Methylnaphthalene	11	J	31 4	J	59		64.4		18.9		43.7	J
1-Methylphenanthrene	25.3		108		168		359		20.2		44.4	
2,3,5-Trimethylnaphthalene	2 5	J	11.5	J	17.7		13.6		3.6	J	5.6	J
2,6-Dimethylnaphthalene	22.1	J	45.3	J	82.4		245		54.3		43.9	J
2-Methylnaphthalene	19 7	J	63 8	J	91.1		210		31 5		40 4	J
Acenaphthene	25 6		59.7		208	J	52.8	J	43.8		75.3	
Acenaphthylene	41.1		141		80.2		210		40 6		14 8	
Anthracene	120	J	340	J	799		741		104		217	J
Benzo(a)anthracene	251		730		1260		787		316		320	
Benzo(a)pyrene	333		964		1170		931		322		257	
benzo(b,j,k)fluoranthene	654		2290		2190		1790		618		588	
benzo(e)pyrene	273	J	963	J	841		772		234		197	J
Benzo(g,h,i)Perylene	270	J	899	J	643		944		201		131	J
Biphenyl	5.6	J	17.3		32 1	J	38.3	J	18.2		17.9	
chrysene/triphenylene	203	J	631		951	J	491	J	277		296	
Dibenzo(a,h)Anthracene	76 1	J	273	J	204		248		57.4		50 3	J
Fluoranthene	528	J	1880		3020		1350		542		882	
Fluorene	30.9	J	74 8	J	302	J	100	J	51.3		92.6	J
Indeno(1,2,3-cd)pyrene	237		785		619		821		195		150	
Naphthalene	25		68 1		157		158		53 3		40.1	
Perylene	80 5		276		864		295		85 6		63 4	
Phenanthrene	271		918		1930		528		294		828	
Pyrene	544	J	1810		2520		1500		523		751	
Sum PAHs (6 High Molecular Weight)	1930		6290		9110		5310		2040		2560	
Sum PAHs (7 Low Molecular Weight)	533		1670		3570		1999 9		619		1310	
Sum PAHs (NOAA Status &Trends)	4050		13400		18200		12700		4110		5150	
PCB Cong./Organochlorine Pesticides (UG/KG)												
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0 6	U	0 6	U	0.6	U	0 6	U	0.9		0 6	U
2,4'-DDE	0.8	U	0.8	U	0 8	U	0 8	U	0 8	U	0.8	U
2,4'-DDT	0.7	J	1.8		1	U	0 7	J	1	U	1	U
4,4'-DDD	12.9	J	15 8	J	0 9	U	46.2	J	1.1		1 1	J
4,4'-DDE	2 3	U	10.5		0 9	U	9 5		1.2		1.1	U
4,4'-DDT	4 1		9 5		1 1	J	17.3	J	1.8		1.7	
Aldrin	0 7	U	0.7	U	0 7	U	0.7	U	0.2	J	0.7	U
alpha-Chlordane	0 8	U	1 1		0 8	U	0.7	J	0.8		0.8	U
Heptachlor	0.5	U	0 5	U	0 5	U	0.5	U	0 5	U	0.45995	U
Heptachlor Epoxide	0 5	U	1	J	0 5	U	0.8		0 5	U	0.5	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-17-SD-0015		OFF-18-SD-0015		OFF-18-SD-105110		OFF-18-SD-5055		OFF-19-SD-0015		OFF-20-SD-0015	
Sample Location	OFF-17		OFF-18		OFF-18		OFF-18		OFF-19		OFF-20	
Date Sampled	4/3/98		4/3/98		4/7/98		4/7/98		4/7/98		4/3/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Hexachlorobenzene	0 4	U	0 4	U	0.4	U	0.4	U	0 9		0.4	U
Mirex	0.6	U	0 6	U	0.6	U	0 6	U	0.6	U	0 6	U
PCB 101/90	2.1	U	4.5		0 6	U	3.5		1.8		1.9	U
PCB 105	1	U	2.4	J	0 6	U	1	U	0.6	U	0 6	U
PCB 118	1.7		5.5		0 7	U	2		1 4		1 8	
PCB 126	1 3	J	1 8	J	0.5	U	1 4	J	0.7	U	1 1	J
PCB 128	0.9		2.4		0 9		2.5		0 5	U	0.7	
PCB 138/163/164	3 2		12 2		4.3		5.1		3		4 1	
PCB 153	2.8		7.5		0.4	UJ	3.7	J	2.4		3.6	
PCB 170	1.3	U	2 9		0 5	U	1.1		0.9	U	1 5	
PCB 18	0 7	U	0.7	U	0.7	U	0 7	U	1.3	J	0.7	U
PCB 180	1.3		5 2		0 5	U	3.1		1.8		1 9	
PCB 187/182/159	1.3		3 8		5.9	J	2 9		1.1		1 4	
PCB 188	0 6	U	1 5		0 6	U	0.8		0.5	J	0 6	
PCB 195	0.6	U	0 6	U	0 6	U	0.6	U	0.6	U	0.6	U
PCB 200	0 3	J	1.2		0 5	U	0 5		0 6		0.4	J
PCB 206	1.5	U	2.3	U	1.4	U	4 8		0 8		1	U
PCB 209	1 4		2 6		0 9	U	9 3		0 9		1	U
PCB 28/50	0.7	U	0.7		0 2	J	0.6	J	0 4	J	0 7	U
PCB 29	0.7	U	0 7	U	0 7	U	0.7	U	0.7	U	0 7	U
PCB 44	0.5	J	1 2	J	0.7		0 7		1.1	J	0.4	J
PCB 50	0 5	U	0 5	U	0.6	U	0.5	U	0 5	U	0.5	U
PCB 52	0 7	U	1 2	J	0.7	U	1.4		0 9	UJ	0.7	U
PCB 66/95	1.3		3 9		0.5	U	2.2		2 3		1.4	
PCB 8	0.3	U	0.8		0 3	U	0.4	U	8.5		0.3	U
PCB 87	0.6	J	1.6	J	0 6	U	1.2	J	0 5	J	0.6	UJ
Sum of PCB Congeners	16.6		62 9		12		46.8		28 4		18.9	
Sum of PCB Congeners X 2	33.2		125 8		24		93 6		56.8		37.8	
trans-Nonachlor	0 8	U	1	J	0 8	U	0 8	U	0.7	J	0.8	U
Metals (MG/KG)												
Aluminum	32010 6	J	40749 6	J	41021 5	J	47170 2	J	37769 6	J	33977	J
Arsenic	4 7	J	6 3	J	6 4	J	5 6	J	5 8	J	4.2	J
Cadmium	0 38		0 69		0 5		1.12		0.21		0.25	
Chromium	44.1		73 6		76 4		79 7		55 6		52 5	
Copper	26 4		83 5		66.2		84 9		30.3		19	
Iron	24563 5	J	31884 5	J	32905.4	J	33905.8	J	29787.1	J	28354.6	J
Lead	71 4		190.4		202		249 5		56		40.6	
Manganese	312 4		332.9		279.7		305.1		362 9		368.4	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-17-SD-0015		OFF-18-SD-0015		OFF-18-SD-105110		OFF-18-SD-5055		OFF-19-SD-0015		OFF-20-SD-0015	
Sample Location	OFF-17		OFF-18		OFF-18		OFF-18		OFF-19		OFF-20	
Date Sampled	4/3/98		4/3/98		4/7/98		4/7/98		4/7/98		4/3/98	
QC Type	None		None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Mercury	0.225		0.562		1.901		0.97		0.299		0.171	
Nickel	18.7		28 4		25 7		28.3		24		21	
Silver	0 4	J	1.08	J	0.28	J	1.17	J	0 18	J	0.19	J
Zinc	125 7		248.3		250.3		305 9		166.3		108 5	
AVS/SEM (µMOLE/GRAM DRY WT)												
Acid Volatile Sulfide	14.13		39			NA		NA	17.26		29 52	
Cadmium	0.005		0.011			NA		NA	0.001		0.004	
Copper	0.111	U	0.22			NA		NA	0.232		0.285	
Lead	0.192		0.476			NA		NA	0.173		0.13	
Nickel	0.06	U	0.056	U		NA		NA	0.046	U	0.072	U
SEM-AVS	-12 651	J	-36 114	J		NA		NA	-15 824	J	-27.863	J
SEM/AVS	0.105	J	0 074	J		NA		NA	0.083	J	0.056	J
Zinc	1.11		2.123			NA		NA	0 984		1.166	
Total Organic Carbon (PERCENT)												
% Water	47.4		59.7		54		46.5		46.7		48.9	
Loss on Ignition	6		9.3		11 7		8.3		6 6		5.2	
Total Organic Carbon	2.6		4		5.1		3 6		2.9		2.3	
Grain Size (PERCENT)												
CLAY	2 3		2.7		3.6		2.7		50 2		60.4	
SAND	46.2		6.9		6.1		6.4		1.7		1.2	
SILT	51 6		90.4		90 3		90 9		48.1		38 3	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-21-SD-0015		OFF-22-SD-0015		OFF-23-SD-0015		OFF-5E-SD-2025		OFF-5E-SD-5560	
Sample Location	OFF-21		OFF-22		OFF-23		OFF-5E		OFF-5E	
Date Sampled	4/3/98		3/27/98		4/3/98		4/27/98		4/27/98	
QC Type	None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Polyaromatic Hydrocarbons (PAH) (UG/KG)										
1-Methylnaphthalene	7.7	J	2	J	27.8		40.8		7.1	U
1-Methylphenanthrene	19.3		2.6	J	49.9		274		6.2	U
2,3,5-Trimethylnaphthalene	2.4	J	0.3	J	8.2		22 6		4.8	U
2,6-Dimethylnaphthalene	13.7	J	5.8	J	38 6		39.9		8 6	U
2-Methylnaphthalene	13 1	J	3.1	J	43.4		18 7		3.6	U
Acenaphthene	9.4		1.8	J	89.5		267	J	8.2	U
Acenaphthylene	18.3		4.4	J	77 5		11		0 2	J
Anthracene	47.9	J	9 5	J	348		390		8.4	U
Benzo(a)anthracene	151		35 6		616		829		8	U
Benzo(a)pyrene	176		38 8		758		648		3	U
benzo(b,j,k)fluoranthene	375		78 6		1540		1130		9	U
benzo(e)pyrene	158	J	49.3	J	688		404		6	U
Benzo(g,h,i)Perylene	133	J	60 4	J	700		293		1.9	J
Biphenyl	5.9	J	0 8	J	12.8		6 5	J	6.4	UJ
chrysene/triphenylene	151		26 7		540		710	J	10	U
Dibenzo(a,h)Anthracene	40.4	J	12.2	J	179		115		1	J
Fluoranthene	291		65 9		1560		2050		9	U
Fluorene	11.3	J	2.4	J	106		205	J	7	UJ
Indeno(1,2,3-cd)pyrene	126		33.9		511		302		1.5	J
Naphthalene	8.7		3.2	J	41.6		8 8		3.6	U
Perylene	43 3		12 9		205		175		6.9	
Phenanthrene	126		23.5		770		1950		10	U
Pyrene	334		69 2		1420		1910		8	U
Sum PAHs (6 High Molecular Weight)	1140		248		5080		6260		7	
Sum PAHs (7 Low Molecular Weight)	234		48		1480		2850		1	
Sum PAHs (NOAA Status &Trends)	2250		543		10300		11800		22	
PCB Cong./Organochlorine Pesticides (UG/KG)										
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0.6	U	0.6	U	0 6	U	0 6	U	0 6	U
2,4'-DDE	0 8	U	0.8	U	0 8	U	0 8	U	0.8	U
2,4'-DDT	1	U	1	U	0 8		1	U	1	U
4,4'-DDD	2 4	J	0 8	U	7.3		0 9	U	0 9	U
4,4'-DDE	1.8	U	0 9	U	3 2		0 9	U	0 9	U
4,4'-DDT	2 1		0 6	J	4.1		0.8	J	0 6	U
Aldrin	0.7	U	0 7	U	0 7	U	0.7	U	0.7	U
alpha-Chlordane	0.8	U	0.8	U	0 8	J	0.8	U	0.8	U
Heptachlor	0.5	U	0 5	U	0.5	U	0.5	U	0.6	U
Heptachlor Epoxide	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

U - Not detected; UJ - DL approximate; J - Quantitation approximate,
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-21-SD-0015		OFF-22-SD-0015		OFF-23-SD-0015		OFF-5E-SD-2025		OFF-5E-SD-5560	
Sample Location	OFF-21		OFF-22		OFF-23		OFF-5E		OFF-5E	
Date Sampled	4/3/98		3/27/98		4/3/98		4/27/98		4/27/98	
QC Type	None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Hexachlorobenzene	0 4	U	0.4	U	0.5		0.4	U	0.4	U
Mirex	0 6	U	0.6	U	1.1	J	0 6	U	0.6	U
PCB 101/90	2 2	U	0.7	U	2.9		0.6	U	0.6	U
PCB 105	0.9	U	0 2	U	1.7	J	0.6	U	0 6	U
PCB 118	2		0.7	U	2.7		0 7	U	0 7	U
PCB 126	0 7	J	0.5	U	2		0 6	J	0 5	U
PCB 128	0 9		0.5	U	2 3		1.5		0.4	U
PCB 138/163/164	2 9		0 9		7.6		0.6	U	0.6	U
PCB 153	2.7		0 7		4 2		0.4	UJ	0.4	UJ
PCB 170	1.1	U	0 5	U	2 1		0.5	U	1	U
PCB 18	0.7	U	0 7	U	0.7	U	1	U	0.7	U
PCB 180	1.3		0 3	J	3 4		0.5	U	0.5	U
PCB 187/182/159	1.5	J	0 5		3 1		0.5	U	0 5	U
PCB 188	0 6		0.6	U	1		0.6	U	0.6	U
PCB 195	0.6	U	0 6	U	1.5	UJ	0.6	U	0 6	U
PCB 200	0.3	J	0 2	J	1.1		0.5	U	0 5	J
PCB 206	1 1	U	1	U	1.2		0.5	U	1	U
PCB 209	0.7	U	0.5	U	1.5		0 7	U	0.5	U
PCB 28/50	0 7	U	0.7	U	1 5		0 8		0 7	U
PCB 29	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U
PCB 44	0.5	J	0 2	J	1 1		0.7		0.5	U
PCB 50	0 5	U	0 5	U	0 5	U	0.5	U	0.5	U
PCB 52	0 9	U	0.7	U	1 4		0.7	U	0 7	U
PCB 66/95	1 6		1	U	2 7		0 5	U	0 5	U
PCB 8	0.3	U	0.3	U	0.6	U	0.7	J	0.3	U
PCB 87	0 6	J	0.6	UJ	1.1		0.6	U	0.6	U
Sum of PCB Congeners	15.6		2 8		44.6		4.3		0.5	
Sum of PCB Congeners X 2	31.2		5 6		89 2		8 6		1	
trans-Nonachlor	0 8	U	0 8	U	1.2		0.8	U	0 8	U
Metals (MG/KG)										
Aluminum	37829 4	J	36057 5	J	92357.6	J	15734	J	26601.5	J
Arsenic	4 9	J	3 8	J	4 8	J	7.3	J	4.6	J
Cadmium	0 39		0 19		0 43		0 11		0.1	
Chromium	52.9		47 8		53 2		19.7		23.2	
Copper	22 7		18.3		44.7		6		2 5	
Iron	25992.7	J	28735.9	J	51702.9	J	11871.7	J	13658 9	J
Lead	46.2		21.7		74 2		13.2		14.6	
Manganese	377.9		318 5		669 7		179.9		262 6	

U - Not detected, UJ - DL approximate; J - Quantitation approximate,
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-21-SD-0015		OFF-22-SD-0015		OFF-23-SD-0015		OFF-5E-SD-2025		OFF-5E-SD-5560	
Sample Location	OFF-21		OFF-22		OFF-23		OFF-5E		OFF-5E	
Date Sampled	4/3/98		3/27/98		4/3/98		4/27/98		4/27/98	
QC Type	None		None		None		None		None	
Filtering	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Mercury	0.112		0.111		0 387		0 062		0.05	U
Nickel	26.9		21.2		42 7		16.6		15.7	
Silver	0 16	J	0.13	UJ	0.27	J	0.13	UJ	0.13	UJ
Zinc	143.9		78 3	U	306 2		35.5	U	29 5	U
AVS/SEM (µMOLE/GRAM DRY WT)										
Acid Volatile Sulfide	12 93		2 74		32 95			NA		NA
Cadmium	0 004		0.001		0.006			NA		NA
Copper	0 175	U	0 234		0.165	U		NA		NA
Lead	0 148		0.039		0.236			NA		NA
Nickel	0.091	U	0 043	U	0 075	U		NA		NA
SEM-AVS	-11 47	J	-1.408	J	-30.715	J		NA		NA
SEM/AVS	0.113	J	0.486	J	0 068	J		NA		NA
Zinc	1 042		1.015		1.753			NA		NA
Total Organic Carbon (PERCENT)										
% Water	49.3		33 3		49 8		39.9		16.9	
Loss on Ignition	5.4		3.1		6 1		6.8		1.7	
Total Organic Carbon	2.3		1.3		2 7		2 9		0 7	
Grain Size (PERCENT)										
CLAY	51.1		91 7		54 5		0.5		0.9	
SAND	1.8		0.3		1 3		82.3		81	
SILT	47 2		8		44.1		17.1		18 1	

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APPENDIX A-2
RESULTS OF SEDIMENT ELUTRIATE CHEMICAL: ORGANICS, INORGANICS

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-ELU-032798		OFF-1-ELU-042798		OFF-2-ELU-032798		OFF-2-ELU-042798		OFF-3-ELU-032798	
Sample Location	OFF-1		OFF-1		OFF-2		OFF-2		OFF-3	
Date Sampled	3/27/98		4/27/98		3/27/98		4/27/98		3/27/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Polyaromatic Hydrocarbons (PAH) (NG/L)										
1-Methylnaphthalene		NA	15 9	UJ		NA	15.9	U		NA
1-Methylphenanthrene		NA	4 5	U		NA	4.5	U		NA
2,3,5-Trimethylnaphthalene		NA	5 7	U		NA	5.7	U		NA
2,6-Dimethylnaphthalene		NA	5 7	UJ		NA	5 7	U		NA
2-Methylnaphthalene		NA	8 7	UJ		NA	8 7	U		NA
Acenaphthene		NA	8.1	U		NA	5.8	J		NA
Acenaphthylene		NA	8 3	U		NA	1.1	J		NA
Anthracene		NA	1.9	U		NA	3			NA
Benzo(a)anthracene		NA	8.9	U		NA	19 5			NA
Benzo(a)pyrene		NA	6.8	J		NA	29	J		NA
benzo(b,j,k)fluoranthene		NA	55.3	J		NA	92.3	J		NA
benzo(e)pyrene		NA	24.6	J		NA	42	J		NA
Benzo(g,h,i)Perylene		NA	4.6	UJ		NA	34	J		NA
Biphenyl		NA	10 6	UJ		NA	14.6	J		NA
chrysene/triphenylene		NA	10.7	U		NA	18.5	U		NA
Dibenzo(a,h)Anthracene		NA	9.5	UJ		NA	23.3	J		NA
Fluoranthene		NA	45 6			NA	74			NA
Fluorene		NA	4 2	U		NA	3 2	J		NA
Indeno(1,2,3-cd)pyrene		NA	7 4	UJ		NA	29.2	J		NA
Naphthalene		NA	6 6	UJ		NA	14 9	U		NA
Perylene		NA	6 1	UJ		NA	7 5	J		NA
Phenanthrene		NA	9 5	U		NA	26.2			NA
Pyrene		NA	41.9			NA	81.5			NA
Sum PAHs (6 High Molecular Weight)		NA	113			NA	246			NA
Sum PAHs (7 Low Molecular Weight)		NA	10			NA	54			NA
Sum PAHs (NOAA Status &Trends)		NA	202			NA	520			NA
PCB Congeners/Organochlorine Pesticides (NG/L)										
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane		NA	0 3	J		NA	2 2	J		NA
2,4'-DDE		NA	0.1	J		NA	0.7	J		NA
2,4'-DDT		NA	1.2	J		NA	0 2	J		NA
4,4'-DDD		NA	0 8	J		NA	0.7	J		NA
4,4'-DDE		NA	0 4	J		NA	1.1	J		NA
4,4'-DDT		NA	3.7	U		NA	1.9	J		NA
Aldrin		NA	3.3	U		NA	3.3	U		NA
alpha-Chlordane		NA	0.3	J		NA	0.5	J		NA
Heptachlor		NA	0.2	J		NA	0 3	J		NA
Heptachlor Epoxide		NA	0.5	J		NA	0.8	J		NA

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-ELU-032798		OFF-1-ELU-042798		OFF-2-ELU-032798		OFF-2-ELU-042798		OFF-3-ELU-032798	
Sample Location	OFF-1		OFF-1		OFF-2		OFF-2		OFF-3	
Date Sampled	3/27/98		4/27/98		3/27/98		4/27/98		3/27/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Hexachlorobenzene		NA	3.8	U		NA	3 8	U		NA
Mirex		NA	2 1	U		NA	2.1	U		NA
PCB 101/90		NA	1.2	J		NA	1 9			NA
PCB 105		NA	0.3	J		NA	1	U		NA
PCB 118		NA	0.2	J		NA	1	U		NA
PCB 126		NA	1 3	U		NA	1 3	U		NA
PCB 128		NA	1.9			NA	2 1			NA
PCB 138/163/164		NA	1.9	U		NA	2 2			NA
PCB 153		NA	1 2	U		NA	4 3			NA
PCB 170		NA	1 3			NA	3 4			NA
PCB 18		NA	2 9	U		NA	1 1	J		NA
PCB 180		NA	2 5			NA	1	U		NA
PCB 187/182/159		NA	1 5	U		NA	2.2	U		NA
PCB 188		NA	0 4	J		NA	1.1	J		NA
PCB 195		NA	2 8			NA	3.2			NA
PCB 200		NA	0 6	U		NA	2.2			NA
PCB 206		NA	1 4	U		NA	2.9			NA
PCB 209		NA	0.7	J		NA	4.7			NA
PCB 28/50		NA	0 5	J		NA	0 3	J		NA
PCB 29		NA	2 3	U		NA	2 3	U		NA
PCB 44		NA	0 4	J		NA	0 5	J		NA
PCB 50		NA	2 9	U		NA	2.9	U		NA
PCB 52		NA	0 7	J		NA	1 5	J		NA
PCB 66/95		NA	1 4	U		NA	1.4	U		NA
PCB 8		NA	1 3	J		NA	0.9	J		NA
PCB 87		NA	0.1	J		NA	0 6	J		NA
Sum of PCB Congeners		NA	14 3			NA	32.9			NA
Sum of PCB Congeners X 2		NA	28 6			NA	65.8			NA
trans-Nonachlor		NA	0.1	J		NA	0 4	J		NA
Metals (UG/L)										
Aluminum	48 1			NA	73 2			NA	20 4	
Cadmium	0.2	U		NA	0 2	U		NA	0.2	
Copper	5 3			NA	6 3			NA	4.7	
Lead	3 4	U		NA	4 2	U		NA	3 5	U
Mercury	0 42	UJ		NA	0 42	UJ		NA	0.42	UJ
Silver	0.5	U		NA	0.5	U		NA	0 5	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-3-ELU-042798		OFF-4-ELU-032798		OFF-4-ELU-042798		OFF-5-ELU-032798		OFF-5-ELU-042798	
Sample Location	OFF-3		OFF-4		OFF-4		OFF-5		OFF-5	
Date Sampled	4/27/98		3/27/98		4/27/98		3/27/98		4/27/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Polyaromatic Hydrocarbons (PAH) (NG/L)										
1-Methylnaphthalene	15 9	UJ		NA	15 9	U		NA	14 6	J
1-Methylphenanthrene	4.6			NA	16			NA	32.2	
2,3,5-Trimethylnaphthalene	5.7	U		NA	5.7	U		NA	3 5	J
2,6-Dimethylnaphthalene	5.7	UJ		NA	2	J		NA	5.7	UJ
2-Methylnaphthalene	8.7	UJ		NA	8.7	U		NA	6.7	J
Acenaphthene	1 5	J		NA	6.4	J		NA	13 5	
Acenaphthylene	3	J		NA	20			NA	28	
Anthracene	4.8			NA	17.3			NA	53.7	
Benzo(a)anthracene	28	J		NA	83 3	J		NA	184	J
Benzo(a)pyrene	26 2			NA	79 7			NA	250	
benzo(b,j,k)fluoranthene	107			NA	214			NA	717	
benzo(e)pyrene	50 2	J		NA	85 3	J		NA	280	J
Benzo(g,h,i)Perylene	25.1	J		NA	99.1	J		NA	249	J
Biphenyl	10 6	UJ		NA	4	J		NA	5.3	J
chrysene/triphenylene	30 5	UJ		NA	83.9	J		NA	163	J
Dibenzo(a,h)Anthracene	9 5	U		NA	37 5			NA	119	
Fluoranthene	154			NA	289			NA	659	
Fluorene	4.2	U		NA	6.3			NA	22 2	
Indeno(1,2,3-cd)pyrene	26			NA	80.4			NA	222	
Naphthalene	6.6	U		NA	21 8	U		NA	22.4	UJ
Perylene	7.5			NA	24 2			NA	73 2	
Phenanthrene	31 3			NA	153			NA	206	
Pyrene	122			NA	237			NA	565	
Sum PAHs (6 High Molecular Weight)	360			NA	810			NA	1940	
Sum PAHs (7 Low Molecular Weight)	45			NA	225			NA	352	
Sum PAHs (NOAA Status &Trends)	626			NA	1560			NA	3890	
PCB Congeners/Organochlorine Pesticides (NG/L)										
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0 3	J		NA	0.1	J		NA	0 3	J
2,4'-DDE	1 8	U		NA	1 8	U		NA	0 4	J
2,4'-DDT	0 1	J		NA	0.2	J		NA	0.2	J
4,4'-DDD	2 4	U		NA	2 4	U		NA	0.6	J
4,4'-DDE	0 2	J		NA	0 4	J		NA	0 6	J
4,4'-DDT	3 7	U		NA	3 7	U		NA	2.8	J
Aldrin	3.3	U		NA	3 3	U		NA	3.3	U
alpha-Chlordane	0.1	J		NA	0 2	J		NA	0.7	J
Heptachlor	1.2	U		NA	0.2	J		NA	1 1	J
Heptachlor Epoxide	2 9	U		NA	0 3	J		NA	0.5	J

U - Not detected, UJ - DL approximate; J - Quantitation approximate;
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
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Sample Number	OFF-3-ELU-042798		OFF-4-ELU-032798		OFF-4-ELU-042798		OFF-5-ELU-032798		OFF-5-ELU-042798	
Sample Location	OFF-3		OFF-4		OFF-4		OFF-5		OFF-5	
Date Sampled	4/27/98		3/27/98		4/27/98		3/27/98		4/27/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Hexachlorobenzene	3.8	U		NA	3.8	U		NA	3 8	U
Mirex	2.1	U		NA	2 1	U		NA	2 1	U
PCB 101/90	0.7	J		NA	0.9	J		NA	1.4	J
PCB 105	1	U		NA	0.1	J		NA	0.3	J
PCB 118	1	U		NA	0 2	J		NA	0.5	J
PCB 126	1.3	U		NA	1 3	U		NA	1 2	J
PCB 128	1 1	U		NA	1.1	U		NA	1 1	U
PCB 138/163/164	0.9	U		NA	0 9	UJ		NA	3 7	
PCB 153	1.2	U		NA	2 5			NA	1 2	U
PCB 170	1.2	U		NA	1 2	U		NA	1 2	U
PCB 18	2.9	U		NA	2 9	U		NA	2 9	U
PCB 180	0 7	U		NA	0 7	U		NA	0 8	U
PCB 187/182/159	0 9	U		NA	0 9	U		NA	0 9	UJ
PCB 188	0 1	J		NA	0 1	J		NA	0 1	J
PCB 195	1 1	U		NA	0 1	J		NA	1.1	U
PCB 200	0.7	J		NA	0.6	U		NA	0.6	U
PCB 206	2.1			NA	1.9	U		NA	2.5	
PCB 209	1.1	U		NA	0 4	J		NA	0 7	J
PCB 28/50	0 1	J		NA	0 3	J		NA	0 5	J
PCB 29	2 3	U		NA	2.3	U		NA	2 3	U
PCB 44	0.1	J		NA	0.3	J		NA	0 7	J
PCB 50	2 9	U		NA	2 9	U		NA	2.9	UJ
PCB 52	0 4	J		NA	0 9	J		NA	1	J
PCB 66/95	1 4	U		NA	1 4	U		NA	1.4	U
PCB 8	2 4	U		NA	2 4	U		NA	1 1	J
PCB 87	0.1	J		NA	0 1	J		NA	0 3	J
Sum of PCB Congeners	4 3			NA	5 9			NA	14	
Sum of PCB Congeners X 2	8 6			NA	11.8			NA	28	
trans-Nonachlor	0 1	J		NA	0 1	J		NA	0 2	J
Metals (UG/L)										
Aluminum		NA	55 5			NA	156 1			NA
Cadmium		NA	0 3			NA	0 2	U		NA
Copper		NA	37.3			NA	3 7			NA
Lead		NA	7 2	U		NA	6.9	U		NA
Mercury		NA	0.42	UJ		NA	0 42	UJ		NA
Silver		NA	0.5	U		NA	0.5	U		NA

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ANALYTICAL RESULTS
LD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-6-ELU-032798		OFF-6-ELU-042798		OFF-7-ELU-032798		OFF-7-ELU-042798		OFF-8-ELU-040798	
Sample Location	OFF-6		OFF-6		OFF-7		OFF-7		OFF-8	
Date Sampled	3/27/98		4/27/98		3/27/98		4/27/98		4/7/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Polyaromatic Hydrocarbons (PAH) (NG/L)										
1-Methylnaphthalene		NA	15 9	UJ		NA	9.7	J	7.7	J
1-Methylphenanthrene		NA	4 5	U		NA	4.5	U	2	J
2,3,5-Trimethylnaphthalene		NA	5.7	U		NA	5.7	U	0 4	J
2,6-Dimethylnaphthalene		NA	5 7	UJ		NA	5.7	U	5.7	U
2-Methylnaphthalene		NA	8 7	UJ		NA	8.7	U	8 4	J
Acenaphthene		NA	6.8	J		NA	5 2	J	2 1	J
Acenaphthylene		NA	8 3	U		NA	2	J	2.9	J
Anthracene		NA	8 3			NA	1.2	J	5 1	
Benzo(a)anthracene		NA	29.1	J		NA	15.7		8 3	UJ
Benzo(a)pyrene		NA	29 4	J		NA	11.9	J	12 1	
benzo(b,j,k)fluoranthene		NA	161	J		NA	61.5	J	68 9	
benzo(e)pyrene		NA	80 6	J		NA	25	J	39	
Benzo(g,h,i)Perylene		NA	69.2	J		NA	21.4	J	38	
Biphenyl		NA	10.6	UJ		NA	3 5	J	7.8	J
chrysene/triphenylene		NA	21.1	UJ		NA	13.7	U	10.7	U
Dibenzo(a,h)Anthracene		NA	9.5	UJ		NA	9 5	UJ	9 3	J
Fluoranthene		NA	134			NA	54 6		20 5	
Fluorene		NA	5.9			NA	5.2		2 8	J
Indeno(1,2,3-cd)pyrene		NA	49 5	J		NA	21.8	J	24 5	
Naphthalene		NA	14.1	UJ		NA	8 4	U	26 6	
Perylene		NA	6.1	UJ		NA	1.4	J	5.4	J
Phenanthrene		NA	45.5			NA	23 2		14 3	U
Pyrene		NA	141			NA	98 3		25 3	
Sum PAHs (6 High Molecular Weight)		NA	355			NA	194		79	
Sum PAHs (7 Low Molecular Weight)		NA	81			NA	45		62	
Sum PAHs (NOAA Status &Trends)		NA	796			NA	384		335	
PCB Congeners/Organochlorine Pesticides (NG/L)										
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane		NA	0 3	J		NA	0 2	J	0 1	J
2,4'-DDE		NA	0 1	J		NA	0.2	J	0.1	J
2,4'-DDT		NA	0 3	J		NA	0.4	J	0.3	J
4,4'-DDD		NA	0.8	J		NA	0.7	J	0 6	J
4,4'-DDE		NA	0 6	J		NA	0 5	J	0.4	J
4,4'-DDT		NA	2 1	J		NA	3 7	U	1.7	J
Aldrin		NA	3.3	U		NA	3.3	U	3.3	U
alpha-Chlordane		NA	0 3	J		NA	0 6	J	0.3	J
Heptachlor		NA	1.2	U		NA	1.2	U	1.2	U
Heptachlor Epoxide		NA	1.5	J		NA	0 3	J	2.9	U

U - Not detected; UJ - DL approximate; J - Quantitation approximate;
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-6-ELU-032798		OFF-6-ELU-042798		OFF-7-ELU-032798		OFF-7-ELU-042798		OFF-8-ELU-040798	
Sample Location	OFF-6		OFF-6		OFF-7		OFF-7		OFF-8	
Date Sampled	3/27/98		4/27/98		3/27/98		4/27/98		4/7/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Hexachlorobenzene		NA	3 8	U		NA	3 8	U	3.8	U
Mirex		NA	2.1	UJ		NA	2.1	UJ	2.1	U
PCB 101/90		NA	2			NA	1.4	J	1.2	J
PCB 105		NA	0.4	J		NA	0.4	J	0 5	J
PCB 118		NA	1	J		NA	0 5	J	0.6	J
PCB 126		NA	0 6	J		NA	1.3	U	0 5	J
PCB 128		NA	1 1	U		NA	1.1	U	1.1	U
PCB 138/163/164		NA	1 3	UJ		NA	0 9	U	1.7	U
PCB 153		NA	1 2	U		NA	1.2	U	1 2	U
PCB 170		NA	1 6	J		NA	1.2	U	1 2	U
PCB 18		NA	2.3	J		NA	2.9	U	2 9	U
PCB 180		NA	0 7	UJ		NA	0 7	U	2.3	
PCB 187/182/159		NA	0 9	U		NA	0.9	U	0 9	U
PCB 188		NA	0.1	J		NA	0.1	J	0 3	J
PCB 195		NA	1.8	J		NA	1.1	UJ	2.7	
PCB 200		NA	0.6	UJ		NA	0 6	U	0 6	J
PCB 206		NA	2 9	J		NA	3.5	J	1 5	U
PCB 209		NA	0 8	J		NA	0.8	J	1	J
PCB 28/50		NA	1.6	J		NA	0.4	J	0 5	J
PCB 29		NA	2 3	U		NA	2.3	U	2.3	U
PCB 44		NA	2 7			NA	0.7	J	0 5	J
PCB 50		NA	2.9	U		NA	2 9	U	2 9	U
PCB 52		NA	2 4	J		NA	0 8	J	0.7	J
PCB 66/95		NA	2.1	J		NA	1 4	U	1	J
PCB 8		NA	2	J		NA	0 8	J	0 6	J
PCB 87		NA	0 5	J		NA	0.4	J	0 2	J
Sum of PCB Congeners		NA	24 8			NA	9.8		13 2	
Sum of PCB Congeners X 2		NA	49 6			NA	19.6		26 4	
trans-Nonachlor		NA	0.2	J		NA	0.1	J	1 7	U
Metals (UG/L)										
Aluminum	126 2			NA	66 7			NA	61.2	
Cadmium	0 2	U		NA	0 2			NA	0.2	U
Copper	2 5	U		NA	2 5	U		NA	2.5	U
Lead	5 3	U		NA	5 5	U		NA	6.3	U
Mercury	0 42	UJ		NA	0 42	UJ		NA	0 42	UJ
Silver	0 5	U		NA	0.5	U		NA	0 5	U

U - Not detected; UJ - DL approximate; J - Quantitation approximate,
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
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Sample Number	OFF-9-ELU-040798		OFF-10-ELU-040398		OFF-11-ELU-040398		OFF-12-ELU-040398		OFF-13-ELU-040398	
Sample Location	OFF-9		OFF-10		OFF-11		OFF-12		OFF-13	
Date Sampled	4/7/98		4/3/98		4/3/98		4/3/98		4/3/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Polyaromatic Hydrocarbons (PAH) (NG/L)										
1-Methylnaphthalene	8 2	J	13.2	J	16.6		16 2		13.1	J
1-Methylphenanthrene	2	J	2.6	J	2	J	4.5	U	4.5	U
2,3,5-Trimethylnaphthalene	5.7	U	0 8	J	0.4	J	2.2	J	1.3	J
2,6-Dimethylnaphthalene	5 7	UJ	9.3		14.4		19.9		12.5	J
2-Methylnaphthalene	13.2	J	7 2	J	8.2	J	23.4		14 2	J
Acenaphthene	3.5	J	3 3	J	5	J	29		5 4	J
Acenaphthylene	2 1	J	11		9.4		8 3	J	14 8	
Anthracene	4 6		11 7		10.8		42		21.2	
Benzo(a)anthracene	7 3	UJ	14.4		11.7		20.1		39 7	
Benzo(a)pyrene	35 2	J	21 2		23 3		57.1	J	41.4	
benzo(b,j,k)fluoranthene	109	J	66 5		61.1		191	J	141	
benzo(e)pyrene	42 8	J	35 2		34 5		115	J	90 2	
Benzo(g,h,i)Perylene	68.2	J	45.1	U	40 7	U	119	UJ	97 7	U
Biphenyl	11 2	J	10 6	U	10.6	U	10 6	U	10 6	UJ
chrysene/triphenylene	10 7	U	20 9		17.5		27.1		17.3	J
Dibenzo(a,h)Anthracene	79	J	9 6	U	9 5	U	21 2	UJ	17.2	UJ
Fluoranthene	24.5		38 6		41.1		55.1		39 7	
Fluorene	3 8	J	5.4		6.4		23 2		6 1	
Indeno(1,2,3-cd)pyrene	62	J	28.3	U	28.1	U	78.3	UJ	52 7	UJ
Naphthalene	36.1	J	17.9		15 6		24.9		6 6	UJ
Perylene	17	J	6.1	U	6.7	U	7 8	UJ	10 6	U
Phenanthrene	14 3	U	16		13.9		42.5		16 2	
Pyrene	22.1		39.8		42.3		191		100	
Sum PAHs (6 High Molecular Weight)	174		145		145		372		255	
Sum PAHs (7 Low Molecular Weight)	78		73		69		193		77.9	
Sum PAHs (NOAA Status &Trends)	572		428		423		1120		761	
PCB Congeners/Organochlorine Pesticides (NG/L)										
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0 5	J	1 8	U	0.9	J	1 5	J	1.8	U
2,4'-DDE	0.1	J	1 8	U	1.8	U	1.8	U	1 8	U
2,4'-DDT	2.9	U	0.3	J	2.9	U	0.4	J	2.9	U
4,4'-DDD	0 7	J	2.5		1.8	J	9.2		8.8	
4,4'-DDE	0 3	J	0 7	J	0.9	J	3.4		3 2	
4,4'-DDT	1 5	J	1	J	0 8	J	1.3	J	2.7	J
Aldrin	3 3	U	0 1	J	0.3	J	3.3	U	0 1	J
alpha-Chlordane	0 3	J	1.9	U	1.9	U	0.8	J	1 3	J
Heptachlor	0.4	J	0 1	J	0.1	J	1 2	U	1.2	U
Heptachlor Epoxide	2 9	U	2 9	U	2.9	U	2 9	U	2 9	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-9-ELU-040798		OFF-10-ELU-040398		OFF-11-ELU-040398		OFF-12-ELU-040398		OFF-13-ELU-040398	
Sample Location	OFF-9		OFF-10		OFF-11		OFF-12		OFF-13	
Date Sampled	4/7/98		4/3/98		4/3/98		4/3/98		4/3/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Hexachlorobenzene	3 8	U	0 5	J	3 8	U	2.4	J	0.7	J
Mirex	2.1	U	2 1	U	2 1	U	2.1	U	2.1	U
PCB 101/90	1.2	J	1 7	U	1 7	U	3.4		2.6	U
PCB 105	0.4	J	0.9	J	0 6	J	1.2	J	1.7	J
PCB 118	0 5	J	1 1		1.2		2		2.1	
PCB 126	1.6		0 9	J	1.3	U	0 8	J	2.7	
PCB 128	1 1	U	1 2		0.9	J	0.9		2.2	
PCB 138/163/164	1.9	U	2	U	1 9	U	3.7		4 4	
PCB 153	1 8		2.1		1 7		3.8		3 9	
PCB 170	1 6		1.2	J	0.6	J	1.3		1	J
PCB 18	2 9	U	2.9	U	2 9	U	0.8	J	2.9	U
PCB 180	3.5		1 2		1 3		3		2.5	
PCB 187/182/159	1.6	U	0.8	J	0.7	J	1.8		1.9	
PCB 188	0.4	J	0 9	J	1.4	U	1	J	1	J
PCB 195	3 4		1	U	0 6	J	0.9	J	1.1	U
PCB 200	1 2		0.5	J	0 6	U	0.7	J	1.3	
PCB 206	2.1		0 4	J	0 7	J	2 4		1.3	J
PCB 209	1 1		0 9	J	0.9	J	2 2		2	
PCB 28/50	1 7	J	1 8	J	1 8	J	1 2	J	1.1	J
PCB 29	2 3	U	2 3	U	2 3	U	2.3	U	0 5	J
PCB 44	0 4	J	0.9	J	0.6	J	1	J	1.1	J
PCB 50	2 9	U	0.5	J	0 6	J	2.9	U	2.9	U
PCB 52	0 6	J	0.8	J	0 9	J	1.3	J	1.2	J
PCB 66/95	1 1	J	1.5	U	1 7	U	2 7		1.9	U
PCB 8	1.5	J	2.4	U	2.4	U	0.6	J	0.5	J
PCB 87	0 2	J	1 2	U	0.5	J	0 8	J	0 9	J
Sum of PCB Congeners	24 3		16 1		13 6		37 5		33.3	
Sum of PCB Congeners X 2	48 6		32 2		27 2		75		66 6	
trans-Nonachlor	0 3	J	0.3	J	0 3	J	1 7	U	1 6	J
Metals (UG/L)										
Aluminum	86 6		176 9		134 2		65		134	
Cadmium	0 2	U	0.2	U	0 2	U	0.2	U	0.2	U
Copper	2 5	U	2 6		2 6		5 1		13 2	
Lead	5 8	U	6 1	U	5 3	U	4.4	U	5 1	U
Mercury	0 42	UJ	0 42	UJ	0.42	UJ	0.42	UJ	0.42	UJ
Silver	0 5	U	0.5	U	0 5	U	0 5	U	0 5	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-14-ELU-040798		OFF-15-ELU-040798		OFF-16-ELU-040398		OFF-17-ELU-040398		OFF-18-ELU-040398	
Sample Location	OFF-14		OFF-15		OFF-16		OFF-17		OFF-18	
Date Sampled	4/7/98		4/7/98		4/3/98		4/3/98		4/3/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Polyaromatic Hydrocarbons (PAH) (NG/L)										
1-Methylnaphthalene	15.9	U	3.1	J	6.2	J	8.1	J	4.3	J
1-Methylphenanthrene	4.5	U	1.6	J	1.2	J	4.5	U	4.5	U
2,3,5-Trimethylnaphthalene	5.7	U	5.7	U	5.7	U	1	J	0.6	J
2,6-Dimethylnaphthalene	5.7	U	5.7	UJ	6.2		4.8	J	5.2	J
2-Methylnaphthalene	8 7	U	3.3	J	4.8	J	5.8	J	5 2	J
Acenaphthene	8.1	U	8 1	U	2.7	J	1 5	J	3 4	J
Acenaphthylene	1 9	J	3.9	J	3 2	J	3.5	J	6 7	J
Anthracene	1 9	U	4 6		3.7		6 8		13 4	
Benzo(a)anthracene	22.5		8 9	UJ	5.2	J	10 8		30.1	
Benzo(a)pyrene	27.6	J	19.2		13.3	U	39.6	J	41.2	J
benzo(b,j,k)fluoranthene	160	J	74.1		38.9	U	172	J	162	J
benzo(e)pyrene	69 9	J	40.6		22	U	99 5	J	87 2	J
Benzo(g,h,i)Perylene	85.9	J	32.5		25	U	225	J	117	UJ
Biphenyl	7 1	J	2.6	J	10.6	U	10 6	U	10 6	U
chrysene/triphenylene	31 7	U	10.7	U	5	J	8.1	J	16 2	J
Dibenzo(a,h)Anthracene	51 1	J	9.5	U	9.5	U	54 3	J	52.4	J
Fluoranthene	55.2		23 8		15 1		26.5		60	
Fluorene	4.2	U	2 2	J	2.2	J	3.1	J	4.8	
Indeno(1,2,3-cd)pyrene	64.1	J	36		15 4	U	120	J	79 4	UJ
Naphthalene	9.6	U	12.3	UJ	11 5		9.5		6 6	U
Perylene	4	J	2 6	J	6.1	U	21.5	J	15.3	UJ
Phenanthrene	22 6		14 1	U	6.7	U	9.4	U	16	
Pyrene	71.5		27 5		23.1		41.8		80 7	
Sum PAHs (6 High Molecular Weight)	260		86		66		181		281	
Sum PAHs (7 Low Molecular Weight)	34		40		35		39.6		49.5	
Sum PAHs (NOAA Status &Trends)	685		319		222		881		807	
PCB Congeners/Organochlorine Pesticides (NG/L)										
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	1 8	U	0.4	J	0.3	J	1.8	U	1.8	U
2,4'-DDE	0.2	J	0.1	J	1.8	U	1.8	U	1.8	U
2,4'-DDT	2.9	U	2.9	UJ	2.9	U	2.9	U	0 3	J
4,4'-DDD	0.8	J	0 5	J	2.99875		1.8	J	5 1	
4,4'-DDE	0 6	J	0.2	J	0 59765	J	1.2	J	2.3	J
4,4'-DDT	2	J	3.7	U	6.87		0.8	J	2.8	J
Aldrin	3.3	U	3 3	U	3.3	U	3.3	U	3 3	U
alpha-Chlordane	0 3	J	0 2	J	0 45266	J	0.6	J	0.7	J
Heptachlor	1 2	U	1 2	U	1 2	U	1.2	U	1.2	U
Heptachlor Epoxide	0.6	J	2 9	UJ	2 9	U	2.9	U	2.9	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-14-ELU-040798		OFF-15-ELU-040798		OFF-16-ELU-040398		OFF-17-ELU-040398		OFF-18-ELU-040398	
Sample Location	OFF-14		OFF-15		OFF-16		OFF-17		OFF-18	
Date Sampled	4/7/98		4/7/98		4/3/98		4/3/98		4/3/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Hexachlorobenzene	3.8	U	3.8	U	3.8	U	0.9	J	2.5	J
Mirex	2.1	U	0.5	J	2 1	U	2.1	U	2.1	U
PCB 101/90	1.8		1.5	J	1.7	U	1.7	U	2 5	U
PCB 105	0 4	J	0 1	J	1.3	J	1	U	1 2	J
PCB 118	2.1	J	1	UJ	1	U	1	U	1 8	
PCB 126	0 5	J	1.3	U	0.5	J	3 9		0.7	J
PCB 128	1 1	U	1.1	U	1.2		0 8	J	1	J
PCB 138/163/164	1 7	U	0 9	U	2 3	U	1.8	U	2 8	
PCB 153	2		1 2	U	1.4		1 1	J	2 9	
PCB 170	1.2	U	1 2	U	1.4		0.4	J	1.2	
PCB 18	2 9	U	2.9	U	2 9	U	2.9	U	2 9	U
PCB 180	0 8	U	0 7	U	1 9		1.1		2 3	
PCB 187/182/159	0 9	U	1	U	1.4		0.8	J	1.4	
PCB 188	0 5	J	0.1	J	1.4	U	1.4	U	0.7	J
PCB 195	0.2	J	0.6	J	2 4	U	1.1	U	1.9	U
PCB 200	0 6	U	0.6	U	0.6	U	0.7	J	0.5	J
PCB 206	4 7		1 3	U	1	J	1.1	J	1.6	
PCB 209	1 8		3.1		1.2	J	1.8		1 3	
PCB 28/50	0.4	J	0 1	J	1 5	U	1 5	U	1 5	U
PCB 29	2.3	U	2 3	U	2 3	U	2.3	U	2 3	U
PCB 44	0.7	J	1.6	UJ	0.6	J	1 6	U	1 6	U
PCB 50	2 9	U	2 9	U	2 9	U	2 9	U	2.9	U
PCB 52	0 9	J	0.2	J	2.7	U	2.7	U	1 2	J
PCB 66/95	1.3	J	1 4	U	1.4	U	1.4	U	2	
PCB 8	0.9	J	2 4	U	0.4	J	0.3	J	2 4	U
PCB 87	0 5	J	0 1	J	1.2	U	1.2	U	0 6	J
Sum of PCB Congeners	18.7		5 8		12.3		12		23.2	
Sum of PCB Congeners X 2	37.4		11 6		24.6		24		46.4	
trans-Nonachlor	0.1	J	0.1	J	0 89006	J	0 6	J	0 9	J
Metals (UG/L)										
Aluminum	126 1		110 4		106.1		150.8		210	
Cadmium	0 2		0.2		0 2	U	0 2	U	0.2	U
Copper	7		3 8		3.1		2.5	U	3 4	
Lead	4 4	U	4.8	U	5 6	U	5 8	U	6.2	U
Mercury	0.42	UJ	0 42	UJ	0 42	U	0 42	U	0 42	UJ
Silver	0.5	U	0 5	U	0 5	U	0.5	U	0 5	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-19-ELU-040798		OFF-20-ELU-040398		OFF-21-ELU-040398		OFF-22-ELU-032798		OFF-22-ELU-042798	
Sample Location	OFF-19		OFF-20		OFF-21		OFF-22		OFF-22	
Date Sampled	4/7/98		4/3/98		4/3/98		3/27/98		4/27/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Polyaromatic Hydrocarbons (PAH) (NG/L)										
1-Methylnaphthalene		R	2 2	J	15.9	UJ		NA	6 2	J
1-Methylphenanthrene	4.5	U	1.2	J	4 5	U		NA	4.5	U
2,3,5-Trimethylnaphthalene	5.7	U	5 7	U	5 7	U		NA	5.7	U
2,6-Dimethylnaphthalene		R	1 4	J	5.7	UJ		NA	2	J
2-Methylnaphthalene		R	1.1	J	8 7	UJ		NA	10 7	J
Acenaphthene	8.1	U	8 1	U	8 1	U		NA	6 3	J
Acenaphthylene	7.3	J	1 4	J	2.2	J		NA	3 2	J
Anthracene	5.3		1 4	J	6 4			NA	3.8	
Benzo(a)anthracene	9 3	UJ	6	J	31.5	J		NA	10 9	U
Benzo(a)pyrene	12		10.7	U	46 1	J		NA	15.1	J
benzo(b,j,k)fluoranthene	39 9	U	34 8	U	198 2	J		NA	62.8	J
benzo(e)pyrene	24 6		18.1	U	76.3	J		NA	34 4	J
Benzo(g,h,i)Perylene	28.8		39.8	U	96 4	J		NA	33 3	J
Biphenyl		R	10 6	U	10 6	UJ		NA	3 7	J
chrysene/triphenylene	10.7	U	2.9	J	16.3	UJ		NA	10 7	U
Dibenzo(a,h)Anthracene	9 5	U	36 5	U	15.6	J		NA	3 4	J
Fluoranthene	18.3		12.1		37.5			NA	40 4	
Fluorene	4 2	U	0.9	J	4.2	U		NA	10	
Indeno(1,2,3-cd)pyrene	19.7		38.5	U	66.5	J		NA	23	J
Naphthalene		R	6.6	U	6 6	UJ		NA	28	
Perylene	3.9	J	6 1	U	26.1	J		NA	4 4	J
Phenanthrene	10	U	4 5	U	11.7	U		NA	27 4	
Pyrene	24.5		13.8		79.2			NA	37 3	
Sum PAHs (6 High Molecular Weight)	69		82		236			NA	116	
Sum PAHs (7 Low Molecular Weight)	23		9.3		20			NA	90	
Sum PAHs (NOAA Status &Trends)	209		233		720			NA	376	
PCB Congeners/Organochlorine Pesticides (NG/L)										
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0 5	J	1.8	U	0 5	J		NA	1.8	U
2,4'-DDE	0 1	J	1 8	U	0 6	J		NA	0 2	J
2,4'-DDT	2 9	U	2 9	U	0.6	J		NA	0 2	J
4,4'-DDD	2 4	U	0 78523	J	2 3	J		NA	0.5	J
4,4'-DDE	0 2	J	2.4	U	1 1	J		NA	0 9	J
4,4'-DDT	2	J	3 77072		1 5	J		NA	3 7	U
Aldrin	3 3	U	3 3	U	3.3	U		NA	3 3	U
alpha-Chlordane	0 2	J	1.9	U	0 6	J		NA	0 5	J
Heptachlor	1 2	U	0.16483	J	0 2	J		NA	1.2	U
Heptachlor Epoxide	0.5	J	2 9	U	1	J		NA	0.2	J

U - Not detected, UJ - DL approximate; J - Quantitation approximate;
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-19-ELU-040798		OFF-20-ELU-040398		OFF-21-ELU-040398		OFF-22-ELU-032798		OFF-22-ELU-042798	
Sample Location	OFF-19		OFF-20		OFF-21		OFF-22		OFF-22	
Date Sampled	4/7/98		4/3/98		4/3/98		3/27/98		4/27/98	
QC Type	None		None		None		None		None	
Matrix	ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE		ELUTRIATE	
Hexachlorobenzene	3 8	U	3.8	U	3.8	U		NA	3.8	U
Mirex	2.1	U	2.1	U	2.1	U		NA	2.1	UJ
PCB 101/90	1 1	J	1.7	U	2.1			NA	1.8	
PCB 105	1	U	0.9	J	1.3	J		NA	0 2	J
PCB 118	0.1	J	1	U	1 5	J		NA	0 6	J
PCB 126	1.3	U	1 2	J	1 9			NA	1 3	UJ
PCB 128	1.1	U	0.7	J	2.1			NA	1.1	U
PCB 138/163/164	1.1	U	1.3	U	3			NA	1	UJ
PCB 153	1 2	U	1.1	J	2 4			NA	1 2	U
PCB 170	1 2	U	1.4		2 4			NA	1.2	U
PCB 18	2 9	U	2.9	U	2 9	U		NA	2 9	U
PCB 180	1 2	U	2.2		3 3			NA	0 8	UJ
PCB 187/182/159	0 9	U	0 7	J	2 9	U		NA	0 9	U
PCB 188	0 2	J	1.4	U	1	J		NA	0.1	J
PCB 195	1	J	1.1	U	2.7			NA	1.2	UJ
PCB 200	0.6	U	0.6	U	1.9			NA	0.5	J
PCB 206	1 6	U	1.1	J	2 5			NA	4 5	J
PCB 209	1.3		1 1	U	1.5			NA	0 5	J
PCB 28/50	0 4	J	1.5	U	0.6	J		NA	0 4	J
PCB 29	2 3	U	2 3	U	2.3	U		NA	2.3	U
PCB 44	0.2	J	1.6	U	1	J		NA	0 7	J
PCB 50	2 9	U	0 2	J	2.9	U		NA	2 9	U
PCB 52	0 9	J	0.5	J	1.3	J		NA	0 7	J
PCB 66/95	1 4	U	1 4	U	1.8	J		NA	1	J
PCB 8	2 4	U	0.3	J	0 98301	J		NA	1.3	J
PCB 87	0 1	J	1.2	U	0 7	J		NA	0.4	J
Sum of PCB Congeners	5 3		10.3		35 98301			NA	12.7	
Sum of PCB Congeners X 2	10 6		20 6		71 96602			NA	25 4	
trans-Nonachlor	1.7	UJ	0 43188	J	0 6	J		NA	0.2	J
Metals (UG/L)										
Aluminum	36.5		45.9		119 2		235.5			NA
Cadmium	0.2	U	0 2	U	0.2	U	0 2	U		NA
Copper	2 5	U	2.5	U	2.5	U	11 4			NA
Lead	5 6	U	4	U	5.8	U	6.3	U		NA
Mercury	0 42	UJ	0 42	U	0.42	UJ	0 42	UJ		NA
Silver	0 5	U	0 5	U	0.5	U	0 5	U		NA

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-23-ELU-040398	
Sample Location	OFF-23	
Date Sampled	4/3/98	
QC Type	None	
Matrix	ELUTRIATE	
Polyaromatic Hydrocarbons (PAH) (NG/L)		
1-Methylnaphthalene	10	J
1-Methylphenanthrene	1 7	J
2,3,5-Trimethylnaphthalene	0 8	J
2,6-Dimethylnaphthalene	6.9	J
2-Methylnaphthalene	15.2	J
Acenaphthene	7	J
Acenaphthylene	11	
Anthracene	25 2	
Benzo(a)anthracene	36.1	J
Benzo(a)pyrene	58 5	
benzo(b,j,k)fluoranthene	204	
benzo(e)pyrene	118	
Benzo(g,h,i)Perylene	109	
Biphenyl	6.9	J
chrysene/triphenylene	28.8	UJ
Dibenzo(a,h)Anthracene	36.1	
Fluoranthene	58.7	
Fluorene	7.2	
Indeno(1,2,3-cd)pyrene	64 9	
Naphthalene	24	J
Perylene	11.1	
Phenanthrene	21 5	
Pyrene	132	
Sum PAHs (6 High Molecular Weight)	351	
Sum PAHs (7 Low Molecular Weight)	111	
Sum PAHs (NOAA Status &Trends)	994	
PCB Congeners/Organochlorine Pesticides (NG/L)		
1a,2a,3b,4a,5a,6b-hexachlorocyclohexane	0.2	J
2,4'-DDE	0.2	J
2,4'-DDT	0 4	J
4,4'-DDD	3 2	
4,4'-DDE	1.9	J
4,4'-DDT	3.7	J
Aldrin	3.3	U
alpha-Chlordane	0.4	J
Heptachlor	0.1	J
Heptachlor Epoxide	0 6	J

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-23-ELU-040398	
Sample Location	OFF-23	
Date Sampled	4/3/98	
QC Type	None	
Matrix	ELUTRIATE	
Hexachlorobenzene	3.8	U
Mirex	2 1	U
PCB 101/90	1 8	
PCB 105	1.1	J
PCB 118	1.8	J
PCB 126	1.2	J
PCB 128	1.3	U
PCB 138/163/164	3.2	
PCB 153	2 9	
PCB 170	1.7	
PCB 18	2 9	U
PCB 180	2.6	
PCB 187/182/159	1.4	U
PCB 188	0 7	J
PCB 195	1 9	
PCB 200	0 9	
PCB 206	1 8	U
PCB 209	2.6	
PCB 28/50	0 9	J
PCB 29	2 3	U
PCB 44	0 5	J
PCB 50	2 9	U
PCB 52	0.8	J
PCB 66/95	1 6	J
PCB 8	0 5	J
PCB 87	0 7	J
Sum of PCB Congeners	27 4	
Sum of PCB Congeners X 2	54 8	
trans-Nonachlor	0.6	J
Metals (UG/L)		
Aluminum	171	
Cadmium	0 2	U
Copper	5 2	
Lead	6.2	U
Mercury	0 42	UJ
Silver	0.5	

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APPENDIX A-3
RESULTS FROM CHEMICAL ANALYSIS OF POREWATER ORGANICS, METALS

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-PW		OFF-2-PW		OFF-3-PW		OFF-4-PW		OFF-5-PW		OFF-6-PW	
Sample Location	OFF-1		OFF-2		OFF-3		OFF-4		OFF-5		OFF-6	
Date Sampled	4/7/98		4/7/98		3/27/98		3/27/98		3/27/98		3/27/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Polyaromatic Hydrocarbons (PAH) (UG/L)												
1-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
1-Methylphenanthrene	1	U	1	U	1	U	1	U	1	U	1	U
2,3,5-Trimethylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
2,6-Dimethylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
2-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
Acenaphthene	1	U	1	U	1	U	1	U	1	U	1	U
Acenaphthylene	1	U	1	U	1	U	1	U	1	U	1	U
Anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(a)anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(a)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
benzo(b,j,k)fluoranthene	1	U	1	U	1	U	1	U	1	U	1	U
benzo(e)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(g,h,i)Perylene	1	U	1	U	1	U	1	U	1	U	1	U
Biphenyl	1	U	1	U	1	U	1	U	1	U	1	U
chrysene/triphenylene	1	U	1	U	1	U	1	U	1	U	1	U
Dibenzo(a,h)Anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Fluoranthene	1	U	1	U	1	U	1	U	1	U	1	U
Fluorene	1	U	1	U	1	U	1	U	1	U	1	U
Indeno(1,2,3-cd)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
Naphthalene	1	U	1	U	1	U	1	U	1	U	1	U
Perylene	1	U	1	U	1	U	1	U	1	U	1	U
Phenanthrene	1	U	1	U	1	U	1	U	1	U	1	U
Pyrene	1	U	1	U	1	U	1	U	1	U	1	U
PCB Congeners/Organochlorine Pesticides (UG/L)												
2,4'-DDD	1	U	1	U	1	U	1	U	1	U	1	U
2,4'-DDE	1	U	1	U	1	U	1	U	1	U	1	U
2,4'-DDT	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDD	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDE	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDT	1	U	1	U	1	U	1	U	1	U	1	U
Aldrin	0 5	U	0.5	U	0 5	U	0 5	U	0.5	U	0.5	U
alpha-Chlordane	1 6		0.5	U	2 6		0 5	U	1		0.5	U
Dieldrin	1	U	1	U	1	U	1 6		1	U	1	U
endosulfan	0 5	U	0 5	U	0.5	U	0 5	U	0.5	U	0.5	U
Endrin	1	U	1	U	1	U	1	U	1	U	1 2	
Heptachlor	1	U	1	U	1	U	1	U	1	U	1	U
Heptachlor Epoxide	1	U	1	U	1	U	1	U	1	U	1	U

U - Not detected; UJ - DL approximate; J - Quantitation approximate,
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-PW		OFF-2-PW		OFF-3-PW		OFF-4-PW		OFF-5-PW		OFF-6-PW	
Sample Location	OFF-1		OFF-2		OFF-3		OFF-4		OFF-5		OFF-6	
Date Sampled	4/7/98		4/7/98		3/27/98		3/27/98		3/27/98		3/27/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Hexachlorobenzene	1	U	1	U	1	U	1	U	1	U	1	U
lindane	1	U	1	U	1	U	1	U	1	U	1	U
Mirex	0 5	U	0.5	U	0 5	U	0.5	U	0 5	U	0.5	U
PCB 101	1	U	1	U	1	U	1	U	2.1		1	U
PCB 105	2 3		1	U	1	U	1	U	1	U	1	U
PCB 118	1	U	1	U	1	U	5 7		1	U	1	U
PCB 126	1	U	2.4		2 9		1	U	1	U	2 1	
PCB 128	1	U	1	U	1	U	1	U	1	U	1	U
PCB 138	1	U	1	U	1	U	1	U	1	U	1	U
PCB 153	1	U	1.5		1	U	1	U	1	U	1	U
PCB 170	1	U	1	U	3.6		1	U	1	U	1	U
PCB 18	0 5	U	0.5	U	0.5	U	3.2		0.5	U	0.5	U
PCB 180	1	U	1	U	1	U	1	U	1	U	1	U
PCB 187	2 5		1	U	1	U	1	U	1	U	1	U
PCB 195	1	U	1	U	1	U	1	U	1	U	1.1	
PCB 206	1	U	1	U	1	U	1	U	1	U	1	U
PCB 209	1	U	1	U	1	U	1	U	1	U	1	U
PCB 28	1	U	1	U	1	U	1	U	1	U	1	U
PCB 44	1	U	1	U	1	U	1	U	1	U	1	U
PCB 52	0.5	U	0 5	U	1		0 5	U	0.5	U	0.5	U
PCB 66	1	U	1	U	1	U	1	U	1	U	1	U
PCB 77	1	U	3.7		1	U	1	U	1	U	1	U
PCB 8	1	U	1	U	1	U	1	U	1	U	1	U
PCB 99	0 5	U	0.5	U	0 5	U	0.5	U	0.5	U	0.5	U
Toxaphene	500	U	500	U	500	U	500	U	500	U	500	U
trans-Nonachlor	0 5	U	0.5	U	0 5	U	0 5	U	0 5	U	0 5	U
Metals (UG/KG)												
Aluminum	55.9		67 4		61.2		54 9		63.8		43 2	
Arsenic	1.1		5 5		3 4		2.8		1		2.9	
Barium	20	U	20	U	20	U	20	U	20	U	20	U
Cadmium	0.1	J	0 5		0 8		0.9		0 5		0 6	
Chromium	28.6		19 2		18 6		22 4		21.8		15 4	
Copper	26		21		23		28		84		19	
Iron	610		310		120		200		170		220	
Lead	18.22		16.43		14 62		18 66		18 24		15.83	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	45		43		45		68		64		59	
Nickel	0.5	U	0.7		2		1.3		1.1		1.5	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-PW		OFF-2-PW		OFF-3-PW		OFF-4-PW		OFF-5-PW		OFF-6-PW	
Sample Location	OFF-1		OFF-2		OFF-3		OFF-4		OFF-5		OFF-6	
Date Sampled	4/7/98		4/7/98		3/27/98		3/27/98		3/27/98		3/27/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Silver	1 6		1.8		1 4		1.7		1.3		0.1	U
Zinc	170		140		100		130		260		420	

U - Not detected, UJ - DL approximate; J - Quantitation approximate;
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-7-PW		OFF-8-PW		OFF-9-PW		OFF-10-PW		OFF-11-PW		OFF-12-PW	
Sample Location	OFF-7		OFF-8		OFF-9		OFF-10		OFF-11		OFF-12	
Date Sampled	3/27/98		4/14/98		4/14/98		4/7/98		4/7/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Polyaromatic Hydrocarbons (PAH) (UG/L)												
1-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
1-Methylphenanthrene	1	U	1	U	1	U	1	U	1	U	1	U
2,3,5-Trimethylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
2,6-Dimethylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
2-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
Acenaphthene	1	U	1	U	1	U	1	U	1	U	1	U
Acenaphthylene	1	U	1	U	1	U	1	U	1	U	1	U
Anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(a)anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(a)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
benzo(b,j,k)fluoranthene	1	U	1	U	1	U	1	U	1	U	1	U
benzo(e)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(g,h,i)Perylene	1	U	1	U	1	U	1	U	1	U	1	U
Biphenyl	1	U	1	U	1	U	1	U	1	U	1	U
chrysene/triphenylene	1	U	1	U	1	U	1	U	1	U	1	U
Dibenzo(a,h)Anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Fluoranthene	1	U	1	U	1	U	1	U	1	U	1	U
Fluorene	1	U	1	U	1	U	1	U	1	U	1	U
Indeno(1,2,3-cd)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
Naphthalene	1	U	1	U	1	U	1	U	1	U	1	U
Perylene	1	U	1	U	1	U	1	U	1	U	1	U
Phenanthrene	1	U	1	U	1	U	1	U	1	U	1	U
Pyrene	1	U	1	U	1	U	1	U	1	U	1	U
PCB Congeners/Organochlorine Pesticides (UG/L)												
2,4'-DDD	1	U	1	U	1	U	1	U	1	U	1	U
2,4'-DDE	1	U	1	U	1	U	1	U	1	U	1	U
2,4'-DDT	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDD	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDE	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDT	1	U	1	U	1	U	1	U	1	U	1	U
Aldrin	0.5	U	1.5		0.5	U	0.5	U	0.5	U	0.5	U
alpha-Chlordane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Dieldrin	1	U	1	U	1	U	2.3		1	U	1.3	
endosulfan	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Endrin	1	U	1	U	1	U	1	U	1	U	1	U
Heptachlor	1	U	1	U	1	U	1	U	1	U	1	U
Heptachlor Epoxide	1	U	1	U	1	U	1	U	1	U	1	U

U - Not detected, UJ - DL approximate; J - Quantitation approximate;
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-7-PW		OFF-8-PW		OFF-9-PW		OFF-10-PW		OFF-11-PW		OFF-12-PW	
Sample Location	OFF-7		OFF-8		OFF-9		OFF-10		OFF-11		OFF-12	
Date Sampled	3/27/98		4/14/98		4/14/98		4/7/98		4/7/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Hexachlorobenzene	1	U	1	U	1	U	1	U	1	U	1	U
lindane	1	U	1	U	1	U	1	U	1	U	1	U
Mirex	0.5	U	0.5	U	0.5	U	0 5	U	0 5	U	0.5	U
PCB 101	1	U	1	U	1	U	2.1		1	U	1	U
PCB 105	1	U	1	U	1	U	1	U	1.4		1	U
PCB 118	1	U	1	U	1	U	1	U	1	U	1	U
PCB 126	1	U	2.4		1	U	1	U	1	U	1.4	
PCB 128	1	U	1	U	2.1		1	U	1	U	1	U
PCB 138	1 3		1	U	1	U	1	U	1	U	1	U
PCB 153	1	U	1	U	1	U	1	U	1	U	1	U
PCB 170	1	U	1	U	1	U	1	U	1	U	1	U
PCB 18	0.5	U	0 5	U	0.5	U	0 5	U	0 5	U	0.5	U
PCB 180	1	U	1	U	1	U	1 2		1	U	1	U
PCB 187	1	U	1	U	1	U	1	U	1	U	1	U
PCB 195	1 7		1	U	2 7		3.4		1	U	3 5	
PCB 206	1	U	1	U	1	U	1	U	1	U	1	U
PCB 209	1	U	1	U	1	U	1	U	1	U	3.7	
PCB 28	1	U	1.4		1	U	1	U	2.2		2.7	
PCB 44	2 5		1	U	1.1		1	U	1	U	1	U
PCB 52	0 5	U	0 5	U	0.5	U	0.5	U	0.5	U	0.5	U
PCB 66	1	U	1	U	1	U	1	U	1	U	1	U
PCB 77	1	U	1.7		1	U	1	U	2.5		1	U
PCB 8	1	U	1	U	1	U	1	U	1	U	1	U
PCB 99	0 5	U	0.5	U	0 5	U	0.5	U	0.5	U	0 5	U
Toxaphene	500	U	500	U	500	U	500	U	500	U	500	U
trans-Nonachlor	0.5	U	0 5	U	0 5	U	0 5	U	0.5	U	0.5	U
Metals (UG/KG)												
Aluminum	58.7		51 2		69 3		48 1		53.8		54 2	
Arsenic	3 2		2 4		2 1		2 6		2		2 6	
Barium	20	U	20	U	20	U	20	U	20	U	20	U
Cadmium	0 5		0.7		0 8		0 4		0.4		0.7	
Chromium	19		20.1		23 9		22 3		20 8		14 7	
Copper	15		19		31		30		31		17	
Iron	120		280		410		340		470		210	
Lead	16 41		15.8		12 4		15 71		13 24		21.4	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	44		40		47		68		61		38	
Nickel	0.5	U	2.4		1 9		3.1		0 9		1.3	

U - Not detected, UJ - DL approximate; J - Quantitation approximate,
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-7-PW		OFF-8-PW		OFF-9-PW		OFF-10-PW		OFF-11-PW		OFF-12-PW	
Sample Location	OFF-7		OFF-8		OFF-9		OFF-10		OFF-11		OFF-12	
Date Sampled	3/27/98		4/14/98		4/14/98		4/7/98		4/7/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Silver	1.7		1.5		1.5		1.6		1.4		1.3	
Zinc	170		180		200		270		260		140	

U - Not detected, UJ - DL approximate; J - Quantitation approximate;
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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-13-PW		OFF-14-PW		OFF-15-PW		OFF-16-PW		OFF-17-PW		OFF-18-PW	
Sample Location	OFF-13		OFF-14		OFF-15		OFF-16		OFF-17		OFF-18	
Date Sampled	4/7/98		4/14/98		4/14/98		4/7/98		4/7/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Polyaromatic Hydrocarbons (PAH) (UG/L)												
1-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
1-Methylphenanthrene	1	U	1	U	1	U	1	U	1	U	1	U
2,3,5-Trimethylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
2,6-Dimethylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
2-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U	1	U
Acenaphthene	1	U	1	U	1	U	1	U	1	U	1	U
Acenaphthylene	1	U	1	U	1	U	1	U	1	U	1	U
Anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(a)anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(a)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
benzo(b,j,k)fluoranthene	1	U	1	U	1	U	1	U	1	U	1	U
benzo(e)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
Benzo(g,h,i)Perylene	1	U	1	U	1	U	1	U	1	U	1	U
Biphenyl	1	U	1	U	1	U	1	U	1	U	1	U
chrysene/triphenylene	1	U	1	U	1	U	1	U	1	U	1	U
Dibenzo(a,h)Anthracene	1	U	1	U	1	U	1	U	1	U	1	U
Fluoranthene	1	U	1	U	1	U	1	U	1	U	1	U
Fluorene	1	U	1	U	1	U	1	U	1	U	1	U
Indeno(1,2,3-cd)pyrene	1	U	1	U	1	U	1	U	1	U	1	U
Naphthalene	1	U	1	U	1	U	1	U	1	U	1	U
Perylene	1	U	1	U	1	U	1	U	1	U	1	U
Phenanthrene	1	U	1	U	1	U	1	U	1	U	1	U
Pyrene	1	U	1	U	1	U	1	U	1	U	1	U
PCB Congeners/Organochlorine Pesticides (UG/L)												
2,4'-DDD	1	U	1	U	1	U	1	U	1	U	1	U
2,4'-DDE	1	U	1	U	1	U	1	U	1	U	1	U
2,4'-DDT	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDD	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDE	1	U	1	U	1	U	1	U	1	U	1	U
4,4'-DDT	1	U	1	U	1	U	1	U	1	U	1	U
Aldrin	0 5	U	0 5	U	0.5	U	0.5	U	0.5	U	0 5	U
alpha-Chlordane	0.5	U	0 5	U	0.5	U	0.5	U	0 5	U	0.5	U
Dieldrin	2 3		1.3		1	U	1	U	1	U	1	U
endosulfan	0 5	U	0 5	U	0.5	U	0 5	U	0 5	U	0.5	U
Endrin	1	U	1	U	1.1		1	U	1	U	1	U
Heptachlor	1	U	1	U	1	U	1	U	1 3		1	U
Heptachlor Epoxide	1	U	1	U	1	U	1	U	1	U	1	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-13-PW		OFF-14-PW		OFF-15-PW		OFF-16-PW		OFF-17-PW		OFF-18-PW	
Sample Location	OFF-13		OFF-14		OFF-15		OFF-16		OFF-17		OFF-18	
Date Sampled	4/7/98		4/14/98		4/14/98		4/7/98		4/7/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Hexachlorobenzene	1	U	1	U	1	U	1	U	1	U	1 8	
lindane	1	U	1	U	1	U	1	U	1	U	1	U
Mirex	0 5	U	0.5	U	0.5	U	0.5	U	0 5	U	0 5	U
PCB 101	1	U	1	U	1	U	1	U	1	U	1	U
PCB 105	1	U	1	U	2.6		1	U	1	U	2.1	
PCB 118	1	U	1	U	1	U	4 9		1	U	1	U
PCB 126	1	U	1	U	1	U	1	U	1	U	1	U
PCB 128	1	U	2.8		1	U	1	U	1	U	1	U
PCB 138	1	U	1	U	1	U	1	U	1	U	1	U
PCB 153	1	U	1	U	1	U	1	U	1	U	1	U
PCB 170	2.3		1	U	1	U	2.1		1	U	1	U
PCB 18	0 5	U	0 5	U	0 5	U	0.5	U	0.5	U	0.5	U
PCB 180	1	U	1	U	2 4		1	U	1	U	1.1	
PCB 187	1	U	1	U	1	U	1	U	1	U	1	U
PCB 195	1	U	1	U	1	U	1	U	2 4		1	U
PCB 206	1	U	1	U	1	U	1	U	1	U	1	U
PCB 209	1	U	1.7		1	U	1	U	1	U	1	U
PCB 28	1	U	1	U	1	U	1	U	1	U	1	U
PCB 44	1	U	1	U	1	U	1.9		1	U	1	U
PCB 52	0 5	U	2 3		0 5	U	0.5	U	0.5	U	0 5	U
PCB 66	1	U	1	U	1	U	1	U	1	U	1	U
PCB 77	1	U	1	U	1	U	1	U	1.4		1	U
PCB 8	1	U	1	U	2.1		1	U	1	U	2 4	
PCB 99	0.5	U	0 5	U	0 5	U	0 5	U	0 5	U	0 5	U
Toxaphene	500	U	500	U	500	U	500	U	500	U	500	U
trans-Nonachlor	0 5	U	0.5	U	0.5	U	0 5	U	0.5	U	0 5	U
Metals (UG/KG)												
Aluminum	47 3		52.7		59 6		49 2		58 7		63.4	
Arsenic	2 7		2 8		3 4		2.9		3 9		1.5	
Barium	20	U	20	U	20	U	20	U	20	U	20	U
Cadmium	0.8		0 7		0.6		0 9		0 6		0.7	
Chromium	19 6		18 6		21.3		23.8		17 3		19.5	
Copper	21		18		26		19		24		28	
Iron	230		160		230		340		180		270	
Lead	18.5		19 9		14.3		12		18.1		12 5	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	41		69		32		49		36		38	
Nickel	1.7		2 1		2.5		1.5		1		1.9	

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ANALYTICAL RESULTS
LD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-13-PW		OFF-14-PW		OFF-15-PW		OFF-16-PW		OFF-17-PW		OFF-18-PW	
Sample Location	OFF-13		OFF-14		OFF-15		OFF-16		OFF-17		OFF-18	
Date Sampled	4/7/98		4/14/98		4/14/98		4/7/98		4/7/98		4/7/98	
QC Type	None		None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Silver	1.9		1.4		1.2		1.6		1.2		1.8	
Zinc	160		110		190		210		240		180	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-19-PW		OFF-20-PW		OFF-21-PW		OFF-22-PW		OFF-23-PW	
Sample Location	OFF-19		OFF-20		OFF-21		OFF-22		OFF-23	
Date Sampled	4/14/98		4/7/98		4/7/98		3/27/98		4/7/98	
QC Type	None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Polyaromatic Hydrocarbons (PAH) (UG/L)										
1-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U
1-Methylphenanthrene	1	U	1	U	1	U	1	U	1	U
2,3,5-Trimethylnaphthalene	1	U	1	U	1	U	1	U	1	U
2,6-Dimethylnaphthalene	1	U	1	U	1	U	1	U	1	U
2-Methylnaphthalene	1	U	1	U	1	U	1	U	1	U
Acenaphthene	1	U	1	U	1	U	1	U	1	U
Acenaphthylene	1	U	1	U	1	U	1	U	1	U
Anthracene	1	U	1	U	1	U	1	U	1	U
Benzo(a)anthracene	1	U	1	U	1	U	1	U	1	U
Benzo(a)pyrene	1	U	1	U	1	U	1	U	1	U
benzo(b,j,k)fluoranthene	1	U	1	U	1	U	1	U	1	U
benzo(e)pyrene	1	U	1	U	1	U	1	U	1	U
Benzo(g,h,i)Perylene	1	U	1	U	1	U	1	U	1	U
Biphenyl	1	U	1	U	1	U	1	U	1	U
chrysene/triphenylene	1	U	1	U	1	U	1	U	1	U
Dibenzo(a,h)Anthracene	1	U	1	U	1	U	1	U	1	U
Fluoranthene	1	U	1	U	1	U	1	U	1	U
Fluorene	1	U	1	U	1	U	1	U	1	U
Indeno(1,2,3-cd)pyrene	1	U	1	U	1	U	1	U	1	U
Naphthalene	1	U	1	U	1	U	1	U	1	U
Perylene	1	U	1	U	1	U	1	U	1	U
Phenanthrene	1	U	1	U	1	U	1	U	1	U
Pyrene	1	U	1	U	1	U	1	U	1	U
PCB Congeners/Organochlorine Pesticides (UG/L)										
2,4'-DDD	1	U	1	U	1	U	1	U	1	U
2,4'-DDE	1	U	1	U	1	U	1	U	1	U
2,4'-DDT	1	U	1	U	1	U	1	U	1	U
4,4'-DDD	1	U	1	U	1	U	1	U	1	U
4,4'-DDE	1	U	1	U	1	U	1	U	1	U
4,4'-DDT	1	U	1	U	1	U	1	U	1	U
Aldrin	0.5	U	0 5	U	0 5	U	0 5	U	0.5	U
alpha-Chlordane	1.1		0 5	U	0 5	U	0.5	U	0.5	U
Dieldrin	1	U	1	U	1 8		1	U	1	U
endosulfan	0.5	U	0 5	U	0.5	U	0.5	U	0 5	U
Endrin	1	U	1	U	1	U	1	U	1.4	
Heptachlor	1	U	1	U	1	U	1	U	1	U
Heptachlor Epoxide	1	U	1	U	1	U	1	U	1	U

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-19-PW		OFF-20-PW		OFF-21-PW		OFF-22-PW		OFF-23-PW	
Sample Location	OFF-19		OFF-20		OFF-21		OFF-22		OFF-23	
Date Sampled	4/14/98		4/7/98		4/7/98		3/27/98		4/7/98	
QC Type	None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Hexachlorobenzene	1	U	1	U	1	U	1	U	1	U
lindane	1	U	1	U	1	U	1	U	1	U
Mirex	0 5	U	0.5	U	2.4		0.5	U	0.5	U
PCB 101	1	U	1	U	1	U	1	U	2.5	
PCB 105	1	U	1	U	1	U	1	U	1	U
PCB 118	1	U	1	U	1 1		1	U	1	U
PCB 126	1	U	1	U	1	U	1	U	1	U
PCB 128	1	U	1	U	1	U	1	U	1	U
PCB 138	1	U	1	U	1	U	1	U	1	U
PCB 153	2.7		2.5		1	U	1	U	1	U
PCB 170	1	U	1	U	1	U	1 2		1	U
PCB 18	0.5	U	0 5	U	0.5	U	0 5	U	1 2	
PCB 180	1	U	1	U	1	U	1	U	1	U
PCB 187	1	U	1	U	1	U	1	U	1	U
PCB 195	1	U	1	U	1	U	1	U	1	U
PCB 206	1	U	1	U	1	U	1	U	1	U
PCB 209	1	U	1	U	1	U	1	U	1	U
PCB 28	3 6		1	U	1	U	1	U	1	U
PCB 44	1	U	1	U	1	U	1	U	1	U
PCB 52	0.5	U	0.5	U	0.5	U	2.4		0.5	U
PCB 66	1	U	1	U	3.7		1	U	1	U
PCB 77	1	U	1	U	1	U	1	U	1	U
PCB 8	1	U	1	U	1	U	1	U	1	U
PCB 99	2.5		1.5		0.5	U	0.5	U	0.5	U
Toxaphene	500	U	500	U	500	U	500	U	500	U
trans-Nonachlor	0.5	U	0.5	U	0.5	U	0 5	U	0 5	U
Metals (UG/KG)										
Aluminum	51.3		49 8		65 1		49 2		59 7	
Arsenic	3		2 4		3		2.6		1.8	
Barium	20	U	20	U	20	U	20	U	20	U
Cadmium	0 8		0 9		0 4		0 9		0 4	
Chromium	17 4		18 5		25 6		17.2		19.7	
Copper	20		21		18		18		11	
Iron	290		110		530		250		390	
Lead	11.7		15.9		11.3		17.14		27.9	
Manganese		NA		NA		NA		NA		NA
Mercury	45		32		44		55		43	
Nickel	1 3		1.4		1.3		1.5		1.6	

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ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-19-PW		OFF-20-PW		OFF-21-PW		OFF-22-PW		OFF-23-PW	
Sample Location	OFF-19		OFF-20		OFF-21		OFF-22		OFF-23	
Date Sampled	4/14/98		4/7/98		4/7/98		3/27/98		4/7/98	
QC Type	None		None		None		None		None	
Filtering	POREWATER		POREWATER		POREWATER		POREWATER		POREWATER	
Silver	1.5		1.6		1 4		1.2		1.8	
Zinc	150		150		220		200		160	

U - Not detected; UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; B - Below CRDL; NA - Not Analyzed

APPENDIX A-4
RESULTS OF TISSUE CHEMICAL ANALYSES. ORGANICS, METALS

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-1-BM-052698		OFF-1-CN-072298		OFF-2-BM-052698		OFF-2-CN-072098		OFF-3-BM-052698		OFF-3-CN-072098	
Sample Location	OFF-1		OFF-1		OFF-2		OFF-2		OFF-3		OFF-3	
Date Sampled	5/26/98		7/22/98		5/26/98		7/20/98		5/26/98		7/20/98	
QC Type	None		None		None		None		None		None	
Matrix	TISSUE-MUSSEL		TISSUE-CUNNER		TISSUE-MUSSEL		TISSUE-CUNNER		TISSUE-MUSSEL		TISSUE-CUNNER	
Metals (UG/KG)												
Aluminum	189.2	J	124.6		58.3	J	141.6		20	UJ	134.7	
Arsenic	1.4		4 6		2		5.2		1.8		3 9	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	9.1		2 3		13.2		2 9		9.3		2.5	
Chromium	0 5	U	36.9		0.5	U	28 5		0.5	U	25.4	
Copper	6.7		32 4		6.1		25.6		5	U	30.4	
Iron	320.6		78.1		466 1		66.4		378 7		68.1	
Lead	4.2		4.4		3		5.1		6.3		5	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	3			R	1 3			R	2.9			R
Nickel	7.1		0.5	U	7 3		0.5	U	12.4		0.5	U
Silver	0.5	U	0.9		0.5	U	1		0.5	U	0.9	
Zinc		NA	18.1		157.3		22.7		148		23.9	

Bold - Exceeds GA Objective; Italic - Exceeds PAL, U - Not detected; UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis, R - Rejected, B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-4-BM-052698		OFF-4-CN-071798		OFF-5-BM-052698		OFF-5-BM-052698-FD		OFF-6-BM-052698		OFF-7-BM-052698	
Sample Location	OFF-4		OFF-4		OFF-5		OFF-5		OFF-6		OFF-7	
Date Sampled	5/26/98		7/17/98		5/26/98		5/26/98		5/26/98		5/26/98	
QC Type	None		None		Dup of OFF-5-BM-052698		Dup of OFF-5-BM-052698		None		None	
Matrix	TISSUE-MUSSEL		TISSUE-CUNNER		TISSUE-MUSSEL		TISSUE-MUSSEL		TISSUE-MUSSEL		TISSUE-MUSSEL	
Metals (UG/KG)												
Aluminum	128.2	J	115.9		20	UJ	101	J	20	UJ	212.6	J
Arsenic	0.9		4.2		2.7		1.9		1.4		2.5	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	5		2.9		6 6		5 5		11 4		17	
Chromium	10 3		21.7		0.5	U	0 5	U	35.3		40 5	
Copper	1.4	J	29.4		10		6.2		4		5	U
Iron	484.3		70.3		538.2		476.9		333.4		498.2	
Lead	4.1		4.7		5.2		3.6		5.8		3.7	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	1.9			R	1.6		2.7		1.9		2.1	
Nickel	5.7		0.5	U	7.5		8.1		9		10.3	
Silver	0.5	U	0.8		0.5	U	0.5	U	0 5	U	0 5	U
Zinc	94		20.9		143 5		148.7		103.4		119 6	

Bold - Exceeds GA Objective; Italic - Exceeds PAL; U - Not detected; UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
LD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-8-HC-051498		OFF-10-HC-051498		OFF-10-HC-051498-FD		OFF-11-HC-051498		OFF-12-HC-051498		OFF-13-DEP	
Sample Location	OFF-8		OFF-10		OFF-10		OFF-11		OFF-12		OFF-13	
Date Sampled	5/14/98		5/14/98		5/21/98		5/14/98		5/14/98		8/17/98	
QC Type	None		Dup of OFF-10-HC-051498		Dup of OFF-10-HC-051498		None		None		None	
Matrix	TISSUE-CLAM		TISSUE-CLAM		TISSUE-CLAM		TISSUE-CLAM		TISSUE-CLAM		DEPLOYED MUSSEL	
Metals (UG/KG)												
Aluminum	536.1	J	474.1	J	574.3	J	508.7	J	518.7	J	193.2	
Arsenic	4.5		5.5		5.4		4.4		5.4		1.5	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	5.3		6.1		8 3		6.7		8.2		14.3	
Chromium	0.5	UJ	0 5	UJ	11.6	J	6.6	J	0.5	UJ	26 4	
Copper	4.2	J	5	U	5	U	5	U	5	U	8.7	
Iron	186 5		241.9		421 5		183 3		154 1		387 6	
Lead	4.4		5		6 2		3 9		6.9		6 9	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	1.9		2 8		3 7		2.1		2.6		2	
Nickel	19.5		20 5		29 3		18.1		24.8		15.8	
Silver	0 5	U	0.5	U	0.5	U	0.5	U	0 5	U	0.5	U
Zinc	83 9		87 1		100.1		68.7		87.3		202 6	

Bold - Exceeds GA Objective, Italic - Exceeds PAL; U - Not detected; UJ - DL approximate, J - Quantitation approximate;
* - From dilution analysis; R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-13-LOB-061098		OFF-14-DEP		OFF-14-LOB-061298		OFF-14-PM-052198		OFF-15-HC-051498		OFF-15-HC-051498-FD	
Sample Location	OFF-13		OFF-14		OFF-14		OFF-14		OFF-15		OFF-15	
Date Sampled	6/10/98		8/17/98		6/12/98		5/21/98		5/14/98		5/14/98	
QC Type	None		None		None		None		Dup of OFF-15-HC-051498		Dup of OFF-15-HC-051498	
Matrix	TISSUE-LOBSTER		DEPLOYED MUSSEL		TISSUE-LOBSTER		TISSUE-CLAM		TISSUE-CLAM		TISSUE-CLAM	
Metals (UG/KG)												
Aluminum	382.4		147.8		361.4		637.8	J	1203.8	J	664.5	J
Arsenic	7.7		1 4		8.5		4.6		7 2		6.3	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	13.3		11.3		0.5	U	6		11 2		8 4	
Chromium	14.3		18 7		11 4		4 1	J	64.4	J	6.3	J
Copper	163.7		5 5		141.2		5	U	5	U	5	U
Iron	97.7		446.2		113 7		243.4		224		321 5	
Lead	14.7		4.3		11.3		5.2		8.2		9 9	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	5.4		2.8		7.2		2 5		2		2 1	
Nickel	32 6		10 7		37.4		23		24.1		18.8	
Silver	2.6		0 5	U	3.8		0 5	U	0.5	U	0 5	U
Zinc	231		174.4		271.4		63 3		112		101 8	

Bold - Exceeds GA Objective; Italic - Exceeds PAL; U - Not detected; UJ - DL approximate, J - Quantitation approximate;
* - From dilution analysis, R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-15-LOB-060898		OFF-15-PM-051498		OFF-16-HC-052198		OFF-16-LOB-060898		OFF-16-LOB-061098		OFF-17-DEP	
Sample Location	OFF-15		OFF-15		OFF-16		OFF-16		OFF-16		OFF-17	
Date Sampled	6/8/98		5/14/98		5/21/98		6/8/98		6/10/98		8/17/98	
QC Type	None		None		None		None		None		None	
Matrix	TISSUE-LOBSTER		TISSUE-CLAM		TISSUE-CLAM		TISSUE-LOBSTER		TISSUE-LOBSTER		DEPLOYED MUSSEL	
Metals (UG/KG)												
Aluminum	397.3		750 5	J	984.8	J	321.5		356.9		179.5	
Arsenic	7.2		5 5		5.5		6.9		6 6		1.2	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	1 5		7		9.8		2.1		2.4		7.9	
Chromium	18.9		30 2	J	0.5	UJ	14 2		15 4		17.8	
Copper	157		5	U	5	U	138.6		120.4		8.1	
Iron	84.2		438 6		314.3		76.4		89.6		493.4	
Lead	19		7		6.6		17.2		16.3		7	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	2.5		2 4		4		2		1 7		2.4	
Nickel	31.7		21.8		20.4		28 5		41.6		17	
Silver	2.6		0.5	U	0.5	U	2 3		2.5		0.5	U
Zinc	256.3		82.8		73 3		241 8		297.5		181.4	

Bold - Exceeds GA Objective; Italic - Exceeds PAL; U - Not detected; UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
LD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-17-HC-051498		OFF-17-LOB-061098		OFF-17-LOB-061298		OFF-18-DEP		OFF-18-DEP-FD		OFF-18-LOB-060898	
Sample Location	OFF-17		OFF-17		OFF-17		OFF-18		OFF-18		OFF-18	
Date Sampled	5/14/98		6/10/98		6/12/98		8/17/98		8/17/98		6/8/98	
QC Type	None		None		None		Dup of OFF-18-DEP		Dup of OFF-18-DEP		None	
Matrix	TISSUE-CLAM		TISSUE-LOBSTER		TISSUE-LOBSTER		DEPLOYED MUSSEL		DEPLOYED MUSSEL		TISSUE-LOBSTER	
Metals (UG/KG)												
Aluminum	622.7	J	364.9		386.6		165 3		152.4		367.2	
Arsenic	4.7		9.3		10 2		1		1.1		5.7	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	6.2		7.4		7.4		8 6		9.2		4 7	
Chromium	3 2	J	11 1		10 5		15.4		13.9		17	
Copper	5	U	172 6		194.2		10.4		9.7		154 9	
Iron	320 5		127 4		116		412 5		428.1		157.6	
Lead	5 6		18 5		12 3		8.5		6.9		15.4	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	3 2		1.4		1.9		4.3		3.7		1.6	
Nickel	15.7		38 7		32.6		13.3		14.2		35.9	
Silver	0.5	U	2 4		2.7		0.5	U	0 5	U	2.4	
Zinc	64.1		281.4		276.3		198.2		210 4		266.8	

Bold - Exceeds GA Objective; Italic - Exceeds PAL; U - Not detected; UJ - DL approximate, J - Quantitation approximate;
* - From dilution analysis, R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
LD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-19-DEP		OFF-19-LOB-060898		OFF-19-PM-052198		OFF-20-DEP		OFF-20-HC-051498		OFF-20-LOB-060898	
Sample Location	OFF-19		OFF-19		OFF-19		OFF-20		OFF-20		OFF-20	
Date Sampled	8/17/98		6/8/98		5/21/98		8/17/98		5/14/98		6/8/98	
QC Type	None		None		None		None		None		None	
Matrix	DEPLOYED MUSSEL		TISSUE-LOBSTER		TISSUE-CLAM		DEPLOYED MUSSEL		TISSUE-CLAM		TISSUE-LOBSTER	
Metals (UG/KG)												
Aluminum	182.4		327.9		771.1	J	140 3		730.7	J	364.3	
Arsenic	1.6		8.5		6.1		1.7		4.4		7.2	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	8.1		3.9		5.3		8.2		8 7		5.1	
Chromium	16.4		17.5		0.5	UJ	18.3		3.1	J	21.1	
Copper	9.2		143 6		5	U	8.3		5	U	101.3	
Iron	411.5		149 3		245.6		515.9		153.3		160.3	
Lead	9.2		16 7		7.1		6 1		7.9		13.8	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	3.6		1.8		3.7		2.7		2.5		1.8	
Nickel	15.6		40 2		14		10.6		16.6		44.9	
Silver	0.5	U	3.8		0.5	U	0 5	U	0.5	U	5	
Zinc	188.5		278		58 9		192 7		61 3		241 8	

Bold - Exceeds GA Objective; Italic - Exceeds PAL; U - Not detected; UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-21-DEP		OFF-21-HC-051498		OFF-21-LOB-060898		OFF-21-LOB-061598		OFF-22-BM-052698		OFF-23-DEP	
Sample Location	OFF-21		OFF-21		OFF-21		OFF-21		OFF-22		OFF-23	
Date Sampled	8/17/98		5/14/98		6/8/98		6/15/98		5/26/98		8/17/98	
QC Type	None		None		None		None		None		None	
Matrix	DEPLOYED MUSSEL		TISSUE-CLAM		TISSUE-LOBSTER		TISSUE-LOBSTER		TISSUE-MUSSEL		DEPLOYED MUSSEL	
Metals (UG/KG)												
Aluminum	185.2		1163 5	J	381.2		373.4		69.8	J	136.8	
Arsenic	1.3		4.3		8 3		8.7		2		1.6	
Barium	32	U	32	U	32	U	32	U	32	U	32	U
Cadmium	9.7		7 9		1.9		1.6		13 8		10 3	
Chromium	11.7		0.5	UJ	17 5		16.2		0.5	U	21	
Copper	6.5		8 7		147.3		162 1		1.7	J	7	
Iron	402.5		307.5		137 9		122.4		453.8		455	
Lead	7.2		4 9		18 9		16.5		5 6		5.3	
Manganese		NA		NA		NA		NA		NA		NA
Mercury	3.5		2.9		2 1		1.8		1.7		1.8	
Nickel	17.3		25.7		39 6		34.8		11.9		11.2	
Silver	0 5	U	0.5	U	3 2		3.3		0.5	U	0 5	U
Zinc	167.6		92.3		263 1		255 1		153 6		157 6	

Bold - Exceeds GA Objective; Italic - Exceeds PAL; U - Not detected; UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected, B - Below CRDL; NA - Not Analyzed

ANALYTICAL RESULTS
OLD FIREFIGHTER SITE
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Sample Number	OFF-23-HC-051498		OFF-23-LOB-060898		OFF-23-LOB-061098		OFF-TO-DEP	
Sample Location	OFF-23		OFF-23		OFF-23		OFF-TO	
Date Sampled	5/14/98		6/8/98		6/10/98		6/22/98	
QC Type	None		None		None		None	
Matrix	TISSUE-CLAM		TISSUE-LOBSTER		TISSUE-LOBSTER		DEPLOYED MUSSEL	
Metals (UG/KG)								
Aluminum	821.8	J	330.2		314.2		137.9	
Arsenic	4.9		9		9.3		0.9	
Barium	32	U	32	U	32	U	32	U
Cadmium	6 4		3.7		3.4		7.6	
Chromium	0.5	UJ	13.8		15 1		12.4	
Copper	5	U	112.4		106.5		5.3	
Iron	106 7		168.8		160.1		380.1	
Lead	8.6		12.9		14.8		5.8	
Manganese		NA		NA		NA		NA
Mercury	2.8		2.4		1.9		1.9	
Nickel	15.3		28.7		30.5		10.3	
Silver	0.5	U	2 7		2.5		0.5	U
Zinc	80		236.6			NA	164 1	

Bold - Exceeds GA Objective; Italic - Exceeds PAL; U - Not detected; UJ - DL approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected, B - Below CRDL; NA - Not Analyzed

Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-23-HC	OFF-8-HC	OFF-15-HC	OFF-15-PM
Battelle ID	Y5269	Y5270	Y5271	Y5272
Sample Weight (g, dry weight)	2.42	2.13	2.59	2.06
Sample Weight (g, wet weight)	25.15	22.37	24.28	25.68
% Lipid	4.05	3.05	4.71	6.91
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/10/98	11/10/98	11/10/98	11/10/98
Battelle Sample Batch	98-369	98-369	98-369	98-369
Naphthalene	6.24	5.79	5.45	6.50
2-Methylnaphthalene	4.72	3.83	3.72	2.95 J
1-Methylnaphthalene	2.99	2.34	1.87	2.50
2,6-Dimethylnaphthalene	2.19	1.86	1.43	2.13
2,3,5-Trimethylnaphthalene	0.89 U	1.01 U	1.06	1.44
Biphenyl	1.45	1.87	1.31	1.08 J
Acenaphthylene	2.49	1.60	2.17	1.49
Acenaphthene	4.89	1.23 J	1.04 J	2.07
Fluorene	3.38	1.66	1.29	2.12
Phenanthrene	18.21	5.98	5.59	10.14
Anthracene	9.30	3.39	3.78	3.57
1-Methylphenanthrene	4.52	1.27 J	1.30 J	2.85
Fluoranthene	77.77	21.22	19.89	36.42
Pyrene	64.16	18.83	16.84	25.23
Benz(a)anthracene	18.26	2.23	2.81	6.60
Chrysene	27.66	6.59	6.91	18.63
Benzo(b)fluoranthene	14.67	3.06	2.86	6.57
Benzo(k)fluoranthene	13.70	2.06	2.18	7.99
Benzo(e)pyrene	21.42	5.22	4.85	8.14
Benzo(a)pyrene	8.17	1.51 J	1.25 J	4.05
Perylene	3.85	1.31	0.84	1.60
Indeno(1,2,3-c,d)pyrene	4.56	1.77 U	1.46 U	1.83 U
Dibenz(a,h)anthracene	0.71 J	1.23 U	1.01 U	1.27 U
Benzo(g,h,i)perylene	6.51	1.77	2.20	1.41 U
Total PAH	321.82	94.61	90.63	154.08
Surrogate Recoveries (%)				
Naphthalene-d8	52	58	62	49
Phenanthrene-d10	51	61	65	55
Chrysene-d12	53	63	69	56

B = Analyte detected in the blank.
& = QC data outside DQOs.
J = Analyte detected below sample MDL.
U = Analyte not detected, sample MDL.
NA = Not Applicable.

Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-17-HC	OFF-21-HC	OFF-12-HC	OFF-20-HC
Battelle ID	Y5273	Y5274	Y5275	Y5276
Sample Weight (g, dry weight)	3.76	2.88	4.14	2.17
Sample Weight (g, wet weight)	25.02	22.91	25.03	25.24
% Lipid	3.25	6.50	2.75	4.93
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/10/98	11/11/98	11/11/98	11/11/98
Battelle Sample Batch	98-369	98-369	98-369	98-369
Naphthalene	4.10	4.88	3.69	6.45
2-Methylnaphthalene	2.18	3.24	2.42	3.37
1-Methylnaphthalene	1.34	2.17	1.85	2.32
2,6-Dimethylnaphthalene	1.79	1.88	1.32	2.29
2,3,5-Trimethylnaphthalene	1.11	1.09	1.22	1.66
Biphenyl	1.18	1.04 J	0.68 J	1.31 J
Acenaphthylene	2.87	3.58	2.51	2.00
Acenaphthene	1.66	2.23	1.49	1.61 U
Fluorene	1.98	2.94	2.09	1.38
Phenanthrene	13.88	17.83	11.48	7.75
Anthracene	7.43	7.78	4.89	3.18
1-Methylphenanthrene	2.97	3.88	2.09	1.96
Fluoranthene	55.87	58.73	45.41	30.88
Pyrene	41.32	45.27	36.70	22.55
Benz(a)anthracene	9.87	13.88	7.33	5.21
Chrysene	21.47	26.10	15.83	12.59
Benzo(b)fluoranthene	9.56	11.69	6.18	4.85
Benzo(k)fluoranthene	10.27	12.15	6.36	4.50
Benzo(e)pyrene	16.25	17.36	12.49	8.30
Benzo(a)pyrene	6.62	8.35	4.23	2.88
Perylene	2.75	4.62	2.64	2.65
Indeno(1,2,3-c,d)pyrene	3.51	4.38	1.97	1.74 U
Dibenz(a,h)anthracene	0.80	1.10	0.63 U	1.21 U
Benzo(g,h,i)perylene	5.89	5.07	4.30	2.41
Total PAH	226.68	261.24	179.17	130.50
Surrogate Recoveries (%)				
Naphthalene-d8	58	67	44	42
Phenanthrene-d10	58	68	45	46
Chrysene-d12	63	74	48	49

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-10-HC	OFF-11-HC	OFF-10-HC-FD	OFF-16-HC
Battelle ID	Y5277	Y5278	Y5279	Y5280
Sample Weight (g, dry weight)	0.33	2.41	1.78	2.47
Sample Weight (g, wet weight)	4.86	24.17	24.51	25.46
% Lipid	5.40	6.09	4.54	3.96
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/11/98	11/11/98	11/11/98	11/11/98
Battelle Sample Batch	98-369	98-369	98-369	98-369
Naphthalene	47.00	6.59	8.36	6.44
2-Methylnaphthalene	24.49	3.33	4.51	4.22
1-Methylnaphthalene	19.31	2.27	3.68	2.95
2,6-Dimethylnaphthalene	10.08 U	1.57	1.90	2.36
2,3,5-Trimethylnaphthalene	6.49 U	1.04	1.21 U	1.22
Biphenyl	9.15 U	0.79 J	1.45 J	0.92 J
Acenaphthylene	9.17 U	1.56	1.26 J	2.24
Acenaphthene	10.46 U	1.52	1.65 J	2.49
Fluorene	7.58 U	1.60	1.25 J	2.48
Phenanthrene	16.43	10.85	10.23	14.62
Anthracene	7.78	4.69	3.66	4.92
1-Methylphenanthrene	11.08 U	3.05	1.33 J	2.65
Fluoranthene	27.95	38.20	28.53	48.59
Pyrene	24.37	30.20	24.66	43.34
Benz(a)anthracene	4.47 J	5.63	6.87	11.45
Chrysene	13.67	18.74	12.50	20.34
Benzo(b)fluoranthene	5.97 J	8.12	6.46	12.71
Benzo(k)fluoranthene	5.61 J	9.84	7.58	13.87
Benzo(e)pyrene	10.64 J	14.15	8.52	18.02
Benzo(a)pyrene	5.04 J	6.08	5.11	8.18
Perylene	5.05 J	3.17	2.40	3.33
Indeno(1,2,3-c,d)pyrene	11.33 U	5.43	3.46	8.40
Dibenz(a,h)anthracene	7.88 U	0.97 J	1.47 U	1.37
Benzo(g,h,i)perylene	8.72 U	8.45	5.81	11.80
Total PAH	217.76	187.86	151.16	248.90
Surrogate Recoveries (%)				
Naphthalene-d8	46	45	50	57
Phenanthrene-d10	45	49	54	59
Chrysene-d12	48	52	59	65

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-14-PM	OFF-19-PM	OFF-15-HC-FD	OFF-7-BM
Battelle ID	Y5281	Y5282	Y5283	Y5284
Sample Weight (g, dry weight)	1.82	1.72	2.45	3.68
Sample Weight (g, wet weight)	25.27	23.65	17.65	24.55
% Lipid	4.93	6.59	3.30	8.21
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/12/98	11/12/98	11/10/98	11/12/98
Battelle Sample Batch	98-369	98-369	98-369	98-369
Naphthalene	7.72	10.08	7.36	9.28
2-Methylnaphthalene	4.56	4.89	5.25	12.03
1-Methylnaphthalene	3.04	4.10	3.11	6.46
2,6-Dimethylnaphthalene	2.26	2.87	1.76	5.51
2,3,5-Trimethylnaphthalene	1.19 U	1.25 U	1.03	3.10
Biphenyl	1.00 J	2.04	1.04 J	1.02
Acenaphthylene	1.82	2.08	1.53	4.24
Acenaphthene	3.38	4.50	1.42 U	5.27
Fluorene	3.03	5.78	1.32	8.49
Phenanthrene	16.81	27.57	6.40	31.03
Anthracene	4.89	11.15	2.79	11.26
1-Methylphenanthrene	2.55	4.66	1.52	5.31
Fluoranthene	35.83	51.81	23.25	109.62
Pyrene	30.19	43.45	20.08	95.78
Benz(a)anthracene	16.39	21.57	3.09	18.30
Chrysene	20.20	27.30	7.69	43.66
Benzo(b)fluoranthene	11.27	14.19	2.78	23.39
Benzo(k)fluoranthene	14.42	14.81	2.81	23.23
Benzo(e)pyrene	11.91	13.91	5.67	42.73
Benzo(a)pyrene	10.26	12.21	2.12 J	9.80
Perylene	4.99	5.58	4.30	4.71
Indeno(1,2,3-c,d)pyrene	7.06	8.93	0.94 J	10.69
Dibenz(a,h)anthracene	1.44 U	2.28	1.07 U	2.04
Benzo(g,h,i)perylene	8.13	8.80	1.78	16.04
Total PAH	221.70	304.54	107.64	502.97
Surrogate Recoveries (%)				
Naphthalene-d8	57	55	50	49
Phenanthrene-d10	59	60	52	52
Chrysene-d12	64	67	54	59

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-6-BM	OFF-5-BM	OFF-4-BM	OFF-3-BM
Battelle ID	Y5285	Y5286	Y5287	Y5288
Sample Weight (g, dry weight)	2.52	0.64	3.07	1.67
Sample Weight (g, wet weight)	23.97	4.13	21.74	11.09
% Lipid	6.11	17.18	7.95	8.76
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/12/98	11/12/98	11/12/98	11/9/98
Battelle Sample Batch	98-369	98-369	98-369	98-369
Naphthalene	8.67	29.01	7.31	11.93
2-Methylnaphthalene	9.35	17.23	7.59	9.88
1-Methylnaphthalene	5.22	9.55	4.35	7.12
2,6-Dimethylnaphthalene	4.54	7.07	3.67	4.96
2,3,5-Trimethylnaphthalene	2.79	5.34	2.58	2.49
Biphenyl	1.37	4.78 U	1.62	2.16
Acenaphthylene	4.07	7.32	4.61	5.89
Acenaphthene	3.85	7.67	5.22	2.91
Fluorene	6.39	11.56	7.01	11.19
Phenanthrene	18.55	32.02	17.84	20.48
Anthracene	7.84	9.74	7.24	8.96
1-Methylphenanthrene	4.30	5.31 J	4.07	3.36
Fluoranthene	72.08	90.97	60.09	67.39
Pyrene	55.62	71.97	43.04	41.22
Benz(a)anthracene	11.82	15.86	12.03	7.48
Chrysene	29.37	36.59	24.13	27.23
Benzo(b)fluoranthene	12.89	17.85	12.46	9.54
Benzo(k)fluoranthene	12.54	18.18	12.16	10.36
Benzo(e)pyrene	28.08	30.35	17.97	17.75
Benzo(a)pyrene	5.88	9.96	6.80	5.49
Perylene	4.09	4.15	11.86	18.46
Indeno(1,2,3-c,d)pyrene	7.57	11.49	6.99	3.85
Dibenz(a,h)anthracene	1.23	4.12 U	1.08	1.02 J
Benzo(g,h,i)perylene	11.87	16.41	9.09	6.84
Total PAH	329.98	465.61	290.80	307.96
Surrogate Recoveries (%)				
Naphthalene-d8	55	53	52	52
Phenanthrene-d10	56	53	55	52
Chrysene-d12	63	59	72	54

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-2-BM	OFF-1-BM	OFF-22-BM	OFF-5-BM-FD
Battelle ID	Y5289	Y5290	Y5291	Y5292
Sample Weight (g, dry weight)	3.11	1.55	3.51	3.69
Sample Weight (g, wet weight)	21.45	12.41	23.41	22.94
% Lipid	6.36	5.10	5.92	7.04
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/12/98	11/13/98	11/12/98	11/13/98
Battelle Sample Batch	98-370	98-370	98-370	98-370
Naphthalene	9.63	17.24	10.95	9.92
2-Methylnaphthalene	7.32	12.44	13.33	10.08
1-Methylnaphthalene	4.30	6.95	8.16	5.61
2,6-Dimethylnaphthalene	3.34	5.28	6.62	4.27
2,3,5-Trimethylnaphthalene	1.20	1.40 U	3.21	3.22
Biphenyl	1.33	3.44	1.75	1.15
Acenaphthylene	4.94	5.13	4.04	4.51
Acenaphthene	2.50	3.42	4.24	3.55
Fluorene	4.03	3.14	5.33	5.45
Phenanthrene	17.99	17.35	23.99	18.91
Anthracene	7.37	6.47	9.22	7.93
1-Methylphenanthrene	2.95	2.82	4.90	3.56
Fluoranthene	58.36	47.20	81.85	81.84
Pyrene	46.61	34.16	65.97	57.94
Benz(a)anthracene	16.39	8.18	18.95	12.81
Chrysene	28.71	23.07	44.47	34.66
Benzo(b)fluoranthene	12.41	9.41	25.74	13.89
Benzo(k)fluoranthene	15.75	8.47	25.18	14.16
Benzo(e)pyrene	19.08	15.29	42.91	28.84
Benzo(a)pyrene	8.77	4.79	8.67	6.97
Perylene	13.31	9.08	26.80	3.45
Indeno(1,2,3-c,d)pyrene	8.07	5.29	10.34	6.85
Dibenz(a,h)anthracene	1.24	1.70 U	1.86	1.03
Benzo(g,h,i)perylene	11.13	9.61	19.20	11.34
Total PAH	306.73	258.23	467.69	351.94
Surrogate Recoveries (%)				
Naphthalene-d8	51	44	37	46
Phenanthrene-d10	52	47	41	49
Chrysene-d12	63	54	44	56

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-1-CN	OFF-2-CN	OFF-3-CN	OFF-4-CN
Battelle ID	Y5293	Y5294	Y5295	Y5296
Sample Weight (g, dry weight)	1.78	4.17	2.14	0.56
Sample Weight (g, wet weight)	7.34	16.80	9.12	2.67
% Lipid	19.38	17.50	10.55	25.84
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/13/98	11/13/98	11/13/98	11/13/98
Battelle Sample Batch	98-370	98-370	98-370	98-370
Naphthalene	12.15	7.04	9.37	30.96
2-Methylnaphthalene	10.99	6.32	4.67	13.12
1-Methylnaphthalene	7.28	3.12	3.81	7.68
2,6-Dimethylnaphthalene	2.50	1.44	1.92	5.87 J
2,3,5-Trimethylnaphthalene	1.22 U	0.52 U	1.01 U	3.86 U
Biphenyl	1.75	0.76	1.78	5.45 U
Acenaphthylene	1.44 J	0.75	1.43 U	5.46 U
Acenaphthene	4.56	3.20	2.35	6.22 U
Fluorene	2.20	1.64	1.54	4.51 U
Phenanthrene	3.39	2.70	2.48	5.94
Anthracene	1.06 U	0.60	0.94	3.37 U
1-Methylphenanthrene	2.08 U	0.88 U	1.73 U	6.59 U
Fluoranthene	2.84	2.92	2.92	5.42 J
Pyrene	2.20	2.03	2.26	5.26 J
Benz(a)anthracene	2.58 U	0.38 J	0.56 J	8.20 U
Chrysene	1.59 U	0.71	1.13 J	2.33 J
Benzo(b)fluoranthene	2.17 U	0.93 U	1.81 U	6.90 U
Benzo(k)fluoranthene	1.78 U	0.76 U	1.48 U	5.65 U
Benzo(e)pyrene	2.58 U	0.73 J	1.13 J	8.17 U
Benzo(a)pyrene	2.96 U	1.26 U	2.46 U	9.40 U
Perylene	5.29	2.34	16.00	19.85
Indeno(1,2,3-c,d)pyrene	2.13 U	0.91 U	1.77 U	6.74 U
Dibenz(a,h)anthracene	1.48 U	0.63 U	1.23 U	4.69 U
Benzo(g,h,i)perylene	1.64 U	0.70 U	1.36 U	5.19 U
Total PAH	56.59	36.68	52.86	96.43
Surrogate Recoveries (%)				
Naphthalene-d8	50	49	46	53
Phenanthrene-d10	52	51	47	57
Chrysene-d12	59	59	54	66

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-13-DEP	OFF-14-DEP	OFF-17-DEP	OFF-18-DEP
Battelle ID	Y5297	Y5298	Y5299	Y5300
Sample Weight (g, dry weight)	1.90	2.85	2.47	3.83
Sample Weight (g, wet weight)	12.13	22.29	14.51	23.10
% Lipid	8.51	7.56	8.96	10.43
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/13/98	11/13/98	11/13/98	11/13/98
Battelle Sample Batch	98-370	98-370	98-370	98-370
Naphthalene	11.91	11.95	11.35	9.16
2-Methylnaphthalene	10.39	9.60	9.92	9.43
1-Methylnaphthalene	6.07	5.42	6.07	5.63
2,6-Dimethylnaphthalene	5.65	6.19	6.28	6.23
2,3,5-Trimethylnaphthalene	4.00	2.41	3.61	4.67
Biphenyl	1.70	1.19	1.70	1.08
Acenaphthylene	7.43	5.25	5.71	8.83
Acenaphthene	5.90	9.80	4.55	8.95
Fluorene	8.22	8.37	7.65	10.68
Phenanthrene	20.31	11.79	18.40	31.75
Anthracene	13.60	7.04	13.40	16.92
1-Methylphenanthrene	4.53	3.17	4.22	6.59
Fluoranthene	169.45	43.60	123.82	196.23
Pyrene	122.97	44.36	88.60	148.22
Benz(a)anthracene	32.87	16.85	22.40	39.08
Chrysene	63.38	23.29	47.81	72.71
Benzo(b)fluoranthene	46.37	22.25	26.80	48.42
Benzo(k)fluoranthene	37.89	21.65	23.18	43.93
Benzo(e)pyrene	78.44	30.82	50.95	79.48
Benzo(a)pyrene	11.36	9.61	7.97	14.94
Perylene	9.18	5.40	7.44	10.05
Indeno(1,2,3-c,d)pyrene	10.51	10.63	7.75	12.90
Dibenz(a,h)anthracene	3.07	2.16	1.72	0.64 J
Benzo(g,h,i)perylene	19.24	14.59	14.67	19.81
Total PAH	704.46	327.40	515.95	806.33
Surrogate Recoveries (%)				
Naphthalene-d8	50	45	46	52
Phenanthrene-d10	54	47	50	54
Chrysene-d12	59	54	58	62

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-19-DEP	OFF-20-DEP	OFF-21-DEP	OFF-23-DEP
Battelle ID	Y5301	Y5302	Y5303	Y5304
Sample Weight (g, dry weight)	3.72	2.89	3.34	3.43
Sample Weight (g, wet weight)	21.89	19.25	20.98	21.50
% Lipid	9.65	8.69	8.37	8.87
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/14/98	11/14/98	11/14/98	11/14/98
Battelle Sample Batch	98-370	98-370	98-370	98-370
Naphthalene	9.78	7.93	9.05	9.07
2-Methylnaphthalene	14.04	8.92	10.57	11.35
1-Methylnaphthalene	8.25	5.61	6.15	6.83
2,6-Dimethylnaphthalene	8.24	5.67	6.53	8.54
2,3,5-Trimethylnaphthalene	3.77	2.80	1.70	4.81
Biphenyl	1.38	1.15	1.05	1.31
Acenaphthylene	4.13	2.77	5.25	6.34
Acenaphthene	4.81	3.83	3.59	8.00
Fluorene	5.80	7.59	4.91	7.63
Phenanthrene	11.67	9.89	15.31	24.08
Anthracene	7.32	6.85	9.98	18.86
1-Methylphenanthrene	3.88	2.60	3.50	7.30
Fluoranthene	60.63	58.04	98.27	231.30
Pyrene	52.86	40.68	70.27	153.35
Benz(a)anthracene	13.90	10.74	14.66	39.56
Chrysene	22.13	21.66	29.71	70.38
Benzo(b)fluoranthene	16.67	11.96	15.50	32.57
Benzo(k)fluoranthene	14.72	10.36	12.63	28.22
Benzo(e)pyrene	24.75	19.12	32.20	64.02
Benzo(a)pyrene	6.09	3.91	6.31	10.64
Perylene	5.41	4.98	8.95	13.69
Indeno(1,2,3-c,d)pyrene	5.36	3.01	5.25	7.24
Dibenz(a,h)anthracene	1.09	0.93	1.30	2.27
Benzo(g,h,i)perylene	9.15	5.85	10.19	15.97
Total PAH	315.84	256.86	382.83	783.34
Surrogate Recoveries (%)				
Naphthalene-d8	49	55	42	46
Phenanthrene-d10	51	58	45	49
Chrysene-d12	59	67	54	57

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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-T0-DEP	OFF-18-DEP-FD	OFF-13-LOB	OFF-14-LOB
Battelle ID	Y5305	Y5306	Y5307	Y5308
Sample Weight (g, dry weight)	0.56	3.85	2.62	2.73
Sample Weight (g, wet weight)	6.45	24.83	16.86	16.53
% Lipid	3.15	9.03	5.11	3.90
Extraction Date	11/2/98	11/2/98	11/2/98	11/2/98
Analysis Date	11/14/98	11/14/98	11/14/98	11/14/98
Battelle Sample Batch	98-370	98-370	98-370	98-370
Naphthalene	32.55	9.66	11.15	9.21
2-Methylnaphthalene	15.58	8.92	8.17	4.74
1-Methylnaphthalene	11.96	6.30	5.51	3.84
2,6-Dimethylnaphthalene	5.96 U	5.95	2.01	1.23 U
2,3,5-Trimethylnaphthalene	3.84 U	4.17	0.85	0.79 U
Biphenyl	5.42 U	1.35	1.16 U	1.12 U
Acenaphthylene	5.43 U	7.36	1.17 U	1.12 U
Acenaphthene	7.53	7.18	1.50	1.28 U
Fluorene	4.49 U	8.94	2.05	0.93 U
Phenanthrene	16.41	33.26	6.61	3.02
Anthracene	4.04	15.73	1.48	0.69 U
1-Methylphenanthrene	6.56 U	5.49	1.46	1.35 U
Fluoranthene	32.42	181.22	47.26	12.98
Pyrene	28.79	137.00	36.40	6.94
Benz(a)anthracene	7.68 J	32.46	7.75	1.13 J
Chrysene	12.28	66.04	31.45	6.05
Benzo(b)fluoranthene	10.26	43.56	17.59	2.30
Benzo(k)fluoranthene	7.66	36.61	9.66	2.16
Benzo(e)pyrene	11.42	74.66	14.99	3.82
Benzo(a)pyrene	4.37 J	12.85	9.27	1.56 J
Perylene	8.08	7.78	10.36	4.81
Indeno(1,2,3-c,d)pyrene	5.74 J	13.48	7.21	1.38 U
Dibenz(a,h)anthracene	4.66 U	2.84	0.86 J	0.96 U
Benzo(g,h,i)perylene	8.40	19.09	7.81	2.66
Total PAH	225.17	741.88	241.40	65.23
Surrogate Recoveries (%)				
Naphthalene-d8	51	49	52	43
Phenanthrene-d10	56	52	62	48
Chrysene-d12	66	62	76	60

B = Analyte detected in the blank.
& = QC data outside DQOs.
J = Analyte detected below sample MD
U = Analyte not detected, sample MDL.
NA = Not Applicable.

Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-15-LOB	OFF-16-LOB	OFF-16-LOB-FD	OFF-17-LOB
Battelle ID	Y5309	Y5310	Y5311	Y5312
Sample Weight (g, dry weight)	3.36	2.11	3.48	3.35
Sample Weight (g, wet weight)	18.73	12.18	24.75	21.05
% Lipid	7.10	7.15	4.45	8.22
Extraction Date	11/5/98	11/5/98	11/5/98	11/5/98
Analysis Date	11/15/98	11/15/98	11/15/98	11/15/98
Battelle Sample Batch	98-371	98-371	98-371	98-371
Naphthalene	7.75	19.81	9.02	10.34
2-Methylnaphthalene	4.56	10.14	5.75	7.06
1-Methylnaphthalene	3.75	10.60	4.05	5.18
2,6-Dimethylnaphthalene	1.00 U	1.79	1.97	1.61
2,3,5-Trimethylnaphthalene	0.64 U	1.38	0.62 U	0.65 U
Biphenyl	0.91 U	1.45 U	0.88 U	0.91 U
Acenaphthylene	0.91 U	1.45 U	0.88 U	0.91 U
Acenaphthene	1.04 U	7.51	2.00	1.23
Fluorene	0.74 J	2.63	1.39	1.13
Phenanthrene	3.00	11.21	14.59	4.84
Anthracene	0.57	2.46	4.44	0.90
1-Methylphenanthrene	0.86 J	1.68 J	4.07	2.42
Fluoranthene	14.26	30.82	78.38	34.60
Pyrene	9.12	31.88	71.30	30.69
Benz(a)anthracene	1.25 J	5.77	34.78	8.78
Chrysene	6.96	15.62	58.76	24.75
Benzo(b)fluoranthene	6.47	8.57	39.47	22.32
Benzo(k)fluoranthene	2.62	6.52	30.57	12.75
Benzo(e)pyrene	3.09	8.13	24.75	13.45
Benzo(a)pyrene	3.26	6.83	41.01	19.24
Perylene	4.81 B	11.83 B	9.38 B	3.69 B
Indeno(1,2,3-c,d)pyrene	1.94	3.99	21.84	9.13
Dibenz(a,h)anthracene	0.78 U	1.25 U	2.12	0.99
Benzo(g,h,i)perylene	1.58	3.96	16.19	6.37
Total PAH	76.58	203.12	475.84	221.48
Surrogate Recoveries (%)				
Naphthalene-d8	49	56	51	48
Phenanthrene-d10	54	61	57	56
Chrysene-d12	59	69	63	63

B = Analyte detected in the blank.
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J = Analyte detected below sample MD
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NA = Not Applicable.

Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-18-LOB	OFF-19-LOB	OFF-20-LOB
Battelle ID	Y5313	Y5314	Y5315
Sample Weight (g, dry weight)	2.45	2.99	3.06
Sample Weight (g, wet weight)	20.08	16.38	14.44
% Lipid	6.02	3.75	5.85
Extraction Date	11/5/98	11/5/98	11/5/98
Analysis Date	11/15/98	11/15/98	11/15/98
Battelle Sample Batch	98-371	98-371	98-371
Naphthalene	19.44	14.50	11.82
2-Methylnaphthalene	16.78	10.24	8.97
1-Methylnaphthalene	11.73	7.27	5.67
2,6-Dimethylnaphthalene	2.37	1.56	1.50
2,3,5-Trimethylnaphthalene	2.07	0.72 U	1.28
Biphenyl	1.24 U	0.99 J	1.00 U
Acenaphthylene	1.25 U	1.02 U	1.00 U
Acenaphthene	2.28	1.17 U	1.17
Fluorene	1.99	1.13	1.41
Phenanthrene	10.48	2.94	4.97
Anthracene	1.30	0.63 U	0.88
1-Methylphenanthrene	3.00	1.11 J	1.67
Fluoranthene	73.51	9.67	25.68
Pyrene	54.52	7.50	17.88
Benz(a)anthracene	9.74	1.21 J	2.52
Chrysene	32.49	4.65	11.39
Benzo(b)fluoranthene	19.32	1.96	7.07
Benzo(k)fluoranthene	12.19	1.57	4.10
Benzo(e)pyrene	14.81	2.80	5.98
Benzo(a)pyrene	11.91	1.96	3.65
Perylen	7.79 B	3.71 B	2.26 B
Indeno(1,2,3-c,d)pyrene	8.38	1.26 U	3.01
Dibenz(a,h)anthracene	0.87 J	0.88 U	0.86 U
Benzo(g,h,i)perylene	6.69	1.95	3.50
Total PAH	323.67	76.72	126.41
Surrogate Recoveries (%)			
Naphthalene-d8	52	49	46
Phenanthrene-d10	59	58	53
Chrysene-d12	69	69	61

B = Analyte detected in the blank.
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Laboratory Name: Battelle
Project Name: OFFTA ERA TISSUE ANALYSIS
Surrogate Corrected Data in ng/g dry wt.
Data Not Validated

Client ID	OFF-21-LOB	OFF-21-LOB-FD	OFF-23-LOB
Battelle ID	Y5316	Y5317	Y5318
Sample Weight (g, dry weight)	1.81	1.94	3.42
Sample Weight (g, wet weight)	13.25	12.05	21.12
% Lipid	9.84	3.75	4.01
Extraction Date	11/5/98	11/5/98	11/5/98
Analysis Date	11/15/98	11/15/98	11/15/98
Battelle Sample Batch	98-371	98-371	98-371
Naphthalene	13.68	9.91	13.25
2-Methylnaphthalene	8.59	6.02	13.36
1-Methylnaphthalene	6.81	4.92	7.60
2,6-Dimethylnaphthalene	2.21	2.18	1.73
2,3,5-Trimethylnaphthalene	1.20 U	1.15	1.12
Biphenyl	1.69 U	1.57 U	1.00
Acenaphthylene	1.69 U	1.58 U	0.89 U
Acenaphthene	1.93 U	1.80 U	1.82
Fluorene	1.31 J	1.30 U	2.04
Phenanthrene	4.90	5.95	14.62
Anthracene	1.79	1.74	2.81
1-Methylphenanthrene	1.75 J	3.66	3.16
Fluoranthene	56.18	212.24	81.30
Pyrene	53.75	159.98	63.13
Benz(a)anthracene	7.63	101.61	12.80
Chrysene	15.55	225.04	28.93
Benzo(b)fluoranthene	8.18	315.45	19.91
Benzo(k)fluoranthene	6.46	160.54	11.06
Benzo(e)pyrene	8.45	108.10	14.69
Benzo(a)pyrene	4.81	258.54	12.79
Perylene	9.57 B	37.51 B	3.54 B
Indeno(1,2,3-c,d)pyrene	4.04	114.48	5.65
Dibenz(a,h)anthracene	1.45 U	12.08	0.77 U
Benzo(g,h,i)perylene	4.47	41.84	7.17
Total PAH	220.13	1782.91	323.47
Surrogate Recoveries (%)			
Naphthalene-d8	47	50	27 &
Phenanthrene-d10	61	59	55
Chrysene-d12	68	69	65

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& = QC data outside DQOs.
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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-3-BM	OFF-23-HC	OFF-8-HC	OFF-15-HC	OFF-15-PM
Battelle ID	Y5288	Y5269	Y5270	Y5271	Y5272
Sample Weight (g, dry weight)	1.67	2 42	2.13	2.59	2.06
Sample Weight (g, wet weight)	11.09	25.15	22.37	24.28	25.68
% Lipid	8.76	4.05	3.05	4.71	6.91
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/17/98	11/15/98	11/15/98	11/15/98	11/15/98
Battelle Batch	98-369	98-369	98-369	98-369	98-369
Cl2(08)	2.26	0.49 J	1.24 J	1.12 J	1 66 U
Hexachlorobenzene	0.27 J	0.71	0.74	0.92	0.34
g-BHC	0.41	0.17 U	0.20 U	1 32	0.20 U
Cl3(18)	1 11	0.35 U	0.40 U	0 33 U	0.42 U
Cl3(29)	0.35 U	0.24 U	0.28 U	0.23 U	0.29 U
Cl3(28)	1.70	0.62	0.51	0.88	0.67
Heptachlor	1.01 U	0.70 U	0.79 U	0 65 U	0 82 U
Cl4(52)	4.85	1.16	1.38	2.39	1.99
Aldrin	0.25 U	0.17 U	0.19 U	0.16 U	0 20 U
Cl4(44)	2.20	0.45	0 39	0 54	0.49
Heptachlor epoxide	0 48	0.18 J	0 32 U	0 26 U	0.33 U
Cl4(66)	3.57	1.40	1.24	1 32	1.27
2,4 DDE	1.83 U	1.26 U	1.43 U	1.18 U	1.48 U
Cl5(101)	16.57	2.98	3.90	6 25	5.05
cis Chlordane	4.60	0.89	0.97	1.65	1.28
trans Nonachlor	4.31	0.66	0.71	1.09	1 63
Cl5(87)	4 78	1.03	1.01	0.55 U	1.50
4,4 DDE	18.28	2.87	2.56	4.31	2.88
Cl5(118)	17.92	2.66	3 09	4.36	3.90
4,4 DDD	8.54	2.63	1.39	2.41	2.03
2,4 DDT	1.76 J	0 20 J	0.16 J	0.27 J	0.65 J
Cl6(153)	53.60	8.48	10.71	13 37	17.32
Cl5(105)	1.15 U	0.79 U	0.90 U	0 65 J	1 17
4,4 DDT	5.41	0.77 J	1.13 U	0.93 U	1 17 U
Cl6(138)	35.06	4.72	6.64	8.63	11.49
Cl5(126)	0.84 U	0 58 U	0 66 U	0.54 U	0.68 U
Cl7(187)	16.99	2.94	4.83	6 82	5 83
Cl6(128)	1 44 U	0 99 U	1.13 U	0 93 U	1.17 U
Cl7(180)	3.11 U	3 92	6.74	9 12	8 62
Mirex	0.68	0.28 J	0.28 J	3.61	0.39 U
Cl7(170)	1.44	1.20	1 36	4.51	2 86
Cl8(195)	0.76 U	0.89	1.52	2.10	1.42
Cl9(206)	0.72 U	0.64	1.63	2.87	1 13
Cl10(209)	1.51	1.41	2.89	3 31	1.96
Cl4(50)	0.31 U	0.21 U	0.24 U	0 20 U	0 25 U
Cl7(188)	1 27 U	0.87 U	0.99 U	0 82 U	1 02 U
Cl8(200)	0 76 U	0.52 U	0 59 U	0.49 U	0 61 U
Sum of 24 Congeners	174.25	39.57	54.25	72.31	72.77
Sum of 24 Congeners x 2	348.50	79.15	108.50	144.62	145.54
Surrogate Recoveries (%)					
Cl3(34)	61	59	74	75	68
Cl5(112)	57	60	74	77	63

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NA - Not Applicable
& = QC result outside acceptance criteria.

Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-21-LOB-FD	
Battelle ID	Y5317DUP	
Sample Weight (g, dry weight)	2.10	
Sample Weight (g, wet weight)	13.03	
% Lipid	NA	
Extraction Date	11/05/98	
Analysis Date	11/16/98	
Battelle Batch	98-371	
Cl2(08)	0.58	J
Hexachlorobenzene	0.39	
g-BHC	0.73	
Cl3(18)	0.41	U
Cl3(29)	0.28	U
Cl3(28)	0.93	
Heptachlor	0.81	U
Cl4(52)	1.29	
Aldrin	0.20	U
Cl4(44)	0 33	U
Heptachlor epoxide	0.33	U
Cl4(66)	4 52	
2,4 DDE	1.46	U
Cl5(101)	1.54	J
cis Chlordane	0.36	
trans Nonachlor	0.55	
Cl5(87)	0 58	J
4,4 DDE	13 39	
Cl5(118)	22.86	
4,4 DDD	1.14	
2,4 DDT	0.98	J
Cl6(153)	52.43	
Cl5(105)	3 62	
4,4 DDT	0 25	J
Cl6(138)	32 59	
Cl5(126)	0 67	U
Cl7(187)	13.33	
Cl6(128)	5.04	
Cl7(180)	15.95	
Mirex	0.39	U
Cl7(170)	7.76	
Cl8(195)	1.48	
Cl9(206)	0.63	
Cl10(209)	0.86	
Cl4(50)	0.24	U
Cl7(188)	1.01	U
Cl8(200)	0.60	U
Sum of 24 Congeners	169 53	
Sum of 24 Congeners x 2	339.05	
Surrogate Recoveries (%)		
Cl3(34)	73	
Cl5(112)	69	

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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-17-HC	OFF-21-HC	OFF-12-HC	OFF-20-HC	OFF-10-HC
Battelle ID	Y5273	Y5274	Y5275	Y5276	Y5277
Sample Weight (g, dry weight)	3.76	2.88	4.14	2.17	0.33
Sample Weight (g, wet weight)	25.02	22.91	25.03	25.24	4.86
% Lipid	3.25	6.50	2.75	4 93	5.40
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/15/98	11/15/98	11/15/98	11/15/98	11/16/98
Battelle Batch	98-369	98-369	98-369	98-369	98-369
Cl2(08)	1.47	2.30	1.29	1.48 J	3.33 J
Hexachlorobenzene	0.63	0.77	0.57	0.77	0.85 J
g-BHC	0.11 U	0.15 U	1.65	0.19 U	2.32
Cl3(18)	0.28	0.30 U	0.29	0.40 U	2.57 U
Cl3(29)	0.16 U	0.20 U	0.14 U	0.27 U	1.77 U
Cl3(28)	0.81	0.92	0.95	0.58	1.77 U
Heptachlor	0.45 U	0.59 U	0.41 U	0.78 U	5.07 U
Cl4(52)	1.54	1.99	1.26	3.42	1 54 U
Aldrin	0.11 U	0.14 U	0.10 U	0.19 U	1 24 U
Cl4(44)	0.49	0.74	0 55	0.56	2.08 U
Heptachlor epoxide	0.19	0.13 J	0.17 U	0 32 U	2.06 U
Cl4(66)	1.71	1.60	1.50	1.78	6.54 J
2,4 DDE	0.81 U	1.06 U	0.74 U	1 41 U	9.17 U
Cl5(101)	3.95	5.12	3.41	4.20	3.03 J
cis Chlordane	1.21	1.89	0.96	0.94	1.84 U
trans Nonachlor	1.10	1.17	0.77	0.74	2.79 U
Cl5(87)	1.15	1.28	0.98	1.37	4.01 J
4,4 DDE	5.21	4.84	3.79	3.44	1.89 J
Cl5(118)	4.00	4.22	3.45	3.44	1.13 J
4,4 DDD	2.80	3.17	2.83	3.39	6.80 J
2,4 DDT	0.17 J	0.13 J	0.16 J	0.32 J	1.62 J
Cl6(153)	9.99	11.37	9.39	13 18	9 09 J
Cl5(105)	1.15	0.96	0.77	0.88 U	5.74 U
4,4 DDT	0.59 J	0.84 U	0 48 J	0 61 J	7 23 U
Cl6(138)	6.37	7.11	4 86	8.32	7.17 J
Cl5(126)	0.37 U	0.49 U	0 34 U	0.65 U	4 20 U
Cl7(187)	4.59	4.51	3 49	4.23	2 31 J
Cl6(128)	0.64 U	0.84 U	0.58 U	1.11 U	7.22 U
Cl7(180)	6.44	6.94	5 08	7.53	5.22 J
Mirex	0.35	0.30	0.20	0.41	2.43 U
Cl7(170)	1.35	1.85	1.36	2.06	8.21
Cl8(195)	1.47	1 33	1.00	1.20	0 86 J
Cl9(206)	1.29	1.30	0.75	0.89	0.67 J
Cl10(209)	2.09	1.77	1.28	2.38	3.57 J
Cl4(50)	0.14 U	0.18 U	0.12 U	0.24 U	1.54 U
Cl7(188)	0.56 U	0.73 U	0.51 U	0.98 U	6.34 U
Cl8(200)	0.34 U	0.44 U	0.30 U	0.58 U	3.78 U
Sum of 24 Congeners	52.34	58.47	43.65	61.73	93.68
Sum of 24 Congeners x 2	104.68	116.95	87.30	123.45	187.36
Surrogate Recoveries (%)					
Cl3(34)	65	77	52	53	54
Cl5(112)	67	78	52	53	53

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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-11-HC	OFF10HCFD	OFF-16-HC	OFF-14-PM	OFF-19-PM
Battelle ID	Y5278	Y5279	Y5280	Y5281	Y5282
Sample Weight (g, dry weight)	2.41	1.78	2.47	1.82	1.72
Sample Weight (g, wet weight)	24.17	24.51	25.46	25.27	23.65
% Lipid	6.09	4.54	3.96	4.93	6.59
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/16/98	11/16/98	11/16/98	11/16/98	11/16/98
Battelle Batch	98-369	98-369	98-369	98-369	98-369
Cl2(08)	2.95	2.81	1.81	1.88 U	1.70 J
Hexachlorobenzene	0.97	1.09	1.01	0.36 U	0.64
g-BHC	0.17 U	2.29	1.66	0.23 U	0.24 U
Cl3(18)	0.35 U	0.48 U	0.18 J	0.47 U	0.12 J
Cl3(29)	0.24 U	0.33 U	0.24 U	0.32 U	0.34 U
Cl3(28)	1.34	0.77	1.07	0.32 U	0.67
Heptachlor	0.70 U	0.95 U	0.27 J	0.93 U	0.98 U
Cl4(52)	1.22	1.84	1.29	1.73	2.18
Aldrin	0.17 U	0.23 U	0.17 U	0.23 U	0.24 U
Cl4(44)	0.50	0 47	0.35	0.63	0 65
Heptachlor epoxide	0.28 U	0.38 U	0.28 U	0.38 U	0.40 U
Cl4(66)	1.52	1.61	1.22	1.27 J	1.34 J
2,4 DDE	1.27 U	1.71 U	1.24 U	1.68 U	1.77 U
Cl5(101)	4.00	3.17	2.26 U	4.16	4.18
cis Chlordane	1.17	1.18	1.63	0.93	1.18
trans Nonachlor	0.83	0.50 J	0.95	1.39	1.69
Cl5(87)	1.31	0 99	1.05	1.50	1.18
4,4 DDE	5.87	3.15	2.19 U	1.95 J	2.32 J
Cl5(118)	3.64	2.24 J	4.54	2.94	3 02
4,4 DDD	2.93	2.63	2.90	1.68	1.80
2,4 DDT	1.53 U	0.26 J	0.57 J	2.14	2.24
Cl6(153)	12.23	8.71	11.13	13.86	13.84
Cl5(105)	0.79 U	3.88	2.85	0 93 J	0.74 J
4,4 DDT	0.54 J	0.64 J	0 45 J	1.32 U	0 34 J
Cl6(138)	6 54	5.21	7 89	9.19	9 17
Cl5(126)	0.58 U	0.78 U	0 57 U	0.77 U	0.81 U
Cl7(187)	4.17	2.95	4 36	4.42	4.76
Cl6(128)	1 00 U	1.35 U	0.97 U	1.32 U	1.39 U
Cl7(180)	6.26	5.14	6.99	6.33	7.28
Mirex	0 24 J	0.35 J	0.36	0.44 U	0.24 J
Cl7(170)	2.60	1.83	2.58	2.44	1 64
Cl8(195)	1.18	0.96	1.49	1.24	1.36
Cl9(206)	0.94	0.75	1.42	0.83	1.11
Cl10(209)	1.84	1.84	2.27	1.42	1 68
Cl4(50)	0.21 U	0.29 U	0.21 U	0.28 U	0.30 U
Cl7(188)	0.87 U	1.18 U	0.85 U	1.16 U	1.22 U
Cl8(200)	0.52 U	0.71 U	0.51 U	0.69 U	0.73 U
Sum of 24 Congeners	56.83	50.31	58 11	60.12	61.42
Sum of 24 Congeners x 2	113.67	100.61	116 22	120.24	122.84
Surrogate Recoveries (%)					
Cl3(34)	57	59	67	68	68
Cl5(112)	56	62	68	66	66

J = Analyte detected below sample specific MDL.
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NA - Not Applicable
& = QC result outside acceptance criteria.

Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-7-BM	OFF-6-BM	OFF-5-BM	OFF-4-BM	OFF-15-HC-FD
Battelle ID	Y5284	Y5285	Y5286	Y5287	Y5283
Sample Weight (g, dry weight)	3.68	2.52	0.64	3.07	2.45
Sample Weight (g, wet weight)	24.55	23.97	4.13	21.74	17.65
% Lipid	8.21	6.11	17.18	7.95	3.30
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/17/98	11/17/98	11/17/98	11/17/98	11/16/98
Battelle Batch	98-369	98-369	98-369	98-369	98-369
Cl2(08)	2.04	2.89	2.12 J	2.32	2.51
Hexachlorobenzene	0.24	0.59	0.54 J	0.33	0.82
g-BHC	0.72	0.34	0.66	0.58	1.21
Cl3(18)	1.16	0.78	0.82 J	0.93	0.27 J
Cl3(29)	0.16 U	0.23 U	0.92 U	0.19 U	0.24 U
Cl3(28)	1.85	1.51	1.34	1.30	0.76
Heptachlor	0.46 U	0.67 U	2.65 U	0 55 U	0.69 U
Cl4(52)	4.08	3.99	4.37	3 87	1.42
Aldrin	0.11 U	0.16 U	0.65 U	0.13 U	0.17 U
Cl4(44)	2.55	1.82	1.60	1.75	0.43
Heptachlor epoxide	0.41	0.27 U	1 08 U	0.22 U	0.10 J
Cl4(66)	3.86	2 86	4.36	2.88	1.59
2,4 DDE	0.83 U	1.21 U	4.80 U	1.00 U	1.25 U
Cl5(101)	14.02	10.59	15.44	13.16	4.15
cis Chlordane	4.47	0.24 U	4.70	4.01	0.91
trans Nonachlor	4.06	3.16	3.50	3.69	0.73
Cl5(87)	4.12	3.23	4.84	3.55	1.20
4,4 DDE	19.07	2.15 U	15.75	14.75	2.69
Cl5(118)	16.28	1.90 U	15.74	13.74	3.64
4,4 DDD	10.57	6.62	9 38	7.16	1 78
2,4 DDT	1.15	0.83 J	2.93 J	1.92	0.77 J
Cl6(153)	48.95	36.68	48.13	41.28	12.47
Cl5(105)	4.13	3.01	3.93	3.59	2.74
4,4 DDT	4 33	4.05	3.85	4.13	0.44 J
Cl6(138)	31.92	22.88	31 83	26.52	6.69
Cl5(126)	0 38 U	0.56 U	2.20 U	0 46 U	0.57 U
Cl7(187)	15.77	11 06	14 65	12 77	5 08
Cl6(128)	0.65 U	1.68	3.77 U	0.50 J	0.98 U
Cl7(180)	4.06	13 36	16.09	15.57	7 78
Mirex	0.33	0.35	5.73	0.74	0 31 J
Cl7(170)	1.01	0.84	0.85 J	0.95	1.78
Cl8(195)	0.34 U	0.11 J	1.98 U	0.15 J	1.54
Cl9(206)	0.32 U	0.13 J	1.17 J	0 26 J	1.36
Cl10(209)	1.11	0.97	1.51 J	1 44	2.07
Cl4(50)	0.14 U	0.20 U	0.80 U	0 17 U	0.21 U
Cl7(188)	0.57 U	0.84 U	3.31 U	0 69 U	0.86 U
Cl8(200)	0.34 U	0.50 U	1.98 U	0 41 U	0.51 U
Sum of 24 Congeners	159.84	122 64	183.77	148.47	60 86
Sum of 24 Congeners x 2	319.67	245 27	367.53	296.93	121.72
Surrogate Recoveries (%)					
Cl3(34)	56	72	61	63	61
Cl5(112)	52	64	58	58	63

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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF15HCFD	OFF-1-BM	OFF-2-BM	OFF-22-BM	OFF-5-BM-FD
Battelle ID	Y5283DUP	Y5290	Y5289	Y5291	Y5292
Sample Weight (g, dry weight)	2.17	1.55	3.11	3.51	3.69
Sample Weight (g, wet weight)	15.62	12.41	21.45	23.41	22.94
% Lipid	NA	5.10	6.36	5.92	7.04
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/16/98	11/12/98	11/12/98	11/12/98	11/13/98
Battelle Batch	98-369	98-370	98-370	98-370	98-370
Cl2(08)	2.47	2.08 J	2.39	3.02	1.95
Hexachlorobenzene	0.95	0.42 U	0.25	0.19 U	0.18 J
g-BHC	1.13	0.37	0.30	0.42	0.46
Cl3(18)	0.24 J	0.55 U	0.95	1.47	1.16
Cl3(29)	0.27 U	0.38 U	0.19 U	0.17 U	0.16 U
Cl3(28)	0.82	0.85	1.05	0.68	1.17
Heptachlor	0.78 U	1.09 U	0.54 U	0 48 U	0.46 U
Cl4(52)	1.31	4.56	5.92	4 43	4.92
Aldrin	0.19 U	0.27 U	0.13 U	0.12 U	0.11 U
Cl4(44)	0.44	1.83	2.53	2.11	3 39
Heptachlor epoxide	0.10 J	0.44 U	0.22 U	0 20 U	0.19 U
Cl4(66)	1.56	2.04	2.12	1.41	2.20
2,4 DDE	1.41 U	1.97 U	0.98 U	0 87 U	0 83 U
Cl5(101)	4.12	15.21	13.95	10.08	15.36
cis Chlordane	1.05	4.72	4 93	4.36	4.61
trans Nonachlor	0.87	3.44	4.08	2.74	3 04
Cl5(87)	1.23	2.74	2.74	2.13	2.97
4,4 DDE	3.67	13.04	13.87	15.02	13.50
Cl5(118)	4.53	14.49	11.97	9.31	12.44
4,4 DDD	1.73	5.24	4.35	6.55	5.24
2,4 DDT	0.80 J	1.18 J	2.34	2.84	1.95
Cl6(153)	12.16	50.46	46.64	32.66	44.51
Cl5(105)	2.78	2.64	2.62	1 90	4.53
4,4 DDT	0.61 J	2.41	4.18	4 10	3.37
Cl6(138)	7.03	30.84	29.24	20.80	27.68
Cl5(126)	0.64 U	0.90 U	0.45 U	0.40 U	0.38 U
Cl7(187)	5.01	15.96	15.72	11.09	14 61
Cl6(128)	1.11 U	3 86	4.04	2.10	3.81
Cl7(180)	7.70	6.05	4.27	2.70	4.80
Mirex	0.64	0.52 U	0.26 U	0.23 U	0 22 U
Cl7(170)	1.53	1.16 U	1.24	0.51 U	0.49 U
Cl8(195)	1.47	0.81 U	0.40 U	0.36 U	0.34 U
Cl9(206)	1.25	0.77	0 29 J	0.73	0.76
Cl10(209)	2.02	1.61	0.92	0.64	0.83
Cl4(50)	0.24 U	0.33 U	0.16 U	0.15 U	0.14 U
Cl7(188)	0.97 U	1.36 U	0.68 U	0.60 U	0.57 U
Cl8(200)	0.58 U	0.81 U	0.40 U	0.36 U	0.34 U
Sum of 24 Congeners	61.48	162.30	150.88	109 78	149.52
Sum of 24 Congeners x 2	122.95	324.60	301.76	219.56	299.04
Surrogate Recoveries (%)					
Cl3(34)	69	53	58	46	56
Cl5(112)	69	50	58	45	54

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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-1-CN	OFF-2-CN	OFF-3-CN	OFF-4-CN	OFF-14-DEP
Battelle ID	Y5293	Y5294	Y5295	Y5296	Y5298
Sample Weight (g, dry weight)	1.78	4.17	2.14	0.56	2.85
Sample Weight (g, wet weight)	7.34	16.80	9.12	2.67	22.29
% Lipid	19.38	17.50	10.55	25.84	7.56
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/13/98	11/13/98	11/13/98	11/13/98	11/13/98
Battelle Batch	98-370	98-370	98-370	98-370	98-370
Cl2(08)	16.45	15.75	13.33	18 08	2.46
Hexachlorobenzene	2.74	1.56	1 01	1.39	0.43
g-BHC	0.55	0.43	0.20	0.75 U	0.70
Cl3(18)	0.48 U	0.21 U	0.40 U	1.53 U	0.30 U
Cl3(29)	0.33 U	0.14 U	0 28 U	1 05 U	0.21 U
Cl3(28)	2.36	1.57	1 23	1 05 U	1.92
Heptachlor	0.95 U	0.41 U	0.79 U	3.02 U	0 59 U
Cl4(52)	11.45	9.17	7.24	7.10	5 83
Aldrin	0.23 U	0.10 U	0.19 U	0.74 U	0.15 U
Cl4(44)	1 93	1.80	0.32 U	1.24 U	2 70
Heptachlor epoxide	1.00	0.84	0.54	1.22 U	0 24 U
Cl4(66)	2.75	1.62	0.69 J	4.63 U	3.02
2,4 DDE	1.72 U	0.73 U	1.43 U	5 46 U	1 07 U
Cl5(101)	31.99	15.05	27.41	20.48	27 27
cis Chlordane	7.97	6.90	3.63	7.04	11.07
trans Nonachlor	10.33	10.71	6.69	8.11	3 81
Cl5(87)	7.89	6.42	3.90	2.48 J	4 75
4,4 DDE	45.15	39.95	31.03	33 17	10 79
Cl5(118)	43.24	54.72	36.04	58.78	19 88
4,4 DDD	11.57	8.21	5.60	6.51	3.64
2,4 DDT	3.17	3.07	2.06	2.45 J	1 24 J
Cl6(153)	137.60	216.63	120.05	176.35	64.23
Cl5(105)	7.87	9.92	5.17	10.99	3 72
4,4 DDT	12.94	11.87	10.22	7.44	0.85 U
Cl6(138)	92.08	137.10	79.22	112.84	41 46
Cl5(126)	0.79 U	0.34 U	0.65 U	2.50 U	0 49 U
Cl7(187)	42.39	63.16	36.07	54.04	18 48
Cl6(128)	9.15	11.93	5.10	9 37	5 26
Cl7(180)	42.62	77.14	38.98	64 15	12 10
Mirex	0.46 U	0.19 U	0.38 U	1 44 U	0.28 U
Cl7(170)	20.30	27.49	18.46	28 02	2.70
Cl8(195)	4.76	5.50	3.73	6 57	0.37 J
Cl9(206)	2.53	4.35	2.10	2.86	0.82
Cl10(209)	2.98	2.83	2.36	5.01	0.74
Cl4(50)	0.29 U	0.12 U	0 24 U	0.92 U	0.18 U
Cl7(188)	1.19 U	0.51 U	0.99 U	3.77 U	0 74 U
Cl8(200)	0.71 U	0.30 U	0.59 U	2.25 U	0.44 U
Sum of 24 Congeners	484.14	663.77	404 56	596.05	220.10
Sum of 24 Congeners x 2	968.27	1327.53	809.11	1192 10	440.20
Surrogate Recoveries (%)					
Cl3(34)	60	54	49	65	47
Cl5(112)	58	57	50	64	51

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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-17-DEP	OFF-18-DEP	OFF-19-DEP	OFF-20-DEP	OFF-21-DEP
Battelle ID	Y5299	Y5300	Y5301	Y5302	Y5303
Sample Weight (g, dry weight)	2.47	3.83	3 72	2.89	3.34
Sample Weight (g, wet weight)	14.51	23.10	21.89	19.25	20.98
% Lipid	8.96	10.43	9.65	8.69	8.37
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/13/98	11/14/98	11/14/98	11/14/98	11/14/98
Battelle Batch	98-370	98-370	98-370	98-370	98-370
Cl2(08)	1.78	2.59	1.34	1.02 J	1.41
Hexachlorobenzene	0.44	0.97	0.69	0.35	0.50
g-BHC	0.75	0.87	1.05	0.76	0.72
Cl3(18)	0.35 U	0.80	0.23 U	1.36	2.78
Cl3(29)	0.24 U	0.15 U	0.16 U	0.20 U	0.18 U
Cl3(28)	1.70	2.34	1 94	1.21	1.75
Heptachlor	0.68 U	0.44 U	0.45 U	0.59 U	0 51 U
Cl4(52)	7.76	8.09	7.65	4 83	7.29
Aldrin	0.17 U	0.11 U	0.11 U	0 14 U	0.12 U
Cl4(44)	3.04	4 60	3.02	2 38	2.96
Heptachlor epoxide	0.28 U	0.18 U	0.18 U	0.24 U	0.21 U
Cl4(66)	3.59	3.94	4 25	2.82	4.03
2,4 DDE	1.24 U	0.80 U	0.82 U	1.06 U	0.92 U
Cl5(101)	28.92	21.71	25.69	17.70	24.36
cis Chlordane	19.09	10.29	12.05	9.97	13.81
trans Nonachlor	7.56	0.24 U	5.26	3.91	6.36
Cl5(87)	5.45	4.95	5.72	3.28	4 70
4,4 DDE	24 74	30.01	12.40	11 10	19 54
Cl5(118)	19.20	19.76	16.71	10.22	17.56
4,4 DDD	15.16	21.67	5.08	5.78	11 03
2,4 DDT	1.59	1 66	1 35	1.02 J	1.67
Cl6(153)	53.77	53.60	51 73	31.37	45 85
Cl5(105)	5.65	5.63	3.76	2.35	4.64
4,4 DDT	2.28	2.38	1.77	0 99	2.31
Cl6(138)	34.42	35.75	34.80	20.94	29.81
Cl5(126)	0.57 U	0.37 U	0.38 U	0.49 U	0.42 U
Cl7(187)	17.49	15.69	14.53	9 91	16.20
Cl6(128)	4.82	5.13	4.11	2.56	4.45
Cl7(180)	4 51	8.48	9.14	6 37	4.84
Mirex	0.33 U	0.31	0 22 U	0.28 U	0 24 U
Cl7(170)	0.73 U	1.95	2 54	1 42	1.91
Cl8(195)	0.38 J	0.52	0 34 U	0 23 J	0.22 J
Cl9(206)	1.09	0.31 U	0.32 U	0.41 U	0.36 U
Cl10(209)	0.71 J	0.79	0.88	0.58 J	0.54
Cl4(50)	0.21 U	0.13 U	0.14 U	0.18 U	0.15 U
Cl7(188)	0.85 U	0.55 U	0.57 U	0.73 U	0.63 U
Cl8(200)	0.51 U	0.33 U	0.34 U	0.44 U	0.38 U
Sum of 24 Congeners	197.72	198.16	190.27	122.98	177.42
Sum of 24 Congeners x 2	395.44	396.31	380.54	245.96	354 83
Surrogate Recoveries (%)					
Cl3(34)	49	59	50	59	45
Cl5(112)	50	55	53	62	47

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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-23-DEP	OFF-T0-DEP	OFF-18-DEP-FD	OFF-13-LOB
Battelle ID	Y5304	Y5305	Y5306	Y5307
Sample Weight (g, dry weight)	3 43	0.56	3.85	2.62
Sample Weight (g, wet weight)	21.50	6.45	24.83	16.86
% Lipid	8.87	3.15	9.03	5 11
Extraction Date	11/02/98	11/02/98	11/02/98	11/02/98
Analysis Date	11/15/98	11/15/98	11/15/98	11/15/98
Battelle Batch	98-370	98-370	98-370	98-370
Cl2(08)	1.47	6.09 U	1.66	0.55 J
Hexachlorobenzene	0.55	1.16 U	0 81	0 35
g-BHC	0.48	0.31 J	0.71	1.46
Cl3(18)	0.25 U	1.52 U	0.22 U	0.33 U
Cl3(29)	0.17 U	1.05 U	0 15 U	0.22 U
Cl3(28)	1.46	1.05 U	1 76	0.78
Heptachlor	0.49 U	3.00 U	0 44 U	0 64 U
Cl4(52)	8.05	0 91 U	8.06	2.16
Aldrin	0.12 U	0.74 U	0 11 U	0 16 U
Cl4(44)	3.68	1.23 U	4 81	0 26 U
Heptachlor epoxide	0.20 U	1.22 U	0.18 U	0 26 U
Cl4(66)	4.32	4.61 U	4.03	4 33
2,4 DDE	0.89 U	5.43 U	0.79 U	1 17 U
Cl5(101)	22.81	9.08 J	24.55	2.80
cis Chlordane	10.97	7.27	14 95	1.34
trans Nonachlor	5.34	1.40 J	6.72	0.69
Cl5(87)	4.70	2.55 U	5 05	0.48 J
4,4 DDE	18 84	3.63 J	27.97	22 05
Cl5(118)	17.51	4 75 J	19 62	21 44
4,4 DDD	10.51	2.26 J	19 90	1.10
2,4 DDT	2.09	6.57 U	1.45	0.79 J
Cl6(153)	47.39	17 25	45 84	50.74
Cl5(105)	4.66	3.40 U	4 74	3.56
4,4 DDT	2.21	4.28 U	2.15	0 38 J
Cl6(138)	30.56	12.69	32.71	29 52
Cl5(126)	0 41 U	2.49 U	0.36 U	0.53 U
Cl7(187)	13.07	6.78	15.55	15.45
Cl6(128)	4 21	0.94 J	4.82	4 66
Cl7(180)	7.72	9.22 U	7.42	14.32
Mirex	0.24 U	1.44 U	0 21 U	0 45
Cl7(170)	2.17	3.19 U	2 11	5 31
Cl8(195)	0.23 J	2.24 U	0 43	1 33
Cl9(206)	0.35 U	2.12 U	0 31 U	0.46 U
Cl10(209)	0.60	3.13 U	0.81	0 76
Cl4(50)	0.15 U	0.91 U	0.13 U	0 20 U
Cl7(188)	0 62 U	3.75 U	0 55 U	0 81 U
Cl8(200)	0.37 U	2.24 U	0.33 U	0 48 U
Sum of 24 Congeners	176.90	103.18	186.02	161 50
Sum of 24 Congeners x 2	353.81	206.36	372 05	322 99
Surrogate Recoveries (%)				
Cl3(34)	50	63	51	71
Cl5(112)	53	62	51	68

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Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-14-LOB	OFF-13-DEP	OFF-13-DEP	OFF-16-LOB	OFF-15-LOB
Battelle ID	Y5308	Y5297	Y5297DUP	Y5310	Y5309
Sample Weight (g, dry weight)	2.73	1.90	1.89	2.11	3.36
Sample Weight (g, wet weight)	16.53	12.13	12.07	12.18	18.73
% Lipid	3.90	8.51	8.51	7	7
Extraction Date	11/02/98	11/02/98	11/02/98	11/05/98	11/05/98
Analysis Date	11/15/98	11/13/98	11/13/98	11/16/98	11/15/98
Battelle Batch	98-370	98-370	98-370	98-371	98-371
Cl2(08)	1.26 U	1.16 J	1.46 J	1.07 J	0.40 J
Hexachlorobenzene	0.44	0.34 J	0.38	0.37	0 26
g-BHC	0.60	0.51	0.52	1.02	1.02
Cl3(18)	0.31 U	0.45 U	0.45 U	0.41 U	0.26 U
Cl3(29)	0.22 U	0.31 U	0.31 U	0.28 U	0.18 U
Cl3(28)	0.30	1.85	1.86	1 11	0 34
Heptachlor	0.62 U	0.89 U	0.90 U	0.80 U	0 50 U
Cl4(52)	0.19 U	7.73	7.23	1.27	0 77
Aldrin	0.15 U	0.22 U	0.22 U	0 20 U	0.12 U
Cl4(44)	0.25 U	3.77	3 49	0.33 U	0.21 U
Heptachlor epoxide	0.25 U	0.36 U	0.36 U	0.33 U	0.20 U
Cl4(66)	1.82	3.14	3.41	3.05	3.01
2,4 DDE	1.12 U	1.61 U	1.62 U	1.45 U	0.91 U
Cl5(101)	1.38 J	25.89	23.68	0.70 J	0.77 J
cis Chlordane	0.47	14.54	15.08	0.47	0.16 J
trans Nonachlor	0.34 U	5.67	6.11	0.39 J	0.28
Cl5(87)	0.53 U	3.52	4.81	0.32 J	0.25 J
4,4 DDE	5.89	19.36	26.75	5.32	9.17
Cl5(118)	13.90	12.02	15.73	12.10	21.82
4,4 DDD	0.59 J	13 00	17.57	0.79 J	0.41 J
2,4 DDT	0 48 J	0.99 J	0.71 J	0 31 J	0.75 J
Cl6(153)	29 49	31.59	44 84	19.41	50 71
Cl5(105)	2.16	2.86	3.73	2.13	3.38
4,4 DDT	0.88 U	1.15 J	1.46	0.23 J	0.72 U
Cl6(138)	17.79	21.68	29.91	15.51	31.19
Cl5(126)	0.51 U	0 74 U	0.74 U	0.66 U	0.42 U
Cl7(187)	9.50	10.37	14.48	6.57	15.82
Cl6(128)	0.88 U	2.70	3.75	2.45	4.70
Cl7(180)	10 38	5.14	7.06	5.55	17.15
Mirex	0.30 U	0.43 U	0.43 U	0.38 U	0 24 U
Cl7(170)	5.01	0.95 U	0.95 U	2 69	7.59
Cl8(195)	1.13	0.66 U	0.67 U	0 80	1 59
Cl9(206)	0.44 U	0.75	0.79	0.25 J	0 68
Cl10(209)	0.81	0.93 U	0 89 J	0 57 J	0.81
Cl4(50)	0.19 U	0.27 U	0.27 U	0.24 U	0.15 U
Cl7(188)	0.77 U	1.11 U	1.12 U	1.00 U	0.63 U
Cl8(200)	0.46 U	0.66 U	0.67 U	0.19 J	0.38 U
Sum of 24 Congeners	99.67	140.27	172.31	78.67	163.18
Sum of 24 Congeners x 2	199.34	280.54	344.62	157 34	326.35
Surrogate Recoveries (%)					
Cl3(34)	56	56	60	74	65
Cl5(112)	53	77	59	73	64

J = Analyte detected below sample specific MDL.
U = Analyte not detected, sample specific MDL.
NA - Not Applicable
& = QC result outside acceptance criteria.

Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-16-LOB-FD	OFF-17-LOB	OFF-18-LOB	OFF-19-LOB
Battelle ID	Y5311	Y5312	Y5313	Y5314
Sample Weight (g, dry weight)	3.48	3.35	2.45	2.99
Sample Weight (g, wet weight)	24.75	21.05	20.08	16.38
% Lipid	4	8	6	4
Extraction Date	11/05/98	11/05/98	11/05/98	11/05/98
Analysis Date	11/16/98	11/16/98	11/16/98	11/16/98
Battelle Batch	98-371	98-371	98-371	98-371
Cl2(08)	0.40 J	4.38	1.40 U	1.15 U
Hexachlorobenzene	0.30	0.26	0.55	0.40
g-BHC	1.73	0.90	1.90	0.14 U
Cl3(18)	0.25 U	3.58	0 35 U	0.29 U
Cl3(29)	0.17 U	0.18 U	0.24 U	0.20 U
Cl3(28)	0.35	30.42	0.69	0.42
Heptachlor	0.49 U	0.50 U	0.69 U	0.57 U
Cl4(52)	1 13	20.33	2.18	0 89
Aldrin	0.12 U	0.12 U	0 17 U	0.14 U
Cl4(44)	0.20 U	0 31	0 28 U	0 23 U
Heptachlor epoxide	0.20 U	0.20 U	0.28 U	0.08 J
Cl4(66)	1.96	9.61	3.01	1.92
2,4 DDE	0.88 U	0.91 U	1.25 U	1.02 U
Cl5(101)	0 62 J	9.15	1.03 J	0.58 J
cis Chlordane	0.47	0.23	0.45	0.43
trans Nonachlor	0.35	0.33	0.55	0.19 J
Cl5(87)	0.43	0.88	0.55 J	0.46 J
4,4 DDE	5.97	4.15	11.63	5.32
Cl5(118)	8.84	18 44	12.57	12.71
4,4 DDD	1.02	0.68	1.57	0.30 J
2,4 DDT	0 16 J	0.41 J	0 46 J	1 24 U
Cl6(153)	20 37	25.58	22.93	29 18
Cl5(105)	1.68	2.54	2.18	1 76
4,4 DDT	0.63 J	0.10 J	0.56 J	0 06 J
Cl6(138)	13.26	17.44	16.30	15 39
Cl5(126)	0.40 U	0 42 U	0.57 U	0.47 U
Cl7(187)	6.10	5 69	7.66	9.72
Cl6(128)	1.98	3 24	3 11	2.31
Cl7(180)	6 39	5.74	7 44	10.91
Mirex	0 23 U	0.24 U	0 22 J	0 50
Cl7(170)	3.09	3.21	3.67	5 20
Cl8(195)	0.82	0.60	1.02	0.93
Cl9(206)	0.58	0.25 J	0.15 J	0.33 J
Cl10(209)	1.11	0.48 J	0.84	0.52 J
Cl4(50)	0.15 U	0.15 U	0.21 U	0.17 U
Cl7(188)	0.61 U	0.63 U	0.86 U	0.71 U
Cl8(200)	0.36 U	0 14 J	0.51 U	0.42 U
Sum of 24 Congeners	71.26	163 38	89.74	96 87
Sum of 24 Congeners x 2	142 52	326.76	179.48	193.75
Surrogate Recoveries (%)				
Cl3(34)	68	68	73	69
Cl5(112)	64	66	70	112

J = Analyte detected below sample specific MDL.
U = Analyte not detected, sample specific MDL.
NA - Not Applicable
& = QC result outside acceptance criteria.

Laboratory Name: Battelle Duxbury Operations
Project Name: OFFTA ERA TISSUE ANALYSIS
PCB/Pesticide Surrogate Corrected Data
Data Not Validated
Units: ng/g dry wt.

Client ID	OFF-20-LOB	OFF-21-LOB	OFF-23-LOB	OFF-21-LOB-FD
Battelle ID	Y5315	Y5316	Y5318	Y5317
Sample Weight (g, dry weight)	3.06	1.81	3.42	1 94
Sample Weight (g, wet weight)	14.44	13.25	21.12	12 05
% Lipid	6	10	4	4
Extraction Date	11/05/98	11/05/98	11/05/98	11/05/98
Analysis Date	11/16/98	11/16/98	11/17/98	11/16/98
Battelle Batch	98-371	98-371	98-371	98-371
Cl2(08)	0.52 J	0.84 J	0 36 J	0.49 J
Hexachlorobenzene	0.43	0.44	0.30	0 39
g-BHC	0.91	1.34	1.36	0.75
Cl3(18)	0.28 U	0.47 U	0.25 U	0.44 U
Cl3(29)	0.19 U	0.33 U	0.17 U	0.30 U
Cl3(28)	0.35	0.71	0.38	0.94
Heptachlor	0.55 U	0.93 U	0.49 U	0.87 U
Cl4(52)	0 84	1.50	1.28	1.16
Aldrin	0.14 U	0.23 U	0.12 U	0 21 U
Cl4(44)	0.23 U	0.38 U	0.20 U	0 36 U
Heptachlor epoxide	0.22 U	0.38 U	0.20 U	0 35 U
Cl4(66)	1.78	3.63	3.28	4 76
2,4 DDE	1.00 U	1.69 U	0.89 U	1 58 U
Cl5(101)	0.47 J	1.19 J	1 08 J	1.22 J
cis Chlordane	0.25	0.35	0.24	0.40
trans Nonachlor	0.23 J	0.59	0.26 J	0 55
Cl5(87)	0.24 J	0.55 J	0.43	0.62 J
4,4 DDE	5.54	10.02	12.17	14 51
Cl5(118)	10.46	16.46	20.75	24.16
4,4 DDD	0.81	0.73 J	0.83	1.19
2,4 DDT	0.43 J	0.61 J	0 69 J	0.70 J
Cl6(153)	25.99	33.02	45.91	55.50
Cl5(105)	1.70	2.51	3.18	4 56
4,4 DDT	0 25 J	0 24 J	0.27 J	0.30 J
Cl6(138)	16 66	23.14	28 92	35.49
Cl5(126)	0.46 U	0.77 U	0 41 U	0.72 U
Cl7(187)	8.35	11.84	14.02	14.24
Cl6(128)	2.66	3.66	5.17	5.72
Cl7(180)	8.28	11.44	12.15	17.30
Mirex	0.26 U	0.45 U	0.17 J	0.42 U
Cl7(170)	3 67	5.45	4.76	6.72
Cl8(195)	0.95	1.38	1 32	1.46
Cl9(206)	0.24 J	0.28 J	0.55	0.75
Cl10(209)	0.70	0.76 J	0.83	0.75 J
Cl4(50)	0.17 U	0.28 U	0.15 U	0.26 U
Cl7(188)	0.69 U	1.17 U	0.62 U	1.09 U
Cl8(200)	0.23 J	0.48 J	0.60	0.65 U
Sum of 24 Congeners	86 11	122.25	146.77	179 69
Sum of 24 Congeners x 2	172.22	244.51	293.55	359 39
Surrogate Recoveries (%)				
Cl3(34)	64	72	69	72
Cl5(112)	62	69	65	68

J = Analyte detected below sample specific MDL.
U = Analyte not detected, sample specific MDL.
NA - Not Applicable
& = QC result outside acceptance criteria.

APPENDIX B
EFFECTS DATA

APPENDIX B-1
TOXICITY TEST RESULTS

Amphipod and Sea Urchin Toxicity Test Results Draft Report

Marine Ecological Risk Assessment Old Fire Fighting Training Area Naval Education and Training Center Newport, Rhode Island

11 August 1998

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Section A
10-Day Amphipod Survival
Bulk Sediment
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Introduction

The acute toxicity of sediments collected from the Old Fire Fighting Training Center at the Naval Education and Training Center (NETC) in, Newport, RI, was assessed as a measure of the biological effects of sediment contaminants and to evaluate the bioavailability of contaminants in bulk sediments. These data will be used in the Ecological Effects component of the Ecological Risk Assessment being conducted for the the Old Fire Fighting Training Center at NETC. Sediment samples were evaluated for toxicity using the 10-day amphipod test at Science Applications International Corporation's (SAIC) Environmental Testing Center (ETC) following the Standard Operating Procedure (SOP), Conducting the 10-Day Solid-Phase Test Using the Four Marine Amphipods *Ampelisca abdita, Eohaustorius estuarius, Leptocheirus plumulosus,* and *Rhepoxynius abronius* (Appendix A). The euryhaline benthic amphipod, *Ampelisca abdita*, which ranges from Newfoundland to Florida and the Gulf of Mexico was used. This tube-dwelling amphipod constructs a soft, upright, membranous tube 3 to 4 cm long in fine-grained sediments from the intertidal zone to a depth of 60 m. *Ampelisca* ingest either surface-deposited particles or particles in suspension, and respire in both overlying and interstitial waters.

The 10-day amphipod test has been used extensively to assess the toxicity of laboratory-spiked and field collected sediments to *Ampelisca abdita* (DiToro et al. 1992, Scott and Redmond 1989, Long et al. 1990). In addition, *Ampelisca abdita* has been used routinely for sediment toxicity tests conducted by SAIC in support of numerous EPA programs (SAIC 1990a, SAIC 1991, SAIC 1992a, and SAIC 1993a). It was the most sensitive species tested in the U.S.EPA/U.S.ACE Field Verification Program, and has formed the toxicological basis for EPA research on the availability of metals in relation to acid volatile sulfides in marine sediments (Gentile et al. 1987 and DiToro et al. 1992). It has been used to characterize the toxicity of sediments from the Calcasieu River, LA, covering a broad range of salinity and grain size (SAIC 1990b). *Ampelisca abdita* was the first species used to demonstrate the toxicity of sediments from New Bedford Harbor, MA, and subsequently was used to assess the effectiveness of capping procedures as part of a Pilot Dredging Project on site remediation techniques (U.S.ACE 1989). Tests of sediments from New York Harbor have been conducted recently for EPA Region II (SAIC 1992b, SAIC 1994a, and SAIC 1995a) and for the U.S. Navy (SAIC 1994b, SAIC 1995b, SAIC 1995c). In addition, SAIC has completed a series of tests for NOAA to characterize toxicity of sediments from the Hudson-Raritan Estuary, Long Island Sound, Boston Harbor, Tampa Bay, the southeast U.S, and Biscayne Bay (SAIC 1992c, SAIC 1992d, SAIC 1993b, SAIC 1994c, SAIC 1994d, SAIC 1995d).

Methods

Sample Collection, Log-In, and Holding

Sediments from 23 sites were collected and delivered to the ETC for testing between 27 March and 7 April 1998 (see Table 1). Standard chain-of-custody procedures were followed. Samples were transported from the site in 4-liter high-density polyethylene jars which had been washed, acid-stripped, and DI rinsed. Samples were delivered to the ETC in insulated coolers with blue ice. Upon arrival at the laboratory, sample containers were inspected and were found to be full with less than 1 - 2" of head space remaining. These samples were received and logged into the ETC sample tracking system. Chain-of custody tracking forms were signed and photocopied. The originals were placed in the ETC's sample log books and copies were retained with test data in experiment binders and project files. After inspection, the sample containers were placed in zip-lock bags and stored at 4 ± 2°C in the dark until testing.

Organism Collection and Holding

Ampelisca abdita were collected locally, according to the procedures outlined in the SOP in Appendix A from tidal flats in the Pettaquamscutt (Narrow) River, a small estuary flowing into Narragansett Bay, Rhode Island. The ETC has used *Ampelisca* from the Narrow River to conduct more than 150 test series with over 2000 sediments. Surface sediments (8 to 10 cm) from this site were collected, sieved through a 0.5-mm-mesh screen and tubes containing amphipods were transported to the laboratory in buckets. At the laboratory, amphipods were sieved from their tubes and then collected from the air/water interface with an aquarium dip net as described in the SOP in Appendix A. Amphipods were held in the laboratory in pre-sieved, uncontaminated sediment from the collection site under static conditions. Fifty percent of the water in the holding containers was replaced every day when the amphipods were fed, *ad libidum*, the laboratory-cultured diatom, *Phaeodactylum tricornutum* (see SOP in Appendix A).

Animals collected for each test series were evaluated during concurrent (3 April, 10 April, 17 April 1998) reference toxicant 96-hour water-only tests with sodium dodecyl sulfate (SDS). The trimmed Spearmen-Karber method of regression analysis, available on ToxCalc (version 4.0.8) from TidePool Scientific Software, was used to calculate the SDS EC values (i.e., the effect concentration derived from the point estimation). The EC50s (the median effect concentration, in this case the effect was lethality) were evaluated against a control chart, a running plot of EC50s obtained from 20 of the most recent reference toxicant tests performed at the ETC with *Ampelisca abdita*. The EC50 is equivalent to the LC50 (i.e., the median lethal concentration).

Sample Preparation

All but two test sediment samples were press-sieved through a 2.0-mm mesh stainless-steel screen. During press-sieving, the entire contents of a sample container were scooped into a 12" diameter sieve and pushed through the sieve into a collection pan (without adding water) using a Plexiglas paddle according to procedures described in the SOP in Appendix A. Sediments were press-sieved no more than seven days before sediments were added to test chambers. Press-sieved sediments were stored prior to testing at 4°C in the dark. Sediments which were not press-sieved were generally composed of large rocks, broken shells, plants, or unidentifiable material which could not pass through a screen. For testing, sediments were mixed with a stainless steel paddle using an electric drill and then added to test chambers. Chambers were then filled with overlying filtered (0.45 μm) seawater from Narragansett Bay, RI (see the SOP Appendix A). Tests were conducted "blind" to eliminate investigator bias. All test chambers were numbered and individual replicate numbers were randomly assigned. Test chambers were arranged in a 20°C water bath in ascending order by number. This ensured that replicates for each treatment were randomly placed within the water bath.

Test Apparatus and Conditions

Amphipods were exposed to test sediments for 10 days under static conditions, following ETC SOPs (see Appendix A) which were developed according to ASTM and U.S.EPA procedures (ASTM 1990 and U.S.EPA 1994). The test chambers were quart-sized glass canning jars with an inverted glass dish as a cover. Two hundred milliliters of homogenized sediment sample was placed in the bottom of each of five replicate chambers and covered with approximately 600 ml of seawater. A plastic disk was used to cover sediments when adding the seawater to minimize disturbance of the sediment. Air was delivered by oil-free air pumps into the water column through a 1-ml pipette inserted through the cover opening. The aeration provided acceptable dissolved oxygen concentrations (> 60% saturation). Ambient laboratory lighting was continuous during the 10-day test to inhibit swimming behavior of the organisms. The addition of sediment occurred the day before the start of the test, assuring that surface sediments were well oxygenated.

At the beginning of a test, amphipods were sieved from holding containers through a 0.5-mm mesh stainless-steel screen and collected from the water's surface with an aquarium dip net as described in the SOP in Appendix A. Twenty sub-adult amphipods (passing through a 1.0 mm, but retained on a 0.71 mm screen) were distributed randomly into 100-ml plastic cups containing 20°C filtered seawater (see Appendix A). After sorting, the cups were examined for dead or outsized animals, which were replaced with others from the same sieved population. The cups were randomized, air delivery to the test chambers stopped, and the amphipods were added to the test chambers. After one hour, the chambers were examined for any amphipods that had not burrowed into the sediment.

Nonburrowing animals were replaced, and air delivery was restarted, initiating the test. The animals were not fed during testing.

Test chambers were monitored daily and the number of individuals found on the sediment surface, trapped in the water column or on the water surface were recorded according to procedures outlined in the SOP in Appendix A. Dead, emerged individuals were removed and examined microscopically. Live, emerged individuals trapped on the water surface were prodded with the large end of a disposable plastic pipette and allowed to reburrow.

Water quality parameters were monitored throughout the test. Temperature was recorded daily using a partial immersion, spirit-filled Celsius thermometer contained in sediment/overlying water test chamber set in the waterbath. Waterbath temperature was monitored continuously with a Dickson 7-day recording thermometer. Salinity, dissolved oxygen (DO), and pH were measured in two replicates selected through a computerized random and blind sampling process, twice during each test. Salinity was measured with a hand-held Reichert-Jung refractometer. DO was measured with an Orion DO meter (model 820) and DO electrode (Orion model 97-08), and pH was measured with an Orion pH meter (model 250A) and Orion Triode pH probe (model 91-57BN) All instruments and equipment were calibrated, maintained and operated according to the manufacturer's specifications. Manufacturer's instructions and calibration logs are maintained in the laboratory in binders designated "Equipment Manuals" and "Equipment Maintenance and Calibration".

Samples were analyzed for ammonia to address the continuing concern and debate over the potential toxic effects of ammonia in static sediment toxicity tests (Whiteman et al. 1996). Sub-samples of sediments were collected for pore water analyses after sediments were press-sieved and homogenized before placement into test chamber. Approximately 50 grams of sediment were centrifuged and pore water was collected for analysis. Overlying water samples were collected twice during each test from two replicate test chambers for analyses. Total ammonia was measured spectrophotometrically using the salicylate-hypochlorite method described by Bower and Holm-Hansen (1980). Dilute pore water samples and overlying water samples (1:20 and 1:10, respectively) were prepared with deionized water. The dilutions ensured that ammonia concentrations were always within the measurable range of up to 2 mg ammonia nitrogen per liter and that sample and ammonia standard salinities were within the required 5 ppt of one another. Un-ionized ammonia was calculated using measured total ammonia values, concurrent measurements of pH and salinity, and test temperature. The calculations were based on information provided in Hampton (1977) and Whitfield (1978).

At the end of a test, each test chamber was individually sieved through a 0.5-mm mesh stainless-steel screen using tap water as described in the SOP in Appendix A. All material remaining on the screen was rinsed into a small dish using seawater. The

contents of each dish were sorted under a stereomicroscope (see SOP in Appendix A). Live animals were recorded. All samples for which greater than 10% (e.g., 2 out of 20) of the original organisms were unaccounted for were reexamined. For animals not found, it was assumed that they had died and decomposed in the sediment during the test. Sorted sediment was covered with seawater and left to stand in the dark overnight. Dishes were examined for additional emerged amphipods every 24 hours for 72 hours. The numbers of surviving amphipods, recorded on laboratory data sheets, were entered into a computer spreadsheet for statistical analyses.

Performance Control

Performance control sediments were collected during May 1995 from the U.S. Army Corps of Engineers New England Division central Long Island Sound (LIS) reference station. Sediments from this reference station have been used for the COE Disposal Areas Monitoring System, the Field Verification Program, and EPA's EMAP Virginian Province in 1990 - 1993. The sediments from this site are fine-grained (> 90% silt-clay) and have an organic carbon content of about 2%. An extensive database has demonstrated its non-toxic nature in solid-phase tests with *A. abdita.*

Data Analysis

Stations with a mean survival less than that of the LIS performance control were compared statistically to the control. Microsoft Excel's two-sample assuming unequal variances t-Test tool was used to perform a two-sample student's t-Test. This test assumed that the variances of both ranges of data were unequal. A one-tailed distribution was specified. The t-Test was used to determine whether two sample means were equal. Data were not transformed since an examination of a large historical data set from the ETC has shown that *A. abdita* percentage survival data meet the requirement of normality. Significant toxicity for *A. abdita* has been defined as survival statistically less than the performance control and ≤ 80% of the mean control survival (U.S.EPA 1994) Statistical power curves created from SAIC's extensive testing database with *A. abdita* have shown that the power to detect a 20% difference from the control is approximately 90%. Sites meeting both requirements (statistically different than the performance control and survival ≤ 80% of the control) were flagged.

Results

A total of 23 sediment samples were evaluated for toxicity in the 10-day amphipod test in three test series. Holding requirements were within acceptable limits for all samples (see Table 1). Samples collected on 27 March were tested on 3 April, those collected on 3 April were tested on 10 April, and those collected on 7 April were tested on 17 April.

Raw survival data are presented Appendix B. Summary survival data are presented in

Table 2. Mean performance control (i.e., LIS) survival was 100% for all three test series. Mean sample survival ranged between 72 and 100%. Mean sample survival, normalized to performance controls, ranged from 72 to > 100%. Mean survival in 22 of the 23 samples was > 85% when normalized to the LIS performance control. Mean survival at six stations was statistically different from mean LIS survival. Mean survival at Station OF-5 (i.e., 72%), was both statistically different from the LIS performance control and < 80% of mean performance control survival. While these data indicate toxicity (i.e., < 80% of the control), expert opinion for areas which are designated as highly toxic is based on survival which is < 20% of the control response (NOAA 1994).

Water quality parameters measured in the overlying water of chambers during the test are presented in Appendix C. Measurements were performed in replicate chambers on Days 2 or 3 and Days 8 or 9 of testing. All parameters were within acceptable limits. The DO in the water overlying the sediment was maintained above the acceptance criteria of 60% saturation. Salinities measured were 27 to 30 parts per thousand (ppt) and pH measurements ranged from 7.84 to 8.69.

Ammonia measurements are presented in Appendix D and are summarized in Tables 3 and 4. Overlying ammonia analyses were performed in replicate chambers on Days 2 or 3 and Days 8 or 9 of testing. Raw data for total and un-ionized ammonia values in overlying waters ranged from < MDL (method detection limit) to 28.16 mg/L and from < MDL to 1.427 mg/L, respectively. Values < MDL are shown as "0". The relationships between the mean total and un-ionized ammonia concentrations in overlying water and amphipod survival (normalized to mean performance control survival) at each station are shown graphically in Figures 1 and 2. Mean values of measurements from Days 2 or 3 and Day 8 or 9, presented in Table 3, were used. The total ammonia no observed effect concentration, the NOEC, of 30.00 mg/L at pH 7.7 (U.S.EPA 1994) was not exceeded. The un-ionized ammonia NOEC of 0.40 mg/L at pH 7.7 (U.S.EPA 1994) was exceeded on seven occasions. Of these seven, significant survival effects (i.e., < 80%), which may be attributable to ammonia, were only observed at Station OF-5.

Total and un-ionized ammonia measured in sediment pore waters are presented in Appendix D and Table 4. Total and un-ionized ammonia values in sediment pore waters ranged between 3.00 and 35.53 mg/L and between 0.048 and 0.751 mg/L, respectively. The relationships between the sediment pore water ammonia measurements and amphipod survival are shown graphically in Figures 3 and 4. Total ammonia was elevated above the NOEC at Station OF-5. The un-ionized ammonia NOEC of 0.40 mg/L at pH 7.7 (U.S.EPA 1994) was exceeded on two occasions at OF-1 and OF-5. Of these two occasions, significant survival effects (i.e., < 80%), which may be attributable to ammonia, were only observed at Station OF-5

Quality Assurance/Quality Control

The ToxCalc output of EC50 data obtained during the SDS reference toxicant tests performed for this study are presented in Appendix E. EC50 values ranged from 7.40 to 11.44 mg/L. A control chart which includes data from 20 of the most recent tests performed at the ETC is presented in Figure 5. Reference toxicant tests 980402, 980406, and 980410 were conducted in conjunction with the three 10-day test series 980401, 980405, and 980409 for this project, and were within the control limits (± 3 SD above and below the mean of 7.07 mg/L or 2.46 and 11.68 mg/L, respectively). At the $P_{0.05}$ probability level, one in 20 tests is expected to fall outside of the control limits by chance alone (U.S. EPA 1988).

Amphipod responses to the negative performance control sediment, LIS, for 217 27 of the most recent tests performed at the ETC are presented in Appendix F and are summarized graphically in Figure 6. The response in *A. abdita* exposed to the collection of LIS sediment (i.e., May 1995) used for this study was consistent with all previous LIS collections (i.e., November 1989, May 1991, and August 1993) used at the ETC. Amphipod responses to LIS < 85%, the acceptance criteria, were measured in 13 out of 217 or only 6% of the tests performed during a nine-year period.

Section B
48-Hour Sea Urchin Development
Sediment Elutriate
Toxicity Test Results

Introduction

The chronic toxicity of elutriates prepared from sediments collected from Old Fire Fighting Training Area, NETC, Newport, RI, was assessed to evaluate the biological effects of sediment contaminants to water column organisms. Toxicity was determined using the sea urchin (*Arbacia punctulata*) embryo/larval development test at SAIC's ETC according to procedures outlined in the SOP, Development Test Using the Sea Urchin *Arbacia punctulata*, in Appendix A.

The purple sea urchin, *Arbacia punctulata*, occurs along the North American east coast from Cape Cod to Florida. They live in widely separated aggregations on rocky and shelly bottoms or adhere to rocks. Their life cycle includes a period of planktonic embryo-larval development, followed by settlement and metamorphosis in the adult life stage. Sea urchin gametes have become widely used and popular subjects for toxicological studies (Bay et al. 1993).

This assay has been used in regulatory programs in California and Washington State to assess the suitability of sediments (as elutriates) for ocean disposal activities. Other regulatory applications include usage of the test to meet minimum data requirements for the derivation of the U.S.EPA's Marine Water Quality Criteria.

The urchin development test has been used to evaluate sediment toxicity using pore waters and/or elutriates for the U.S. Navy in McAllister Point, Allen Harbor, and Newport, Rhode Island (SAIC 1994b, SAIC 1995b, SAIC 1995c). The inclusion of this test in the Navy's previous Ecological Risk Assessment program's in Rhode Island and the widespread use of this species and these endpoints by the U.S. EPA and others indicated their importance to this study at the Old Fire Fighting Training Area.

The endpoint evaluated was the abnormal or delayed development of the pluteus larva. The response was measured in each of three concentrations per station/sample. The use of multiple concentration series provides information which can be applied to several techniques and integrated into the ecological risk assessment methodology. The concentration series responses can be used to develop an effect concentration (EC), a point estimate of the concentration that would cause a given percent reduction (e.g., IC50) in development. In conjunction with the estimated environmental concentration (EEC), the EC value can be used as the toxicological benchmark concentration (TBC) in the risk assessment quotient method, used to quantitatively estimate ecological risk. If the quotient, EEC/TBC is > 1, then a response or biological effect is expected.

In addition, the concentration series could be used to develop exposure-response models. This technique, used previously to estimate ecological risk, utilized concentrations as independent variables to determine the level of endpoint response for each test species (Munns et al. 1994). Using a joint probability method, probabilities of risk from sediment contaminants to water column and benthic organisms were calculated.

Methods

Sample Collection, Log-In, and Holding

Sediments from 23 sites were collected and delivered to the ETC for testing between 3 April and 27 April 1998 (see Table 5). Standard chain-of-custody procedures were followed. Samples were transported from the site in 2-liter high-density polyethylene jars which had been washed, acid-stripped, and DI rinsed. Samples were delivered to the ETC in insulated coolers with blue ice. Upon arrival at the laboratory, sample containers were inspected and were found to be full with less than 1 - 2" of head space remaining. These samples were received and logged into the ETC sample tracking system. Chain-of custody tracking forms were signed and photocopied. The originals were placed in the ETC's sample log books and copies were retained with test data in experiment binders and project files. After inspection, the sample containers were placed in zip-lock bags and stored at 4 ± 2°C in the dark until testing.

Organism Collection and Holding

Adult sea urchins were obtained from a commercial supplier. A 12 wH(v) transformer was used to electrically stimulate spawning. The urchins were segregated by sex into 20-liter aquaria each holding about 15 animals. The aquaria were aerated and biological filters were used to maintain water quality. The tanks were partially renewed with filtered seawater from lower Narragansett Bay, RI twice weekly. Temperature was maintained at 15 ± 3°C. Salinity was between 28 and 32 ppt. The urchins were fed Romaine lettuce. Non-ingested food was removed when new lettuce was added.

Organisms used for testing are evaluated periodically during a reference toxicant test with sodium dodecyl sulfate (SDS). The linear interpolation method of regression analysis, available on ToxCalc (version 4.0.8) from TidePool Scientific Software, was used to calculate the SDS IC values (i.e., the inhibition concentration derived from the point estimation). The IC50s (the median inhibition concentration, in this case the inhibited response was fertilization) were evaluated against a control chart, a running plot of IC50s obtained from 20 of the most recent reference toxicant tests performed at the ETC with *Arbacia punctulata.*

Elutriate Preparation

Methods presented in the SOP of Appendix A, Preparation of Elutriates from Dredged Material Samples, were modified by adding 2000 mL of homogenized sediment to 6000 mL of filtered (0.45 μm) natural seawater collected from Narragansett Bay, RI on an incoming tide. The mixture was hand mixed for 30 minutes and allowed to settle for 1 hour. The supernatant was siphoned off and transported to the University of Rhode Island Graduate School of Oceanography for centrifugation. The elutriates were centrifuged at 3700 rpm for 15 minutes.

Elutriates were returned to SAIC's ETC for testing. Three concentrations (i.e., 10, 50, and 100%) created by diluting the elutriate with natural seawater were tested. An untreated natural seawater performance control (0%) was tested with each dilution series.

In addition to the 23 field sediments, an elutriate concentration series was prepared using LIS, the ETC's control sediment collected from central Long Island Sound. The LIS elutriate was centrifuged at SAIC's ETC for 10 minutes at ca. 2000 rpm for testing.

As LIS is considered a "clean" sediment, the LIS elutriate was used to normalize for particulate interferences which may confound sea urchin test results. Since elutriates prepared from test sediments were centrifuged at higher speeds for longer periods (15 minutes at ca. 3700 rpms) versus 10 minutes at 2000 rpms for LIS, the LIS elutriate treatment likely was a "worst case" treatment (i.e., highest percentage of suspended sediment). Therefore, sample responses which exceeded the LIS response were likely due to contaminants and not attributable to particulate interferences.

Test Apparatus and Conditions

Modified U.S.EPA procedures were used to perform the sea urchin development test (Mueller et al. 1992). Briefly, four male urchins were placed in seawater in shallow bowls. Males were stimulated to release sperm by touching the shell for about 30 seconds with the steel electrodes of a 12 V transformer. Sperm were collected using a 1 mL disposable syringe fitted with an 18-gauge, blunt tipped needle. The sperm were held on ice and were used within 1 hr of release. Sperm were diluted with seawater to a concentration of 5×10^7 sperm per mL.

Four female urchins were placed in seawater in shallow bowls. Females were stimulated to release eggs by touching the shell as described above. Eggs were collected and held at room temperature for up to two hours with aeration. The eggs were washed two times with seawater by gentle centrifugation (500xg) for two minutes in a conical centrifuge tube. The eggs were diluted with seawater to a concentration of 2000 eggs/mL and were aerated until used. Sperm and egg suspensions were mixed to a final concentration of 1:2500 egg:sperm ratio.

After 60 minutes, 1 mL of fertilized egg suspension was added to 10 mL of sample in each of three replicates and was incubated for 48 hours at 20 ± 1°C. The test was terminated by adding 2 mL of preservative to each vial.

One mL of suspension from each of the three replicates was transferred to a Sedgwick-Rafter counting chamber. Embryos were examined using a compound microscope (100X). One hundred embryos were examined for normal (i.e., not delayed) development as indicated by the presence of the pluteus larva. Additional subsamples from random replicates were examined when data varied by more than 10%. The total number of embryos counted, the number of normal pluteii larvae, and the number of abnormal larvae were recorded on laboratory data sheets and entered into a computer spreadsheet for statistical analyses.

Performance Control

The performance control, natural seawater (NSW), was collected daily from lower Narragansett Bay, RI during an incoming tide and passed though a 0.45 μm filter.

Data Analysis

Sample- and dilution-specific elutriate preparations with mean normal development less than that of for LIS were compared statistically to the LIS elutriate response. A comparison of the two values was performed using Microsoft Excel's t-Test tool assuming unequal variance. Samples with an alpha or p value less than or equal to 0.05, indicating statistical significance, and samples with normal development less than the LIS control when normalized to LIS were flagged.

Regression analysis using the linear interpolation method was used to calculate inhibition concentrations (ICs) for all stations and the LIS elutriate. Toxicity values (i.e , the ICs) were corrected by dividing the value for the sample by the value for LIS. The resulting IC values represent a point estimate of the elutriate concentration that caused a give percent reduction (e.g., IC25) in normal development of the sea urchin.

Results

A total of 23 elutriate samples were evaluated for toxicity in the sea urchin development test in eight test series. Holding periods are presented in Table 5. Testing occurred between 8 and 28 days after samples were collected < 24 hours after samples were centrifuged.

Data are presented Appendix G and are summarized in Table 6. Mean normal development in the NSW performance control ranged between 87 and 97%. Mean normal development was 83, 88, and 64% in 10, 50, and 100% dilutions of the LIS elutriate,

respectively. Mean normal development ranged between 77 and > 98% for 10% dilutions of elutriates of test sediments, between 0 and > 98% for the 50% dilutions, and between 0 and 94% for 100% dilutions of elutriates of test sediments. When normalized to LIS, they ranged between 93 and > 100% for 10% dilutions and between 0 and > 100% for the 50 and 100% dilutions. In total, responses in 10 out of 23 of the elutriate samples (i.e., the 100% dilutions) were statistically different and less than the 100% LIS dilution when compared to the response for the LIS elutriate.

The inhibition concentrations for all elutriate samples are presented in Appendix H and summarized in Table 7. IC10s for elutriates prepared from test sediments ranged between 12.4 and > 100%. When corrected using the LIS IC10 (i.e., 65.4%), the test results ranged between 19.0 and > 100%. IC25s for elutriates prepared from test sediments ranged between 18.7 and > 100%. When corrected using the LIS IC25 (i.e., 95.3%) test results ranged between 19.7 and > 100%. For samples which were both less than and statistically different from LIS (shown in Table 6 and Appendix G) actual IC10s were < 56.1% and actual IC25s were < 65.1%.

Samples with responses which were statistically different and lower than the response for LIS are presented in Figure 7. This graphic indicates that for both IC10 and IC25 values, 10 of 10 (i.e., OF-6, -8, -9, -13, -15, -18, -19, -20, -22, and -23) were low when compared to the same values for LIS. Ammonia would not be expected to occur in elutriates prepared from these samples.

Quality Assurance Results

The ToxCalc output of data with the IC50s from the SDS reference toxicant tests conducted during the testing period are presented in Appendix I. The IC50s were 7.70 and 6.57 mg/L for monthly tests performed 4/98 and 5/98. The control chart which includes data from 20 of the most recent tests performed at the ETC is presented in Figure 8. The IC50s, 7.70 and 6.57 mg/L, were within the upper and lower warning limits, ± 2 SD above and below the mean of 7.51 mg/L or 9.19 and 5.84 mg/L, respectively. At the $P_{0.05}$ probability level, one in 20 tests is expected to fall outside of the control limits by chance alone (U.S. EPA 1988).

Sea urchin responses (i.e., fertilization) to the negative performance control, NSW, for 32 of the most recent sea urchin reference toxicant tests performed at the ETC are presented in Appendix J and summarized graphically in Figure 9. The response in *Arbacia* exposed to NSW in the last two tests performed during the testing period were consistent with all 32 previous NSW collections at the ETC. Responses < 70%, the acceptance criteria, were not measured in any of the 32 tests performed over a five year period.

Section C
48-Hour Sea Urchin Development
Sediment Pore Water
Toxicity Test Results

Introduction

The chronic toxicity of pore waters prepared from sediments collected from Old Fire Fighting Training Area, NETC, Newport, RI, was assessed to evaluate the biological effects of sediment contaminants to water column organisms. Toxicity was determined using the sea urchin (*Arbacia punctulata*) test as described above.

Methods

Sample Collection, Log-In, and Holding

Sediments from 23 sites were collected and delivered to the ETC for testing between 27 March and 7 April 1998 (see Table 8). Chain-of-custody, sample storage, and documentation procedures were similar to those described above.

Organism Collection and Holding

Adult sea urchins were collected and maintained in the laboratory as described above for elutriate tests.

Pore Water Preparation

Pore waters were obtained according to the methods presented in the SOP of Appendix A, Techniques for Extracting Pore-Water. Pore water was extracted by inserting a fused-glass air stone attached with plastic tubing to a 50 cc syringe. A vacuum was created by retracting and bracing the syringe plunger. Extractions were performed overnight in the dark at 4°C before testing. Samples for which pore water was unobtainable (i.e., OF-1 and OF-2) were saturated for 24 hours with clean filtered seawater. Pore water samples were neither filtered nor centrifuged before testing. Three concentrations (i.e., 10, 50, and 100%) were created by diluting the pore water with natural seawater and an untreated natural seawater performance control (0%) were tested. In addition to the 23 field sediments, a pore water concentration series was prepared for testing using LIS, the ETC's negative performance control sediment.

Salinity of several pore water samples was below requirements for the test organism. Therefore, sample salinity was adjusted to 30 ppt (parts per thousand) using 2X GP2 in seawater (U.S.EPA 1988) from 15 and 20 ppt in OF-3 and OF-4, respectively.

Test Apparatus and Conditions

Modified U.S.EPA procedures for the sea urchin development test were used as described above for elutriate samples (Mueller et al. 1992).

Performance Control

Each test series included a performance control as described above.

Data Analysis

Data analysis was performed as described above for the elutriate tests. Sample- and dilution-specific pore water preparations with mean normal development less than that of the LIS pore water concentration were compared statistically to the LIS pore water. A comparison of the two values was performed using Microsoft Excel's t-Test tool assuming unequal variance. Samples with an alpha or p value less than or equal to 0.05, indicating statistical significance, and samples with normal development less than LIS when normalized to LIS were flagged.

Regression analysis using the linear interpolation method was used to calculate inhibition concentrations (ICs) for all stations and LIS. Toxicity values (i.e., the ICs) were corrected by dividing the value for the sample by the value for LIS. The resulting IC values represent a point estimate of the pore water concentration that caused a give percent reduction (e.g., IC25) in normal development of the sea urchin.

Results

A total of 23 pore water samples were evaluated for toxicity in the sea urchin test in three test series. Holding periods are presented in Table 8. Testing occurred between 4 and 11 days after samples were collected and < 24 hours after pore water samples were collected.

Data are presented Appendix K and are summarized in Table 9. Mean normal development in the NSW performance control ranged between 81 and 90%. Mean normal development was 81, 79, and 8% in 10, 50, and 100% dilutions of the LIS elutriate, respectively. Mean normal development ranged between 19 and 94% for 10% dilutions of the pore waters, between 0 and 94% for 50% dilutions, and between 0 and 85% for the 100% dilutions. When normalized using LIS, they ranged between 24 and > 100% for 10% dilutions and between 0 and > 100% for both the 50 and 100% dilutions. In total, responses in 16 out of 23 of the pore water samples (i.e., the 100% dilutions) were statistically different and less than the 100% LIS dilution when compared to the response for the LIS pore water.

The inhibition concentrations for all pore water samples are presented in Appendix L and summarized in Table 10. IC10s for pore waters prepared from test sediments ranged between 1.3 and > 100%. When corrected using the LIS IC10 (i.e., 16.6%), the test results ranged between 7.7 and > 100%. IC25s for pore waters prepared from test sediments ranged between 3.2 and > 100%. When corrected using the LIS IC25 (i.e., 26.5%) test results ranged between 12.1 and > 100%. For samples which were < and statistically different from LIS shown in Table 9 and Appendix K) actual IC10s were < 55.0% and actual IC25s were < 62.5%. There were four instances (i.e., OF-3, -6, -12, and -21) where 100% dilutions were not statistically different and less than LIS but IC10s and IC25s were < 55.0 and 62.5%, respectively.

Samples with responses which were statistically different and less than the response for LIS are presented in Figure 10. This graphic indicates that for both IC10 and IC25 values, 9 of 16 (i.e., OF-1, -2, -5, -9, -12, -13, -18, -19, and 23) were low when compared to the same values for LIS. Ammonia, at least in part, may have contributed to the toxicity observed for OF-5.

Quality Assurance Results

Quality assurance results for the pore water urchin tests performed were those described above for elutriate samples.

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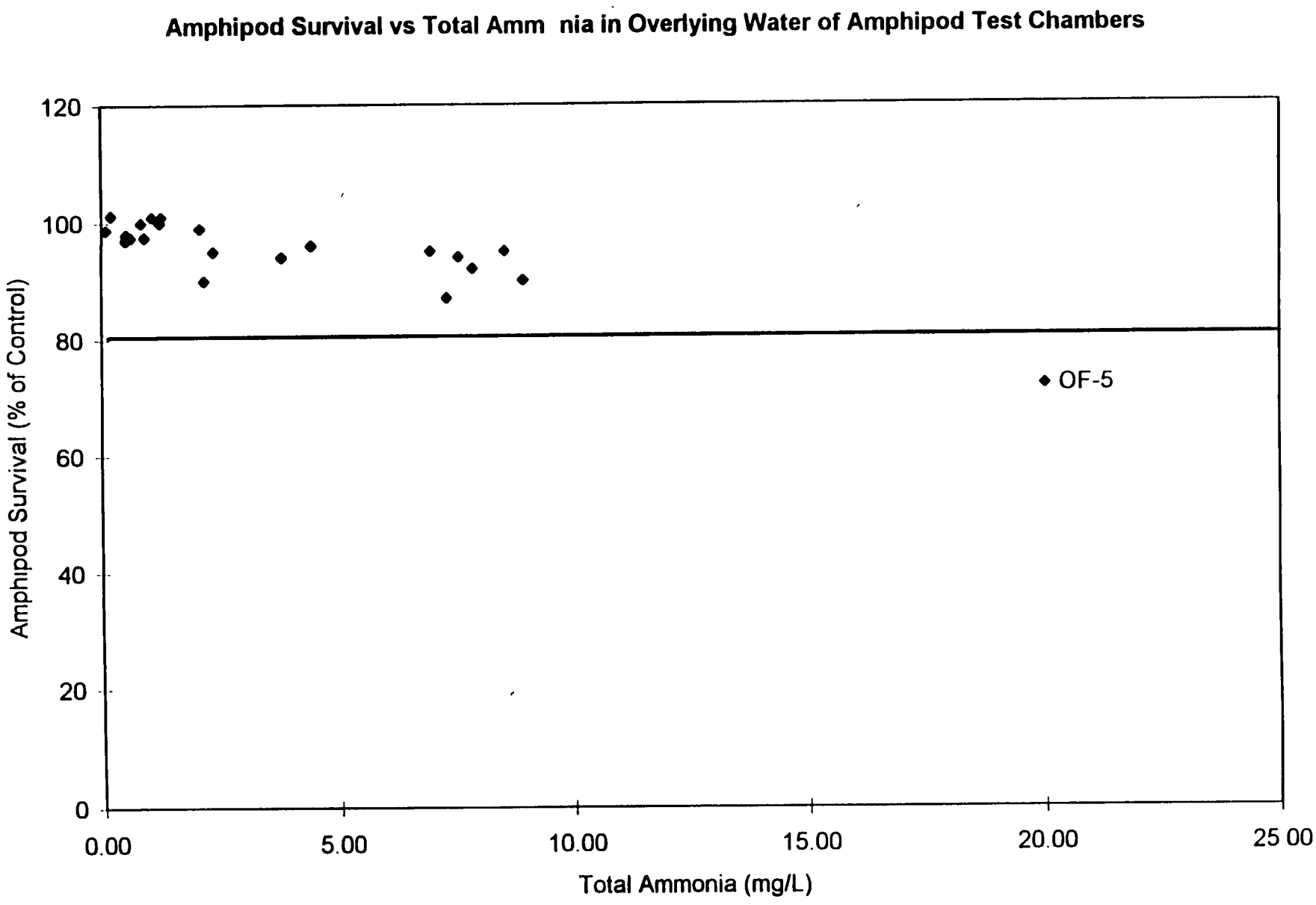

Figure 1. Mean amphipod survival vs mean total ammonia measured in overlying waters of replicate test chambers during the test. The solid line at 80% survival represents the criteria for significant toxicity. The NOEC is 30.00 mg/L at pH 7.7.

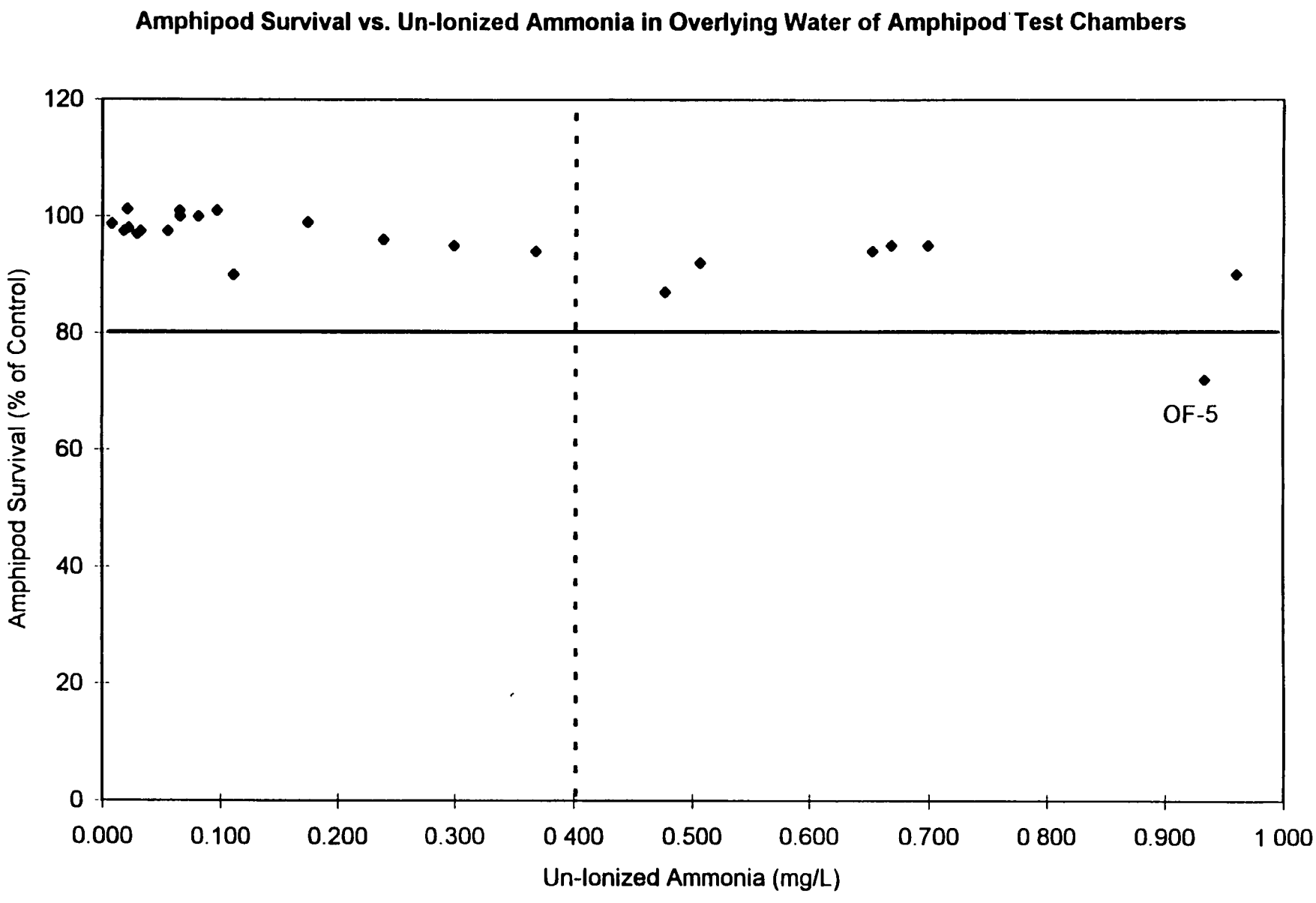

Figure 2. Amphipod survival vs. un-ionized ammonia measured in overlying waters of replicate test chambers during the test. The solid line represents the criteria for significant toxicity. The dotted line at 0.40 mg/L is the NOEC at pH 7.7.

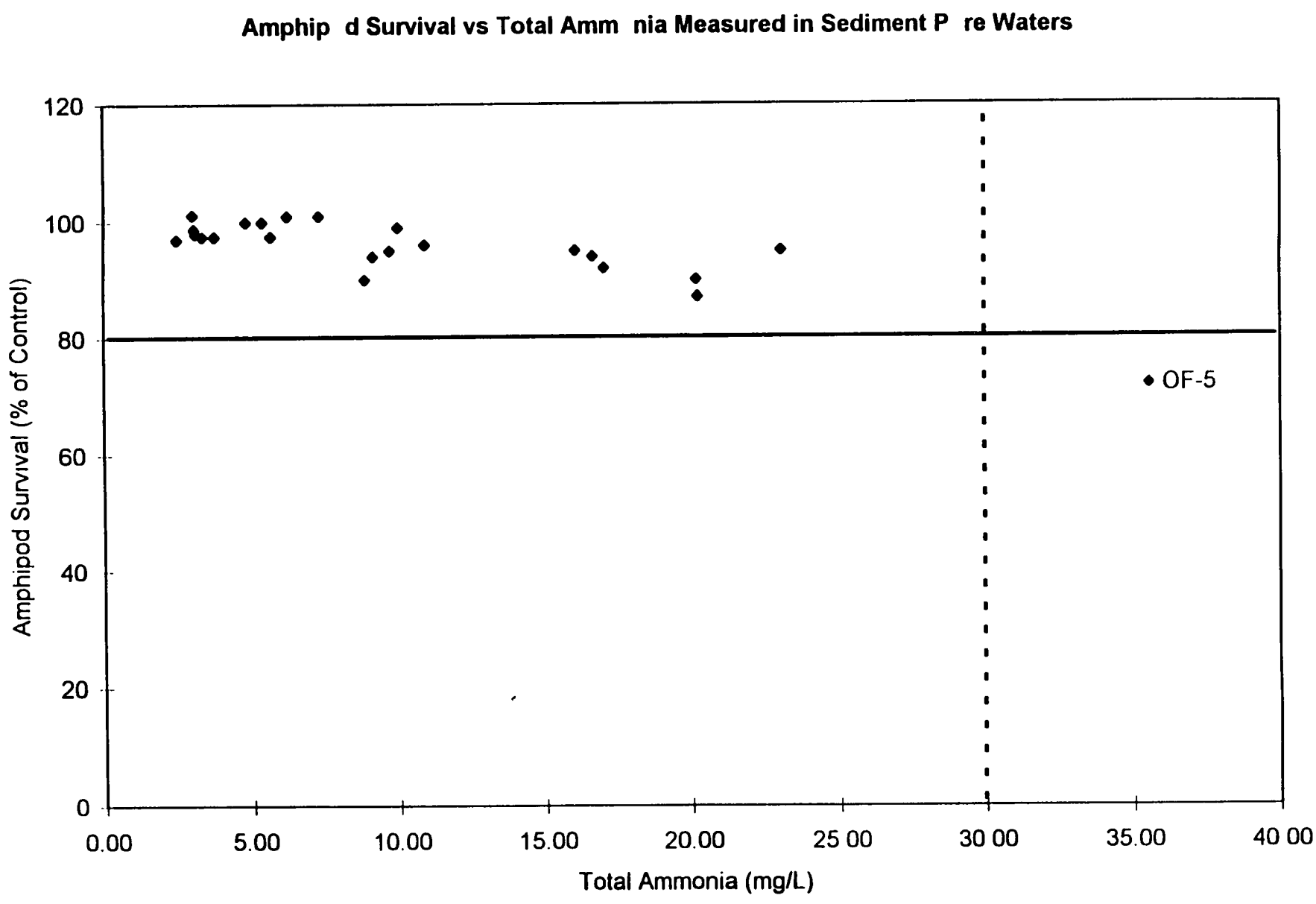

Figure 3. Amphipod survival vs total ammonia measured in sediment pore waters. The solid line at 80% represents the criteria for significant toxicity. The dotted line at 30.00 mg/L is the NOEC at pH 7.7

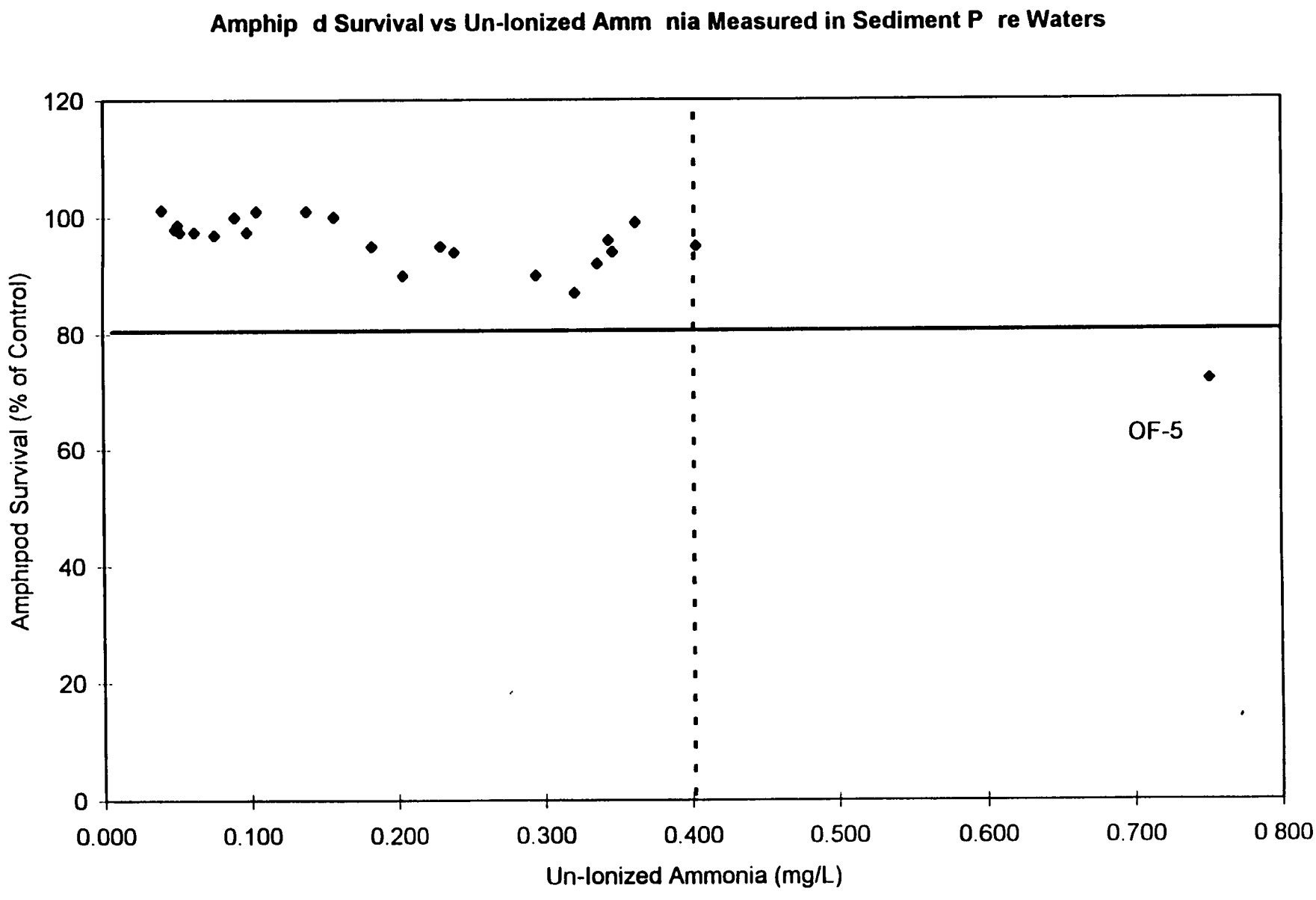

Figure 4. Amphipod survival vs un-ionized ammonia mesured in sediment pore waters. The solid line at 80% represents the criteria for significant toxicity. The dotted line at 0.40 mg/L is the NOEC at pH 7 7.

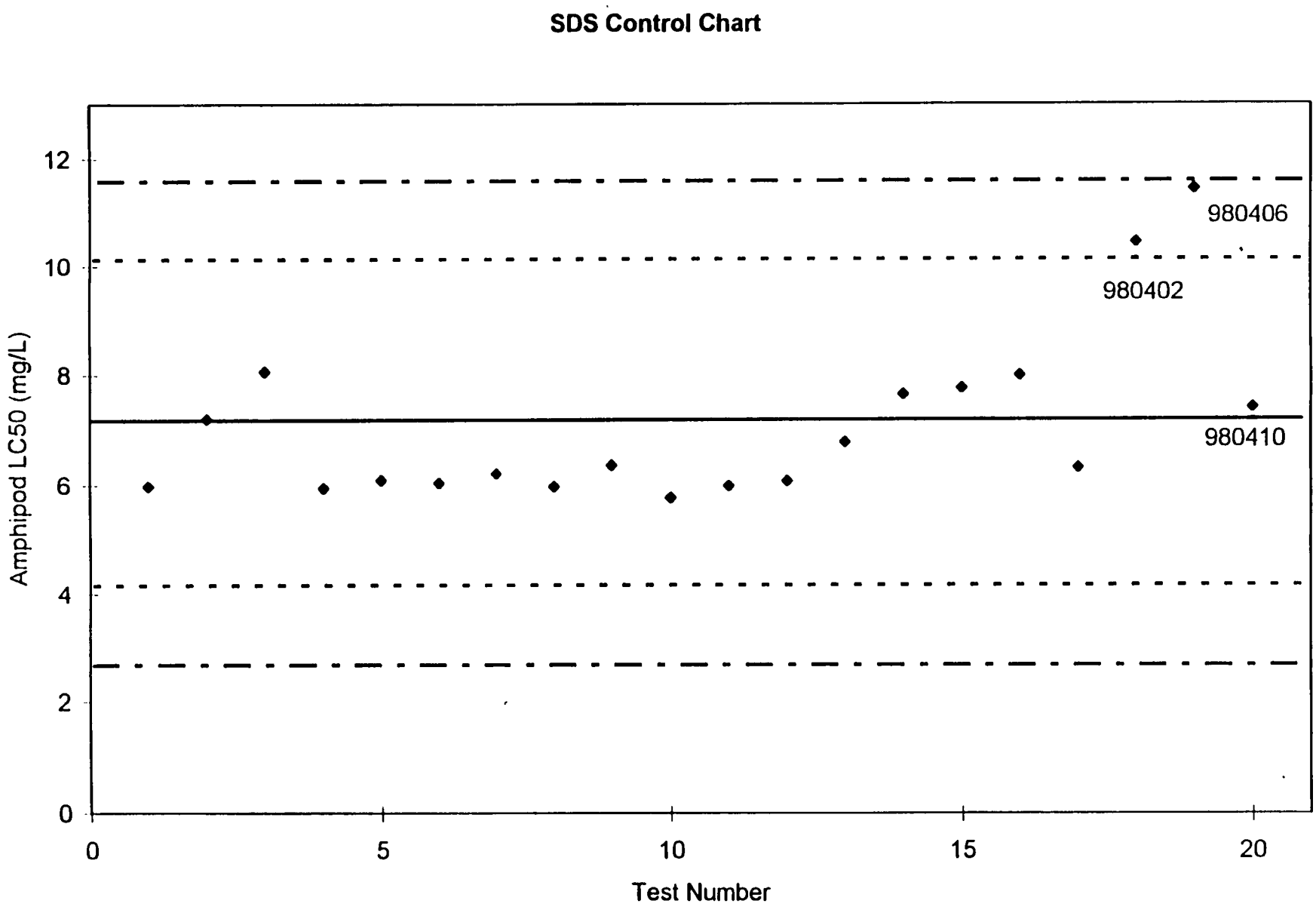

Figure 5. The solid line is the mean. Dotted lines are the warning limits (2 SD). Dotted/dashed lines are the control limits (3 SD). Tests were conducted from 9/97 to 4/98. Survival was measured in a 4-day water-only test.

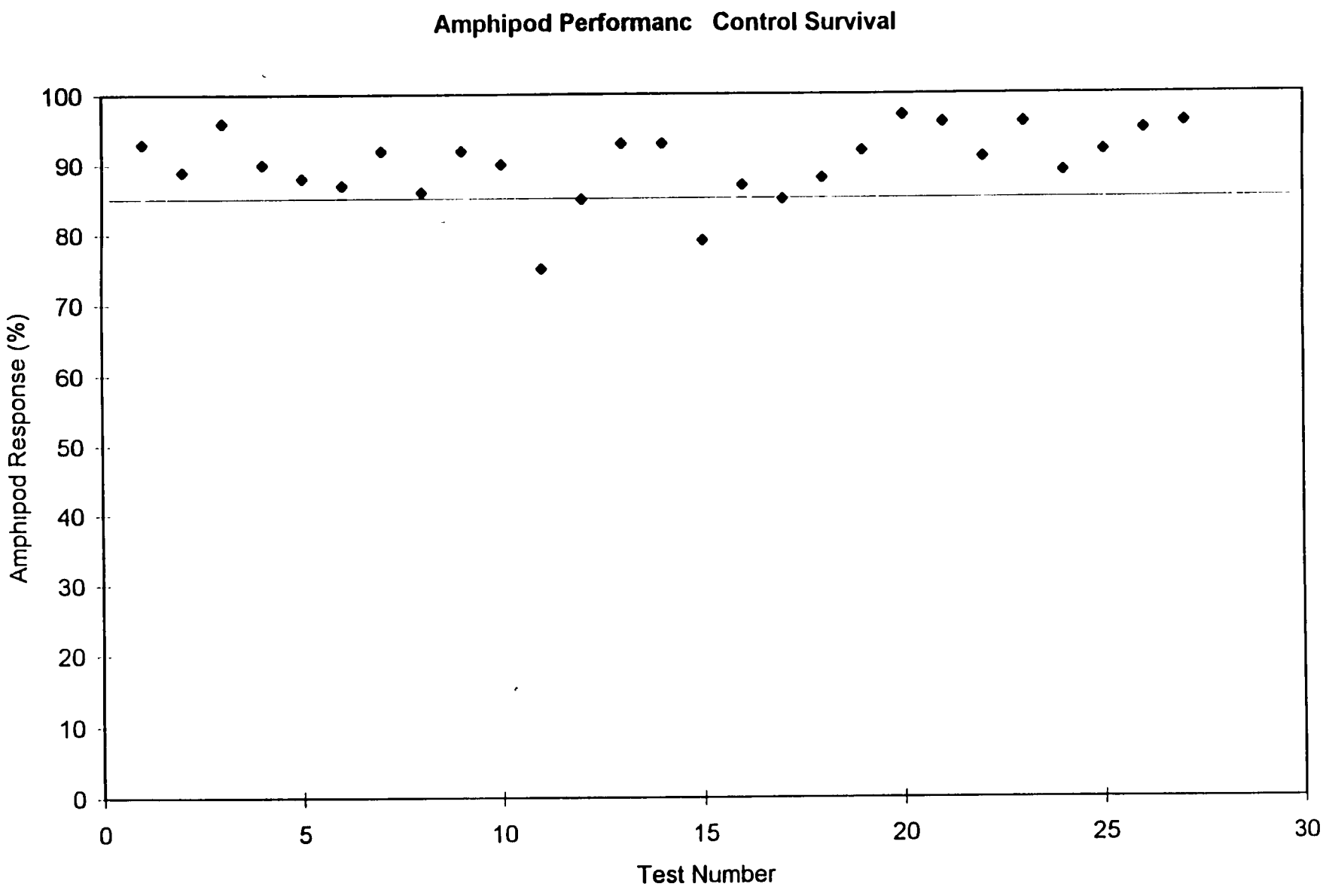

Figure 6. Amphipod response to negative performance control sediment from recent test performed at SAIC's ETC. The solid line at 85% indicates the criteria for test acceptability.

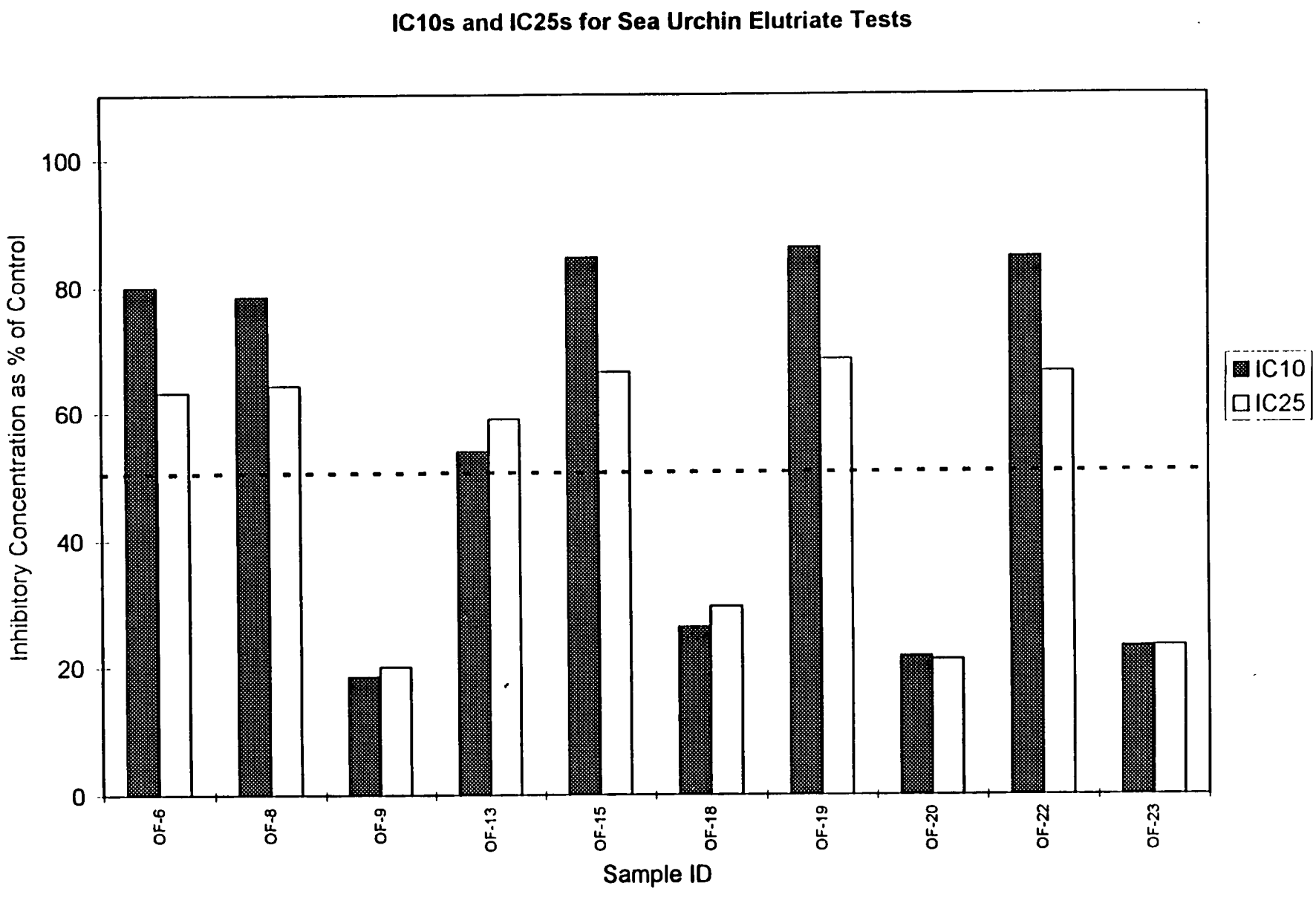

Figure 7. The elutriate concentrations which induced 10 and 25% reductions in the response in the sea urchin test. The dashed line is the inferred toxicity threshold.

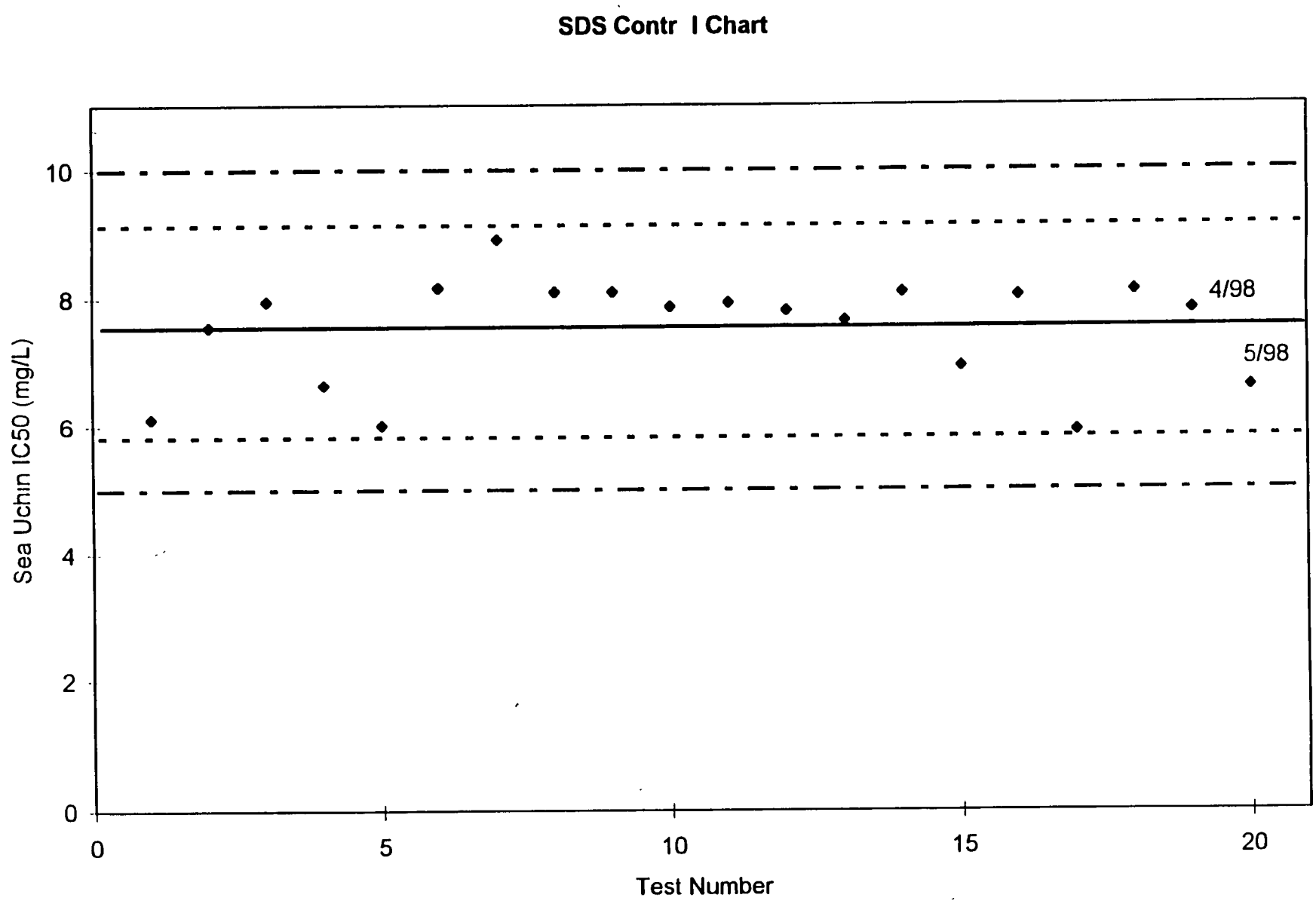

Figure 8 The solid line is the mean. Dotted lines are the warning limits (2 SD). Dotted/dashed lines are the control limits (3 SD). Tests were conducted between 2/94 and 5/98. Fertilization was measured in the Sperm Cell Test.

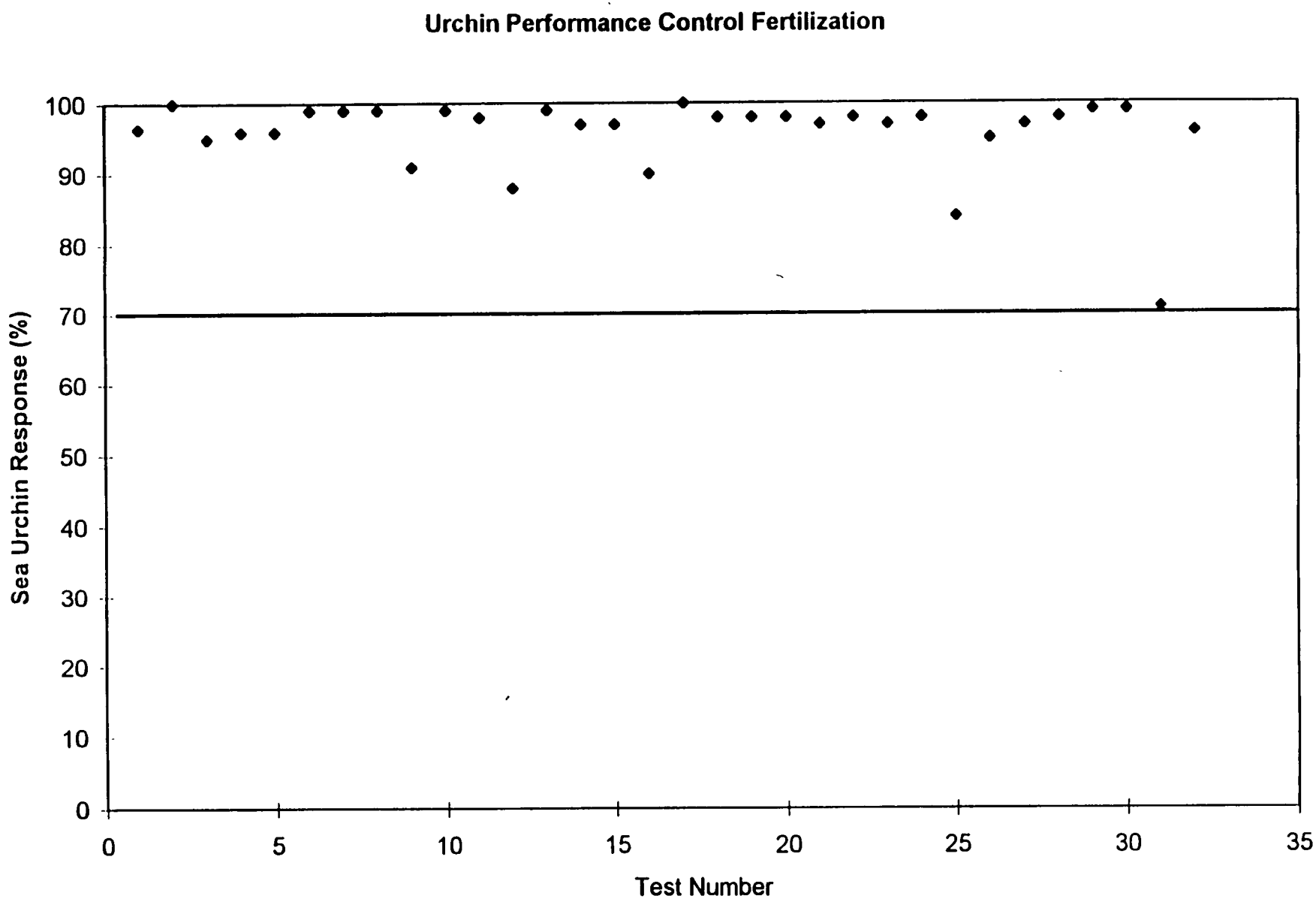

Figure 9. Urchin response to negative performance control seawater from tests performed at SAIC's ETC. The solid line indicates the criteria for test acceptability.

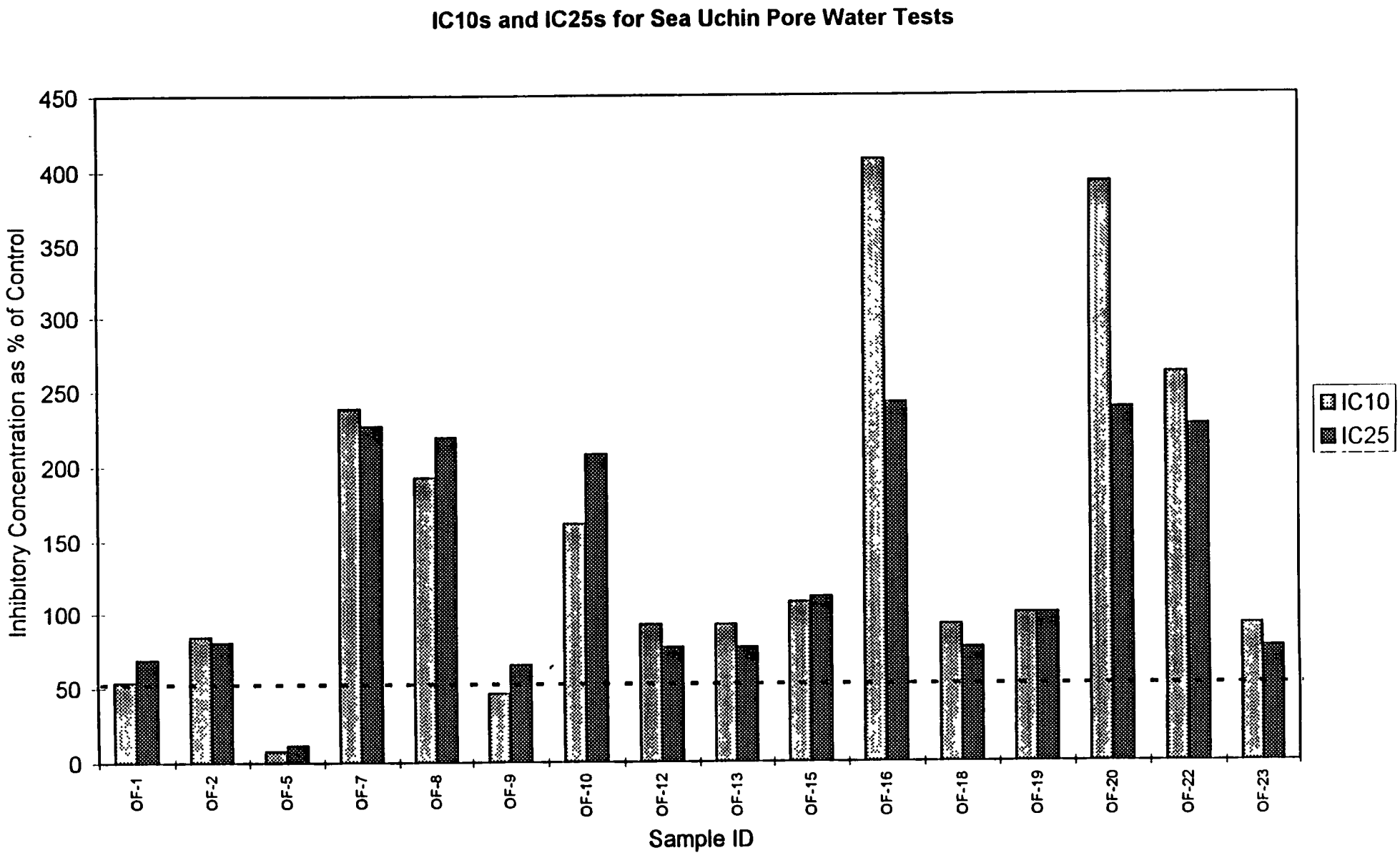

Figure 10. The pore water concentrations which induced 10 and 25% reductions in the response in the sea urchin test. The dashed line is the inferred toxicity threshold.

TABLE 3
AMMONIA IN AMPHIPOD TEST CHAMBERS[1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Mean Total Ammonia (mg/L[3])	SD[4]	Mean Un-Ionized Ammonia (mg/L[3])	SD[4]
OF-1	OF-SS1	980401	8.56	2.617	0.669	0.3192
OF-2	OF-SS2	980401	7.31	2.657	0.477	0.2381
OF-3	OF-SS3	980401	7.87	3.261	0.506	0.2252
OF-4	OF-SS4	980401	2.19	0.273	0.111	0.0126
OF-5	OF-SS5	980401	20.01	6.881	0.933	0.3643
OF-6	OF-SS6	980401	7.57	2.695	0.653	0.3665
OF-7	OF-SS7	980401	3.81	0.909	0.368	0.1798
OF-8	OFF-8-SUR A	980409	0.20	0.283	0.021	0.0294
OF-9	OFF-9-SUR A	980409	6.96	4.232	0.699	0.6657
OF-10	OFF-10-SUR A	980405	1.08	1.386	0.065	0.0790
OF-11	OFF-11-SUR A	980405	1.27	1.000	0.096	0.0761
OF-12	OFF-12-SUR A	980405	1.25	0.846	0.080	0.0540
OF-13	OFF-13-SUR A	980405	2.09	1.744	0.174	0.1502
OF-14	OFF-14-SUR A	980409	0.09	0.100	0.008	0.0094
OF-15	OFF-15-SUR A	980409	0.92	0.564	0.055	0.0319
OF-16	OFF-16-SUR A	980405	0.52	0.600	0.029	0.0338
OF-17	OFF-17-SUR A	980405	0.53	0.609	0.022	0.0254
OF-18	OFF-18-SUR A	980405	4.43	0.858	0.238	0.0547
OF-19	OFF-19-SUR A	980409	0.55	0.535	0.018	0.0104
OF-20	OFF-20-SUR A	980405	0.85	0.912	0.065	0.0694
OF-21	OFF-21-SUR A	980409	0.63	0.638	0.032	0.0221
OF-22	OF-SS22	980401	8.96	2.587	0.960	0.6618
OF-23	OFF-23-SUR A	980409	2.38	2.749	0.299	0.3461

FOOTNOTES

(1) Mean Day 2 or 3 and Day 8 or 9 ammonia measured in overlying water of replicate test chambers during the 10-day solid-phase test.

(2) ETC Exp. No. = Test Series Identification Number

(3) mg = Milligram, L = Liter

(4) SD = Standard Deviation

TABLE 2
SUMMARY 10-DAY AMPHIPOD TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING CENTER, NETC
NEWPORT, RHODE ISLAND

ETC Test No.(1)	SAIC ETC ID	Sample ID	Mean Control Survival (%)	SD(2)	Mean Sample Survival (%)	SD(2)	Survival as % of Control	Comment
980401	OF-1	OF-SS1	100	0.0	95	5.0	95	*
980401	OF-2	OF-SS2	100	0.0	87	21.1	87	
980401	OF-3	OF-SS3	100	0.0	92	5.7	92	*
980401	OF-4	OF-SS4	100	0.0	90	14.6	90	
980401	OF-5	OF-SS5	100	0.0	72	19.6	72	**
980401	OF-6	OF-SS6	100	0.0	94	5.5	94	*
980401	OF-7	OF-SS7	100	0.0	94	4.2	94	*
980409	OF-8	OFF-8-SUR-A	100	0.0	100	5.2	101	
980409	OF-9	OFF-9-SUR A	100	0.0	95	5.2	95	
980405	OF-10	OFF-10-SUR A	100	0.0	100	2.2	101	
980405	OF-11	OFF-11-SUR A	100	0.0	100	6.5	101	
980405	OF-12	OFF-12-SUR A	100	0.0	100	0.0	100	
980405	OF-13	OFF-13-SUR A	100	0.0	99	2.2	99	
980409	OF-14	OFF-14-SUR A	100	0.0	99	2.8	99	
980409	OF-15	OFF-15-SUR A	100	0.0	98	3.4	98	
980405	OF-16	OFF-16-SUR A	100	0.0	97	2.7	97	*
980405	OF-17	OFF-17-SUR A	100	0.0	98	4.5	98	
980405	OF-18	OFF-18-SUR A	100	0.0	96	4.2	96	
980409	OF-19	OFF-19-SUR A	100	0.0	98	5.6	98	
980405	OF-20	OFF-20-SUR A	100	0.0	100	0.0	100	
980409	OF-21	OFF-21-SUR A	100	0.0	98	3.4	98	
980401	OF-22	OF-SS22	100	0.0	90	7.9	90	*
980409	OF-23	OFF-23-SUR A	100	0.0	95	5.2	95	

FOOTNOTES

* = Mean sample response was statistically different than mean LIS response.

** = Mean sample response was both statistically different and less than 80% of mean LIS response.

(1) ETC Exp. No. = Test Series Identification Number

(2) SD = Standard Deviation

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TABLE 5
COLLECTION, RECEIVING, PREPARATION AND TEST DATES FOR ELUTRIATE TESTS[1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND
PAGE 1 OF 1

Sample ID	SAIC ETC ID	Date Sediment Collected[2]	Date Sediment Received	Date Elutriate Prepared by ETC	Date Elutriate to URI (Centrif.)	Date Elutriate Received from URI	Date Elutriate Tested	ETC Exp. No.[3]
OFF-1-ELU	OF-1	27-Apr	27-Apr	29-Apr	29-Apr	5-May	5-May	980501
OFF-2-ELU	OF-2	27-Apr	27-Apr	4-May	4-May	5-May	6-May	980503
OFF-3-ELU	OF-3	27-Apr	27-Apr	4-May	4-May	6-May	6-May	980503
OFF-4-ELU	OF-4	27-Apr	27-Apr	5-May	5-May	6-May	6-May	980503
OFF-5-ELU	OF-5	27-Apr	27-Apr	5-May	5-May	6-May	6-May	980503
OFF-6-ELU	OF-6	27-Apr	27-Apr	6-May	6-May	7-May	7-May	980504
OFF-7-ELU	OF-7	27-Apr	27-Apr	6-May	6-May	7-May	7-May	980504
OFF-8-SUR	OF-8	7-Apr	7-Apr	27-Apr	27-Apr	29-Apr	29-Apr	980412
OFF-9-SUR	OF-9	7-Apr	7-Apr	27-Apr	27-Apr	29-Apr	29-Apr	980412
OFF-10-SUR	OF-10	3-Apr	3-Apr	13-Apr	13-Apr	14-Apr	15-Apr	980301
OFF-11-SUR	OF-11	3-Apr	3-Apr	13-Apr	13-Apr	14-Apr	15-Apr	980301
OFF-12-SUR	OF-12	3-Apr	3-Apr	14-Apr	14-Apr	15-Apr	15-Apr	980301
OFF-13-SUR	OF-13	3-Apr	3-Apr	14-Apr	14-Apr	15-Apr	15-Apr	980301
OFF-14-SUR	OF-14	7-Apr	7-Apr	28-Apr	28-Apr	5-May	5-May	980501
OFF-15-SUR	OF-15	7-Apr	7-Apr	28-Apr	28-Apr	5-May	5-May	980501
OFF-16-SUR	OF-16	3-Apr	3-Apr	15-Apr	15-Apr	16-Apr	17-Apr	980403
OFF-17-SUR	OF-17	3-Apr	3-Apr	15-Apr	15-Apr	16-Apr	17-Apr	980403
OFF-18-SUR	OF-18	3-Apr	3-Apr	20-Apr	20-Apr	24-Apr	24-Apr	980407
OFF-19-SUR	OF-19	7-Apr	7-Apr	29-Apr	29-Apr	5-May	5-May	980501
OFF-20-SUR	OF-20	3-Apr	3-Apr	20-Apr	20-Apr	24-Apr	24-Apr	980407
OFF-21-SUR	OF-21	3-Apr	3-Apr	21-Apr	21-Apr	24-Apr	24-Apr	980407
OFF-22-ELU	OF-22	27-Apr	27-Apr	11-May	11-May	11-May	12-May	980505
OFF-23-SUR	OF-23	3-Apr	3-Apr	21-Apr	21-Apr	24-Apr	24-Apr	980407

FOOTNOTES

(1) Elutriates were used in sea urchin tests.

(2) Samples were stored on ice until received at the testing laborartory.

(3) ETC Exp. No. = Test Series Identification Number

TABLE 4
AMMONIA IN PORE WATERS OF SEDIMENTS[1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Total Ammonia (mg/L[3])	Un-Ionized Ammonia (mg/L[3])
OF-1	OF-SS1	980401	23.03	0.403
OF-2	OF-SS2	980401	20.23	0.321
OF-3	OF-SS3	980401	17.03	0.336
OF-4	OF-SS4	980401	8.84	0.204
OF-5	OF-SS5	980401	35.53	0.751
OF-6	OF-SS6	980401	16.64	0.347
OF-7	OF-SS7	980401	9.12	0.240
OF-8	OFF-8-SUR A	980409	3.00	0.039
OF-9	OFF-9-SUR A	980409	16.05	0.231
OF-10	OFF-10-SUR A	980405	7.24	0.138
OF-11	OFF-11-SUR A	980405	6.17	0.104
OF-12	OFF-12-SUR A	980405	4.79	0.157
OF-13	OFF-13-SUR A	980405	9.97	0.362
OF-14	OFF-14-SUR A	980409	3.05	0.051
OF-15	OFF-15-SUR A	980409	5.62	0.097
OF-16	OFF-16-SUR A	980405	2.48	0.075
OF-17	OFF-17-SUR A	980405	3.10	0.048
OF-18	OFF-18-SUR A	980405	10.90	0.344
OF-19	OFF-19-SUR A	980409	3.34	0.062
OF-20	OFF-20-SUR A	980405	5.34	0.089
OF-21	OFF-21-SUR A	980409	3.74	0.052
OF-22	OF-SS22	980401	20.18	0.295
OF-23	OFF-23-SUR A	980409	9.71	0.183

FOOTNOTES

(1) Ammonia measured in the pore water of sediments used during 10-day amphipod tests. Elutriates and pore waters of same sediments were used for the sea urchin tests.

(2) ETC Exp. No. = Test Series Identification Number

(3) mg = Milligram, L = Liter

TABLE 6
SUMMARY SEA URCHIN ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

Sample ID	SAIC ETC ID	ETC Exp. No.[1]	Conc. (%)	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value [4]	Comment
LIS[3]	LIS[3]	980505	50	88	4.4	na	nc	
OFF-1-ELU	OF-1	980501	50	90	3.2	103		
OFF-2-ELU	OF-2	980503	50	90	3.5	102		
OFF-3-ELU	OF-3	980503	50	86	3.6	98	0.29	
OFF-4-ELU	OF-4	980503	50	88	4.7	100		
OFF-5-ELU	OF-5	980503	50	90	4.0	102		
OFF-6-ELU	OF-6	980504	50	84	8.6	96	0.28	
OFF-7-ELU	OF-7	980504	50	81	10.8	92	0.19	
OFF-8-SUR	OF-8	980412	50	84	2.3	95	0.11	
OFF-9-SUR	OF-9	980412	50	0	0.0	0	0.00	**
OFF-10-SUR	OF-10	980301	50	90	2.5	102		
OFF-11-SUR	OF-11	980301	50	89	3.2	101		
OFF-12-SUR	OF-12	980301	50	92	2.1	105		
OFF-13-SUR	OF-13	980301	50	78	3.1	89	0.02	**
OFF-14-SUR	OF-14	980501	50	87	6.4	98	0.39	
OFF-15-SUR	OF-15	980501	50	90	4.2	103		
OFF-16-SUR	OF-16	980403	50	91	4.4	103		
OFF-17-SUR	OF-17	980403	50	98	0.6	111		
OFF-18-SUR	OF-18	980407	50	41	13.0	47	0.01	**
OFF-19-SUR	OF-19	980501	50	90	2.1	103		
OFF-20-SUR	OF-20	980407	50	0	0.6	0	0.00	**
OFF-21-SUR	OF-21	980407	50	73	11.8	83	0.07	
OFF-22-ELU	OF-22	980505	50	89	2.3	101		
OFF-23-SUR	OF-23	980407	50	13	7.5	15	0.00	**

TABLE 6
SUMMARY SEA URCHIN ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

Sample ID	SAIC ETC ID	ETC Exp. No.[1]	Conc. (%)	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value [4]	Comment
LIS[3]	LIS[3]	980505	10	83	5.5	na	nc	
OFF-1-ELU	OF-1	980501	10	87	3.8	104		
OFF-2-ELU	OF-2	980503	10	91	2.5	109		
OFF-3-ELU	OF-3	980503	10	90	2.5	108		
OFF-4-ELU	OF-4	980503	10	90	1.0	108		
OFF-5-ELU	OF-5	980503	10	91	1.5	109		
OFF-6-ELU	OF-6	980504	10	94	1.7	113		
OFF-7-ELU	OF-7	980504	10	77	5.5	93	0.13	
OFF-8-SUR	OF-8	980412	10	86	2.1	103		
OFF-9-SUR	OF-9	980412	10	88	0.6	105		
OFF-10-SUR	OF-10	980301	10	90	2.5	108		
OFF-11-SUR	OF-11	980301	10	96	1.2	115		
OFF-12-SUR	OF-12	980301	10	93	5.7	112		
OFF-13-SUR	OF-13	980301	10	96	2.0	115		
OFF-14-SUR	OF-14	980501	10	91	1.0	109		
OFF-15-SUR	OF-15	980501	10	90	1.2	108		
OFF-16-SUR	OF-16	980403	10	95	3.6	114		
OFF-17-SUR	OF-17	980403	10	91	4.0	109		
OFF-18-SUR	OF-18	980407	10	96	1.5	115		
OFF-19-SUR	OF-19	980501	10	87	2.9	105		
OFF-20-SUR	OF-20	980407	10	95	1.0	114		
OFF-21-SUR	OF-21	980407	10	98	1.2	117		
OFF-22-ELU	OF-22	980505	10	84	5.0	101		
OFF-23-SUR	OF-23	980407	10	96	2.1	116		

TABLE 7
SUMMARY SEA URCHIN ELUTRIATE IC10S AND IC25S
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND
PAGE 1 OF 2

SAIC ETC ID	ETC Exp. No.[1]	IC10[2] (%)	95% CL[3]	Corrected[4] IC10 (%)	IC25[5] (%)	95% CL[3]	Corrected[4] IC25 (%)	Comment
LIS[6]	980505	65.38	48.48 - 91.28	100.00	95.27	nc[7]	100.00	
OF-1	980501	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-2	980503	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-3	980503	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-4	980503	85.24	nc[7]	130.38	> 100	nc[7]	> 100.00	
OF-5	980503	99.50	nc[7]	152.19	> 100	nc[7]	> 100.00	
OF-6	980504	51.84	17.84 - 58.68	79.29	60.03	51.03 - 65.72	63.01	**
OF-7	980504	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-8	980412	50.85	2.02 - 53.32	77.78	60.92	57.71 - 63.11	63.94	**
OF-9	980412	12.39	10.36 - 13.83	18.95	18.73	17.10 - 19.94	19.66	**
OF-10	980301	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-11	980301	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-12	980301	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-13	980301	35.36	26.42 - 46.00	54.08	55.70	51.67 - 58.80	58.47	**
OF-14	980501	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-15	980501	55.04	52.30 - 55.12	84.18	62.59	60.32 - 62.79	65.70	**
OF-16	980403	70.69	nc[7]	108.12	> 100	nc[7]	> 100.00	
OF-17	980403	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-18	980407	17.06	15.17 - 19.66	26.09	27.64	22.92 - 34.14	29.01	**
OF-19	980501	56.05	52.01 - 56.22	85.73	65.12	61.73 - 65.56	68.35	**
OF-20	980407	14.01	13.48 - 14.05	21.43	20.04	19.59 - 20.11	21.03	**
OF-21	980407	39.01	nc[7]	59.67	> 100	nc[7]	> 100.00	
OF-22	980505	54.87	49.90 - 56.91	83.92	63.48	59.37 - 65.84	66.63	**
OF-23	980407	14.63	14.06 - 15.27	22.38	21.59	20.17 - 23.17	22.66	**

FOOTNOTES

** = Mean sample response was statistically different and less than mean LIS response (see Table 6 and Appendix G)

(1) ETC Exp. No. = Test Series Identification Number

(2) IC10 is a point estimate of the concentration that would cause a ten percent reduction in the normal response of the test organism.

(3) CL = Confidence Limit

TABLE 6
SUMMARY SEA URCHIN ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

Sample ID	SAIC ETC ID	ETC Exp. No.(1)	Conc. (%)	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value (4)	Comment
LIS(3)	LIS(3)	980505	100	64	10.7	na	nc	
OFF-1-ELU	OF-1	980501	100	89	6.1	140		
OFF-2-ELU	OF-2	980503	100	89	2.5	139		
OFF-3-ELU	OF-3	980503	100	87	4.5	137		
OFF-4-ELU	OF-4	980503	100	81	4.5	128		
OFF-5-ELU	OF-5	980503	100	83	3.2	131		
OFF-6-ELU	OF-6	980504	100	2	1.2	3	0.00	**
OFF-7-ELU	OF-7	980504	100	84	11.7	131		
OFF-8-SUR	OF-8	980412	100	15	1.5	24	0.01	**
OFF-9-SUR	OF-9	980412	100	2	2.0	3	0.00	**
OFF-10-SUR	OF-10	980301	100	90	4.7	141		
OFF-11-SUR	OF-11	980301	100	87	4.7	136		
OFF-12-SUR	OF-12	980301	100	94	1.5	147		
OFF-13-SUR	OF-13	980301	100	3	4.4	5	0.00	**
OFF-14-SUR	OF-14	980501	100	89	1.5	140		
OFF-15-SUR	OF-15	980501	100	1	1.2	1	0.00	**
OFF-16-SUR	OF-16	980403	100	81	7.4	128		
OFF-17-SUR	OF-17	980403	100	94	6.7	147		
OFF-18-SUR	OF-18	980407	100	1	0.6	1	0.00	**
OFF-19-SUR	OF-19	980501	100	15	1.5	24	0.01	**
OFF-20-SUR	OF-20	980407	100	0	0.0	0	0.00	**
OFF-21-SUR	OF-21	980407	100	92	6.2	145		
OFF-22-ELU	OF-22	980505	100	10	4.4	16	0.00	**
OFF-23-SUR	OF-23	980407	100	0	0.0	0	0.00	**

FOOTNOTES

** = Mean sample response was statistically different and less than mean LIS response.

(1) ETC Exp. No. = Test Series Identification Number

(2) SD = Standard Deviation

(3) LIS = Long Island Sound Negative Performance Control Sediment

(4) p value = Significance Level of t-Test

na = not applicable

nc = not calculated

TABLE 8
COLLECTION, RECEIVING, PREPARATION AND TEST DATES FOR PORE WATER TESTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND
PAGE 1 OF 1

Sample ID	SAIC ETC ID	Date Collected[1]	Date Received	Date Prepared	Date Tested	ETC Exp. No.[2]
OF-SS1	OF-1	27-Mar	27-Mar	6-Apr	7-Apr	980404
OF-SS2	OF-2	27-Mar	27-Mar	6-Apr	7-Apr	980404
OF-SS3	OF-3	27-Mar	27-Mar	30-Mar	31-Mar	980302
OF-SS4	OF-4	27-Mar	27-Mar	30-Mar	31-Mar	980302
OF-SS5	OF-5	27-Mar	27-Mar	30-Mar	31-Mar	980302
OF-SS6	OF-6	27-Mar	27-Mar	30-Mar	31-Mar	980302
OF-SS7	OF-7	27-Mar	27-Mar	30-Mar	31-Mar	980302
OFF-8-SUR B	OF-8	7-Apr	7-Apr	13-Apr	14-Apr	980408
OFF-9-SUR B	OF-9	7-Apr	7-Apr	13-Apr	14-Apr	980408
OFF-10-SUR B	OF-10	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-11-SUR B	OF-11	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-12-SUR B	OF-12	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-13-SUR B	OF-13	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-14-SUR B	OF-14	7-Apr	7-Apr	13-Apr	14-Apr	980408
OFF-15-SUR B	OF-15	7-Apr	7-Apr	13-Apr	14-Apr	980408
OFF-16-SUR B	OF-16	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-17-SUR B	OF-17	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-18-SUR B	OF-18	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-19-SUR B	OF-19	7-Apr	7-Apr	13-Apr	14-Apr	980408
OFF-20-SUR B	OF-20	3-Apr	3-Apr	6-Apr	7-Apr	980404
OFF-21-SUR B	OF-21	3-Apr	3-Apr	6-Apr	7-Apr	980404
OF-SS22	OF-22	27-Mar	27-Mar	30-Mar	31-Mar	980302
OFF-23-SUR B	OF-23	3-Apr	3-Apr	6-Apr	7-Apr	980404

FOOTNOTES

(1) Samples were stored on ice until received at the testing laborartory.

(2) ETC Exp. No. = Test Series Identification Number

TABLE 7
SUMMARY SEA URCHIN ELUTRIATE IC10S AND IC25S
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

(4) The IC value for each sample was corrected by dividing it by the IC value for LIS.

(5) IC25 is a point estimate of the concentration that would cause a 25 percent reduction in the response of the test organism.

(6) LIS = Long Island Sound Negative Performance Control Sediment

(7) nc = Not Calculated

TABLE 9
SUMMARY SEA URCHIN PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

Sample ID	SAIC ETC ID	ETC Exp. No.[1]	Conc. (%)	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value [4]	Comment
LIS[3]	LIS[3]	980408	50	79	5.0	na	nc	
OF-SS1	OF-1	980404	50	7	3.8	8	0.00	**
OF-SS2	OF-2	980404	50	13	2.5	17	0.00	**
OF-SS3	OF-3	980302	50	73	2.1	92	0.07	
OF-SS4	OF-4	980302	50	83	3.1	104		
OF-SS5	OF-5	980302	50	1	1.2	1	0.00	**
OF-SS6	OF-6	980302	50	79	3.2	99	0.43	
OF-SS7	OF-7	980302	50	81	4.7	102		
OFF-8-SUR B	OF-8	980408	50	71	9.5	90	0.14	
OFF-9-SUR B	OF-9	980408	50	0	0.0	0	0.00	**
OFF-10-SUR B	OF-10	980404	50	74	3.6	93	0.11	
OFF-11-SUR B	OF-11	980404	50	95	3.1	119		
OFF-12-SUR B	OF-12	980404	50	1	0.6	1	0.00	**
OFF-13-SUR B	OF-13	980404	50	0	0.0	0	0.00	**
OFF-14-SUR B	OF-14	980408	50	81	4.4	102		
OFF-15-SUR B	OF-15	980408	50	41	2.1	51	0.00	**
OFF-16-SUR B	OF-16	980404	50	93	1.7	117		
OFF-17-SUR B	OF-17	980404	50	94	1.0	118		
OFF-18-SUR B	OF-18	980404	50	0	0.0	0	0.00	**
OFF-19-SUR B	OF-19	980408	50	33	6.8	41	0.00	**
OFF-20-SUR B	OF-20	980404	50	89	6.0	112		
OFF-21-SUR B	OF-21	980404	50	88	1.5	111		
OF-SS22	OF-22	980302	50	82	7.8	104		
OFF-23-SUR B	OF-23	980404	50	0	0.6	0	0.00	**

TABLE 9
SUMMARY SEA URCHIN PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

Sample ID	SAIC ETC ID	ETC Exp. No.[1]	Conc. (%)	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value [4]	Comment
LIS[3]	LIS[3]	980408	10	81	4.6	na	nc	
OF-SS1	OF-1	980404	10	84	10.1	103		
OF-SS2	OF-2	980404	10	88	3.8	108		
OF-SS3	OF-3	980302	10	88	6.6	108		
OF-SS4	OF-4	980302	10	90	1.0	111		
OF-SS5	OF-5	980302	10	19	25.1	24	0.02	**
OF-SS6	OF-6	980302	10	85	1.2	105		
OF-SS7	OF-7	980302	10	88	2.0	108		
OFF-8-SUR B	OF-8	980408	10	80	4.2	99	0.40	
OFF-9-SUR B	OF-9	980408	10	74	11.0	91	0.20	
OFF-10-SUR B	OF-10	980404	10	91	1.5	112		
OFF-11-SUR B	OF-11	980404	10	94	2.5	115		
OFF-12-SUR B	OF-12	980404	10	93	1.5	114		
OFF-13-SUR B	OF-13	980404	10	93	2.3	114		
OFF-14-SUR B	OF-14	980408	10	79	4.0	97	0.27	
OFF-15-SUR B	OF-15	980408	10	87	2.0	107		
OFF-16-SUR B	OF-16	980404	10	90	0.6	110		
OFF-17-SUR B	OF-17	980404	10	94	1.5	116		
OFF-18-SUR B	OF-18	980404	10	94	2.5	116		
OFF-19-SUR B	OF-19	980408	10	85	2.6	105		
OFF-20-SUR B	OF-20	980404	10	93	3.5	114		
OFF-21-SUR B	OF-21	980404	10	91	3.5	112		
OF-SS22	OF-22	980302	10	91	2.6	112		
OFF-23-SUR B	OF-23	980404	10	89	1.5	110		

TABLE 10
SUMMARY SEA URCHIN PORE WATER IC10S AND IC25S
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND
PAGE 1 OF 2

SAIC ETC ID	ETC Exp. No.[1]	IC10[2] (%)	95% CL[3]	Corrected[4] IC10 (%)	IC25[5] (%)	95% CL[3]	Corrected[4] IC25 (%)	Comment
LIS[3]	980408	16.60	15.39 - 18.11	100.00	26.49	23.48 - 30.28	100.00	
OF-1	980404	11.22	0.10 - 17.64	67.59	18.27	9.64 - 23.65	68.97	**
OF-2	980404	13.43	7.56 - 16.27	80.90	20.71	15.49 - 23.30	78.18	**
OF-3	980302	31.78	0.00 - 38.72	191.45	54.58	50.31 - 57.22	206.04	
OF-4	980302	> 100	nc[7]	> 100.00	> 100	nc[7]	> 100.00	
OF-5	980302	1.28	0.90 - 2.72	7.71	3.20	2.24 - 6.80	12.08	**
OF-6	980302	44.10	0.00 - 56.72	265.66	58.50	53.88 - 62.13	220.84	
OF-7	980302	50.64	17.88 - 55.28	305.06	58.93	54.08 - 62.90	222.46	**
OF-8	980408	43.04	7.98 - 65.56	259.28	57.42	48.79 - 65.92	216.76	**
OF-9	980408	10.79	0.00 - 17.59	65.00	17.48	8.10 - 3.22	65.99	**
OF-10	980404	31.58	12.33 - 39.94	190.24	53.97	48.06 - 57.27	203.74	**
OF-11	980404	55.54	52.78 - 56.69	334.58	63.84	60.12 - 66.73	241.00	
OF-12	980404	14.03	11.26 - 14.06	84.52	20.07	17.72 - 20.16	75.76	**
OF-13	980404	14.00	11.28 - 14.00	84.34	20.00	17.73 - 20.00	75.50	**
OF-12	980404	14.03	11.26 - 14.06	84.52	20.07	17.72 - 20.16	75.76	
OF-15	980408	17.75	17.08 - 18.66	106.93	29.39	27.70 - 31.64	110.95	**
OF-16	980404	55.00	50.17 - 55.00	331.33	62.50	58.48 - 62.50	235.94	**
OF-17	980404	56.15	53.64 - 56.70	338.25	65.37	62.61 - 66.74	246.77	
OF-18	980404	14.01	12.63 - 14.05	84.40	20.04	18.83 - 20.12	75.65	**
OF-19	980408	16.60	15.39 - 18.11	100.00	26.49	23.48 - 30.28	100.00	**
OF-20	980404	53.74	50.00 - 56.87	323.73	61.64	57.69 - 64.64	232.69	**
OF-21	980404	53.68	47.61 - 56.63	323.37	62.16	57.18 - 64.61	234.65	
OF-22	980302	51.00	24.86 - 56.81	307.23	59.31	53.11 - 64.21	223.90	**
OF-23	980404	13.61	8.79 - 14.49	81.99	19.70	15.68 - 20.49	74.37	**

FOOTNOTES

** = Mean sample response was statistically different and less than mean LIS response (see Table 9 and Appendix K).

(1) ETC Exp. No. = Test Series Identification Number

(2) IC10 is a point estimate of the concentration that would cause a ten percent reduction in the normal response of the test organism.

(3) CL = Confidence Limit

(4) The IC value for each sample was corrected by dividing it by the IC value for LIS.

TABLE 9
SUMMARY SEA URCHIN PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

Sample ID	SAIC ETC ID	ETC Exp. No.(1)	Conc. (%)	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value (4)	Comment
LIS(3)	LIS(3)	980408	100	8	3.0	na	nc	
OF-SS1	OF-1	980404	100	0	0.0	0	0.02	**
OF-SS2	OF-2	980404	100	0	0.0	0	0.02	**
OF-SS3	OF-3	980302	100	4	1.7	50	0.07	
OF-SS4	OF-4	980302	100	85	4.7	1058		
OF-SS5	OF-5	980302	100	0	0.0	0	0.02	**
OF-SS6	OF-6	980302	100	6	1.5	79	0.23	
OF-SS7	OF-7	980302	100	1	1.2	8	0.02	**
OFF-8-SUR B	OF-8	980408	100	0	0.0	0	0.02	**
OFF-9-SUR B	OF-9	980408	100	3	4.9	42	0.12	**
OFF-10-SUR B	OF-10	980404	100	0	0.0	0	0.02	**
OFF-11-SUR B	OF-11	980404	100	9	12.2	113		
OFF-12-SUR B	OF-12	980404	100	0	0.0	0	0.02	**
OFF-13-SUR B	OF-13	980404	100	0	0.0	0	0.02	**
OFF-14-SUR B	OF-14	980408	100	54	6.7	679		
OFF-15-SUR B	OF-15	980408	100	0	0.6	4	0.02	**
OFF-16-SUR B	OF-16	980404	100	0	0.0	0	0.02	**
OFF-17-SUR B	OF-17	980404	100	17	6.7	217		
OFF-18-SUR B	OF-18	980404	100	1	1.2	8	0.02	**
OFF-19-SUR B	OF-19	980408	100	0	0.6	4	0.02	**
OFF-20-SUR B	OF-20	980404	100	2	3.5	25	0.04	**
OFF-21-SUR B	OF-21	980404	100	7	2.1	92	0.38	
OF-SS22	OF-22	980302	100	2	1.5	21	0.02	**
OFF-23-SUR B	OF-23	980404	100	0	0.0	0	0.02	**

FOOTNOTES

** = Mean sample response was statistically different and less than mean LIS response.

(1) ETC Exp. No. = Test Series Identification Number

(2) SD = Standard Deviation

(3) LIS = Long Island Sound Negative Performance Control Sediment

(4) p value = Significance Level of t-Test

na = Not Applicable

nc = Not Calculated

TABLE 1
COLLECTION, RECEIVING, AND TEST DATES FOR AMPHIPOD TESTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

Sample ID	SAIC ETC ID	Date Collected[1]	Date Received	Date Tested	ETC Exp. No.[2]
OF-SS1	OF-1	27-Mar	27-Mar	3-Apr	980401
OF-SS2	OF-2	27-Mar	27-Mar	3-Apr	980401
OF-SS3	OF-3	27-Mar	27-Mar	3-Apr	980401
OF-SS4	OF-4	27-Mar	27-Mar	3-Apr	980401
OF-SS5	OF-5	27-Mar	27-Mar	3-Apr	980401
OF-SS6	OF-6	27-Mar	27-Mar	3-Apr	980401
OF-SS7	OF-7	27-Mar	27-Mar	3-Apr	980401
OFF-8-SUR A	OF-8	7-Apr	7-Apr	17-Apr	980409
OFF-9-SUR A	OF-9	7-Apr	7-Apr	17-Apr	980409
OFF-10-SUR A	OF-10	3-Apr	3-Apr	10-Apr	980405
OFF-11-SUR A	OF-11	3-Apr	3-Apr	10-Apr	980405
OFF-12-SUR A	OF-12	3-Apr	3-Apr	10-Apr	980405
OFF-13-SUR A	OF-13	3-Apr	3-Apr	10-Apr	980405
OFF-14-SUR A	OF-14	7-Apr	7-Apr	17-Apr	980409
OFF-15-SUR A	OF-15	7-Apr	7-Apr	17-Apr	980409
OFF-16-SUR A	OF-16	3-Apr	3-Apr	10-Apr	980405
OFF-17-SUR A	OF-17	3-Apr	3-Apr	10-Apr	980405
OFF-18-SUR A	OF-18	3-Apr	3-Apr	10-Apr	980405
OFF-19-SUR A	OF-19	7-Apr	7-Apr	17-Apr	980409
OFF-20-SUR A	OF-20	3-Apr	3-Apr	10-Apr	980405
OFF-21-SUR A	OF-21	3-Apr	3-Apr	17-Apr	980409
OF-SS22	OF-22	27-Mar	27-Mar	3-Apr	980401
OFF-23-SUR A	OF-23	3-Apr	3-Apr	17-Apr	980409

FOOTNOTES

(1) Samples were stored on ice until received at the testing laborartory.

(2) ETC Exp. No. = Test Series Identification Number

TABLE 10
SUMMARY SEA URCHIN PORE WATER IC10S AND IC25S
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

(5) IC25 is a point estimate of the concentration that would cause a 25 percent reduction in the response of the test organism.

(6) LIS = Long Island Sound Negative Performance Control Sediment

(7) nc = Not Calculated

Appendix A

The ETC's Standard Operating Procedures:

10-day solid-phase test with *Ampelisca abdita*
Conducting the 10-day Solid-Phase Test Using Four Marine Amphipods, *Ampelisca abdita*, *Eohaustorius estuarius*, *Leptocheirus plumulosus*, and *Rhepoxynius abronius*

Embryo/Larval Development Test with *Arbacia punctulata*
48 Hour Embryo/Larval Development Test Using the Sea Urchin *Arbacia punctulata*

Elutriate Preparation
Preparation of Elutriates from Dredged Material Samples

Pore Water Preparation
Techniques for Extracting Pore-Water

CONDUCTING THE 10-DAY SOLID-PHASE TEST USING FOUR MARINE AMPHIPODS *AMPELISCA ABDITA, EOHAUSTORIUS ESTUARIUS, LEPTOCHEIRUS PLUMULOSUS,* AND *RHEPOXYNIUS ABRONIUS*

1.0 OBJECTIVE

1.1 This document describes the methods used to set-up, monitor, and breakdown the 10 Day Solid Phase test using four marine amphipods: *Ampelisca abdita, Eohaustorius estuarius, Leptocheirus plumulosus,* and *Rhepoxynius abronius*.

1.2 An appendix at the end of this document describes specific procedures involving collection, culture, and laboratory holding of the indiviual species can be found in the appendix.

2.0 SAFETY

2.1 Sediment samples may contain hazardous biological or chemical constituents. Always wear protective gear (i.e. polylaminated aprons/labcoats, faceshield, latex gloves, and glasses) to prevent exposure.

2.2 Hazardous constituents can become airborne when spilled/splattered sediment is allowed to dry. All spills must be wiped immediately with a damp paper towel.

2.3 Clean and disinfect the work area as soon as work is completed, particularly areas where spills have occurred.

2.4 Make sure that the work station is comfortable whether at the computer or at the hood. Chairs should be positioned ergonomically. Try not to spend too much time in one position, particularly working at the hood. **Never** work with your head **in** the hood. Use the microscopes at eye level to relieve tension in the neck. If at any time you feel pain, discomfort, or fatigue, let somebody know immediately.

3.0 MATERIALS

3.1 10% buffered formalin solution with rose bengal

3.2 12" Diameter, 1.0mm standard test sieve

3.3 12" Diameter, 2.0mm standard test sieve

3.4 12" Diameter, 500μm standard test sieve

3.5 Acetone

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3.6 Amphipods that have been acclimated to test conditions

3.7 Black pen

3.8 Bowl for rinsing

3.9 Control sediment

3.10 Data sheets (attached)

3.11 Disposable pipette with cut tip

3.12 Dissecting tools: probes, forceps

3.13 Drill with stainless steel homogenizer attachments

3.14 ETC computer, networked to the ETC Library computer

3.15 Formalin contaminated blue bin

3.16 Formalin contaminated disposable pipette with cut tip

3.17 Formalin contaminated large rinsing bowl

3.18 Formalin contaminated plastic bowl

3.19 Formalin contaminated plastic petri dishes, various sizes

3.20 Formalin contaminated plastic spoon, bent and straight probes, and forceps

3.21 Formalin contaminated settling bucket

3.22 Formalin contaminated sieve, 500µm

3.23 Formalin contaminated squeeze bottle filled with test water

3.24 Formalin waste container with waste log

3.25 Gray bins

3.26 Large carolina dish

3.27 Modified funnel

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3.28 Modified transfer pipette

3.29 Paper towels

3.30 Pipet and bulb

3.31 Plastic bowls/picking dishes

3.32 Plastic petri dishes, various sizes

3.33 Plastic spoon, bent and straight probes, and forceps

3.34 Plastic spoon and spatula

3.35 Plexiglas paddles

3.36 Preserving jars

3.37 Red plastic trays

3.38 Round Plastic Bins

3.39 Sample jars preserved with formalin

3.40 Screen cup (specimen cup, bottomless, with Nitex screen)

3.41 Sediment samples

3.42 Settling bucket with liners

3.43 Specimen cups

3.44 Squeeze bottle filled with test water

3.45 Stereo Microscope

3.46 Test chamber lids (small crystallization dish with hole drilled in the bottom)

3.47 Test chambers (1 quart mason jar)

3.48 Test water at appropriate salinity

3.49 The experiment number assigned to the test

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3.50 Thermometers

3.51 Turbulence reducers

3.52 Waterproof colored labels

3.53 Waterproof markers

4.0 METHODS

4.1 Preparing Data sheets for Sample Preparation and Test Monitoring
4.2 Preparing Test Chambers
4.3 Sample Preparation for Test Initiation
4.4 Adding Sediment to Test Chambers
4.5 Counting Amphipods into the Test Chambers--Initiating the Test
4.6 Daily Observations of Amphipod Toxicity Test
4.7 Sieving out Test Chambers at End of Test
4.8 Picking Samples at End of Test
4.9 Picking Preserved Samples at End of Test

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4.1 PREPARING DATASHEETS FOR SAMPLE PREPARATION AND TEST MONITORING

4.1.1 OBJECTIVE

4.1.1.1 This section describes the methods used to set-up the datasheet for the solid-phase amphipod test.

4.1.1.2 Datasheets are generated from comuter files stored on the ETC library computer under the file name:

4.1.2 SAFETY

4.1.2.1 Make sure that the work station is comfortable (ie. a wrist support, the mouse isn't too far away, the moniter isn't too high) and that the chair positioned ergonomically To avoid eye strain, try to look away from the computer screen for 15 seconds every 15 minutes.

4.1.3 MATERIALS

4.1.3.1 ETC computer, networked to the ETC Library computer

4.1.3.2 The experiment number assigned to the test

4.1.4 METHODS

4.1.4.1 Access the amphipod datasheets from the library computer.

4.1.4.1.1 Acces the 'C' drive on the library computer.

4.1.4 1.2 Open the EXCEL®spreadsheet program and access the directory. \Share.

4.1.4.1.3 Select the Directory. \\Datasheets\Solidpha.

4.1.4.2.4 Open the file: amp01ds.xls.

4.1.4.2.5 Save the file amp01ds.xls as the experiment number (ie. 950101.xls).

4.1.4.2 Fill in the information on the Method Summary.

4.1.4.2.1 Select the file tab labelled 'Method Summary'.

4.1.4.2.2 Enter the project name, test number, experiment number, test start date, and accompanying reference test experiment number in the spaces provided.

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NOTE: This information will automatically transfer to all pages of the datasheet.

4.1.4.3 Create the Randomization Sheet.

4.1.4.3.1 Select ther file tab labelled 'Randomization Sheet'

4.1.4.3.2 In the space designated 'organisim' type in the genus and species of the test organism being used.

4.1.4.3.3 Select 'Data Analysis' from the Tools menu.

4.1.4.3.4 Generate random numbers in column A.

1. Choose 'Random Number Generation'.
2. Leave the 'Number of Variables' box blank.
3. Select the 'Number of Random Numbers' box and enter the number that corresponds to the number of jars in the test.
4. Select 'Distribution', choose 'Uniform'.
5. Set Parameters, choose any numbers.
6. Select the 'Output Options' box, choose output range then use the mouse to highlight the desired range on the randomization sheet in column A only.

4.1.4.4 Sort the jar numbers.

4.1.4.4.1 Highlight columns A and B.

4.1.4.4.2 Choose 'Sort' from the Data menu.

4.1.4.4.3 Select 'Sort by column A, Ascending', choose OK.

4.1.4.4.4 Delete column A.

4.1.4.5 Sort the circles and stars.

4.1.4.5.1 Scroll over to column Z.

4.1.4.5.2 Highlight the numbers under the heading 'Circles'.

4.1.4.5.3 Select 'Copy' from the Edit menu.

4.1.4.5.4 Select 'Paste Special' from the Edit menu, choose 'Values', then click on OK.

4.1.4.5.5 Scroll down to row 51 in column Z and repeat this process for the numbers under the heading 'Stars'

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4.1.4.6 Save the file under the project directory.

4 1.4 6.1 Access the Directory· \\Share\Projects on the hard drive of the library computer.

4.1.4.6.2 Create a directory for the project if there isn't one already.

4.1.4 6.3 Save the file to the new directory.
NOTE: If more than one project is covered by the experiment number, save the file toall project directories involved.

4.1.4.6.4 Print the entire file.

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4.2 PREPARING TEST CHAMBERS FOR AMPHIPOD TOXICITY TESTS

4.2.1 OBJECTIVE

4.2.1.1 This section describes the methods used to label and soak test chambers prior to test initiation.

4.2.1.2 Test chambers are labeled and soaked with test water at least 24 hours prior to the addition of sediment samples.

4.2.2 SAFETY

4.2.2.1 Test chambers are made of glass Always check for cracks and chips before handling.

4.2.3 MATERIALS

4.2.3.1 Seawater

4.2.3.2 Data sheets (attached)

4.2.3.3 Waterproof colored label tape

4.2.3.4 Waterproof marker

4.2.3.5 Test chambers (1 quart mason jar)

4.2.3.6 Test chamber lids (small crystallization dish with hole drilled in the bottom)

4.2.4 METHODS

4.2.4.1 Obtain the randomization sheet.

4.2.4.2 Label glassware.

4.2.4.2.1 Select enough test chambers for the test as determined by the randomization sheet.

4.2.4.2.2 Attach waterproof colored label tape to each jar, just above the word "Ball".
NOTE: Turn under one side of the tape so that it can be easily removed later.

4.2.4.2.3 Arrange the jars in groups of five on a cart or a table.

4.2.4.2.4 Label each group of five jars with a group of five numbers from the randomization sheet, using the waterproof marker.

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4 2.4.2.5 Circle the numbers that correspond to the first two replicates of each group.

4 2.4.2.6 Put a star next to the number that corresponds to the third replicate of each group.

4.2.4.2.7 Sign the randomization sheet in the spaced designated, 'randomized by '

4.2.4.2.8 Label the lids in the same manner.

4.2.4.3 QA the randomization.

4.2.4.3.1 Ask a second person to check the number assignments on the jars and lids against the randomization sheet to insure that they are labeled correctly and that no numbers are duplicated.

4.2.4.3.2 The second person must also sign the randomization sheet.

4.2.4.4 Soak the test chambers.
NOTE: The chambers do not need to be totally emersed in water Only the inside needs exposure to the soak.

4.2.4.4.1 Fill test chambers with test water (usually seawater at 30ppt).

4.2.4.4.2 Cover the test chambers with black plastic to avoid dust.

4.2.4 4.3 Let chambers stand for at least 24 hours.

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4.3 SAMPLE PREPARATION FOR TEST INITIATION

4.3.1 OBJECTIVE

4.3.1.1 This section describes the methods used to press sieve sediment samples prior to test initiation.

4.3.1.2 Sediment samples are press sieved through a 2.0mm sieve to remove large debris or predators If a sample already contains amphipods, it must be press sieved through a 1.0mm sieve to remove the resident amphipods.

4.3.2 SAFETY

4.3.2.1 Sediment samples may contain hazardous biological or chemical constituents. Polylaminated (waterproof) coveralls, polylaminated apron, facesheild, latex gloves, silvershield gloves, nitrile gloves, and dielectric boots are to be worn.

4.3.2.2 Hazardous constituents can become airborne when spilled/splattered sediment is allowed to dry. All spills must be wiped immediately with a damp paper towel.

4.3.2.3 Excess sediment is double bagged and disposed of in the dumpster when work is completed. Check with ECH&S Officer first.

4.3.2.4 Press sieving must be performed in a hood.

4.3.3 MATERIALS

4.3.3.1 12" Diameter, 2.0mm standard test sieve (one per person)

4.3.3.2 12" Diameter, 1.0mm standard test sieve (one per person)

4.3.3.3 Round Plastic Bin (one per sample)

4.3.3.4 Plexiglas paddle (one per sample)

4.3.3.5 Plastic spoon, spatula, and funnel (one per sample)

4.3.3.6 Drill with stainless steel homogenizer attachments

4.3.3.7 Acetone

4.3.3.8 Seawater

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4.3.3 9 Sediment samples

4 3.3.10 Data sheets (attached)

4.3.3 11 Paper towels

4.3.3.12 Settling bucket with liners.

4.3.3.13 Red plastic tray (one per person)

4.3.3.14 Sediment samples

4.3.4 METHODS

4.3.4.1 Obtain samples from storage.

4.3.4.2 Select a sample container.

4.3.4.2.1 Remove a sample from its plastic ziploc bag.

4.3.4.2.2 Observe sample number and initial the appropriate space on the randomization sheet.

4.3.4.2.3 Place sample container in the hood.

4.3.4.4 Set-up sieving station

4.3.4.4 1 Select a sieve
1. Remove the lid of the sample jar and look for any resident amphipods floating on the surface.
2. Choose the 2.0mm sieve if no amphipods are present.
3. Choose the 1.0mm sieve if amphipods are present.

4.3.4.4.2 Obtain a round plastic bin, a plastic spoon, a plastic funnel, a red plastic tray, and a Plexiglas® paddle.

4.3.4.4 3 Place the sieve inside the bin, and place the bin on the tray.

4.3.4.5 Press sieve the sample.
NOTE: Do **not** add any water to the samples.

4.3.4 5.1 Homogenize the sample by shaking vigorously or by using the drill and the stainless steel homogenizer.

4.3.4.5.2 Pour or spoon the entire contents of the sample container onto the sieve.

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4 3.4.5.3 Push the sediment through the sieve using the Plexiglas paddle until only the material larger than the sieve opening remains.
NOTE: If tubes are present in the sample it must be press sieved through a 1.0mm sieve.

4.3.4.5 4 Rinse out the sample container with seawater, discard rinse into a settling bucket.

4.3.4.5.5 Discard the material remaining on the sieve into a garbage can with a double liner.

4.3.4.5.6 Wipe excess material from the paddle and use it to scrape sediment off the bottom of the sieve into the garbage can.

4.3.4.6 Return the sample to its original container.

4.3.4.6.1 Homogenize the sediment in the bin using the plastic spoon.

4.3.4 6.2 Place the funnel in the mouth of the sample container.

4.3.4.6.3 Pour or spoon the sample slowly back into the container and secure the lid.

4.3.4.6.4 Wipe any excess sediment from the outside of the container using a damp paper towel. Discard the towel.

4.3.4.6.5 Place an elastic band with a green clip around the neck of the sample container to indicate that the sample has been press sieved.

4.3.4.6.6 Return the sample to the plastic ziploc bag and seal.

4.3.4.6 7 Fill out the randomization sheet.

1. Record sediment type, odor, color, and components under sample description on the randomization sheet.
2. Have a second person verify the sample number and countersign the appropriate space on the randomization sheet.

4.3.4.7 Clean equipment between samples.

4.3.4.7.1 Rinse all excess sediment from sieve(s), bin, spoon, funnel, tray, and paddle into a settling bucket using tap water.

4.3.4.7.2 Place the bin, spoon, funnel, and paddle into a dishbin.

4.3.4.7.3 Rinse the sieve with acetone over an acetone waste container and cap the container.

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4.3.4 7.4 Rinse the sieve thoroughly first with deionized water and then with seawater so that it can be used again.

4.3.4.8 Return all samples to storage.

4.3.4.9 Clean the work area.

4.3.4.9.1 Return any un-used /clean equipment to its storage area.

4.3.4.9.2 Wipe any splattered sediment from the hood and surrounding area (including the floor) using damp paper towels.

4.3.4.9.3 Wash the hood and surrounding area (walls, floor mats, cabinets, faucets, counter-tops, etc.) with a solution of alconox/dissinfectant. Rinse thoroughly.

4.3.4.9 4 Remove the floor mat from in front of the hood and spray it down outside.

4.3.4.9.5 Wash the floor with alconox dissolved in hot water Rinse.

4.3.4.9.6 Discard apron and coveralls if grossly dirty.
NOTE: Coveralls can be used again if they are free of sediment; store them on the labcoat rack.

4.3.4.9.7 Clean faceshield and hang on wall; rinse silvershield and nitrile gloves and hang on glove rack.

4.3.4.10 Discard the sediment in the settling bucket.

4.3.4.10.1 Allow the bucket to sit overnight in the hood.

4.3.4.10.2 Decant the overlying water down the drain after 24 hours.

4.3.4.10.3 Remove the liner from the settling bucket and discard in the dumpster.

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4.4 ADDING SEDIMENT SAMPLES TO TEST CHAMBERS

4.4.1 OBJECTIVE

4.4.1.1 This section describes the methods used to add sediments to test chambers for solid-phase testing.

4.4.1.2 To insure oxidation of the sediment surface, sediments and seawater are added to the test chambers 24 hours prior to test initiation.

4.4.2 SAFETY

4.4.2.1 Sediment samples may contain hazardous biological or chemical constituents. Polylaminated (waterproof) coveralls, polylaminated apron, facesheild, latex gloves, silvershield gloves, nitrile gloves, and dielectric boots are to be worn.

4.4.2.2 Hazardous constituents can become airborne when spilled/splattered sediment is allowed to dry. All spills must be wiped immediately with a damp paper towel

4.3.2.3 Excess sediment is double bagged and disposed of in the dumpster when work is completed. Check with ECH&S Officer first.

4.4.2.4 Press seiving must be performed in a hood.

4.4.3 MATERIALS

4.4.3.1 Plastic spoon, spatula, and funnel (one per sample)

4.4.3.2 Drill with stainless steel homogenizer attachments

4.4.3.3 Seawater at appropriate test salinity

4.4.3.4 Sediment samples

4.4.3.5 Data sheets (attached)

4.4.3.6 Control sediment

4.4.3.7 Turbulence reducer

4.4.3.8 Squeeze bottle filled with test water

4.4.3.9 Paper towels

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4.4.3.10 Settling bucket with liners

4.4.3.11 Red plastic trays (one per person)

4.4.4 METHODS

4.4.4.1 Obtain samples from storage.

4.4.4.2 Select a sample container.

4.4.4.2.1 Remove a sample from its plastic ziploc bag.

4.4.4.2.2 Observe sample number and initial the 'Seds in' space on the randomization sheet.

4.4.4.2.3 Place sample container in hood.

4.4.4.4 Set-up station in hood.

4.4.4.4.1 Place the red tray in the hood.

4.4.4.4.2 Select the appropriately numbered jars for the sample that was chosen, discard the soak water and place them on the red tray.

4.4.4.4.3 Obtain a plastic spoon and a plastic funnel.

4.4.4.4.4 Fill a squeeze bottle with test water and place it in the hood. (Refill as necessary).

4.4.4.5 Fill the test chambers with sediment.
NOTE: To avoid cross-contamination, fill the control replicates first.

4.4.4 5.1 Homogenize the sample by shaking vigorously and/or by using the drill and the stainless steel homogenizer.

4.4.4.5.2 Place the funnel in the mouth of the first test chamber.

4.4.4.5.3 Pour or spoon ~ 200mls of homogenized sample through the funnel into the test chamber using the metric markings on the side of the jar as the measure. Repeat this for all five replicates.

4.4.4.5.4 Eliminate air pockets and surface irregularities by gently tapping the test chamber and by smoothing the sediment surface with a spatula.

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4.4.4.5.5 Rinse all mud from the sides (inside and out) of the test chamber using the squeeze bottle filled with test water.

4.4.4.5.6 Wipe excess sediment from the outside of the chamber using a paper towel.

4.4.4.5.7 Ask a second person to verify that the appropriate sediment was placed into the appropriate jars.

4.4.4.5.8 The second person must countersign the randomization sheet.

4.4.4.5.9 Place the five replicate jars on the cart.

4.4.4.6 Put the completed sample aside.

4.4.4.6.1 Secure the lid of the sample container.

4.4.4.6 2 Wipe any excess sediment from the outside of the container using a damp paper towel.

4.4.4.6.3 Return the sample to the plastic ziploc bag and seal.

4.4.4.6.4 Set the sample aside.

4.4.4.7 Clean equipment between samples.

4.4.4.7.1 Rinse all excess sediment from the spoon, funnel, and tray into a settling bucket using tap water.

4.4.4.7.2 Place the spoon and funnel into a dishbin.

4.4.4.7.3 Wipe any excess sediment from the hood using tap water and paper towels.

4.4.4.7.4 Discard excess water from the hood into the sink using the squeege

4.4.4.7.5 Place the red tray back into the hood.

4.4.4.8 Fill the test chambers with test water.

4.4.4.8.1 Hold a turbulence reducer in the first test chamber just above the sediment surface.

4.4.4.8.2 Pour test water slowly from a pitcher onto the turbulence reducer in the test chamber until the water level is between the 750 and the 800ml mark on the jar.
NOTE: For best results, keep the turbulence reducer above the water surface by slowly raising it while pouring.

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4.4.4.8.3 Rinse the turbulence reducer between test treatments but not between treatment replicates.

4.4.4 8.4 Record the number of the carboy used to fill the test chambers on the randomization sheet.

4.4.4.9 Transfer the test chambers to the test table.

4.4.4.9.1 Set-up the test table.
1. Add tap water to the table to just below the labels.
2. Turn on the circulating pump.
3. Set the temperature control on the chiller unit to the appropriate test temperature.
4. Set the upper limit temperature control inside the chiller unit for 2°C higher than the desired test temperature.
5. Set-up a temperature recorder and a thermometer at the table.

4.4.4.9.2 Place the test chambers into the test table in numerical order, in groups of five.

4.4.4.9.3 Place the corresponding lid onto each test chamber.

4.4 4.9.4 Place pipettes in test chambers so that the tip of the pipette is approximately half-way down the water column (between the 400 and 600ml mark on the jar).

4.4.4.9.5 Attach the air lines to the pipettes and turn on the air pump.

4.4.4.9.6 Check to make sure air is flowing to all test chambers and adjust the 'gang' valves for gentle aeration.

4.4.4.9.7 Fill out the "Method Summary Datasheet".
1. Check the appropriate spaces describing the test methods used.
2. Record the Carboy #'s, the Lot # for the control sediment, the sieve size used, the table #, the air pump #, the thermometer #, the temperature recorder #.
3. Obtain physical data information from the Assistant Manager and fill in the appropriate spaces.

4.4.4.10 Clean the work area.

4.4.4.10.1 Return any un-used /clean equipment back to its storage area.

4.4.4.10.2 Wipe any splattered sediment from the hood and surrounding area (including the floor) using damp paper towels.

4.4.4.10.3 Wash the hood and surrounding area (walls, floor mats, cabinets, faucets, counter-tops, etc) with a solution of alconox/dissinfectant. Rinse thoroughly

4.4.4.10.4 Remove the floor mat from in front of the hood and spray it down outside.

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4.4.4.10.5 Wash the floor with alconox dissolved in hot water. Rinse.

4 4.4.10.6 Discard apron and coveralls if grossly dirty.
NOTE. Coveralls can be used again if they are free of sediment; store them on the labcoat rack.

4.4.4.10.7 Clean faceshield and hang on wall; rinse silvershield and nitrile gloves and hang on the glove rack.

4.4.4.11 Discard the sediment in the settling bucket.

4.4.4.11.1 Allow the bucket to sit overnight in the hood.

4.4.4.11.2 Decant the overlying water down the drain after 24 hours.

4.4.4.11.3 Remove the liner from the settling bucket and discard in the dumpster.

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4.5 INITIATING THE TEST-Counting Amphipods into the Test Chambers

4.5.1 OBJECTIVE

4.5.1.1 This section describes the methods used to count amphipods into the test chambers.

4.5.1.2 Amphipods are randomly distributed into specimen cups containing test water before being transfered to test chambers. Twenty amphipods are added to each test chamber.

4.5.2 SAFETY

4.5.2.1 A labcoat and latex gloves(rinsed) are to be worn when adding animals to the test chambers.

4.5.3 MATERIALS

4.5.3.1 Amphipods that have been acclimated to test conditions

4.5.3.2 Specimen cups (one for each test replicate)

4.5.3.3 Specimen cup (for representative sample of animals to be preserved)

4.5.3.4 Test water at appropriate salinity

4.5.3.5 Modified transfer pipette (end cut off)

4.5.3.6 Screen cup (specimen cup, bottomless, with Nitex screen)

4.5.3.7 Squeeze bottle filled with test water

4.5.3.8 Datasheets

4.5.4 METHODS

4.5.4.1 Set-up the work area.

4.5.4.1.1 Cover the work space with white absorbant paper.

4.5.4.1.3 Count out the number of specimen cups needed (include the extra cup for preserving).

4.5.4.1.4 Fill each cup approximately one third to half full with test water.

4.5.4.2 Determine amphipod mortality in the holding jars.

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4.5.4.2.1 Remove all animals that look dead, from each holding jar.

4.5.4.2.2 Examine the amphipod's condition under a stereo microscope.

4.5.4.2.3 Record the number of dead amphipods for each holding jar on the "Field Collection and Laboratory Holding Datasheet".

4.5.4.2.4 Determine the acceptability of the percent mortality.
1. Divide the number of dead animals by the total number of animals added to the jar initially.
2. Use the animals from the dish if percent mortality is less than or equal to 5% (ie. 18 dead out of 350, or 15 dead out of 300).

4.5.4.4 Add the animals to the specimen cups.

4.5.4.4 1 Determine the number of animals that can be used from each holding jar by dividing the desired number of animals per test chamber (20) by the number of acceptable dishes containing animals.

4.5.4.4.2 Select a dish containing animals (keep track of the number of the dish you choose).

4.5.4.4.3 Select healthy looking, non-gravid, amphipods from the dish using a pipette.
1. Determine healthy animials using the following criteria:
   animals should have good color, full guts, and be active.
2. Determine non-gravid animals by looking for the absence of eggs in the oviduct or brood chamber.

4.5.4.4.4 Place the pre-determined number of amphipods from each numbered dish (usually 2-3) into each specimen cup until all of the cups contain 20 animals.
NOTE: If there are not enough animals to fill all of the cups with 20; the laboratory manager must be consulted to determine a course of action.

4.5.4.4.5 Examine each cup and replace any weak or gravid looking animals.

4.5.4.5 Count animals into the test chambers.
NOTE: Take notice of the time.

4.5.4.5.1 Place the specimen cups on a cart and bring them to the test table.
NOTE: To help prevent double dosing or skipping a test chamber, it is suggested that the cups be placed on the cart in rows of five.

4.5.4.5.2 Turn off the air pump that supplies the test chambers.

4.5.4.5.3 Remove the lid and pipette from the first test chamber.

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4.5.4.5.4 Pour the content of one specimen cup through the screen cup.
NOTE: Work over a bucket on the floor.

4.5.4.5.5 Verifiy that the number of animals in the cup equals 20.
NOTE: Avoid exposing animals to the air for extended periods by nesting the screen cup in a specimen cup containing test water.

4.5.4 5.6 Replace any gravid or weak animals in the screen cup.

4.5.4.5.7 Verify the count again.

4.5.4.5.8 Add the animals to the test chamber.
1. Rinse the contents of the screen cup into the test chamber using the squeeze bottle containing test water.
2. Examine the cup inside and out for the presence of any amphipods.
3. Rinse any remaining amphipods into the test chamber.

4.5.4 5.9 Examine the test chamber for animals stuck on the sides or floating in the surface.

4.5.4.5.10 Spray down the inside rim of the test chamber using the squeeze bottle. Bring the volume up to the 800 ml mark.

4.5.4 5.11 Prod the floating animals toward the sediment using the aeration pipette or the bulb end of a transfer pipette.

4 5.4.5.12 Replace the lid and the aeration pipette and move on to the next test chamber. Continue untill all amphipods have been added to all test chambers.

4.5.4.6 Initiate the test (one hour after the addition of animals to the first chambers).

4.5.4.6.1 Examine all test chambers one at a time.
1. Look for amimals that have not burrowed into the sediment.
2. Replace animals that have not burrowed with animals from the holding dishes.
3. Record any replacements on the datasheet for day zero.

4.5.4.6.2 Record your initials, the time, the table temperature, and the thermometer number, in the appropriate space on the "Daily Datasheet" for day 0.

4.5.4.6.3 Turn on the air pump that supplies the test chambers.

4.5.4 6.4 Check to make sure that air is flowing to all the test chambers and adjust the 'gang' valves for gentle aeration.

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4.5.4.6.7 Complete the "Method Summary Datasheet" using the information from the "Field Collection Datasheet", the "Randomization Datasheet", and the "10-Day Daily Datasheet" for Day 0.

4.5.4.6.8 Make sure that **all** datasheets have been filled out completely and correctly

4.5.4.7 Preserve the extra cup of 20 animals.

4.5.4.7.1 Transfer the animals from the extra cup to a 20ml scintillation vial using a small amount of test water.

4.5.4.7.2 Verify the count as twenty.

4.5.4.7.3 Add a volume 10% formalin equal to the volume in the vial and cap the vial tightly.

4.5.4.7.4 Mark the vial with the experiment number and the name of the test species.

4.5.4.7.5 Place the labelled vial in the scintillation vial tray designated for animal storage.

4.5.4.8 Clean the equipment and the work area.

4.5.4.8.1 Return any un-used /clean equipment back to its storage area.

4.5.4.8.2 Rinse all specimen cups, screen cups, and holding dishes with deionized water. Let drip dry

4.5.4.8.3 Replace the absorbant paper if it is grossly dirty.

4.5.4.8.4 Return all materials to their appropriate storage area.

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4.6 DAILY OBSERVATIONS OF THE AMPHIPOD TOXICITY TEST

4.6.1 OBJECTIVE

4.6.1.1 This section describes the methods used to make and record daily observations of test chambers during the 10 day exposure.

4.6.1.2 Each test chamber is checked daily to identify any emerged or dead amphipods and observe the presence of molts.

4.6.1.3 Physical parameters are measured twice during the exposure, they include: pH, salinity, dissolved oxygen, and sometimes ammonia.

4.6.2 SAFETY

4.6.2.1 A labcoat, latex gloves (rinsed), and safety glassed are to be worn when performing the daily test check and measuring physical parameters.

4.6.3 MATERIALS

4.6.3.1 Pipet and bulb

4.6.3.2 Stereo Microscope

4.6.3.3 Dissecting tools: probes, forceps

4.6.3.4 Plastic petri dish

4.6.3.5 Bowl for rinsing

4.6.3.6 Data sheets (attached)

4.6.3.7 Seawater at appropriate test salinity

4.6.3.8 Squeeze bottle filled with test water

4.6.4 METHODS

4.6.4.1 Record the time and your initials on the 'Daily Data Sheet'.

4.6.4.2 Check test temperature.

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4.6.4 2.1 Observe the temperature recorder and note any irregularities on the daily data sheet and the general comment sheet.
NOTE: Unusual temperatures should be brought to the attention of the assistant laboratory manager immediately.

4.6.4.2.2 Record the thermometer number on the data sheet.

4.6.4.2.3 Read the thermometer and record the temperature on the data sheet, taking into account the calibration adjustment on the label.

4.6.4.3 Check each test chamber (Day 1 - 9).

4.6.4.3.1 Remove aeration pipette and lid from the test chamber.

4.6.4.3.2 Rinse the inside edge of the test chamber with test water from a squeeze bottle. Use only enough water to dislodge any emerged animals that may have been caught in an air bubble.

4.6.4.3.3 Look into the test chamber to find amphipods that are not burrowed into the sediment and remove them to a petri dish using a clean pipette.

4.6.4.34 Examine the animals under the stereo microscope.

4.6.4.3.5 Record observations on the "10-Day Daily Datasheet", based on the following classifications:
Emerged (E)--any live amphipod not burrowed in the sediment, i.e. floating swimming, or lying on the sediment surface.
Molt (M)--discarded exo-skeleton the usually exhibits the following: it is transparent, has no eyes or gut, it appears hollow and is usually split at the neck.
Neuromuscular twitch (NMT)--a live amphipod that appears dead, when gently probed near the legs or the midsection, one or two legs may kick spasmodically (this may take some time to observe).
Dead (D)--a dead amphipod usually exhibits the following: there is *no* neuromuscular twitch; the body is soft and extended, it may be disintegrating; and the gut is usually empty.

4.6.4.3.6 Return all live animals (include NMT) and molts to the test chamber.

4.6.4.3.7 Discard all dead animals by rinsing them into the rinse bowl.
NOTE: An experienced technician **must** verify any animals that you have designated dead until he/she has determined that you can work on your own.

4.6.4.3.8 Replace the lid and the aeration pipette to the test chamber.

4.6.4.3.9 Rinse the pipette, inside and out, with test water between test chambers.

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4.6.4.3.10 After all chambers have been checked, rinse probes and dishes with deionized water. Clean the microscope and cover.

4.6.4.3.11 Walk back along both sides of the test table and insure that all lids and pipettes have been replaced and that all chamber are aerating properly.

4.6.4.4 Check each test chamber (Day 10).

4.6.4.4.1 Repeat steps 4.6.4.3.1 through 4.6.4.3.5.

4.6.4.4.2 Place emerged animals (include NMT) in a labeled vial corresponding to the test chamber.

4.6.4.4.3 Record the number emerged (include NMT) on the 'Test Breakdown Sheet' as well as the 'Daily Data Sheet'.

4.6.4.4.4 Repeat steps 4.6.4 2.7 through 4.6.4.2.11.

4.4.4.5 Complete the Daily Data Sheet (Day 1-10).

4.6.4.5.1 QA the cumulative number dead from yesterday.
NOTE: This does not apply for Day's 0 and 1.

1. For each jar, re-tabulate the cumulative number dead from yesterday by adding the number of dead found yesterday to the cumulative total from the day before.
2. Record your initials on today's datasheet in the space labeled 'Previous day's Cumulative number dead, QA'd by: _____'.

4.6.4.5.2 Calculate today's cumulative number dead by adding today's observed dead to yesterday's QA'd total. Record data in the columns labeled: 'Cum # Dead'.

4.6.4.5.3 Make photocopies of today's data sheet and any previous sheet that needed corrections and place them into the test folder in the file cabinet.
NOTE: Do not wear protective clothing outside the laboratory.

4.6.4.5.4 Return the original data to the clipboard; place completed data sheets at the bottom of the stack.

4.6.4.6 Take physical measurements twice during test.

4.6.4.6.1 Calibrate the equipment needed to measure dissolve oxygen, pH, and salinity. See individual SOP's for specific instructions.

4.6.4.6.2 Record calibrations in the *EQUIPMENT-Calibration Logs for Measurement of Dissolved Oxygen, pH, Salinity, and Temperature on Experiments Performed in (Year).*

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4.6.4.6.3 Obtain physical data measurements from test chambers designated by the presence of a circle

4.6.4.6.4 Record data on the 'Physical Data Sheet' for the appropriate day.

4.6.4.6.5 Record your initials and the date in the appropriate space on the 'Physical Data Sheet'

4.6.4.6.6 Walk back along both sides of the test table and insure that all lids and pipettes have been replaced and that all chamber are aerating properly.

4.6.4.6.7 Make photocopies of today's data sheet and any previous sheet that needed corrections and place them into the test folder in the file cabinet.

4.6.4.6.8 Return the original data to the clipboard; place completed data sheets at the bottom of the stack.

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4.7 SIEVING TEST CHAMBERS FOR TEST BREAKDOWN

4.7.1 OBJECTIVE

4.7.1.1 This section describes the methods used to sieve amphipods from test sediments at the end of the 10 day exposure.

4.7.1.2 Sediment from each test chamber must be sieved so that the remaining material can be picked through to find the surviving amphipods.

4.7.1.3 All replicates must be sieved, if all replicates can not be picked immediately, it is possible to preserve the last two replicates. This is determined by the Laboratory Manager.

4.7.2 SAFETY

4.7.2.1 Sediment samples may contain hazardous biological or chemical constituents. Polylaminated (waterproof) coveralls, polylaminated apron, facesheild, latex gloves, silvershield gloves, nitrile gloves, and dielectric boots are to be worn.

4.7.2.2 Hazardous constituents can become airborne when spilled/splattered sediment is allowed to dry. All spills must be wiped immediately with a damp paper towel.

4.7.3 MATERIALS

4.7.3.1 Settling bucket with liners (one per person)

4.7.3.2 500µm sieve (one per person)

4.7.3.3 Modified transfer pipette (cut tip) and forceps (one per person)

4.7.3.4 Gray bins (one per person)

4.7.3.5 Large carolina dish (one per person)

4.7.3.6 Plastic bowls/picking dishes (one per sample)

4.7.3.7 Seawater at appropriate test salinity

4.7.3.8 Squeeze bottle filled with test water

4.7.3.9 Thermometer

4.7.3.10 Test chambers

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4.7.3 11 Preserving jars (one for each sample)

4.7.3.12 Modified funnel

4.7.3.13 10% buffered formalin solution with rose bengal

4.7.3.14 Datasheets (attached)

4.7.4 METHODS

4.7.4.1 Set-up the sieving station.

4.7.4.1.1 Place a settling bucket in the sink.

4.7.4.1.2 Place a 500µm sieve over the bucket.

4.7.4.1.3 Place a gray bin labeled 'test breakdown' to the left or right of the sink.

4.7.4.1.4 Fill the gray bin at least half full with test water.

4.7.4.1.5 Place the squeeze bottle containing test water, the large glass dish, the forceps, and the pipette on the opposite side of the sink as the bin.

4.7.4.2 Sieve out the samples.
NOTE: This must be done **after** daily observations have been recorded for Day 10.

4.7.4.2.1 Obtain the first three replicates for each treatment, indicated by a circle or a star, and bring them to the sieving station.

4.7.4.2.2 Determine who will sieve the odd numbered chambers and who will sieve the even numbered chambers. Record this on the data sheet.

4.7.4.2.3 Select a test chamber and a medium dish.

4.7.4.2.4 Transfer the label from the chamber to the medium dish and place the labeled medium dish inside the large dish next to the sink.

4.7.4.2.5 Rinse the content of the test chamber into the sieve using a moderate force tap water spray. Rinse jar thoroughly then place it in a dish bin.

4.7.4.2.6 Rinse the sediment through the sieve using a gentle to moderate force tap water spray, until no more material will pass through the sieve.
NOTE: Do not expose amphipods to this fresh water spray for more than 10 minutes.

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4.7.4.2.7 Carefully rinse the material retained on the sieve to one end, while holding the sieve at a slight angle.

4.7 4.2.8 Rinse the material remaining on the sieve generously with test water, using the squeeze bottle and let the water drain through the sieve.

4.7.4.3 Transfer the material on the sieve to the picking dish.

4.7.4.3.1 Dip the end of the sieve carefully into the gray bin, do not let any material flow out of the sieve.

4.7.4.3.2 Rinse the material again with test water to one end of the sieve, using the squeeze bottle.

4.7.4.3.3 Place the sieve over the medium dish (inside the large dish) and tip it slightly toward you.

4.7.4.3.4 Carefully rinse the material from the sieve into the medium dish, using the squeeze bottle containing test water.

4.7.4 3.5 Check the large dish for any spillage and pipette or pour it into the medium dish.

4.7.4.4 Check the sieve for amphipods that are remaining on the sieve.

4.7.4.4.1 Dislodge amphipods clinging to the sieve by slapping the sieve forcefully against the surface of the water in the gray bin.

4.7.4.4.2 Submerge the sieve gently using water tension to trap any remaining amphipods on the surface.

4.7.4.4.3 Remove remaining amphipods to the labeled medium dish using the pipette.

4.7.4.4.4 Notice any material caught in the mesh of the sieve, use forceps to remove it to the labeled medium dish.

4.7.4.4.5 Repeat this process twice before moving on to the next sample.

4.7.4.4.6 Transfer the medium dish containing sample (picking dish) to the designated 'To Be Picked' Area.

4.7.4.5 Repeat the sieving process for the last two treatment replicates.
NOTE: These replicates can be preserved if time does not allow for them to be picked immediately

4.7.4.6 Preserving the last two treatment replicates.

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NOTE. The desion to preserve is made by the laboratory manager. Samples are preserved with formalin, always work in the hood.

4.7.4.6.1 Determine the number of preserving jars required.
NOTE. If samples contain a lot of material two jars may be required per replicate.

4.7.4.6.2 Select a labeled medium dish containing sample and an empty preserving jar. Check the space on the data sheet 'Check if Preserved' for the corresponding jar number.

4.7.4.6.3 Transfer the label from the dish to the preserving jar. If two jars are needed, make sure that both are labeled.

4.7.4.6.4 Place a modified funnel into the labeled jar and place the jar inside a large dish.

4.7.4.6.5 Pour the sample carefully from the medium dish through the funnel into the preserving jar.

4.7.4.6.6 Rinse material remaining in the dish and on the funnel into the jar using a squeeze bottle containing test water.
NOTE. Use minimal amounts of test water for this procedure.

4.7.4.6.7 Note the volume of water in the jar and add an equal amount of 10% buffered formalin containing rose bengal.

4.7.4.6.8 Cap the jar tightly and swirl vigorously so that all material is exposed to the formalin.

4.7.4.6.9 Place the jar into a storage box. Label the box(es)with the project name and experiment number.
NOTE: Do not store in a box that already contains preserved samples.

4.7.4.6.10 Place a photocopy of the incomplete 'Test Breakdown Sheet' **in** the box.

4.7.4.7 Clean-up the work area.

4.7.4.7.1 Fill the dish bin with hot tap water, make sure that all jars are soaking.

4.7.4.7.2 Remove labels from the lids and carefully stack and soak the lids in a gray dishroom bin.

4.7.4.7.3 Wipe an splattered sediment from the work area (walls, cabinets, faucets, counter-tops, etc.) using damp paper towels.

4.7.4.7.4 Wash the work area (including the floor and floor mats) with an alconox solution and then a dissinfectant solution. Rinse.

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4.7.4.7.5 Clean facesheild and hang it on the wall. Clean gloves and hang on the glove rack. Wipe splattered mud from apron and coveralls and hang on the coat rack. Disposable protective wear may be discarded if grossly dirty.

4.7.4.8 Clean the test table.

4.7.4.8.1 Make sure that no aeration tubing is dangling in the water table.

4.7.4.8.2 Remove any stray petri dishes, bowls, or dissecting tools to a dish bin.
NOTE: Dissecting tools should be cleaned and put away immediately.

4.7.4.8.3 Discard any stray pipettes.

4.7.4.8.4 Drain the water from the table and wipe it down with clean hot water to remove any scum.
NOTE: If the table is very dirty a mild bleach solution can be used. Always check with a manager before using bleach in the lab.

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4.8 PICKING SAMPLES AT THE END OF THE TEST

4.8.1 OBJECTIVE

4.8.1.1 This section describes the methods used to sort through the remaining material after the samples have been sieved out.

4.8.1.2 If all replicates can not be picked immediately it is possible to preserve the last two replicates.

4.8.2 SAFETY

4.8.2.1 Sediment samples may contain hazardous biological or chemical constituents. Polylaminated apron, labcoat, and latex gloves, are to be worn.

4.8.2.2 Hazardous constituents can become airborne when spilled/splattered sediment is allowed to dry. All spills must be wiped immediately with a damp paper towel.

4.8.3 MATERIALS

4.8.3.1 Disposable pipette with cut tip (one per person)

4.8.3.2 Stereo Microscope (one per person)

4.8.3.3 Plastic spoon, bent and straight probes, and forceps (one per person)

4.8.3.4 Plastic petri dishes, various sizes (several per person)

4.8.3.5 Plastic bowl (one per person)

4.8.3.6 Squeeze bottle filled with test water (one per person)

4.8.3.7 Black pen (one per person)

4.8.3.8 Data sheets (attached)

4.8.3.7 Testwater at appropriate test salinity

4.8.4 METHODS

4.8.4.1 Set-up the picking table.

4.8.4.1.1 Cover the table with absorbent paper.

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4.8.4.1.2 Arrange the microscopes on the table so that each person will have plenty of work space (this includes leg space).

4.8.4.1.3 Place a plastic bowl, picking tools, petri dishes, black pen, and a squeeze bottle at each microscope station.

4.8.4.1.4 Place a bowl labeled 'PODS' at each end of the table.

4.8.4.1.5 Make sure there is a suitable chair at each microscope station.

4.8.4.2 Select a sample.
NOTE: Select only one sample at a time.

4.8.4.2.1 Obtain a sample from the area designated: 'To Be Picked'
NOTE: The first three replicates for each treatment, indicated by a circle or a star, must be picked first.

4.8.4.2.2 Observe the sample number and record your initials and the time in the spaces provided for that sample on the breakdown datasheet.

4.8.4.2.3 Determine the number of emerged animals found during the daily test check on your sample from the 'Day 10 Emerged' column on the breakdown data sheet.

4.8.4.2.4 Obtain the vial containing the emerged animals corresponding to that sample (if any).

4.8.4.2.5 Return to the microscope station with the sample.

4.8.4.2.6 Once you have started picking a sample, do not leave the work station until the sample is completed.

4.8.4.3 Look for amphipods.

4.8.4.3.1 Remove amphipods floating on the surface to a small petri dish (counting dish).

4.8.4.3.2 Agitate the sample using a spoon or probe to encourage any submerged amphipods to the surface and remove them to the counting dish.

4.8.4.4 Pick through the material remaining in the sample bowl.
NOTE: Material must be picked even if all 20 animals have been found.

4.8.4.4.1 Pour most of the surface water in the sample dish/picking dish into the empty plastic bowl.

4.8.4 4.2 If picking *Ampelisca*, look for tubes and arrange them on a larger petri dish.
1. Place the petri dish under the stereo microscope.

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2. Using the forceps and a probe, carefully tear apart the tubes trying not to destroy any animals that might be present.
3. Carefully transfer any amphipods you find to the counting dish.
4. Transfer the tube material to the bowl containing the sample water.

4.8.4.4.3 Use the spoon to transfer a small portion of the sample material onto a large petri dish.

4.8.4.4.4 Pick through the material under a stereo microscope using the probes and forceps.

4.8.4.4.5 Rinse the material into the plastic bowl containing your sample water (and tubes, if any) using a squeeze bottle containing test water.

4.8.4.4.6 Repeat this process until the entire sample has been picked.

4.8.4.5 Return the sample to its original labeled dish.
NOTE: This sometimes helps to loosen any remaining amphipods from the sediment.

4.8.4.5.1 Carefully pour the sample from your plastic bowl into its original dish.

4.8.4.5.2 Rinse any leftover material into the original dish using a squeeze bottle containing test testwater.

4.8.4.5.3 Remove any additional animals to the counting dish.

4.8.4.6 Observe the condition of the animals in your amphipod dish and fill in the datasheet.

4.8.4.6.1 Count the number of live and dead amphipods in the counting dish.
NOTE: Animals that are determined to be dead must be verified by a senior technician.

4.8.4.6.2 Have an experienced technician verify your count by recounting the animals in the counting dish and by counting the animals in the emerged vial (if any).
NOTE: If the counts disagree both parties must recount.

4.8.4.6.3 Record *your own* count under "First Pick" in the '# Live' and '# Dead' columns that correspond to your sample number.

4.8.4.6.4 Have the experienced technician verify your sample number and record *his/her own* initials and the number live counted under the "First Pick-Recount" column corresponding to your sample number.
NOTE: The number live recorded in the recount column includes any animals that were emerged on Day 10.

4.8.4.6.5 Rinse the amphipods from your counting dish into any of the dishes labeled 'PODS' located at each end of the picking table.

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4 8.4.6.6 Observe the counting dish to insure that no animals remain.

4.8.4.7 Determine whether or not the sample must be re-picked.
NOTE: This is usually done by the person performing the recount

4.8.4.7.1 Determine the number of animals missing by adding the total number live from the recount to the number dead and subtracting this number from 20.

1. If more than 10% of the animals are missing (i.e. 3 out of 20) the sample dish must be placed in the area designated: 'To Be Re-picked'.
2. If the number of animals missing is less than or equal to 10%, then the sample does not need to be repicked. The sample can be placed in the area designated 'No Re-pick'.

4.8.4.7.2 Place the sample in the appropriate area make sure that all material is covered with water, cover the sample with a lid. The sample is now completed.

4.8.4.8 Repeat this process for all samples.

4.8.4.9 Re-pick all samples that have more than 10% missing.
NOTE: Repicks should be performed within 24 hours, but no more than 72 hours.

4.8.4.9.1 Have an experienced technician QA the breakdown data sheet.

1. Verify the number live recorded in the recount section of the data sheet.
2. Verify the number missing recorded in the recount section of the data sheet.
3. Verify that all samples requiring a repick are located in the area designated: 'To Be Repicked'.

4.8.4.9.2 Select a sample that you did not pick originally.

4.8.4.9.3 Record your initials in the "QA-Repick" column.

4.8.4.9.4 Pick the sample using the techniques described above.

4.8.4.9.5 Count the number of live and dead amphipods in the counting dish. Record the number live found during the repick in the "QA-Repick" '# Live' column.

4.8.4.9.6 Have an experienced technician verify your count by recounting the animals in the counting dish. He/she will verify your sample number and record *his/her own* initials and the number live counted under the "QA Repick-Recount" column corresponding to your sample number.

4.8.4.9.7 Rinse the amphipods from your counting dish into any of the dishes labeled 'PODS' located at each end of the picking table.

4.8.4.9.8 Observe the counting dish to insure that no animals remain.

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4.8.4.9.9 When all samples have been picked and repicked, transfer them to a safe place and cover them with dark plastic.

4.8.4.10 Determine the Final Count and QA the Breakdown Data Sheet

4.8.4.10.1 Have the an experience technician calculate the final number live by adding the number live from the "First Pick-Recount" column to the number live from the "QA-Repick-Recount" column.

4.8.4.10.2 Have the Assistant Manager verify all of the tallies and transcribe the 'Final Number Live' to the "72-Hour Extended QA" Datasheet.

4.8.4.10.3 The assistant manager will have someone QA the transcription of the data.

4.8.4.11 Clean the work table.

4.8.4.11.1 Clean all microscopes with deionized water (remove the glass plate and clean under it), then with alcohol, paying special attention to the eyepieces.

4.8.4.11.2 Cover the microscopes and put them away unless they are needed tomorrow.

4.8.4.11.3 Collect all of the picking tools, petri dishes, and bowls.

1. Rinse with deionized water.
2. Let the picking tools dry overnight on a paper towel.
3. Discard the pipette.
4. Place the bowls and the petri dishes in a dishbin to be washed unless they are needed tomorrow.

4.8.4.11.4 Discard the absorbent paper and replace it with fresh paper.

4.8.4.12 Perform the 72-Hour Extended QA.

4.8.4.12.1 After 24 hours, uncover the sample dishes and look for floating or emerged amphipods in all sample dishes.

4.8.4.12.2 Note the sample number and remove the animals using a modified pipette and observe them under a stereo microscope.

1. If the animals are live, record the number in the '24 hr' column on the "72-Hour Extended QA" datasheet.
2. If the animals are dead, nothing needs to be recorded. You can record the number followed by a 'd' for dead.
3. If nothing is found, record a dash (-) in the space.

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4.8.4.12.3 Cover the dishes with dark plastic.

4.8.4.12.4 Repeat this process at 48 and 72 hours. The samples can be discarded.

4.8.4.12.5 Have an experienced technician tally the 'Final # Live Animals' by adding the number recorded in the 'Final # Live from Brkdwn' column to the numbers recorded in the '24 hr', '48 hr', and '72 hr' columns.

4.8.4.12.6 Have the Assistant Manager QA the datasheet.

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4.9 PICKING PRESERVED SAMPLES AT THE END OF THE TEST

4.9.1 OBJECTIVE

4.9.1.1 This section describes the methods used to sort through the remaining material after the samples have been sieved out and preserved.

4.9.2 SAFETY

4.9.2.1 Sediment samples may contain hazardous biological or chemical constituents. Polylaminated apron, labcoat, and latex gloves, are to be worn.

4.9.2.2 Hazardous constituents can become airborne when spilled/splattered sediment is allowed to dry. All spills must be wiped immediately with a damp paper towel.

4.9.2.3 All work with formalin must be conducted under the hood or a fume adsorber.

4.9.3 MATERIALS

4.9.3.1 Formalin contaminated disposable pipette with cut tip (one per person)

4.9.3.2 Stereo Microscope (one per person)

4.9.3.3 Formalin contaminated plastic spoon, bent and straight probes, and forceps (one per person)

4.9.3.4 Formalin contaminated plastic petri dishes, various sizes (several per person)

4.9.3.5 Formalin contaminated plastic bowl (one per person)

4.9.3.6 Formalin contaminated squeeze bottle filled with test water (one per person)

4.9.3.7 Black pen (one per person)

4.9.3.8 Data sheets (attached)

4.9.3.7 Testwater at appropriate test salinity

4.9.3.7 Formalin contaminated sieve, 500μm

4.9.3.7 Formalin contaminated blue bin

4.9.3.8 Formalin contaminated large rinsing bowl

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4.9.3.9 Formalin contaminated settling bucket

4.9.3.10 Formalin waste container with waste log

4.9.3.11 Sample jars preserved with formalin

4.9.4 METHODS

4.9.4.1 Set-up the picking stations under the fume adsorbers.
NOTE: A table can be set-up outside without a fume adsorber, weather and wind direction permitting.

4.9.4.1.1 Cover the table with absorbent paper.

4.9.4.1.2 Arrange the microscopes so that they are under the fume adsorber and so that each person has plenty of work space.

4.9.4.1.3 Place a formalin contaminated plastic bowl, picking tools, petri dishes, black pen, and a squeeze bottle at each microscope station.

4.9.4.1.4 Make sure there is a suitable chair at each microscope station.

4.9.4.2 Obtain the preserved samples.

4.9.4.2.1 Find the storage box containing the test that needs to be finished.

4.9.4.2.2 Obtain the original 'Breakdown Datasheet' for that test.
NOTE: This can be found in the original data notebooks located in the ETC library.

4.9.4.3 Set-up a sieving station in the hood sink.

4.9.4.3.1 Place the formalin contaminated settling bucket in the sink.

4.9.4.3.2 Place the formalin contaminated 500µm sieve over the bucket.

4.9.4.3.3 Place the formalin contaminated blue bin to the left or right of the sink.

4.9.4.3.4 Place the formalin contaminated, white plastic grid over the blue bin.

4.9.4.3.5 Place the formalin contaminated squeeze bottle containing test water, the large glass dish, the forceps, and the pipette on the opposite side of the sink as the bin.

4.9.4.4 Sieve out a preserved sample.
NOTE: Several may be sieved ahead, but only sieve as many as can be picked in one day.

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4.9.4 4 1 Obtain a jar from the box containing preserved samples.

4.9.4.4.2 Select a jar containing preserved sample and a formalin contaminated medium dish (picking dish).

4.9.4.4.3 Transfer the label from the jar to the medium dish and place the labeled medium dish inside the large dish next to the sink.

4.9.4.4.4 Swirl the contents of the jar and pour it into the sieve over the blue bin.

4.9.4.4.5 Rinse any remaining material from the jar into the sieve using a small amount tap water.

4.9.4.4.6 Place the sieve over the settling bucket. Rinse the jar thoroughly, over the settling bucket, then place it back into a storage box.

4.9.4.4.7 Rinse the material in the sieve by flushing it with copious quantities of tapwater until the formalin has been rinsed from the sample.
NOTE: Do not allow any material/animals to bounce out of the sieve.

4.9.4.4.8 Carefully rinse the material retained on the sieve to one end, while holding the sieve at a slight angle.

4.9.4.4.9 Rinse the material remaining on the sieve generously with test water, using the squeeze bottle and let the water drain through the sieve.

4.9.4.5 Transfer the material on the sieve to the picking dish.

4.9.4.5.1 Place the sieve over the medium dish (inside the large dish) and tip it slightly toward you.

4.9.4.5.2 Carefully rinse the material from the sieve into the medium dish, using the squeeze bottle containing test water.

4.9.4.5.3 Check the large dish for any spillage and pipette or pour it into the medium dish.

4.9.4.5.4 Check the sieve for amphipods that are remaining on the sieve.

4.9.4.6 Select a sample.

4.9.4.6.1 Obtain a sample from the area designated: 'To Be Picked'

4.9.4.6.2 Observe the sample number and record your initials and the time in the spaces provided for that sample on the breakdown datasheet.

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4.9.4.6.3 Determine the number of emerged animals found during the daily test check on your sample from the 'Day 10 Emerged' column on the breakdown data sheet.

4.9.4.6.4 Return to the microscope station with the sample.

4.9.4.6.5 Once you have started picking a sample, do not leave the work station until the sample is completed.

4.9.4.7 Pick the sample using the methods described in section 4.8-Picking Samples at End of Test.

4.9.4.8 Return the sample to its original labeled dish.

4.9.4.9 Determine whether or not the sample must be re-picked using the methods described in Section 4.8.
NOTE: This is usually done by the person performing the recount.
If the sample needs to be re-picked, have someone do it right away.

4.9.4.10 Re-pick all samples that have more than 10% missing.

4.9.4.11 Repeat this process for all samples until they are completed.

4.9.4.12 Determine the Final Count and QA the Breakdown Data Sheet

4.9.4.12.1 Have the an experience technician calculate the final number live by adding the number live from the "First Pick-Recount" column to the number live from the "QA-Repick-Recount" column.

4.9.4.12.2 Have the Assistant Manager verify all of the tallies and transcribe the 'Final Number Live' to the 72-Hour Extended QA Datasheet.

4.9.4.12.3 The assistant manager will have someone QA the transcription of the data.

4.9.4.13 Clean the work area.

4.9.4.13.1 Place the formalin waste container **in** the hood.
NOTE: If a waste container is not available, contact the ECH&S Officer.

4.9.4.13.2 Transfer the formalin waste to the waste container.

1. Carefully pour the formalin from the blue bin into the waste container
2. Rinse the blue bin several times with tap water and pour the **first** rinse into the waste container.
3. Pour off most of the water in the settling bucket and rinse the material at the bottom into the waste container.

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4. Record the date, your initials, the project, and the approximate volume of waste added to the container on the waste log for that container.

4.9.4.13.3 Discard the completed samples into the formalin waste container by pouring them through a funnel and rinsing the funnel with minimal water.

4.9.4.13.4 Rinse all formalin contaminated dishes and tools with tap water and place them in their storage area.

4.9.4.13.5 Clean the microscopes and put them away. Turn off the fume adsorber.

4.9.4.13.6 Replace the absorbent paper and wipe down the fume guard.

4.9.4.13.7 Clean all surfaces with a solution of alconox. Rinse.

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48 HOUR EMBRYO/LARVAL DEVELOPMENT TEST USING THE SEA URCHIN *ARBACIA PUNCTULATA*

1.0 OBJECTIVE

1.1 This document describes the methods used to measure the toxicity of effluent and receiving waters to the larvae of the sea urchin *Arbacia punctulata*.

1.2 The purpose of the larval development toxicity test is to determine the concentration of a test treatment that inhibits survival and development relative to that of the control.

2.0 SAFETY

2.1 Environmental samples may contain hazardous biological or chemical constituents. Latex gloves (rinsed before wearing), tyvek labcoat, and safety glasses are to be worn.

2.2 Embryos preserved in formalin must be examined under a fume hood.

3.0 MATERIALS

3.1 Air pump

3.2 Plastic 1 ml pipettes

3.3 Centrifuge, bench top, variable speed

3.4 Fume hood.

3.5 Dissecting microscope with detachable light

3.6 Compound microscope

3.7 Sedgwick-Rafter counting chamber

3.8 Hemacytometer

3.9 Count register, 2-place

3.10 Ice bucket

3.11 Capped centrifuge tubes, conical, 50 ml, plastic

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3.12 18 oz, tall, glass jar

3.13 Two large crystallization dishes

3.14 Wash bottles filled with deionized water and natural sea water

3.15 Transformer, 10-12 volt, with steel electrodes

3.16 Two syringes: 1cc (1ml), and 10cc (10 ml), with 18 gauge, blunt-tipped needles (tips cut off). Or an acceptable substitute (i.e. a modified pipette tip attached to the syringe with 1/8 inch silastic tubing)

3.17 5 ml, automatic pipette

3.18 1 ml, adjustable pipette

3.19 Permanent marker

3.20 Sea urchins, 4 or 5 of each sex

3.21 Scintillation vials, 20 ml, disposable

3.22 250 ml glass exposure chamber

3.23 Plastic Plunger

3.24 20 ml grid-type petri dish

3.25 Formalin, 5% buffered in sea water, filtered

3.26 Acetic acid, reagent grade, 10% in sea water

3.27 Hypersaline brine (as needed)

3.28 Gloves, lab coat, and safety glasses

3.29 Data sheets (attached)

4.0 METHODS

4.1 Prepare samples.

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4.1.1 Adjust salinity of sample to 28 to 30 ppt with hypersaline brine if necessary (see ETC SOP). Prepare dilutions if necessary.

4.2 Fill test chambers.

4.2.1 Dispense 200 mls of sample or dilution of sample into each of three replicate exposure chambers.

4.3 Prepare gamete dilution vials.

4.3.1 Label and fill the sperm dilution vials as follows:
A: 19 mls of NSW
B: 10 mls of NSW
C: 10 mls of NSW
D: 10 mls of NSW
E: 4 mls of NSW

4.3.2 Place vials A, B, and D on ice for later use.

4.3.3 Label and fill four egg dilution vials with 9 mls of NSW and set aside.

4.4 Collect the eggs.

4.4.1 Select four female urchins and place in large crystallization dish, barely covering the tests with sea water.

4.4.2 Direct microscope light on urchins to better view gamete release.

4.4.3 Stimulate the release of eggs by touching the test with electrodes from the transformer.
NOTE: Do not let the electrodes touch the genital pore or gametes.

4.4.4 Collect eggs from at least three of the females in the dish using a 10 cc syringe with a blunted tip.

4.4.5 Remove the needle from the syringe before adding the eggs to a 50 ml conical centrifuge tube containing several mls of control seawater.

4.4.6 Bring contents of centrifuge tube to maximum volume by adding control seawater.

4.4.7 The egg stock may be held at room temperature for several hours before use and may be prepared during sperm exposure to sample or dilution of sample.

4.5 Collect the sperm.

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4.5.1 Select four males and place in large dish, barely covering the urchins with sea water.

4.5.2 Direct microscope light on the urchins to better view the release of gametes.

4.5.3 Stimulate the release of sperm by touching the test with electrodes from the transformer. NOTE: Do not let the electrodes touch the genital pore or gametes.

4.5.4 Collect sperm from at least three of the males, using a 1 ml disposable syringe fitted with an 18-gauge, blunt tipped needle. Collect until syringe is full.

4.5.5 Keep the syringe containing pooled sperm sample on ice.

4.5.6 The sperm should be used within 1 hour of collection.

4.6 Prepare the sperm.

4.6.1 Estimate the sperm concentration by preparing dilutions of 1:50, 1:100, 1:200, and 1:400, using 30 ppt seawater. NOTE: All sperm vials should be maintained on ice before starting the test.

1. Add 1 ml of collected sperm to 19 ml of seawater in Vial A. Cap Vial A and mix by inversion.
2. Add 10 mls of sperm suspension from Vial A to 10 mls of seawater in Vial B. Cap Vial B and mix by inversion.
3. Add 10 mls of sperm suspension from Vial B to 10 mls of seawater in Vial C. Cap Vial C and mix by inversion.
4. Add 10 mls of sperm suspension from Vial B to 10 mls of seawater in Vial D. Cap Vial D and mix by inversion.
5. Discard 10 mls from Vial D. (The final volume of all sperm suspensions is 10 mls).

4.6.2 Make a 1:2000 killed sperm suspension and determine the sperm/ml (SPM)

1. Add 10 mls 10% acetic acid in seawater to Vial C. Cap Vial C and mix by inversion.
2. Add 1ml of killed sperm from Vial C to 4 mls seawater in Vial E. Mix by gentle inversion.
3. Add sperm from Vial E to both sides of the hemacytometer. Let the sperm settle for 15 minutes.
4. Count the number of sperm in the central 400 squares on both sides of the hemacytometer using a compound microscope (400X).
5. Average the counts from the two sides and calculate the SPM using the calculation: SPM in Vial E = 10^4 x average count from Vial E.

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4.6.3 Calculate the SPM in all other suspensions using the SPM in Vial E.

1. SPM in Vial A = 40 x SPM in Vial E.
2. SPM in Vial B = 20 x SPM in Vial E.
3. SPM in Vial D = 5 x SPM in Vial E.
4. SPM in original sperm sample = 2000 x SPM in Vial E.

4.6.4 Select the vial with a sperm concentration greater than and closest to 5×10^7

4.6.5 Using the following calculation, dilute the sperm concentration of the chosen vial to 5×10^7.

1. Actual SPM/(5×10^7) = dilution factor (DF).
2. ((DF) x 10) - 10 = mls of seawater to add to vial.

4.7 Prepare the eggs.

4.7.1 Using a tabletop centrifuge, wash the pooled eggs twice with control seawater.
NOTE: This can be done while waiting for the sperm to settle on the hemacytometer.

1. Spin for two minutes at lowest possible setting.
2. Carefully pour off the overlying water.
3. Add more control seawater and spin again.

4.7.2 If the wash water becomes red, the eggs have lysed and must be discarded.

4.7.3 Remove the final wash water and refill the tube with control water.

4.7.4 Transfer the washed eggs from the centrifuge tube to a beaker containing a small volume (about 50 mls) of control water by gently inverting the tube to suspend the eggs and carefully pouring the contents into the beaker.

4.7.5 Estimate the egg concentration by preparing a 1:10 dilution using control seawater. NOTE: The desired egg stock concentration is 3500±350 eggs/ml, the desired count for the dilutions is 350±35 eggs/ml.

1. Dilute the egg stock by adding enough control water to the beaker to bring the egg stock to a volume of 200 ml.
2. Suspend the egg stock using gentle aeration.
3. Cut the point from a 1 ml pipette tip and use it to transfer 1 ml of suspended egg stock into two vials containing 9 mls of control water
4. Mix the contents of each vial by inversion and transfer 1 ml of eggs from each vial to a Sedgwick-Rafter counting chamber.

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5. Count all of the eggs in the chamber using a dissecting microscope.
6. Calculate the 'egg count' by averaging the counts from both vials

4.7.6 Calculate the egg stock concentration using the equation: Eggs/ml = 10 x (egg count).

4.7.7 Dilute the egg stock to 3500±350 eggs/ml.

1. If the egg count is equal to or greater than 350: (egg count) - 350 = volume (ml) of control water to add to egg stock.
2. If the egg count is less than 350, allow the eggs to settle and remove enough control water to concentrate the eggs to greater than 350, repeat the count, and dilute the egg stock as above. NOTE: It requires 18 ml of an egg stock solution for each test with a control and five exposure concentrations (three replicates).

4.7.8 After diluting or concentrating the egg stock confirm the final egg count by repeating step 4.7.5.

1. Suspend the egg stock using gentle aeration.
2. Cut the point from a 1 ml pipette tip and use it to transfer 1 ml of suspended egg stock into two vials containing 9 mls of control water.
3. Mix the contents of each vial by inversion and transfer 1 ml of eggs from each vial to a Sedgwick-Rafter counting chamber.
4. Count all of the eggs in the chamber using a dissecting microscope.
5. Calculate the 'egg count' by averaging the counts from both vials.

4.8 Fertilize the eggs.

4.8.1 Mix the egg stock well and subsample 100mls.

4.8.2 Pour the subsample into a clean beaker labeled 'embryo suspension'.

4.8.3 Within 1 hour of collection, add 1.75 mls of the proper sperm dilution to the beaker and mix well. NOTE: This will result in an egg:sperm ratio of 1:2500, which should allow acceptable egg fertilization.

4.8.4 Allow 1 hour for fertilization.

4.9 Start the test.

4.9.1 Mix the embryo suspension (3500 eggs/ml), using gentle aeration.

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4.9.2 Add 1 ml of egg suspension to each 100 mls of test solution in each exposure chamber using a cut, 1 ml pipette tip.

4.9.3 Determine initial counts (for survivial endpoint) by gently suspending the test media in each control chamber using a plunger.

1. Sub-sample two 10 ml aliquots from each of the control chambers into two 20 ml scintillation vials.
2. Preserve the samples by adding 2 ml of 2.5% buffered formalin and in seawater o each vial.
3. Count allof the fertilized eggs in each vial. Record and average the counts to determine the actual number of embryos added at test initiation.

4.9.4 Incubate test chambers for 48 hours at 20 $\pm$ 1°C.

4.9.5 Record physical data daily .

4.10 Terminate the test.

4.10.1 Gently suspend the test media in each exposure jar using a plunger.

4.10.2 Sub-sample two 10 ml aliquots from each chamber into two 20 ml scintillation vials.

4.10.3 Preserve the samples by adding 2 ml of 2.5% buffered formalin and Rose Bengal in seawater to each vial.

4.11.4 Cap each vial tightly.

4.11 Evaluate the test.
NOTE: Vials may be evaluated immediately or they can be stored refrigerated for as long as one week.

4.11.1 Gently mix each vial by inversion.

4.11.2 Carefully pour the entire content into a 20 ml grid-type petri dish.

4.11.3 Observe the embryos using a compound microscope (40-100X) under a fume hood.

4.11.4 Count the total number of live larvae in each vial. Distinguish between normal and abnormal larvae. NOTE: Do not include the number of dead animals in either total.

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4.11.5 Record the number 'normal' and 'abnormal' to determine development relative to the control. The total number of larvae is used to determine percent survial relative to the control and test initiation.

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Point of Contact
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1. OBJECTIVE

This document describes the procedures used to prepare elutriates from field collected sediment samples.

2. SAFETY

Sediment samples may contain hazardous biological or chemical constituents. Proper attire should be worn.

3. MATERIALS

Glassware
Detergent
Hydrochloric Acid Solution (10%)
Dilution water, use: disposal site water, clean seawater, or artificial sea/salt mixtures
Dredged material sample, at least 1 liter
Unfilterd dredging site water
Graduated cylinder
Magnetic stirrer
Stir bar
1ml pipette
Siphon
Receiving vessel
Centrifuge
Centrifuge tubes
T sting Chambers

4. METHODS

4.1 Cleaning the glassware

4.1.1 Wash with detergent.

4.1.2 Rinse five times with hot tap water.

4.1.3 Rinse with deionized water.

4.1.4 Place in a 10% HCL acid bath for at least 4 hours.

4.1.5 Remove from acid bath and rinse 4 times with deionized water.

4.2 Preparing the elutriate

4.2.1 Subsample approximately 1 L of homogenized sample.

4.2.2 Using volumetric displacement, combine, in a graduated cylinder, the homogenized sample with unfiltered dredging-site water in a sediment- to-water ratio of 1:4 on a volume basis.

4.2.3 Place the sediment-water mixture and a stir bar into the labeled piece of glassware.

4.2.4 Stir the mixture vigorously on a magnetic stirrer for 30 minutes.

4.2.5 Hand stir the mixture every 10 minutes using the 1 ml pipette.

4.2.6 At the end of the 30 minute mixing period, remove the mixture from the stirrer and allow to settle for 1 hour.

4.3 Preparing the supernatant

4.3.1 Carefully siphon off the supernatent into the centrifugation vessels without disturbing the settled material.

4.3.2 Centrifuge the supernatant until the suspension is clear enough at the first observation time for the organisms to be visible in the testing chambers.

NOTE: This step is only necessary wtih some very fine-grained dredged materials.

Point of Contact:
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1. OBJECTIVE

This document describes the procedures used to extract pore-water from estuarine and freshwater sediments using a vacuum-operated system following methods described in Winger and Lasier (1991). Actual volumes needed for analyses and biological testing and holding requirements are task-specific and require consultation with the Project Manager.

2. SAFETY

Sediments may be contaminated with hazardous biological or chemical constituents. Proper attire should be worn.

3. MATERIALS

Fused-glass air stone
Hose clamp
Medical grade silastic tubing (3/16" I.D.)
30 or 60 cc polypropylene syringe with catheter tip
Piece of wood cut to fit between the end of the syringe and the lip of the plunger
0.45 μm filter unit
50-ml centrifuge tube
Deionized water in squirt bottle

4. METHODS

4.1 Label the syringes and 50-ml centrifuge tubes with data transcribed from the sample container.

4.2 Use tubing to attach fused-glass air stone to the syringe.

4.3 Insert air stone 8 to 10 cm into the sediment sample.

4.4 Secure the tubing to container with elastic bands.

4.5 Attach hose clamp to the tubing.

4.6 Create a vacuum by loosening the hose clamp retracting the plunger of the syringe.

4.7 Brace the plunger in the retracted position by inserting a piece of wood between the end of the syringe and the lip of the plunger.

4.8 Collect 2 to 5 ml of pore-water.

4.9 Maintain vacuum by tightening hose clamp.

4.10 Remove the brace.

4.11 Remove the syringe.

4.12 Discard pore-water.

4.13 Rinse syringe and plunger with deionized water from squirt bottle.

4.14 Reassemble and reattach syringe to tubing.

4.15 Reestablish the brace.

4.16 Loosen the hose clamp.

4.17 Fill the syringe. For fine-grained sediments, 12 - 18 hours may be required. Store sample in at 4°C in the dark during extraction.

4.18 Remove the airline tubing from the syringe when the syringe is full.

4.19 Examine pore-water for turbidity. Filter if necessary. Multiple collections require homogenization before filtration.

4.20 Dispense the pore-water from the syringe or the filter unit into a pre-labeled 50-ml centrifuge tube. Multiple collections require homogenization before dispensation into 50-ml tubes.

4.21 Store sample at 4°C in the dark for further analyses.

4.22 Sediments are discarded in waste barrels for disposal. Barrels are sampled and analyzed to establish proper disposal procedures. Disposal procedures are performed in accordance with local, state, and federal disposal regulations.

5.0 QA/QC

Any deviations from this SOP are documented and reported to the Program Manager.

6.0 REFERENCES

Winger, PV and PJ Lasier. 1991. A Vacuum-Operated Pore-Water Extractor for Estuarine and Freshwater Sediments. Arch. Environ. Contam. Toxicol. 21, 321-324.

Appendix B

Raw *Ampelisca abdita* toxicity data for Old Fire Fighting Training Center sediment samples. Data are for 10-day tests. "Rep No." refers to the replicate number assigned to each test chamber. "SAIC ETC ID" refers to the identification number assigned to the sample in the laboratory. "Sample ID" are station numbers assigned by field personnel except in the case of LIS, the ETC performance control sediment from central Long Island Sound. "ETC Exp. No." is the laboratory number used to identify the test series. The "Final No. Alive" refers to the number of live animals observed at the end of the 10-day solid-phase test. The "% Survival" refers to percentage of live animals observed at the end of the 10-day solid-phase test out of the initial 20 animals added to each replicate test chamber. NOTE: 16 animals were added to each replicate test chamber in the third test series. The "Mean %" refers to the mean percent survival of all five replicates per sample. The "SD" refers to the standard deviation of the "Mean %". The "% of the Control" is the ratio of the actual mean % survival to the mean % survival of the performance control. The "p value" refers to the probability that the observed differences in survival occurred strictly by chance and was obtained using Excel's t-Test. Low values infer highly significant differences. Mortality was considered statistically different when $p \leq 0.05$. Test sediments for which survival was lower and statistically different from LIS survival were flagged.

APPENDIX B
10-DAY SOLID-PHASE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING CENTER, NETC
NEWPORT, RHODE ISLAND

Rep No.	SAIC ETC ID	Sample ID	ETC Exp. No.[1]	Final No. Live	Survival (%)	Mean Survival (%)	SD[2]	Survival as % of Control	p value[3]	Comment
20	LIS[4]	LIS[4]	980401	20	100	100	0.0			
4	LIS[4]	LIS[4]	980401	20	100					
38	LIS[4]	LIS[4]	980401	20	100					
43	LIS[4]	LIS[4]	980401	20	100					
3	LIS[4]	LIS[4]	980401	20	100					
10	OF-1	OF-SS1	980401	18	90	95	5.0	95	0.04	*
41	OF-1	OF-SS1	980401	20	100					
25	OF-1	OF-SS1	980401	19	95					
39	OF-1	OF-SS1	980401	18	90					
28	OF-1	OF-SS1	980401	20	100					
10	OF-2	OF-SS2	980401	10	50	87	21.1	87	0.12	
41	OF-2	OF-SS2	980401	19	95					
25	OF-2	OF-SS2	980401	20	100					
39	OF-2	OF-SS2	980401	20	100					
28	OF-2	OF-SS2	980401	18	90					
10	OF-3	OF-SS3	980401	17	85	92	5.7	92	0.02	*
41	OF-3	OF-SS3	980401	20	100					
25	OF-3	OF-SS3	980401	19	95					
39	OF-3	OF-SS3	980401	18	90					
28	OF-3	OF-SS3	980401	18	90					
10	OF-4	OF-SS4	980401	13	65	90	14.6	90	0.10	
41	OF-4	OF-SS4	980401	18	90					
25	OF-4	OF-SS4	980401	20	100					
39	OF-4	OF-SS4	980401	19	95					
28	OF-4	OF-SS4	980401	20	100					
10	OF-5	OF-SS5	980401	14	70	72	19.6	72	0.02	**
41	OF-5	OF-SS5	980401	15	75					
25	OF-5	OF-SS5	980401	8	40					
39	OF-5	OF-SS5	980401	17	85					
28	OF-5	OF-SS5	980401	18	90					
10	OF-6	OF-SS6	980401	18	90	94	5.5	94	0.04	*
41	OF-6	OF-SS6	980401	20	100					
25	OF-6	OF-SS6	980401	18	90					
39	OF-6	OF-SS6	980401	18	90					
28	OF-6	OF-SS6	980401	20	100					
10	OF-22	OF-SS22	980401	19	95	90	7.9	90	0.02	*
41	OF-22	OF-SS22	980401	17	85					
25	OF-22	OF-SS22	980401	18	90					
39	OF-22	OF-SS22	980401	20	100					
28	OF-22	OF-SS22	980401	16	80					

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NEWPORT, RHODE ISLAND

Rep No.	SAIC ETC Sample ID	Sample ID	ETC Exp. No.[1]	Final No. Live	Survival (%)	Mean Survival (%)	SD[1]	Survival as % of Control	p value[2]	Comment
10	OF-7	OF-SS7	980401	20	100	94	4.2	94	0.02	*
41	OF-7	OF-SS7	980401	19	95					
25	OF-7	OF-SS7	980401	18	90					
39	OF-7	OF-SS7	980401	19	95					
28	OF-7	OF-SS7	980401	18	90					

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Rep No.	SAIC ETC Sample ID	Sample ID	ETC Exp. No.[1]	Final No. Live	Survival (%)	Mean Survival (%)	SD	Survival as % of Control	p value	Comment
10	LIS[4]	LIS[4]	980405	20	100	100	0.0			
41	LIS[4]	LIS[4]	980405	20	100					
25	LIS[4]	LIS[4]	980405	20	100					
39	LIS[4]	LIS[4]	980405	20	100					
28	LIS[4]	LIS[4]	980405	20	100					
10	OF-10	OFF-10-SUR A	980405	20	100	100	0.0	100	#DIV/0!	
41	OF-10	OFF-10-SUR A	980405	20	100					
25	OF-10	OFF-10-SUR A	980405	20	100					
39	OF-10	OFF-10-SUR A	980405	20	100					
28	OF-10	OFF-10-SUR A	980405	21	100					a
10	OF-11	OFF-11-SUR A	980405	19	95	98	2.7	98	0.09	
41	OF-11	OFF-11-SUR A	980405	20	100					
25	OF-11	OFF-11-SUR A	980405	19	95					
39	OF-11	OFF-11-SUR A	980405	21	100					a
28	OF-11	OFF-11-SUR A	980405	22	100					a
10	OF-12	OFF-12-SUR A	980405	20	100	100	0.0	100		
41	OF-12	OFF-12-SUR A	980405	20	100					
25	OF-12	OFF-12-SUR A	980405	20	100					
39	OF-12	OFF-12-SUR A	980405	20	100					
28	OF-12	OFF-12-SUR A	980405	20	100					
10	OF-13	OFF-13-SUR A	980405	19	95	99	2.2	99	0.19	
41	OF-13	OFF-13-SUR A	980405	20	100					
25	OF-13	OFF-13-SUR A	980405	20	100					
39	OF-13	OFF-13-SUR A	980405	20	100					
28	OF-13	OFF-13-SUR A	980405	20	100					
10	OF-16	OFF-16-SUR A	980405	20	100	97	2.7	97	0.04	*
41	OF-16	OFF-16-SUR A	980405	20	100					
25	OF-16	OFF-16-SUR A	980405	19	95					
39	OF-16	OFF-16-SUR A	980405	19	95					
28	OF-16	OFF-16-SUR A	980405	19	95					
10	OF-17	OFF-17-SUR A	980405	20	100	98	4.5	98	0.19	
41	OF-17	OFF-17-SUR A	980405	19	95					
25	OF-17	OFF-17-SUR A	980405	21	105					
39	OF-17	OFF-17-SUR A	980405	19	95					
28	OF-17	OFF-17-SUR A	980405	19	95					
10	OF-18	OFF-18-SUR A	980405	19	95	96	4.2	96	0.05	
41	OF-18	OFF-18-SUR A	980405	20	100					
25	OF-18	OFF-18-SUR A	980405	18	90					
39	OF-18	OFF-18-SUR A	980405	19	95					
28	OF-18	OFF-18-SUR A	980405	20	100					

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Rep No.	SAIC ETC Sample ID	Sample ID	ETC Exp. No.[1]	Final No. Live	Survival (%)	Mean Survival (%)	SD	Survival as % of Control	p value	Comment
10	OF-20	OFF-20-SUR A	980405	20	100	100	0.0	100		
41	OF-20	OFF-20-SUR A	980405	20	100					
25	OF-20	OFF-20-SUR A	980405	20	100					
39	OF-20	OFF-20-SUR A	980405	20	100					
28	OF-20	OFF-20-SUR A	980405	20	100					

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NEWPORT, RHODE ISLAND

Rep No.	SAIC ETC Sample ID	Sample ID	ETC Exp. No.[1]	Final No. Live	Survival (%)	Mean Survival (%)	SD	Survival as % of Control	p value	Comment
20	LIS[4]	LIS[4]	980409	16	100	100	0.0			
4	LIS[4]	LIS[4]	980409	16	100					
38	LIS[4]	LIS[4]	980409	16	100					
43	LIS[4]	LIS[4]	980409	16	100					
3	LIS[4]	LIS[4]	980409	16	100					
10	OF-8	OFF-8-SUR-A	980409	15	94	101	5.2	101	0.31	
41	OF-8	OFF-8-SUR-A	980409	17	106					
25	OF-8	OFF-8-SUR-A	980409	16	100					
39	OF-8	OFF-8-SUR-A	980409	16	100					
28	OF-8	OFF-8-SUR-A	980409	17	106					
27	OF-9	OFF-9-SUR A	980409	15	94	95	5.2	95	0.05	
37	OF-9	OFF-9-SUR A	980409	14	88					
29	OF-9	OFF-9-SUR A	980409	16	100					
11	OF-9	OFF-9-SUR A	980409	16	100					
23	OF-9	OFF-9-SUR A	980409	15	94					
42	OF-14	OFF-14-SUR A	980409	16	100	99	2.8	99	0.19	
30	OF-14	OFF-14-SUR A	980409	16	100					
12	OF-14	OFF-14-SUR A	980409	16	100					
15	OF-14	OFF-14-SUR A	980409	15	94					
19	OF-14	OFF-14-SUR A	980409	16	100					
1	OF-15	OFF-15-SUR A	980409	15	94	98	3.4	98	0.09	
7	OF-15	OFF-15-SUR A	980409	16	100					
9	OF-15	OFF-15-SUR A	980409	15	94					
31	OF-15	OFF-15-SUR A	980409	16	100					
22	OF-15	OFF-15-SUR A	980409	16	100					
6	OF-19	OFF-19-SUR A	980409	14	88	98	5.6	98	0.19	
16	OF-19	OFF-19-SUR A	980409	16	100					
5	OF-19	OFF-19-SUR A	980409	16	100					
24	OF-19	OFF-19-SUR A	980409	16	100					
35	OF-19	OFF-19-SUR A	980409	16	100					
2	OF-21	OFF-21-SUR A	980409	16	100	98	3.4	98	0.09	
33	OF-21	OFF-21-SUR A	980409	15	94					
18	OF-21	OFF-21-SUR A	980409	15	94					
8	OF-21	OFF-21-SUR A	980409	16	100					
32	OF-21	OFF-21-SUR A	980409	16	100					
13	OF-23	OFF-23-SUR A	980409	16	100	95	5.2	95	0.05	
26	OF-23	OFF-23-SUR A	980409	14	88					
40	OF-23	OFF-23-SUR A	980409	16	100					
36	OF-23	OFF-23-SUR A	980409	15	94					
34	OF-23	OFF-23-SUR A	980409	15	94					

FOOTNOTES

* = Mean sample response was statistically different than mean LIS response.

** = Mean sample response was both statistically different and less than 80% of mean LIS response.

a = > 20 animals were added to the replicate test chamber.

(1) ETC Exp. No. = Test Series Identification Number

(2) SD = Standard Deviation

(3) p value = significance level of t test

(4) LIS = Long Island Sound Performance Control Sediment

Appendix C

Water quality parameters measured during 10-day amphipod testing of Old Fire Fighting Training Center sediment samples using *Ampelisca abdita*. "SAIC ETC ID" refers to the identification number assigned to the sample in the laboratory. "Sample ID" are station numbers assigned by field personnel except in the case of LIS, the ETC performance control sediment from central Long Island Sound. "ETC Exp. No." is the laboratory number used to identify the test series. Water quality parameters were measured twice during each test, on days 2 or 3 and 6 or 8, in each of two replicates. "Temperature" is presented in °C. "Salinity" is parts per thousand (ppt). "pH" is in pH units. "DO" is mg/L of dissolved oxygen.

APPENDIX C
WATER QUALITY PARAMETERS[1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Day	Temperature (°C[3])	Salinity (ppt[4])	pH	DO (mg/L[5])
OF-1	OF-SS1	980401	2	20.5	28	8.25	6.8
OF-1	OF-SS1	980401	2	20.5	28	8.30	6.8
OF-1	OF-SS1	980401	2	20.5	28	8.27	6.6
OF-1	OF-SS1	980401	8	20.0	28	8.40	7.0
OF-1	OF-SS1	980401	8	20.0	28	8.58	6.9
OF-1	OF-SS1	980401	8	20.0	28	8.41	6.9
OF-2	OF-SS2	980401	2	20.5	28	8.22	6.7
OF-2	OF-SS2	980401	2	20.5	28	8.29	6.8
OF-2	OF-SS2	980401	8	20.0	28	8.29	7.0
OF-2	OF-SS2	980401	8	20.0	29	8.38	7.0
OF-3	OF-SS3	980401	2	20.5	28	8.31	7.0
OF-3	OF-SS3	980401	2	20.5	28	8.27	6.7
OF-3	OF-SS3	980401	2	20.5	28	8.19	6.4
OF-3	OF-SS3	980401	2	20.5	28	8.28	6.8
OF-3	OF-SS3	980401	8	20.0	27	8.35	7.0
OF-3	OF-SS3	980401	8	20.0	28	8.32	7.2
OF-3	OF-SS3	980401	8	20.0	28	8.31	6.9
OF-3	OF-SS3	980401	8	20.0	28	8.36	7.1
OF-4	OF-SS4	980401	2	20.5	28	8.20	6.9
OF-4	OF-SS4	980401	2	20.5	28	8.27	6.8
OF-4	OF-SS4	980401	8	20.0	28	8.14	7.2
OF-4	OF-SS4	980401	8	20.0	28	8.18	7.2
OF-5	OF-SS5	980401	2	20.5	28	8.02	5.7
OF-5	OF-SS5	980401	2	20.5	28	8.21	6.3
OF-5	OF-SS5	980401	8	20.0	28	8.14	6.7
OF-5	OF-SS5	980401	8	20.0	29	8.23	7.0
OF-6	OF-SS6	980401	2	20.5	28	8.30	6.7
OF-6	OF-SS6	980401	2	20.5	28	8.29	6.6
OF-6	OF-SS6	980401	8	20.0	28	8.52	6.8
OF-6	OF-SS6	980401	8	20.0	28	8.51	7.0
OF-22	OF-SS22	980401	2	20.5	28	8.33	6.7
OF-22	OF-SS22	980401	8	20.0	29	8.66	7.1

APPENDIX C
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DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
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SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Day	Temperature (°C[3])	Salinity (ppt[4])	pH	DO (mg/L[5])
OF-7	OF-SS7	980401	2	20.5	28	8.36	6.8
OF-7	OF-SS7	980401	2	20.5	28	8.26	6.5
OF-7	OF-SS7	980401	8	20.0	28	8.56	7.1
OF-7	OF-SS7	980401	8	20.0	28	8.66	6.8
OF-10	OFF-10-SUR A	980405	3	20.0	28	8.27	7.3
OF-10	OFF-10-SUR A	980405	9	20.0	29	8.45	6.9
OF-11	OFF-11-SUR A	980405	3	20.0	28	8.33	7.0
OF-11	OFF-11-SUR A	980405	3	20.0	29	8.39	7.1
OF-11	OFF-11-SUR A	980405	3	20.0	28	8.31	7.1
OF-11	OFF-11-SUR A	980405	9	20.0	29	8.56	6.6
OF-11	OFF-11-SUR A	980405	9	20.0	28	8.52	6.6
OF-11	OFF-11-SUR A	980405	9	20.0	29	8.53	6.6
OF-12	OFF-12-SUR A	980405	3	20.0	28	8.30	7.3
OF-12	OFF-12-SUR A	980405	3	20.0	28	8.27	7.2
OF-12	OFF-12-SUR A	980405	9	20.0	29	8.38	6.7
OF-12	OFF-12-SUR A	980405	9	20.0	29	8.36	6.9
OF-13	OFF-13-SUR A	980405	3	20.0	28	8.43	7.0
OF-13	OFF-13-SUR A	980405	3	20.0	28	8.42	7.2
OF-13	OFF-13-SUR A	980405	3	20.0	28	8.39	7.0
OF-13	OFF-13-SUR A	980405	3	20.0	29	8.38	6.8
OF-13	OFF-13-SUR A	980405	9	20.0	28	8.44	6.9
OF-13	OFF-13-SUR A	980405	9	20.0	29	8.48	6.9
OF-13	OFF-13-SUR A	980405	9	20.0	29	8.51	6.7
OF-13	OFF-13-SUR A	980405	9	20.0	29	8.53	6.5
OF-16	OFF-16-SUR A	980405	3	20.0	28	8.26	7.2
OF-16	OFF-16-SUR A	980405	3	20.0	28	8.24	7.0
OF-16	OFF-16-SUR A	980405	9	20.0	29	8.44	7.0
OF-16	OFF-16-SUR A	980405	9	20.0	29	8.55	6.7
OF-17	OFF-17-SUR A	980405	3	20.0	28	8.12	7.1
OF-17	OFF-17-SUR A	980405	3	20.0	28	8.11	7.3
OF-17	OFF-17-SUR A	980405	9	20.0	28	8.23	6.7
OF-17	OFF-17-SUR A	980405	9	20.0	29	8.23	6.8

APPENDIX C
WATER QUALITY PARAMETERS[1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Day	Temperature (°C[3])	Salinity (ppt[4])	pH	DO (mg/L[5])
OF-8	OFF-8-SUR A	980409	2	20.0	30	7.90	6.6
OF-8	OFF-8-SUR A	980409	8	20.0	30	8.55	6.4
OF-9	OFF-9-SUR A	980409	2	20.0	30	7.90	6.5
OF-9	OFF-9-SUR A	980409	2	20.0	30	7.95	6.7
OF-9	OFF-9-SUR A	980409	2	20.0	30	7.96	6.5
OF-9	OFF-9-SUR A	980409	8	20.0	30	8.66	6.6
OF-9	OFF-9-SUR A	980409	8	20.0	30	8.64	6.6
OF-9	OFF-9-SUR A	980409	8	20.0	30	8.63	6.7
OF-14	OFF-14-SUR A	980409	2	20.0	30	7.84	6.7
OF-14	OFF-14-SUR A	980409	2	20.0	30	7.87	6.7
OF-14	OFF-14-SUR A	980409	8	20.0	30	8.56	6.3
OF-14	OFF-14-SUR A	980409	8	20.0	30	8.39	6.7
OF-18	OFF-18-SUR A	980405	3	20.0	29	8.21	6.9
OF-18	OFF-18-SUR A	980405	3	20.0	28	8.23	7.1
OF-18	OFF-18-SUR A	980405	9	20.0	29	8.26	6.7
OF-18	OFF-18-SUR A	980405	9	20.0	29	8.22	6.9
OF-20	OFF-20-SUR A	980405	3	20.0	28	8.39	7.3
OF-20	OFF-20-SUR A	980405	3	20.0	28	8.40	7.2
OF-20	OFF-20-SUR A	980405	9	20.0	29	8.54	6.8
OF-20	OFF-20-SUR A	980405	9	20.0	29	8.47	6.9
OF-21	OFF-21-SUR A	980409	2	20.0	30	7.94	6.6
OF-21	OFF-21-SUR A	980409	2	20.0	30	7.88	6.5
OF-21	OFF-21-SUR A	980409	8	20.0	30	8.48	6.6
OF-21	OFF-21-SUR A	980409	8	20.0	30	8.46	6.2
OF-23	OFF-23-SUR A	980409	2	20.0	30	7.91	6.8
OF-23	OFF-23-SUR A	980409	2	20.0	30	7.96	6.6
OF-23	OFF-23-SUR A	980409	8	20.0	30	8.69	6.4
OF-23	OFF-23-SUR A	980409	8	20.0	30	8.60	6.7

APPENDIX C
WATER QUALITY PARAMETERS[1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC Sample ID	Sample ID	ETC Exp. No.[2]	Day	Temperature (°C[3])	Salinity (ppt[4])	pH	DO (mg/L[5])
OF-15	OFF-15-SUR A	980409	2	20.0	30	8.02	6.7
OF-15	OFF-15-SUR A	980409	2	20.0	30	7.90	6.9
OF-15	OFF-15-SUR A	980409	2	20.0	30	7.89	6.8
OF-15	OFF-15-SUR A	980409	2	20.0	30	7.89	7.0
OF-15	OFF-15-SUR A	980409	8	20.0	30	8.52	6.4
OF-15	OFF-15-SUR A	980409	8	20.0	30	8.59	6.5
OF-15	OFF-15-SUR A	980409	8	20.0	30	8.57	6.7
OF-15	OFF-15-SUR A	980409	8	20.0	30	8.54	6.6
OF-19	OFF-19-SUR A	980409	2	20.0	30	7.92	6.7
OF-19	OFF-19-SUR A	980409	2	20.0	30	7.89	6.8
OF-19	OFF-19-SUR A	980409	8	20.0	30	8.58	6.4
OF-19	OFF-19-SUR A	980409	8	20.0	30	8.49	6.7

FOOTNOTES

(1) Parameters were measured in 10-day solid-phase test chambers.

(2) ETC Exp. No. = Test Series Identification Number

(3) °C = Degrees Celsius

(4) ppt = Parts Per Thousand

(5) mg = Milligram, L = Liter

Appendix D

Overlying and pore water ammonia measured during 10-day amphipod testing of Old Fire Fighting Training Center sediment samples. "SAIC ETC Sample ID" refers to the identification number assigned to the sample in the laboratory. "Sample ID" are station numbers assigned by field personnel except in the case of LIS, the ETC performance control sediment from central Long Island Sound. "ETC Exp. No." is the laboratory number used to identify the test series. Total ammonia was measured twice during each test, on days 2 or 3 and 6 or 8, in each of two replicates in the overlying water and on day 0 in the pore water. Un-ionized ammonia was calculated using temperature, pH, and salinity presented in Appendix C.

APPENDIX D
OVERLYING AND PORE WATER AMMONIA [1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Day	Total Ammonia (mg/L[3])	Un-Ionized Ammonia (mg/L[3])
OF-1	OF-SS1	980401	2	6.49	0.376
OF-1	OF-SS1	980401	2	5.99	0.387
OF-1	OF-SS1	980401	2	6.38	0.386
OF-1	OF-SS1	980401	8	11.96	0.924
OF-1	OF-SS1	980401	8	9.48	1.066
OF-1	OF-SS1	980401	8	11.05	0.872
OF-1	OF-SS1	980401	Pore Water	23.03	0.403
OF-2	OF-SS2	980401	2	5.04	0.274
OF-2	OF-SS2	980401	2	5.89	0.373
OF-2	OF-SS2	980401	8	7.26	0.443
OF-2	OF-SS2	980401	8	11.05	0.819
OF-2	OF-SS2	980401	Pore Water	20.23	0.321
OF-3	OF-SS3	980401	2	5.29	0.349
OF-3	OF-SS3	980401	2	5.50	0.333
OF-3	OF-SS3	980401	2	5.56	0.283
OF-3	OF-SS3	980401	2	5.52	0.341
OF-3	OF-SS3	980401	8	8.37	0.582
OF-3	OF-SS3	980401	8	8.76	0.570
OF-3	OF-SS3	980401	8	14.86	0.947
OF-3	OF-SS3	980401	8	9.08	0.645
OF-3	OF-SS3	980401	Pore Water	17.03	0.336
OF-4	OF-SS4	980401	2	2.18	0.113
OF-4	OF-SS4	980401	2	1.90	0.115
OF-4	OF-SS4	980401	8	2.11	0.093
OF-4	OF-SS4	980401	8	2.55	0.123
OF-4	OF-SS4	980401	Pore Water	8.84	0.204
OF-5	OF-SS5	980401	2	15.13	0.529
OF-5	OF-SS5	980401	2	13.55	0.720
OF-5	OF-SS5	980401	8	28.16	1.239
OF-5	OF-SS5	980401	8	23.20	1.243
OF-5	OF-SS5	980401	Pore Water	35.53	0.751

APPENDIX D
OVERLYING AND PORE WATER AMMONIA [1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Day	Total Ammonia (mg/L[3])	Un-Ionized Ammonia (mg/L[3])
OF-6	OF-SS6	980401	2	5.40	0.349
OF-6	OF-SS6	980401	2	5.25	0.332
OF-6	OF-SS6	980401	8	8.94	0.889
OF-6	OF-SS6	980401	8	10.70	1.042
OF-6	OF-SS6	980401	Pore Water	16.64	0.347
OF-7	OF-SS7	980401	2	3.54	0.260
OF-7	OF-SS7	980401	2	2.92	0.173
OF-7	OF-SS7	980401	8	5.08	0.548
OF-7	OF-SS7	980401	8	3.70	0.490
OF-7	OF-SS7	980401	Pore Water	9.12	0.240
OF-8	OFF-8-SUR A	980409	2	0.00	0.000
OF-8	OFF-8-SUR A	980409	8	0.40	0.042
OF-8	OFF-8-SUR A	980409	Pore Water	3.00	0.039
OF-9	OFF-9-SUR A	980409	2	5.42	0.137
OF-9	OFF-9-SUR A	980409	2	5.17	0.146
OF-9	OFF-9-SUR A	980409	2	0.00	0.000
OF-9	OFF-9-SUR A	980409	8	10.48	1.359
OF-9	OFF-9-SUR A	980409	8	10.43	1.299
OF-9	OFF-9-SUR A	980409	8	10.29	1.256
OF-9	OFF-9-SUR A	980409	Pore Water	16.05	0.231
OF-10	OFF-10-SUR A	980405	3	2.06	0.121
OF-10	OFF-10-SUR A	980405	9	0.10	0.009
OF-10	OFF-10-SUR A	980405	Pore Water	7.24	0.138
OF-11	OFF-11-SUR A	980405	3	1.98	0.132
OF-11	OFF-11-SUR A	980405	3	2.13	0.161
OF-11	OFF-11-SUR A	980405	3	1.90	0.121
OF-11	OFF-11-SUR A	980405	9	0.00	0.000
OF-11	OFF-11-SUR A	980405	9	1.63	0.162
OF-11	OFF-11-SUR A	980405	9	0.00	0.000
OF-11	OFF-11-SUR A	980405	Pore Water	6.17	0.104

APPENDIX D
OVERLYING AND PORE WATER AMMONIA [1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Day	Total Ammonia (mg/L[3])	Un-Ionized Ammonia (mg/L[3])
OF-12	OFF-12-SUR A	980405	3	1.84	0.115
OF-12	OFF-12-SUR A	980405	3	1.70	0.099
OF-12	OFF-12-SUR A	980405	9	1.45	0.108
OF-12	OFF-12-SUR A	980405	9	0.00	0.000
OF-12	OFF-12-SUR A	980405	Pore Water	4.79	0.157
OF-13	OFF-13-SUR A	980405	3	3.09	0.255
OF-13	OFF-13-SUR A	980405	3	3.14	0.253
OF-13	OFF-13-SUR A	980405	3	3.30	0.250
OF-13	OFF-13-SUR A	980405	3	3.49	0.258
OF-13	OFF-13-SUR A	980405	9	0.00	0.000
OF-13	OFF-13-SUR A	980405	9	0.00	0.000
OF-13	OFF-13-SUR A	980405	9	0.00	0.000
OF-13	OFF-13-SUR A	980405	9	3.72	0.377
OF-13	OFF-13-SUR A	980405	Pore Water	9.97	0.362
OF-14	OFF-14-SUR A	980409	2	0.00	0.000
OF-14	OFF-14-SUR A	980409	2	0.00	0.000
OF-14	OFF-14-SUR A	980409	8	0.18	0.019
OF-14	OFF-14-SUR A	980409	8	0.17	0.012
OF-14	OFF-14-SUR A	980409	Pore Water	3.05	0.051
OF-15	OFF-15-SUR A	980409	2	1.84	0.061
OF-15	OFF-15-SUR A	980409	2	1.55	0.039
OF-15	OFF-15-SUR A	980409	2	0.94	0.023
OF-15	OFF-15-SUR A	980409	2	0.00	0.000
OF-15	OFF-15-SUR A	980409	8	0.69	0.068
OF-15	OFF-15-SUR A	980409	8	0.86	0.096
OF-15	OFF-15-SUR A	980409	8	0.66	0.072
OF-15	OFF-15-SUR A	980409	8	0.79	0.081
OF-15	OFF-15-SUR A	980409	Pore Water	5.62	0.097
OF-16	OFF-16-SUR A	980405	3	1.12	0.064
OF-16	OFF-16-SUR A	980405	3	0.94	0.052
OF-16	OFF-16-SUR A	980405	9	0.00	0.000
OF-16	OFF-16-SUR A	980405	9	0.00	0.000
OF-16	OFF-16-SUR A	980405	Pore Water	2.48	0.075

APPENDIX D
OVERLYING AND PORE WATER AMMONIA [1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.[2]	Day	Total Ammonia (mg/L[3])	Un-Ionized Ammonia (mg/L[3])
OF-17	OFF-17-SUR A	980405	3	1.07	0.045
OF-17	OFF-17-SUR A	980405	3	1.04	0.043
OF-17	OFF-17-SUR A	980405	9	0.00	0.000
OF-17	OFF-17-SUR A	980405	9	0.00	0.000
OF-17	OFF-17-SUR A	980405	Pore Water	3.10	0.048
OF-18	OFF-18-SUR A	980405	3	3.83	0.196
OF-18	OFF-18-SUR A	980405	3	3.57	0.192
OF-18	OFF-18-SUR A	980405	9	5.35	0.306
OF-18	OFF-18-SUR A	980405	9	4.95	0.259
OF-18	OFF-18-SUR A	980405	Pore Water	10.90	0.344
OF-19	OFF-19-SUR A	980409	2	1.14	0.030
OF-19	OFF-19-SUR A	980409	2	0.86	0.021
OF-19	OFF-19-SUR A	980409	8	0.14	0.015
OF-19	OFF-19-SUR A	980409	8	0.06	0.005
OF-19	OFF-19-SUR A	980409	Pore Water	3.34	0.062
OF-20	OFF-20-SUR A	980405	3	1.63	0.123
OF-20	OFF-20-SUR A	980405	3	1.64	0.127
OF-20	OFF-20-SUR A	980405	9	0.00	0.000
OF-20	OFF-20-SUR A	980405	9	0.11	0.010
OF-20	OFF-20-SUR A	980405	Pore Water	5.34	0.089
OF-21	OFF-21-SUR A	980409	2	1.51	0.042
OF-21	OFF-21-SUR A	980409	2	0.00	0.000
OF-21	OFF-21-SUR A	980409	8	0.41	0.037
OF-21	OFF-21-SUR A	980409	8	0.58	0.050
OF-21	OFF-21-SUR A	980409	Pore Water	3.74	0.052
OF-22	OF-SS22	980401	2	7.13	0.492
OF-22	OF-SS22	980401	8	10.79	1.427
OF-22	OF-SS22	980401	Pore Water	20.18	0.295
OF-23	OFF-23-SUR A	980409	2	0.00	0.000
OF-23	OFF-23-SUR A	980409	2	0.00	0.000
OF-23	OFF-23-SUR A	980409	8	4.56	0.628
OF-23	OFF-23-SUR A	980409	8	4.95	0.568
OF-23	OFF-23-SUR A	980409	Pore Water	9.71	0.183

FOOTNOTES

(1) Parameters were measured in 10-day solid-phase test chambers.

(2) ETC Exp. No. = Test Series Identification Number

(3) mg = Milligram, L = Liter

Appendix E

ToxCalc output for sodium dodecyl sulfate (SDS) reference toxicant tests conducted during each 10-day amphipod test series with *Ampelisca abdita* for Old Fire Fighting Training Center sediment samples. The trimmed Spearmen-Karber method of regression analysis, available on ToxCalc (version 4.0.8) from TidePool Scientific Software, was used to calculate the SDS EC values (i.e., the effect concentration derived from the point estimation). The EC50 is equivalent to the LC50 (i.e., the median lethal concentration). The "Trim Level" is the amount of trim applied to the dose-reponse relationship. The "95% CL" (i.e., the confidence limit), when calculated, is shown at each trim level

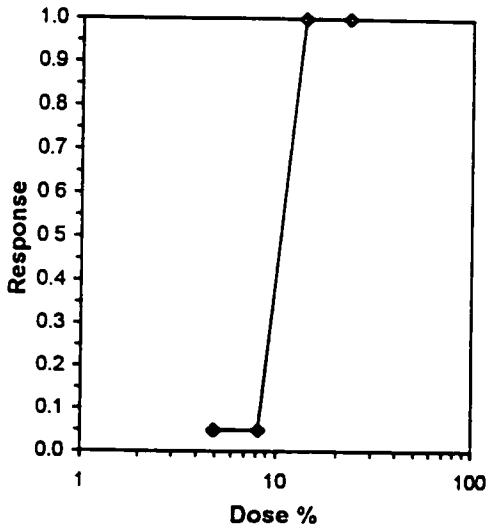
-96 Hr Survival

Start Date:	Test ID.	980402	Sample ID.
End Date:	Lab ID		Sample Type:
Sample Date	Protocol		Test Species
Comments:			

Conc-%	1	2
0	1 0000	1 0000
4 91	0 9000	1 0000
8 21	0 9000	1 0000
13.67	0 0000	0.0000
22.78	0 0000	0 0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL
0.0%		
5.0%	10.453	
10.0%	10 453	
20.0%	10 453	
Auto-5 0%	10.453	



ToxCalc v5 0

Reviewed by _____

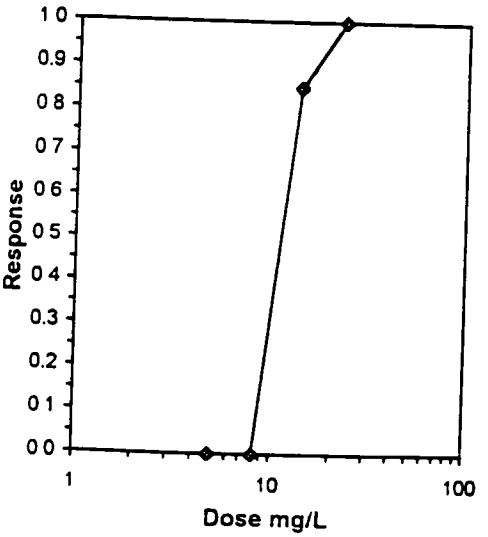
-96 Hr Survival

Start Date	Test ID	980405	Sample ID
End Date	Lab ID		Sample Type:
Sample Date	Protocol		Test Species:
Comments:			

Conc-mg/L	1	2
0	1 0000	1 0000
4 91	1 0000	1 0000
8 21	1 0000	1 0000
13 67	0 3000	0 0000
22 78	0 0000	0 0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0 0%	11 437	10.542	12.407
5 0%	11 255	10.331	12.262
10 0%	11 130	10.275	12 056
20.0%	11 081	10.474	11 724
Auto-0 0%	11 437	10 542	12 407



ToxCalc v5 0

Reviewed by _____

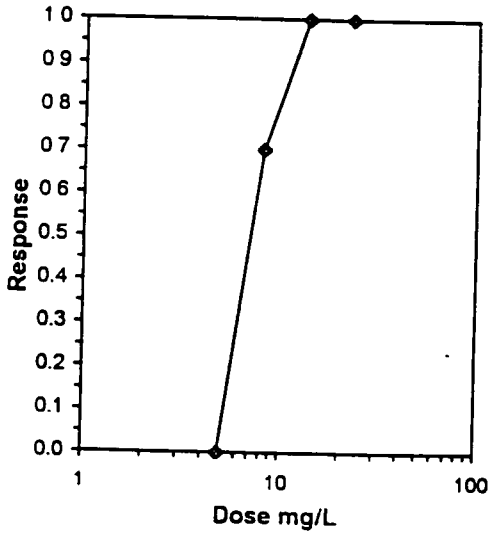
-96 Hr Survival

Start Date	Test ID	980410	Sample ID
End Date:	Lab ID		Sample Type:
Sample Date	Protocol		Test Species.
Comments:			

Conc-mg/L	1	2
0	1 0000	1 0000
4 91	1 0000	1 0000
8.21	0 2000	0 4000
13.67	0 0000	0 0000
22 78	0 0000	0 0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0 0%	7 4031	6.3823	8.5873
5 0%	7 3301	6.2275	8.6278
10.0%	7 2616	6.0829	8.6687
20.0%	7 1457	5.8346	8 7515
Auto-0 0%	7 4031	6 3823	8 5873



ToxCalc v5 0

Reviewed by _____

Appendix F

Amphipod responses to performance control sediment (i.e., LIS) for test series performed at the ETC. The "Mean Survival" refers to percentage of live animals observed at the end of the 10-day amphipod test out of the initial number of animals added to each replicate test chamber. Tests were performed in 1997.

APPENDIX F
PERFORMANCE CONTROL SURVIVAL
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING CENTER, NETC
NEWPORT, RHODE ISLAND

Test No.	Mean Survival (%)
1	93.0
2	89.0
3	96.0
4	90.0
5	88.0
6	87.0
7	92.0
8	86.0
9	92.0
10	90.0
11	75.0
12	85.0
13	93.0
14	93.0
15	79.0
16	87.0
17	85.0
18	88.0
19	92.0
20	97.0
21	96.0
22	91.0
23	96.0
24	89.0
25	92.0
26	95.0
27	96.0

Appendix G

Sea urchin, *Arbacia punctulata*, pore water test results of Old Fire Fighting Training Center sediment samples. "ETC Sample ID" is the identification number assigned to the sample in the laboratory. "Sample ID" are station numbers assigned by field personnel except in the case of NSW, filtered natural seawater collected from lower Narragansett Bay, RI. "ETC Exp. No." is the identification number assigned to the test series. "Conc." is the concentration of the pore water. Dilutions were created by mixing the pore water with natural seawater. "Rep No." refers to the replicate number assigned to each test chamber. The "SD" refers standard deviation of the mean number of normal larvae. The "Mean No. of Normal Larvae as % of LIS" is the ratio of the actual mean number normal to the mean number of normal in the corresponding LIS pore water treatment. The "p value" refers to the probability that the observed differences in development between test elutriate and LIS elutriate occurred strictly by chance and was obtained using Excel's t-Test. Low values infer highly significant differences. Development in the test elutriate was considered statistically different from the LIS elutriate when $p \leq 0.05$. Test sediment elutriate concentrations in which development was lower and statistically different from LIS sediment elutriate concentrations were flagged.

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980505	0	1	91	88	3.5	100		9	
NSW	NSW	980505	0	2	84					16	
NSW	NSW	980505	0	3	88					12	
LIS	LIS	980505	10	1	77	83	5.5	100		23	
LIS	LIS	980505	10	2	86					14	
LIS	LIS	980505	10	3	87					13	
LIS	LIS	980505	50	1	83	88	4.4	100		17	
LIS	LIS	980505	50	2	91					9	
LIS	LIS	980505	50	3	90					10	
LIS	LIS	980505	100	1	58	64	10.7	100		42	
LIS	LIS	980505	100	2	76					24	
LIS	LIS	980505	100	3	57					43	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980501	0	1	88	88	4.5			12	
NSW	NSW	980501	0	2	88					12	
NSW	NSW	980501	0	3	83					17	
NSW	NSW	980501	0	4	94					6	
OF-1	OFF-1-ELU	980501	10	1	85	87	3.8	104		15	
OF-1	OFF-1-ELU	980501	10	2	84					16	
OF-1	OFF-1-ELU	980501	10	3	91					9	
OF-1	OFF-1-ELU	980501	50	1	88	90	3.2	103		12	
OF-1	OFF-1-ELU	980501	50	2	94					6	
OF-1	OFF-1-ELU	980501	50	3	89					11	
OF-1	OFF-1-ELU	980501	100	1	96	89	6.1	140		4	
OF-1	OFF-1-ELU	980501	100	2	84					16	
OF-1	OFF-1-ELU	980501	100	3	88					12	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980503	0	1	88	93	5.0			12	
NSW	NSW	980503	0	2	98					2	
NSW	NSW	980503	0	3	92					8	
OF-2	OFF-2-ELU	980503	10	1	91	91	2.5	109		9	
OF-2	OFF-2-ELU	980503	10	2	88					12	
OF-2	OFF-2-ELU	980503	10	3	93					7	
OF-2	OFF-2-ELU	980503	50	1	86	90	3.5	102		14	
OF-2	OFF-2-ELU	980503	50	2	92					8	
OF-2	OFF-2-ELU	980503	50	3	92					8	
OF-2	OFF-2-ELU	980503	100	1	89	89	2.5	139		11	
OF-2	OFF-2-ELU	980503	100	2	91					9	
OF-2	OFF-2-ELU	980503	100	3	86					14	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980503	0	1	88	93	5.0			12	
NSW	NSW	980503	0	2	98					2	
NSW	NSW	980503	0	3	92					8	
OF-3	OFF-3-ELU	980503	10	1	90	90	2.5	108		10	
OF-3	OFF-3-ELU	980503	10	2	88					12	
OF-3	OFF-3-ELU	980503	10	3	93					7	
OF-3	OFF-3-ELU	980503	50	1	82	86	3.6	98	0.29	18	
OF-3	OFF-3-ELU	980503	50	2	89					11	
OF-3	OFF-3-ELU	980503	50	3	87					13	
OF-3	OFF-3-ELU	980503	100	1	83	87	4.5	137		17	
OF-3	OFF-3-ELU	980503	100	2	92					8	
OF-3	OFF-3-ELU	980503	100	3	87					13	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980503	0	1	88	93	5.0			12	
NSW	NSW	980503	0	2	98					2	
NSW	NSW	980503	0	3	92					8	
OF-4	OFF-4-ELU	980503	10	1	91	90	1.0	108		9	
OF-4	OFF-4-ELU	980503	10	2	89					11	
OF-4	OFF-4-ELU	980503	10	3	90					10	
OF-4	OFF-4-ELU	980503	50	1	92	88	4.7	100		8	
OF-4	OFF-4-ELU	980503	50	2	83					17	
OF-4	OFF-4-ELU	980503	50	3	90					10	
OF-4	OFF-4-ELU	980503	100	1	77	81	4.5	128		23	
OF-4	OFF-4-ELU	980503	100	2	86					14	
OF-4	OFF-4-ELU	980503	100	3	81					19	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980503	0	1	88	93	5.0			12	
NSW	NSW	980503	0	2	98					2	
NSW	NSW	980503	0	3	92					8	
OF-5	OFF-5-ELU	980503	10	1	91	91	1.5	109		9	
OF-5	OFF-5-ELU	980503	10	2	89					11	
OF-5	OFF-5-ELU	980503	10	3	92					8	
OF-5	OFF-5-ELU	980503	50	1	90	90	4.0	102		10	
OF-5	OFF-5-ELU	980503	50	2	94					6	
OF-5	OFF-5-ELU	980503	50	3	86					14	
OF-5	OFF-5-ELU	980503	100	1	87	83	3.2	131		13	
OF-5	OFF-5-ELU	980503	100	2	81					19	
OF-5	OFF-5-ELU	980503	100	3	82					18	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980504	0	1	86	87	7.0			14	
NSW	NSW	980504	0	2	94					6	
NSW	NSW	980504	0	3	80					20	
OF-6	OFF-6-ELU	980504	10	1	95	94	1.7	113		5	
OF-6	OFF-6-ELU	980504	10	2	92					8	
OF-6	OFF-6-ELU	980504	10	3	95					5	
OF-6	OFF-6-ELU	980504	50	1	86	84	8.6	96	0.28	14	
OF-6	OFF-6-ELU	980504	50	2	92					8	
OF-6	OFF-6-ELU	980504	50	3	75					25	
OF-6	OFF-6-ELU	980504	100	1	3	2	1.2	3	0.00	97	**
OF-6	OFF-6-ELU	980504	100	2	1					99	
OF-6	OFF-6-ELU	980504	100	3	1					99	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980504	0	1	86	87	7.0			14	
NSW	NSW	980504	0	2	94					6	
NSW	NSW	980504	0	3	80					20	
OF-7	OFF-7-ELU	980504	10	1	71	77	5.5	93	0.13	29	
OF-7	OFF-7-ELU	980504	10	2	81					19	
OF-7	OFF-7-ELU	980504	10	3	80					20	
OF-7	OFF-7-ELU	980504	50	1	72	81	10.8	92	0.19	28	
OF-7	OFF-7-ELU	980504	50	2	78					22	
OF-7	OFF-7-ELU	980504	50	3	93					7	
OF-7	OFF-7-ELU	980504	100	1	71	84	11.7	131		29	
OF-7	OFF-7-ELU	980504	100	2	94					6	
OF-7	OFF-7-ELU	980504	100	3	86					14	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980412	0	1	90	92	2.1			10	
NSW	NSW	980412	0	2	91					9	
NSW	NSW	980412	0	3	94					6	
OF-8	OFF-8-SUR	980412	10	1	84	86	2.1	103		16	
OF-8	OFF-8-SUR	980412	10	2	85					15	
OF-8	OFF-8-SUR	980412	10	3	88					12	
OF-8	OFF-8-SUR	980412	50	1	85	84	2.3	95	0.11	15	
OF-8	OFF-8-SUR	980412	50	2	85					15	
OF-8	OFF-8-SUR	980412	50	3	81					19	
OF-8	OFF-8-SUR	980412	100	1	14	15	1.5	24	0.01	86	**
OF-8	OFF-8-SUR	980412	100	2	17					83	
OF-8	OFF-8-SUR	980412	100	3	15					85	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980412	0	1	90	92	2.1			10	
NSW	NSW	980412	0	2	91					9	
NSW	NSW	980412	0	3	94					6	
OF-9	OFF-9-SUR	980412	10	1	88	88	0.6	105		12	
OF-9	OFF-9-SUR	980412	10	2	87					13	
OF-9	OFF-9-SUR	980412	10	3	88					12	
OF-9	OFF-9-SUR	980412	50	1	0	0	0.0	0	0.00	100	**
OF-9	OFF-9-SUR	980412	50	2	0					100	
OF-9	OFF-9-SUR	980412	50	3	0					100	
OF-9	OFF-9-SUR	980412	100	1	4	2	2.0	3	0.00	96	**
OF-9	OFF-9-SUR	980412	100	2	2					98	
OF-9	OFF-9-SUR	980412	100	3	0					100	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Pluteus Larva	Mean No. of Pluteus Larva	SD(2)	Development as % of LIS(3)	p value(4)	No. of Non-Pluteus Larva	Comment
NSW	NSW	980301	0	1	91	90	1.7			9	
NSW	NSW	980301	0	2	91					9	
NSW	NSW	980301	0	3	88					12	
OF-10	OFF-10-SUR	980301	10	1	90	90	2.5	108		10	
OF-10	OFF-10-SUR	980301	10	2	93					7	
OF-10	OFF-10-SUR	980301	10	3	88					12	
OF-10	OFF-10-SUR	980301	50	1	87	90	2.5	102		13	
OF-10	OFF-10-SUR	980301	50	2	90					10	
OF-10	OFF-10-SUR	980301	50	3	92					8	
OF-10	OFF-10-SUR	980301	100	1	86	90	4.7	141		14	
OF-10	OFF-10-SUR	980301	100	2	88					12	
OF-10	OFF-10-SUR	980301	100	3	95					5	

SAIC ETC ID	Sample ID	ETC Exp. No [1]	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value[4]	No. of Abnormal Larvae	Comment
NSW	NSW	980301	0	1	91	90	1.7			9	
NSW	NSW	980301	0	2	91					9	
NSW	NSW	980301	0	3	88					12	
OF-11	OFF-11-SUR	980301	10	1	95	96	1.2	115		10	
OF-11	OFF-11-SUR	980301	10	2	97					7	
OF-11	OFF-11-SUR	980301	10	3	95					12	
OF-11	OFF-11-SUR	980301	50	1	85	89	3.2	101		13	
OF-11	OFF-11-SUR	980301	50	2	90					10	
OF-11	OFF-11-SUR	980301	50	3	91					8	
OF-11	OFF-11-SUR	980301	100	1	92	87	4.7	136		14	
OF-11	OFF-11-SUR	980301	100	2	83					12	
OF-11	OFF-11-SUR	980301	100	3	85					5	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No of Abnormal Larvae	Comment
NSW	NSW	980301	0	1	91	90	1.7			9	
NSW	NSW	980301	0	2	91					9	
NSW	NSW	980301	0	3	88					12	
OF-12	OFF-12-SUR	980301	10	1	98	93	5.7	112		2	
OF-12	OFF-12-SUR	980301	10	2	87					13	
OF-12	OFF-12-SUR	980301	10	3	95					5	
OF-12	OFF-12-SUR	980301	50	1	90	92	2.1	105		10	
OF-12	OFF-12-SUR	980301	50	2	93					7	
OF-12	OFF-12-SUR	980301	50	3	94					6	
OF-12	OFF-12-SUR	980301	100	1	94	94	1.5	147		6	
OF-12	OFF-12-SUR	980301	100	2	95					5	
OF-12	OFF-12-SUR	980301	100	3	92					8	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980301	0	1	91	90	1.7			9	
NSW	NSW	980301	0	2	91					9	
NSW	NSW	980301	0	3	88					12	
OF-13	OFF-13-SUR	980301	10	1	98	96	2.0	115		2	
OF-13	OFF-13-SUR	980301	10	2	94					6	
OF-13	OFF-13-SUR	980301	10	3	96					4	
OF-13	OFF-13-SUR	980301	50	1	81	78	3.1	89	0.02	19	**
OF-13	OFF-13-SUR	980301	50	2	79					21	
OF-13	OFF-13-SUR	980301	50	3	75					25	
OF-13	OFF-13-SUR	980301	100	1	8	3	4.4	5	0.00	92	**
OF-13	OFF-13-SUR	980301	100	2	1					99	
OF-13	OFF-13-SUR	980301	100	3	0					100	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980501	0	1	88	88	4 5			12	
NSW	NSW	980501	0	2	88					12	
NSW	NSW	980501	0	3	83					17	
NSW	NSW	980501	0	4	94					6	
OF-14	OFF-14-SUR	980501	10	1	91	91	1.0	109		9	
OF-14	OFF-14-SUR	980501	10	2	92					8	
OF-14	OFF-14-SUR	980501	10	3	90					10	
OF-14	OFF-14-SUR	980501	50	1	83	87	6.4	98	0.39	17	
OF-14	OFF-14-SUR	980501	50	2	83					17	
OF-14	OFF-14-SUR	980501	50	3	94					6	
OF-14	OFF-14-SUR	980501	100	1	89	89	1.5	140		11	
OF-14	OFF-14-SUR	980501	100	2	88					12	
OF-14	OFF-14-SUR	980501	100	3	91					9	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No [1]	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value[4]	No. of Abnormal Larvae	Comment
NSW	NSW	980501	0	1	88	88	4.5			12	
NSW	NSW	980501	0	2	88					12	
NSW	NSW	980501	0	3	83					17	
NSW	NSW	980501	0	4	94					6	
OF-15	OFF-15-SUR	980501	10	1	91	90	1.2	108		9	
OF-15	OFF-15-SUR	980501	10	2	89					11	
OF-15	OFF-15-SUR	980501	10	3	91					9	
OF-15	OFF-15-SUR	980501	50	1	87	90	4.2	103		13	
OF-15	OFF-15-SUR	980501	50	2	89					11	
OF-15	OFF-15-SUR	980501	50	3	95					5	
OF-15	OFF-15-SUR	980501	100	1	0	1	1.2	1	0.00	100	**
OF-15	OFF-15-SUR	980501	100	2	0					100	
OF-15	OFF-15-SUR	980501	100	3	2					98	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980403	0	2	99	97	2.1			1	
NSW	NSW	980403	0	2	96					4	
NSW	NSW	980403	0	3	95					5	
OF-16	OFF-16-SUR	980403	10	1	98	95	3.6	114		2	
OF-16	OFF-16-SUR	980403	10	2	96					4	
OF-16	OFF-16-SUR	980403	10	3	91					9	
OF-16	OFF-16-SUR	980403	50	1	86	91	4.4	103		14	
OF-16	OFF-16-SUR	980403	50	2	94					6	
OF-16	OFF-16-SUR	980403	50	3	93					7	
OF-16	OFF-16-SUR	980403	100	1	84	81	7.4	128		16	
OF-16	OFF-16-SUR	980403	100	2	87					13	
OF-16	OFF-16-SUR	980403	100	3	73					27	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980403	0	1	99	97	2.1			1	
NSW	NSW	980403	0	2	96					4	
NSW	NSW	980403	0	3	95					5	
OF-17	OFF-17-SUR	980403	10	1	95	91	4.0	109		5	
OF-17	OFF-17-SUR	980403	10	2	90					10	
OF-17	OFF-17-SUR	980403	10	3	87					13	
OF-17	OFF-17-SUR	980403	50	1	97	98	0.6	111		3	
OF-17	OFF-17-SUR	980403	50	2	98					2	
OF-17	OFF-17-SUR	980403	50	3	98					2	
OF-17	OFF-17-SUR	980403	100	1	86	94	6.7	147		14	
OF-17	OFF-17-SUR	980403	100	2	98					2	
OF-17	OFF-17-SUR	980403	100	3	97					3	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980407	0	1	95	94	2.3			5	
NSW	NSW	980407	0	2	91					9	
NSW	NSW	980407	0	3	95					5	
OF-18	OFF-18-SUR	980407	10	1	97	96	1.5	115		3	
OF-18	OFF-18-SUR	980407	10	2	94					6	
OF-18	OFF-18-SUR	980407	10	3	96					4	
OF-18	OFF-18-SUR	980407	50	1	56	41	13.0	47	0.01	44	**
OF-18	OFF-18-SUR	980407	50	2	33					67	
OF-18	OFF-18-SUR	980407	50	3	34					66	
OF-18	OFF-18-SUR	980407	100	1	1	1	0 6	1	0.00	99	**
OF-18	OFF-18-SUR	980407	100	2	0					100	
OF-18	OFF-18-SUR	980407	100	3	1					99	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980501	0	1	88	88	4.5			12	
NSW	NSW	980501	0	2	88					12	
NSW	NSW	980501	0	3	83					17	
NSW	NSW	980501	0	4	94					6	
OF-19	OFF-19-SUR	980501	10	1	84	87	2.9	105		16	
OF-19	OFF-19-SUR	980501	10	2	89					11	
OF-19	OFF-19-SUR	980501	10	3	89					11	
OF-19	OFF-19-SUR	980501	50	1	92	90	2.1	103		8	
OF-19	OFF-19-SUR	980501	50	2	88					12	
OF-19	OFF-19-SUR	980501	50	3	91					9	
OF-19	OFF-19-SUR	980501	100	1	15	15	1.5	24	0.01	85	**
OF-19	OFF-19-SUR	980501	100	2	17					83	
OF-19	OFF-19-SUR	980501	100	3	14					86	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No of Abnormal Larvae	Comment
NSW	NSW	980407	0	1	95	94	2 3			5	
NSW	NSW	980407	0	2	91					9	
NSW	NSW	980407	0	3	95					5	
OF-20	OFF-20-SUR	980407	10	1	95	95	1.0	114		5	
OF-20	OFF-20-SUR	980407	10	2	94					6	
OF-20	OFF-20-SUR	980407	10	3	96					4	
OF-20	OFF-20-SUR	980407	50	1	1	0	0 6	0	0.00	99	**
OF-20	OFF-20-SUR	980407	50	2	0					100	
OF-20	OFF-20-SUR	980407	50	3	0					100	
OF-20	OFF-20-SUR	980407	100	1	0	0	0.0	0	0.00	100	**
OF-20	OFF-20-SUR	980407	100	2	0					100	
OF-20	OFF-20-SUR	980407	100	3	0					100	

APPENDIX G
SEA URCHIN DEVELOPMENT ELUTRIATE TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980407	0	1	95	94	2.3			5	
NSW	NSW	980407	0	2	91					9	
NSW	NSW	980407	0	3	95					5	
OF-21	OFF-21-SUR	980407	10	1	97	98	1.2	117		3	
OF-21	OFF-21-SUR	980407	10	2	97					3	
OF-21	OFF-21-SUR	980407	10	3	99					1	
OF-21	OFF-21-SUR	980407	50	1	86	73	11.8	83	0.07	14	
OF-21	OFF-21-SUR	980407	50	2	70					30	
OF-21	OFF-21-SUR	980407	50	3	63					37	
OF-21	OFF-21-SUR	980407	100	1	97	92	6.2	145		3	
OF-21	OFF-21-SUR	980407	100	2	85					15	
OF-21	OFF-21-SUR	980407	100	3	94					6	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No of Abnormal Larvae	Comment
NSW	NSW	980505	0	1	91	88	3.5			9	
NSW	NSW	980505	0	2	84					16	
NSW	NSW	980505	0	3	88					12	
OF-22	OFF-22-ELU	980505	10	1	79	84	5.0	101		21	
OF-22	OFF-22-ELU	980505	10	2	84					16	
OF-22	OFF-22-ELU	980505	10	3	89					11	
OF-22	OFF-22-ELU	980505	50	1	90	89	2.3	101		10	
OF-22	OFF-22-ELU	980505	50	2	86					14	
OF-22	OFF-22-ELU	980505	50	3	90					10	
OF-22	OFF-22-ELU	980505	100	1	7	10	4.4	16	0.00	93	**
OF-22	OFF-22-ELU	980505	100	2	15					85	
OF-22	OFF-22-ELU	980505	100	3	8					92	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980407	0	1	95	94	2.3			5	
NSW	NSW	980407	0	2	91					9	
NSW	NSW	980407	0	3	95					5	
OF-23	OFF-23-SUR	980407	10	1	98	96	2.1	116		2	
OF-23	OFF-23-SUR	980407	10	2	97					3	
OF-23	OFF-23-SUR	980407	10	3	94					6	
OF-23	OFF-23-SUR	980407	50	1	6	13	7.5	15	0.00	94	**
OF-23	OFF-23-SUR	980407	50	2	21					79	
OF-23	OFF-23-SUR	980407	50	3	12					88	
OF-23	OFF-23-SUR	980407	100	1	0	0	0.0	0	0.00	100	**
OF-23	OFF-23-SUR	980407	100	2	0					100	
OF-23	OFF-23-SUR	980407	100	3	0					100	

FOOTNOTES

** = Mean sample response was both statistically different and less than the mean LIS response.

(1) ETC Exp. No. = Laboratory Identification Number

(2) SD = Standard Deviation

(3) LIS = Long Island Sound Negative Performance Control Sediment

(4) p value = Significance Level of t Test

Appendix H

ToxCalc output for elutriate samples evaluated using the sea urchin test. The linear interpolation method of regression analysis, available on ToxCalc (version 4.0.8) from TidePool Scientific Software, was used to calculate the IC values (i.e., the inhibition concentrations derived from the point estimation). The "Isotonic Mean" is the isotonized mean response. The "Isotonic N-Mean" is Abbott's corrected mean response. The "NOEC" is the no observed effect concentration or the highest concentration tested causing no statistically measurable effect to the test system The "LOEC" is the lowest observed effect concentration or the lowest concentration tested causing a statistically measurable effect to the test system. The "ChV" is the chronic value derived from the geometric mean of the NOEC and LOEC. The ChV represents a presumably safe concentration. The IC05 - IC50 are shown as % elutriate. The SD (standard deviation) and 95% CL (i.e., confidence limits) when calculated are shown for each IC value. The "Skew" is the skewness of the bootstrap distribution

Urchin Larval Dev lopment-48 Hour Development

Start Date:	Test ID LIS	Sample ID.	
End Date:	Lab ID	Sample Type.	
Sample Date:	Protocol: DLA 91-Modified Dinnel	Test Species:	AP-Arbacia punctulata
Comments.			

Conc-%	1	2	3
0	0.9100	0.8400	0.8800
10	0.7700	0 8600	0.8700
50	0 8300	0 9100	0 9000
100	0.5800	0 7600	0 5700

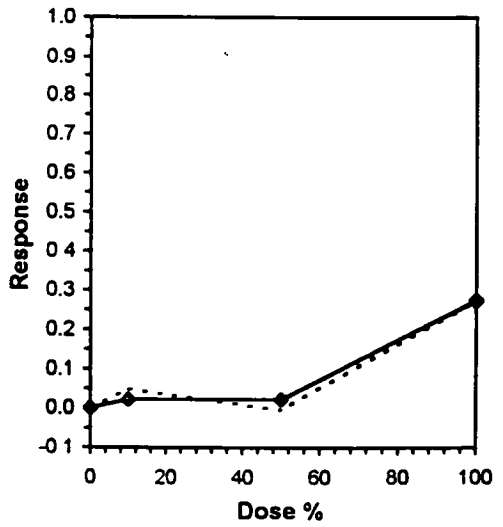
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8767	1.0000	1.2141	1.1593	1.2661	4.404	3				0.8767	1.0000
10	0.8333	0.9506	1 1533	1.0706	1.2019	6.240	3	0.936	2.420	0.1574	0.8567	0.9772
50	0.8800	1.0038	1 2203	1.1458	1.2661	5.334	3	-0.095	2.420	0.1574	0.8567	0.9772
*100	0.6367	0.7262	0.9267	0.8556	1 0588	12.356	3	4 419	2.420	0.1574	0.6367	0.7262

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.89902	0.805	0.3441	-0.7071
Bartlett's Test indicates equal variances (p = 0 77)	1.12431	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.11989	0.13653	0.05709	0.00635	0.00608	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	55.417	16.819	0 000	69.550	-1.9863
IC10	65.379	5.622	48.474	91.277	0.3020
IC15	75.341				
IC20	85.303				
IC25	95.265				
IC40	>100				
IC50	>100				



ToxCalc v5 0

Reviewed by:_____

-48 Hour Devel pment

Start Date:		Test ID	OFF-1	Sample ID.	
End Date.		Lab ID		Sample Type.	
Sample Date·		Protocol.		Test Species.	
Comments·					

C nc-%	1	2	3	4
0	0.8800	0 8800	0.8300	0 9400
10	0 8500	0.8400	0.9100	
50	0 8800	0.9400	0.8900	
100	0 9600	0.8400	0.8800	

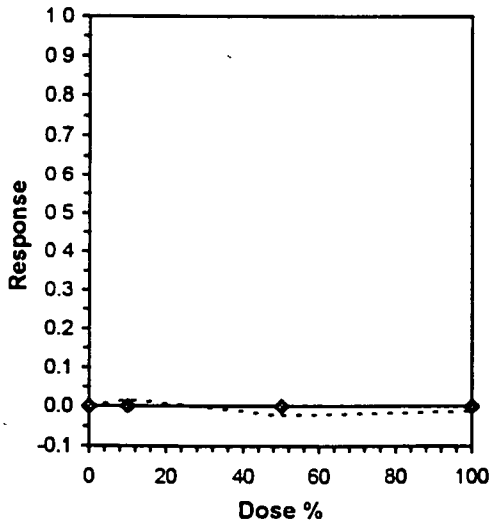
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8825	1.0000	1 2258	1 1458	1 3233	5.970	4				0.8865	1 0000
10	0.8667	0.9821	1 1995	1 1593	1 2661	4 844	3	0.449	2.510	0 1470	0.8865	1 0000
50	0 9033	1.0236	1 2577	1 2171	1 3233	4 562	3	-0.544	2 510	0 1470	0.8865	1 0000
100	0 8933	1 0123	1 2486	1 1593	1 3694	8.695	3	-0.389	2 510	0 1470	0 8865	1 0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.90574	0.814	0.62022	-0.7167
Bartlett's Test indicates equal variances (p = 0.81)	0.98152	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	100	>100		1	0.10881	0 12287	0 00204	0 00589	0.79223	3, 9

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



 ToxCalc v5 0 Reviewed by _____

-48 Hour Development

Start Date.	Test ID OFF-2	Sample ID	
End Date:	Lab ID.	Sample Type	
Sample Date:	Protocol·	Test Species	
Comments·			

Conc-%	1	2	3
0	0.8800	0 9800	0 9200
10	0.9100	0.8800	0 9300
50	0.8600	0 9200	0 9200
100	0 8900	0.9100	0 8600

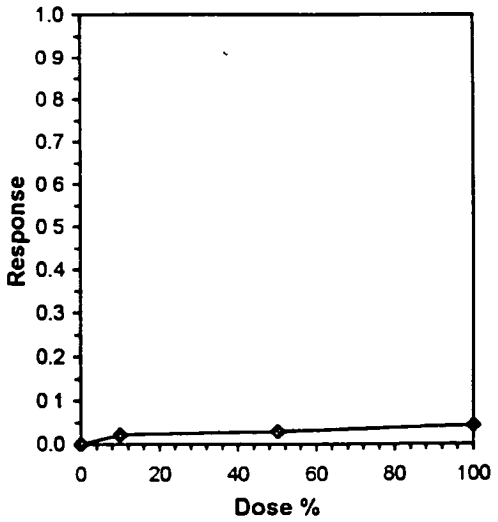
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9267	1.0000	1 3100	1 2171	1.4289	8.266	3				0.9267	1 0000
10	0.9067	0.9784	1 2621	1 2171	1 3030	3.418	3	0 869	2.420	0.1335	0.9067	0 9784
50	0.9000	0.9712	1 2518	1.1873	1 2840	4.462	3	1.055	2.420	0.1335	0.9000	0.9712
100	0.8867	0.9568	1 2287	1.1873	1 2661	3.219	3	1 473	2.420	0.1335	0.8867	0.9568

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 96155	0.805	0.35237	0.33997
Bartlett's Test indicates equal variances (p = 0 51)	2.33036	11.3449		

Hyp thesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.08112	0 0869	0.00351	0.00457	0.54303	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5 0

Reviewed by._____

-48 Hour Development

Start Date		Test ID	OFF-3	Sample ID.	
End Date:		Lab ID		Sample Type	
Sample Date:		Protocol		Test Species	
Comments:					

Conc-%	1	2	3
0	0.8800	0.9800	0 9200
10	0 9000	0 8800	0.9300
50	0 8200	0.8900	0 8700
100	0.8300	0.9200	0.8700

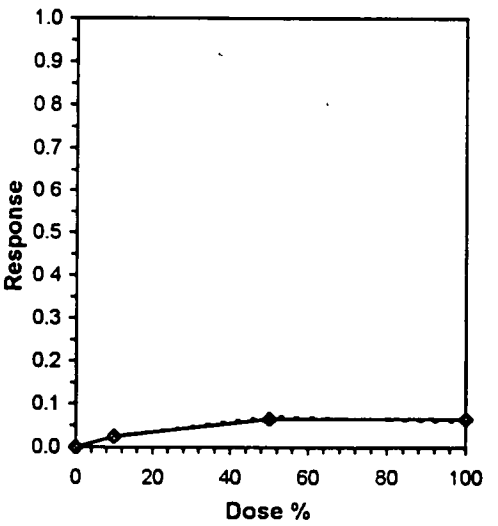
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9267	1.0000	1 3100	1 2171	1.4289	8.266	3				0.9267	1.0000
10	0 9033	0.9748	1 2564	1 2171	1 3030	3.459	3	0.905	2.420	0 1434	0.9033	0 9748
50	0.8600	0.9281	1.1891	1 1326	1 2327	4.311	3	2 040	2.420	0 1434	0.8667	0 9353
100	0 8733	0.9424	1.2106	1 1458	1.2840	5 743	3	1 677	2.420	0.1434	0 8667	0.9353

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.97694	0 805	0.42765	-0 3562
Bartlett's Test indicates equal variances (p = 0 64)	1 66837	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.0882	0.09448	0.00861	0.00527	0.25683	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)	Skew
IC05	35.091			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5 0

Reviewed by _____

-48 H ur Dev lopment

Start Date:	Test ID OFF-4	Sample ID	
End Date	Lab ID	Sample Type	
Sample Date:	Protocol	Test Species	
Comments:			

Conc-%	1	2	3
0	0 8800	0.9800	0 9200
10	0.9100	0 8900	0 9000
50	0 9200	0 8300	0 9000
100	0.7700	0 8600	0 8100

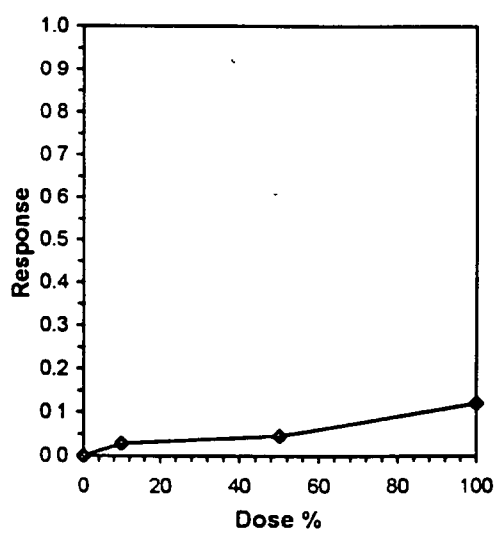
			Transform: Arcsin Square Root						1-Tailed		Isot nic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9267	1.0000	1 3100	1.2171	1 4289	8.266	3				0.9267	1 0000
10	0.9000	0.9712	1 2493	1 2327	1 2661	1.336	3	1.036	2.420	0 1418	0 9000	0.9712
50	0.8833	0.9532	1 2263	1.1458	1 2840	5.861	3	1 428	2.420	0 1418	0.8833	0.9532
*100	0.8133	0.8777	1 1259	1.0706	1 1873	5.203	3	3.142	2.420	0 1418	0.8133	0.8777

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0 97738	0 805	0.2884	-0.0794
Bartlett's Test indicates equal variances (p = 0 25)	4 13417	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.08703	0.09323	0.01761	0 00515	0 07304	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	52.143	25.757	0.000	120.599	-0.2504
IC10	85.238				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



-48 Hour Development

Start Date:		Test ID	OFF-5	Sample ID.	
End Date		Lab ID		Sample Type.	
Sample Date:		Protocol		Test Species·	
Comments					

Conc-%	1	2	3
0	0 8800	0 9800	0.9200
10	0 9100	0 8900	0 9200
50	0 9000	0 9400	0 8600
100	0.8700	0.8100	0.8200

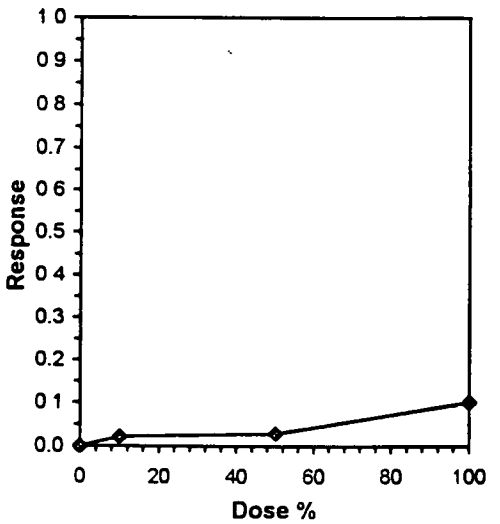
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9267	1.0000	1.3100	1 2171	1.4289	8.266	3				0.9267	1.0000
10	0.9067	0.9784	1 2610	1 2327	1.2840	2.065	3	0.872	2.420	0 1362	0.9067	0.9784
50	0.9000	0.9712	1 2532	1 1873	1 3233	5.435	3	1.009	2.420	0 1362	0.9000	0.9712
*100	0.8333	0.8993	1 1515	1 1198	1 2019	3 838	3	2.818	2.420	0 1362	0.8333	0.8993

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.96983	0 805	0.5368	0.28058
Bartlett's Test indicates equal variances (p = 0 36)	3 23514	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.08299	0.0889	0 01329	0.00475	0.10863	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	64.750			
IC10	99.500			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5 0

Reviewed by _____

Urchin Larval Development-48 Hour Development

Start Date:		Test ID	OFF-6	Sample ID.	
End Date:		Lab ID		Sample Type.	
Sample Date		Protocol	DLA 91-Modified Dinnel	Test Species.	AP-Arbacia punctulata
Comments:					

Conc-%	1	2	3
0	0.8600	0.9400	0.8000
10	0 9500	0.9200	0 9500
50	0 8600	0.9200	0.7500
100	0 0300	0 0100	0.0100

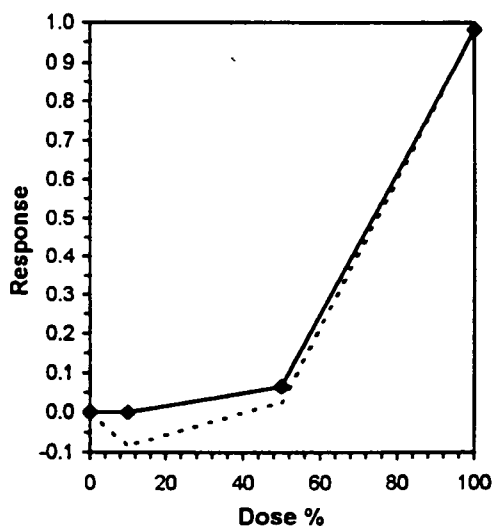
			Transform: Arcsin Square Root						1-Tailed		Isot nic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8667	1.0000	1 2059	1.1071	1 3233	9.063	3				0.9033	1 0000
10	0.9400	1.0846	1.3249	1 2840	1 3453	2.669	3	-1.705	2.420	0.1688	0.9033	1 0000
50	0.8433	0.9731	1 1728	1.0472	1.2840	10.153	3	0.474	2.420	0.1688	0.8433	0.9336
*100	0.0167	0.0192	0.1248	0.1002	0.1741	34.193	3	15.499	2.420	0.1688	0.0167	0.0185

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.95656	0.805	0.02282	-0 1343
Bartlett's Test indicates equal variances (p = 0.35)	3.30371	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Pr b	df
Dunnett's Test	50	100	70.7107	2	0.13145	0.15063	0.93643	0.0073	4 2E-07	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	40.111	10.918	3.805	66.228	-0.1748
IC10	51.835	5.624	17 835	58.683	-1.6798
IC15	54.567	2.908	41.757	61.029	-1.8869
IC20	57.298	2.275	47 621	63.374	-0.6219
IC25	60.030	2.117	51 034	65.720	-0.5858
IC40	68.226	1.680	61 275	72.756	-0.5895
IC50	73.690	1 390	68 102	77 454	-0.5913



-48 Hour Devel pment

Start Date:	Test ID OFF-7	Sample ID.	
End Date:	Lab ID:	Sample Type:	
Sample Date:	Protocol.	Test Species:	
Comments·			

Conc-%	1	2	3
0	0 8600	0 9400	0 8000
10	0 7100	0.8100	0.8000
50	0.7200	0 7800	0 9300
100	0 7100	0.9400	0.8600

			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8667	1.0000	1 2059	1 1071	1.3233	9.063	3				0.8667	1 0000
10	0.7733	0 8923	1.0763	1 0021	1.1198	6 001	3	1 245	2.420	0.2519	0.8067	0.9308
50	0.8100	0.9346	1.1329	1 0132	1 3030	13.358	3	0.701	2.420	0 2519	0.8067	0 9308
100	0.8367	0.9654	1 1709	1.0021	1 3233	13.770	3	0 336	2.420	0.2519	0.8067	0.9308

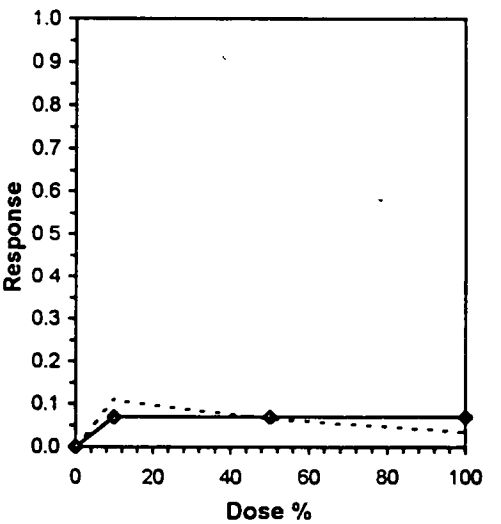
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.96363	0 805	0.18354	-0.9651
Bartlett's Test indicates equal variances (p = 0.70)	1.41592	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.20723	0.23747	0.00923	0.01625	0.65143	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)	Skew
IC05*	7.2222			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

* indicates IC estimate less than the lowest concentration



Urchin Larval Development-48 Hour Development

Start Date:		Test ID	OF-8	Sample ID.	
End Date.		Lab ID:		Sample Type.	
Sample Date:		Protocol:	DLA 91-Modified Dinnel	Test Species:	AP-Arbacia punctulata
Comments:					

Conc-%	1	2	3
0	0.9000	0.9100	0.9400
10	0.8400	0.8500	0 8800
50	0 8500	0 8500	0 8100
100	0.1400	0.1700	0.1500

			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 9167	1.0000	1.2795	1.2490	1.3233	3.041	3				0.9167	1.0000
*10	0.8567	0.9345	1.1831	1.1593	1 2171	2.550	3	3.820	2.420	0 0610	0.8567	0.9345
*50	0.8367	0.9127	1.1553	1.1198	1.1731	2.665	3	4.923	2.420	0 0610	0.8367	0.9127
*100	0.1533	0.1673	0.4021	0.3835	0.4250	5.245	3	34.789	2.420	0 0610	0.1533	0.1673

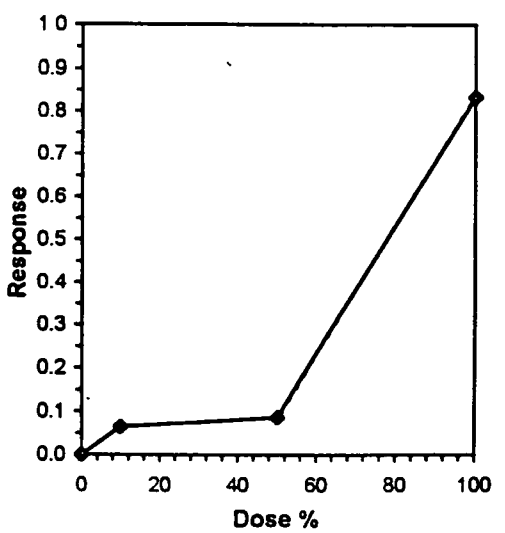
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93882	0.805	0.29761	-1.2738
Bartlett's Test indicates equal variances (p = 0.90)	0.58874	11.3449		

Hyp thesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<10	10			0.03661	0.0399	0.49321	0.00095	1.7E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	7.639	3.875	2.986	33.747	2.8662
IC10	50.854	6.810	2.021	53.323	-2.4467
IC15	54.207	0.883	50.517	56.579	-0 3168
IC20	57.561	0.829	54 116	59.845	-0 3236
IC25	60.915	0.777	57 714	63.110	-0.3307
IC40	70.976	0.631	68.502	72.906	-0 3504
IC50	77.683	0.550	75 690	79.443	-0.3541

* indicates IC estimate less than the lowest concentration



Urchin Larval Devel pment-48 Hour Development

Start Date		Test ID	OFF-9	Sample ID.	
End Date·		Lab ID		Sample Type:	
Sample Date		Protocol	DLA 91-Modified Dinnel	Test Species:	AP-Arbacia punctulata
Comments					

Conc-%	1	2	3
0	0.9000	0 9100	0 9400
10	0 8800	0 8700	0 8800
50	0.0000	0 0000	0 0000
100	0.0400	0.0200	0 0000

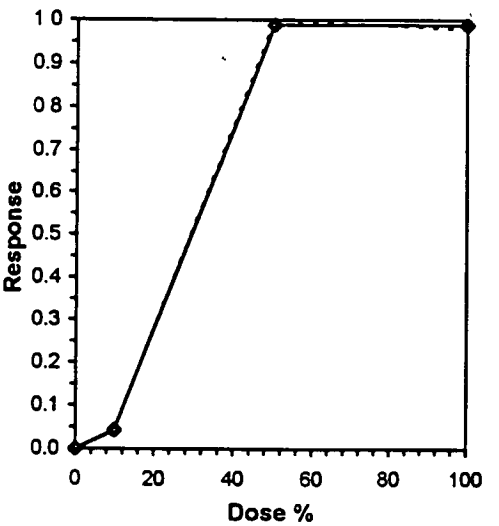
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9167	1 0000	1.2795	1 2490	1.3233	3.041	3				0.9167	1.0000
10	0.8767	0.9564	1 2120	1 2019	1.2171	0.720	3	1.921	2.420	0 0850	0.8767	0.9564
*50	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	3	35.001	2.420	0.0850	0.0100	0.0109
*100	0.0200	0.0218	0 1311	0.0500	0.2014	58.161	3	32.693	2.420	0.0850	0.0100	0.0109

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91029	0.805	-0.2912	2.24418
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Pr b	df
Dunnett's Test	10	50	22.3607	10	0.05257	0.05729	1 34004	0.00185	4.5E-10	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	10.269	0.945	4 288	11.804	-1.1858
IC10	12.385	0.443	10.360	13.838	-0 1004
IC15	14 500	0.421	12.605	15.873	-0.0995
IC20	16.615	0.400	14 850	17 908	-0.0985
IC25	18.731	0.378	17 096	19 942	-0.0975
IC40	25.077	0.318	23 691	26.100	-0 0942
IC50	29.308	0.281	28 036	30 271	-0.0921



ToxCalc v5.0

Reviewed by _____

-48 Hour Development

Start Date	Test ID	OFF-10	Sample ID.
End Date	Lab ID		Sample Type.
Sample Date:	Protocol·		Test Species
Comments.			

Conc-%	1	2	3
0	0.9100	0 9100	0 8800
10	0.9000	0.9300	0.8800
50	0 8700	0.9000	0 9200
100	0 8600	0 8800	0 9500

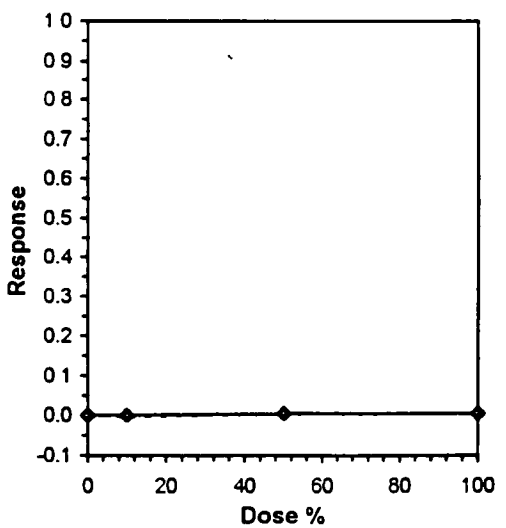
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9000	1.0000	1.2498	1 2171	1 2661	2.266	3				0.9017	1 0000
10	0.9033	1.0037	1 2564	1.2171	1.3030	3.459	3	-0.152	2.420	0 1057	0.9017	1.0000
50	0.8967	0.9963	1 2450	1.2019	1 2840	3.309	3	0 109	2.420	0 1057	0.8967	0.9945
100	0 8967	0.9963	1 2499	1 1873	1 3453	6.717	3	-0 003	2.420	0 1057	0.8967	0.9945

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.94978	0.805	0 6693	0.10455
Bartlett's Test indicates equal variances (p = 0 54)	2.15977	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.07171	0.07964	#######	0 00286	0 99493	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



-48 Hour Devel pment

Start Date	Test ID	OFF-11	Sample ID
End Date·	Lab ID		Sample Type.
Sample Date.	Protocol		Test Species
Comments:			

Conc-%	1	2	3
0	0.9100	0.9100	0 8800
10	0 9500	0.9700	0 9500
50	0 8500	0 9000	0 9100
100	0.9200	0.8300	0 8500

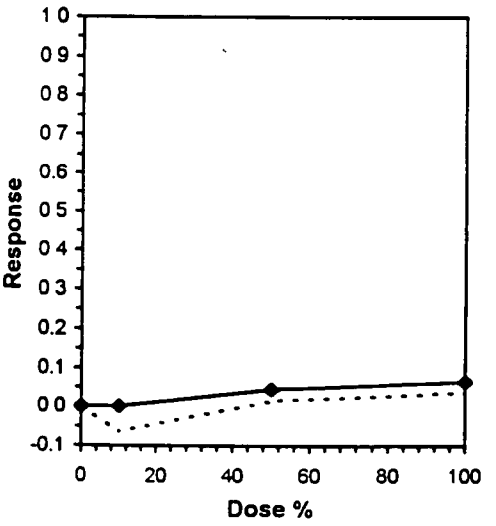
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9000	1.0000	1 2498	1.2171	1 2661	2.266	3				0.9283	1 0000
10	0.9567	1.0630	1.3624	1 3453	1 3967	2.179	3	-2.832	2 420	0.0963	0.9283	1 0000
50	0.8867	0.9852	1 2294	1.1731	1.2661	4 027	3	0.511	2.420	0.0963	0 8867	0 9551
100	0.8667	0 9630	1 2010	1 1458	1 2840	6.096	3	1.226	2.420	0 0963	0.8667	0 9336

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.94852	0.805	0.40404	-0.2097
Bartlett's Test indicates equal variances (p = 0 57)	2.03414	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.0647	0.07185	0.01501	0 00237	0.01662	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	61.875			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5 0

Reviewed by _____

-48 H ur Development

Start Date:		Test ID.	OFF-12	Sample ID	
End Date:		Lab ID:		Sample Type:	
Sample Date:		Protocol:		Test Species:	
Comments:					

Conc-%	1	2	3
0	0.9100	0 9100	0.8800
10	0 9800	0 8700	0.9500
50	0 9000	0.9300	0.9400
100	0.9400	0 9500	0.9200

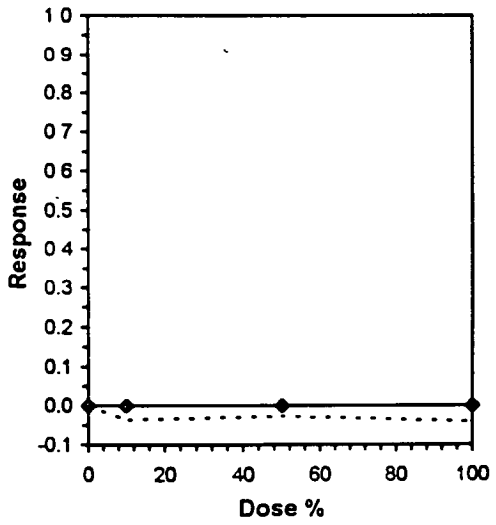
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
C nc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9000	1.0000	1.2498	1.2171	1 2661	2.266	3				0.9233	1.0000
10	0.9333	1.0370	1 3254	1 2019	1.4289	8.661	3	-1.446	2.420	0 1266	0.9233	1 0000
50	0.9233	1.0259	1 2918	1 2490	1 3233	2.972	3	-0.804	2.420	0 1266	0.9233	1.0000
100	0.9367	1.0407	1 3176	1 2840	1 3453	2.355	3	-1 296	2.420	0 1266	0.9233	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.90967	0.805	-0.5695	2.24152
Bartlett's Test indicates equal variances (p = 0 18)	4 86583	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.08776	0.09746	0.00348	0.0041	0.50507	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5.0

Reviewed by: _____

Urchin Larval Development-48 Hour Development

Start Date.	Test ID. OF-13	Sample ID	
End Date.	Lab ID.	Sample Type:	
Sample Date:	Protocol DLA 91-Modified Dinnel	Test Species:	AP-Arbacia punctulata
Comments:			

Conc-%	1	2	3
0	0.9100	0.9100	0 8800
10	0.9800	0.9400	0 9600
50	0.8100	0.7900	0 7500
100	0 0800	0.0100	0 0000

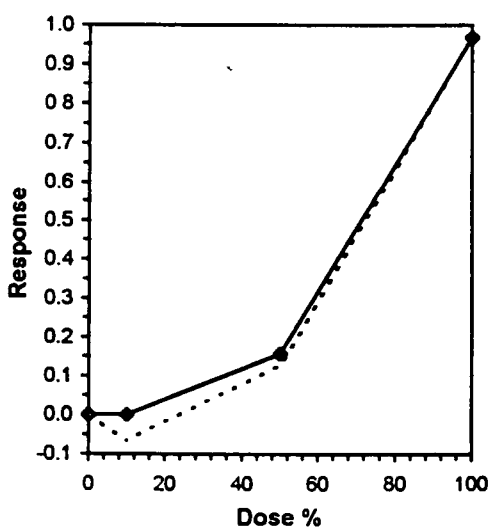
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9000	1.0000	1.2498	1.2171	1.2661	2.266	3				0.9300	1.0000
10	0.9600	1.0667	1.3739	1.3233	1.4289	3.852	3	-2.122	2.420	0.1415	0.9300	1.0000
*50	0.7833	0.8704	1 0872	1 0472	1.1198	3.391	3	2.779	2.420	0.1415	0.7833	0.8423
*100	0.0300	0.0333	0.1456	0 0500	0 2868	85.651	3	18.878	2.420	0.1415	0.0300	0.0323

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94402	0.805	0.87223	1.68148
Bartlett's Test indicates equal variances (p = 0.22)	4 43643	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.09957	0.11058	0.93455	0.00513	1.1E-07	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	22.682	1.354	18.212	28.001	0.2593
IC10	35.364	2.708	26 423	46.002	0.2593
IC15	48.045	2.863	34.635	54 484	-0.7686
IC20	52.611	0.955	48.504	55 749	-0.3341
IC25	55.697	0.891	51 671	58 802	-0 3170
IC40	64 956	0.756	61 190	67 490	-0 0969
IC50	71.128	0.730	67 946	73 836	0 1874



 ToxCalc v5.0 Reviewed by _____

-48 Hour Development

Start Date		Test ID	OFF-14	Sample ID	
End Date.		Lab ID		Sample Type	
Sample Date·		Protocol.		Test Species	
Comments:					

Conc-%	1	2	3	4
0	0.8800	0.8800	0.8300	0.9400
10	0.9100	0 9200	0 9000	
50	0 8300	0.8300	0 9400	
100	0.8900	0.8800	0.9100	

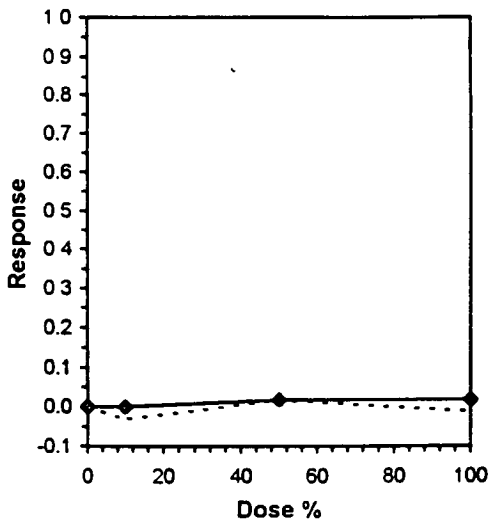
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8825	1.0000	1 2258	1.1458	1 3233	5.970	4				0.8963	1.0000
10	0.9100	1 0312	1 2664	1.2490	1 2840	1 382	3	-0.808	2.510	0 1261	0.8963	1 0000
50	0.8667	0.9821	1.2050	1.1458	1 3233	8.506	3	0 415	2.510	0.1261	0.8800	0.9819
100	0.8933	1.0123	1.2386	1.2171	1 2661	2.022	3	-0.255	2.510	0.1261	0.8800	0.9819

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.90783	0 814	0.88861	0 69585
Bartlett's Test indicates equal variances (p = 0 13)	5.66132	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	100	>100		1	0.0916	0 10343	0 002	0.00433	0 71548	3, 9

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5 0

Reviewed by _____

Urchin Larval Devel pment-48 Hour Development

Start Date.	Test ID OFF-15	Sample ID:	
End Date	Lab ID	Sample Type:	
Sample Date:	Protocol DLA 91-Modified Dinnel	Test Species.	AP-Arbacia punctulata
Comments:			

Conc-%	1	2	3	4
0	0 8800	0.8800	0 8300	0 9400
10	0.9100	0.8900	0 9100	
50	0.8700	0.8900	0 9500	
100	0 0000	0 0000	0 0200	

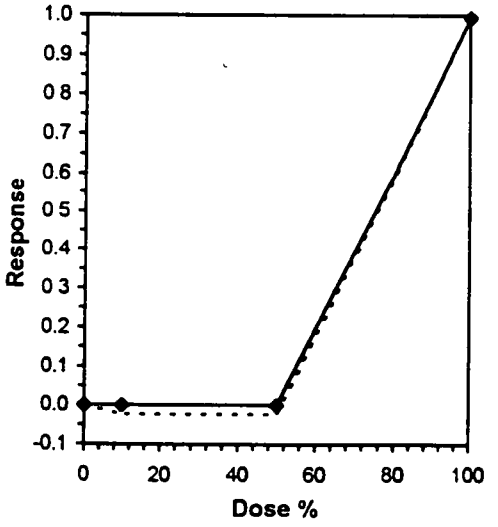
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8825	1 0000	1 2258	1.1458	1.3233	5.970	4				0.8964	1.0000
10	0.9033	1.0236	1 2550	1.2327	1 2661	1 535	3	-0.623	2.510	0.1175	0 8964	1.0000
50	0.9033	1 0236	1 2600	1 2019	1 3453	5.989	3	-0.730	2.510	0.1175	0.8964	1.0000
*100	0.0067	0.0076	0.0806	0 0500	0.1419	65.775	3	24.459	2.510	0.1175	0.0067	0.0074

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.92659	0.814	0.64688	-0.2413
Bartlett's Test indicates equal variances (p = 0 43)	2.78256	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	50	100	70.7107	2	0.0847	0.09564	1 04334	0.00376	3.5E-09	3, 9

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	52.519	0.442	49 626	52.559	-2.2371
IC10	55.037	0.420	52.298	55.117	-2.2038
IC15	57.556	0.398	54 970	57.676	-2.1579
IC20	60.075	0.376	57 643	60.234	-2.0960
IC25	62.594	0.356	60.315	62.793	-2.0145
IC40	70.150	0.301	68.321	70.468	-1 6127
IC50	75.187	0.272	73.561	75.586	-1.1917



ToxCalc v5 0

Reviewed by _____

-48 Hour Development

Start Date.		Test ID	OFF-16	Sample ID:	
End Date·		Lab ID		Sample Type.	
Sample Date:		Protocol:		Test Species	
Comments:					

Conc-%	1	2	3
0	0 9900	0.9600	0.9500
10	0 9800	0.9600	0 9100
50	0 8600	0.9400	0 9300
100	0.8400	0.8700	0 7300

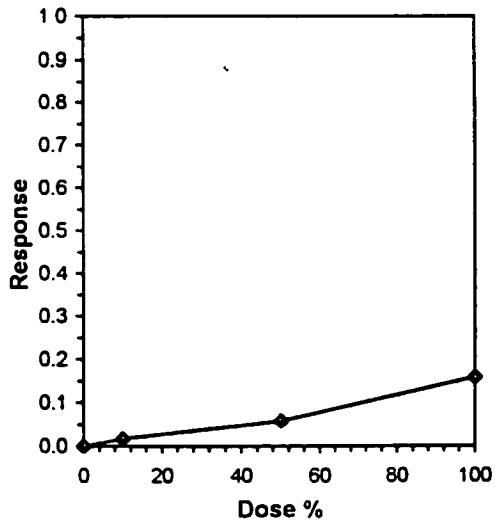
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9667	1.0000	1.3951	1.3453	1.4706	4.767	3				0.9667	1.0000
10	0.9500	0.9828	1.3548	1.2661	1.4289	6.080	3	0.622	2.420	0 1568	0.9500	0 9828
50	0.9100	0.9414	1 2712	1 1873	1 3233	5 773	3	1 912	2.420	0 1568	0.9100	0.9414
*100	0.8133	0.8414	1 1285	1 0244	1 2019	8.212	3	4 115	2.420	0.1568	0.8133	0.8414

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.88707	0.805	-0.3946	-1 5021
Bartlett's Test indicates equal variances (p = 0.98)	0.20482	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70 7107	2	0.07597	0.07836	0.04165	0 0063	0.01471	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	41.667	14.261	0.000	83.398	-0.4091
IC10	70.690				
IC15	95 690				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



ToxCalc v5.0

Reviewed by _____

-48 Hour Devel pment

Start Date.	Test ID	OFF-17	Sample ID:
End Date:	Lab ID.		Sample Type:
Sample Date:	Protocol		Test Species:
Comments:			

Conc-%	1	2	3
0	0.9900	0.9600	0.9500
10	0.9500	0.9000	0 8700
50	0 9700	0.9800	0.9800
100	0 8600	0 9800	0 9700

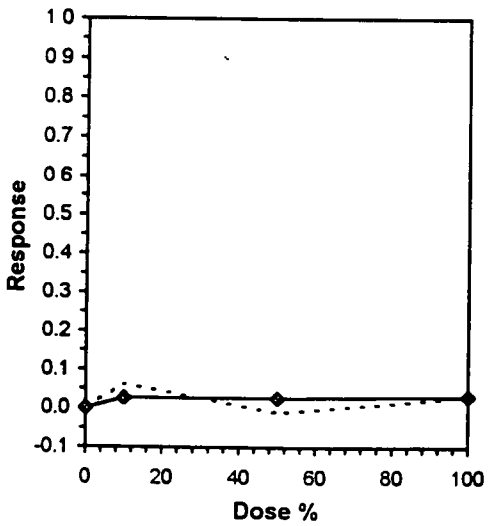
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9667	1.0000	1 3951	1 3453	1.4706	4 767	3				0.9667	1 0000
10	0.9067	0.9379	1 2654	1.2019	1.3453	5.774	3	1 922	2.420	0.1633	0 9417	0.9741
50	0.9767	1.0103	1 4182	1 3967	1.4289	1 310	3	-0.342	2.420	0 1633	0.9417	0.9741
100	0.9367	0.9690	1 3376	1 1873	1.4289	9.807	3	0.852	2.420	0.1633	0.9367	0.9690

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.93978	0.805	-0.5922	0 36634
Bartlett's Test indicates equal variances (p = 0 21)	4 53674	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.08002	0.08254	0.01392	0 00683	0.18706	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5 0

Reviewed by _____

Urchin Larval Development-48 Hour Development

Start Date.		Test ID	OFF-18	Sample ID.	
End Date·		Lab ID		Sample Type.	
Sample Date		Protocol	DLA 91-Modified Dinnel	Test Species	AP-Arbacia punctulata
Comments·					

C nc-%	1	2	3
0	0 9500	0.9100	0 9500
10	0 9700	0 9400	0 9600
50	0.5600	0 3300	0 3400
100	0 0100	0.0000	0.0100

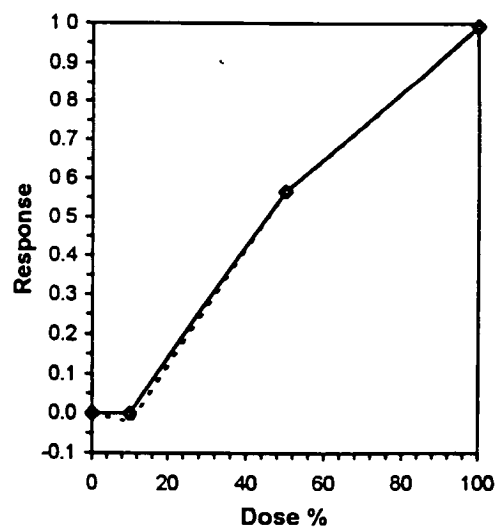
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9367	1.0000	1 3189	1.2661	1.3453	3.466	3				0.9467	1.0000
10	0.9567	1 0214	1 3632	1.3233	1.3967	2.721	3	-0.736	2.420	0.1456	0.9467	1.0000
*50	0.4100	0 4377	0.6933	0 6119	0 8455	19.027	3	10.400	2.420	0.1456	0.4100	0.4331
*100	0 0067	0.0071	0 0835	0.0500	0.1002	34 693	3	20.540	2.420	0.1456	0.0067	0.0070

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.89053	0.805	1.08598	2.23521
Bartlett's Test indicates equal variances (p = 0.17)	5.01348	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.08771	0.09352	1 09446	0 00543	7 1E-08	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	13.528	0.400	12.583	14 828	0.3442
IC10	17.056	0.795	15.166	19.656	0 3733
IC15	20.584	1.190	17.749	24.484	0.3808
IC20	24.112	1.586	20 332	29.312	0.3842
IC25	27.640	1 981	22 916	34 140	0 3861
IC40	38.224	3.168	30 665	48 625	0.3888
IC50	45 280	3.992	35.831	58.813	0.3225



ToxCalc v5.0

Reviewed by:_____

Urchin Larval Development-48 Hour D vel pment

Start Date:	Test ID OFF-19	Sample ID.	
End Date:	Lab ID	Sample Type:	
Sample Date·	Protocol: DLA 91-Modified Dinnel	Test Species:	AP-Arbacia punctulata
Comments:			

Conc-%	1	2	3	4
0	0.8800	0.8800	0 8300	0 9400
10	0 8400	0.8900	0 8900	
50	0.9200	0.8800	0 9100	
100	0 1500	0.1700	0 1400	

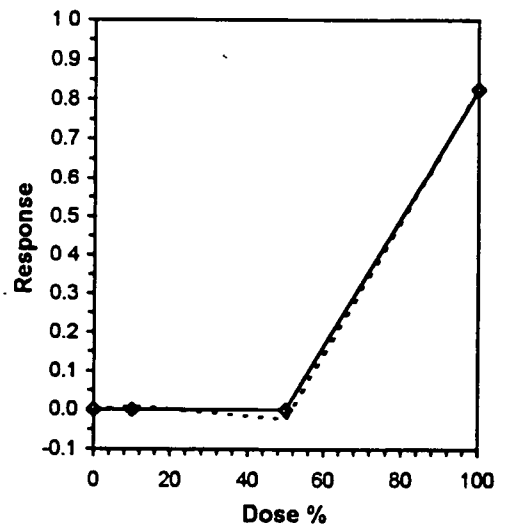
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8825	1.0000	1 2258	1.1458	1 3233	5.970	4				0.8864	1.0000
10	0.8733	0.9896	1.2082	1.1593	1.2327	3.510	3	0.455	2.510	0.0968	0.8864	1.0000
50	0.9033	1 0236	1.2557	1.2171	1.2840	2.761	3	-0.776	2.510	0.0968	0.8864	1.0000
*100	0.1533	0.1737	0.4021	0 3835	0 4250	5.245	3	21.356	2.510	0.0968	0.1533	0.1730

Auxiliary Tests	Statistic	Critical	Sk w	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.95325	0.814	0.35007	1.39211
Bartlett's Test indicates equal variances (p = 0.41)	2.91368	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	50	100	70.7107	2	0.06843	0.07727	0.52784	0.00255	1.3E-08	3, 9

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	53.023	0.614	48.687	53.112	-1 4349
IC10	56.046	0.583	52.013	56 224	-1.3814
IC15	59.069	0.554	55 340	59.336	-1 3092
IC20	62.092	0.527	58 548	62.447	-1 2155
IC25	65.115	0.502	61 730	65 559	-1 0981
IC40	74.183	0.446	71.721	74 895	-0 6194
IC50	80 229	0.428	77 987	81 119	-0.2724



ToxCalc v5 0

Reviewed by _____

Urchin Larval Development-48 Hour Development

Start Date:		Test ID	OFF-20	Sample ID.	
End Date:		Lab ID.		Sample Type:	
Sample Date:		Protocol	DLA 91-Modified Dinnel	Test Species	AP-Arbacia punctulata
Comments					

Conc-%	1	2	3
0	0.9500	0.9100	0 9500
10	0 9500	0 9400	0 9600
50	0 0100	0 0000	0 0000
100	0.0000	0.0000	0 0000

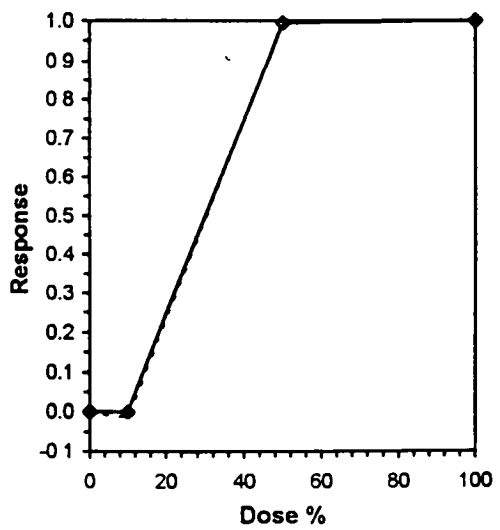
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9367	1.0000	1.3189	1.2661	1.3453	3.466	3				0.9433	1 0000
10	0.9500	1.0142	1 3460	1 3233	1.3694	1.713	3	-1 130	2.420	0 0581	0.9433	1.0000
*50	0 0033	0.0036	0 0667	0 0500	0.1002	43.383	3	52.143	2.420	0.0581	0.0033	0 0035
*100	0 0000	0.0000	0.0500	0.0500	0 0500	0.000	3	52.840	2.420	0 0581	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.92659	0.805	-0.5609	0.2294
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Pr b	df
Dunnett's Test	10	50	22.3607	10	0 03095	0.033	1 62377	0.00086	1 0E-11	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	12.007	0.074	11.441	12.022	-2.9220
IC10	14.014	0.070	13.478	14.045	-2 8227
IC15	16.021	0.068	15.515	16.067	-2.6660
IC20	18.028	0.065	17 552	18.089	-2.4496
IC25	20.035	0 064	19 589	20.112	-2.1795
IC40	26.057	0.063	25.699	26.178	-1 2397
IC50	30.071	0.066	29 773	30 223	-0.7321



ToxCalc v5 0

Reviewed by:_____

-48 Hour Development

Start Date:		Test ID:	OFF-21	Sample ID.	
End Date:		Lab ID:		Sample Type:	
Sample Date:		Protocol		Test Species:	
Comments:					

Conc-%	1	2	3
0	0.9500	0 9100	0.9500
10	0 9700	0.9700	0 9900
50	0.8600	0.7000	0 6300
100	0 9700	0.8500	0.9400

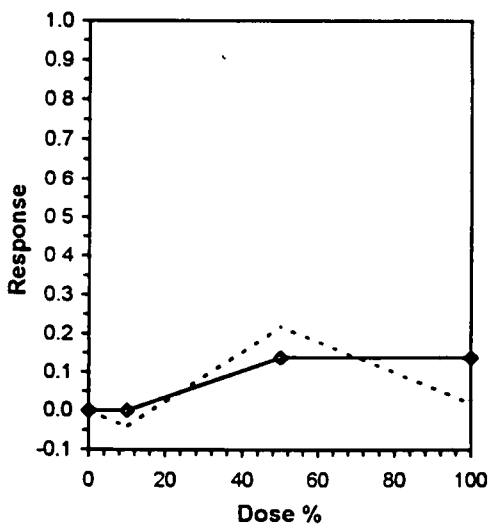
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9367	1.0000	1.3189	1 2661	1.3453	3 466	3				0.9567	1.0000
10	0 9767	1.0427	1.4214	1 3967	1.4706	3.002	3	-1.315	2.420	0 1885	0.9567	1 0000
*50	0.7300	0.7794	1.0318	0.9169	1.1873	13.540	3	3.685	2.420	0.1885	0.8250	0.8624
100	0.9200	0 9822	1 2977	1.1731	1 3967	8.784	3	0 272	2 420	0.1885	0.8250	0 8624

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96626	0.805	0.24477	-0.0273
Bartlett's Test indicates equal variances (p = 0.35)	3 24928	11.3449		

Hypoth sis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.11964	0.12757	0.08278	0 00911	0.00589	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	24.532	3.578	15.482	45 322	0 8404
IC10	39.063				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



ToxCalc v5 0

Reviewed by _____

Urchin Larval Development-48 Hour Development

Start Date:		Test ID.	OFF-22	Sample ID.	
End Date:		Lab ID		Sample Type:	.
Sample Date:		Protocol.	DLA 91-Modified Dinnel	Test Species:	AP-Arbacia punctulata
Comments:					

Conc-%	1	2	3
0	0.9100	0 8400	0.8800
10	0.7900	0 8400	0 8900
50	0.9000	0.8600	0 9000
100	0 0700	0.1500	0 0800

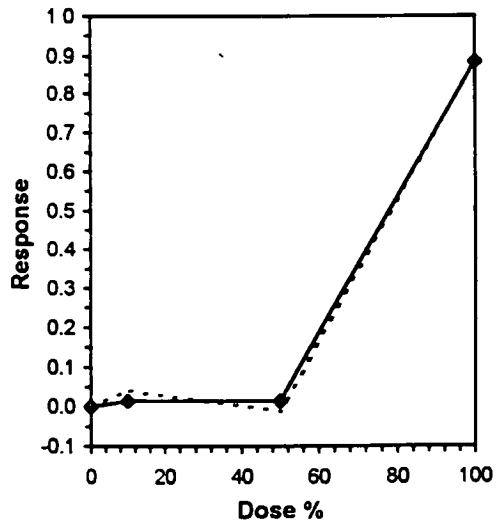
			Transform: Arcsin Square Root						1-Tailed		Is t nic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	M an	N-M an
0	0.8767	1.0000	1 2141	1 1593	1.2661	4.404	3				0.8767	1.0000
10	0 8400	0.9582	1 1623	1.0948	1.2327	5.940	3	1.081	2.420	0 1161	0.8633	0.9848
50	0 8867	1.0114	1 2285	1.1873	1.2490	2.902	3	-0.298	2.420	0.1161	0.8633	0.9848
*100	0.1000	0.1141	0 3174	0.2678	0 3977	22.111	3	18.684	2.420	0.1161	0 1000	0 1141

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.93926	0.805	0.28736	-1.2006
Bartlett's Test indicates equal variances (p = 0.84)	0.84996	11.3449		

Hyp thesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.08547	0.09734	0.58881	0.00346	1.4E-07	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	51.998	10.565	0.000	53.937	-3.6519
IC10	54.869	0.933	49.990	56.913	-0 8986
IC15	57.740	0.883	53.118	59.889	-0.8929
IC20	60.611	0.838	56.246	62.865	-0.8593
IC25	63 483	0.801	59.374	65 841	-0.7912
IC40	72.096	0 744	68.758	74 769	-0.3857
IC50	77 838	0.757	75 014	80.722	-0 0768



ToxCalc v5 0

Reviewed by:_____

Urchin Larval Development-48 Hour Devel pment

Start Date:	Test ID OFF-23	Sample ID:	
End Date	Lab ID	Sample Type:	
Sample Date:	Protocol· DLA 91-Modified Dinnel	Test Species:	AP-Arbacia punctulata
Comments:			

Conc-%	1	2	3
0	0.9500	0.9100	0.9500
10	0.9800	0.9700	0.9400
50	0.0600	0 2100	0.1200
100	0.0000	0.0000	0.0000

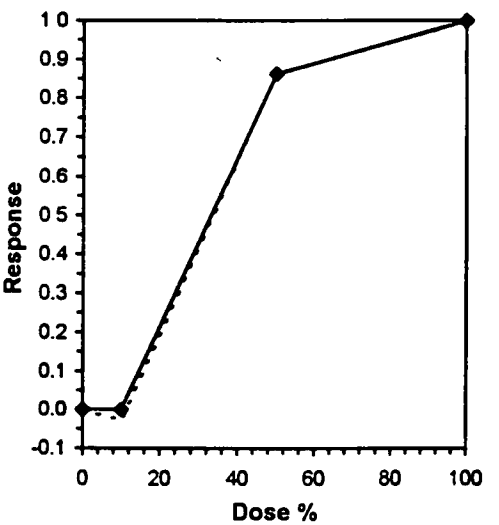
			Transform: Arcsin Square Root						1-Tailed		Is t nic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9367	1.0000	1.3189	1.2661	1.3453	3.466	3				0.9500	1.0000
10	0.9633	1.0285	1 3830	1.3233	1.4289	3.912	3	-1.167	2.420	0.1329	0.9500	1.0000
*50	0.1300	0.1388	0.3591	0.2475	0.4760	31.853	3	17.475	2.420	0.1329	0.1300	0.1368
*100	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	3	23.102	2.420	0.1329	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.94674	0.805	-0.0081	1.32357
Equality of variance cannot be confirmed				

Hyp thesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.07879	0.08401	1.36401	0.00452	1.4E-08	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	12.317	0.105	12.030	12.633	-0.9459
IC10	14 634	0.186	14.060	15.266	0.1872
IC15	16.951	0.273	16.089	17 899	0.3543
IC20	19.268	0.360	18.127	20.532	0.3964
IC25	21.585	0.448	20.169	23.165	0.4101
IC40	28.537	0.714	26 270	31.065	0 4171
IC50	33.171	0.891	30.337	36.331	0 4164



 ToxCalc v5.0 Reviewed by:_____

Appendix I

ToxCalc output for monthly sodium dodecyl sulfate (SDS) reference toxicant tests with the sea urchin. The linear interpolation method of regression analysis, available on ToxCalc (version 4.0.8) from TidePool Scientific Software, was used to calculate the SDS IC values (i.e., the inhibition concentration derived from the point estimation) The IC05 - IC50 is shown as mg/L SDS. The SD (standard deviation) and 95% confidence limits (CLs) are shown for each IC value. The "Skew" is the skewness of the bootstrap distribution.

Sperm Cell Fertilization Test-Proportion Fertilized

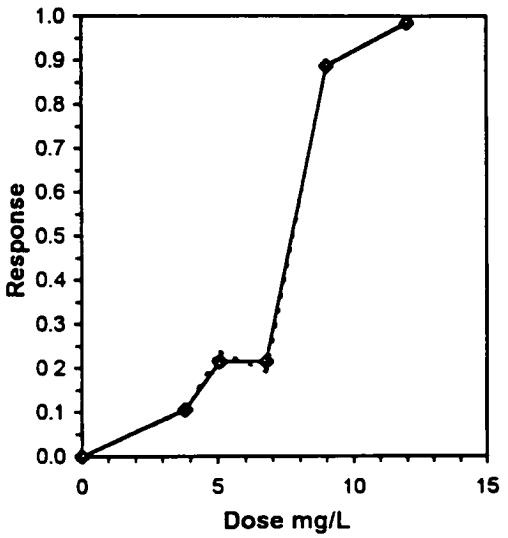
Start Date:	Test ID. 980411	Sample ID.
End Date:	Lab ID.	Sample Type:
Sample Date.	Protocol: DL 87-Dinnel/Link	Test Species.
Comments:		

Conc-mg/L	1	2
0	0.6200	0.8000
3.8	0.6000	0.6700
5 06	0.5500	0.5300
6.75	0.5700	0.5800
9	0.0600	0.1000
12	0.0100	0.0100

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	1.7987	1.3600	0.0000	12.0651	0.2051
IC10*	3.5973	1.2823	0.0000	16 2440	0.1426
IC15	4.3121	1.5035	0.0000	14.6576	0 4026
IC20	4.8893	1.2384	0.0000	13.4845	0.4194
IC25	6.8678	1.1396	0.0000	8.1111	-1.2593
IC40	7.3696	0.1743	6.2538	8.3324	-0.1748
IC50	7.7042	0.1463	6.7048	8.5052	-0.2272

* indicates IC estimate less than the lowest concentration



ToxCalc v5 0

Reviewed by:_____

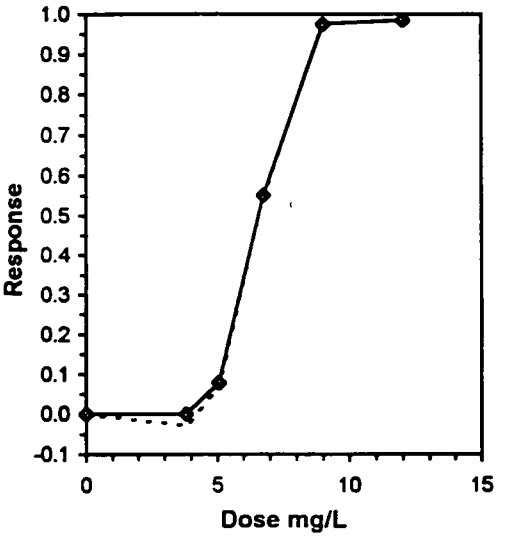
Sperm Cell Fertilization Test-Proportion Fertilized

Start Date:		Test ID	980502	Sample ID.	
End Date:		Lab ID:		Sample Type.	
Sample Date:		Protocol:	DL 87-Dinnel/Link	Test Species:	
Comments:					

Conc-mg/L	1	2	3
0	0 9400	0.9700	0.9500
3.8	0.9800	0.9700	0.9900
5.06	0.8500	0.9400	0.8800
6.75	0.4100	0.4700	0.4200
9	0.0100	0.0500	0.0100
12	0.0200	0.0100	0.0100

Linear Interpolation (80 Resamples)

P int	mg/L	SD	95% CL(Exp)		Skew
IC05	4.5943	0.2391	4.0507	5.6433	0.7060
IC10	5.1340	0.0998	4.5815	5.3962	-1.0240
IC15	5.3129	0.0680	5.0493	5.5622	-0.0148
IC20	5.4918	0.0609	5.2660	5.7000	-0.0503
IC25	5.6706	0.0545	5.4675	5.8656	-0.0796
IC40	6.2072	0.0440	6.0672	6.4073	0.0756
IC50	6.5650	0.0470	6 4144	6.7487	0.3167



Appendix J

Sea urchin responses to performance control water (i.e., filtered natural seawater) for 32 test series performed at the ETC. "Mean Fertilization" refers to the percentage of fertilized eggs observed at the end of the sperm cell test. Fertilization was measured in 2 or 3 replicate chambers and is presented as a percentage.

APPENDIX J
PERFORMANCE CONTROL FERTILIZATION
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING CENTER, NETC
NEWPORT, RHODE ISLAND

Test No.	Mean Fertilization (%)
1	97
2	100
3	95
4	96
5	96
6	99
7	99
8	99
9	91
10	99
11	98
12	88
13	99
14	97
15	97
16	90
17	100
18	98
19	98
20	98
21	97
22	98
23	97
24	98
25	84
26	95
27	97
28	98
29	99
30	99
31	71
32	96

Appendix K

Sea urchin, *Arbacia punctulata*, pore water test results of Old Fire Fighting Training Center sediment samples. "ETC Sample ID" is the identification number assigned to the sample in the laboratory. "Sample ID" are station numbers assigned by field personnel except in the case of NSW, filtered natural seawater collected from lower Narragansett Bay, RI. "ETC Exp. No." is the identification number assigned to the test series. "Conc." is the concentration of the pore water. Dilutions were created by mixing the pore water with natural seawater. "Rep No." refers to the replicate number assigned to each test chamber. The "SD" refers standard deviation of the mean number of normal larvae. The "Mean No. of Normal Larvae as % of LIS" is the ratio of the actual mean number normal to the mean number of normal in the corresponding LIS pore water treatment. The "p value" refers to the probability that the observed differences in development between test pore water and LIS pore water occurred strictly by chance and was obtained using Excel's t-Test. Low values infer highly significant differences. Development in the test pore water was considered statistically different from the LIS pore water when $p \leq 0.05$. Test sediment pore water concentrations in which development was lower and statistically different from LIS sediment pore water concentrations were flagged.

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980408	0	1	78	81	3.0	100		22	
NSW	NSW	980408	0	2	81					19	
NSW	NSW	980408	0	3	84					16	
LIS	LIS	980408	10	1	76	81	4.6	100		24	
LIS	LIS	980408	10	2	84					16	
LIS	LIS	980408	10	3	84					16	
LIS	LIS	980408	50	1	74	79	5.0	100		26	
LIS	LIS	980408	50	2	80					20	
LIS	LIS	980408	50	3	84					16	
LIS	LIS	980408	100	1	11	8	3.0	100		89	
LIS	LIS	980408	100	2	5					95	
LIS	LIS	980408	100	3	8					92	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4 9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-1	OF-SS1	980404	10	1	89	84	10.1	103		11	
OF-1	OF-SS1	980404	10	2	90					10	
OF-1	OF-SS1	980404	10	3	72					28	
OF-1	OF-SS1	980404	50	1	5	7	3.8	8	0.00	95	**
OF-1	OF-SS1	980404	50	2	11					89	
OF-1	OF-SS1	980404	50	3	4					96	
OF-1	OF-SS1	980404	100	1	0	0	0.0	0	0.02	100	**
OF-1	OF-SS1	980404	100	2	0					100	
OF-1	OF-SS1	980404	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No [1]	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value[4]	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-2	OF-SS2	980404	10	1	86	88	3.8	108		14	
OF-2	OF-SS2	980404	10	2	92					8	
OF-2	OF-SS2	980404	10	3	85					15	
OF-2	OF-SS2	980404	50	1	11	13	2.5	17	0.00	89	**
OF-2	OF-SS2	980404	50	2	16					84	
OF-2	OF-SS2	980404	50	3	13					87	
OF-2	OF-SS2	980404	100	1	0	0	0.0	0	0.02	100	**
OF-2	OF-SS2	980404	100	2	0					100	
OF-2	OF-SS2	980404	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980302	0	1	85	89	7.2	109		15	
NSW	NSW	980302	0	2	89					11	
NSW	NSW	980302	0	3	76					24	
NSW	NSW	980302	0	4	95					5	
NSW	NSW	980302	0	5	91					9	
NSW	NSW	980302	0	6	95					5	
OF-3	OF-SS3	980302	10	1	81	88	6.6	108		19	
OF-3	OF-SS3	980302	10	2	89					11	
OF-3	OF-SS3	980302	10	3	94					16	
OF-3	OF-SS3	980302	50	1	75	73	2.1	92	0.07	25	
OF-3	OF-SS3	980302	50	2	71					29	
OF-3	OF-SS3	980302	50	3	72					28	
OF-3	OF-SS3	980302	100	1	3	4	1.7	50	0.07	97	
OF-3	OF-SS3	980302	100	2	6					94	
OF-3	OF-SS3	980302	100	3	3					97	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No [1]	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD[2]	Mean No. of Normal Larvae as % of LIS[3]	p value[4]	No. of Abnormal Larvae	Comment
NSW	NSW	980302	0	1	85	89	7.2	109		15	
NSW	NSW	980302	0	2	89					11	
NSW	NSW	980302	0	3	76					24	
NSW	NSW	980302	0	4	95					5	
NSW	NSW	980302	0	5	91					9	
NSW	NSW	980302	0	6	95					5	
OF-4	OF-SS4	980302	10	1	90	90	1.0	111		10	
OF-4	OF-SS4	980302	10	2	91					9	
OF-4	OF-SS4	980302	10	3	89					11	
OF-4	OF-SS4	980302	50	1	86	83	3.1	104		14	
OF-4	OF-SS4	980302	50	2	80					20	
OF-4	OF-SS4	980302	50	3	82					18	
OF-4	OF-SS4	980302	100	1	81	85	4.7	1058		19	
OF-4	OF-SS4	980302	100	2	90					10	
OF-4	OF-SS4	980302	100	3	83					17	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980302	0	1	85	89	7.2	109		15	
NSW	NSW	980302	0	2	89					11	
NSW	NSW	980302	0	3	76					24	
NSW	NSW	980302	0	4	95					5	
NSW	NSW	980302	0	5	91					9	
NSW	NSW	980302	0	6	95					5	
OF-5	OF-SS5	980302	10	1	48	19	25.1	24	0.02	52	**
OF-5	OF-SS5	980302	10	2	9					91	
OF-5	OF-SS5	980302	10	3	1					99	
OF-5	OF-SS5	980302	50	1	2	1	1.2	1	0.00	98	**
OF-5	OF-SS5	980302	50	2	0					100	
OF-5	OF-SS5	980302	50	3	0					100	
OF-5	OF-SS5	980302	100	1	0	0	0.0	0	0.02	100	**
OF-5	OF-SS5	980302	100	2	0					100	
OF-5	OF-SS5	980302	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980302	0	1	85	89	7.2	109		15	
NSW	NSW	980302	0	2	89					11	
NSW	NSW	980302	0	3	76					24	
NSW	NSW	980302	0	4	95					5	
NSW	NSW	980302	0	5	91					9	
NSW	NSW	980302	0	6	95					5	
OF-6	OF-SS6	980302	10	1	84	85	1.2	105		16	
OF-6	OF-SS6	980302	10	2	86					14	
OF-6	OF-SS6	980302	10	3	86					14	
OF-6	OF-SS6	980302	50	1	80	79	3.2	99	0.43	20	
OF-6	OF-SS6	980302	50	2	81					19	
OF-6	OF-SS6	980302	50	3	75					25	
OF-6	OF-SS6	980302	100	1	6	6	1.5	79	0.23	94	
OF-6	OF-SS6	980302	100	2	8					92	
OF-6	OF-SS6	980302	100	3	5					95	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980302	0	1	85	89	7.2	109		15	
NSW	NSW	980302	0	2	89					11	
NSW	NSW	980302	0	3	76					24	
NSW	NSW	980302	0	4	95					5	
NSW	NSW	980302	0	5	91					9	
NSW	NSW	980302	0	6	95					5	
OF-7	OF-SS7	980302	10	1	88	88	2.0	108		12	
OF-7	OF-SS7	980302	10	2	86					14	
OF-7	OF-SS7	980302	10	3	90					10	
OF-7	OF-SS7	980302	50	1	86	81	4.7	102		14	
OF-7	OF-SS7	980302	50	2	77					23	
OF-7	OF-SS7	980302	50	3	79					21	
OF-7	OF-SS7	980302	100	1	2	1	1.2	8	0.02	98	**
OF-7	OF-SS7	980302	100	2	0					100	
OF-7	OF-SS7	980302	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980408	0	1	78	81	3 0	100		22	
NSW	NSW	980408	0	2	81					19	
NSW	NSW	980408	0	3	84					16	
OF-8	OFF-8-SUR B	980408	10	1	85	80	4.2	99	0.40	15	
OF-8	OFF-8-SUR B	980408	10	2	79					21	
OF-8	OFF-8-SUR B	980408	10	3	77					23	
OF-8	OFF-8-SUR B	980408	50	1	82	71	9.5	90	0.14	18	
OF-8	OFF-8-SUR B	980408	50	2	64					36	
OF-8	OFF-8-SUR B	980408	50	3	68					32	
OF-8	OFF-8-SUR B	980408	100	1	0	0	0 0	0	0.02	100	**
OF-8	OFF-8-SUR B	980408	100	2	0					100	
OF-8	OFF-8-SUR B	980408	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980408	0	1	78	81	3.0	100		22	
NSW	NSW	980408	0	2	81					19	
NSW	NSW	980408	0	3	84					16	
OF-9	OFF-9-SUR B	980408	10	1	83	74	11.0	91	0.20	17	
OF-9	OFF-9-SUR B	980408	10	2	62					38	
OF-9	OFF-9-SUR B	980408	10	3	78					22	
OF-9	OFF-9-SUR B	980408	50	1	0	0	0.0	0	0.00	100	**
OF-9	OFF-9-SUR B	980408	50	2	0					100	
OF-9	OFF-9-SUR B	980408	50	3	0					100	
OF-9	OFF-9-SUR B	980408	100	1	9	3	4.9	42	0.12	91	
OF-9	OFF-9-SUR B	980408	100	2	1					99	
OF-9	OFF-9-SUR B	980408	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-10	OFF-10-SUR B	980404	10	1	93	91	1.5	112		7	
OF-10	OFF-10-SUR B	980404	10	2	91					9	
OF-10	OFF-10-SUR B	980404	10	3	90					10	
OF-10	OFF-10-SUR B	980404	50	1	71	74	3.6	93	0.11	29	
OF-10	OFF-10-SUR B	980404	50	2	78					22	
OF-10	OFF-10-SUR B	980404	50	3	73					27	
OF-10	OFF-10-SUR B	980404	100	1	0	0	0.0	0	0.02	100	**
OF-10	OFF-10-SUR B	980404	100	2	0					100	
OF-10	OFF-10-SUR B	980404	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-11	OFF-11-SUR B	980404	10	1	91	94	2 5	115		9	
OF-11	OFF-11-SUR B	980404	10	2	94					6	
OF-11	OFF-11-SUR B	980404	10	3	96					4	
OF-11	OFF-11-SUR B	980404	50	1	98	95	3.1	119		2	
OF-11	OFF-11-SUR B	980404	50	2	92					8	
OF-11	OFF-11-SUR B	980404	50	3	94					6	
OF-11	OFF-11-SUR B	980404	100	1	23	9	12.2	113		77	
OF-11	OFF-11-SUR B	980404	100	2	3					97	
OF-11	OFF-11-SUR B	980404	100	3	1					99	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
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NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-12	OFF-12-SUR B	980404	10	1	93	93	1.5	114		7	
OF-12	OFF-12-SUR B	980404	10	2	94					6	
OF-12	OFF-12-SUR B	980404	10	3	91					9	
OF-12	OFF-12-SUR B	980404	50	1	0	1	0.6	1	0.00	100	**
OF-12	OFF-12-SUR B	980404	50	2	1					99	
OF-12	OFF-12-SUR B	980404	50	3	1					99	
OF-12	OFF-12-SUR B	980404	100	1	0	0	0.0	0	0.02	100	**
OF-12	OFF-12-SUR B	980404	100	2	0					100	
OF-12	OFF-12-SUR B	980404	100	3	0					100	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-13	OFF-13-SUR B	980404	10	1	94	93	2.3	114		6	
OF-13	OFF-13-SUR B	980404	10	2	94					6	
OF-13	OFF-13-SUR B	980404	10	3	90					10	
OF-13	OFF-13-SUR B	980404	50	1	0	0	0.0	0	0.00	100	**
OF-13	OFF-13-SUR B	980404	50	2	0					100	
OF-13	OFF-13-SUR B	980404	50	3	0					100	
OF-13	OFF-13-SUR B	980404	100	1	0	0	0.0	0	0.02	100	**
OF-13	OFF-13-SUR B	980404	100	2	0					100	
OF-13	OFF-13-SUR B	980404	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980408	0	1	78	81	3.0	100		22	
NSW	NSW	980408	0	2	81					19	
NSW	NSW	980408	0	3	84					16	
OF-14	OFF-14-SUR B	980408	10	1	79	79	4.0	97	0.27	21	
OF-14	OFF-14-SUR B	980408	10	2	75					25	
OF-14	OFF-14-SUR B	980408	10	3	83					16	
OF-14	OFF-14-SUR B	980408	50	1	79	81	4.4	102		21	
OF-14	OFF-14-SUR B	980408	50	2	78					22	
OF-14	OFF-14-SUR B	980408	50	3	86					14	
OF-14	OFF-14-SUR B	980408	100	1	60	54	6.7	679		40	
OF-14	OFF-14-SUR B	980408	100	2	56					44	
OF-14	OFF-14-SUR B	980408	100	3	47					53	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980408	0	1	78	81	3.0	100		22	
NSW	NSW	980408	0	2	81					19	
NSW	NSW	980408	0	3	84					16	
OF-15	OFF-15-SUR B	980408	10	1	87	87	2.0	107		13	
OF-15	OFF-15-SUR B	980408	10	2	89					11	
OF-15	OFF-15-SUR B	980408	10	3	85					15	
OF-15	OFF-15-SUR B	980408	50	1	39	41	2.1	51	0.00	61	**
OF-15	OFF-15-SUR B	980408	50	2	40					60	
OF-15	OFF-15-SUR B	980408	50	3	43					57	
OF-15	OFF-15-SUR B	980408	100	1	0	0	0.6	4	0.02	100	**
OF-15	OFF-15-SUR B	980408	100	2	1					99	
OF-15	OFF-15-SUR B	980408	100	3	0					100	

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SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
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NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-16	OFF-16-SUR B	980404	10	1	90	90	0.6	110		10	
OF-16	OFF-16-SUR B	980404	10	2	90					10	
OF-16	OFF-16-SUR B	980404	10	3	89					11	
OF-16	OFF-16-SUR B	980404	50	1	95	93	1.7	117		5	
OF-16	OFF-16-SUR B	980404	50	2	92					8	
OF-16	OFF-16-SUR B	980404	50	3	92					8	
OF-16	OFF-16-SUR B	980404	100	1	0	0	0.0	0	0.02	100	**
OF-16	OFF-16-SUR B	980404	100	2	0					100	
OF-16	OFF-16-SUR B	980404	100	3	0					100	

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SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-17	OFF-17-SUR B	980404	10	1	96	94	1.5	116		4	
OF-17	OFF-17-SUR B	980404	10	2	93					7	
OF-17	OFF-17-SUR B	980404	10	3	94					6	
OF-17	OFF-17-SUR B	980404	50	1	94	94	1.0	118 .		6	
OF-17	OFF-17-SUR B	980404	50	2	95					5	
OF-17	OFF-17-SUR B	980404	50	3	93					7	
OF-17	OFF-17-SUR B	980404	100	1	23	17	6.7	217		77	
OF-17	OFF-17-SUR B	980404	100	2	10					90	
OF-17	OFF-17-SUR B	980404	100	3	19					81	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-18	OFF-18-SUR B	980404	10	1	94	94	2.5	116		6	
OF-18	OFF-18-SUR B	980404	10	2	97					3	
OF-18	OFF-18-SUR B	980404	10	3	92					8	
OF-18	OFF-18-SUR B	980404	50	1	0	0	0.0	0	0.00	100	**
OF-18	OFF-18-SUR B	980404	50	2	0					100	
OF-18	OFF-18-SUR B	980404	50	3	0					100	
OF-18	OFF-18-SUR B	980404	100	1	0	1	1.2	8	0.02	100	**
OF-18	OFF-18-SUR B	980404	100	2	2					98	
OF-18	OFF-18-SUR B	980404	100	3	0					100	

APPENDIX K
SEA URCHIN DEVELOPMENT PORE WATER TEST RESULTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OLD FIRE FIGHTING TRAINING AREA, NETC
NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980408	0	1	78	81	3.0	100		22	
NSW	NSW	980408	0	2	81					19	
NSW	NSW	980408	0	3	84					16	
OF-19	OFF-19-SUR B	980408	10	1	83	85	2.6	105		17	
OF-19	OFF-19-SUR B	980408	10	2	84					16	
OF-19	OFF-19-SUR B	980408	10	3	88					12	
OF-19	OFF-19-SUR B	980408	50	1	35	33	6.8	41	0.00	65	**
OF-19	OFF-19-SUR B	980408	50	2	25					75	
OF-19	OFF-19-SUR B	980408	50	3	38					62	
OF-19	OFF-19-SUR B	980408	100	1	0	0	0.6	4	0.02	100	**
OF-19	OFF-19-SUR B	980408	100	2	1					99	
OF-19	OFF-19-SUR B	980408	100	3	0					100	

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DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
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NEWPORT, RHODE ISLAND

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-20	OFF-20-SUR B	980404	10	1	91	93	3.5	114		9	
OF-20	OFF-20-SUR B	980404	10	2	97					3	
OF-20	OFF-20-SUR B	980404	10	3	91					9	
OF-20	OFF-20-SUR B	980404	50	1	89	89	6.0	112		11	
OF-20	OFF-20-SUR B	980404	50	2	83					17	
OF-20	OFF-20-SUR B	980404	50	3	95					5	
OF-20	OFF-20-SUR B	980404	100	1	0	2	3.5	25	0.04	100	**
OF-20	OFF-20-SUR B	980404	100	2	0					100	
OF-20	OFF-20-SUR B	980404	100	3	6					94	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-21	OFF-21-SUR B	980404	10	1	91	91	3.5	112		9	
OF-21	OFF-21-SUR B	980404	10	2	95					5	
OF-21	OFF-21-SUR B	980404	10	3	88					11	
OF-21	OFF-21-SUR B	980404	50	1	89	88	1.5	111		11	
OF-21	OFF-21-SUR B	980404	50	2	88					12	
OF-21	OFF-21-SUR B	980404	50	3	86					14	
OF-21	OFF-21-SUR B	980404	100	1	8	7	2.1	92	0.38	92	
OF-21	OFF-21-SUR B	980404	100	2	9					91	
OF-21	OFF-21-SUR B	980404	100	3	5					95	

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SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980302	0	1	85	89	7.2			15	
NSW	NSW	980302	0	2	89					11	
NSW	NSW	980302	0	3	76					24	
NSW	NSW	980302	0	4	95					5	
NSW	NSW	980302	0	5	91					9	
NSW	NSW	980302	0	6	95					5	
OF-22	OF-SS22	980302	10	1	89	91	2.6	112		11	
OF-22	OF-SS22	980302	10	2	94					6	
OF-22	OF-SS22	980302	10	3	90					10	
OF-22	OF-SS22	980302	50	1	91	82	7.8	104		9	
OF-22	OF-SS22	980302	50	2	80					20	
OF-22	OF-SS22	980302	50	3	76					24	
OF-22	OF-SS22	980302	100	1	2	2	1 5	21	0.02	98	**
OF-22	OF-SS22	980302	100	2	0					100	
OF-22	OF-SS22	980302	100	3	3					97	

SAIC ETC ID	Sample ID	ETC Exp. No.(1)	Conc. (%)	Rep No.	No. of Normal Larvae	Mean No. of Normal Larvae	SD(2)	Mean No. of Normal Larvae as % of LIS(3)	p value(4)	No. of Abnormal Larvae	Comment
NSW	NSW	980404	0	1	87	90	4.9	112		13	
NSW	NSW	980404	0	2	88					12	
NSW	NSW	980404	0	3	96					4	
OF-23	OFF-23-SUR B	980404	10	1	88	89	1.5	110		12	
OF-23	OFF-23-SUR B	980404	10	2	89					11	
OF-23	OFF-23-SUR B	980404	10	3	91					9	
OF-23	OFF-23-SUR B	980404	50	1	1	0	0.6	0	0.00	99	**
OF-23	OFF-23-SUR B	980404	50	2	0					100	
OF-23	OFF-23-SUR B	980404	50	3	0					100	
OF-23	OFF-23-SUR B	980404	100	1	0	0	0.0	0	0.02	100	**
OF-23	OFF-23-SUR B	980404	100	2	0					100	
OF-23	OFF-23-SUR B	980404	100	3	0					100	

FOOTNOTES

** = Mean sample response was statistically different and less than the mean LIS response.

(1) ETC Exp. No. = Test Series Identification Number

(2) SD = Standard Deviation

(3) LIS = Long Island Sound Negative Performance Control Sediment

(4) p value = Significance Level of t Test

Appendix L

ToxCalc output for pore water samples evaluated using the sea urchin test. The linear interpolation method of regression analysis, available on ToxCalc (version 4 0.8) from TidePool Scientific Software, was used to calculate the IC values (i e., the inhibition concentrations derived from the point estimation) The "Isotonic Mean" is the isotonized mean response. The "Isotonic N-Mean' is Abbott's corrected mean response. The "NOEC" is the no observed effect concentration or the highest concentration tested causing no statistically measurable effect to the test system. The "LOEC" is the lowest observed effect concentration or the lowest concentration tested causing a statistically measurable effect to the test system. The "ChV" is the chronic value derived from the geometric mean of the NOEC and LOEC. The ChV represents a presumably safe concentration. The IC05 - IC50 are shown as % pore water. The SD (standard deviation) and 95% CL (i e., confidence level) when calculated are shown for each IC value The "Skew" is the skewness of the bootstrap distribution

-48 Hour Development

Start Date.	Test ID LIS		Sample ID
End Date	Lab ID		Sample Type:
Sample Date	Protocol		Test Species
Comments·			

Conc-%	1	2	3
0	0 7800	0 8100	0 8400
10	0 8300	0 8400	0 8800
50	0.3500	0 2500	0 3800
100	0.0000	0 0100	0.0000

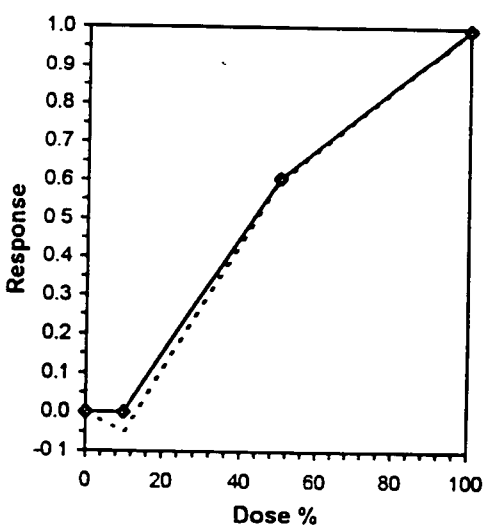
			Transform: Arcsin Square Root						1-Tailed		Isot nic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8100	1.0000	1 1205	1 0826	1 1593	3 422	3				0.8300	1 0000
10	0 8500	1 0494	1 1740	1 1458	1 2171	3.224	3	-1.367	2.420	0 0947	0.8300	1.0000
*50	0 3267	0.4033	0.6070	0.5236	0 6642	12.168	3	13.119	2.420	0.0947	0.3267	0.3936
*100	0 0033	0.0041	0.0667	0 0500	0 1002	43 383	3	26.918	2.420	0 0947	0.0033	0 0040

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.9467	0.805	-0.4602	-0.1252
Bartlett's Test indicates equal variances (p = 0 62)	1.76206	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.07936	0.0979	0.80418	0 0023	8.0E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	13.298	0.197	12.697	14.055	-0.0756
IC10	16.596	0.395	15 393	18.111	-0 0756
IC15	19.894	0.592	18 090	22.166	-0 0756
IC20	23 192	0 790	20.786	26.221	-0.0756
IC25	26.490	0.987	23 483	30.277	-0.0756
IC40	36.384	1 579	31 572	42.443	-0.0756
IC50	42.980	1 974	36 966	50 553	-0 0756



ToxCalc v5 0

Reviewed by·_____

-48 H ur Development

Start Date	Test ID	OFF-1	Sample ID.
End Date	Lab ID		Sample Type.
Sample Date	Protocol		Test Species:
Comments:			

Conc-%	1	2	3
0	0.8700	0 8800	0 9600
10	0 8900	0 9000	0 7200
50	0 0500	0 1100	0 0400
100	0 0000	0 0000	0 0000

			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 9033	1 0000	1 2628	1 2019	1 3694	7 337	3				0.9033	1 0000
10	0 8367	0 9262	1 1650	1 0132	1 2490	11.306	3	1 355	2.420	0 1747	0.8367	0 9262
*50	0 0667	0 0738	-0 2550	0 2014	0 3381	28 615	3	13.964	2 420	0.1747	0.0667	0.0738
*100	0.0000	0 0000	0 0500	0 0500	0 0500	0 000	3	16 803	2.420	0 1747	0.0000	0.0000

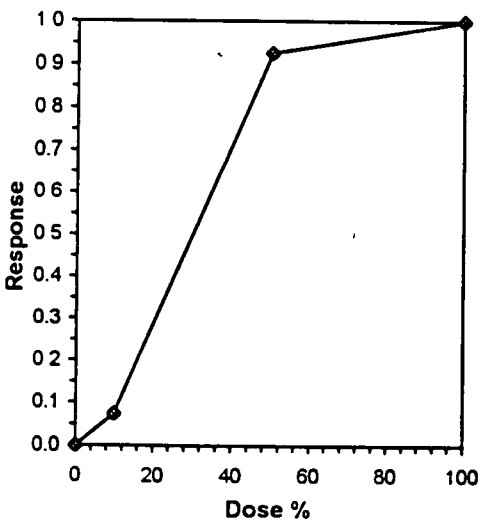
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.94056	0 805	-0.3331	-0.1009
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.12352	0.13602	1 15236	0 00781	2.4E-07	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	6.775	3 362	0.000	17 984	0 2848
IC10	11 229	2.800	0.100	17 638	-0 2913
IC15	13.576	2.447	3 746	19 696	-0.3895
IC20	15 922	2.306	6 836	21.661	-0 4420
IC25	18 268	2.161	9 639	23 647	-0 4606
IC40	25.307	1 696	18 057	29.960	-0 3726
IC50	30 000	1 404	23 668	34 169	-0 2700

* indicates IC estimate less than the lowest concentration



ToxCalc v5 0

Reviewed by:_____

-48 Hour Development

Start Date:	Test ID OFF-2		Sample ID
End Date	Lab ID		Sample Type.
Sample Date	Protocol		Test Species
Comments·			

Conc-%	1	2	3
0	0 8700	0 8800	0 9600
10	0 8600	0 9200	0.8500
50	0 1100	0 1600	0 1300
100	0 0000	0 0000	0 0000

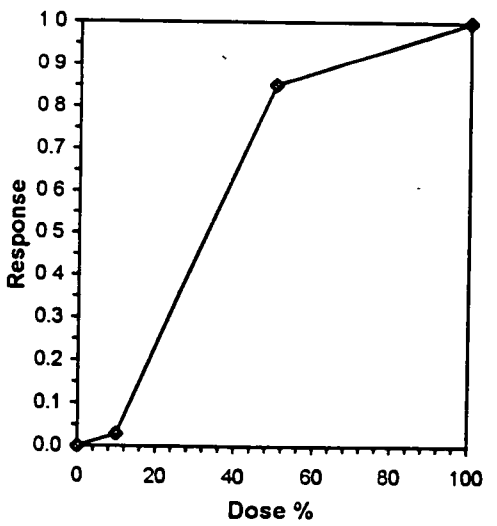
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1 0000	1 2628	1 2019	1 3694	7 337	3				0.9033	1.0000
10	0.8767	0.9705	1 2148	1 1731	1 2840	4.970	3	1 009	2.420	0.1152	0 8767	0.9705
*50	0.1333	0 1476	0 3728	0.3381	0 4115	9.894	3	18.701	2.420	0.1152	0.1333	0.1476
*100	0 0000	0 0000	0 0500	0 0500	0 0500	0.000	3	25.483	2.420	0.1152	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.90668	0.805	1.01724	0.55205
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.07673	0.0845	1.10879	0.0034	1.1E-08	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	10.996	2.276	0.000	13 922	-0 9760
IC10	13.426	1 405	7 559	16 266	-0 7444
IC15	15.857	1 310	10.214	18.610	-0.6728
IC20	18.287	1 235	12.852	20 953	-0.6667
IC25	20.717	1 162	15 490	23.297	-0 6566
IC40	28 009	0 954	23 406	30 328	-0 5859
IC50	32 870	0 829	28.683	35 016	-0 4806



ToxCalc v5 0

Reviewed by _____

-48 Hour Development

Start Date	Test ID	OFF-3	Sample ID
End Date:	Lab ID		Sample Type
Sample Date:	Protocol		Test Species:
Comments:			

Conc-%	1	2	3	4	5	6
0	0 8500	0 8900	0 7600	0 9500	0 9100	0 9500
10	0.8100	0 8900	0.9400			
50	0 7500	0 7100	0 7200			
100	0 0300	0 0600	0.0300			

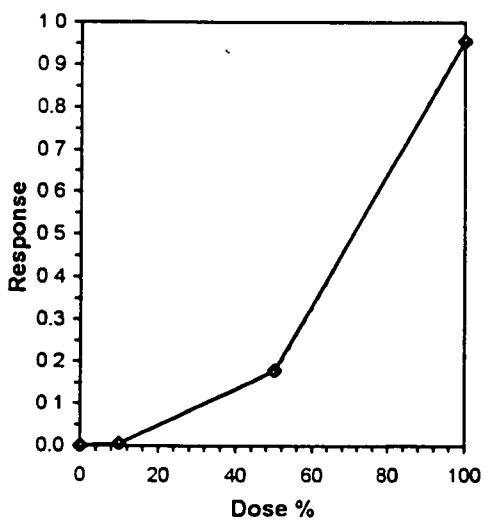
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 8850	1 0000	1.2369	1.0588	1 3453	8 867	6				0.8850	1 0000
10	0.8800	0.9944	1.2253	1 1198	1 3233	8 323	3	0.186	2.431	0 1517	0.8800	0 9944
*50	0.7267	0 8211	1.0208	1 0021	1.0472	2.301	3	3 463	2.431	0 1517	0.7267	0.8211
*100	0.0400	0 0452	0 1985	0.1741	0 2475	21.339	3	16.642	2.431	0 1517	0.0400	0 0452

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 94369	0 835	-0.597	0 70063
Bartlett's Test indicates equal variances (p = 0 20)	4 6435	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	10	50	22.3607	10	0.11043	0.12372	0.80442	0 00779	2.4E-08	3, 11

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	20.239	5.940	0 000	24.753	-0.5237
IC10	31.783	6.640	0.000	38.722	-1 0640
IC15	43.326	5.938	15 643	53.169	-0 8780
IC20	51.359	2.620	38.420	54 088	-1 3021
IC25	54 581	1 299	50.312	57 216	-0 0330
IC40	64 248	1 073	60 590	66 599	0 0389
IC50	70.692	0.931	67 441	72 777	0 1052



ToxCalc v5 0

Reviewed by _____

-48 H ur Devel pment

Start Date		Test ID	OFF-4	Sample ID	
End Date:		Lab ID.		Sample Type.	
Sample Date		Protocol:		Test Species:	
Comments:					

Conc-%	1	2	3	4	5	6
0	0.8500	0 8900	0 7600	0 9500	0.9100	0 9500
10	0.9000	0 9100	0 8900			
50	0 8600	0 8000	0 8200			
100	0 8100	0 9000	0 8300			

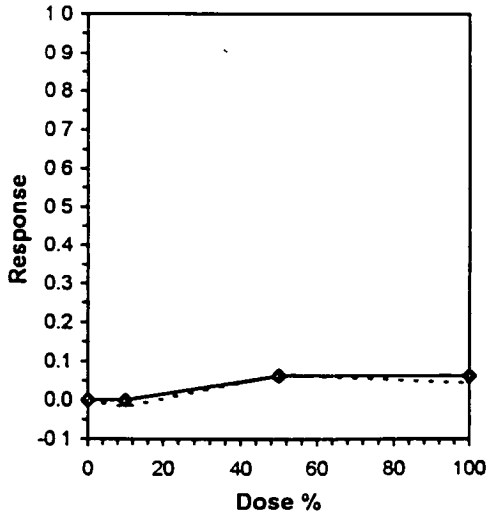
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8850	1 0000	1 2369	1 0588	1 3453	8.867	6				0.8925	1 0000
10	0.9000	1.0169	1 2493	1 2327	1 2661	1.336	3	-0.215	2.431	0.1404	0.8925	1 0000
50	0.8267	0.9341	1 1424	1 1071	1.1873	3.585	3	1 636	2 431	0 1404	0.8367	0.9374
100	0 8467	0.9567	1 1715	1 1198	1.2490	5.836	3	1 131	2.431	0.1404	0 8367	0.9374

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 93898	0.835	-0.6463	1 61967
Bartlett's Test indicates equal variances (p = 0 12)	5 83751	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	100	>100		1	0.10122	0.1134	0.00901	0.00667	0.30859	3, 11

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	41.970			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



ToxCalc v5 0

Reviewed by _____

48 Hour Development

Start Date:	Test ID	OFF-5	Sample ID
End Date	Lab ID		Sample Type:
Sample Date.	Protocol		Test Species:
Comments:			

Conc-%	1	2	3	4	5	6
0	0.8500	0 8900	0 7600	0 9500	0 9100	0.9500
10	0 4800	0 0900	0 0100			
50	0 0200	0 0000	0 0000			
100	0 0000	0 0000	0.0000			

			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
0	0.8850	1 0000	1 2369	1 0588	1 3453	8.867	6			0.8850	1.0000
*10	0.1933	0 2185	0 3901	0.1002	0.7654	87 349	3	6.00	6.00	0.1933	0 2185
*50	0 0067	0 0075	0.0806	0 0500	0 1419	65.775	3	6.00	6 00	0.0067	0.0075
*100	0.0000	0 0000	0 0500	0 0500	0 0500	0 000	3	6 00	6.00	0.0000	0 0000

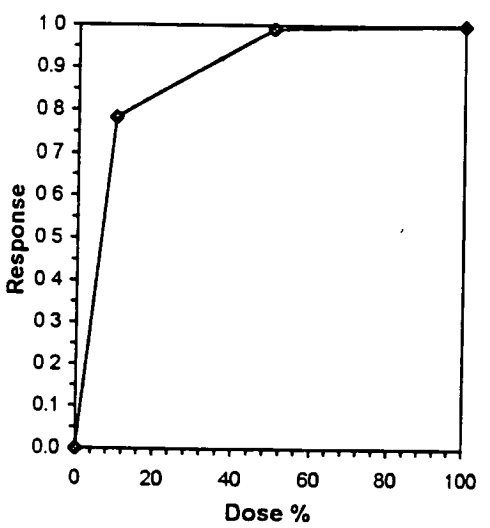
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 90781	0 835	0.65595	3.08929
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	<10	10		

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05*	0.6398	0.1397	0 4486	1.3609	1 5238
IC10*	1 2795	0.2795	0 8973	2 7218	1 5238
IC15*	1.9193	0.4192	1 3459	4 0827	1 5238
IC20*	2.5590	0 5590	1 7945	5 4436	1 5238
IC25*	3 1988	0 6987	2.2431	6 8045	1 5238
IC40*	5.1181	1 1179	3 5890	10.8872	1 5238
IC50*	6.3976	1 8044	4 4863	17 2043	2.3762

* indicates IC estimate less than the lowest concentration



ToxCalc v5 0

Reviewed by _____

-48 Hour Development

Start Date:	Test ID OFF-6	Sample ID	
End Date:	Lab ID	Sample Type.	
Sample Date.	Protocol	Test Species.	
Comments:			

Conc-%	1	2	3	4	5	6
0	0.8500	0 8900	0.7600	0 9500	0 9100	0 9500
10	0 8400	0 8600	0 8600			
50	0.8000	0 8100	0 7500			
100	0 0600	0 0800	0.0500			

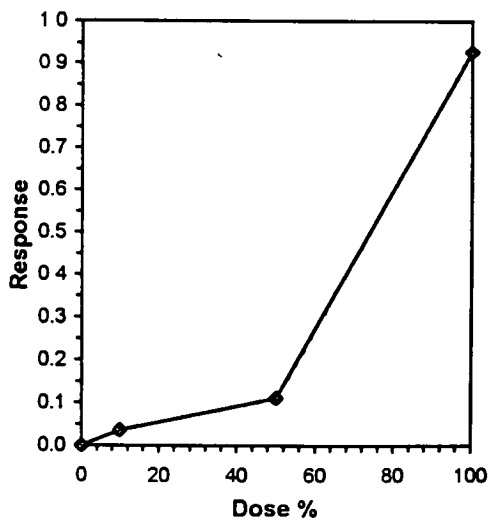
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8850	1 0000	1 2369	1 0588	1 3453	8.867	6				0.8850	1.0000
10	0 8533	0 9642	1 1780	1.1593	1 1873	1.373	3	1.079	2.431	0.1328	0.8533	0.9642
*50	0 7867	0 8889	1 0914	1 0472	1 1198	3.553	3	2.665	2.431	0.1328	0.7867	0.8889
*100	0.0633	0 0716	0 2532	0 2255	0 2868	12.252	3	18.013	2.431	0.1328	0.0633	0 0716

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.90293	0.835	-0.8688	2.76309
Bartlett's Test indicates equal variances (p = 0 05)	7 76028	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	10	50	22.3607	10	0.09501	0.10645	0.70989	0.00596	1.1E-08	3, 11

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	17 550	11 261	0 000	52.608	0.9980
IC10	44 100	11 229	0.000	56 720	-0 6212
IC15	52.379	2.980	38.402	56.336	-2.7380
IC20	55 438	1 564	50 420	59.232	-0 0827
IC25	58 497	1 467	53 880	62.130	-0 0800
IC40	67 673	1 180	63.962	70 824	-0 0702
IC50	73 790	0.996	70 471	76 620	-0 0619



 ToxCalc v5.0 Reviewed by _____

-48 Hour Devel pment

Start Date	Test ID	OFF-7	Sample ID.
End Date.	Lab ID		Sample Type
Sample Date·	Protocol		Test Species:
Comments			

Conc-%	1	2	3	4	5	6
0	0.8500	0 8900	0 7600	0 9500	0 9100	0 9500
10	0 8800	0 8600	0 9000			
50	0 8600	0 7700	0 7900			
100	0 0200	0 0000	0 0000			

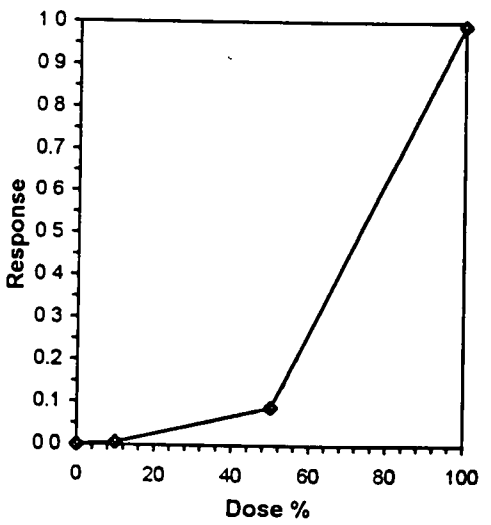
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8850	1.0000	1 2369	1 0588	1 3453	8 867	6				0.8850	1 0000
10	0.8800	0.9944	1 2178	1 1873	1 2490	2.536	3	0 326	2.431	0.1422	0.8800	0.9944
50	0 8067	0.9115	1 1176	1 0706	1 1873	5.511	3	2.040	2.431	0.1422	0.8067	0.9115
*100	0 0067	0.0075	0 0806	0 0500	0 1419	65 775	3	19 768	2.431	0 1422	0.0067	0 0075

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 93582	0 835	-0.6136	1 34482
Bartlett's Test indicates equal variances (p = 0 33)	3 45905	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	50	100	70 7107	2	0.10266	0.11501	1 01627	0.00684	3.5E-09	3, 11

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	31 409	12.445	0 000	62.680	0 0124
IC10	50 635	7 336	17 878	55 275	-1 2532
IC15	53.401	1.790	47 956	57 747	-0 8821
IC20	56 167	1.522	51 032	60 218	-0 1518
IC25	58 932	1 423	54 078	62.690	-0 1593
IC40	67.229	1 128	63 216	70.105	-0 1891
IC50	72.760	0 935	69 415	75 049	-0 2175



ToxCalc v5 0

Reviewed by·_____

48 Hour Development

Start Date		Test ID	OFF-8	Sample ID	
End Date		Lab ID		Sample Type.	
Sample Date.		Protocol		Test Species:	
Comments:					

Conc-%	1	2	3
0	0 7800	0 8100	0 8400
10	0.8500	0 7900	0 7700
50	0 8200	0 6400	0.6800
100	0.0000	0.0000	0 0000

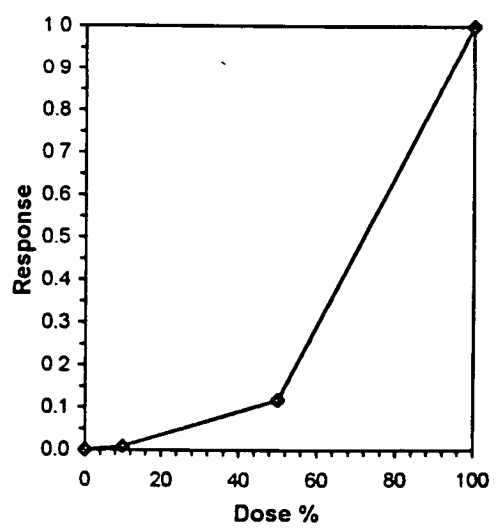
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8100	1.0000	1 1205	1 0826	1.1593	3.422	3				0.8100	1.0000
10	0.8033	0.9918	1 1128	1.0706	1 1731	4 814	3	0.149	2.420	0 1254	0.8033	0.9918
50	0.7133	0 8807	1 0098	0 9273	1 1326	10.739	3	2.137	2.420	0.1254	0.7133	0.8807
*100	0.0000	0.0000	0 0500	0 0500	0 0500	0.000	3	20.666	2.420	0.1254	0 0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 92685	0.805	0.94121	1.43491
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.10692	0.13191	0.80493	0 00403	7.3E-08	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	25.037	12 226	0.000	79 963	0 8546
IC10	43 037	9.404	7 984	65 557	-0 4625
IC15	51 741	5 268	24 072	61 378	-1 6608
IC20	54 579	2.881	45 377	63 650	-1 2272
IC25	57 418	2.412	48 791	65 922	-0 2158
IC40	65.935	1 930	59 033	72.737	-0 2158
IC50	71.612	1 608	65 861	77 281	-0 2158



ToxCalc v5.0

Reviewed by _____

-48 Hour Development

Start Date:	Test ID	OFF-9	Sample ID
End Date.	Lab ID		Sample Type.
Sample Date.	Protocol		Test Species
Comments			

Conc-%	1	2	3
0	0 7800	0 8100	0 8400
10	0 8300	0 6200	0 7800
50	0 0000	0.0000	0 0000
100	0 0900	0 0100	0 0000

			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8100	1 0000	1 1205	1 0826	1 1593	3.422	3				0.8100	1 0000
10	0 7433	0 9177	1 0450	0 9066	1 1458	11 863	3	0 989	2.420	0.1849	0.7433	0.9177
*50	0 0000	0.0000	0.0500	0 0500	0.0500	0.000	3	14 009	2.420	0 1849	0.0167	0.0206
*100	0 0333	0 0412	0 1516	0 0500	0 3047	88.974	3	12.679	2.420	0 1849	0.0167	0 0206

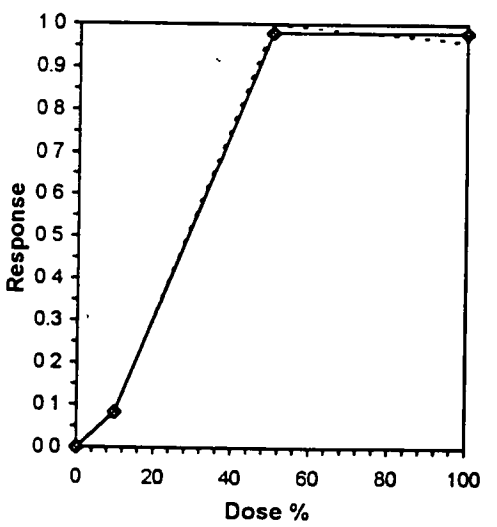
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 96547	0.805	0.17817	0 38953
Equality of variance cannot be confirmed				

Hyp thesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.16264	0.20064	0 97223	0 00876	7.4E-07	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	6.075	3 025	0 000	18 545	0 3719
IC10	10.789	2.500	0 000	17 588	-0.6292
IC15	13.018	2.200	2 348	19 492	-0.7289
IC20	15 248	2.060	5 367	21 383	-0 7753
IC25	17.477	1.942	8 097	23 219	-0 8366
IC40	24.165	1 551	16 286	28.729	-0 9003
IC50	28 624	1 298	21 915	32 402	-0 9532

* indicates IC estimate less than the lowest concentration



ToxCalc v5 0

Reviewed by _____

-48 Hour Devel pment

Start Date	Test ID OFF-10		Sample ID
End Date	Lab ID		Sample Type.
Sample Date	Protocol		Test Species
Comments			

Conc-%	1	2	3
0	0 8700	0 8800	0 9600
10	0 9300	0 9100	0 9000
50	0 7100	0 7800	0 7300
100	0 0000	0 0000	0 0000

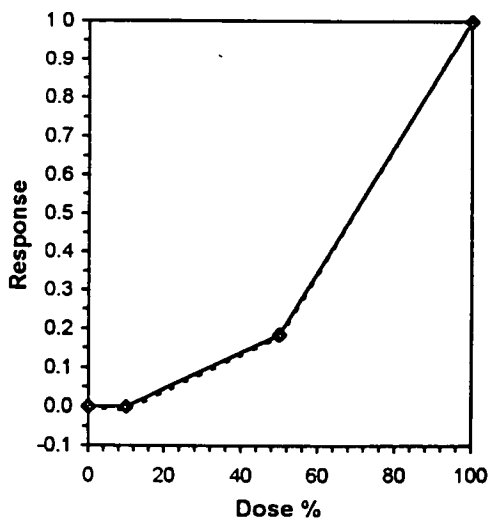
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 9033	1.0000	1 2628	1 2019	1 3694	7.337	3				0.9083	1.0000
10	0.9133	1 0111	1 2727	1 2490	1 3030	2.168	3	-0 231	2.420	0 1040	0.9083	1.0000
*50	0.7400	0.8192	1 0364	1 0021	1 0826	4.009	3	5.271	2.420	0 1040	0.7400	0.8147
*100	0 0000	0.0000	0 0500	0 0500	0 0500	0.000	3	28.232	2 420	0.1040	0 0000	0 0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 917	0 805	1.16195	1 97397
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.06842	0.07534	1 0115	0.00277	6.8E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	20.792	3.285	0 000	24 968	-1 1708
IC10	31 584	3.733	12.335	39 936	-0.4438
IC15	42.376	4.414	22 885	54 904	-0.0500
IC20	50 901	2 811	35 434	54 425	-1 1735
IC25	53 970	1 365	48 060	57 274	-0 3342
IC40	63.176	1 079	58 448	65 819	-0 2519
IC50	69 313	0.899	65 374	71 516	-0 2519



-48 Hour Development

Start Date	Test ID	OFF-11	Sample ID.
End Date·	Lab ID		Sample Type:
Sample Date	Protocol		Test Species·
Comments·			

Conc-%	1	2	3
0	0.8700	0 8800	0 9600
10	0 9100	0 9400	0 9600
50	0 9800	0 9200	0 9400
100	0 2300	0.0300	0 0100

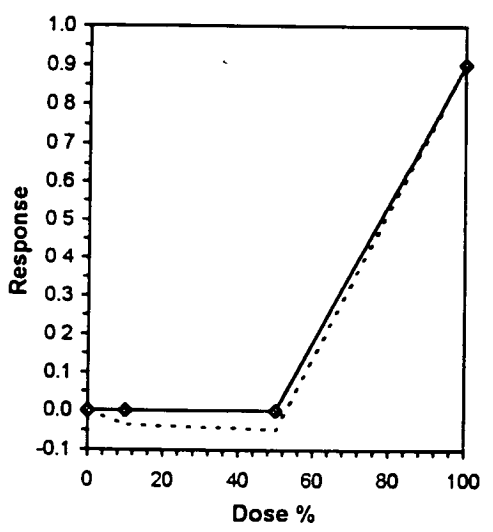
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1 0000	1 2628	1 2019	1 3694	7 337	3				0.9289	1 0000
10	0 9367	1.0369	1 3196	1 2661	1 3694	3.923	3	-0.558	2.420	0 2464	0.9289	1 0000
50	0.9467	1 0480	1 3454	1 2840	1.4289	5 568	3	-0.812	2.420	0 2464	0 9289	1.0000
*100	0 0900	0 0996	0 2581	0 1002	0 5002	82.451	3	9.869	2 420	0.2464	0.0900	0 0969

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.92935	0.805	0.98409	1 30432
Bartlett's Test indicates equal variances (p = 0 28)	3 80833	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0 18519	0.20392	0 83225	0 01554	1 2E-05	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	52.768	0.393	50.008	53.345	-3.2356
IC10	55.536	0.487	52.775	56 690	-1 2718
IC15	58.305	0.616	55.218	60 035	-0.2501
IC20	61 073	0.761	57 661	63.380	0 1954
IC25	63.841	0 916	60 119	66 725	0 3948
IC40	72.146	1 404	68 071	76 759	0 5629
IC50	77.682	1 738	72.602	83 449	0 5834



ToxCalc v5 0

Reviewed by _____

-48 Hour Development

Start Date.	Test ID	OFF-12	Sample ID
End Date.	Lab ID.		Sample Type·
Sample Date	Protocol		Test Species
Comments			

Conc-%	1	2	3
0	0.8700	0 8800	0 9600
10	0 9300	0 9400	0 9100
50	0 0000	0 0100	0 0100
100	0 0000	0.0000	0 0000

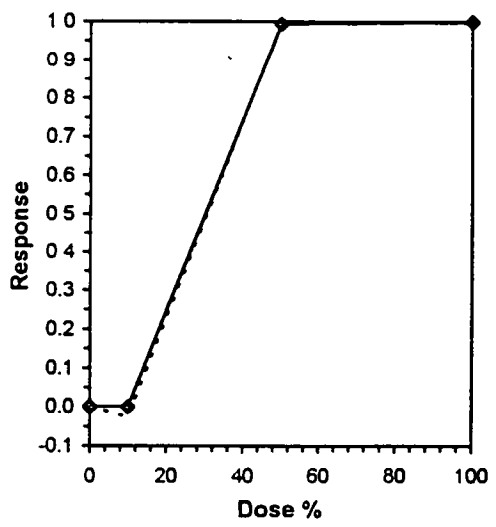
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1.0000	1 2628	1 2019	1 3694	7 337	3				0.9150	1 0000
10	0 9267	1 0258	1 2975	1 2661	1 3233	2.236	3	-0.838	2.420	0 1001	0.9150	1.0000
*50	0.0067	0.0074	0 0835	0 0500	0 1002	34.693	3	28.514	2.420	0.1001	0.0067	0.0073
*100	0.0000	0 0000	0 0500	0 0500	0 0500	0 000	3	29 322	2.420	0 1001	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.89335	0.805	1 14941	2.76246
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.06559	0.07223	1.47353	0 00257	1.1E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	12.015	0.378	9 111	12.031	-2 4185
IC10	14 029	0.359	11 262	14 062	-2 4056
IC15	16.044	0.340	13.414	16.093	-2.3890
IC20	18.059	0.321	15 565	18 125	-2.3673
IC25	20 073	0 302	17 716	20 156	-2 3393
IC40	26.117	0.246	24 171	26 249	-2 1945
IC50	30.147	0.211	28 474	30 311	-2 0104



 ToxCalc v5 0 Reviewed by _____

-48 Hour Development

Start Date:	Test ID	OFF-13	Sample ID
End Date:	Lab ID		Sample Type
Sample Date.	Protocol·		Test Species:
Comments·			

Conc-%	1	2	3
0	0.8700	0 8800	0 9600
10	0 9400	0 9400	0 9000
50	0 0000	0 0000	0 0000
100	0 0000	0 0000	0 0000

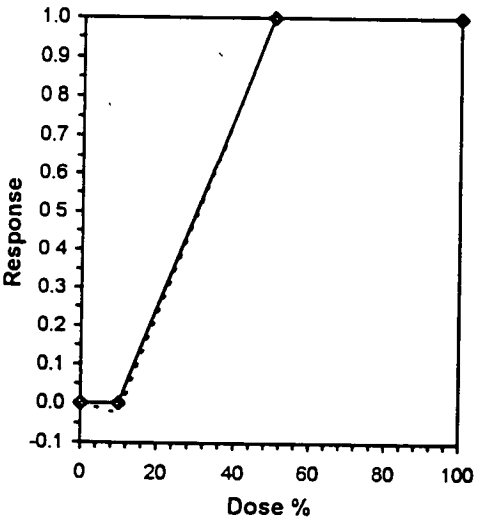
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 9033	1.0000	1 2628	1 2019	1 3694	7 337	3				0.9150	1 0000
10	0.9267	1 0258	1 2986	1 2490	1 3233	3.303	3	-0.858	2.420	0 1009	0.9150	1.0000
*50	0.0000	0.0000	0 0500	0 0500	0.0500	0.000	3	29.097	2.420	0 1009	0.0000	0.0000
*100	0.0000	0.0000	0 0500	0 0500	0.0500	0 000	3	29 097	2.420	0.1009	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 84795	0.805	1.0576	2.72926
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0 06616	0.07285	1 51518	0 00261	1.1E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	12.000	0.400	9.129	12.000	-2.0704
IC10	14 000	0.379	11 281	14 000	-2.0704
IC15	16.000	0.358	13 432	16 000	-2.0704
IC20	18.000	0 337	15.583	18 000	-2.0704
IC25	20.000	0.316	17 734	20.000	-2.0704
IC40	26.000	0 253	24 187	26 000	-2.0704
IC50	30 000	0 211	28 489	30 000	-2.0704



ToxCalc v5 0

Reviewed by·_____

-48 Hour Development

Start Date:	Test ID	OFF-14	Sample ID
End Date	Lab ID		Sample Type.
Sample Date	Protocol		Test Species
Comments.			

Conc-%	1	2	3
0	0 7800	0 8100	0 8400
10	0.7900	0 7500	0.8300
50	0.7900	0 7800	0 8600
100	0.6000	0 5600	0.4700

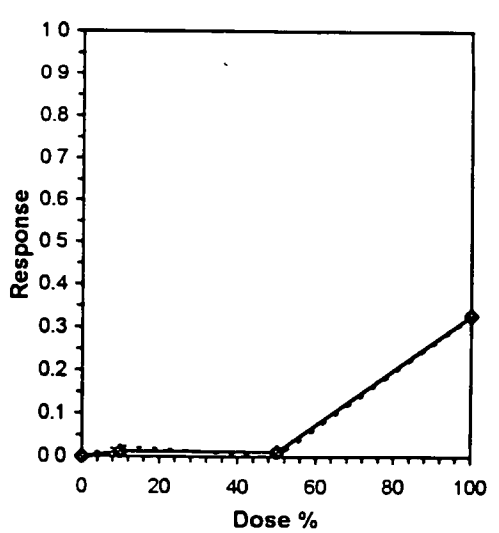
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 8100	1 0000	1.1205	1 0826	1 1593	3.422	3				0.8100	1.0000
10	0.7900	0.9753	1 0959	1.0472	1 1458	4.500	3	0.559	2.420	0 1067	0 8000	0.9877
50	0 8100	1.0000	1.1216	1 0826	1 1873	5 106	3	-0 023	2.420	0 1067	0 8000	0.9877
*100	0.5433	0.6708	0 8290	0.7554	0 8861	8.070	3	6.614	2.420	0 1067	0.5433	0.6708

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 94589	0.805	0.01029	-1.3071
Bartlett's Test indicates equal variances (p = 0 91)	0.52622	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70 7107	2	0.09	0.11103	0.06077	0 00291	3.9E-04	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	55.942	11.299	0.000	63 326	-3.2225
IC10	63.831	3 412	49 447	74 509	-0.1654
IC15	71.721	3.880	55.867	85.693	0 0095
IC20	79.610	4 524	63 215	96.876	0.1091
IC25	87.500	5 282	69.826	108 059	0 1715
IC40	>100				
IC50	>100				



ToxCalc v5 0

Reviewed by _____

-48 Hour Development

Start Date	Test ID	OFF-15	Sample ID
End Date	Lab ID		Sample Type:
Sample Date:	Protocol		Test Species:
Comments:			

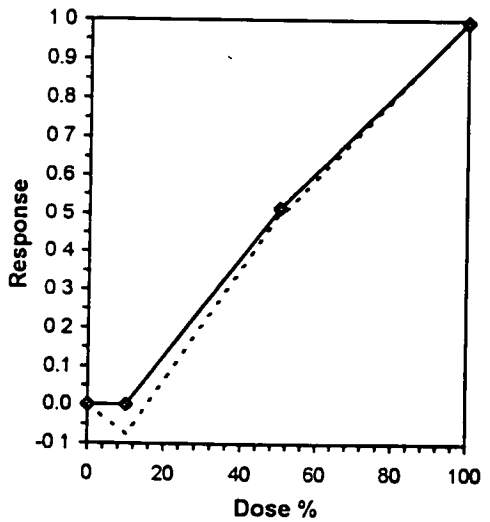
Conc-%	1	2	3
0	0.7800	0 8100	0 8400
10	0 8700	0 8900	0 8500
50	0 3900	0 4000	0 4300
100	0 0000	0.0100	0 0000

			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.8100	1.0000	1 1205	1 0826	1 1593	3.422	3				0.8400	1.0000
10	0 8700	1.0741	1 2026	1 1731	1 2327	2.480	3	-3 328	2.420	0 0597	0.8400	1 0000
*50	0.4067	0.5021	0.6915	0.6745	0 7152	3.060	3	17 406	2.420	0 0597	0.4067	0.4841
*100	0.0033	0 0041	0 0667	0 0500	0 1002	43.383	3	42.749	2.420	0 0597	0.0033	0.0040

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92295	0.805	0.26415	-1.2673
Bartlett's Test indicates equal variances (p = 0 90)	0.56431	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.04885	0.06026	0.81076	0 00091	2.0E-10	3, 8

			Linear Interpolation (80 Resamples)		
Point	%	SD	95% CL(Exp)		Skew
IC05	13.877	0.099	13.539	14 328	0.5554
IC10	17 754	0.199	17 079	18 657	0.5554
IC15	21.631	0 298	20.618	22.985	0 5554
IC20	25 508	0 398	24 158	27.313	0 5554
IC25	29 385	0 497	27 697	31.642	0.5554
IC40	41 015	0.796	38 315	44 627	0 5554
IC50	48 769	1.028	45 394	53 678	0 6917



ToxCalc v5 0

Reviewed by._____

-48 Hour Development

Start Date:	Test ID OFF-16	Sample ID	
End Date.	Lab ID	Sample Type:	
Sample Date.	Protocol	Test Species	
Comments			

Conc-%	1	2	3
0	0 8700	0 8800	0 9600
10	0 9000	0 9000	0 8900
50	0 9500	0 9200	0 9200
100	0 0000	0 0000	0 0000

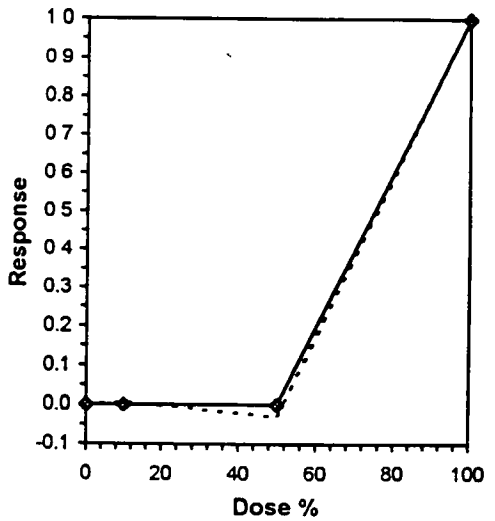
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1 0000	1 2628	1 2019	1.3694	7 337	3				0.9100	1 0000
10	0.8967	0 9926	1 2436	1 2327	1 2490	0.757	3	0.472	2.420	0 0984	0.9100	1.0000
50	0 9300	1.0295	1 3045	1 2840	1 3453	2.711	3	-1.024	2.420	0.0984	0.9100	1 0000
*100	0.0000	0.0000	0 0500	0 0500	0.0500	0.000	3	29.821	2.420	0.0984	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.87351	0.805	1.33954	3.25301
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70 7107	2	0.06438	0.07089	1 11873	0 00248	2.9E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	52.500	4.831	47 403	52.500	-8 7266
IC10	55.000	0 633	50 172	55.000	-1 9783
IC15	57 500	0.598	52.940	57.500	-1 9783
IC20	60.000	0 563	55.708	60 000	-1 9783
IC25	62.500	0.528	58 476	62.500	-1 9783
IC40	70.000	0 422	66 781	70 000	-1 9783
IC50	75 000	0.352	72 318	75 000	-1 9783



ToxCalc v5 0

Reviewed by _____

-48 Hour Development

Start Date	Test ID	OFF-17	Sample ID
End Date	Lab ID		Sample Type.
Sample Date:	Protocol·		Test Species:
Comments·			

Conc-%	1	2	3
0	0.8700	0 8800	0 9600
10	0 9600	0 9300	0 9400
50	0.9400	0 9500	0 9300
100	0 2300	0 1000	0 1900

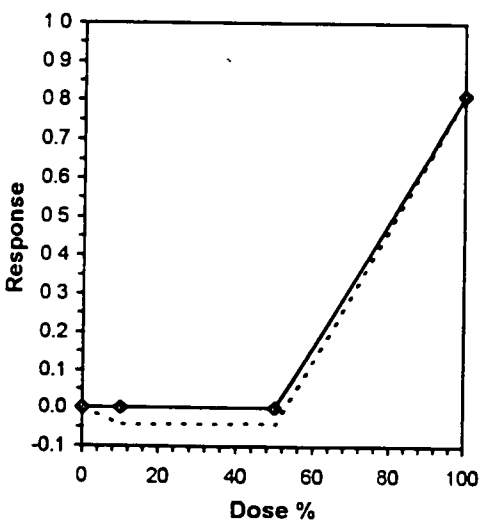
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1 0000	1 2628	1 2019	1 3694	7.337	3				0.9289	1 0000
10	0.9433	1 0443	1 3319	1 3030	1 3694	2.555	3	-1.239	2.420	0 1350	0.9289	1.0000
50	0.9400	1 0406	1 3239	1 3030	1.3453	1 596	3	-1 094	2.420	0 1350	0.9289	1 0000
*100	0 1733	0.1919	0 4243	0 3218	0 5002	21 720	3	15 026	2.420	0 1350	0.1733	0 1866

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.9917	0.805	0.16325	-0 008
Bartlett's Test indicates equal variances (p = 0 24)	4.19695	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.09187	0 10117	0.58615	0.00467	4 6E-07	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	53.074	0.325	50 385	53 348	-2.8350
IC10	56.147	0.348	53.642	56 696	-1 8130
IC15	59.221	0.397	56 833	60.045	-0.9312
IC20	62.294	0 465	59 824	63.393	-0.4075
IC25	65.368	0.544	62.611	66.741	-0.1321
IC40	74.588	0.816	70 945	77.138	0 1460
IC50	80.735	1.011	76.516	84 162	0 2029



ToxCalc v5.0

Reviewed by _____

-48 Hour Development

Start Date.	Test ID OFF-18		Sample ID
End Date.	Lab ID		Sample Type.
Sample Date:	Protocol		Test Species
Comments:			

Conc-%	1	2	3
0	0.8700	0.8800	0 9600
10	0 9400	0.9700	0.9200
50	0 0000	0 0000	0 0000
100	0.0000	0 0200	0 0000

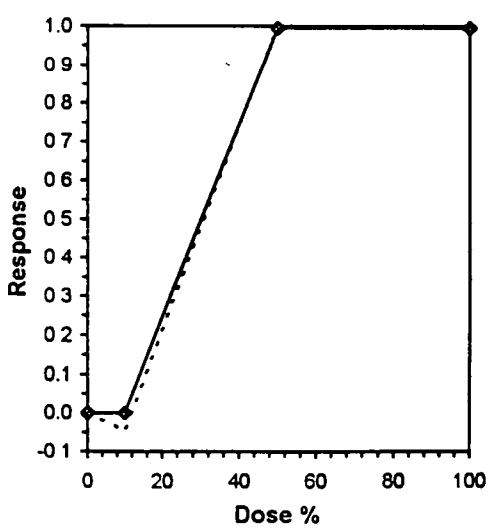
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1.0000	1 2628	1 2019	1.3694	7 337	3				0.9233	1 0000
10	0.9433	1.0443	1 3347	1 2840	1.3967	4 285	3	-1.454	2.420	0.1197	0.9233	1 0000
*50	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	3	24 528	2.420	0 1197	0.0033	0 0036
*100	0.0067	0 0074	0.0806	0 0500	0 1419	65.775	3	23.909	2.420	0.1197	0.0033	0.0036

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.89799	0.805	0.927	0 05634
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.08011	0.08821	1.52437	0 00367	4.1E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	12.007	0.209	10.561	12.023	-3.8151
IC10	14 014	0.198	12.628	14 046	-3 8083
IC15	16 022	0.188	14 696	16 070	-3.7917
IC20	18 029	0.178	16 764	18 093	-3 7622
IC25	20.036	0 168	18 832	20 116	-3.7155
IC40	26 058	0 140	25 035	26.186	-3 4123
IC50	30 072	0.123	29.170	30 232	-2 9914



-48 H ur Development

Start Date	Test ID	OFF-19	Sample ID.
End Date.	Lab ID		Sample Type:
Sample Date	Protocol		Test Species:
Comments:			

Conc-%	1	2	3
0	0 7800	0 8100	0 8400
10	0.8300	0.8400	0 8800
50	0 3500	0 2500	0 3800
100	0.0000	0 0100	0 0000

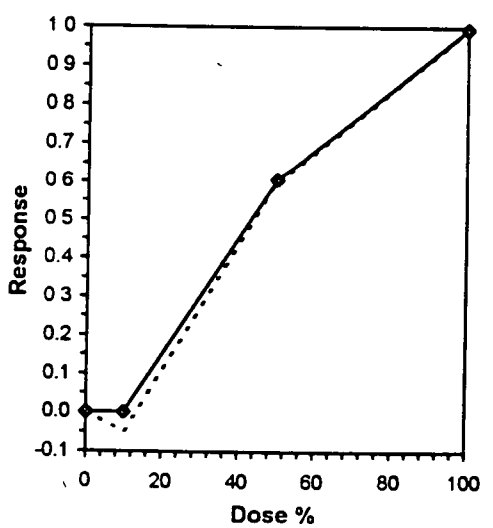
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 8100	1.0000	1 1205	1 0826	1.1593	3.422	3				0.8300	1.0000
10	0 8500	1.0494	1 1740	1 1458	1 2171	3.224	3	-1.367	2.420	0.0947	0.8300	1.0000
*50	0.3267	0 4033	0.6070	0.5236	0.6642	12.168	3	13.119	2.420	0 0947	0.3267	0.3936
*100	0 0033	0 0041	0 0667	0 0500	0.1002	43 383	3	26.918	2.420	0.0947	0.0033	0.0040

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 9467	0.805	-0.4602	-0.1252
Bartlett's Test indicates equal variances (p = 0.62)	1 76206	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.07936	0.0979	0 80418	0 0023	8.0E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	13.298	0.197	12.697	14.055	-0.0756
IC10	16.596	0.395	15.393	18.111	-0.0756
IC15	19.894	0.592	18 090	22.166	-0.0756
IC20	23 192	0.790	20 786	26 221	-0.0756
IC25	26.490	0.987	23.483	30 277	-0.0756
IC40	36 384	1 579	31 572	42.443	-0 0756
IC50	42.980	1 974	36 966	50 553	-0 0756



ToxCalc v5 0

Reviewed by._____

-48 Hour Development

Start Date:	Test ID OFF-20	Sample ID	
End Date:	Lab ID	Sample Type.	
Sample Date:	Protocol	Test Species	
Comments.			

Conc-%	1	2	3
0	0.8700	0.8800	0 9600
10	0 9100	0 9700	0 9100
50	0.8900	0 8300	0 9500
100	0 0000	0 0000	0 0600

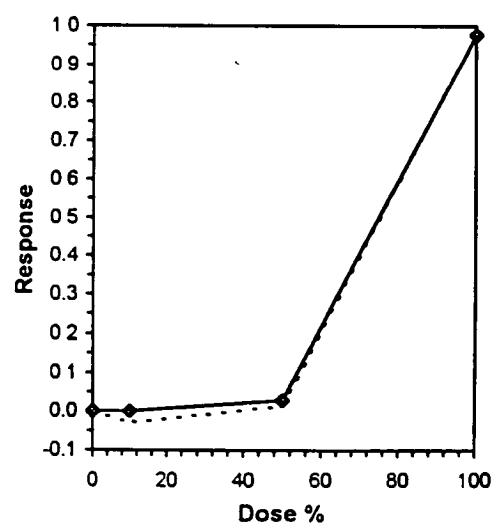
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1 0000	1 2628	1 2019	1.3694	7.337	3				0.9167	1 0000
10	0 9300	1 0295	1 3096	1 2661	1.3967	5.758	3	-0.594	2.420	0.1907	0.9167	1 0000
50	0 8900	0 9852	1 2413	1 1458	1 3453	8.057	3	0 273	2.420	0.1907	0.8900	0.9709
*100	0 0200	0 0221	0.1158	0 0500	0 2475	98.411	3	14.553	2.420	0.1907	0 0200	0.0218

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.828	0.805	0.65541	-1.4598
Bartlett's Test indicates equal variances (p = 0 96)	0 28465	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.13687	0.15072	1 00366	0 00932	8.3E-07	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	51 102	8.856	0 000	54 277	-2.4401
IC10	53 736	2.129	48 991	56 868	-4 2279
IC15	56.370	1 379	51 889	59 459	-0 7863
IC20	59.004	1.288	54 787	62.051	-0 7963
IC25	61 638	1.201	57 685	64 642	-0 8031
IC40	69.540	0 958	65 908	72 415	-0 7728
IC50	74 808	0 824	71 415	77 598	-0 6498



ToxCalc v5 0

Reviewed by _____

-48 H ur Development

Start Date:	Test ID. OFF-21	Sample ID	
End Date:	Lab ID.	Sample Type	
Sample Date:	Protocol	Test Species:	
Comments:			

Conc-%	1	2	3
0	0.8700	0.8800	0 9600
10	0.9100	0.9500	0 8800
50	0.8900	0.8800	0 8600
100	0 0800	0.0900	0 0500

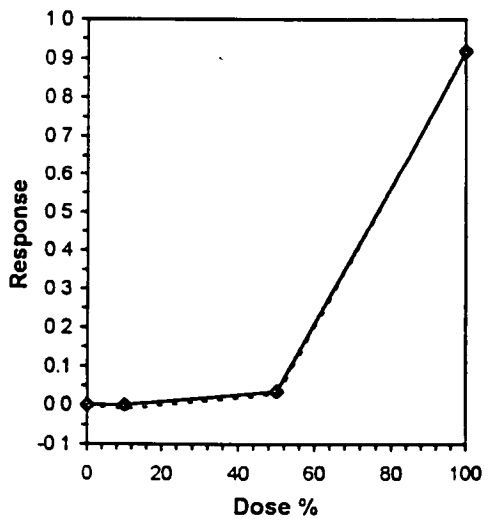
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1.0000	1 2628	1 2019	1.3694	7.337	3				0.9083	1.0000
10	0.9133	1 0111	1.2761	1 2171	1 3453	5.070	3	-0.267	2.420	0.1211	0.9083	1 0000
50	0.8767	0.9705	1 2124	1 1873	1.2327	1.903	3	1 008	2.420	0.1211	0.8767	0.9651
*100	0.0733	0 0812	0 2723	0 2255	0.3047	15 245	3	19 792	2 420	0.1211	0.0733	0 0807

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.93357	0 805	0.71902	-0 0448
Bartlett's Test indicates equal variances (p = 0 40)	2.97621	11 3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.0812	0.08942	0 7198	0 00376	8.7E-08	3, 8

Linear Interpolation (80 Resamples)

P int	%	SD	95% CL(Exp)		Skew
IC05	50.856	12.089	0 000	53 963	-2.0602
IC10	53.683	1.062	47 611	56 626	-0.6251
IC15	56.509	1.011	50.801	59 289	-0.6217
IC20	59.336	0.960	53 991	61 952	-0 6157
IC25	62.163	0.912	57 181	64 613	-0 6068
IC40	70.643	0.776	66 697	72 881	-0 5561
IC50	76 297	0 699	72 925	78 312	-0 4987



-48 H ur Development

Start Date	Test ID	OFF-22	Sample ID.
End Date	Lab ID		Sample Type
Sample Date:	Protocol		Test Species·
Comments·			

Conc-%	1	2	3	4	5	6
0	0 8500	0 8900	0 7600	0 9500	0 9100	0 9500
10	0 8900	0 9400	0 9000			
50	0 9100	0 8000	0 7600			
100	0 0200	0 0000	0 0300			

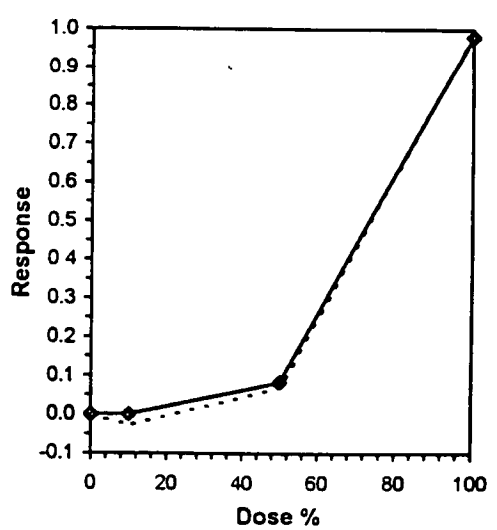
			Transform: Arcsin Square Root						1-Tailed		Is tonic	
C nc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0 8850	1 0000	1 2369	1 0588	1.3453	8 867	6				0.8975	1.0000
10	0.9100	1.0282	1 2684	1 2327	1 3233	3.807	3	-0.475	2.431	0 1611	0.8975	1.0000
50	0 8233	0.9303	1 1440	1 0588	1 2661	9.480	3	1 401	2.431	0.1611	0.8233	0.9174
*100	0.0167	0.0188	0 1220	0 0500	0 1741	52.770	3	16 823	2.431	0 1611	0.0167	0.0186

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.96481	0.835	-0.3296	-0.0304
Bartlett's Test indicates equal variances (p = 0 64)	1 69542	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	50	100	70.7107	2	0.11827	0.1325	0 97587	0.00878	1.7E-08	3, 11

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	34.202	11.502	6.577	62.736	0.0403
IC10	50.966	6.159	24 857	56.811	-1 2144
IC15	53.747	2.544	43 091	59 275	-0 9087
IC20	56.529	2.073	49 814	61 740	-0 3432
IC25	59.310	1.938	53.111	64 213	-0.3405
IC40	67.655	1 539	63 003	71 682	-0 3289
IC50	73.218	1 276	69 352	76 662	-0 3161



ToxCalc v5 0

Reviewed by _____

-48 H ur Development

Start Date	Test ID OFF-23	Sample ID:	
End Date	Lab ID.	Sample Type:	
Sample Date	Protocol	Test Species	
Comments:			

Conc-%	1	2	3
0	0 8700	0.8800	0 9600
10	0 8800	0 8900	0 9100
50	0 0100	0.0000	0 0000
100	0 0000	0.0000	0 0000

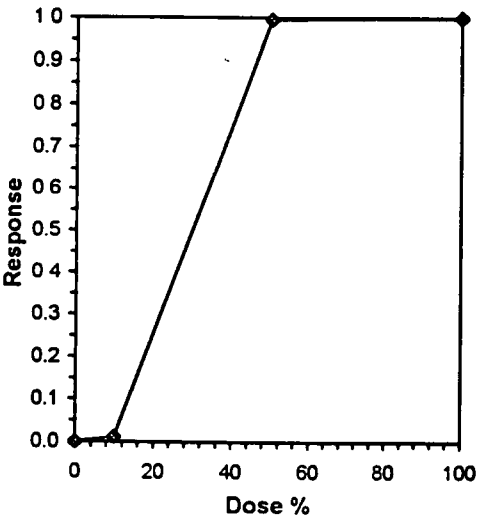
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
0	0.9033	1 0000	1 2628	1 2019	1.3694	7.337	3				0.9033	1.0000
10	0.8933	0.9889	1 2386	1 2171	1 2661	2.022	3	0.591	2.420	0.0990	0.8933	0.9889
*50	0.0033	0.0037	0 0667	0.0500	0 1002	43.383	3	29.224	2.420	0 0990	0.0033	0.0037
*100	0.0000	0.0000	0 0500	0 0500	0 0500	0.000	3	29.633	2.420	0 0990	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.89225	0.805	1.29811	3.02552
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10	50	22.3607	10	0.06483	0.07139	1 42211	0 00251	1.2E-09	3, 8

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	11.581	1.244	2.363	12.493	-2.0776
IC10	13.610	0.813	8 789	14 492	-1 0271
IC15	15.640	0.767	11 087	16.492	-1 0313
IC20	17 670	0.721	13 385	18.491	-1.0359
IC25	19.700	0.675	15.683	20.490	-1 0409
IC40	25 790	0.537	22.576	26.487	-1 0580
IC50	29.850	0.446	27 172	30 485	-1 0703



ToxCalc v5 0

Reviewed by:_____

Appendix M

Chain-of-custody forms for Old Fire Fighting Training Center sediment samples.

Science Applications International Corporation
Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: Coaster's Island Sampling

Client Name and Contact: Tetra Tech Steven Parker

Sample No	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OF-SS1	2	1 gallon	3-27-98	1:00-2:30pm	Sediments	Sed. Toxicity; Elutriate
OF-SS2						
OF-SS3						
OF-SS4						
OF-SS5						
OF-SS6						
OF-SS7						
OF-SS22 HLS						
Total :						

Packed/Released By: H Sanders, SAIC; J. King URI
Signature: Heather Saffert
Printed Name: Heather Saffert
Date Time: 3-27-98 3:30pm

Released By:
Signature
Printed Name:
Date Time
Final Destination:
Shipping Method:

Received By:
Signature: Pamela Pace
Printed Name:
Date Time: 3/27/98

Received By:
Signature:
Printed Name:
Date Time
Contact Name and Phone Number

Page 1 of 1 HLS

Remarks:
OF-SS22 = Reference Station

Original Form Accompanies Shipment

URI

Inorganic Geochemistry/Paleomagnetics
GRADUATE SCHOOL OF OCEANOGRAPHY
Narragansett Bay Campus, Narragansett, RI 02882

CHAIN OF CUSTODY RECORD

Project: Old Fire Fighters

Client Name/Contact: Tetra Tech / Steve Parker

Sample ID	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-11 Sur(a)	1	1 Liter Poly	4/3/98	13:30	Sediment Toxicity	
OFF-11 Sur(b)	1	1 Liter Poly	4/3/98	13:30	Pore Water Toxicity	
OFF-11 Sur(c)	1	5 Liter Poly	4/3/98	13:30	Elutriate	
OFF-16 Sur(a)	1	1 Liter Poly	4/3/98	14:15	Sediment Toxicity	
OFF-16 Sur(b)	1	1 Liter Poly	4/3/98	14:15	Pore Water Toxicity	
OFF-16 Sur(c)	1	5 Liter Poly	4/3/98	14:15	Elutriate	
OFF-21-Sur(a)	1	1 Liter Poly	4/3/98	13:00	Sediment Toxicity	
OFF-21-Sur(b)	1	1 Liter Poly	4/3/98	13:00	Pore H_2O Toxicity	
OFF-21-Sur(c)	1	5 Liter Poly	4/3/98	13:00	Elutriate	
OFF-12 Sur(a)	1	1 Liter Poly	4/3/98	12:00	Sediment Toxicity	
OFF-12 Sur(b)	1	1 Liter Poly	4/3/98	12:00	Pore Water Toxicity	
OFF-12 Sur(c)	1	5 Liter Poly	4/3/98	12:00	Elutriate	
OFF-20 Sur(a)	1	1 Liter Poly	4/3/98	15:00	Sediment Toxicity	
OFF-20 Sur(b)	1	1 Liter Poly	4/3/98	15:00	Pore Water Toxicity	
OFF-20 Sur(c)	1	5 Liter Poly	4/3/98	15:00	Elutriate	

Remarks:

Packed/Released By: John King URI
Signature: John W. King
Printed Name: John W. King
Date/Time: 4/3/98 17:15

Received By: John T. Morris (SAIC)
Signature: John T. Morris
Printed Name: John T. Morris
Date/Time: 4/3/98 17:15

Received By: Sherry Poulter SAIC
Signature: Sherry Poulter
Printed Name:
Date/Time: 4/3/98 18:00

Page 1 of 2

Total Samples This Page: 15

Total Samples in Shipment: 30

URI

Inorganic Geochemistry/Paleomagnetics
GRADUATE SCHOOL OF OCEANOGRAPHY
Narragansett Bay Campus, Narragansett, RI 02882

CHAIN OF CUSTODY RECORD

Project: Old Fire Fighters

Client Name/Contact: Tetra Tech / Steve Parker

Sample ID	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-10 Sur(a)	1	1 Liter Poly	4/3/98	15:45	Sediment Toxicity	
OFF-10 Sur(b)	1	1 Liter Poly	4/3/98	15:45	Pore Water Toxicity	
OFF-10 Sur(c)	1	.5 Liter Poly	4/3/98	15:45	Elutriate	
OFF-13 Sur(a)	1	1 Liter Poly	4/3/98	10:00	Sediment Toxicity	
OFF-13 Sur(b)	1	1 L Poly	4/3/98	10:00	Pore Water Toxicity	
OFF-13 Sur(c)	1	.5 L Poly	4/3/98	10:00	Elutriate	
OFF-23 Sur(a)	1	1 L Poly	4/3/98	9:15	Sediment Toxicity	
OFF-23 Sur(b)	1	1 L Poly	4/3/98	9:15	Pore Water Toxicity	
OFF-23 Sur(c)	1	.5 L Poly	4/3/98	9:15	Elutriate	
OFF-18 Sur(a)	1	1 L Poly	4/3/98	10:30	Sediment Toxicity	
OFF-18 Sur(b)	1	1 L Poly	4/3/98	10:30	Pore Water Toxicity	
OFF-18 Sur(c)	1	.5 L Poly	4/3/98	10:30	Elutriate	
OFF-17 Sur(a)	1	1 L Poly	4/3/98	11:30	Sediment Toxicity	
OFF-17 Sur(b)	1	1 L Poly	4/3/98	11:30	Pore Water Toxicity	
OFF-17 Sur(c)	1	.5 L Poly	4/3/98	11:30	Elutriate	

Remarks:

Packed/Released By: John King/URI
Signature: John W. King
Printed Name: John W. King
Date/Time: 4/3/98 17:15

Received By: John T. Morris (SAIC)
Signature: John T. Morris
Printed Name: John T. Morris
Date/Time: 4/3/98 17:15

Received By: Sherry Poucher
Signature: Sherry Poucher
Printed Name:
Date/Time: 4/3/98 18:00

Page 2 of 2

Total Samples This Page: 15

Total Samples in Shipment: 30

URI Inorganic Geochemistry/Paleomagnetics
GRADUATE SCHOOL OF OCEANOGRAPHY
Narragansett Bay Campus, Narragansett, RI 02882

CHAIN OF CUSTODY RECORD

Project: Old Fire Fighters NETC

Client Name/Contact: Tetra Tech / Steve Parker

Sample ID	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-9 SUR	1	1L poly	4/7/98	11:25	Sediment Toxicity	
OFF-9-SUR	1	1L poly	"	11:25	Pore Water Toxicity	
OFF-9-SUR	1	.5L poly	"	11:25	Elutriate	
OFF-15-SUR	1	1L poly	"	12:45	Sediment Toxicity	
OFF-15-SUR	1	1L poly	"	12:45	Pore Water Toxicity	
OFF-15-SUR	1	.5L poly	"	12:45	Elutriate	
OFF-19-SUR	1	1L poly	"	13:30	Sediment Toxicity	
OFF-19-SUR	1	1L poly	"	13:30	Pore Water Toxicity	
OFF-19-SUR	1	.5L poly	"	13:30	Elutriate	
OFF-14SUR	1	1L poly	"	14:10	Sediment Toxicity	
OFF-14SUR	1	1L poly	"	14:10	Pore Water Toxicity	
OFF-14SUR	1	.5L poly	"	14:10	Elutriate	
OFF-8-SUR	1	1L poly	"	15:05	Sediment Toxicity	
OFF-8-SUR	1	1L poly	"	15:05	Pore Water Toxicity	
OFF-8-SUR	1	.5L poly	"	15:05	Elutriate	

Remarks:

Packed/Released By: John W King URI
Signature: [signature]
Printed Name: John W King
Date/Time: 4/7/98

Received By: Michael Cole / STIC
Signature: [signature]
Printed Name: Michael Cole
Date/Time: 4/7/98 15:53

Received By: BRIAN KOZIOL
Signature: [signature]
Printed Name: BRIAN KOZIOL
Date/Time: 4/7/98 17:51

Page 1 of 1

Total Samples This Page: 15

Total Samples in Shipment: 15

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Re

Project: OFFTA -ERA

Client Name and Contact: TTNUS Steve Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-1-ELU	1	PE liquid	4/27/98	1505	SEDIMENT SAMPLE	ELUTRIATE TOX & CHEM
OFF-2-ELU	1			1505		
OFF-3-ELU	1			1452		
OFF-4-ELU	1			1445		
OFF-6-ELU-FD	1			1418		
OFF-5-ELU	1			1405		ELUTRIATE CHEM
OFF-5-ELU-FD	1			1405		ELUTRIATE TOX & CHEM
OFF-6-ELU	1			1418		ELUTRIATE CHEM
OFF-7-ELU	1			1425		ELUTRIATE TOX & CHEM
OFF-22-ELU	1			1530		
Total :	10					

Packed/Released By:
Signature: [signature] Date Time 4/27/98
Printed Name: GREGORY A. TRANEY 1610

Released By:
Signature: Date Time
Printed Name:
Final Destination:
Shipping Method:

Received By: BRIAN KOZIOL
Signature: [signature] Date Time 4/27/98
Printed Name: BRIAN KOZIOL K-11

Received By: Date Time
Signature:
Printed Name:
Contact Name and Phone Number

Page 1 of 1

Remarks:

Original Form Accompanie

APPENDIX B-2
FIELD EFFECTS DATA

B-2. Field Effects Data

B-2-1. Benthic Community Structure

B-2-2. Biota Bivalve Condition

B-2-3. Hematopoietic Neoplasia

B-2-4. Fecal Pollution Indicators

B-2-5. Cytochrome P450 Assay

B-2-6. Sediment Oxygen Demand Test Results

B-2-7. Water Quality Test Results

APPENDIX B-2-1.
BENTHIC COMMUNITY STRUCTURE

Evaluation of Benthic Community Structure near Newport, R.I. for the Draft Marine Ecological Risk Assessment for OFFTA NETC

October 1998

Submitted to:

Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Submitted by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

SAIC Project No. 01-0440-04-9817-306
Task 4E

Table of Contents

Table A-1. Benthic community abundance data from sediment collections in the vicinity of Old Fire Fighting Training Area, NETC Newport.

Appendix A. Species Codes and Notes.

Appendix B. Chain-of-Custody Forms.

Table A-1. Benthic community abundance data from sediment collections in the vicinity of Old Fire Fighting Training Area, NETC Newport[1,2]

yr	station	replicate	Annelida AGLCIR	Annelida AMPHAR	Annelida ANAMUC	Annelida APHELO	Annelida ARICAT	Annelida ASAOCU	Annelida BOCHAM	Annelida BRAWEL	Annelida CAPCAP	Annelida CHAETO	Annelida CIRGRA	Annelida CLYTOR	Annelida DEMMIC	Annelida DIOCUP	Annelida DODECA	Annelida DRILON
1998	OF-SS-1	A									5	31	14					
1998	OF-SS-1	B										23	13					
1998	OF-SS-2	A			2	90				7	5	3	4		4			
1998	OF-SS-2	B		2	1	123				2	3		3		4			
1998	OF-SS-3	A				13				5	10	1	5		1	1		
1998	OF-SS-3	B				15				2	2	2	9		1			
1998	OF-SS-4	A				86				2	4	2	2	1				1
1998	OF-SS-4	B			2	47				10	7	2	13	1	1			
1998	OF-SS-5	A								8	75	1						
1998	OF-SS-5	B				8				7	40	3	2					
1998	OF-SS-6	A			1						109							
1998	OF-SS-6	B									78							
1998	OF-SS-7	A									9							
1998	OF-SS-7	B									2							
1998	OFF-8-BI	A		3		1	4				4							
1998	OFF-8-BI	C		1	1		1											
1998	OFF-9-BI	A				3												
1998	OFF-9-BI	B				1												
1998	OFF-9-BI	C	1		3	3			1					3				
1998	OFF-9-BI	D	1			1			1		1			1				
1998	OFF-10-BI	A	2			6			5	1	9						2	
1998	OFF-10-BI	B	1		1			1		1	19							
1998	OFF-11-BI	A									14							
1998	OFF-11-BI	B		1							34							
1998	OFF-11-BI	C		2							39						1	
1998	OFF-11-BI	D									45							
1998	OFF-12-BI	A									3							
1998	OFF-12-BI	B									6							
1998	OFF-13-BI	A									1							
1998	OFF-13-BI	B									4							
1998	OFF-14-BI	A												1				
1998	OFF-14-BI	B			1		3							1				
1998	OFF-15-BI	A		1	1						8			7	3			
1998	OFF-15-BI	B		1		4					4			10	1			
1998	OFF-16-BI	A																
1998	OFF-16-BI	B		1							3							
1998	OFF-17-BI	A		1							2							
1998	OFF-17-BI	B																
1998	OFF-18-BI	A									16							
1998	OFF-18-BI	B									30							
1998	OFF-19-BI	A				1												
1998	OFF-19-BI	B		1		5	2											
1998	OFF-20-BI	A									1							
1998	OFF-20-BI	B									6							
1998	OFF-21-BI	A									1							
1998	OFF-21-BI	B		1							1						1	
1998	OF-SS-22	A				47				7	35			5				
1998	OF-SS-22	B				35				3	46							
1998	OFF-23-BI	A									23							
1998	OFF-23-BI	B									17							

1- Codes are the first 3 letters of the genus and species of each taxon (or first 6 letters if not identified to species)
2- See attached list of codes for interpredation of genus/species names

Table A-1.con't.

yr	station	replicate	Annelida EUCLYM	Annelida EUMSAN	Annelida EXODIS	Annelida EXOHEB	Annelida GLYAME	Annelida GLYCER	Annelida GRUCLA	Annelida GYPVIT	Annelida HAREXT	Annelida HARIMB	Annelida HETFIL	Annelida HYDDIA	Annelida HYPHET	Annelida LAOCIR	Annelida LEIACU	Annelida LEIFRA
1998	OF-SS-1	A		3	1		1				11			2				
1998	OF-SS-1	B		1	3													
1998	OF-SS-2	A		9	31		1			2	23	7						
1998	OF-SS-2	B		18	83					2	51	6		1				
1998	OF-SS-3	A		8	15				1	1	11	8	3					
1998	OF-SS-3	B		1	11		2		3	3	13			1				
1998	OF-SS-4	A		6	16		2			1	18	6					3	
1998	OF-SS-4	B		5	17		3		6	1	40	8	1		1		3	
1998	OF-SS-5	A									7	3	2				1	
1998	OF-SS-5	B					2		3		5	9						
1998	OF-SS-6	A		1	2						3	3						
1998	OF-SS-6	B					1				3							
1998	OF-SS-7	A		1							18	10	1		1			
1998	OF-SS-7	B									20	4						
1998	OFF-8-BI	A		3	4		1				7							
1998	OFF-8-BI	C			5		4				8							
1998	OFF-9-BI	A		7	117		1				20	5						
1998	OFF-9-BI	B		1	44		1				20	4					1	
1998	OFF-9-BI	C		3	73		9				17	9	3	1				
1998	OFF-9-BI	D		9	72		9				18	7		1			1	
1998	OFF-10-BI	A		5	20	2	2				17	2					1	
1998	OFF-10-BI	B					2				2	1					1	
1998	OFF-11-BI	A		5							14							
1998	OFF-11-BI	B		1							5	4						
1998	OFF-11-BI	C		1							4	10			1			
1998	OFF-11-BI	D		1			1				2	7						
1998	OFF-12-BI	A		2							2	2			1			
1998	OFF-12-BI	B		1							3	2			1			
1998	OFF-13-BI	A									1				1		19	
1998	OFF-13-BI	B									2	1					4	
1998	OFF-14-BI	A																
1998	OFF-14-BI	B																
1998	OFF-15-BI	A		4	5						26	3						
1998	OFF-15-BI	B			9		1				16	2						
1998	OFF-16-BI	A			1						6	1			3		1	
1998	OFF-16-BI	B		3			1				7				1			1
1998	OFF-17-BI	A		1							11						3	8
1998	OFF-17-BI	B					1											9
1998	OFF-18-BI	A									6						11	
1998	OFF-18-BI	B															5	2
1998	OFF-19-BI	A	1				1	1			5							
1998	OFF-19-BI	B			1						9							
1998	OFF-20-BI	A		4	1						23	4						
1998	OFF-20-BI	B		10	1						36	4						
1998	OFF-21-BI	A		4	1						17							
1998	OFF-21-BI	B		6	1						10	2			1		2	
1998	OF-SS-22	A		2					37		20	2	4			4	2	
1998	OF-SS-22	B		3			1		23		7		3			16		
1998	OFF-23-BI	A									8						1	
1998	OFF-23-BI	B		2							32	1						

Table A-1.con't.

yr	station	replicate	Annelida LEIROB	Annelida LEITOS	Annelida LEPSQU	Annelida LEPSUB	Annelida MALDAN	Annelida MARVIR	Annelida MEDAMB	Annelida NEAARE	Annelida NEASUC	Annelida NEAVIR	Annelida NEPBUC	Annelida NEPHTY	Annelida NEPINC	Annelida NEPPIC	Annelida NEREID	Annelida NINNIG
1998	OF-SS-1	A																
1998	OF-SS-1	B								1								
1998	OF-SS-2	A								5	1							
1998	OF-SS-2	B		1					11									
1998	OF-SS-3	A		1					4		2							
1998	OF-SS-3	B			1				9		3			1				
1998	OF-SS-4	A	1						4	5				1		4		
1998	OF-SS-4	B			1				9	4								
1998	OF-SS-5	A								1								
1998	OF-SS-5	B								6								
1998	OF-SS-6	A		1					2		10					9		
1998	OF-SS-6	B									6					11		
1998	OF-SS-7	A							7		54	1						
1998	OF-SS-7	B							4		33							
1998	OFF-8-BI	A					3		77							15		7
1998	OFF-8-BI	C					1		5							10		6
1998	OFF-9-BI	A		1					85									
1998	OFF-9-BI	B							69							1		
1998	OFF-9-BI	C							23			2						
1998	OFF-9-BI	D			1				17			2						
1998	OFF-10-BI	A							26		3					4		
1998	OFF-10-BI	B							12		2							
1998	OFF-11-BI	A									4					1		
1998	OFF-11-BI	B									5							
1998	OFF-11-BI	C							1									
1998	OFF-11-BI	D							1		8					1		
1998	OFF-12-BI	A	2						4		31					1		
1998	OFF-12-BI	B	1						3		28					1		
1998	OFF-13-BI	A									15					1		
1998	OFF-13-BI	B							1		9					1		
1998	OFF-14-BI	A					1									75		29
1998	OFF-14-BI	B							5							87		25
1998	OFF-15-BI	A		1					190		1					17		
1998	OFF-15-BI	B							204							19		
1998	OFF-16-BI	A							9		19		1				1	
1998	OFF-16-BI	B							85		18							
1998	OFF-17-BI	A							2		9			4				
1998	OFF-17-BI	B									1			1		2		
1998	OFF-18-BI	A									9							
1998	OFF-18-BI	B									5							
1998	OFF-19-BI	A							4					53	2			7
1998	OFF-19-BI	B					1		2					47	1			12
1998	OFF-20-BI	A				1					21	1					2	
1998	OFF-20-BI	B							1		22			1				
1998	OFF-21-BI	A	4						39		28	1		3				
1998	OFF-21-BI	B	2						47		17			2				
1998	OF-SS-22	A						10	2	6	15					6	1	
1998	OF-SS-22	B	1					7	3		14			5		1		
1998	OFF-23-BI	A									18							
1998	OFF-23-BI	B									26			1				

Table A-1.con't.

yr	station	replicate	Annelida OLIGOC	Annelida OPHRYO	Annelida OWEFUS	Annelida PARPUL	Annelida PARLON	Annelida PECGOU	Annelida PHEAFF	Annelida PHOMIN	Annelida PHYARE	Annelida PHYLLO	Annelida PISPAL	Annelida PLADUM	Annelida PODOBS	Annelida POLEXI	Annelida POLCAU	Annelida POLCOM
1998	OF-SS-1	A		1			1				2					10		
1998	OF-SS-1	B	158				1									1		
1998	OF-SS-2	A	21				12	1			1					38	5	
1998	OF-SS-2	B	86				13						3	2		35	13	
1998	OF-SS-3	A	194				8									5	2	
1998	OF-SS-3	B	60					1					2			21	9	
1998	OF-SS-4	A	339				5									9	7	
1998	OF-SS-4	B	671											1		12	10	
1998	OF-SS-5	A	64														2	
1998	OF-SS-5	B	525														1	
1998	OF-SS-6	A	204														9	
1998	OF-SS-6	B	87														1	
1998	OF-SS-7	A	29														2	
1998	OF-SS-7	B	6														2	
1998	OFF-8-BI	A	8				4		3	1					1		1	
1998	OFF-8-BI	C	4															
1998	OFF-9-BI	A	62		1		2		1					2		4	1	
1998	OFF-9-BI	B	58				2									1		
1998	OFF-9-BI	C	27		1		1									4	7	
1998	OFF-9-BI	D	20	1			3	1	1	3			1			2	4	
1998	OFF-10-BI	A	50				6							1			1	
1998	OFF-10-BI	B	98														3	
1998	OFF-11-BI	A	10				1										2	
1998	OFF-11-BI	B	13														4	
1998	OFF-11-BI	C	9				2										24	
1998	OFF-11-BI	D	8														11	
1998	OFF-12-BI	A	14														2	
1998	OFF-12-BI	B	18													1	2	
1998	OFF-13-BI	A	54													1		
1998	OFF-13-BI	B	26															
1998	OFF-14-BI	A			2													
1998	OFF-14-BI	B	1		6				2									
1998	OFF-15-BI	A	7							1			1	3		2		
1998	OFF-15-BI	B	13							3			2	1			2	
1998	OFF-16-BI	A	83														1	
1998	OFF-16-BI	B	36															
1998	OFF-17-BI	A	69						2							1	1	
1998	OFF-17-BI	B	91							1								
1998	OFF-18-BI	A					27										2	
1998	OFF-18-BI	B	35														2	
1998	OFF-19-BI	A							1									
1998	OFF-19-BI	B	2						5	3						12		
1998	OFF-20-BI	A	4									1			1	3		
1998	OFF-20-BI	B	22												1	2		
1998	OFF-21-BI	A	70									1					1	
1998	OFF-21-BI	B	46				1									1		
1998	OF-SS-22	A	48			1	2									1		4
1998	OF-SS-22	B	19				1									2	1	12
1998	OFF-23-BI	A																2
1998	OFF-23-BI	B																4

Table A-1.con't.

yr	station	replicate	Annelida POLCOR	Annelida POLYDO	Annelida POLYGO	Annelida PRICIR	Annelida PRISTE	Annelida PYGELE	Annelida SABELL	Annelida SABELO	Annelida SABVUL	Annelida SCHCAE	Annelida SCOSQU	Annelida SCOTEN	Annelida SPHERI	Annelida SPIBOM	Annelida SPIOCU	Annelida SPISET
1998	OF-SS-1	A									2							
1998	OF-SS-1	B																
1998	OF-SS-2	A	3											1				1
1998	OF-SS-2	B												3	17	1	1	2
1998	OF-SS-3	A			4											1		1
1998	OF-SS-3	B																3
1998	OF-SS-4	A			19									1				2
1998	OF-SS-4	B			33													2
1998	OF-SS-5	A	1		1													10
1998	OF-SS-5	B			3							1						1
1998	OF-SS-6	A	6												1	1		250
1998	OF-SS-6	B	10													1		362
1998	OF-SS-7	A																4
1998	OF-SS-7	B	1															8
1998	OFF-8-BI	A	2										1			1		1
1998	OFF-8-BI	C	1													3		
1998	OFF-9-BI	A	1											15	37	1		1
1998	OFF-9-BI	B												18	3			3
1998	OFF-9-BI	C							1		2			45	1	3		
1998	OFF-9-BI	D									2			67	3	4		3
1998	OFF-10-BI	A											1	27	2	2		5
1998	OFF-10-BI	B	1											1		3		4
1998	OFF-11-BI	A																1
1998	OFF-11-BI	B													1			1
1998	OFF-11-BI	C																6
1998	OFF-11-BI	D																13
1998	OFF-12-BI	A	3															7
1998	OFF-12-BI	B	1															10
1998	OFF-13-BI	A																9
1998	OFF-13-BI	B	2															6
1998	OFF-14-BI	A					3			1							1	
1998	OFF-14-BI	B					1						1				1	
1998	OFF-15-BI	A	1												14	6		
1998	OFF-15-BI	B													6	3	1	
1998	OFF-16-BI	A	1												1	2		
1998	OFF-16-BI	B	3													1		
1998	OFF-17-BI	A	2			1												
1998	OFF-17-BI	B	4															
1998	OFF-18-BI	A	2													1		8
1998	OFF-18-BI	B	2															
1998	OFF-19-BI	A												1				1
1998	OFF-19-BI	B												3	1			
1998	OFF-20-BI	A	1															
1998	OFF-20-BI	B	1															
1998	OFF-21-BI	A	5															3
1998	OFF-21-BI	B	3													2		1
1998	OF-SS-22	A	17		7			62					21			7		18
1998	OF-SS-22	B	20		15			68					8			1		4
1998	OFF-23-BI	A		28				31										16
1998	OFF-23-BI	B		4														3

Table A-1.con't.

yr	station	replicate	Annelida SPISPI	Annelida STHBOA	Annelida STRARE	Annelida STRBEN	Annelida SYLLID	Annelida TEREBE	Arthropoda AMPELI	Arthropoda AMPHIP	Arthropoda AMPLON	Arthropoda AMPVAL	Arthropoda BALANU	Arthropoda CALLAE	Arthropoda CANIRR	Arthropoda CAPPEN	Arthropoda CAPREL	Arthropoda CARMAE
1998	OF-SS-1	A	8				1						144		1	13		
1998	OF-SS-1	B					1						1			24		
1998	OF-SS-2	A					1									25	7	
1998	OF-SS-2	B	10	1			1		3			1		5		74	7	
1998	OF-SS-3	A	1				1									19	1	
1998	OF-SS-3	B												1	1	31		
1998	OF-SS-4	A														1		
1998	OF-SS-4	B											16			1		
1998	OF-SS-5	A																
1998	OF-SS-5	B						1										
1998	OF-SS-6	A							4					2		1		
1998	OF-SS-6	B				2			2	1								1
1998	OF-SS-7	A	26			6			8				2	5		1		
1998	OF-SS-7	B	2			2			9							2	1	
1998	OFF-8-BI	A							9	1			5					
1998	OFF-8-BI	C							5				2			1		
1998	OFF-9-BI	A									1		200				1	
1998	OFF-9-BI	B							1				35					
1998	OFF-9-BI	C		1					1		1		74					
1998	OFF-9-BI	D	12	1					2		1		161			1	1	
1998	OFF-10-BI	A				4			12				1					
1998	OFF-10-BI	B							13		1							
1998	OFF-11-BI	A	1										14					
1998	OFF-11-BI	B							3				14					
1998	OFF-11-BI	C											4					
1998	OFF-11-BI	D							5				31					
1998	OFF-12-BI	A				19			24									
1998	OFF-12-BI	B				13			17									
1998	OFF-13-BI	A				4			1									
1998	OFF-13-BI	B				2			3									
1998	OFF-14-BI	A							2									
1998	OFF-14-BI	B							3									
1998	OFF-15-BI	A		1					2					9		1	7	
1998	OFF-15-BI	B		2					3		2						5	
1998	OFF-16-BI	A				25			26				3					
1998	OFF-16-BI	B				17			22				9					
1998	OFF-17-BI	A				17			4				1					
1998	OFF-17-BI	B				16			11									
1998	OFF-18-BI	A				9			1				1					
1998	OFF-18-BI	B				5			1									
1998	OFF-19-BI	A							1	2								
1998	OFF-19-BI	B							1									
1998	OFF-20-BI	A				6							4					
1998	OFF-20-BI	B				2												1
1998	OFF-21-BI	A				13			16				6		1			
1998	OFF-21-BI	B				14			52				9					
1998	OF-SS-22	A			3											2		1
1998	OF-SS-22	B					1						22					
1998	OFF-23-BI	A				2			13								1	
1998	OFF-23-BI	B				2				1								

Table A-1.con't.

yr	station	replicate	Arthropoda CHIRON	Arthropoda COPEPO	Arthropoda CORACU	Arthropoda CRASEP	Arthropoda CYCVAR	Arthropoda DEXTHE	Arthropoda ERIBRA	Arthropoda ERIFIL	Arthropoda EUDORE	Arthropoda IANIRO	Arthropoda JASMAR	Arthropoda LEPPIN	Arthropoda LEPSAV	Arthropoda LIBDUB	Arthropoda LIBEMA	Arthropoda LISBAR
1998	OF-SS-1	A			5			1				21	7					
1998	OF-SS-1	B		3	24							6	11					
1998	OF-SS-2	A		6	115			2	6	1		27	20		5			
1998	OF-SS-2	B	1	28	231			22	14	3		43	20		41			
1998	OF-SS-3	A			34			2				26			4			
1998	OF-SS-3	B	1	26	22							8			4			
1998	OF-SS-4	A		17	14			1				7						
1998	OF-SS-4	B		42	19							20			2			
1998	OF-SS-5	A		10	1	1						1						
1998	OF-SS-5	B		156	5	2						2						
1998	OF-SS-6	A		36	2									2				
1998	OF-SS-6	B		30	2													
1998	OF-SS-7	A		130	9	1	5					6						
1998	OF-SS-7	B		71	5		2					1		2				
1998	OFF-8-BI	A			7									1	15			
1998	OFF-8-BI	C		6	3			3						2				
1998	OFF-9-BI	A		6	16			2					2		41			1
1998	OFF-9-BI	B			5										2			
1998	OFF-9-BI	C			21			2							25			
1998	OFF-9-BI	D			85			2							105			
1998	OFF-10-BI	A			17										34			
1998	OFF-10-BI	B			3		2								1			
1998	OFF-11-BI	A			25										1			
1998	OFF-11-BI	B			22													
1998	OFF-11-BI	C			4													
1998	OFF-11-BI	D			7										1			
1998	OFF-12-BI	A					77											
1998	OFF-12-BI	B			3		32							3				
1998	OFF-13-BI	A					197	1										
1998	OFF-13-BI	B																
1998	OFF-14-BI	A											1					
1998	OFF-14-BI	B									1			2				
1998	OFF-15-BI	A			23					1		1	2		71	1		
1998	OFF-15-BI	B			18								3	2	27			
1998	OFF-16-BI	A			6													
1998	OFF-16-BI	B			6													
1998	OFF-17-BI	A			1													
1998	OFF-17-BI	B																
1998	OFF-18-BI	A			3													
1998	OFF-18-BI	B																
1998	OFF-19-BI	A			2									1			1	
1998	OFF-19-BI	B																
1998	OFF-20-BI	A			16													
1998	OFF-20-BI	B			16			3										
1998	OFF-21-BI	A			5													
1998	OFF-21-BI	B			6													
1998	OF-SS-22	A			10			1				1						
1998	OF-SS-22	B	1		3							3						
1998	OFF-23-BI	A			5													
1998	OFF-23-BI	B			14													

Table A-1.con't.

yr	station	replicate	Arthropoda LYSALB	Arthropoda MELNIT	Arthropoda MICANO	Arthropoda MICRAN	Arthropoda MYSIDS	Arthropoda ORCHES	Arthropoda OXYSMI	Arthropoda OXYURO	Arthropoda PAGLON	Arthropoda PAGURU	Arthropoda PANHER	Arthropoda PARSPI	Arthropoda PINSAY	Arthropoda TRIEPI	Arthropoda UNCIRR	Arthropoda XANTHI
1998	OF-SS-1	A			2								3			1		
1998	OF-SS-1	B																
1998	OF-SS-2	A	16	17	32								2			41		
1998	OF-SS-2	B	12	16	123							1	3			46		
1998	OF-SS-3	A	17	6	31								6			30		1
1998	OF-SS-3	B	23	2	39				1				2	12		19		
1998	OF-SS-4	A	4	1	32								1			44		
1998	OF-SS-4	B	12	2	73					1			2			86		
1998	OF-SS-5	A		1	13					1			1			5		
1998	OF-SS-5	B	2		9						1		3			13		
1998	OF-SS-6	A			16	3				5								
1998	OF-SS-6	B			4					1								
1998	OF-SS-7	A			41								1					
1998	OF-SS-7	B			38													
1998	OFF-8-BI	A			5	1											4	
1998	OFF-8-BI	C			4								1				2	
1998	OFF-9-BI	A	6		40											4		
1998	OFF-9-BI	B			23	1				1	1					1		
1998	OFF-9-BI	C	4		50	1				2						6		
1998	OFF-9-BI	D	2		114	1	1			1			3			1		
1998	OFF-10-BI	A			104				2								1	
1998	OFF-10-BI	B			9				3									
1998	OFF-11-BI	A			41	1					1							
1998	OFF-11-BI	B			23				1									
1998	OFF-11-BI	C			21	5							1					
1998	OFF-11-BI	D			13				1									
1998	OFF-12-BI	A			5	1												
1998	OFF-12-BI	B			11				2									
1998	OFF-13-BI	A			1	1			4									
1998	OFF-13-BI	B			2													
1998	OFF-14-BI	A	1		2													
1998	OFF-14-BI	B															2	
1998	OFF-15-BI	A		2	41	1									1			
1998	OFF-15-BI	B		1	18	2	1											
1998	OFF-16-BI	A			22				11									
1998	OFF-16-BI	B			48	1			5									
1998	OFF-17-BI	A			16				19									
1998	OFF-17-BI	B			3				26									
1998	OFF-18-BI	A			1				73									
1998	OFF-18-BI	B				1			16								1	
1998	OFF-19-BI	A															1	
1998	OFF-19-BI	B			5				1									
1998	OFF-20-BI	A			96		1											
1998	OFF-20-BI	B			64	1			1									
1998	OFF-21-BI	A			34				10									
1998	OFF-21-BI	B			36			1	34		1							
1998	OF-SS-22	A		4	36						1					8		
1998	OF-SS-22	B		3	9				1							5		
1998	OFF-23-BI	A			11				2									1
1998	OFF-23-BI	B		1	119				2									

Table A-1.con't.

yr	station	replicate	Mollusca ACTCAN	Mollusca ANOSIM	Mollusca ANAAVA	Mollusca ANATRA	Mollusca ARCISL	Mollusca BITALT	Mollusca BIVALV	Mollusca BOOSEM	Mollusca CERPIN	Mollusca CORCON	Mollusca CRAVIR	Mollusca CREFOR	Mollusca CREPLA	Mollusca CUMTEL	Mollusca GASTRO	Mollusca GEMGEM
1998	OF-SS-1	A												2				
1998	OF-SS-1	B																
1998	OF-SS-2	A						2				1		4				
1998	OF-SS-2	B						5			1			15		12		
1998	OF-SS-3	A						1						15		1		1
1998	OF-SS-3	B							1					35	3			
1998	OF-SS-4	A												6	1	1		
1998	OF-SS-4	B												26	2	3		
1998	OF-SS-5	A																
1998	OF-SS-5	B												2				
1998	OF-SS-6	A											1	2	1			
1998	OF-SS-6	B																
1998	OF-SS-7	A		1									1	19	1			
1998	OF-SS-7	B																
1998	OFF-8-BI	A												1			2	
1998	OFF-8-BI	C	4				7							10				
1998	OFF-9-BI	A	3					3						3				
1998	OFF-9-BI	B	5											1				
1998	OFF-9-BI	C	3					15						2				
1998	OFF-9-BI	D	8	2				11						24	3		2	
1998	OFF-10-BI	A						9						23	3			
1998	OFF-10-BI	B						1										
1998	OFF-11-BI	A						1					2	16	2			
1998	OFF-11-BI	B						1						17				
1998	OFF-11-BI	C						1						6	2			
1998	OFF-11-BI	D												1	1			
1998	OFF-12-BI	A												1				
1998	OFF-12-BI	B																
1998	OFF-13-BI	A																
1998	OFF-13-BI	B																
1998	OFF-14-BI	A					9				1							
1998	OFF-14-BI	B	1				7											
1998	OFF-15-BI	A			11	1		2		29				10				
1998	OFF-15-BI	B			1	1	1	1		15				7				
1998	OFF-16-BI	A												4				
1998	OFF-16-BI	B												21				
1998	OFF-17-BI	A												18				
1998	OFF-17-BI	B	1															
1998	OFF-18-BI	A																
1998	OFF-18-BI	B																
1998	OFF-19-BI	A	2															
1998	OFF-19-BI	B	2															
1998	OFF-20-BI	A								2				54	2			
1998	OFF-20-BI	B								1				30				
1998	OFF-21-BI	A								1				14	2			
1998	OFF-21-BI	B					1			4				29	1			
1998	OF-SS-22	A																1
1998	OF-SS-22	B																
1998	OFF-23-BI	A												3				
1998	OFF-23-BI	B												9				

Table A-1.con't.

yr	station	replicate	Mollusca HAMSOL	Mollusca ILYTRI	Mollusca LITLIT	Mollusca LYOHYA	Mollusca MACBAL	Mollusca MERMER	Mollusca MITLUN	Mollusca MULLAT	Mollusca MYSPLA	Mollusca MYTEDU	Mollusca NASVIB	Mollusca NUCPRO	Mollusca NUDIBR	Mollusca ODOSTO	Mollusca PANGOU	Mollusca PERPAP
1998	OF-SS-1	A			172							110						
1998	OF-SS-1	B			256							140						
1998	OF-SS-2	A			1157	2			1			809						
1998	OF-SS-2	B			809	16		1				308						
1998	OF-SS-3	A			669			6	3			209						
1998	OF-SS-3	B			384			4				81		1				
1998	OF-SS-4	A			9			2			1	3						
1998	OF-SS-4	B			8			5				7		2				
1998	OF-SS-5	A			10							1						
1998	OF-SS-5	B			6			2				1						
1998	OF-SS-6	A			9						2	7						
1998	OF-SS-6	B			5			1				1						
1998	OF-SS-7	A			20			1				5		1				
1998	OF-SS-7	B			12							10		1				
1998	OFF-8-BI	A		6	2							62						
1998	OFF-8-BI	C	2		4	1						58		5		10		
1998	OFF-9-BI	A			113	3					1	52		3				
1998	OFF-9-BI	B			122	2					2	18		1		4		
1998	OFF-9-BI	C				1		3			2	50		6				
1998	OFF-9-BI	D			65	1		1			1	38		2		1		
1998	OFF-10-BI	A									2	3		1	1			
1998	OFF-10-BI	B		1								3		3				
1998	OFF-11-BI	A			7							4						
1998	OFF-11-BI	B			2							3						
1998	OFF-11-BI	C										4						
1998	OFF-11-BI	D			3							9						
1998	OFF-12-BI	A	1							1				6				
1998	OFF-12-BI	B	1											2				
1998	OFF-13-BI	A	1							1		2						
1998	OFF-13-BI	B	2		1							1						
1998	OFF-14-BI	A										6		1164				
1998	OFF-14-BI	B		4										1008				1
1998	OFF-15-BI	A		3	49	1			48			219		20				
1998	OFF-15-BI	B	2						4			427		33	1			
1998	OFF-16-BI	A										1		7				
1998	OFF-16-BI	B			1							2		20				
1998	OFF-17-BI	A								2		1		4				
1998	OFF-17-BI	B								1				6				
1998	OFF-18-BI	A					1											
1998	OFF-18-BI	B										7		1				
1998	OFF-19-BI	A	4					1				2	1	9			1	
1998	OFF-19-BI	B	3			2		1				14		7			2	
1998	OFF-20-BI	A										1		3				
1998	OFF-20-BI	B			1									17	1			
1998	OFF-21-BI	A												4				
1998	OFF-21-BI	B												6				
1998	OF-SS-22	A			16							15		5				
1998	OF-SS-22	B			8							27						
1998	OFF-23-BI	A			2							11		1				
1998	OFF-23-BI	B			2							68		1				

Table A-1.con't.

yr	station	replicate	Mollusca PETPHO	Mollusca RICPUN	Mollusca SOLVEL	Mollusca TELAGI	Mollusca TURBON	Mollusca TURELE	Mollusca UROCIN	Mollusca YOLLIM	Misc ANEMON	Misc ASTFOR	Misc AXISQU	Misc. HOLOTHU	Misc HYDROZ	Misc. NEMERT	Misc PHASTR	Misc PHORON
1998	OF-SS-1	A											1					
1998	OF-SS-1	B																
1998	OF-SS-2	A				1	1		1					1		2		
1998	OF-SS-2	B											11	3		17		
1998	OF-SS-3	A				1		3	2				2			2		
1998	OF-SS-3	B						2	1				3			2		
1998	OF-SS-4	A				1										1		
1998	OF-SS-4	B						1	1				2			3		
1998	OF-SS-5	A																
1998	OF-SS-5	B				1												
1998	OF-SS-6	A																
1998	OF-SS-6	B												1				
1998	OF-SS-7	A																
1998	OF-SS-7	B													1			
1998	OFF-8-BI	A				38		2		2						2		2
1998	OFF-8-BI	C				27		1		6						1		1
1998	OFF-9-BI	A						3	1				1			2		
1998	OFF-9-BI	B				3		6										
1998	OFF-9-BI	C			4	9		5					1		1	2		
1998	OFF-9-BI	D				8							1		1	4		
1998	OFF-10-BI	A				10					13					3		
1998	OFF-10-BI	B				13				1								
1998	OFF-11-BI	A																
1998	OFF-11-BI	B																
1998	OFF-11-BI	C				1												
1998	OFF-11-BI	D				1												
1998	OFF-12-BI	A													1			
1998	OFF-12-BI	B																
1998	OFF-13-BI	A																
1998	OFF-13-BI	B																
1998	OFF-14-BI	A			1	5		5		7						2		
1998	OFF-14-BI	B				6		6		4						5	1	1
1998	OFF-15-BI	A	1	11		50		3		9								
1998	OFF-15-BI	B		9		85				6						2		
1998	OFF-16-BI	A								1								
1998	OFF-16-BI	B				3		2										
1998	OFF-17-BI	A				2					1							
1998	OFF-17-BI	B				1				1								
1998	OFF-18-BI	A				2												
1998	OFF-18-BI	B				1												
1998	OFF-19-BI	A				6		3		2						1		
1998	OFF-19-BI	B		1		2		1		1								1
1998	OFF-20-BI	A				2												
1998	OFF-20-BI	B						1				1						
1998	OFF-21-BI	A				1		1										
1998	OFF-21-BI	B				4		1										
1998	OF-SS-22	A				10												
1998	OF-SS-22	B				4												
1998	OFF-23-BI	A				2												
1998	OFF-23-BI	B				3												

Appendix A

Species Codes and Notes

This list accompanies data collected in Narragansett Bay and submitted to SAIC (August 21, 1998) by Gary R. Gaston (University of Mississippi). Dr. Gaston can be contacted by email (bygaston@olemiss.edu) or by phone (601-232-7162).

ANNELIDS

Aglaophamus circinata	AGLCIR	Nephtyidae
Ampharetidae	AMPHAR	Ampharetidae
Anaitides mucosa	ANAMUC	Phyllodocidae
Aphelochaeta sp.	APHELO	Cirratulidae
Aricidea catherinae	ARICAT	Paraonidae
Asabellides oculata	ASAOCU	Ampharetidae
Boccardia hamata	BOCHAM	Spionidae
Brania wellfleetensis	BRAWEL	Syllidae
Capitella capitata	CAPCAP	Capitellidae
Chaetozone sp.	CHAETO	Cirratulidae
Cirriformia grandis	CIRGRA	Cirratulidae
Clymenella torquata	CLYTOR	Maldanidae
Demonax micropthalmus	DEMMIC	Sabellidae
Diopatra cuprea	DIOPAT	Onuphidae
Dodecaceria sp.	DODECA	Cirratulidae
Drilonereis sp.	DRILON	Oenonidae (formerly Arabellidae)
Euclymene sp.	EUCLYM	Maldanidae
Eumida sanguinea	EUMSAN	Phyllodocidae
Exgone dispar	EXODIS	Syllidae
Exgone hebes	EXOHEB	Syllidae
Glycera sp.	GLYCER	Glyceridae
Glycera americana	GLYAME	Glyceridae
Grubeosyllis clavata	GRUCLA	Syllidae
Gyptis vittata	GYPVIT	Hesionidae
Harmothoe extenuata	HAREXT	Polynoidae
Harmothoe imbricata	HARIMB	Polynoidae
Heteromastus filiformis	HETFIL	Capitellidae
Hydroides dianthus	HYDDIA	Serpulidae
Hypereteone heteropoda	HYPHET	Phyllodocidae
Laonice cirrata	LAOCIR	Spionidae
Leitoscoloplos acutus	LEIACU	Orbiniidae
Leitoscoloplos fragilis	LEIFRA	Orbiniidae
Leitoscoloplos robustus	LEIROB	Orbiniidae
Leitoscoloplos sp.	LEITOS	Orbiniidae
Lepidonotus squamata	LEPSQU	Polynoidae
Lepidonotus sublevis	LEPSUB	Polynoidae
Maldanidae	MALDAN	Maldanidae
Marenzellaria viridis	MARVIR	Spionidae
Mediomastus ambiseta	MEDAMB	Capitellidae
Neanthes arenaceodentata	NEAARE	Nereididae (formerly Nereidae)
Neanthes succinea	NEASUC	Nereididae (formerly Nereidae)
Neanthes virens	NEAVIR	Nereididae (formerly Nereidae)
Nephtys sp.	NEPHTY	Nephtyidae
Nephtys bucera	NEPBUC	Nephtyidae

Nephtys incisa	NEPINC	Nephtyidae
Nephtys picta	NEPPIC	Nephtyidae
Nereididae	NEREID	Nereididae (formerly Nereidae)
Ninoe nigripes	NINNIG	Lumbrineridae
Oligochaeta	OLIGOC	Oligochaeta
Ophryotrocha sp.	OPHRYO	Dorvilleidae
Owenia fusiformis	OWEFUS	Oweniidae
Paramphinome pulchella	PARPUL	Amphinomidae
Parapionosyllis longicirrata	PARLON	Syllidae
Pectinaria gouldii	PECGOU	Pectinariidae
Pherusa affinis	PHEAFF	Flabelligeridae
Pholoe minuta	PHOMIN	Polynoidae
Phyllodocidae	PHYLLO	Phyllodocidae
Phyllodoce arenae	PHYARE	Phyllodocidae
Pista palmata	PISPAL	Terebellidae
Platynereis dumerillii	PLADUM	Nereididae (formerly Nereidae)
Podarke obscura	PODOBS	Hesionidae
Polycirrus eximius	POLEXI	Terebellidae
Polydora sp.	POLYDO	Spionidae
Polydora caulleryi	POLCAU	Spionidae
Polydora commensalis	POLCOM	Spionidae
Polydora cornuta	POLCOR	Spionidae (= P. ligni)
Polygordius sp.	POLYGO	Polygordiidae (Archiannelida)
Prionospio cirrifera	PRICIR	Spionidae
Prionospio steenstrupi	PRISTE	Spionidae
Pygospio elegans	PYGELE	Spionidae
Sabaco elongata	SABELO	Maldanidae (genus was Asychis)
Sabellidae	SABELL	Sabellidae
Sabellaria vulgaris	SABVUL	Sabellariidae (colonial; number present estimated)
Schistomeringos caeca	SCHCAE	Dorvilleidae
Scolelepis squamata	SCOSQU	Spionidae
Scoletoma tenuis	SCOTEN	Lumbrineridae
Sphaerosyllis erinaceus	SPHERI	Syllidae
Spiochaetopterus oculatus	SPIOCU	Chaetopteridae
Spio setosa	SPISET	Spionidae
Spiophanes bombyx	SPIBOM	Spionidae
Spirorbis spirillum	SPISPI	Spirorbidae
Sthenelais boa	STHBOA	Sigalionidae
Streblospio benedicti	STRBEN	Spionidae
Streptosyllis arenae	STRARE	Syllidae
Syllidae	SYLLID	Syllidae
Terebellidae	TEREBE	Terebellidae

Arthropods

Ampelisca sp.	AMPELI	Ampeliscidae (complex of A. vadorum and A. abdita)
Amphipoda	AMPHIP	Amphipoda
Ampithoe longimana	AMPLON	Ampithoidae
Ampithoe valida	AMPVAL	Ampithoidae
Balanus sp.	BALANU	Cirripedia
Calliopius laeviusculus	CALLAE	Calliopiidae

Cancer irroratus	CANIRR	Decapoda
Caprella penantis	CAPPEN	Caprellidea
Caprellidea	CAPREL	Caprellidea
Carcinus maenas	CARMAE	Portunidae
Chironomidae	CHIRON	Chironomidae
Copepoda	COPEPO	Copepoda (at least some planktonic)
Corophium acutum	CORACU	Corophiidae
Crangon septemspinosa	CRASEP	Crangonidae
Cyclaspis varians	CYCVAR	Cumacea
Dexamine thea	DEXTHE	Dexaminidae
Erichsonella filiformis	ERIFIL	Isopoda
Erichthonius brasiliensis	ERIBRA	Corophiidae
Eudorella sp.	EUDORE	Cumacea
Ianiropsis sp.	IANIRO	Isopoda
Jassa marmorata	JASMAR	Ischyroceridae
Leptocheirus pinguis	LEPPIN	Aoridae
Leptochelia savignyi	LEPSAV	Tanaidceea
Libinia dubia	LIBDUB	Decapoda
Libinia emarginata	LIBEMA	Decapoda
Listriella barnardi	LISBAR	Liljeborgiidae
Lysianopsis alba	LYSALB	Lysianassidae
Melita nitida	MELNIT	Melitidae
Microdeutopsis anomalus	MICANO	Aoridae
Microprotopus raneyi	MICRAN	Photidae
Mysidacea	MYSIDS	Mysids
Orchestia sp.	ORCHES	Talitridae
Oxyurostylis sp.	OXYURO	Diastylidae; Cumacea
Oxyurostylis smithi	OXYSMI	Diastylidae
Pagurus sp.	PAGURU	Paguridae
Pagurus longicarpus	PAGLON	Paguridae
Panopeus herbstii	PANHER	Xanthidae
Paraphoxus spinosus	PARSPI	Phoxocephalidae
Pinnixa sayana	PINSAY	Pinnotheridae
Trichophoxus epistomus	TRIEPI	Phoxocephalidae
Unciola irrorata	UNCIRR	Aoridae
Xanthidae	XANTHI	Xanthidae

Molluscs

Acteocina canaliculata	ACTCAN	Scaphandridae
Anomia simplex	ANOSIM	Anomiidae
Anachis avara	ANAAVA	Columbellidae
Anadara transversa	ANATRA	Arcidae
Arctica islandica	ARCISL	Arcticidae
Bittium alternatum	BITALT	Cerithiidae
Bivalvia	BIVALV	Bivalvia (damaged or lost shell)
Boonea seminuda	BOOSEM	Pyrimidellidae (former Odostomia)
Cerastoderma pinnulatum	CERPIN	Cardiidae
Corbula contracta	CORCON	Corbulidae
Crassostrea virginica	CRAVIR	Ostreidae
Crepidula fornicata	CREFOR	Calyptraeidae

Crepidula plana	CREPLA	Calyptraeidae
Cumingia tellinoides	CUMTEL	Semelidae
Gastropoda	GASTRO	Gastropoda
Gemma gemma	GEMGEM	Veneridae
Haminoea solitaria	HAMSOL	Haminoeidae
Ilyanassa trivittata	ILYTRI	Nassariidae
Littorina littorea	LITLIT	Littorinidae
Lyonsia hyalina	LYOHYA	Lyonsiidae
Macoma balthica	MACBAL	Tellinidae
Mercenaria mercenaria	MERMER	Veneridae
Mitrella lunata	MITLUN	Columbellidae
Mulinia lateralis	MULLAT	Mactridae
Mysella planulata	MYSPLA	Leptonidae
Mytilus edulis	MYTEDU	Mytilidae
Nassarius vibex	NASVIB	Nassariidae
Nucula proxima	NUCPRO	Nuculidae
Nudibranchia	NUDIBR	Nudibranchia
Odostomia sp.	ODOSTO	Pyramidellidae
Pandora gouldiana	PANGOU	Pandoridae
Periploma papyratium	PERPAP	Periplomatidae
Petricola pholadiformis	PETPHO	Petricolidae
Rictaxis punctostriatus	RICPUN	Acteonidae (formerly Acteon)
Solemya velum	SOLVEL	Solemycidae
Tellina agilis	TELAGI	Tellinidae
Turbonilla sp.	TURBON	Pyramidellidae
Turbonilla elegantula	TURELE	Pyramidellidae
Urosalpinx cinerea	UROCIN	Muricidae
Yoldia limatula	YOLLIM	Nuculanidae

Other

Anemones	ANEMON (colonial; present = 1)	
Asterias forbesi	ASTFOR	Asteroidea
Axiognatha squamata	AXISQU	Ophiuroidea
Holothuroidea	HOLOTH	
Hydrozoa	HYDROZ (colonial; present = 1);mostly Podocoryna carnea	
Nemertean	NEMERT	
Phascolion strombi	PHASTR	Sipunculida
Phoronis sp.	PHORON	Phoronida
Sclerodactyla briareus	SCLBRI	Holothuroidea (old name = Thyone briareus)
Sipunculida	SIPUNC	
Tunicate	TUNICA	
Turbellaria	TURBEL	

Appendix B

Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Project: Coaster's Island Sampling

Client Name and Contact: Tetra Tech Steven Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OF-SS1-A	2	1L Polypropylene	3-27-98	3:30	EPA Van Veen Grab Sampler 0.04 m^2	Benthic Index
OF-SS1-B	2		3-27-98	3:30		
OF-SS2-A	3		3-27-98	3:30		
OF-SS2-B	2		3-27-98	3:30		
OF-SS3-A	4		3-27-98	3:30		
OF-SS3-B	2		3-27-98	3:30		
OF-SS4-A	2		3-27-98	3:30		
OF-SS4-B	2		3-27-98	3:30		
OF-SS5-A	2		3-26-98	3:30		
OF-SS5-B	3		3-26-98	3:30		
OF-SS6-A	1		3-26-98	3:30		
OF-SS6-B	1		3-26-98	3:30		
OF-SS7-A	3		3-26-98	3:30		
OF-SS7-B HLS	2		3-26-98	3:30		
Total: 31 31 HLS						

Packed/Released By: SAIC Signature: Heather Saffert Printed Name: Heather Saffert Date Time: ~~HLS 3-26-98 3:30~~ 3-27-98 3:30	Received By: Cornelia Heller Signature: Cornelia Heller Printed Name: Date Time: 3/27/98 4:00pm	Remarks: 2 grab samples (A + B) taken at each station and sieved separately.
Released By: Signature: Printed Name: Date Time:	Received By: Signature: Printed Name: Date Time:	
Final Destination:	Contact Name and Phone Number	
Shipping Method:	Page 1 of 2	

Original Form Accompanies Shipment

Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Project: Coaster's Island

Client Name and Contact: Tetra Tech Steven Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OF-SS22-A	2	1L Polypropylene	3-27-98	3 30	EPA Van Veen Grab Samples 0.04 m2	Benthic Index
OF-SS22-B	2	"	3 27-98	3:30		

Total : 4

Packed/Released By: SAIC Signature: Heather Seffert Printed Name: Heather Seffert Date Time: 3-27-98	Received By: Cornelia Hall Signature: [illegible] Printed Name: Date Time: 3/27/98 4:00pm	Remarks: OF-SS 22 = Reference Area
Released By: Signature: Printed Name: Date Time:	Received By: Signature: Printed Name: Date Time:	
Final Destination:	Contact Name and Phone Number	
Shipping Method:	Page 2 of 2	

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Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: FFTA (Coasters Is.)

Client Name and Contact: Tetra Tech Steven Parker

Sample No.	Containers No	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-20-BI-A	1	1 ltr poly	4/3/98	14:35	Benthic Infauna (0.04 m² grab)	Benthic Index (species id and enum)
OFF-20 BI-B	1		4/3/98	14:39		
OFF-10-BI-A	1		4/3/98	15:21		
OFF-10-BI-B	1		4/3/98	15:24		
OFF-16-BI-B	1		4/3/98	14:02		
OFF-16-BI-A	1		4/3/98	14:00		
OFF-11-BI-A	1		4/3/98	13:15		
OFF-11-BI-B	1		4/3/98	13:20		
OFF-21-BI-A	1		4/3/98	12:10		
OFF-21-BI-B	1		4/3/98	12:45		
OFF-17-BI-A	1		4/3/98	11:15		
OFF-17-BI-B	1		4/3/98	11:18		
OFF-12-BI-A	1		4/3/98	11:52		
OFF-12 BI-B	1		4/3/98	11:52		
OFF-18-BI-A	1		4/3/98	10:27		
Total	15					

Packed/Released By	Received By	Remarks
Signature: [signature] Date Time: 4/3/98 18:00	Signature: [signature] Date Time: 4/3/98 18:00	0.04 m² Van Veen grab sampling device
Printed Name: Jim T. Morris (SAIC)	Printed Name: Sherry Poucher	
Released By Signature: Printed Name: Date Time:	**Received By** Signature: Printed Name: Date Time:	
Final Destination:	Contact Name and Phone Number:	
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Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA (Coasters Island)

Client Name and Contact: Tetra Tech Steven Parker

Sample No	Containers No	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-18-BI-B	1	1L tr poly	4/3/98	10:31	Benthic Infauna (0.04 m² grab)	Benthic Index (sp id and enu)
OFF-13-BI-A	1		4/3/98	09:52		
OFF-13-BI-B	1		4/3/98	09:54		
OFF-23-BI-A	1		4/3/98	09:00		
OFF-23 BI B	1		4/3/98	09:05		
Total	5					

Packed/Released By	Date Time	Received By	Date Time	Remarks
Signature [signature]	4/3/98	Signature [signature]	18:00	
Printed Name John T. Morris (SAIC)	18:00	Printed Name Steven Parker	4/3/98	
Released By	Date Time	Received By	Date Time	
Signature		Signature		
Printed Name		Printed Name		
Final Destination		Contact Name and Phone Number		
Shipping Method		Page 2 of 2		

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SAIC, Science Applications International Corporation

Chain of Custody Record

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Project: OFFTA (Coaster Island)

Client Name and Contact: Tetra Tech Steven Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-9-BI-A	1	1L poly	4/7/98	11:30	Benthic Infauna (.04m² grab)	Benthic Index sp. id & environment
OFF-9-BI-B	1		4/7/98	11:30		
OFF-15-BI-A	1			12:46		
OFF-15-BI-B	1			12:48		
OFF-19-BI-A	1			13:20		
OFF-19-BI-B	1			13:20		
OFF-14-BI-A	1			14:10		
OFF-14-BI-B	1			14:10		
OFF-8-BI-A	1			14:55		
Total:	9					

Packed/Released By	Date Time	Received By:	Date Time	Remarks
Signature: Michael Cole	4/7/98 17:57	Signature: Brian Koziol	4/7/98 1751	
Printed Name: Michael Cole / SAIC		Printed Name: BRIAN KOZIOL		
Released By	Date Time	Received By.	Date Time	
Signature		Signature		
Printed Name		Printed Name		
Final Destination		Contact Name and Phone Number		
Shipping Method		Page 1 of 1		

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Chain of Custody Record

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Project: OFFTA (Coasters Island)

Client Name and Contact: Tetra Tech Steven Parker

Sample No.	Containers No	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-9-BI C	1	1L Poly	4/14/98	11:53	Benthic Infauna (0.04 m² grab)	Benthic Index
OFF-9-BI C	2	1L Poly	4/14/98	12:04	2 bottles	(species and id)
OFF-9-BI D	2	1L Poly	4/14/98	12:17	2 bottles	
OFF-11-BI C	1	1L Poly	4/14/98	14:09		
OFF-11-BI D	1	1L Poly	4/14/98	14:19		
Total:	7					

Packed/Released By: John T. Morris SAIC Signature: John T. Morris Printed Name: John T. Morris Date Time: 4/14/98 1555	Received By: BRIAN KOZIOL Signature: Brian Koziol Printed Name: BRIAN KOZIOL Date Time: 4/14/98 1555	Remarks - Supplemental samples
Released By Signature Printed Name Date Time	Received By. Signature Printed Name Date Time	
Final Destination	Contact Name and Phone Number	
Shipping Method	Page 1 of 1	

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Science Applications International Corporation

Chain of Custody Reco

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA

Client Name and Contact: BROWN AND ROOT ENVIRONMENTAL

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OF-SS1A	2	1L Plastic	3/27/98	1530	Benthic Grab	Benthic Analysis
OF-SS1-B	2	↓	↓	1530	↓	↓
OF-SS2-A	3	↓	↓	1530	↓	↓
OF-SS2-B	2	↓	↓	1530	↓	↓
OF-SS3-A	4	↓	↓	1530	↓	↓
Total :	13					

Packed/Released By: BRIAN KOZIOL SAIC
Signature: Brian Koziol
Printed Name: BRIAN KOZIOL
Date Time: 4/27/98 1530

Released By:
Signature:
Printed Name:
Date Time:

Received By: Carol M. Cleveland
Signature: Carol M Cleveland
Printed Name: Carol M. Cleveland
Date Time: 4 28 98 pm

Received By:
Signature:
Printed Name:
Date Time:

Final Destination: University of Miss.

Shipping Method: Federal Express

Contact Name and Phone Number: Gary Gaston 601-232-7162

Page 1 of 1

Remarks:

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Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Reco

Project: OFFTA

Client Name and Contact: BROWN AND ROOT ENVIRONMENTAL

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OF-SS22-A	2	1L Plastic	3-27-98	1530	Benthic Grab	Benthic Analysis
OF-SS22-B	2	1L Plastic	3-27-98	1530		
OF-SS3-B	2	1L Plastic	3-27-98	1530		
OF-SS4-A	2	1L Plastic	3-27-98	1530		
OF-SS4-B	2	1L Plastic	3-27-98	1530		
Total :	10					

Packed/Released By: BRIAN KOZIOL SAIC
Signature: Brian Koziol
Printed Name: BRIAN KOZIOL
Date Time: 4/27/98 1530

Released By:
Signature:
Printed Name:
Date Time

Received By: Carol M Cleveland
Signature: Carol M Cleveland
Printed Name: Carol M Cleveland
Date Time: 4-28-98 pm

Received By:
Signature:
Printed Name:
Date Time

Final Destination: UNIVERSITY OF MISS.

Shipping Method: FEDERAL EXPRESS

Contact Name and Phone Number: GARY GASTON 601-232-7162

Page 1 of 1

Remarks:

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Chain of Custody Reco

Project: OFFTA

Client Name and Contact: BROWN AND ROOT ENVIRONMENTAL

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OF-SS-5A	2	1L Plastic	3/26/98	1530	Benthic Grab	Benthic Analyses
OF-SS-5B	3			1530		
OF-SS-6A	1			1530		
OF-SS-6B	1			1530		
OF-SS-7A	3			1530		
OF-SS-7B	2			1530		
Total:	12					

Packed/Released By: BRIAN KOZIOL SAIC
Signature: Brian Koziol
Printed Name: BRIAN KOZIOL
Date Time: 4/27/98 1530

Released By:
Signature:
Printed Name:
Date Time:

Final Destination: UNIVERSITY OF MISS

Shipping Method: FEDERAL EXPRESS

Received By: Carol M. Cleveland
Signature: Carol M Cleveland
Printed Name: Carol M. Cleveland
Date Time: 4-27-98 pm

Received By:
Signature:
Printed Name:
Date Time:

Contact Name and Phone Number: GARY GASTON 601-232-7162

Page 1 of 1

Remarks:

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Chain of Custody Reco

Project: OFF TA

Client Name and Contact: BROWN AND ROOT ENVIRONMENTAL

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-11-B1-A	1	1L Plastic	4/3/98	1315	Benthic Grab	Benthic Analyses
OFF-11-B1-B	1			1320		
OFF-12-B1-A	1			1152		
OFF-12-B1-B	1			1156		
OFF-16-B1-A	1			~~1402~~ BK 1410		
OFF-16-B1-B	1			1402		
OFF-18-B1-A	1			1027		
OFF-18-B1-B	1			1031		
OFF-13-B1-A	1			0952		
OFF-13-B1-B	1			0954		
OFF-20-B1-A	1			1435		
OFF-20-B1-B	1			1439		
OFF-21-B1-A	1			1240		
OFF-21-B1-B	1			1245		
Total :	14					

Packed/Released By: BRIAN KOZICL SAIC
Signature: Brian Kozicl
Printed Name: BRIAN KOZICL
Date Time: 4/27/98 1530

Released By:
Signature:
Printed Name:
Date Time

Final Destination: University of Miss.

Shipping Method: Federal Express

Received By: Carol M Cleveland
Signature: Carol M Cleveland
Printed Name: Carol M Cleveland
Date Time: 4-28-98 pm

Received By:
Signature:
Printed Name:
Date Time

Contact Name and Phone Number: Gary Gaston 601-232-7162

Page 1 of 1

Remarks:

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Chain of Custody Reco

Project: OFFTA

Client Name and Contact: Brown + Root Environmental

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-9-B1 D	2	1L Plastic	4/14/98	1130	17 Benthic Grab	Benthic Analyses
OFF-9-B1 C	2	1L Plastic	4/14/98	1204		
* OFF-11-B1 D	2	1L Plastic	4/14/98	1419		
OFF-8-B1 C	2	1L Plastic	4/14/98	1153		
OFF-10-B1 A	1		4/3/98	1521		
OFF-10-B1 B	1		4/3/98	1524		
OFF-23 B1 A	1		4/3/98	0900		
OFF-23 B1 B	1		4/3/98	0905		
OFF-17-B1 A	1		4/3/98	1115		
OFF-17-B1 B	1		4/3/98	1118		
Total:	13					

Packed/Released By: BRIAN KOZIOL SAIC
Signature: Brian Koziol
Printed Name: BRIAN KOZIOL
Date Time: 4/21/98 1530

Released By:
Signature:
Printed Name:
Date Time:

Final Destination: ~~Brown Root~~ Gary Gaston University of Miss.

Shipping Method: Federal Express

Received By: Carol M Cleveland
Signature: Carol M Cleveland
Printed Name: Carol M Cleveland
Date Time: 4-28-98 pm

Received By:
Signature:
Printed Name:
Date Time:

Contact Name and Phone Number: Gary Gaston 601-232-7162

Page 1 of 1

Remarks: OFF-11-B1-D only 1 jar present however there was a jar labeled OFF-11-B1-C Both say 1 of 1 CMC

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Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Reco

Project: OFFTA

Client Name and Contact: BROWN AND ROOT ENVIRONMENTAL

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
Off-15-BI-A	1	1L Plastic	4-7-98	1246	Benthic Grab	Benthic Analysis
Off-15-BI-B	1	1L Plastic	4-7-98	1248		
Off-8-BI-A	1	1L Plastic	4-7-98	1455		
~~Off-8-BI-B~~						
Off-9-BI-A	1	1L Plastic	4-7-98	1130		
Off-9-BI-B	1	1L Plastic	4-7-98	1130		
Off-19-BI-A	1	1L Plastic	4-7-98	1320		
Off-19-BI-B	1	1L Plastic	4-7-98	1320		
Off-14-BI-A	1	1L Plastic	4-7-98	1410		
Off-14-BI-B	1	1L plastic	4-7-98	1410		
Total :	9					

Packed/Released By: BRIAN KOZIOL Signature: Brian Koziol SAIC Printed Name: BRIAN KOZIOL	Date Time 4/27/98 1530	Received By: Carol M Cleveland Signature: Carol M Cleveland Printed Name: Carol M. Cleveland
Released By: Signature: Printed Name:	Date Time	Received By: Signature: Printed Name:
Final Destination: University of Miss.		Contact Name and Phone Number: Gary Gaston 601-232-7162
Shipping Method: Federal Express		Page 1 of 1

Date Time: 4-28-98 pm

Remarks:

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APPENDIX B-2-2.
BIOTA BIVALVE CONDITION

Evaluation of Biotic Condition Indices for Indigenous and Deployed Blue Mussels (*Mytilus edulis*) near Newport, R.I. for the Draft Marine Ecological Risk Assessment for OFFTA, NETC

October 1998

Submitted to:
Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Submitted by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

SAIC Project No. 01-0440-04-9817-302
Task 4B and 5

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Methods 1

Results and Discussion 2

References 5

Figure 1. OFFTA NETC ERA sampling locations for deployed and indigenous mussels.

Table 1. Average station values for selected biotic measurements and condition indices for indigenous blue mussels collected from OFFTA NETC.

Table 2. Average station values for selected biotic measurements and condition indices for blue mussels deployed in OFFTA NETC.

Table 3. OFFTA NETC deployed mussel mortality mean by station trawl bag.

Appendix A. Calculated condition index data for indigenous blue mussels in OFFTA NETC.

Appendix B. Calculated condition index data for deployed blue mussels in OFFTA NETC.

Appendix C. Raw indigenous mussel condition data for OFFTA NETC.

Appendix D. Raw deployed mussel condition data for OFFTA NETC.

Appendix E. Chain-of-Custody Forms.

Introduction

The health of bivalve molluscs under varying environmental conditions has often been evaluated using measures of condition index, growth rate, and survival rate (Brown and Hartwick, 1988). While biotic condition indices derived from allometric relationships were developed primarily for detecting the ecophysiological health of organisms in aquaculture settings (e.g. Lucas and Benninger, 1985), their use has become more common in water quality monitoring programs (Lawrence and Scott, 1982).

Lucas and Benninger (1985) and Mann (1978) recommended the use of the ratio of dry tissue weight to dry shell weight as an index, where low index values are thought to be indicative of energy deficits resulting from environmental stress or loss of gametes. The ratio of dry tissue weight to shell volume (calculated from length) has also been proposed as a condition index, because the proportion of internal shell body occupied by tissue should reflect the status (related to fitness) of a bivalve's metabolic reserves (Brown and Hartwick, 1988). Also, the ratio of shell weight to shell length indicates shell thickness; enhanced shell thickness is interpreted as an indication of stunted shell growth resulting from crowding or other environmental influences.

The biotic condition of both deployed and indigenous blue mussels (*Mytilus edulis*) was examined as part of the ecological risk assessment being conducted at the Derecktor Shipyard, Newport, R.I, and are reported here. Measurements and subsequently calculated indices of biotic condition will be compared to chemical, biological and toxicological measurements in order to evaluate the likelihood that stressors attributable to Derecktor Shipyard activities are causing adverse ecological impacts.

Methods

Collection and Deployment:

Indigenous mussels were collected by hand from OFFTA NETC and reference locations on 26 May 1998. Indigeneous mussel sampling sites included 7 intertidal stations along the OFFTA waterfront (OFF-1, OFF-2, OFF-3, OFF-4, OFF-5, OFF-6, and OFF-7), and 1 reference location - located in an area of southeastern Coasters Harbor (OFF-22); Figure 1a.

Blue mussels used in the deployment study were collected from lower Narragansett Bay near Dutch Island. Approximately 2,000 mussels were collected from the site and brought back to SAIC in Narragansett, R.I. From this population, two hundred of these mussels were sorted by size (2.9 to 3.2 cm length), numbered on the shell with a diamond etching tool, and measured to the nearest 0.01 cm with vernier calipers. The selected size range (2.9 to 3.2 cm) represents animals young enough to permit appreciable growth during the deployment period, yet large enough to provide sufficient

tissue biomass for chemistry analysis.

Twenty mussels, including five numbered mussels were placed in polyethylene mesh bags. Four replicate bags per station were prepared. Each bag was attached to a float and mooring block such that the bag would remain suspended approximately 1 meter above bottom. The float/mooring assembly was connected in series to form a trawl. Each trawl had additional line on each end for connection to surface marker floats. These trawls were then deployed for a period of 60 days, one trawl per station, from June 17, 1998 at 7 locations in OFFTA (OFF-13, OFF-14, OFF-17, OFF-18, OFF-19, OFF-20, and OFF-21), as well as one reference location (OFF-23). Figure 1b indicates deployment stations in Coasters Harbor. An additional set of mussels, including 20 from the numbered and measured population were set aside for chemical and biological measurements according to approved SOP procedures. This set is referred to as "time zero" mussels, the data from which are intended for comparison against chemical and biological results for the deployed mussels. On graphs and in tables, results for time zero mussels are presented under station number T0.

Approximately half way through the sixty day deployment period, the trawls were hauled from the water to visually check the overall condition and mortality of the mussels before being returned to the water.

Analysis:

Following collection of indigenous and deployed mussels, length, wet weight, tissue dry weight, and shell weight were recorded. The ratios of dry Tissue Weight to Shell Length (CI-TW/SL), dry Tissue Weight to Shell Weight (CI-TW/SW), and dry Shell Weight to Shell Length (CI-SW/SL) were then calculated for use as indices of mussel condition.

For the indigenous mussels, the mean parameter values for a station were calculated using all mussels collected at the station (e.g. n=1). For deployed mussels, the mean values were calculated in two steps; 1) means of five individuals in each trawl bag were averaged first, and 2) the mean of individual bags (n=4) for each station was obtained. In the following graphs, the mean $\pm$ standard error for each station is presented. In addition, mortality (i.e. the number of dead mussels/total mussels) was also recorded. Biotic index calculations were not performed for moribund individuals.

Results and Discussion

Raw data for the indigenous and deployed mussel collections are listed in Appendices A-D. A summary of results for indigenous and deployed mussel measurements, condition indices and mortality is presented below.

Indigenous Mussels:

The following sections summarize the measurement, condition index, and mortality results for the indigenous mussels. Table 1 presents a complete listing of the indigenous mussel data.

Length. Average indigenous mussel length for the reference station is 50.8 mm. The highest mean length was 58.5 mm (OFF-7) corresponding to a 25% increase above the lowest mean value of 46.7 mm (OFF-4). Values for two of the assessment stations (OFF-2 and OFF-4) were below but close to the reference station value.

Tissue Dry Weight . Average mussel tissue weight for the reference station is 1.39 g. The highest mean weight was 1.9 g (OFF-7), equaling a 34% increase above the lowest mean value of 0.812 g (OFF-2). Average tissue weights for OFF-5, OFF-6, and OFF-7 were above the reference, while the remaining stations average tissue weights were below the reference, being from 14 to 71 % of the average reference station value.

Shell Weight. Average mussel shell weight for the reference station is 8.11 g at OFF-22. The range in assessment station values was almost a two-fold (89%) increase above the lowest value, being from 6.71 g (OFF-2) to 12.7 g (OFF-7).

Shell Weight to Shell Length Ratio. Average mussel Shell Weight to Shell Length ratio (CI-SW/SL) for the reference station is 0.157 at OFF-22. Mean assessment station values increased by 51% from lowest to highest, going from 0.14 g/mm (OFF-2) to 0.212 g/mm (OFF-7).

Tissue Dry Weight to Shell Length Ratio. The average Tissue Dry Weight to Shell Length (CI-TW/SL) values for indigenous mussels at the reference station is 0.028 g/mm at OFF-22. The range in assessment station values was approximately 82%, ranging from 0.031 g/mm at OFF-7 to 0.017 g/mm at OFF-2.

Tissue Dry Weight to Shell Weight Ratio. The range in station values for Tissue Dry Weight to Shell Weight (CI-TW/SW) for indigenous mussels at the reference station is 0.187 g/mm at OFF-22. The range in assessment station values was 31%, being from 0.121 g/g (OFF-1) to 0.158 g/g (OFF-3).

Deployed Mussels:

The following sections summarize the measurement, condition index, and mortality results for the deployed and Time zero mussels. Table 2 presents a complete listing of the deployed and Time zero mussel data.

Length. Time zero average mussel length was 30.5 mm. Average mussel length following deployment for the reference station is 38.8 mm at OFF-23. The highest mean length of 41.4 (OFF-20) was 8% above the lowest value of 38.2 mm.

Shell Weight. Time zero average dry shell weight was 1.19 g. Average shell weight for the reference station was 2.20 g at OFF-23. The range in assessment station values was approximately 23%, being from 2.01 g (OFF-21) to 2.59 g (OFF-14).

Tissue Weight. Time zero average dry tissue weight was 0.102 g. Average mussel tissue weight for the reference station was 0.490 g at OFF-23. Mean assessment station tissue weights increased by approximately 51%, ranging from 0.431 g (OFF-21) to 0.650 g (OFF-13).

Shell Weight to Shell Length Ratio. Time zero average Shell Weight to Shell Length ratio (CI-SW/SL) was 0.039 g/mm. Average mussel Shell Weight to Shell Length ratio for the reference station was 0.057 g/mm at OFF-23. The mean assessment station values increased by approximately 13% from lowest to highest (0.052 g/mm at OFF-21 to 0.059 g/mm at OFF-13 and OFF-14).

Tissue Dry Weight to Shell Length Ratio. Time zero average Tissue Dry Weight to Shell Length ratio (CI-TW/SL) was 0.003 g/mm. CI-TW/SL for deployed mussels at the reference station was 0.013 g/mm at OFF-23. The range in assessment station values was 46%, being from 0.011 g/mm (OFF-21) to 0.016 g/mm (OFF-20 and OFF-13). The assessment stations all had CI-TW/SL values close to the reference station.

Tissue Dry Weight to Shell Weight Ratio. Time zero average Tissue Dry Weight to Shell Length ratio (CI-TW/SW) was 0.086. Average CI-TW/SW value for mussels deployed at the reference station was 0.221 at OFF-23. Mean assessment station CI-TW/SW increased by approximately 32%, going from 0.203 g/mm (OFF-21) to 0.268 g/mm (OFF-20).

Mortality. Mortality of deployed mussels was observed at a number of stations, as can be seen in Table 3. Mortality rates ranged from 0% at several stations, to 25% at station OFF-21. Mortality rates of 5%, 10%, and 20% were observed at stations OFF-14, OFF-18, OFF-19, OFF-20, and OFF-23, respectively. At this point it is difficult to hypothesize as to the causes of mortality.

Much of the observed variation in mussel condition index and mortality values may be due to differences in water column or sediment contaminant levels. Correlations will be performed to elucidate potential exposure-response relationships.

References

Brown, J.R. and E.B. Hartwick, 1988. Influences of temperature, salinity and available food upon suspended culture of the pacific oyster, *Crassostrea gigas* II. Condition index and survival. Aquaculture, 70:253-267.

Lawrence, D.R. and G.I. Scott, 1982. The determination and use of condition index in oysters. Estuaries 5:23-27.

Lucas, A. and P.G. Benninger, 1985. The use of physiological condition indices in marine bivalve aquaculture. Aquaculture 44:187-200.

Mann, R. 1978. A Comparison of morphometric, biochemical and physiological indices of condition in marine bivalve molluscs. In: J.H. Thorpe and I.W. Gibbons (eds), Energy and Environmental Stress in Aquatic Systems. I.W. DOE Symp. Ser. 48:484-497.

Nelson, W.G., D.K. Phelps, W.B. Galloway, P.F. Rogerson, and R.J. Pruell, 1988. Effects of Black Rock Harbor dredged material on the scope for growth of the blue mussel, *Mytilus edulis*, after laboratory and field exposures. Technical Report D-87-7, prepared by the US Environmental Protection Agency, Environmental Research Laboratory, Narragansett, R.I. for the U.S. Army Engineers Wat

Table 1. Average station values for selected biotic measurements and condition indices for indigenous blue mussels collected from OFFTA NETC.

Field ID	Length (mm)	Tissue Dry Wt (g)	Shell Wt (g)	CI-SW/SL	CI-TW/SL	CI-TW/SW
OFF-1-BM-CI	52.9	1.08	8.87	0.166	0.020	0.121
OFF-2-BM-CI	47.0	0.812	6.71	0.140	0.017	0.124
OFF-3-BM-CI	50.0	1.22	7.83	0.155	0.024	0.158
OFF-4-BM-CI	46.7	0.95	7.05	0.147	0.020	0.137
OFF-5-BM-CI	55.8	1.67	10.6	0.185	0.029	0.156
OFF-6-BM-CI	54.4	1.40	10.0	0.174	0.024	0.137
OFF-7-BM-CI	58.5	1.90	12.7	0.212	0.031	0.147
OFF-22-BM-CI	50.8	1.39	8.11	0.157	0.028	0.187

CI-TW/SL = average station value for ratio of dry tissue weight to dry shell length.

CI-SW/SL = average station value for ratio of shell weight to shell length.

CI-TW/SW = average station value for ratio of dry tissue weight to shell weight.

Table 2. Average station values for selected biotic measurements and condition indices for blue mussels deployed in OFFTA NETC.

Field ID	Length (mm)	Tissue Dry Wt (g)	Shell Wt (g)	CI-SW/SL	CI-TW/SL	CI-TW/SW
T0	30.5	0.102	1.19	0.039	0.003	0.086
OFF-21-DEP*	38.2	0.461	2.01	0.052	0.012	0.216
OFF-20-DEP*	41.4	0.649	2.39	0.058	0.016	0.268
OFF-19-DEP*	40.7	0.624	2.21	0.053	0.015	0.260
OFF-18-DEP*	40.6	0.592	2.32	0.057	0.015	0.255
OFF-17-DEP	41.1	0.560	2.31	0.056	0.014	0.241
OFF-14-DEP*	43.5	0.541	2.59	0.059	0.012	0.208
OFF-13-DEP	41.0	0.650	2.42	0.059	0.016	0.267
OFF-23-DEP*	38.8	0.490	2.20	0.057	0.013	0.221

* Some mussels were not found in their shells (see Table 3).

CI-TW/SL = average station value for ratio of dry tissue weight to dry shell length.

CI-SW/SL = average station value for ratio of shell weight to shell length

CI-TW/SW = average station value for ratio of dry tissue weight to shell weight.

Table 3. OFFTA NETC Deployed Mussel Mortality
Mean by Station Trawl Bag.

FIELD ID	REP	NO. DEAD	TOTAL+	%MORT by Rep	%MORT by Station	MEAN STDEV
T0	A	0	5	0	0	0 ±0
	B	0	5	0		
	C	0	5	0		
	D	0	5	0		
OFF-21-DEP	A	0	5	0	25	20 ±16.3
	B	1	4	20		
	C	2	3	40		
	D	1	4	20		
OFF-20-DEP	A	0	5	0	20	20 ±16.3
	B	1	4	20		
	C	1	4	20		
	D	2	3	40		
OFF-19-DEP	A	0	5	0	10	15 ±10.0
	B	1	4	20		
	C	1	4	20		
	D	1	4	20		
OFF-18-DEP	A	1	4	20	10	10 ±11.5
	B	1	4	20		
	C	0	5	0		
	D	0	5	0		
OFF-17-DEP	A	0	5	0	0	0 ±0
	B	0	5	0		
	C	0	5	0		
	D	0	5	0		
OFF-14-DEP	A	0	5	0	5	5 ±10
	B	0	5	0		
	C	0	5	0		
	D	1	4	20		
OFF-13-DEP	A	0	5	0	0	0 ±0
	B	0	5	0		
	C	0	5	0		
	D	0	5	0		
OFF-23-DEP	A	2	3	40	20	20 ±23.1
	B	0	5	0		
	C	2	3	40		
	D	0	5	0		

+ = Total number of animals per rep after recovery.

Figure 1a. OFFTA, NETC ERA Sampling Locations for Indigenous Mussels

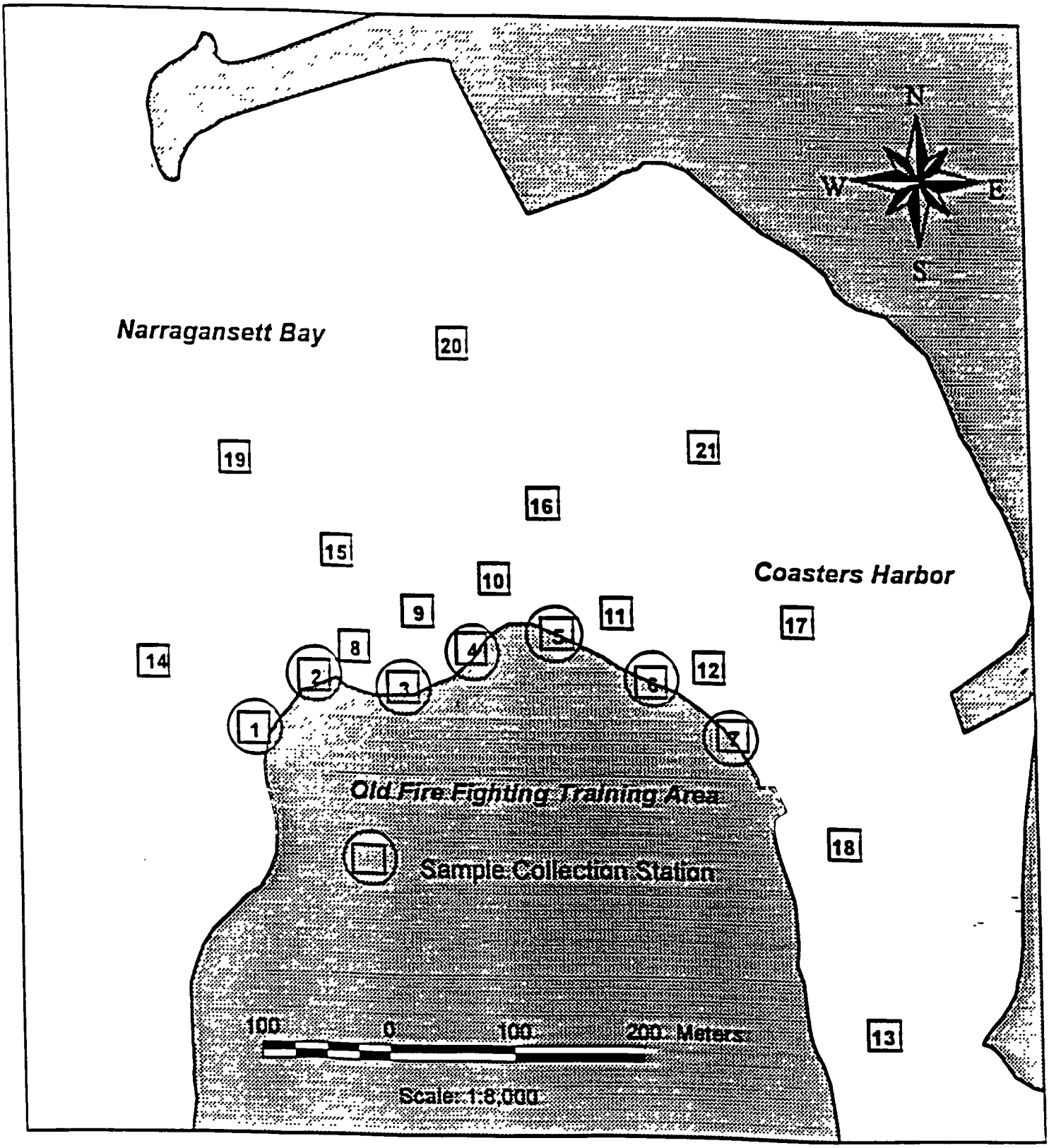
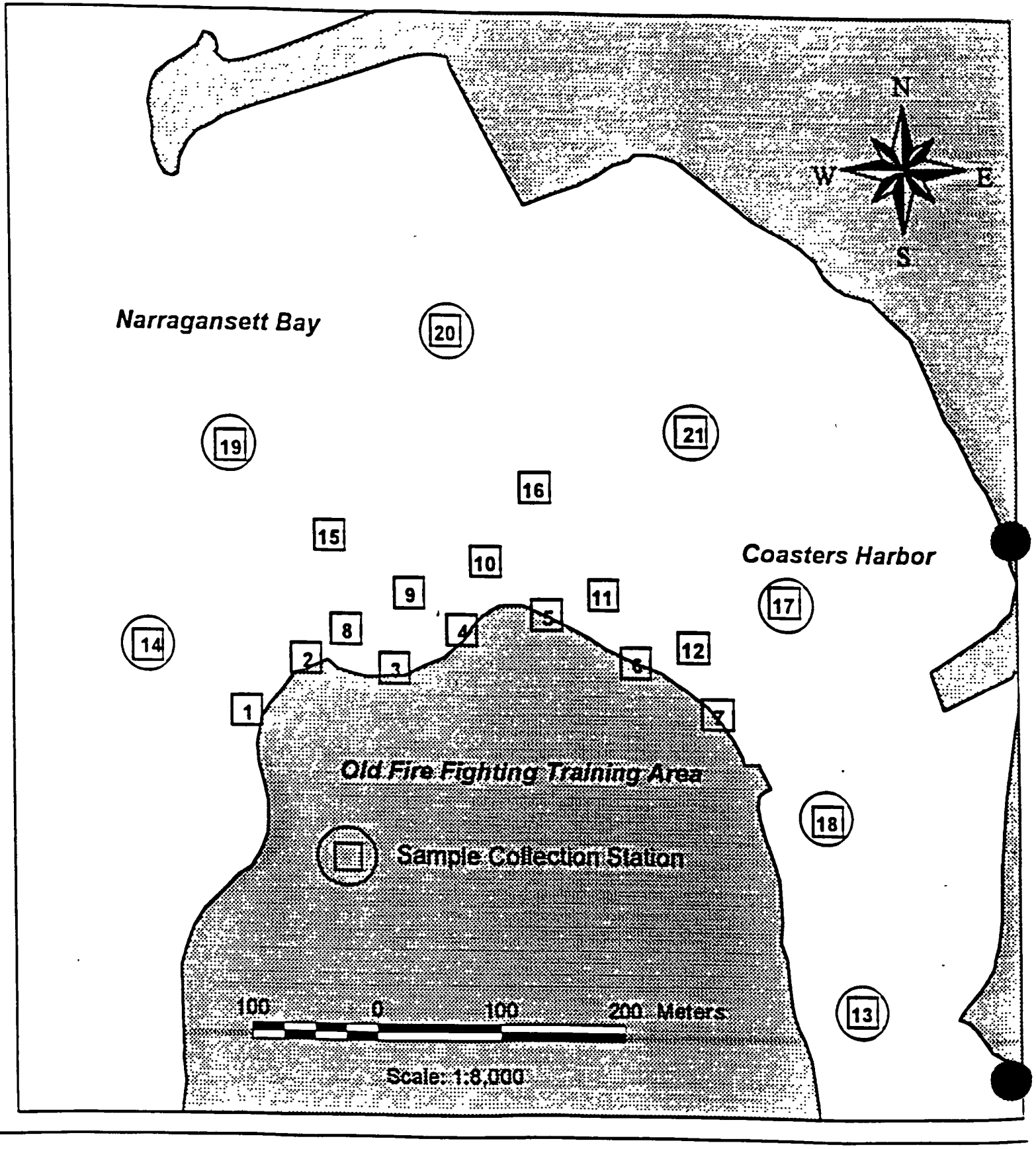


Figure 1b. OFFTA, NETC ERA Sampling Locations for Deployed Mussels



Appendix A

APPENDIX A. Calculated Condition Index Data for Indigenous Blue Mussels in OFFTA NETC.

FIELDID	Length	Tissue Dry Wt	Shell Wt	CI-SW/SL	CI-TW/SL	CI-TW/SW
OFF-1-BM-CI	54.1	1.3265	11.26	0.208	0.025	0.118
OFF-1-BM-CI	61.0	1.4529	14 09	0.231	0.024	0.103
OFF-1-BM-CI	50.7	0.8553	7 09	0.140	0.017	0.121
OFF-1-BM-CI	51.4	0.7746	6.93	0.135	0.015	0.112
OFF-1-BM-CI	56.8	1.2081	10 28	0.181	0.021	0.118
OFF-1-BM-CI	49.0	0.9511	7.65	0.156	0.019	0.124
OFF-1-BM-CI	54.0	0.7893	6.96	0.129	0.015	0.113
OFF-1-BM-CI	58.8	1.348	9.75	0 166	0.023	0.138
OFF-1-BM-CI	50.5	0.839	8.22	0.163	0.017	0.102
OFF-1-BM-CI	48.1	0.6574	6.31	0.131	0.014	0.104
OFF-1-BM-CI	55.1	1.1486	10.70	0.194	0.021	0.107
OFF-1-BM-CI	53.0	1.4065	9.70	0.183	0.027	0.145
OFF-1-BM-CI	54.3	1.0805	8.03	0.148	0.020	0.135
OFF-1-BM-CI	50.4	1.0292	8.92	0.177	0.020	0.115
OFF-1-BM-CI	48.3	1.0692	7 11	0.147	0.022	0.150
OFF-1-BM-CI	50.1	0.5738	6 09	0.122	0.011	0.094
OFF-1-BM-CI	52.0	1.4246	10 47	0.201	0.027	0.136
OFF-1-BM-CI	50.9	0 8984	7.28	0.143	0.018	0.123
OFF-1-BM-CI	51.2	1 21	8.08	0.158	0.024	0 150
OFF-1-BM-CI	58.5	1.4819	12.55	0.215	0.025	0.118
OFF-2-BM-CI	55.6	1.2097	9 81	0.176	0.022	0 123
OFF-2-BM-CI	59.0	1.1406	15.56	0.264	0.019	0.073
OFF-2-BM-CI	44.4	0.6103	5.93	0 134	0.014	0.103
OFF-2-BM-CI	49.0	0.8359	6 27	0.128	0.017	0.133
OFF-2-BM-CI	48.3	0.7458	4 85	0.100	0.015	0.154
OFF-2-BM-CI	55.0	1.3869	8 75	0.159	0.025	0.159
OFF-2-BM-CI	40.3	0 593	4.39	0.109	0.015	0.135
OFF-2-BM-CI	49.7	1.1314	6.68	0.135	0.023	0.169
OFF-2-BM-CI	42.3	0.5662	4.91	0.116	0.013	0.115
OFF-2-BM-CI	50.0	0.8506	6.89	0.138	0.017	0.124
OFF-2-BM-CI	48.5	0 8763	6.34	0.131	0.018	0.138
OFF-2-BM-CI	42.6	0.6947	5.06	0.119	0.016	0.137
OFF-2-BM-CI	42.0	0.7385	6.11	0.146	0.018	0.121
OFF-2-BM-CI	43.0	0.6008	5 29	0.123	0.014	0.114
OFF-2-BM-CI	47.4	0.9977	7.66	0.162	0.021	0.130
OFF-2-BM-CI	45.3	0.726	6.26	0.138	0.016	0.116
OFF-2-BM-CI	46.6	0.7949	6.60	0.142	0.017	0.120
OFF-2-BM-CI	45.8	0.5825	6.39	0.140	0.013	0.091
OFF-2-BM-CI	42.7	0.6466	5.43	0 127	0.015	0.119
OFF-2-BM-CI	43.6	0.5073	5.11	0.117	0.012	0.099
OFF-3-BM-CI	53.5	1.2858	7.43	0.139	0.024	0.173
OFF-3-BM-CI	56.2	1.4625	9.96	0.177	0.026	0.147
OFF-3-BM-CI	41.0	0.5866	3.61	0.088	0.014	0.163
OFF-3-BM-CI	46.3	0.9049	5.10	0.110	0.020	0.177
OFF-3-BM-CI	53.2	1.2827	7.43	0.140	0.024	0.173
OFF-3-BM-CI	53.3	1.2078	8.86	0.166	0.023	0.136
OFF-3-BM-CI	52.5	1.3784	9.01	0.172	0.026	0.153
OFF-3-BM-CI	41.4	0.9137	5.23	0.127	0.022	0.175
OFF-3-BM-CI	47.1	1.1175	6.93	0.147	0.024	0.161
OFF-3-BM-CI	48.1	1.0625	8.55	0.178	0.022	0.124
OFF-3-BM-CI	48.6	1.3028	8.56	0.176	0.027	0.152
OFF-3-BM-CI	48.1	1.0091	7.06	0.147	0.021	0.143
OFF-3-BM-CI	46.9	0.9287	7.58	0.162	0.020	0.123
OFF-3-BM-CI	46.9	1.0921	7.01	0.150	0.023	0.156
OFF-3-BM-CI	51.3	1.4964	8.19	0.160	0.029	0.183

FIELDID	Length	Tissue Dry Wt	Shell Wt	CI-SW/SL	CI-TW/SL	CI-TW/SW
OFF-3-BM-CI	46.1	0.9758	6.77	0.147	0.021	0.144
OFF-3-BM-CI	56.0	2.0902	8.60	0 154	0.037	0 243
OFF-3-BM-CI	59.3	1.5123	11.10	0.187	0.026	0.136
OFF-3-BM-CI	49.4	1.2683	8.58	0.174	0 026	0.148
OFF-3-BM-CI	55.0	1.6147	11.08	0.201	0 029	0.146
OFF-4-BM-CI	43.7	0 6357	4.66	0.107	0.015	0.136
OFF-4-BM-CI	42.8	0.7844	5.01	0 117	0.018	0.157
OFF-4-BM-CI	46.6	0.9079	7.71	0.166	0.020	0.118
OFF-4-BM-CI	45.2	0.8742	6 29	0.139	0.019	0.139
OFF-4-BM-CI	48.6	0.9977	6.69	0.138	0.021	0.149
OFF-4-BM-CI	42.8	0.7293	5.47	0.128	0.017	0.133
OFF-4-BM-CI	39.1	0.4417	3.66	0.094	0.011	0.121
OFF-4-BM-CI	47.4	0.8126	7.06	0.149	0.017	0.115
OFF-4-BM-CI	40.4	0.7057	4 86	0.120	0.017	0.145
OFF-4-BM-CI	45.0	0.7613	6 23	0.139	0.017	0 122
OFF-4-BM-CI	44.4	0.7703	5.07	0.114	0.017	0 152
OFF-4-BM-CI	53.3	1.7103	9.47	0.178	0.032	0 181
OFF-4-BM-CI	50.0	1.1448	8.17	0.163	0.023	0 140
OFF-4-BM-CI	43.5	0.5752	7 33	0.168	0.013	0.079
OFF-4-BM-CI	48.7	1.3815	8.17	0.168	0.028	0.169
OFF-4-BM-CI	41.9	0.7919	4 97	0.119	0.019	0.159
OFF-4-BM-CI	63.1	1.7983	13.66	0.217	0.029	0.132
OFF-4-BM-CI	54.7	1.357	13.69	0.251	0.025	0.099
OFF-4-BM-CI	44.7	0.879	5.31	0.119	0 020	0.166
OFF-4-BM-CI	48 4	0.9588	7 61	0.157	0.020	0.126
OFF-5-BM-CI	57.4	1.6335	10.11	0.176	0.028	0.162
OFF-5-BM-CI	57.4	1.6804	10.11	0 176	0.029	0.166
OFF-5-BM-CI	72.0	2.7999	16.86	0 234	0.039	0.166
OFF-5-BM-CI	57.3	1 7132	10.77	0.188	0.030	0.159
OFF-5-BM-CI	56.6	1.759	12.13	0.214	0.031	0.145
OFF-5-BM-CI	56.7	1 8487	10.40	0.183	0.033	0.178
OFF-5-BM-CI	62.0	1 9532	15.41	0.249	0.032	0.127
OFF-5-BM-CI	58.7	2.1513	16.16	0.275	0.037	0.133
OFF-5-BM-CI	61.6	1.6493	11 68	0.190	0.027	0.141
OFF-5-BM-CI	46.1	0.7969	5.96	0 129	0.017	0.134
OFF-5-BM-CI	31.2	0 3105	2.04	0.065	0.010	0.152
OFF-5-BM-CI	62.0	2.5431	12.58	0.203	0.041	0.202
OFF-5-BM-CI	58.4	1.603	10.46	0.179	0.027	0.153
OFF-5-BM-CI	55.2	1.884	10.23	0.186	0.034	0.184
OFF-5-BM-CI	56.6	1.686	8.97	0.158	0.030	0.188
OFF-5-BM-CI	54.1	1.6955	10.50	0.194	0.031	0.162
OFF-5-BM-CI	63.9	2.0563	11 50	0.180	0.032	0.179
OFF-5-BM-CI	38.2	0.4178	3 82	0.100	0.011	0.109
OFF-5-BM-CI	54.4	1.8537	10.51	0.193	0.034	0.176
OFF-5-BM-CI	57.2	1.4458	12.77	0.223	0.025	0.113
OFF-6-BM-CI	41.1	0.5174	3.77	0.092	0.013	0.137
OFF-6-BM-CI	73.1	2.683	23.17	0.317	0.037	0.116
OFF-6-BM-CI	54.7	0.9214	10.15	0.186	0.017	0.091
OFF-6-BM-CI	49.0	0.6984	5.82	0.119	0.014	0.120
OFF-6-BM-CI	40.2	0.47	4.29	0.107	0.012	0.110
OFF-6-BM-CI	55.1	1.3339	8.50	0.154	0.024	0.157
OFF-6-BM-CI	50.8	1.3862	8.73	0.172	0.027	0.159
OFF-6-BM-CI	40.2	0.4982	3.74	0.093	0.012	0.133
OFF-6-BM-CI	63.7	2.2184	14.24	0.224	0.035	0.156
OFF-6-BM-CI	59.8	1.6455	9.99	0.167	0.028	0.165
OFF-6-BM-CI	63.4	1.4427	14.30	0.226	0.023	0.101
OFF-6-BM-CI	58.0	1.5565	11.63	0.201	0.027	0.134

FIELDID	Length	Tissue Dry Wt	Shell Wt	CI-SW/SL	CI-TW/SL	CI-TW/SW
OFF-6-BM-CI	67.8	2.5801	14.88	0.219	0.038	0.173
OFF-6-BM-CI	68.1	2.9556	14.86	0.218	0.043	0.199
OFF-6-BM-CI	48.3	0.8872	7.06	0.146	0.018	0.126
OFF-6-BM-CI	62.8	2.3669	15.42	0.246	0.038	0.154
OFF-6-BM-CI	40 0	0.3796	3.13	0.078	0.010	0.121
OFF-6-BM-CI	53.6	1.0648	9.32	0.174	0.020	0.114
OFF-6-BM-CI	39.9	0.4883	3.11	0.078	0.012	0.157
OFF-6-BM-CI	58.0	1.9022	14.87	0.257	0.033	0.128
OFF-7-BM-CI	58.2	1.9791	14.05	0.242	0.034	0.141
OFF-7-BM-CI	51.4	1.2349	10.00	0.195	0.024	0.124
OFF-7-BM-CI	57.2	1.7968	14.25	0.249	0.031	0.126
OFF-7-BM-CI	51.7	1 2958	8.93	0.173	0.025	0 145
OFF-7-BM-CI	62.1	2.0871	14.00	0.225	0.034	0 149
OFF-7-BM-CI	61.9	2.1724	10.83	0.175	0.035	0 201
OFF-7-BM-CI	71.6	3.0815	17.78	0.249	0.043	0.173
OFF-7-BM-CI	61.5	2.1593	12.14	0.197	0.035	0.178
OFF-7-BM-CI	71.1	3.005	19.79	0.278	0.042	0.152
OFF-7-BM-CI	47.4	0.8691	8.79	0.186	0.018	0.099
OFF-7-BM-CI	66.6	2.8057	24.40	0 366	0.042	0.115
OFF-7-BM-CI	60.0	1.6052	12.46	0.208	0.027	0.129
OFF-7-BM-CI	65.6	2.9063	15.57	0.237	0.044	0.187
OFF-7-BM-CI	66.9	3.2283	15.55	0.232	0.048	0.208
OFF-7-BM-CI	48.0	0.6002	6.13	0.128	0 013	0.098
OFF-7-BM-CI	60.1	1.9425	12.99	0 216	0.032	0.150
OFF-7-BM-CI	49.2	0.9437	8.95	0.182	0.019	0.105
OFF-7-BM-CI	49.2	0.9863	6.85	0.139	0.020	0.144
OFF-7-BM-CI	61.1	2.2875	12.85	0.210	0.037	0.178
OFF-7-BM-CI	49.2	1.1	7 41	0.151	0.022	0.148
OFF-22-BM-CI	51.0	0.9314	7.16	0.141	0.018	0.130
OFF-22-BM-CI	47.1	6.9238	6.04	0.128	0.147	1.146
OFF-22-BM-CI	47 5	1.0288	9.40	0.198	0.022	0.109
OFF-22-BM-CI	48.4	1 0183	5.50	0.114	0.021	0.185
OFF-22-BM-CI	49.9	0.7702	6.64	0.133	0.015	0.116
OFF-22-BM-CI	54.5	1.3183	9.90	0 182	0.024	0.133
OFF-22-BM-CI	50.4	1.0443	7.95	0.158	0.021	0.131
OFF-22-BM-CI	49.3	0.8935	7.22	0.147	0.018	0.124
OFF-22-BM-CI	43.4	0.6933	4.78	0.110	0.016	0.145
OFF-22-BM-CI	59.5	1.8367	13.06	0.219	0.031	0.141
OFF-22-BM-CI	57.8	1.3706	8.92	0.154	0.024	0.154
OFF-22-BM-CI	50.5	1.0175	7.98	0.158	0.020	0.128
OFF-22-BM-CI	57.0	1.4877	10.65	0.187	0.026	0.140
OFF-22-BM-CI	47.4	0.8256	6.06	0.128	0.017	0.136
OFF-22-BM-CI	48.6	1 2129	7.17	0.148	0.025	0.169
OFF-22-BM-CI	45.7	0.7744	5.18	0.113	0.017	0.150
OFF-22-BM-CI	53.6	1.1514	8.69	0.162	0.021	0.133
OFF-22-BM-CI	56.5	1.5703	15.06	0.267	0.028	0.104
OFF-22-BM-CI	48.7	0.7911	6.48	0.133	0.016	0.122
OFF-22-BM-CI	50.1	1.1735	8.33	0.166	0.023	0.141

CI-TW/SL = average station value for ratio of dry tissue weight to dry shell length

CI-SW/SL = average station value for ratio of shell weight to shell length.

CI-TW/SW = average station value for ratio of dry tissue weight to shell weight.

Appendix B

APPENDIX B. Calculated Condition Index Data for Deployed Blue Mussels in OFFTA NETC.

FIELDID	Length	Tissue Dry Wt	Shell Wt	CI-SW/SL	CI-TW/SL	CI-TW/SW
T0	30.7	0.099	1.10	0.036	0.003	0.090
T0	31.8	0.111	1.38	0.044	0.004	0.081
T0	29.7	0.122	1.20	0.041	0.004	0.102
T0	30.5	0.084	1.11	0.036	0.003	0.076
T0	30.7	0.132	1.50	0.049	0.004	0.088
T0	31.1	0.119	1.29	0.042	0.004	0.092
T0	31.1	0.130	1.26	0.040	0.004	0.103
T0	30.8	0.107	1.21	0.039	0.003	0.089
T0	30.1	0.093	1.10	0.037	0.003	0.084
T0	30.9	0.109	1.31	0.043	0.004	0.083
T0	30.3	0.103	1.09	0.036	0.003	0.094
T0	30.3	0.065	1.28	0.042	0.002	0.051
T0	30.6	0.113	1.08	0.035	0.004	0.104
T0	29.7	0.088	1.01	0.034	0.003	0.087
T0	31.1	0.105	1.15	0.037	0.003	0.091
T0	30.3	0.103	1.18	0.039	0.003	0.087
T0	30.1	0.097	1.18	0.039	0.003	0.082
T0	29.4	0.077	1.12	0.038	0.003	0.069
T0	30.9	0.087	1.05	0.034	0.003	0.083
T0	30.3	0.090	1.19	0.039	0.003	0.075
OFF-21-DEP	30.1	EM	1.15	0.038		
OFF-21-DEP	42.9	0.632	2.39	0.056	0.015	0.265
OFF-21-DEP	34.6	0.284	1.63	0.047	0.008	0.174
OFF-21-DEP	43.1	0.423	2.42	0.056	0.010	0.175
OFF-21-DEP	43.0	0.518	2.23	0.052	0.012	0.232
OFF-21-DEP	39.9	0.643	2.34	0.059	0.016	0.274
OFF-21-DEP	38.9	0.512	1.97	0.051	0.013	0.261
OFF-21-DEP	EM					
OFF-21-DEP	32.2	0.095	1.15	0.036	0.003	0.083
OFF-21-DEP	44.0	0.656	2.53	0.057	0.015	0.260
OFF-21-DEP	EM					
OFF-21-DEP	EM					
OFF-21-DEP	39.2	0.528	2.29	0.059	0.013	0.230
OFF-21-DEP	EM					
OFF-21-DEP	38.6	0.524	2.29	0.059	0.014	0.229
OFF-21-DEP	41.9	0.522	2.54	0.061	0.012	0.205
OFF-21-DEP	EM					
OFF-21-DEP	33.6	0.339	1.48	0.044	0.010	0.229
OFF-21-DEP	35.7	0.386	2.00	0.056	0.011	0.193
OFF-21-DEP	34.9	0.390	1.78	0.051	0.011	0.219
OFF-20-DEP	43.8	0.765	2.45	0.056	0.017	0.312
OFF-20-DEP	42.8	0.534	2.42	0.056	0.012	0.221
OFF-20-DEP	42.9	0.817	2.92	0.068	0.019	0.280
OFF-20-DEP	41.7	0.650	2.33	0.056	0.016	0.279
OFF-20-DEP	39.7	0.566	2.06	0.052	0.014	0.275
OFF-20-DEP	EM					
OFF-20-DEP	42.4	0.699	2.41	0.057	0.016	0.290

FIELDID	Length	Tissue Dry Wt	Shell Wt	CI-SW/SL	CI-TW/SL	CI-TW/SW
OFF-20-DEP	36.0	0.484	1.84	0.051	0.013	0.263
OFF-20-DEP	38.9	0.576	2.12	0.054	0.015	0.272
OFF-20-DEP	38.1	0.532	2.05	0.054	0.014	0.260
OFF-20-DEP	41.4	0.565	2.13	0.051	0.014	0.265
OFF-20-DEP	42.2	0.562	2.46	0.058	0.013	0.229
OFF-20-DEP	43.0	0.646	2.56	0.059	0.015	0.253
OFF-20-DEP	39.1	0.554	2.17	0.056	0.014	0.255
OFF-20-DEP	EM					
OFF-20-DEP	EM					
OFF-20-DEP	EM					
OFF-20-DEP	47.3	0.935	3.18	0.067	0.020	0.294
OFF-20-DEP	38.7	0.404	2.16	0.056	0.010	0.187
OFF-20-DEP	44.1	1.101	3.06	0.070	0.025	0.359
OFF-19-DEP	32.1	0.352	1.57	0.049	0.011	0.224
OFF-19-DEP	45.4	0.891	2.59	0.057	0.020	0.343
OFF-19-DEP	43.0	0.648	2.32	0.054	0.015	0.279
OFF-19-DEP	42.2	0.717	2.64	0.063	0.017	0.271
OFF-19-DEP	46.6	1.097	2.92	0.063	0.024	0.376
OFF-19-DEP	31.9	0.250	1.26	0.040	0.008	0.198
OFF-19-DEP	EM					
OFF-19-DEP	35.3	0.415	1.86	0.053	0.012	0.224
OFF-19-DEP	46.1	0.978	2.99	0.065	0.021	0.327
OFF-19-DEP	34.5	0.355	1.85	0.053	0.010	0.193
OFF-19-DEP	EM	0.000				
OFF-19-DEP	38.8	0.928	2.20	0.057	0.024	0.422
OFF-19-DEP	32.0	0.159	1.16	0.036	0.005	0.137
OFF-19-DEP	37.2	0.321	1.77	0.048	0.009	0.181
OFF-19-DEP	49.3	1.005	2.90	0.059	0.020	0.347
OFF-19-DEP	39.5	EM	1.01			
OFF-19-DEP	48.5	0.999	3.07	0.063	0.021	0.325
OFF-19-DEP	42.4	0.550	2.68	0.063	0.013	0.205
OFF-19-DEP	44.7	0.908	2.47	0.055	0.020	0.368
OFF-19-DEP	43.0	0.658	2.58	0.060	0.015	0.254
OFF-18-DEP	41.7	0.619	2.15	0.052	0.015	0.288
OFF-18-DEP	42.6	0.659	2.59	0.061	0.015	0.255
OFF-18-DEP	EM					
OFF-18-DEP	33.0	0.289	1.57	0.048	0.009	0.184
OFF-18-DEP	40.7	0.669	2.30	0.056	0.016	0.291
OFF-18-DEP	EM					
OFF-18-DEP	41.3	0.712	2.38	0.058	0.017	0.299
OFF-18-DEP	42.9	0.647	2.32	0.054	0.015	0.279
OFF-18-DEP	39.2	0.491	2.38	0.061	0.013	0.206
OFF-18-DEP	40.0	0.703	2.33	0.058	0.018	0.302
OFF-18-DEP	36.0	0.357	1.71	0.048	0.010	0.208
OFF-18-DEP	41.7	0.665	2.13	0.051	0.016	0.312
OFF-18-DEP	45.0	0.612	2.50	0.056	0.014	0.245
OFF-18-DEP	42.7	0.601	2.36	0.055	0.014	0.255
OFF-18-DEP	39.9	0.572	2.34	0.059	0.014	0.245
OFF-18-DEP	39.1	0.514	2.21	0.057	0.013	0.232
OFF-18-DEP	41.2	0.630	2.86	0.069	0.015	0.220

FIELDID	Length	Tissue Dry Wt	Shell Wt	CI-SW/SL	CI-TW/SL	CI-TW/SW
OFF-18-DEP	39.8	0.569	2.40	0.060	0.014	0.237
OFF-18-DEP	41.0	0.733	2.40	0.059	0.018	0.306
OFF-18-DEP	43.1	0.622	2.75	0.064	0.014	0.226
OFF-17-DEP	40.1	0.640	2.81	0.070	0.016	0.228
OFF-17-DEP	43.1	0.528	2.46	0.057	0.012	0.214
OFF-17-DEP	42.8	0.618	2.38	0.055	0.014	0.260
OFF-17-DEP	43.5	0.682	2.55	0.059	0.016	0.267
OFF-17-DEP	41.0	0.733	2.60	0.064	0.018	0.281
OFF-17-DEP	43.6	0.616	2.12	0.049	0.014	0.291
OFF-17-DEP	40.3	0.562	2.38	0.059	0.014	0.237
OFF-17-DEP	41.1	0.667	2.38	0.058	0.016	0.280
OFF-17-DEP	42.2	0.684	2.57	0.061	0.016	0.266
OFF-17-DEP	31.2	0.291	1.26	0.040	0.009	0.232
OFF-17-DEP	45.6	0.197	2.81	0.062	0.004	0.070
OFF-17-DEP	45.3	0.785	2.83	0.062	0.017	0.278
OFF-17-DEP	43.2	0.716	2.67	0.062	0.017	0.268
OFF-17-DEP	41.1	0.303	1.97	0.048	0.007	0.154
OFF-17-DEP	42.5	0.715	2.39	0.056	0.017	0.300
OFF-17-DEP	31.8	0.207	1.37	0.043	0.007	0.151
OFF-17-DEP	41.6	0.466	2.10	0.051	0.011	0.222
OFF-17-DEP	41.3	0.587	2.24	0.054	0.014	0.262
OFF-17-DEP	40.6	0.591	2.26	0.056	0.015	0.261
OFF-17-DEP	40.7	0.619	2.12	0.052	0.015	0.292
OFF-14-DEP	42.9	0.559	2.36	0.055	0.013	0.237
OFF-14-DEP	45.2	0.480	2.43	0.054	0.011	0.198
OFF-14-DEP	45.6	0.724	2.65	0.058	0.016	0.273
OFF-14-DEP	44.7	0.516	2.69	0.060	0.012	0.191
OFF-14-DEP	39.9	0.441	2.28	0.057	0.011	0.193
OFF-14-DEP	41.4	0.440	2.83	0.069	0.011	0.155
OFF-14-DEP	41.7	0.403	2.41	0.058	0.010	0.168
OFF-14-DEP	46.2	0.625	2.74	0.059	0.014	0.228
OFF-14-DEP	43.4	0.431	2.41	0.055	0.010	0.179
OFF-14-DEP	43.1	0.653	2.59	0.060	0.015	0.252
OFF-14-DEP	46.4	0.717	2.97	0.064	0.015	0.241
OFF-14-DEP	47.3	0.753	2.94	0.062	0.016	0.256
OFF-14-DEP	36.1	0.458	2.03	0.056	0.013	0.225
OFF-14-DEP	42.7	0.370	2.50	0.058	0.009	0.148
OFF-14-DEP	43.1	0.403	2.42	0.056	0.009	0.167
OFF-14-DEP	43.7	0.354	2.45	0.056	0.008	0.144
OFF-14-DEP	46.2	0.709	3.02	0.066	0.015	0.234
OFF-14-DEP	EM					
OFF-14-DEP	47.7	0.850	2.80	0.059	0.018	0.303
OFF-14-DEP	40.5	0.395	2.60	0.064	0.010	0.152
OFF-13-DEP	34.7	0.382	1.78	0.051	0.011	0.214
OFF-13-DEP	41.6	0.758	2.64	0.063	0.018	0.288
OFF-13-DEP	41.8	0.734	2.48	0.059	0.018	0.296
OFF-13-DEP	43.1	0.704	2.87	0.067	0.016	0.245
OFF-13-DEP	43.1	0.951	2.24	0.052	0.022	0.424
OFF-13-DEP	39.4	0.592	2.06	0.052	0.015	0.287
OFF-13-DEP	38.3	0.458	1.95	0.051	0.012	0.235

FIELDID	Length	Tissue Dry Wt	Shell Wt	CI-SW/SL	CI-TW/SL	CI-TW/SW
OFF-13-DEP	39.7	0.611	2.37	0.060	0.015	0.258
OFF-13-DEP	43.0	0.698	2.65	0.062	0.016	0.264
OFF-13-DEP	42.2	0.675	2.51	0.059	0.016	0.269
OFF-13-DEP	41.6	0.767	2.72	0.065	0.018	0.283
OFF-13-DEP	44.7	0.994	2.81	0.063	0.022	0.353
OFF-13-DEP	44.5	0.905	3.16	0.071	0.020	0.286
OFF-13-DEP	39.0	0.379	1.80	0.046	0.010	0.210
OFF-13-DEP	41.2	0.566	2.28	0.056	0.014	0.248
OFF-13-DEP	39.2	0.344	2.27	0.058	0.009	0.151
OFF-13-DEP	40.7	0.507	2.35	0.058	0.012	0.216
OFF-13-DEP	42.3	0.750	2.76	0.065	0.018	0.271
OFF-13-DEP	40.3	0.569	2.63	0.065	0.014	0.217
OFF-13-DEP	39.1	0.660	2.06	0.053	0.017	0.320
OFF-23-DEP	EM					
OFF-23-DEP	43.2	0.585	2.10	0.049	0.014	0.278
OFF-23-DEP	34.2	0.339	1.87	0.055	0.010	0.181
OFF-23-DEP	EM					
OFF-23-DEP	43.4	0.583	2.31	0.053	0.013	0.253
OFF-23-DEP	41.4	0.545	2.67	0.065	0.013	0.204
OFF-23-DEP	41.9	0.548	2.40	0.057	0.013	0.228
OFF-23-DEP	34.5	0.407	2.11	0.061	0.012	0.193
OFF-23-DEP	36.5	0.360	1.96	0.054	0.010	0.183
OFF-23-DEP	36.5	0.423	1.90	0.052	0.012	0.223
OFF-23-DEP	EM					
OFF-23-DEP	39.5	0.620	2.41	0.061	0.016	0.258
OFF-23-DEP	44.8	0.754	2.91	0.065	0.017	0.259
OFF-23-DEP	EM					
OFF-23-DEP	38.8	0.560	2.20	0.057	0.014	0.254
OFF-23-DEP	36.2	0.323	1.92	0.053	0.009	0.169
OFF-23-DEP	36.5	0.438	2.29	0.063	0.012	0.191
OFF-23-DEP	39.1	0.476	2.07	0.053	0.012	0.230
OFF-23-DEP	38.0	0.461	2.24	0.059	0.012	0.206
OFF-23-DEP	36.8	0.427	1.84	0.050	0.012	0.233

EM-Empty Shell

CI-TW/SL = average station value for ratio of dry tissue weight to dry shell length

CI-SW/SL = average station value for ratio of shell weight to shell length.

CI-TW/SW = average station value for ratio of dry tissue weight to shell weight

Appendix C

Appendix C. Indigenous Mussel Condition Raw Data for OFFTA NETC

Laboratory Record for Shellfish Condition

Date and time: Site Location
Collection Method: Analyst Brian Koziel
Species collected Initials

Station Field ID	Collection date	Pan#	Pan Wt. (gm)	Length (mm)	Tissue Wet Wt.+Pan(gm)	Tissue Wet Wt.(gm)	Tissue Dry Wt.+Pan (gm)	Tissue Dry Wt. (gm)	Date	Shell Wet Wt. (gm)
OFF-1-BM-CI	5/26/98	1	1.94	54 1	14.04	12 10	3.27	1 33	6/4/98	11.26
OFF-1-BM-CI	5/26/98	2	1 95	61.0	13.03	11 09	3.40	1.45	6/4/98	14.09
OFF-1-BM-CI	5/26/98	3	1 95	50.7	8.48	6.53	2.81	0.86	6/4/98	7 09
OFF-1-BM-CI	5/26/98	4	1 94	51 4	7 72	5 78	2.72	0.77	6/4/98	6.93
OFF-1-BM-CI	5/26/98	5	1 95	56 8	9 77	7.83	3 15	1 21	6/4/98	10.28
OFF-1-BM-CI	5/26/98	6	1.89	49 0	8.34	6 46	2 84	0.95	6/4/98	7.65
OFF-1-BM-CI	5/26/98	7	1 88	54.0	8 12	6.24	2 67	0 79	6/4/98	6.96
OFF-1-BM-CI	5/26/98	8	1 88	58.8	11 28	9 39	3.23	1.35	6/4/98	9 75
OFF-1-BM-CI	5/26/98	9	1 88	50.5	7 10	5 22	2 72	0.84	6/4/98	8 22
OFF-1-BM-CI	5/26/98	10	1 88	48.1	8.43	6.54	2 54	0 66	6/4/98	6 31
OFF-1-BM-CI	5/26/98	11	1 90	55 1	9.59	7 69	3.05	1 15	6/4/98	10 70
OFF-1-BM-CI	5/26/98	12	1.90	53.0	10 29	8 38	3.31	1 41	6/4/98	9.70
OFF-1-BM-CI	5/26/98	13	1 90	54 3	12.06	10.16	2.98	1.08	6/4/98	8.03
OFF-1-BM-CI	5/26/98	14	1 91	50 4	10 16	8.25	2.94	1.03	6/4/98	8 92
OFF-1-BM-CI	5/26/98	15	1.90	48 3	11 31	9.41	2.97	1 07	6/4/98	7.11
OFF-1-BM-CI	5/26/98	16	1 92	50.1	6.37	4 45	2.49	0.57	6/4/98	6 09
OFF-1-BM-CI	5/26/98	17	1 97	52.0	13 29	11.32	3.39	1 42	6/4/98	10.47
OFF-1-BM-CI	5/26/98	18	1 97	50.9	8 28	6 31	2.86	0 90	6/4/98	7.28
OFF-1-BM-CI	5/26/98	19	1 96	51.2	12 16	10 20	3.17	1.21	6/4/98	8.08
OFF-1-BM-CI	5/26/98	20	1 96	58.5	16 07	14 11	3.44	1.48	6/4/98	12.55
OFF-2-BM-CI	5/26/98	21	1.90	55.6	11 74	9 84	3 11	1.21	6/4/98	9.81
OFF-2-BM-CI	5/26/98	22	1.88	59.0	17.88	16.01	3 02	1 14	6/4/98	15.56
OFF-2-BM-CI	5/26/98	23	1.88	44.4	8 20	6 32	2.49	0 61	6/4/98	5.93
OFF-2-BM-CI	5/26/98	24	1.89	49 0	9 32	7 42	2.73	0.84	6/4/98	6 27
OFF-2-BM-CI	5/26/98	25	1 90	48.3	9 28	7 38	2.64	0.75	6/4/98	4 85
OFF-2-BM-CI	5/26/98	26	1 92	55 0	13 62	11 70	3.31	1 39	6/4/98	8 75
OFF-2-BM-CI	5/26/98	27	1 92	40 3	7.19	5 28	2.51	0.59	6/4/98	4 39
OFF-2-BM-CI	5/26/98	28	1.93	49.7	11 70	9 77	3 06	1 13	6/4/98	6 68
OFF-2-BM-CI	5/26/98	29	1.94	42.3	7 25	5 31	2 50	0 57	6/4/98	4 91
OFF-2-BM-CI	5/26/98	30	1.94	50.0	9 19	7 24	2.80	0 85	6/4/98	6 89
OFF-2-BM-CI	5/26/98	31	1 95	48.5	10 56	8.61	2.83	0.88	6/4/98	6.34
OFF-2-BM-CI	5/26/98	32	1.96	42.6	7 72	5 76	2.66	0.69	6/4/98	5 06
OFF-2-BM-CI	5/26/98	33	1 97	42.0	8.66	6.69	2.71	0 74	6/4/98	6.11
OFF-2-BM-CI	5/26/98	34	1 98	43 0	7 25	5 27	2.58	0 60	6/4/98	5 29
OFF-2-BM-CI	5/26/98	35	1.98	47 4	10.20	8 22	2.98	1 00	6/4/98	7.66
OFF-2-BM-CI	5/26/98	36	1.99	45 3	7 47	5 49	2.71	0.73	6/4/98	6.26
OFF-2-BM-CI	5/26/98	37	1.98	46 6	9.56	7 58	2 77	0.79	6/4/98	6 60
OFF-2-BM-CI	5/26/98	38	1 97	45 8	5.43	3.46	2.55	0.58	6/4/98	6.39
OFF-2-BM-CI	5/26/98	39	1 97	42 7	8.01	6.04	2 62	0.65	6/4/98	5 43
OFF-2-BM-CI	5/26/98	40	1.95	43.6	5.94	3.99	2.46	0.51	6/4/98	5.11
OFF-3-BM-CI	5/26/98	41	1 94	53.5	12.48	10.54	3.23	1.29	6/4/98	7 43
OFF-3-BM-CI	5/26/98	42	1 96	56.2	12.68	10 73	3.42	1.46	6/4/98	9.96
OFF-3-BM-CI	5/26/98	43	1-94	41.0	6 73	4 79	2.53	0 59	6/4/98	3.61
OFF-3-BM-CI	5/26/98	44	1 94	46.3	8.41	6.47	2.84	0 90	6/4/98	5.10
OFF-3-BM-CI	5/26/98	45	1.92	53.2	11.88	9.96	3.20	1 28	6/4/98	7.43
OFF-3-BM-CI	5/26/98	46	1 91	53.3	12.52	10.61	3 12	1.21	6/4/98	8.86
OFF-3-BM-CI	5/26/98	47	1.92	52.5	11 05	9.13	3.30	1.38	6/4/98	9 01
OFF-3-BM-CI	5/26/98	48	1.92	41 4	7.91	5.99	2.83	0.91	6/4/98	5 23
OFF-3-BM-CI	5/26/98	49	1.89	47.1	10.27	8.38	3.01	1.12	6/4/98	6.93
OFF-3-BM-CI	5/26/98	50	1 90	48.1	9.30	7 41	2.96	1.06	6/4/98	8 55
OFF-3-BM-CI	5/26/98	51	1.89	48 6	10 20	8.32	3 19	1.30	6/4/98	8.56
OFF-3-BM-CI	5/26/98	52	1.97	48.1	8.92	6 96	2.98	1.01	6/4/98	7 06
OFF-3-BM-CI	5/26/98	53	1 98	46.9	9 76	7 78	2.91	0 93	6/4/98	7 58
OFF-3-BM-CI	5/26/98	54	1 98	46.9	10.75	8.77	3.07	1 09	6/4/98	7 01

Station Field ID	Collection date	Pan#	Pan Wt. (gm)	Length (mm)	Tissue Wet Wt.+Pan(gm)	Tissue Wet Wt.(gm)	Tissue Dry Wt.+Pan (gm)	Tissue Dry Wt. (gm)	Date	Shell Wet Wt. (gm)
OFF-3-BM-CI	5/26/98	55	1 97	51.3	12.53	10.56	3 47	1 50	6/4/98	8 19
OFF-3-BM-CI	5/26/98	56	1 96	46.1	9 14	7 18	2.94	0 98	6/4/98	6.77
OFF-3-BM-CI	5/26/98	57	1 95	56.0	14 27	12.31	4 05	2.09	6/4/98	8 60
OFF-3-BM-CI	5/26/98	58	1 97	59.3	16 22	14 26	3 48	1 51	6/4/98	11.10
OFF-3-BM-CI	5/26/98	59	1 97	49.4	10 98	9 01	3 23	1 27	6/4/98	8 58
OFF-3-BM-CI	5/26/98	60	1 95	55.0	11 86	9 91	3.57	1 61	6/4/98	11.08
OFF-4-BM-CI	5/26/98	61	1 95	43 7	8.38	6 43	2.59	0 64	6/4/98	4 66
OFF-4-BM-CI	5/26/98	62	1 94	42 8	8.14	6 20	2 72	0.78	6/4/98	5 01
OFF-4-BM-CI	5/26/98	63	1 94	46.6	9.56	7 62	2 85	0.91	6/4/98	7.71
OFF-4-BM-CI	5/26/98	64	1 94	45.2	9.41	7.47	2.82	0.87	6/4/98	6.29
OFF-4-BM-CI	5/26/98	65	1 93	48 6	10 20	8 27	2.93	1.00	6/4/98	6.69
OFF-4-BM-CI	5/26/98	66	1 93	42 8	8 34	6 41	2.66	0.73	6/4/98	5.47
OFF-4-BM-CI	5/26/98	67	1 93	39 1	5.49	3 56	2.37	0.44	6/4/98	3.66
OFF-4-BM-CI	5/26/98	68	1 92	47 4	10 79	8 87	2.73	0.81	6/4/98	7 06
OFF-4-BM-CI	5/26/98	69	1 92	40.4	7.43	5 51	2 62	0.71	6/4/98	4 86
OFF-4-BM-CI	5/26/98	70	1 92	45.0	7 08	5.16	2.68	0.76	6/4/98	6 23
OFF-4-BM-CI	5/26/98	71	1 91	44 4	8.29	6 38	2 68	0.77	6/4/98	5 07
OFF-4-BM-CI	5/26/98	72	1 90	53.3	13 59	11.69	3 61	1 71	6/4/98	9.47
OFF-4-BM-CI	5/26/98	73	1 89	50 0	11 27	9 38	3 04	1 14	6/4/98	8 17
OFF-4-BM-CI	5/26/98	74	1 91	43.5	8.54	6 63	2 49	0.58	6/4/98	7 33
OFF-4-BM-CI	5/26/98	75	1 91	48.7	8.11	6.20	3.30	1 38	6/4/98	8.17
OFF-4-BM-CI	5/26/98	76	1 93	41.9	7.12	5 20	2 72	0.79	6/4/98	4 97
OFF-4-BM-CI	5/26/98	77	1 92	63.1	18 60	16.68	3.72	1 80	6/4/98	13 66
OFF-4-BM-CI	5/26/98	78	1 92	54 7	13.98	12.06	3.28	1 36	6/4/98	13.69
OFF-4-BM-CI	5/26/98	79	1 94	44 7	7 28	5 35	2.81	0.88	6/4/98	5 31
OFF-4-BM-CI	5/26/98	80	1 92	48 4	7 20	5.28	2 88	0.96	6/4/98	7 61
OFF-5-BM-CI	5/26/98	81	1 95	57 4	16.87	14.92	3 59	1.63	6/4/98	10.11
OFF-5-BM-CI	5/26/98	82	1 96	57 4	14 41	12.46	3.64	1 68	6/4/98	10.11
OFF-5-BM-CI	5/26/98	83	1 96	72.0	29.34	27 38	4.76	2.80	6/4/98	16 86
OFF-5-BM-CI	5/26/98	84	1 96	57.3	15.92	13.97	3.67	1 71	6/4/98	10.77
OFF-5-BM-CI	5/26/98	85	1 94	56.6	13.55	11.60	3 70	1.76	6/4/98	12.13
OFF-5-BM-CI	5/26/98	86	1.95	56.7	15 27	13.31	3 80	1 85	6/4/98	10.40
OFF-5-BM-CI	5/26/98	87	1 97	62.0	21 10	19.14	3 92	1 95	6/4/98	15 41
OFF-5-BM-CI	5/26/98	88	1 92	58 7	19 22	17.30	4 07	2 15	6/4/98	16 16
OFF-5-BM-CI	5/26/98	89	1 92	61.6	12 38	10.46	3 57	1 65	6/4/98	11 68
OFF-5-BM-CI	5/26/98	90	1 93	46 1	8.32	6 39	2.73	0 80	6/4/98	5 96
OFF-5-BM-CI	5/26/98	91	1 94	31 2	4 31	2.38	2.25	0 31	6/4/98	2 04
OFF-5-BM-CI	5/26/98	92	1.95	62.0	19.55	17 60	4 49	2.54	6/4/98	12.58
OFF-5-BM-CI	5/26/98	93	1.95	58.4	15.11	13 16	3.55	1.60	6/4/98	10.46
OFF-5-BM-CI	5/26/98	94	1.94	55.2	16.40	14 46	3.82	1.88	6/4/98	10.23
OFF-5-BM-CI	5/26/98	95	1 94	56.6	13.36	11.42	3.63	1.69	6/4/98	8.97
OFF-5-BM-CI	5/26/98	96	1 94	54.1	14 10	12.16	3.64	1.70	6/4/98	10 50
OFF-5-BM-CI	5/26/98	97	1 94	63.9	21 06	19.12	4 00	2.06	6/4/98	11.50
OFF-5-BM-CI	5/26/98	98	1.95	38.2	5.71	3.75	2 37	0.42	6/4/98	3.82
OFF-5-BM-CI	5/26/98	99	1 95	54 4	12.32	10 37	3 80	1.85	6/4/98	10 51
OFF-5-BM-CI	5/26/98	100	1.95	57 2	11.33	9.38	3 40	1.45	6/4/98	12.77
OFF-6-BM-CI	5/26/98	101	1 95	41 1	5 41	3.46	2.47	0.52	6/4/98	3 77
OFF-6-BM-CI	5/26/98	102	1.95	73.1	27.69	25.74	4.63	2.68	6/4/98	23.17
OFF-6-BM-CI	5/26/98	103	1 93	54.7	16 33	14.40	2.85	0.92	6/4/98	10.15
OFF-6-BM-CI	5/26/98	104	1.94	49 0	8.69	6.75	2.63	0.70	6/4/98	5 82
OFF-6-BM-CI	5/26/98	105	1 93	40.2	5.32	3 39	2.40	0 47	6/4/98	4.29
OFF-6-BM-CI	5/26/98	106	1 92	55.1	13.16	11.24	3.26	1 33	6/4/98	8.50
OFF-6-BM-CI	5/26/98	107	1 91	50.8	12.04	10 12	3.30	1.39	6/4/98	8 73
OFF-6-BM-CI	5/26/98	108	1 92	40.2	4 95	3 03	2.42	0.50	6/4/98	3 74
OFF-6-BM-CI	5/26/98	109	1.92	63.7	20 22	18.30	4.13	2.22	6/4/98	14.24
OFF-6-BM-CI	5/26/98	110	1.93	59 8	12.91	10.99	3 57	1 65	6/4/98	9 99
OFF-6-BM-CI	5/26/98	111	1.92	63.4	22.12	20.20	3 37	1.44	6/4/98	14.30
OFF-6-BM-CI	5/26/98	112	1.91	58 0	11.86	9.95	3.47	1.56	6/4/98	11 63
OFF-6-BM-CI	5/26/98	113	1.91	67 8	23.07	21 16	4 49	2.58	6/4/98	14 88
OFF-6-BM-CI	5/26/98	114	1 91	68 1	22.55	20.65	4 86	2.96	6/4/98	14 86

Station Field ID	Collection date	Pan#	Pan Wt. (gm)	Length (mm)	Tissue Wet Wt.+Pan(gm)	Tissue Wet Wt.(gm)	Tissue Dry Wt.+Pan (gm)	Tissue Dry Wt. (gm)	Date	Shell Wet Wt. (gm)
OFF-6-BM-CI	5/26/98	115	1.90	48.3	10 12	8.22	2.79	0 89	6/4/98	7.06
OFF-6-BM-CI	5/26/98	116	1 91	62 8	17 40	15 49	4.27	2 37	6/4/98	15.42
OFF-6-BM-CI	5/26/98	117	1 90	40 0	5 11	3.21	2.28	0.38	6/4/98	3.13
OFF-6-BM-CI	5/26/98	118	1 91	53.6	11 58	9.68	2.97	1.06	6/4/98	9 32
OFF-6-BM-CI	5/26/98	119	1.90	39.9	5 27	3 37	2.39	0 49	6/4/98	3.11
OFF-6-BM-CI	5/26/98	120	1 92	58.0	16.02	14.10	3.82	1.90	6/4/98	14 87
OFF-7-BM-CI	5/26/98	121	1 95	58.2	17 16	15 21	3.92	1.98	6/4/98	14.05
OFF-7-BM-CI	5/26/98	122	1 95	51.4	12 84	10.89	3.18	1 23	6/4/98	10.00
OFF-7-BM-CI	5/26/98	123	1.95	57 2	16.93	14 98	3.75	1 80	6/4/98	14.25
OFF-7-BM-CI	5/26/98	124	1 95	51 7	10.04	8.09	3.24	1 30	6/4/98	8.93
OFF-7-BM-CI	5/26/98	125	1 94	62.1	20.99	19.05	4.03	2.09	6/4/98	14.00
OFF-7-BM-CI	5/26/98	126	1 93	61 9	17 32	15.39	4 10	2.17	6/4/98	10.83
OFF-7-BM-CI	5/26/98	127	1 91	71 6	27.43	25 51	5.00	3 08	6/4/98	17 78
OFF-7-BM-CI	5/26/98	128	1 91	61 5	19.93	18 01	4 07	2.16	6/4/98	12 14
OFF-7-BM-CI	5/26/98	129	1 92	71.1	29.75	27.84	4 92	3.01	6/4/98	19.79
OFF-7-BM-CI	5/26/98	130	1 92	47.4	9 81	7 88	2.79	0 87	6/4/98	8 79
OFF-7-BM-CI	5/26/98	131	1 92	66.6	24 88	22 96	4.73	2 81	6/4/98	24.40
OFF-7-BM-CI	5/26/98	132	1 93	60 0	16 22	14 29	3.53	1 61	6/4/98	12.46
OFF-7-BM-CI	5/26/98	133	1 93	65 6	23.57	21.65	4 83	2.91	6/4/98	15.57
OFF-7-BM-CI	5/26/98	134	1 93	66 9	23.49	21 56	5 16	3 23	6/4/98	15.55
OFF-7-BM-CI	5/26/98	135	1 94	48.0	7 01	5 07	2 54	0 60	6/4/98	6 13
OFF-7-BM-CI	5/26/98	136	1 95	60.1	18 49	16.54	3.89	1 94	6/4/98	12.99
OFF-7-BM-CI	5/26/98	137	1 96	49.2	9 19	7 23	2.90	0 94	6/4/98	8.95
OFF-7-BM-CI	5/26/98	138	1.97	49 2	9.16	7 19	2.96	0 99	6/4/98	6 85
OFF-7-BM-CI	5/26/98	139	1 96	61.1	17 91	15.95	4.25	2.29	6/4/98	12.85
OFF-7-BM-CI	5/26/98	140	1 95	49 2	8 63	6.68	3 05	1 10	6/4/98	7 41
OFF-22-BM-CI	5/26/98	141	1 94	51 0	11 05	9 11	2.87	0 93	6/4/98	7 16
OFF-22-BM-CI	5/26/98	142	1.95	47 1	9.39	7.44	8.87	6 92	6/4/98	6 04
OFF-22-BM-CI	5/26/98	143	1 95	47.5	10 45	8.50	2.98	1 03	6/4/98	9.40
OFF-22-BM-CI	5/26/98	144	1 96	48.4	10 49	8 52	2 98	1 02	6/4/98	5.50
OFF-22-BM-CI	5/26/98	145	1 97	49 9	7 76	5.80	2.74	0 77	6/4/98	6 64
OFF-22-BM-CI	5/26/98	146	1 96	54.5	13.99	12.03	3 28	1 32	6/4/98	9 90
OFF-22-BM-CI	5/26/98	147	1 94	50.4	12.32	10.38	2.98	1 04	6/4/98	7 95
OFF-22-BM-CI	5/26/98	148	1 94	49.3	9.22	7.28	2 83	0.89	6/4/98	7 22
OFF-22-BM-CI	5/26/98	149	1 93	43 4	8.25	6 32	2 62	0 69	6/4/98	4.78
OFF-22-BM-CI	5/26/98	150	1 92	59.5	17 58	15 66	3 75	1.84	6/4/98	13 06
OFF-22-BM-CI	5/26/98	151	1 91	57.8	15 59	13.68	3.28	1 37	6/4/98	8 92
OFF-22-BM-CI	5/26/98	152	1 90	50.5	11.70	9 80	2.92	1 02	6/4/98	7.98
OFF-22-BM-CI	5/26/98	153	1 90	57.0	15.89	13 99	3.39	1 49	6/4/98	10 65
OFF-22-BM-CI	5/26/98	154	1 90	47 4	9 04	7.14	2 73	0.83	6/4/98	6 06
OFF-22-BM-CI	5/26/98	155	1.91	48 6	10.84	8.93	3 12	1.21	6/4/98	7.17
OFF-22-BM-CI	5/26/98	156	1.92	45.7	7.23	5 31	2.69	0.77	6/4/98	5 18
OFF-22-BM-CI	5/26/98	157	1 93	53.6	12.01	10.08	3.08	1.15	6/4/98	8 69
OFF-22-BM-CI	5/26/98	158	1.92	56.5	17 11	15.19	3 49	1.57	6/4/98	15.06
OFF-22-BM-CI	5/26/98	159	1.91	48.7	8.57	6.66	2 70	0.79	6/4/98	6.48
OFF-22-BM-CI	5/26/98	160	1 90	50 1	11.09	9.18	3.08	1 17	6/4/98	8.33

Appendix D

Appendix D. Deployed Mussel Condition Raw Data for OFFTA NETC

Laboratory Record for Shellfish Condition

Date and time: Site Location:
Collection Method: Analyst: Amanda Petteruti
Species collected Initials:

Station Field ID	Collection date	Pan#	Pan Wt. (gm)	Length (mm)	Tissue Wet Wt.+Pan(gm)	Tissue Wet Wt.(gm)	Tissue Dry Wt.+Pan (gm)	Tissue Dry Wt. (gm)	Date	Shell Wet Wt. (gm)
T0	6/17/98	A1	0 959	30.7	2.04	1.0777	1.06	0.099	6/24/98	1.10
T0	6/17/98	A2	0.973	31.8	1.99	1.0215	1.08	0.111	6/24/98	1.38
T0	6/17/98	A3	0.977	29.7	2.35	1.3734	1.10	0.122	6/24/98	1.20
T0	6/17/98	A4	0.976	30.5	1.91	0.9369	1.06	0.084	6/24/98	1.11
T0	6/17/98	A5	0.973	30 7	2.63	1 6529	1.11	0.132	6/24/98	1.50
T0	6/17/98	B1	0.972	31.1	2.24	1 2645	1.09	0.119	6/24/98	1.29
T0	6/17/98	B2	0 971	31.1	2.49	1.5196	1.10	0.130	6/24/98	1.26
T0	6/17/98	B3	0 975	30.8	2.25	1 2797	1.08	0.107	6/24/98	1.21
T0	6/17/98	B4	0.969	30.1	1.88	0 9091	1.06	0.093	6/24/98	1.10
T0	6/17/98	B5	0.971	30.9	2.11	1.143	1 08	0 109	6/24/98	1.31
T0	6/17/98	C1	0.967	30.3	2.02	1 0494	1.07	0.103	6/24/98	1 09
T0	6/17/98	C2	0 972	30.3	1.50	0.532	1.04	0.065	6/24/98	1 28
T0	6/17/98	C3	0.972	30.6	2.40	1 424	1 09	0.113	6/24/98	1.08
T0	6/17/98	C4	0 975	29.7	1 93	0 955	1.06	0.088	6/24/98	1.01
T0	6/17/98	C5	0.973	31 1	2.02	1 0501	1.08	0 105	6/24/98	1.15
T0	6/17/98	D1	0 967	30.3	1 88	0.9101	1.07	0.103	6/24/98	1.18
T0	6/17/98	D2	0 966	30.1	1 95	0 9798	1.06	0.097	6/24/98	1.18
T0	6/17/98	D3	0 965	29.4	1 74	0.7795	1.04	0.077	6/24/98	1.12
T0	6/17/98	D4	0.974	30.9	1.76	0.7845	1 06	0.087	6/24/98	1.05
T0	6/17/98	D5	0 969	30.3	1.76	0.7934	1.06	0 090	6/24/98	1.19
OFF-21-DEP	8/17/98	21A1	0.980	30.1	1.96	EM			8/19-10/14/98	1.15
OFF-21-DEP	8/17/98	21A2	0.980	42.9	5.92	4.9449	1.61	0.632	8/19-10/14/98	2.39
OFF-21-DEP	8/17/98	21A3	0.977	34.6	2.82	1.8384	1.26	0.284	8/19-10/14/98	1.63
OFF-21-DEP	8/17/98	21A4	0.982	43.1	4.21	3.2311	1.41	0.423	8/19-10/14/98	2.42
OFF-21-DEP	8/17/98	21A5	0 981	43.0	5.00	4 0189	1.50	0.518	8/19-10/14/98	2.23
OFF-21-DEP	8/17/98	21B5	0 979	39.9	4 82	3 8385	1.62	0.643	8/19-10/14/98	2.34
OFF-21-DEP	8/17/98	21B6	0 981	38.9	4.56	3 582	1.49	0 512	8/19-10/14/98	1.97
OFF-21-DEP	8/17/98	21B7	EM			21.4361			8/19-10/14/98	
OFF-21-DEP	8/17/98	21B8	0.985	32.2	1.57	0.5812	1.08	0.095	8/19-10/14/98	1.15
OFF-21-DEP	8/17/98	21B9	0.982	44.0	6.07	5.0912	1.64	0.656	8/19-10/14/98	2.53
OFF-21-DEP	8/17/98	21C5	EM						8/19-10/14/98	
OFF-21-DEP	8/17/98	21C6	EM						8/19-10/14/98	
OFF-21-DEP	8/17/98	21C7	0.988	39.2	4.12	3.1306	1.52	0.528	8/19-10/14/98	2.29
OFF-21-DEP	8/17/98	21C8	EM						8/19-10/14/98	
OFF-21-DEP	8/17/98	21C9	0.989	38.6	4.52	3.5355	1.51	0.524	8/19-10/14/98	2.29
OFF-21-DEP	8/17/98	21D5	0.977	41.9	5.13	4.1493	1.50	0.522	8/19-10/14/98	2.54
OFF-21-DEP	8/17/98	21D6	EM						8/19-10/14/98	
OFF-21-DEP	8/17/98	21D7	0 982	33.6	2.74	1.7585	1 32	0.339	8/19-10/14/98	1.48
OFF-21-DEP	8/17/98	21D8	0.982	35.7	3.27	2.2899	1.37	0.386	8/19-10/14/98	2.00
OFF-21-DEP	8/17/98	21D9	0.981	34.9	3.47	2.4937	1.37	0 390	8/19-10/14/98	1.78
OFF-20-DEP	8/17/98	20A1	0.980	43.8	6.14	5.159	1 74	0.765	8/31-10/14/98	2.45
OFF-20-DEP	8/17/98	20A2	0.983	42.8	5.44	4.4613	1.52	0.534	8/31-10/14/98	2.42
OFF-20-DEP	8/17/98	20A3	0.981	42 9	6 31	5.3309	1 80	0.817	8/31-10/14/98	2.92
OFF-20-DEP	8/17/98	20A4	0.979	41.7	5.71	4.7285	1.63	0.650	8/31-10/14/98	2.33
OFF-20-DEP	8/17/98	20A5	0.977	39.7	4.85	3.873	1.54	0.566	8/31-10/14/98	2.06
OFF-20-DEP	8/17/98	20B1	EM						8/31-10/14/98	
OFF-20-DEP	8/17/98	20B2	0.981	42.4	5.83	4.8449	1.68	0.699	8/31-10/14/98	2.41
OFF-20-DEP	8/17/98	20B3	0.982	36.0	4 18	3.2031	1.47	0 484	8/31-10/14/98	1.84
OFF-20-DEP	8/17/98	20B4	0.980	38.9	4.37	3.3906	1.56	0.576	8/31-10/14/98	2.12
OFF-20-DEP	8/17/98	20B5	0.979	38.1	4.67	3.6901	1.51	0 532	8/31-10/14/98	2.05

Station Field ID	Collection date	Pan#	Pan Wt. (gm)	Length (mm)	Tissue Wet Wt.+Pan(gm)	Tissue Wet Wt.(gm)	Tissue Dry Wt.+Pan (gm)	Tissue Dry Wt. (gm)	Date	Shell Wet Wt. (gm)
OFF-20-DEP	8/17/98	20C1	0.979	41 4	4.75	3.7722	1.54	0.565	8/31-10/14/98	2.13
OFF-20-DEP	8/17/98	20C2	0 977	42.2	5.32	4.339	1 54	0.562	8/31-10/14/98	2.46
OFF-20-DEP	8/17/98	20C3	0.980	43.0	5.69	4.7134	1.63	0.646	8/31-10/14/98	2.56
OFF-20-DEP	8/17/98	20C4	0.980	39.1	4 75	3.7725	1.53	0.554	8/31-10/14/98	2.17
OFF-20-DEP	8/17/98	20C5	EM						8/31-10/14/98	
OFF-20-DEP	8/17/98	20D1	EM						8/31-10/14/98	
OFF-20-DEP	8/17/98	20D2	EM						8/31-10/14/98	
OFF-20-DEP	8/17/98	20D3	0.986	47 3	7 13	6.1484	1 92	0.935	8/31-10/14/98	3.18
OFF-20-DEP	8/17/98	20D4	0.981	38.7	4.22	3.2342	1.38	0.404	8/31-10/14/98	2.16
OFF-20-DEP	8/17/98	20D5	0 981	44.1	6.67	5.6861	2 08	1 101	8/31-10/14/98	3.06
OFF-19-DEP	8/17/98	19A1	0.979	32.1	3 09	2 1064	1.33	0.352	9/1-10/14/98	1.57
OFF-19-DEP	8/17/98	19A2	0.980	45.4	6.58	5.6044	1 87	0.891	9/1-10/14/98	2.59
OFF-19-DEP	8/17/98	19A3	0.972	43.0	5 54	4 5718	1.62	0.648	9/1-10/14/98	2.32
OFF-19-DEP	8/17/98	19A4	0 982	42.2	5.73	4 7511	1.70	0.717	9/1-10/14/98	2.64
OFF-19-DEP	8/17/98	19A5	0.979	46.6	7.41	6.4264	2.08	1 097	9/1-10/14/98	2.92
OFF-19-DEP	8/17/98	19B1	0 983	31.9	1.15	0.166	1.23	0.250	9/1-10/14/98	1.26
OFF-19-DEP	8/17/98	19B2	EM						9/1-10/14/98	
OFF-19-DEP	8/17/98	19B3	0.976	35.3	3.73	2.7577	1.39	0.415	9/1-10/14/98	1 86
OFF-19-DEP	8/17/98	19B4	0.982	46.1	7 93	6.9465	1.96	0.978	9/1-10/14/98	2 99
OFF-19-DEP	8/17/98	19B5	0.984	34.5	3.41	2.43	1 34	0.355	9/1-10/14/98	1.85
OFF-19-DEP	8/17/98	19C1	EM						9/1-10/14/98	
OFF-19-DEP	8/17/98	19C2	0 980	38.8	4.97	3.9885	1.91	0.928	9/1-10/14/98	2.20
OFF-19-DEP	8/17/98	19C3	0.977	32.0	2.44	1.4675	1 14	0.159	9/1-10/14/98	1.16
OFF-19-DEP	8/17/98	19C4	0.980	37.2	3.02	2.0424	1.30	0.321	9/1-10/14/98	1 77
OFF-19-DEP	8/17/98	19C5	0 977	49.3	7.51	6.5336	1.98	1.005	9/1-10/14/98	2.90
OFF-19-DEP	8/17/98	19D1	EM	39.5					9/1-10/14/98	1.01
OFF-19-DEP	8/17/98	19D2	0 981	48.5	6.54	5.5636	1.98	0.999	9/1-10/14/98	3.07
OFF-19-DEP	8/17/98	19D3	0.983	42.4	4.58	3.5976	1.53	0.550	9/1-10/14/98	2.68
OFF-19-DEP	8/17/98	19D4	0.983	44.7	5.89	4.9071	1 89	0.908	9/1-10/14/98	2.47
OFF-19-DEP	8/17/98	19D5	0 983	43.0	5.57	4 5836	1.64	0.658	9/1-10/14/98	2.58
OFF-18-DEP	8/17/98	18A1	0 977	41.7	4.42	3.4385	1 60	0.619	9/10-10/14/98	2.15
OFF-18-DEP	8/17/98	18A2	0.975	42.6	5.39	4.4193	1 63	0.659	9/10-10/14/98	2.59
OFF-18-DEP	8/17/98	18A3	EM						9/10-10/14/98	
OFF-18-DEP	8/17/98	18A4	0 980	33.0	2.98	2.0047	1.27	0.289	9/10-10/14/98	1.57
OFF-18-DEP	8/17/98	18A5	0.980	40.7	5.28	4.2955	1 65	0.669	9/10-10/14/98	2.30
OFF-18-DEP	8/17/98	18B1	EM						9/10-10/14/98	
OFF-18-DEP	8/17/98	18B2	0.983	41.3	5.68	4.6954	1.69	0.712	9/10-10/14/98	2.38
OFF-18-DEP	8/17/98	18B3	0 980	42.9	5 58	4.5997	1.63	0.647	9/10-10/14/98	2.32
OFF-18-DEP	8/17/98	18B4	0 982	39.2	4.57	3.5863	1.47	0.491	9/10-10/14/98	2.38
OFF-18-DEP	8/17/98	18B5	0.982	40.0	5.04	4.0563	1.69	0.703	9/10-10/14/98	2.33
OFF-18-DEP	8/17/98	18C1	0.979	36.0	3.65	2.676	1.34	0.357	9/10-10/14/98	1.71
OFF-18-DEP	8/17/98	18C2	0.978	41 7	5.55	4.5743	1.64	0.665	9/10-10/14/98	2.13
OFF-18-DEP	8/17/98	18C3	0.980	45.0	5 40	4.4168	1 59	0.612	9/10-10/14/98	2.50
OFF-18-DEP	8/17/98	18C4	0.980	42.7	5.38	4 3991	1.58	0.601	9/10-10/14/98	2.36
OFF-18-DEP	8/17/98	18C5	0.978	39.9	4.21	3.2276	1.55	0.572	9/10-10/14/98	2.34
OFF-18-DEP	8/17/98	18D1	0.982	39.1	4.84	3 8594	1 50	0.514	9/10-10/14/98	2.21
OFF-18-DEP	8/17/98	18D2	0.983	41.2	5 32	4.3349	1.61	0.630	9/10-10/14/98	2.86
OFF-18-DEP	8/17/98	18D3	0.980	39.8	4.57	3.5884	1.55	0.569	9/10-10/14/98	2.40
OFF-18-DEP	8/17/98	18D4	0.983	41.0	5.53	4.5487	1.72	0.733	9/10-10/14/98	2.40
OFF-18-DEP	8/17/98	18D5	0.978	43.1	5.72	4.74	1.60	0.622	9/10-10/14/98	2.75
OFF-17-DEP	8/17/98	17A1	0.981	40 1	4 71	3.7303	1 62	0.640	9/10-10/14/98	2.81
OFF-17-DEP	8/17/98	17A2	0.979	43.1	5.47	4.4891	1.51	0.528	9/10-10/14/98	2.46
OFF-17-DEP	8/17/98	17A3	0.984	42.8	5.25	4.2635	1.60	0.618	9/10-10/14/98	2.38
OFF-17-DEP	8/17/98	17A4	0.990	43.5	5.66	4 6678	1.67	0.682	9/10-10/14/98	2.55
OFF-17-DEP	8/17/98	17A5	0.981	41.0	4 97	3.9891	1 71	0 733	9/10-10/14/98	2.60
OFF-17-DEP	8/17/98	17B1	0 980	43.6	4 69	3.7055	1.60	0.616	9/10-10/14/98	2.12

Station Field ID	Collection date	Pan#	Pan Wt. (gm)	Length (mm)	Tissue Wet Wt.+Pan(gm)	Tissue Wet Wt.(gm)	Tissue Dry Wt.+Pan (gm)	Tissue Dry Wt. (gm)	Date	Shell Wet Wt. (gm)
OFF-17-DEP	8/17/98	17B2	0 984	40.3	5.18	4 1973	1.55	0.562	9/10-10/14/98	2.38
OFF-17-DEP	8/17/98	17B3	0 985	41 1	4.60	3 6174	1.65	0.667	9/10-10/14/98	2.38
OFF-17-DEP	8/17/98	17B4	0 985	42.2	5 86	4 8748	1.67	0.684	9/10-10/14/98	2.57
OFF-17-DEP	8/17/98	17B5	0.929	31.2	2.30	1.3688	1.22	0.291	9/10-10/14/98	1 26
OFF-17-DEP	8/17/98	17C1	0.983	45 6	6.34	5.3542	1.18	0.197	9/10-10/14/98	2.81
OFF-17-DEP	8/17/98	17C2	0.984	45.3	6.83	5.8444	1.77	0.785	9/10-10/14/98	2.83
OFF-17-DEP	8/17/98	17C3	0 980	43.2	6.26	5 279	1.70	0.716	9/10-10/14/98	2.67
OFF-17-DEP	8/17/98	17C4	0.980	41.1	4.73	3.7453	1 28	0.303	9/10-10/14/98	1.97
OFF-17-DEP	8/17/98	17C5	0.984	42.5	5.53	4.5505	1 70	0.715	9/10-10/14/98	2.39
OFF-17-DEP	8/17/98	17D1	0.971	31 8	2.37	1.3976	1 18	0.207	9/10-10/14/98	1 37
OFF-17-DEP	8/17/98	17D2	0.977	41 6	5.07	4.0928	1.44	0.466	9/10-10/14/98	2 10
OFF-17-DEP	8/17/98	17D3	0.980	41.3	5 05	4 0673	1.57	0 587	9/10-10/14/98	2.24
OFF-17-DEP	8/17/98	17D4	0.979	40.6	4 75	3.773	1.57	0.591	9/10-10/14/98	2 26
OFF-17-DEP	8/17/98	17D5	0.977	40.7	5.33	4 3557	1.60	0.619	9/10-10/14/98	2.12
OFF-14-DEP	8/17/98	14A1	0 979	42.9	6.49	5.5134	1.54	0 559	9/10-10/14/98	2.36
OFF-14-DEP	8/17/98	14A2	0.981	45 2	6 17	5.1856	1 46	0 480	9/10-10/14/98	2.43
OFF-14-DEP	8/17/98	14A3	0 981	45.6	6.28	5.2987	1.71	0.724	9/10-10/14/98	2.65
OFF-14-DEP	8/17/98	14A4	0.981	44.7	5.55	4.57	1.50	0.516	9/10-10/14/98	2.69
OFF-14-DEP	8/17/98	14A5	0 982	39.9	4.73	3.7508	1.42	0.441	9/10-10/14/98	2.28
OFF-14-DEP	8/17/98	14B1	0.976	41 4	4.93	3.9559	1 42	0.440	9/10-10/14/98	2 83
OFF-14-DEP	8/17/98	14B2	0.981	41.7	4.15	3.1676	1.38	0.403	9/10-10/14/98	2.41
OFF-14-DEP	8/17/98	14B3	0.979	46.2	6.30	5 3193	1.60	0.625	9/10-10/14/98	2.74
OFF-14-DEP	8/17/98	14B4	0.977	43.4	5.01	4 0309	1.41	0.431	9/10-10/14/98	2.41
OFF-14-DEP	8/17/98	14B5	0 984	43.1	5.93	4.9414	1 64	0.653	9/10-10/14/98	2 59
OFF-14-DEP	8/17/98	14C1	0.972	46.4	6.30	5.3247	1 69	0.717	9/10-10/14/98	2.97
OFF-14-DEP	8/17/98	14C2	0.970	47 3	7.35	6.3761	1 72	0.753	9/10-10/14/98	2.94
OFF-14-DEP	8/17/98	14C3	0.981	36.1	3 81	2.8289	1.44	0 458	9/10-10/14/98	2.03
OFF-14-DEP	8/17/98	14C4	0.979	42.7	4 45	3.4724	1.35	0.370	9/10-10/14/98	2.50
OFF-14-DEP	8/17/98	14C5	0.976	43.1	4.89	3.9109	1.38	0.403	9/10-10/14/98	2.42
OFF-14-DEP	8/17/98	14D1	0.985	43.7	4 13	3.1459	1.34	0.354	9/10-10/14/98	2.45
OFF-14-DEP	8/17/98	14D2	0 982	46.2	6.90	5 9148	1.69	0.709	9/10-10/14/98	3.02
OFF-14-DEP	8/17/98	14D3	EM						9/10-10/14/98	
OFF-14-DEP	8/17/98	14D4	0.979	47 7	6.90	5.9208	1.83	0 850	9/10-10/14/98	2.80
OFF-14-DEP	8/17/98	14D5	0 982	40.5	4 60	3.6187	1 38	0.395	9/10-10/14/98	2.60
OFF-13-DEP	8/17/98	13A1	0.981	34 7	3.52	2.5429	1.36	0.382	10/15-10/16/98	1 78
OFF-13-DEP	8/17/98	13A2	0.985	41.6	5.49	4.5042	1.74	0.758	10/15-10/16/98	2.64
OFF-13-DEP	8/17/98	13A3	0 979	41.8	5.11	4.1319	1.71	0 734	10/15-10/16/98	2 48
OFF-13-DEP	8/17/98	13A4	0 980	43.1	5.97	4 9943	1.68	0 704	10/15-10/16/98	2.87
OFF-13-DEP	8/17/98	13A5	0.979	43.1	6.90	5.9188	1.93	0.951	10/15-10/16/98	2.24
OFF-13-DEP	8/17/98	13B1	0 982	39.4	4.40	3 4146	1.57	0.592	10/15-10/16/98	2.06
OFF-13-DEP	8/17/98	13B2	0 978	38.3	4.30	3.3269	1.44	0.458	10/15-10/16/98	1.95
OFF-13-DEP	8/17/98	13B3	0 979	39.7	5.16	4.1804	1.59	0.611	10/15-10/16/98	2.37
OFF-13-DEP	8/17/98	13B4	0.979	43.0	5.81	4.836	1.68	0.698	10/15-10/16/98	2.65
OFF-13-DEP	8/17/98	13B5	0.978	42.2	5.32	4.3403	1.65	0 675	10/15-10/16/98	2.51
OFF-13-DEP	8/17/98	13C1	0 989	41.6	5.61	4.6202	1.76	0.767	10/15-10/16/98	2.72
OFF-13-DEP	8/17/98	13C2	0 985	44.7	6 33	5.3416	1 98	0.994	10/15-10/16/98	2 81
OFF-13-DEP	8/17/98	13C3	0.984	44 5	6.40	5.4116	1.89	0 905	10/15-10/16/98	3.16
OFF-13-DEP	8/17/98	13C4	0.977	39.0	3.18	2.1998	1 36	0.379	10/15-10/16/98	1 80
OFF-13-DEP	8/17/98	13C5	0.976	41 2	4.75	3.7759	1.54	0.566	10/15-10/16/98	2.28
OFF-13-DEP	8/17/98	13D1	0.975	39.2	4.16	3.1811	1.32	0.344	10/15-10/16/98	2.27
OFF-13-DEP	8/17/98	13D2	0.978	40.7	4.99	4.0144	1.49	0.507	10/15-10/16/98	2.35
OFF-13-DEP	8/17/98	13D3	0 977	42.3	5.65	4.6755	1.73	0.750	10/15-10/16/98	2.76
OFF-13-DEP	8/17/98	13D4	0.971	40.3	4.91	3.9393	1.54	0.569	10/15-10/16/98	2.63
OFF-13-DEP	8/17/98	13D5	0.979	39.1	4 63	3.6482	1.64	0.660	10/15-10/16/98	2.06
OFF-23-DEP	8/17/98	23A1	EM						10/15-10/16/98	
OFF-23-DEP	8/17/98	23A2	0.991	43.2	5.16	4.1681	1.58	0 585	10/15-10/16/98	2.10

Station Field ID	Collection date	Pan#	Pan Wt. (gm)	Length (mm)	Tissue Wet Wt.+Pan(gm)	Tissue Wet Wt.(gm)	Tissue Dry Wt.+Pan (gm)	Tissue Dry Wt. (gm)	Date	Shell Wet Wt. (gm)
OFF-23-DEP	8/17/98	23A3	0 994	34.2	3.78	2.7813	1 33	0 339	10/15-10/16/98	1.87
OFF-23-DEP	8/17/98	23A4	EM						10/15-10/16/98	
OFF-23-DEP	8/17/98	23A5	0 994	43 4	5 45	4.4537	1 58	0.583	10/15-10/16/98	2.31
OFF-23-DEP	8/17/98	23B1	0 992	41.4	4.10	3.1061	1.54	0.545	10/15-10/16/98	2.67
OFF-23-DEP	8/17/98	23B2	0 987	41 9	5.25	4.2607	1.53	0.548	10/15-10/16/98	2.40
OFF-23-DEP	8/17/98	23B3	0.993	34 5	3.90	2 9043	1.40	0.407	10/15-10/16/98	2 11
OFF-23-DEP	8/17/98	23B4	0.987	36.5	3 25	2.2658	1.35	0.360	10/15-10/16/98	1.96
OFF-23-DEP	8/17/98	23B5	0 990	36.5	3.81	2 8169	1.41	0 423	10/15-10/16/98	1 90
OFF-23-DEP	8/17/98	23C1	EM						10/15-10/16/98	
OFF-23-DEP	8/17/98	23C2	0 994	39.5	4 10	3.1025	1.61	0.620	10/15-10/16/98	2.41
OFF-23-DEP	8/17/98	23C3	0.993	44 8	6.95	5.9594	1 75	0.754	10/15-10/16/98	2.91
OFF-23-DEP	8/17/98	23C4	EM						10/15-10/16/98	
OFF-23-DEP	8/17/98	23C5	0.988	38.8	4 88	3 8901	1.55	0.560	10/15-10/16/98	2.20
OFF-23-DEP	8/17/98	23D1	0 996	36.2	4 04	3.0416	1.32	0.323	10/15-10/16/98	1 92
OFF-23-DEP	8/17/98	23D2	0 988	36.5	3 84	2 8476	1 43	0.438	10/15-10/16/98	2.29
OFF-23-DEP	8/17/98	23D3	0.989	39 1	4 49	3 4971	1 47	0 476	10/15-10/16/98	2.07
OFF-23-DEP	8/17/98	23D4	0 989	38.0	4.21	3.2231	1.45	0.461	10/15-10/16/98	2 24
OFF-23-DEP	8/17/98	23D5	0 992	36.8	3.95	2.9563	1.42	0 427	10/15-10/16/98	1.84

EM-Empty Shell

Appendix E

Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA ERA

Client Name and Contact: STEVE PARKER, TTNUS

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-7-BM-CI	1	BAG	5/26/98	1:34 pm	Ziplock bag, 20+ minnows	Condition index
OFF-6-BM-CI	1			1:44 pm		
OFF-5-BM-CI	1			2:00 pm		
OFF-4-BM-CI	1			2:20 pm		
OFF-3-BM-CI	1			2:30 pm		
OFF-2-BM-CI	1			2:45 pm		
OFF-1-BM-CI	1			3:05 pm		
OFF-22-BM-CI	1			3:20 pm		
Total	8					

Packed/Released By Signature Printed Name GREG TRACEY, SAIC	Date Time 5/26/98 4:20 pm	Received By SAIC ETC Signature Printed Name: Cornelia Heller, 9 20am Date Time 5/27/98
Released By Signature Printed Name.	Date Time	Received By Signature Printed Name: Date Time
Final Destination. SAIC, ETC.		Contact Name and Phone Number SAIC ETC, Cornelia Heller 401 782-1900
Shipping Method Not required		Page 1 of 1

Remarks

Original Form Accompanies Shipment

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-13-DEP A	1	wide bottle	8/17/98	08:35	Deployed Mussels	Conventional analysis, Metal analysis, Chemistry
OFF-13-DEP-B	1			08:36		
OFF-13-DEP-C	1			08:37		
OFF-13-DEP-D	1			08:38		
OFF-18-DEP-A	1			08:41		
OFF-18-DEP-B	1			08:42		
OFF-18-DEP-C	1			08:43		
OFF-18-DEP-D	1			08:44		
OFF-17-DEP-A	1			09:03		
OFF-17-DEP-B	1			09:04		
OFF-17-DEP-C	1			09:05		
OFF-17-DEP-D	1			09:06		
OFF-21-DEP A	1			09:23		
OFF-21-DEP-B	1			09:24		
OFF-21-DEP-C	1			09:25		
Total:	15					

Packed/Released By: SAIC	Date Time	Received By: SAIC	Date Time	Remarks:
Signature: John T. Morris	8/17/98 11:54	Signature: Brian Kozial	8/17/98 1205	
Printed Name: John T. Morris		Printed Name: BRIAN KOZIOL		
Released By:	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name.		Printed Name:		
Final Destination.		Contact Name and Phone Number		
Shipping Method		Page 1 of 3		

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Pirlum

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-21-DEP-D	1	mesh bag	8/17/98	09:26	Deployed Blue Mussels	conductivity index, microbiology, chemistry
OFF-20-DEP-A	1			09:33		
OFF-20-DEP-B	1			09:34		
OFF-20-DEP C	1			09:35		
OFF-20-DEP D	1			09:36		
OFF-19-DEP-A	1			09:56		
OFF-19-DEP-B	1			09:57		
OFF-19-DEP-C	1			09:58		
OFF-19-DEP-D	1			09:59		
OFF-14-DEP-A	1			10:10		
OFF-14-DEP B	1			10:11		
OFF-14-DEP C	1			10:12		
OFF-14-DEP-D	1			10:13		
OFF-23-DEP-A	1			10:26		
OFF-23-DEP-B	1			10:27		
Total:	15					

Packed/Released By: SAIC Signature: [signature] Printed Name: John T. Morris	Date Time 8/17/98 11:58	Received By: SAIC Signature: [signature] Printed Name: BRIAN KEZIOL
Released By Signature. Printed Name:	Date Time	Received By: Signature: Printed Name:
Final Destination:		Contact Name and Phone Number
Shipping Method:		Page 2 of 3

Date Time 8/17/98 1205

Remarks:

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782 1900 / Fax (401) 782 2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Pinto

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-23-DEP-C	1	mesh bag	8/17/98	10:28	Deployed Blue Mussels	Microbiology, Cd, Cu, Pb, Zn, Chrom VI
OFF-23 DEP-D	1	↓	~	10:29	↓	
Total :	2					

Packed/Released By: SAIC Signature: John T. Morris Printed Name: John T. Morris	Date Time 8/17/98 11:54	Received By: SAIC Signature: Brian Kozial Printed Name: BRIAN KOZIAL	Date Time 8/17/98 1205
Released By: Signature: Printed Name:	Date Time	Received By: Signature: Printed Name:	Date Time
Final Destination:		Contact Name and Phone Number	
Shipping Method:		Page 3 of 3	

Remarks

APPENDIX B-2-3.
HEMATOPOIETIC NEOPLASIA

EVALUATION
OF THE
BLUE MUSSEL, *MYTILUS EDULIS*,
FROM NEWPORT, RI
FOR
HEMATOPOIETIC NEOPLASIA
FOR THE
DRAFT ECOLOGICAL RISK ASSESSMENT
FOR
OFFTA, NETC

October 1998

Submitted to:

Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Submitted by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

SAIC Project No. 01-0440-04-9817-304
Task 4D

TABLE OF CONTENTS

Introduction 1

Methods 1

Results and Discussion 2

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Table 1. Results of Hematopoietic neoplasia assessment in blue mussels indigenous to Coasters Harbor at OFFTA, NETC.

Appendix A. Chain-of-Custody forms.

INTRODUCTION

Blue mussels, *Mytilus edulis*, from Coasters Harbor were examined for incidence of hematopoietic neoplasia as part of the ecological risk assessment being conducted at this site. Hematopoietic neoplasia is a proliferative blood disorders of bivalve molluscs are known to be progressive, fatal, and transmissible (Elston *et al.* 1988). The incidence of hematopoietic neoplasia observed in *Mytilus edulis* collected from each station will be compared to chemical, biological, and toxicological measurements to evaluate the likelihood that adverse ecological effects are occurring as a result of exposure to stressors attributable to the OFFTA study area.

Hematopoietic neoplasia has been reported world-wide in field populations of 15 marine and estuarine bivalves mollusc species (Peters 1988). These include several commercially important species (i.e., the soft-shell clam, *Mya arenaria*, the eastern oyster, *Crassostrea virginica*, and the blue mussel, *Mytilus edulis*) (Harshberger *et al.* 1979, Brousseau 1987, and Elston *et al.* 1988). These diseases can be diagnosed by histopathological examinations or histocytological techniques (Cooper *et al.* 1982). Several studies indicate that this disease may be caused by contact with viruses, exposure to environmental contaminants or stressors, or from the synergistic effects of several etiologic agents (Peters 1988).

METHODS

Collection, Transportation, and Holding

Indigeneous mussels from 8 stations in Coasters Harbor (OFF-1, OFF-2, OFF-3, OFF-4, OFF-5, OFF-6, OFF-7, and OFF-22) were collected and transported in insulated coolers to SAIC's Environmental Testing Center and were held in ambient flowing seawater in plastic cages until preparation. Slides were prepared within 48 hours of collection.

Slide Preparation and Analysis

Slides were prepared according to procedures described in Morrison *et al.* (1993). The method is described in detail in the standard operating procedure in Appendix A. Briefly, a 1-ml disposable syringe was used to aspirate hemolymph from the pericardial region of the adductor muscle between the anterior or posterior muscle. Blood samples were put into eight-chambered tissue culture slides and were allowed to settle for one hour. Excess fluid was drained. Slides were fixed and stained using picromethyl stain and Schiff reagent (Farley *et al.* 1969). When possible, up to one thousand cells were examined microscopically per animal.

Blood samples from each animal were examined for the presence of three cell types: 1) normal cells, characterized by numerous pseudopodia, round regular nuclei, and abundant cytoplasm; 2) abnormal but non-neoplastic rounded cells with pycnotic-like nuclei; and 3)

neoplastic cells, being enlarged cells with large, hyperchromatic nuclei surrounded by little cytoplasm. Although abnormal cells are distinguished, their appearance indicates a moribund, but normal, cell. Hence, the rate of neoplasia incidence, is expressed as the number of neoplastic cells divided by the total of normal, abnormal and neoplastic cells x 100.

RESULTS AND DISCUSSION

Raw data are presented in Table 1. No incidence of hematopoietic neoplasia was observed at any station.

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Table 1 Results of Hematopoietic neoplasia assessment in blue mussels indigeneous to Coaster Harbor, RI at OFFTA, NETC

Station	#	Normal Cells	Neoplastic Cells	Total	% Neoplasia	Mean	SD
OFF-1-HN	1	1000	0	1000	0 0		
OFF-1-HN	2	1000	0	1000	0 0		
OFF-1-HN	3	1000	0	1000	0 0		
OFF-1-HN	4	1000	0	1000	0 0		
OFF-1-HN	5	1000	0	1000	0 0		
OFF-1-HN	6	1000	0	1000	0 0		
OFF-1-HN	7	1000	0	1000	0 0		
OFF-1-HN	8	1000	0	1000	0 0		
OFF-1-HN	9	1000	0	1000	0 0		
OFF-1-HN	10	1000	0	1000	0 0		
OFF-1-HN	11	1000	0	1000	0 0		
OFF-1-HN	12	1000	0	1000	0 0		
OFF-1-HN	13	1000	0	1000	0 0		
OFF-1-HN	14	1000	0	1000	0 0		
OFF-1-HN	15	1000	0	1000	0 0		
OFF-1-HN	16	1000	0	1000	0 0		
OFF-1-HN	17	1000	0	1000	0 0		
OFF-1-HN	18	1000	0	1000	0 0		
OFF-1-HN	19	1000	0	1000	0 0		
OFF-1-HN	20	1000	0	1000	0 0	0 0	0 00
OFF-2-HN	1	1000	0	1000	0 0		
OFF-2-HN	2	1000	0	1000	0 0		
OFF-2-HN	3	1000	0	1000	0 0		
OFF-2-HN	4	1000	0	1000	0 0		
OFF-2-HN	5	1000	0	1000	0 0		
OFF-2-HN	6	1000	0	1000	0 0		
OFF-2-HN	7	1000	0	1000	0 0		
OFF-2-HN	8	1000	0	1000	0 0		
OFF-2-HN	9	1000	0	1000	0 0		
OFF-2-HN	10	1000	0	1000	0 0		
OFF-2-HN	11	1000	0	1000	0 0		
OFF-2-HN	12	1000	0	1000	0 0		
OFF-2-HN	13	1000	0	1000	0 0		
OFF-2-HN	14	1000	0	1000	0 0		
OFF-2-HN	15	1000	0	1000	0 0		
OFF-2-HN	16	1000	0	1000	0 0	0 0	0 00
OFF-3-HN	1	1000	0	1000	0 0		
OFF-3-HN	2	1000	0	1000	0 0		
OFF-3-HN	3	1000	0	1000	0 0		
OFF-3-HN	4	1000	0	1000	0 0		
OFF-3-HN	5	1000	0	1000	0 0		
OFF-3-HN	6	1000	0	1000	0 0		
OFF-3-HN	7	1000	0	1000	0 0		
OFF-3-HN	8	1000	0	1000	0 0		
OFF-3-HN	9	1000	0	1000	0 0		
OFF-3-HN	10	1000	0	1000	0 0		
OFF-3-HN	11	1000	0	1000	0 0		
OFF-3-HN	12	1000	0	1000	0 0		
OFF-3-HN	13	1000	0	1000	0 0		
OFF-3-HN	14	1000	0	1000	0 0		
OFF-3-HN	15	1000	0	1000	0 0	0 0	0 00
OFF-4-HN	1	1000	0	1000	0 0		
OFF-4-HN	2	1000	0	1000	0 0		
OFF-4-HN	3	1000	0	1000	0 0		
OFF-4-HN	4	1000	0	1000	0 0		
OFF-4-HN	5	1000	0	1000	0 0		
OFF-4-HN	6	1000	0	1000	0 0		
OFF-4-HN	7	1000	0	1000	0 0		
OFF-4-HN	8	1000	0	1000	0 0		
OFF-4-HN	9	1000	0	1000	0 0		
OFF-4-HN	10	1000	0	1000	0 0		
OFF-4-HN	11	1000	0	1000	0 0		
OFF-4-HN	12	1000	0	1000	0 0		
OFF-4-HN	13	1000	0	1000	0 0		
OFF-4-HN	14	1000	0	1000	0 0		
OFF-4-HN	15	1000	0	1000	0 0		
OFF-4-HN	16	1000	0	1000	0 0		
OFF-4-HN	17	1000	0	1000	0 0		
OFF-4-HN	18	1000	0	1000	0 0		
OFF-4-HN	19	1000	0	1000	0 0		
OFF-4-HN	20	1000	0	1000	0 0	0 0	0 00
OFF-5-HN	1	1000	0	1000	0 0		
OFF-5-HN	2	1000	0	1000	0 0		
OFF-5-HN	3	1000	0	1000	0 0		
OFF-5-HN	4	1000	0	1000	0 0		
OFF-5-HN	5	1000	0	1000	0 0		
OFF-5-HN	6	1000	0	1000	0 0		
OFF-5-HN	7	1000	0	1000	0 0		
OFF-5-HN	8	1000	0	1000	0 0		
OFF-5-HN	9	1000	0	1000	0 0		
OFF-5-HN	10	1000	0	1000	0 0		
OFF-5-HN	11	1000	0	1000	0 0		
OFF-5-HN	12	1000	0	1000	0 0		
OFF-5-HN	13	1000	0	1000	0 0		
OFF-5-HN	14	1000	0	1000	0 0	0 0	0 00
OFF-6-HN	1	1000	0	1000	0 0		
OFF-6-HN	2	1000	0	1000	0 0		
OFF-6-HN	3	1000	0	1000	0 0		
OFF-6-HN	4	1000	0	1000	0 0		
OFF-6-HN	5	1000	0	1000	0 0		

Station	#	Normal Cells	Neoplastic Cells	Total	% Neoplasia	Mean	SD
OFF-6-HN	6	1000	0	1000	0 0		
OFF-6-HN	7	1000	0	1000	0 0		
OFF-6-HN	8	1000	0	1000	0 0		
OFF-6-HN	9	1000	0	1000	0 0		
OFF-6-HN	10	1000	0	1000	0 0		
OFF-6-HN	11	1000	0	1000	0 0		
OFF-6-HN	12	1000	0	1000	0 0		
OFF-6-HN	13	1000	0	1000	0 0		
OFF-6-HN	14	1000	0	1000	0 0	0 0	0 00
OFF-7-HN	1	1000	0	1000	0 0		
OFF-7-HN	2	1000	0	1000	0 0		
OFF-7-HN	3	1000	0	1000	0 0		
OFF-7-HN	4	1000	0	1000	0 0		
OFF-7-HN	5	1000	0	1000	0 0		
OFF-7-HN	6	1000	0	1000	0 0		
OFF-7-HN	7	1000	0	1000	0 0		
OFF-7-HN	8	1000	0	1000	0 0		
OFF-7-HN	9	1000	0	1000	0 0		
OFF-7-HN	10	1000	0	1000	0 0		
OFF-7-HN	11	1000	0	1000	0 0		
OFF-7-HN	12	1000	0	1000	0 0		
OFF-7-HN	13	1000	0	1000	0 0		
OFF-7-HN	14	1000	0	1000	0 0		
OFF-7-HN	15	1000	0	1000	0 0		
OFF-7-HN	16	1000	0	1000	0 0		
OFF-7-HN	17	1000	0	1000	0 0		
OFF-7-HN	18	1000	0	1000	0 0		
OFF-7-HN	19	1000	0	1000	0 0		
OFF-7-HN	20	1000	0	1000	0 0	0 0	0 00
OFF-22-HN	1	1000	0	1000	0 0		
OFF-22-HN	2	1000	0	1000	0 0		
OFF-22-HN	3	1000	0	1000	0 0		
OFF-22-HN	4	1000	0	1000	0 0		
OFF-22-HN	5	1000	0	1000	0 0		
OFF-22-HN	6	1000	0	1000	0 0		
OFF-22-HN	7	1000	0	1000	0 0		
OFF-22-HN	8	1000	0	1000	0 0		
OFF-22-HN	9	1000	0	1000	0 0		
OFF-22-HN	10	1000	0	1000	0 0		
OFF-22-HN	11	1000	0	1000	0 0		
OFF-22-HN	12	1000	0	1000	0 0		
OFF-22-HN	13	1000	0	1000	0 0		
OFF-22-HN	14	1000	0	1000	0 0	0 0	0 00

Appendix A

Science Applications International Corporation

:nvironmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech NUS Steve Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-5 HN	1	Plastic Bag	10-6-98	14:00	20 Mytilus	Neoplasia
OFF-6 HN	↓	↓	↓	14:15	↓	↓
OFF-7 HN				14:30		
OFF-22 HN				14:45		
Total :	4					

ked/Released By: Christine Tietjen ature: ed Name: Christine Tietjen Date Time 10/6/98 3:00pm	Received By: SAIC Signature: Printed Name: Cornelia Muller Date Time 10/6/98 3:00pm	Remarks:
ased By: ature: ed Name: Date Time	Received By: Signature. Printed Name: Date Time	
Destination: SAIC ETC	Contact Name and Phone Number (401) 782 1900	
ing Method: NA	Page 1 of 1	

Science Applications International Corporation

Chain of Custody Record

nvironmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA

Client Name and Contact: Tetra Tech NUS Steve Parker

Sample N .	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-1-HN	1	Plastic Bag	10-5-98	13:00	20 Mytilus	Neoplasia
OFF-2-HN				13:15		
OFF-3-HN				13:30		
OFF-4-HN				13:45		
Total :	4					

ked/Released By: CT
ature: Christine Tietjen
ted Name: Christine Tietjen
Date Time: 2:30pm 10/5/98

Received By: CT
Signature: Cornelia Mueller
Printed Name: SAIC
Date Time: 2:30pm 10/5/98

ased By:
ature:
ed Name:
Date Time

Received By:
Signature:
Printed Name:
Date Time

Destination: SAIC ETC

Contact Name and Phone Number: Cornelia Mueller 401 782 1900

ping Method: Na

Page 1 of 1

Remarks:

APPENDIX B-2-4.
FECAL POLLUTION INDICATORS

Microbiology Tests Results

Draft Marine Ecological Risk Assessment
OFFTA, NETC
Newport, Rhode Island

October 1998

Submitted to:

Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Submitted by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

SAIC Project Number
01-0440-04-9817-305
Task 5

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Table 2. Positive and Negative Test Criteria for Presumptive and Confirmation Media

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Appendix A. ETC Microbiology Standard Operating Procedures

Appendix B. Raw Data Sheets for Microbiological Analyses

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Introduction

Shellfish tissues from mussels deployed at locations in the Old Fire Fighting Area (OFFTA), Navel Education and Training Center (NETC), Newport, RI, as well as at a reference location were analyzed for fecal pollution indicator bacteria to assess the sanitary quality of this marine environment. Fecal pollution indicator bacteria used to assess the sanitary quality of marine environments have consistently shown a direct association with sewage and other fecal materials as well as waters, sediments, and marine food animals impacted by fecal material (APHA 1970, FDA 1992b, Institute of Medicine 1991, Mitchell 1978). Fecal pollution indicator bacteria of choice for this investigation included: total and fecal coliforms, fecal streptococci, and *Clostridium perfringens* spores. Shellfish tissues were evaluated for the aforementioned indicators using the Most Probable Number (MPN) methodology at Science Applications International Corporation's (SAIC) Environmental Testing Center (ETC). Methods used followed Standard Operating Procedures (SOPs) and Quality Assurance/Quality Control (QA/QC) procedures as described in Appendix A.

Methods

Mussel Collection and Deployment

Blue mussels were collected and deployed according to the SAIC Standard Operating Procedure: Deployment and Retrieval of Caged Bivalves for Environmental Monitoring (URI and SAIC 1995). To summarize, blue mussels used in the deployment study were collected from Dutch Island in Narragansett Bay, RI. Mussels collected from the site were brought back to SAIC in Narragansett, RI and held for approximately 96 hours in well-aerated tanks with flowing filtered seawater until deployment on June 17, 1998. Mussels were placed in polyethylene mesh bags. Four replicate bags per station were prepared. Each bag was attached to a float and mooring block such that the bag would remain suspended approximately 1 meter above bottom. The float/mooring assembly was connected in series to form a trawl. Each trawl had additional line on each end for connection to surface marker floats. These trawls were then deployed, one trawl per station, at 7 locations in Coasters Harbor (OFF-13, OFF-14, OFF-17, OFF-18, OFF-19, OFF-20, and OFF-21) as well as 1 reference location (OFF-23). Deployed trawls were removed for final analysis on August 17, 1998.

An additional set of mussels consisting of four replicates designated T0 or "time zero" mussels, were not deployed. This set of mussels was used for data comparison against biological results obtained for deployed mussels.

Sample Collection, Log-In, and Holding

Mussels were collected from the 7 deployment stations and delivered to the ETC for testing on August 17, 1998 by SAIC (Applied Aquatic Science Division). Mussel samples were collected and placed in waterproof plastic bags durable enough to withstand the cutting action of shellfish

during transport. Samples were delivered to the ETC in insulated coolers with blue ice and inspected upon receipt for leaks or damage during transport. After inspection, the sample containers were stored at 4 ± 2 °C in the dark until testing on August 17, 1998. Shellfish tissues were analyzed within 24 h of collection from deployment stations. Standard chain-of-custody procedures were followed. Samples were logged into the ETC sample tracking system following receipt and inspection. Chain-of custody tracking forms were signed and xeroxed. The originals were placed in the ETC's sample log books and copies were retained with test data in experiment binders and project files.

Shellfish Preparation

When available, a minimum of 12 shellfish were used in order to obtain a representative sample (approximately 100 g of shellfish liquor and meats) and to allow for the selection of sound animals suitable for shucking. Hands were scrubbed thoroughly with soap and water prior to cleaning shell stock. Growth and loose material were cleaned from the shells. The shell stock were scrubbed with a sterile stiff brush under running water of drinking-water quality, paying particular attention to the crevices at the junctions of the shells. Cleaned shell stock were placed on clean paper towels to air dry.

Before starting the removal of shell contents, hands were again scrubbed thoroughly with soap and water, and then rinsed with 70% alcohol. The byssal threads of mussels were removed during the cleansing of the shell. Mussels were entered at the byssal opening by inserting the knife and spreading the shells apart with a twisting motion. The liquor was drained, and the body transferred into a sterile tared blender.

Shellfish meats and liquors were weighed and an equal amount by weight of sterile buffered dilution water was added to the sterile Waring blender (50% dilution). Shellfish meats and buffer water were blended at approximately 14,000 RPM for 2 minutes. Excessive blending was avoided to prevent overheating.

Following grinding, a 10-fold dilution (10^{-1}) of the homogenate was prepared by adding 20 ml of the ground sample to 80 ml of buffered dilution water. A subsequent 10-fold dilution (10^{-2}) was prepared by adding 11 ml of the 10^{-1} dilution to 99 ml of sterile buffered dilution water. The ground sample and dilutions of the sample were cultured within 2 minutes after completion of the grinding period to avoid separation of the sample on standing.

Test Procedures and Conditions

Shellfish tissues were examined according to the test procedures outlined in ETC Microbiological SOPs presented in Appendix A. ETC Microbiological SOPs are also presented in Appendix A of the Narragansett Bay Ecorisk and Monitoring for Navy Sites, Work/Quality Assurance Project Plan (URI and SAIC 1995). ETC SOPs were developed according to APHA, FDA and U.S. EPA procedures (APHA 1970 and 1992, FDA 1992a and b, and U.S. EPA 1995). A summary of ETC SOPs used in the microbiological analyses of mussel tissues for bacterial

indicators follows:

Most Probable Number Method for Enumeration of Total Coliforms and Fecal Coliforms in Shellfish

Most Probable Number Method for Enumeration of Fecal Streptococci and Enterococci in Shellfish

Most Probable Number Method for Enumeration of *Clostridium perfringens* in Shellfish

For each fecal pollution indicator bacteria, a presumptive test medium and confirmation medium were prepared. A summary of test media and conditions is presented in Table 1. Fifteen tubes of each presumptive culture medium were used for each sample analysis. For shellfish tissues, 2 ml of the 50% preparation (equivalent to 1.0 g) was added to 5 tubes, 1 ml of the 10^{-1} preparation (equivalent to 0.1 g) was added to 5 tubes, and 1 ml of the 10^{-2} preparation (equivalent to 0.01 g) was added to 5 tubes. This was repeated for each indicator bacteria's presumptive culture medium. Presumptive medium culture tubes were then incubated according to ETC SOPs. Following the incubation period for presumptive culture, tubes were observed and positive and negative test results were recorded. At this time, an aliquot of each positive presumptive tube was transferred to a separate tube of the appropriate confirmation medium(s) and incubated according to ETC SOPs. Following the incubation period for confirmation culture, tubes were observed and positive and negative test results were recorded. A summary of positive and negative test criteria is presented in Table 2.

Performance Controls

Quality Assurance/Quality Control procedures were used for each batch of culture medium prepared. Qualitative Control included a sterility check on at least 5% of the medium prepared to ensure the medium was free of contaminants which could potentially influence test results. Analytical Quality Control included positive and negative control checks on at least 5% of the medium prepared. Positive and negative control checks ensured the test results obtained reflected the metabolic properties of the bacteria present in the sample analyzed, and were not false positives or false negatives attributable to poor media quality. Sterility checks and positive and negative control checks were performed on the day of culture medium preparation and with each test initiation. A summary of positive and negative control organisms used for analytical quality control is presented in Table 3.

Calculating Bacterial Densities Using the MPN Geometric Mean Series

Bacterial densities were calculated using an MPN chart, presented in Table 4. The number of positive tubes from each of the three dilutions performed was counted. The number of positive tubes from each dilution was then used to form a 3 digit code. The three digit code was located on the most probable number geometric series chart. The MPN number which corresponded to the three

digit code was adjusted according to the dilution series (i.e., where the lowest dilution was 1 ml, the value was multiplied by 10). The adjusted value obtained was the density of indicator bacteria per 100 g of sample.

Results

Shellfish indicator densities are presented in Table 5. Mussel tissue analyses demonstrated the presence of one or more of the fecal pollution indicators.

Time Zero Mussels

The "time zero" mussel replicates designated T0 are presented in Table 5 for comparison to deployed mussel data. Indicator densities for the shellfish samples from T0 were low for total coliforms and fecal streptococci (<100 CFU/100 g) and negligible for fecal coliforms and *Clostridium perfringens* (<100 CFU/100 g).

Deployed Mussels

Indicator densities for the shellfish samples collected from deployment stations OFF-18 was high (>1000 CFU/100 g) for total coliforms and fecal streptococci. Deployment stations OFF-13, OFF-14, OFF-17 , OFF-19, OFF-20, OFF-21, and OFF-23 ranged from negligible (<100 CFU/100g) to intermediate (>350 CFU/100g) for total coliforms, fecal coliforms, fecal streptococci, and *Clostriduium perfringens.*

Quality Assurance Results

All sterility checks demonstrated that each batch of culture medium was free of contaminants on the day of preparation and with each test initiation. Positive/negative control checks demonstrated that each batch of culture media performed according to the bacteria inoculated.

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TABLE 1
TEST MEDIA AND CONDITIONS FOR ENUMERATING FECAL POLLUTION INDICATOR BACTERIA USING THE MOST PROBABLE NUMBER METHOD
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Indicator	Presumptive Medium	Confirmation Medium	Incubation Temperature and Duration
Total Coliforms	Lauryl Tryptose Sulfate Broth	Brilliant Green Bile 2%	35.0 ± 0.5°C, 48 ± 3 h
Fecal Coliforms	Lauryl Tryptose Sulfate Broth		35.0 ± 0.5°C, 48 ± 3 h
		EC Medium	44.5 ± 0.2°C, 24 ± 2 h
Fecal Streptococci	Azide Dextrose Broth	Ethyl Violet Azide Broth	35.0 ± 0.5°C, 48 ± 3 h
Clostridium perfringens	Iron Milk Medium/Anaerobic		44.5 ± 0.2°C, 18 h
		modified mCP medium	44.5 ± 0.2°C, 18 - 24 h

TABLE 2
POSITIVE AND NEGATIVE TEST CRITERIA FOR PRESUMPTIVE AND CONFIRMATION MEDIA
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Indicator	Culture Medium	Positive Test Result	Negative Test Result
Total and Fecal Coliforms	Lauryl Tryptose Sulfate Broth	Growth, with gas production	Some growth or no growth, no gas production
Total and Fecal Coliforms	Brilliant Green Bile 2%	Growth, with gas production	Some growth or no growth, no gas production
Fecal Coliforms	EC Medium	Growth, with gas production	Some growth or no growth, no gas production
Fecal Streptococci	Azide Dextrose Broth	Turbid growth	Some growth or no growth
Fecal Streptococci	Ethyl Violet Azide Broth	Turbid growth, purple button at butt of test tube	Some or no growth, no purple button at butt of test tube
Clostridium perfringens	Iron Milk Medium/Anaerobic	Stormy fermentation of milk, with fracturing and rising of curd	No stormy fermentation
Clostridium perfringens	modified mCP medium	Typical straw yellow colonies, turn magenta upon exposure to NH_4OH vapors	No growth or some growth, colonies do not turn magenta

Table 3
ANALYTICAL QUALITY CONTROL: POSITIVE AND NEGATIVE CONTROL ORGANISMS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Culture Medium	Positive Control Organism(s)	Negative Control Organism
Lauryl Tryptose Sulfate Broth	*Escherichia coli*, ATCC® 25922 *Enterobacter aerogenes*, ATCC® 13048	*Staphylococcus aureus*, ATCC® 25923
Brilliant Green Bile 2%	*Escherichia coli*, ATCC® 25922 *Enterobacter aerogenes*, ATCC® 13048	*Staphylococcus aures*, ATCC® 25923
EC Medium	*Escherichia coli*, ATCC® 25922	*Enterobacter aerogenes*, ATCC® 13048
Azide Dextrose Broth	*Streptococcus faecalis*, ATCC® 19433	*Escherichia coli*, ATCC® 25922 *Staphylococcus aures*, ATCC® 25923
Ethyl Violet Azide Broth	*Streptococcus faecalis*, ATCC® 19433	*Escherichia coli*, ATCC® 25922 *Staphylococcus aures*, ATCC® 25923
Iron Milk Medium/Anaerobic	*Clostridium perfringens*, ATCC® 3624	*Escherichia coli*, ATCC® 25922
modified mCP medium	*Clostridium perfringens*, ATCC® 3624	*Escherichia coli*, ATCC® 25922

Table 4. Most Probable Number per 100 ml or g of sample, planting 5 portions in each of 3 dilutions in geometric series.

No. Positive Tubes			MPN	No. Positive Tubes			MPN	No. Positive Tubes			MPN	No. Positive Tubes			MPN	No. Positive Tubes			MPN	No. Positive Tubes			MPN
10 ml	1 ml	0.1 ml		10 ml	1 ml	0.1 ml		10 ml	1 ml	0.1 ml		10 ml	1 ml	0.1 ml		10 ml	1 ml	0.1 ml		10 ml	1 ml	0.1 ml	
0	0	0		1	0	0	2.0	2	0	0	4.5	3	0	0	7.8	4	0	0	13	5	0	0	23
0	0	1	1.8	1	0	1	4.0	2	0	1	6.8	3	0	1	11	4	0	1	17	5	0	1	31
0	0	2	3.6	1	0	2	6.0	2	0	2	9.1	3	0	2	13	4	0	2	21	5	0	2	43
0	0	3	5.4	1	0	3	8.0	2	0	3	12	3	0	3	16	4	0	3	25	5	0	3	58
0	0	4	7.2	1	0	4	10	2	0	4	14	3	0	4	20	4	0	4	30	5	0	4	76
0	0	5	9.0	1	0	5	12	2	0	5	16	3	0	5	23	4	0	5	36	5	0	5	95
0	1	0	1.8	1	1	0	4.0	2	1	0	6.8	3	1	0	11	4	1	0	17	5	1	0	33
0	1	1	3.6	1	1	1	6.1	2	1	1	9.2	3	1	1	14	4	1	1	21	5	1	1	46
0	1	2	5.5	1	1	2	8.1	2	1	2	12	3	1	2	17	4	1	2	26	5	1	2	64
0	1	3	7.3	1	1	3	10	2	1	3	14	3	1	3	20	4	1	3	31	5	1	3	84
0	1	4	9.1	1	1	4	12	2	1	4	17	3	1	4	23	4	1	4	36	5	1	4	110
0	1	5	11	1	1	5	14	2	1	5	19	3	1	5	27	4	1	5	42	5	1	5	130
0	2	0	3.7	1	2	0	6.1	2	2	0	9.3	3	2	0	14	4	2	0	22	5	2	0	49
0	2	1	5.5	1	2	1	8.2	2	2	1	12	3	2	1	17	4	2	1	26	5	2	1	70
0	2	2	7.4	1	2	2	10	2	2	2	14	3	2	2	20	4	2	2	32	5	2	2	95
0	2	3	9.2	1	2	3	12	2	2	3	17	3	2	3	24	4	2	3	38	5	2	3	120
0	2	4	11	1	2	4	15	2	2	4	19	3	2	4	27	4	2	4	44	5	2	4	150
0	2	5	13	1	2	5	17	2	2	5	22	3	2	5	31	4	2	5	50	5	2	5	180
0	3	0	5.6	1	3	0	8.3	2	3	0	12	3	3	0	17	4	3	0	27	5	3	0	79
0	3	1	7.4	1	3	1	10	2	3	1	14	3	3	1	21	4	3	1	33	5	3	1	110
0	3	2	9.3	1	3	2	13	2	3	2	17	3	3	2	24	4	3	2	39	5	3	2	140
0	3	3	11	1	3	3	15	2	3	3	20	3	3	3	28	4	3	3	45	5	3	3	180
0	3	4	13	1	3	4	17	2	3	4	22	3	3	4	31	4	3	4	52	5	3	4	210
0	3	5	15	1	3	5	19	2	3	5	25	3	3	5	35	4	3	5	59	5	3	5	250
0	4	0	7.5	1	4	0	11	2	4	0	15	3	4	0	21	4	4	0	34	5	4	0	130
0	4	1	9.4	1	4	1	13	2	4	1	17	3	4	1	24	4	4	1	40	5	4	1	170
0	4	2	11	1	4	2	15	2	4	2	20	3	4	2	28	4	4	2	47	5	4	2	220
0	4	3	13	1	4	3	17	2	4	3	23	3	4	3	32	4	4	3	54	5	4	3	280
0	4	4	15	1	4	4	19	2	4	4	25	3	4	4	36	4	4	4	62	5	4	4	350
0	4	5	17	1	4	5	22	2	4	5	28	3	4	5	40	4	4	5	69	5	4	5	430
0	5	0	9.4	1	5	0	13	2	5	0	17	3	5	0	25	4	5	0	41	5	5	0	240
0	5	1	11	1	5	1	15	2	5	1	20	3	5	1	29	4	5	1	48	5	5	1	350
0	5	2	13	1	5	2	17	2	5	2	23	3	5	2	32	4	5	2	56	5	5	2	540
0	5	3	15	1	5	3	19	2	5	3	26	3	5	3	37	4	5	3	64	5	5	3	920
0	5	4	17	1	5	4	22	2	5	4	29	3	5	4	41	4	5	4	72	5	5	4	1600
0	5	5	19	1	5	5	24	2	5	5	32	3	5	5	45	4	5	5	81	5	5	5	

TABLE 5
MICROBIAL FECAL INDICATOR DENSITIES FOR MUSSEL TISSUES
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND[6]

Station Number	Date Collected	Date Assayed [3],[4]	Number of Animals Assayed	Total Wet Weight of Tissues(g) [5]	Mean Wet Weight/ Animal (g)	Total Coliforms CFU[1]/100 g	Fecal Coliforms CFU[1]/100 g	Fecal Streptococci CFU[1]/100 g	*Clostridium perfringens* CFU[1]/100 g
OFF-13-DEP	8/17/98	8/23/98	20	83.0	4.1	790	790	410	<18
OFF-14-DEP	8/17/98	8/23/98	20	86.2	4 3	460	680	480	230
OFF-17-DEP	8/17/98	8/23/98	20	81.4	4.1	230	230	110	<18
OFF-18-DEP	8/17/98	8/23/98	20	71.5	3.6	1300	490	1400	<18
OFF-19-DEP	8/17/98	8/23/98	20	68.4	3.4	230	130	470	<18
OFF-20-DEP	8/17/98	8/23/98	20	70 3	3.5	40	40	560	<18
OFF-21-DEP	8/17/98	8/23/98	20	67.9	3.4	45	<18	410	<18
OFF-23-DEP	8/17/98	8/23/98	20	55.3	2.8	230	230	150	230
T_0 [2]	6/16/98	6/23/98	20	28.0	1 4	130	<18	230	<18

FOOTNOTES

g = Grams
l = Low density of indicator bacteria
m = Moderate density of indicator bacteria
e = Elevated density of indicator bacteria

(1) CFU = Colony forming units
(2) T_0 mussels collected on 6/16/98, depurated in fresh marine water for 96 h, frozen at -20°C and assayed on 6/23/98 for spore-forming bacteria only. Data presented are means of replicate samples assayed.
(3) Mussels collected on 8/17/98, depurated in fresh marine water for 96 h and assayed on 8/23/98 for vegetative and spore-forming bacteria.
(4) Mussels collected on 8/17/98, depurated in fresh marine water for 96 h, frozen for 2 hours at -20°C (to eliminate vegetative bacteria), and assayed on 8/23/98 for spore-forming bacteria only.
(5) Average weight (g) based on wet tissue wt from B-2-2 Appendix D.
(6) - Indicator-specific rankings: "-" = <100 CFU/100 g; "+" = 100-350 CFU/100 g (low); "++" = >350 CFU/100 g (intermediate); "+++" = >1000 CFU/100 g (high).

ND= [illegible] data; explanation throughout.

Appendix A

MOST PROBABLE NUMBER METHOD FOR THE ENUMERATION OF TOTAL COLIFORMS AND FECAL COLIFORMS IN SHELLFISH

Point of Contact
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The term "total coliform" refers to a group of gram-negative aerobic to facultative anaerobic, non-spore forming, rod shaped bacteria which ferment lactose at 35.0±0.5°C in 24-48 hours. Included in this group are the genera *Escherichia*, *Enterobacter*, *Citrobacter* and *Klebsiella*. These organisms are widely distributed in nature and many are native to the gut of warm blooded animals, including man. The term "fecal coliform" refers to the thermotolerant forms of the total coliform group which ferment lactose at 44.5±0.2° in 24 hours. Within this group, *Escherichia coli* and *Klebsiella sp.* are of interest since, when present, they indicate that recent fecal contamination has occurred. Enumeration of total coliforms and fecal coliforms using the most probable number method is a means of determining the sanitary quality of shellfish meats.

1.0 Necessary Materials and Equipment

1.1 Glassware, Plasticware, Equipment and Disposable Supplies

2 liter Erlenmeyer flasks
6 x 50 mm culture tubes
16 x 100 mm test tubes
16 x 150 mm test tubes
16 and test tube caps and racks
1.0 and 10.0 ml sterile pipettes
20 liter polypropylene carboy
Heating mantle with magnetic stirrer and stir bars
Balance and weigh boats
Autoclave
Cornwall syringe
Air incubators 35.0±0.5°C
Waterbaths 44.5±0.2°C
Sterile shucking knives and scrub brushes
Waring blenders
Timer

1.0 Necessary Materials and Equipment (continued)

1.1 Glassware, Plasticware, Equipment and Disposable Supplies

pH meter
Sterile transfer sticks

1.2 Media and Diluent

Lauryl Tryptose Broth
Brilliant Green Bile 2%
EC Medium
Sodium chloride
Potassium phosphate
Sodium hydroxide
Deionized water

2.0 Media and Diluent Preparation

2.1 Enrichment Media Preparation: Single Strength Lauryl Tryptose Broth

2.1.1 Weigh 35.6 g of lauryl tryptose broth into a 2 liter Erlenmeyer flask.
2.1.2 Add 1.0 liter of deionized water and bring to a boil with continuous stirring.
2.1.3 Dispense the medium in 10.0 ml aliquots into 16 x 150 mm test tubes containing inverted 6 x 50 mm culture tubes.
2.1.4 Cap the test tubes and autoclave at 121°C for 15 minutes, total time of heat exposure **MUST** not exceed 45 minutes.
2.1.5 Store the media at 4°C in the dark for up to one month.

2.2 Total Coliform Confirmation Media Preparation: Brilliant Green Bile 2%

2.2.1 Weigh 40.0 g of Brilliant Green Bile 2% into a 2 liter Erlenmeyer flask.
2.2.2 Add 1.0 liter of deionized water and warm slightly with continuous stirring to completely dissolve the medium.
2.2.3 Dispense the medium in 5.0 ml aliquots into 16 x 100 mm test tubes containing inverted 6 x 50 mm culture tubes.
2.2.4 Cap the test tubes and autoclave at 121°C for 15 minutes, total time of heat exposure **MUST** not exceed 45 minutes.
2.2.5 Store media at 4°C in the dark for up to one month.

2.3 Fecal Coliform Confirmation Media Preparation: EC Medium

2.3.1 Weigh 37.0 g of EC medium into a 2 liter Erlenmeyer flask.
2.3.2 Add 1.0 liter of deionized water and bring to a boil with continuous stirring.
2.3.3 Dispense the medium in 5.0 ml aliquots into 16 x 100 mm test tubes containing inverted 6 x 50 mm culture tubes.
2.3.4 Cap the test tubes and autoclave at 121°C for 15 minutes, total time of heat exposure **MUST** not exceed 45 minutes.

2.3.5 Store media at 4°C in the dark for up to one month.

2.0 Media and Diluent Preparation (continued)

2.4 Stock Phosphate Buffer Solution: Buffered Dilution Water

2.4.1 In a 1 liter volumetric flask, dissolve 34.0 g of potassium phosphate in 500 ml of deionized water.

2.4.2 Adjust to pH 7.2 with 10N sodium hydroxide.

2.4.3 Make up to 1 liter with deionized water.

2.4.4 Add the buffer solution to a 1 liter polypropylene bottle and autoclave at 121°C for 15 minutes.

2.4.5 Store at 4°C in the dark for up to one month.

2.5 Diluent Preparation: Final Phosphate Buffered Dilution Water

2.5.1 Add 20 liters of deionized water to an autoclavable polypropylene carboy.

2.5.2 Add 25 ml of stock phosphate buffer solution and mix thoroughly.

2.5.3 Autoclave at 121°C for 45 minutes.

2.5.4 Store at room temperature for up to two weeks.

2.6 Diluent Preparation: Final Phosphate Buffered Dilution Blanks

2.6.1 Add 1.0 liter of deionized water to a 2 liter Erlenmeyer flask.

2.6.2 Add 1.25 ml of stock phosphate buffer solution and mix thoroughly.

2.6.3 Dispense the medium in 9.2 ml aliquots into 16 x 150 mm test tubes, 81.0 ml aliquots into 100 ml graduated dilution bottles and 91.0 ml aliquots into 100 ml graduated dilution bottles.

2.6.4 Cap the test tubes and/or dilution bottles and autoclave at 121°C for 15 minutes.

2.6.5 Refrigerate at 4°C in the dark for up to one month. **NOTE: Always check the volume of dilution water present in dilution blanks with each use. Discard any batch of buffered dilution water where evaporation has resulted in an unappropriate volume of buffered dilution water.**

3.0 Sample Storage

3.1 Shellfish Storage Containers

3.1.1 Use containers for shell-stock which are waterproof and durable enough to withstand the cutting action of the shellfish. Waterproof paper bags and plastic bags are suitable containers.

3.1.2 Use sterile wide-mouth jars with watertight closure for freshly shucked shellfish samples. Transfer samples of the final product to the sample jar with sterile forceps or spoon.

3.1.3 Use one or two packages of frozen shucked shellfish, containing 10 to 12 animals each, as one sample. Transfer core samples taken from larger blocks to sterile wide-mouth jars for transportation to the laboratory.

3.0 Sample Storage (continued)

3.2 Shellfish Storage Conditions and Temperature

3.2.1 Keep shell-stock samples in dry storage at a temperature above freezing but lower than 10°C until examination. Do not allow samples to come in contact with ice.

3.2.2 Refrigerate samples of shucked shellfish immediately after collection by packing in crushed ice until examination.

3.2.3 Keep samples of frozen shucked shellfish in the frozen state or at temperatures close to those at which the commercial stock was maintained. When this is not possible, pack samples of frozen shucked shellfish in crushed ice until examination.

3.3 Shellfish Identification Records

3.3.1 Maintain records of identification for each shellfish sample to enter the laboratory. Include the date, time, and place of collection, area the shellfish were harvested, the date and time of harvesting and the physical and chemical measurements of the harvesting water (if applicable). Also include the storage conditions between harvesting and collection.

3.3.2 Mark individual containers of shellfish samples for identification. Also, include identification information on a descriptive form to accompany the sample.

3.3.3 Record the time elapsed between collection and examination for each shellfish sample examined in the laboratory. Examine samples of shell stock and shucked, unfrozen shellfish within 6 hours after collection and in no case examine shellfish if they have been held more than 24 hours after collection.

3.3.4 Record the identification of the shipper, the date of shipment, and the harvesting area, the date, time and place of collection for market shellfish samples when other specified information is not available.

4.0 Sample Preparation

4.1 Shellfish in the Shell - Cleaning the Shells

4.1.1 Use a minimum of 12 shellfish in order to obtain a representative sample (approximately 200 g of shellfish liquor and meats) and to allow for the selection of sound animals suitable for shucking. Collect at least 200 g of sample when examining shucked or frozen shellfish.

4.1.2 Scrub hands thoroughly with soap and water.

4.1.3 Scrape off all growth and loose material from the shell. Scrub the shell stock with a sterile stiff brush under running water of drinking-water quality, paying particular attention to the crevices of the shells.

4.0 Sample Preparation (continued)

4.1 Shellfish in the Shell - Cleaning the Shells

4.1.4 Place the cleaned shell stock in clean containers or on clean towels to drain in the air.

4.2 Removal of Shell Contents

4.2.1 Before starting the removal of shell contents, scrub hands thoroughly with soap and water and rinse with 70% alcohol.

4.2.2 **OYSTERS:** Hold the oyster in the hand or on a fresh clean paper towel on the bench with the deep shell on the bottom. Using a sterile oyster knife, insert the point between the shells on the ventral side (at the right when the hinge is pointed away from the examiner), about 1/4 the distance from the hinge to the bill. Entry may also be made at the bill. Cut the adductor muscle from the upper flat shell and pry the shell wide enough to drain the shell liquor into a sterile tared blender. The upper shell may then be pried loose at the hinge, discarded, and the meats transferred to a sterile tared blender after severing the muscle attachment to the lower shell.

4.2.3 **HARD CLAMS:** Enter the hard clam with a sterile, thin-bladed knife similar to a paring knife. To open the clam, hold it in the hand, place the edge of the knife at the junction of the bills, and force it between the shells with a squeezing motion. An alternative method is to nibble a small hole in the bill, and with the knife, severe the two adductor muscles. Drain the shell liquor into a sterile tared blender. Cut the adductor muscles from the shells and transfer the body of the animal to the blender.

4.2.4 **OTHER CLAMS:** Shuck soft clams, butter clams, surf clams and similar species with a sterile paring knife, entering at the siphon end and cutting the adductor muscles first from the top valve and then from the bottom valve. Drain the shell liquor into a sterile tared blender. Transfer the body of the animal to the blender.

4.2.5 **MUSSELS:** Remove the byssal threads during the cleansing of the shell. Enter the mussel at the byssal opening. Insert the knife and spread the shells apart with a twisting motion, draining the liquor of the shellfish into a sterile tared blender. Transfer the body of the animal to the blender.

4.3 Dilution and Grinding

4.3.1 Weigh the shellfish meats and liquors.

4.3.2 Add an equal amount, by weight, of phosphate buffered dilution water to the blender.

4.3.3 Grind for 60-120 sec in a sterile waring blender at approximately 14,000 RPM. Avoid excessive grinding to prevent overheating.

5.0 Sample Analyses

5.1 Presumptive Test Using Lauryl Tryptose Broth

5.1.1 Inoculate each of 5 single strength lauryl tryptose broth tubes with 2.0 ml of the prepared sample (equal to 1.0 g of shellfish), 5 single strength lauryl tryptose broth tubes with 1.0 ml of a 10 fold dilution of the prepared sample (equal to 0.1 g of shellfish) and 5 single strength lauryl tryptose broth tubes with 1.0 ml of a 100 fold dilution of the prepared sample (equal to 0.01 g of shellfish).

5.1.2 In order to avoid indeterminate results, perform extensions of the dilutions mentioned.

5.1.3 Incubate tubes at 35.0±0.5°C for 24±2 hours.

5.1.4 Examine tubes for the presence/absence of gas production.

5.1.5 Score tubes with gas production and perform confirmation tests at this time.

5.1.6 Return tubes to 35.0±0.5°C.

5.1.7 Re-examine the tubes at 48±3 hours for the presence/absence of gas production.

5.1.8 Score tubes with gas production and perform confirmation tests at this time.

5.1.9 Absence of gas production at the end of 48±3 hours constitutes a negative test result for the total and fecal coliform groups.

5.2 Confirmed Tests Using Brilliant Green Bile 2% and EC Medium

5.2.1 General Rules for Performing the Confirmed Test (when 3 or more replicate portions of a series of 3 or more decimal dilutions of sample are planted): Select the tubes of the highest dilution (smallest volume) in which all tubes show gas production in 24 hours. Submit all of these tubes as well as every one of the gas-positive tubes in all higher dilutions to the confirmed tests. If all tubes show gas production, submit all tubes of the highest dilution and of the next-to-the-highest dilution to the confirmed tests. Submit all tubes of all dilutions in which gas is produced only at the end of 48 hours incubation to the confirmed test. All tubes producing gas that have not been submitted to the confirmed test shall be recorded as containing organsims of the coliform group, even though all the confirmed tests may yield negative results.

5.2.2 Mix the presumptive lauryl tryptose broth tubes by gentle shaking or rotating.

5.2.3 Transfer sample using sterile transfer sticks from lauryl tryptose broth tubes to Brilliant Green Bile 2% and EC Medium tubes.

5.2.4 Incubate Brilliant Green Bile tubes at 35.0±0.5°C for 48±3 hours and EC Medium tubes at 44.5±0.2°C for 24±2 hours.

5.2.5 Examine tubes for the presence/absence of gas production.

5.2.6 Score Briliant Green Bile 2% tubes with gas production positive for the

total coliform group and EC Medium tubes with gas production positive for the fecal coliform group.

5.2.7 Score Brilliant Green Bile 2% tubes and EC Medium tubes with no gas production negative for the total and fecal coliform groups.

6.0 Using the Most Probable Number Geometric Series

6.1 Count the number of positive tubes from each of the three dilutions performed.

6.2 Use the number of positive tubes from each dilution to form a 3 digit code.

6.3 Locate your three digit code on the most probable number geometric series chart.

6.4 Read the MPN number which corresponds to your three digit code. This is your density per 100 g of sample.

6.5 If, instead of 10, 1.0, and 0.1 ml a combination of portions of 100, 10, and 1 ml is used, record the MPN as 0.1 times the figure in the tabulation. On the other hand, should a combination of corresponding portions of 1.0, 0.1 and 0.01 ml be planted, record 10 times the figure in the tabulation; should a combination of portions of 0.1, 0.01, and 0.001 ml be planted, record 100 times the figure in the tabulation.

6.6 When more than 3 dilutions are employed in a decimal series of dilutions, the results from only 3 of them are significant. To select the 3 dilutions to be used in determining the MPN index, using the system of 5 tubes of each dilutions as an example, choose the highest dilution which gives positive results in all of the 5 portions tested (no lower dilution giving any negative results) and the 2 next succeeding high dilutions. The results of these 3 volumes should then be used in the computations of the MPN index.

6.0 Using the Most Probable Number Geometric Series (continued)

In examples given below, significant dilutions results are shown in boldface. The number in the numerator represents positive tubes; that in the denominator, the total tubes planted.

	1 ml or g	0.1 ml or g	0.01 ml or g	0.001 ml or g
(a)	5/5	**5/5**	**2/5**	**0/5**
(b)	**5/5**	**4/5**	**2/5**	0/5
(c)	**0/5**	**1/5**	**0/5**	0/5
(d)	**5/5**	**3/5**	**1/5**	1/5
(e)	**5/5**	**3/5**	**2/5**	0/5

In example (c) above, the first 3 dilutions are taken in order to throw the positive result into the middle dilution. When a case arises such as is shown in (d), where a positive occurs in a dilution higher than the 3 chosen according to the rule, it is included in the result of the highest chosen dilution (e).

7.0 Trouble Shooting

7.1 Thoroughly clean the shells of each shellfish, especially the hinge regions.

7.2 Adequately mix samples and dilutions of samples prior to addition to enrichment tubes.

7.3 Adequately mix presumptive enrichment tubes prior to addition of sample to confirmation enrichment tubes.

8.0 Statistical Analysis and Data Usage

8.1 Tabulate and summarize the data.

8.2 Use data in conjunction with other indicator tests to determine sanitary quality.

9.0 References

9.1 American Public Health Association, Inc. 1970. Recommended Procedures for the Examination of Sea Water and Shellfish. Washington, DC. p. 1-105.

9.2 American Public Health Association, American Water Works Association, Water Pollution Control Federation. 1989. Standard Methods for the Examination of Water and Wastewater, Seventeenth Edition. Washington, DC. Chapter 9.

MOST PROBABLE NUMBER METHOD FOR THE ENUMERATION OF FECAL STREPTOCOCCI AND ENTEROCOCCI IN SHELLFISH

Point of Contact
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The term "fecal streptococci" refers to the Lancefield Group D bacteria. The term "enterococci" refers to a specific subgroup of fecal streptococci including *Streptococcus faecalis, Streptococcus faecium, Streptococcus avium* and *Streptococcus gallinarum*. Fecal streptococci and enterococci are found in the intestines of humans and other animals, where they behave as commensals of limited pathogenic potential. Because these organisms are associated with fecal wastes of man and animals, they can be isolated from contaminated waters containing such waste. Enumeration of fecal streptococci and enterococci *sp.* using the most probable number method is a means of determining the sanitary quality of shellfish meats.

1.0 Necessary Materials and Equipment

1.1 Glassware, Plasticware, Equipment and Disposable Supplies

2 liter Erlenmeyer flasks
16 x 150 mm test tubes
20 x 150 mm test tubes
16 and 20 mm test tube caps
16 and 20 mm test tube racks
1.0 and 10.0 ml sterile pipettes
20 liter polypropylene carboy
Heating mantle with magnetic stirrer and stir bars
Balance and weigh boats
Autoclave
Cornwall syringe
Air incubators 35.0$\pm$0.5°C
Air incubator 41.0$\pm$0.5°C
Waterbath 44-46°C
Sterile shucking knives
Sterile scrub brushes
Waring blenders

1.0 Necessary Materials and Equipment (continued)

1.1 Glassware, Plasticware, Equipment and Disposable Supplies

Timer
Sterile transfer sticks
pH meter
Alcohol burner
Membranes, 0.45 micron
Membrane forceps

1.2 Media and Diluent

Azide dextrose broth
Ethyl Violet Azide (EVA) Broth
mE agar
Esculin iron agar
KF agar
Nalidixic acid
2,3,5-Triphenyltetrazolium chloride
Ethanol
Potassium phosphate
Sodium hydroxide
Sodium carbonate
Deionized water

2.0 Media and Diluent Preparation

2.1 Enrichment Media Preparation: Single Strength Azide Dextrose Broth

2.1.1 Weigh 34.7 g of azide dextrose broth into a 2 liter Erlenmeyer flask.
2.1.2 Add 1.0 liter of deionized water and bring to a boil with continuous stirring.
2.1.3 Dispense the medium in 10.0 ml aliquots into 16 x 150 mm test tubes.
2.1.4 Cap the test tubes and autoclave at 116°C for 10 minutes.
2.1.5 Store the media at 4°C in the dark for up to one month.

2.2 Fecal Streptococci Confirmation Media Preparation: EVA Broth

2.2.1 Weigh 35.8 g of EVA broth into a 2 liter Erlenmeyer flask.
2.2.2 Add 1.0 liter of deionized water and bring to a boil with continuous stirring.
2.2.3 Dispense the medium in 10.0 ml aliquots into 16 x 150 mm test tubes.
2.2.4 Cap the test tubes and autoclave at 121°C for 15 minutes.
2.2.5 Store the media at 4°C in the dark for up to one month.

2.0 Media and Diluent Preparation (continued)

2.3 Fecal Streptococci Confirmation Media Preparation: mE Agar

2.3.1 Weigh 71.4 g of mE agar powder into a 2 liter Erlenmeyer flask. Add 1.0 liter of deionized water and mix well.

2.3.2 Heat with continuous mixing. Boil for approximately 1 minute to completely dissolve the powder.

2.3.3 Autoclave at 121°C for 15 minutes.

2.3.4 Temper the media to 44-46°C for approximately 30 minutes.

2.3.5 Aseptically add:
0.24 g of nalidixic acid dissolved in 0.3 ml of sterile deionized water and 0.2 ml of 10N sodium hydroxide and 15.0 ml of sterile 1% 2,3,5 triphenyltetrazolium chloride.

2.3.6 Adjust the pH to 7.1 $\pm$ 0.01.

2.3.7 Dispense the medium into 9 x 50 mm petri dishes in 4.5 ml aliquots and allow to solidify.

2.3.8 Store mE agar plates inverted at 4°C in the dark for up to one month.

2.4 Enterococci Confirmation Media Preparation: KF Agar

2.4.1 Weigh 76.4 g of KF agar into 2 liter Erlenmeyer flask add 1.0 liter of deionized water and mix well.

2.4.2 Bring the medium to a boil and continue to heat for 5 minutes, no longer.

2.4.3 Temper the media to 44-46°C for approximately 30 minutes.

2.4.4 Aseptically add 1.0 ml of a 1% solution of 2,3,5 triphenyltetrazolium chloride.

2.4.5 If necessary, adjust the pH to 7.2$\pm$0.2 with 10%sodium carbonate.

2.4.6 Dispense the medium into 9 x 50 mm petri dishes in 4.5 ml aliquots.

2.4.7 Store KF agar plates inverted at 4°C in the dark for up to one month.

2.5 Fecal Streptococci Confirmation Media Preparation: Esculin Iron Agar

2.5.1 Weigh 16.5 g of EIA powder into a 2 liter Erlenmeyer flask. Add 1.0 liter of deionized water and mix well.

2.5.2 Heat with continuous mixing. Boil for approximately 1 minute to completely dissolve the powder.

2.5.3 Autoclave at 121°C for 15 minutes.

2.5.4 Temper the media to 44-46°C for approximately 30 minutes.

2.5.5 Dispense the medium into 9 x 50 mm petri dishes in 4.5 ml aliquots and allow to solidify.

2.5.6 Store EIA plates inverted at 4°C in the dark for up to one month.

2.6 Stock Phosphate Buffer Solution: Buffered Dilution Water

2.6.1 In a 1 liter volumetric flask, dissolve 34.0 g of potassium phosphate in 500 ml of deionized water.

2.6.2 Adjust to pH 7.2 with 10N sodium hydroxide.

2.0 Media and Diluent Preparation (continued)

2.6.3 Make up to 1 liter with deionized water.

2.6.4 Add the buffer solution to a 1 liter polypropylene bottle and autoclave at 121°C for 15 minutes.

2.6.5 Store at 4°C in the dark for up to one month.

2.7 Diluent Preparation: Phosphate Buffered Dilution Water

2.7.1 Add 20 liters of deionized water to an autoclavable carboy.

2.7.2 Add 25 ml of stock phosphate buffer solution.

2.7.3 Autoclave at 121°C for 45 minutes.

2.7.4 Store at room temperature for up to two weeks.

2.8 Diluent Preparation: Phosphate Buffered Dilution Blanks

2.8.1 Add 1.0 liter of deionized water to a 2 liter Erlenmeyer flask.

2.8.2 Add 1.25 ml of stock phosphate buffer solution.

2.8.3 Dispense the medium in 9.2 ml aliquots into 16 x 150 mm test tubes, 81.0 ml aliquots into 100 ml graduated dilution bottles and 91.0 ml aliquots into 100 ml graduated dilution bottles.

2.8.4 Cap the test tubes and/or dilution bottles and autoclave at 121°C for 15 minutes.

2.8.5 Refrigerate at 4°C in the dark for up to one month. **NOTE: Always check the volume of dilution water present in dilution blanks with each use. Discard any batch of buffered dilution water where evaporation has resulted in an unappropriate volume of buffered dilution water.**

3.0 Sample Storage

3.1 Shellfish Storage Containers

3.1.1 Use containers for shell-stock which are waterproof and durable enough to withstand the cutting action of the shellfish and abrasion during transport. Waterproof paper bags, paraffined cardboard cups or plastic bags are suitable containers.

3.1.2 Use sterile wide-mouth jars with watertight closure for freshly shucked shellfish samples. Transfer samples of the final product to the sample jar with sterile forceps or spoon.

3.1.3 Use one or two packages of frozen shucked shellfish, containing 10 to 12 animals each, as one sample. Transfer core samples taken from larger blocks to sterile wide-mouth jars for transportation to the laboratory.

3.2 Shellfish Storage Conditions and Temperature

3.2.1 Keep shell-stock samples in dry storage at a temperature above freezing but lower than 10°C until examination. Do not allow samples to come in

contact with ice.

3.0 Sample Storage (continued)

3.2.2 Refrigerate samples of shucked shellfish immediately after collection by packing in crushed ice until examination.

3.2.3 Keep samples of frozen shucked shellfish in the frozen state or at temperatures close to those at which the commercial stock was maintained. When this is not possible, pack samples of frozen shucked shellfish in crushed ice until examination.

3.3 Shellfish Identification Records

3.3.1 Maintain records of identification for each shellfish sample to enter the laboratory. Include the date, time, and place of collection, area the shellfish were harvested, the date and time of harvesting and the physical and chemical measurements of the harvesting water (if applicable). Also include the storage conditions between harvesting and collection.

3.3.2 Mark individual containers of shellfish samples for identification. Also, include identification information on a descriptive form to accompany the sample.

3.3.3 Record the time elapsed between collection and examination for each shellfish sample examined in the laboratory. Examine samples of shell stock and shucked, unfrozen shellfish within 6 hours after collection and in no case examine shellfish if they have been held more than 24 hours after collection.

3.3.4 Record the identification of the shipper, the date of shipment, and the harvesting area as well as the date, time and place of collection for shellfish samples collected in market areas and when other specified information is not available.

4.0 Sample Preparation

4.1 Shellfish in the Shell - Cleaning the Shells

4.1.1 Use a minimum of 12 shellfish in order to obtain a representative sample (approximately 200 g of shellfish liquor and meats) and to allow for the selection of sound animals suitable for shucking. Collect at least 200 g of sample when examining shucked or frozen shellfish.

4.1.2 Scrub hands thoroughly with soap and water.

4.1.3 Scrape off all growth and loose material from the shell. Scrub the shell stock with a sterile stiff brush under running water of drinking-water quality, paying particular attention to the crevices of the shells.

4.1 Shellfish in the Shell - Cleaning the Shells

4.1.4 Place the cleaned shell stock in clean containers or on clean towels to drain in the air.

4.0 Sample Preparation (continued)

4.2 Removal of Shell Contents

4.2.1 Before starting the removal of shell contents, scrub hands thoroughly with soap and water and rinse with 70% alcohol.

4.2.2 **OYSTERS:** Hold the oyster in the hand or on a fresh clean paper towel on the bench with the deep shell on the bottom. Using a sterile oyster knife, insert the point between the shells on the ventral side (at the right when the hinge is pointed away from the examiner), about 1/4 the distance from the hinge to the bill. Entry may also be made at the bill. Cut the adductor muscle from the upper flat shell and pry the shell wide enough to drain the shell liquor into a sterile tared blender. The upper shell may then be pried loose at the hinge, discarded, and the meats transferred to a sterile tared blender after severing the muscle attachment to the lower shell.

4.2.3 **HARD CLAMS:** Enter the hard clam with a sterile, thin-bladed knife similar to a paring knife. To open the clam, hold it in the hand, place the edge of the knife at the junction of the bills, and force it between the shells with a squeezing motion. An alternative method is to nibble a small hole in the bill, and with the knife, severe the two adductor muscles. Drain the shell liquor into a sterile tared blender. Cut the adductor muscles from the shells and transfer the body of the animal to the blender.

4.2.4 **OTHER CLAMS:** Shuck soft clams, butter clams, surf clams and similar species with a sterile paring knife, entering at the siphon end and cutting the adductor muscles first from the top valve and then from the bottom valve. Drain the shell liquor into a sterile tared blender. Transfer the body of the animal to the blender.

4.2.5 **MUSSELS:** Remove the byssal threads during the cleansing of the shell. Enter the mussel at the byssal opening. Insert the knife and spread the shells apart with a twisting motion, draining the liquor of the shellfish into a sterile tared blender. Transfer the body of the animal to the blender.

4.3 Dilution and Grinding

4.3.1 Weigh the shellfish meats and liquors.

4.3.2 Add an equal amount, by weight, of phosphate buffered dilution water to the blender.

4.3.3 Grind for 60-120 sec in a sterile waring blender operating at approximately 14,000 RPM. Avoid excessive grinding to prevent overheating.

5.0 Sample Analyses

5.1 Presumptive Test Using Azide Dextrose Broth

5.1.1 Inoculate each of 5 single strength azide dextrose broth tubes with 2.0 ml of the prepared sample (equal to 1.0 g of shellfish), 5 single strength azide dextrose broth tubes with 1.0 ml of a 10 fold dilution of the prepared sample (equal to 0.1 g of shellfish) and 5 single strength azide dextrose broth tubes with 1.0 ml of a 100 fold dilution of the prepared sample (equal to 0.01 g of shellfish).

5.1.2 In order to avoid indeterminate results, perform extensions of the dilutions mentioned.

5.1.3 Incubate tubes at 35.0±0.5°C for 24±2 hours.

5.1.4 Examine tubes for the presence/absence of turbidity.

5.1.5 Score tubes with turbidity and perform confirmation tests for only those tubes with turbidity at this time.

5.1.6 Return tubes to 35.0±0.5°C for an additional 24±2 hours.

5.1.7 Re-examine the tubes at 48±3 hours for the presence/absence of turbidity.

5.1.8 Score tubes with turbidity and perform confirmation tests for only those tubes with turbidity at this time.

5.1.9 Absence of turbidity at the end of 48±3 hours constitutes a negative test result for the fecal streptococci and enterococci groups.

5.2 Fecal Streptococci Confirmation Test Using EVA Broth

5.2.1 Mix the presumptive azide dextrose broth tubes by gentle shaking or rotating.

5.2.2 Transfer 1.0 ml of sample using sterile pipets from azide dextrose broth tubes with turbidity/growth to EVA Broth tubes.

5.2.3 Incubate tubes at 35.0±0.5°C for 48±3 hours.

5.2.4 Examine tubes for the presence/absence of a purple button and/or turbidity.

5.2.5 Score tubes with a purple button and/or turbidity positive for the fecal streptococci group.

5.2.6 Score tubes with no purple button and/or turbidity negative for the fecal streptococci group.

5.3 Fecal Streptococci Confirmation Test Using KF Agar

5.3.1 Mix the presumptive azide dextrose broth tubes by gentle shaking or rotating.

5.3.2 Place a sterile 0.45 micron membrane on a KF agar plate.

5.3.3 Transfer sample using sterile transfer sticks from azide dextrose broth tubes with turbidity to the membrane of a KF plate.

5.3.4 Repeat this process for each tube with turbidity. Use one plate for each dilution (maximum 5 transfers/ plate).

5.0 Sample Analyses (continued)

5.3 Fecal Streptococci Confirmation Test Using KF Agar

5.3.5 Incubate the inverted plates at 35.0±0.5°C for 48 hours.

5.3.6 Score carmine or red transfers positive for the fecal streptococci group.

5.4 Enterococci Confirmation Test Using mE and EIA Agar

5.4.1 Mix the presumptive azide dextrose broth tubes by gentle shaking or rotating.

5.4.2 Place a sterile 0.45 micron membrane on a mE agar plate.

5.4.3 Transfer sample using sterile transfer sticks from azide dextrose broth tubes with turbidity to the membrane of a mE plate.

5.4.4 Repeat this process for each tube with turbidity. Use one plate for each dilution (maximum 5 transfers/ plate).

5.4.5 Incubate the inverted plates at 41.0±0.5°C for 48 hours.

5.4.6 After the incubation period, score all typical, presumptive enterococci transfers (pink to red in color).

5.4.7 Transfer membranes to EIA plates and incubate at 41.0±0.5°C for 20 minutes.

5.4.8 Score transfers which possess a brown/black precipitate positive for the enterococci group.

6.0 Using the Most Probable Number Geometric Series

6.1 Count the number of positive tubes from each of the three dilutions performed.

6.2 Use the number of positive tubes from each dilution to form a 3 digit code.

6.3 Locate your three digit code on the most probable number geometric series chart.

6.4 Read the MPN number which corresponds to your three digit code. This is your density per 100 g of sample.

6.5 If, instead of 10, 1.0, and 0.1 ml a combination of portions of 100, 10, and 1 ml is used, record the MPN as 0.1 times the figure in the tabulation. On the other hand, should a combination of corresponding portions of 1.0, 0.1 and 0.01 ml be planted, record 10 times the figure in the tabulation; should a combination of portions of 0.1, 0.01, and 0.001 ml be planted, record 100 times the figure in the tabulation.

6.6 When more than 3 dilutions are employed in a decimal series of dilutions, the results from only 3 of them are significant. To select the 3 dilutions to be used in determining the MPN index, using the system of 5 tubes of each dilutions as an example, choose the highest dilution which gives positive results in all of the 5 portions tested (no lower dilution giving any negative results) and the 2 next

succeeding high dilutions. The results of these 3 volumes should then be used in the computations of the MPN index. In examples given below, significant dilutions results are shown in boldface.

6.0 Using the Most Probable Number Geometric Series (continued)

The number in the numerator represents positive tubes; that in the denominator, the total tubes planted.

	1 ml or g	0.1 ml or g	0.01 ml or g	0.001 ml or g
(a)	5/5	**5/5**	**2/5**	**0/5**
(b)	**5/5**	**4/5**	**2/5**	0/5
(c)	**0/5**	**1/5**	**0/5**	0/5
(d)	**5/5**	**3/5**	**1/5**	1/5
(e)	**5/5**	**3/5**	**2/5**	0/5

In example (c) above, the first 3 dilutions are taken in order to throw the positive result into the middle dilution. When a case arises such as is shown in (d), where a positive occurs in a dilution higher than the 3 chosen according to the rule, it is included in the result of the highest chosen dilution (e).

7.0 Trouble Shooting

7.1 Thoroughly clean the shells of each shellfish, especially the hinge regions.

7.2 Adequately mix samples and dilutions of samples prior to addition to enrichment tubes.

7.3 Adequately mix presumptive enrichment tubes prior to addition of sample to confirmation enrichment tubes and media.

8.0 Statistical Analysis and Data Usage

8.1 Tabulate and summarize the data.

8.2 Use data in conjunction with other indicator tests to determine sanitary quality.

9.0 References

9.1 American Public Health Association, Inc. 1970. Recommended Procedures for the Examination of Sea Water and Shellfish. Washington, DC. p. 1-105.

9.2 American Public Health Association, American Water Works Association, Water Pollution Control Federation. 1989. Standard Methods for the Examination of Water and Wastewater, Seventeenth Edition. Washington, DC. Chapter 9.

9.3 Levin, M.A., S.R. Fischer, V.J. Cabelli. 1975. Membrane Filter Technique for Enumeration of Enterococci in Marine Waters. Appl. Microbiol. 30:66-71.

MOST PROBABLE NUMBER METHOD FOR THE ENUMERATION OF *CLOSTRIDIUM PERFRINGENS* IN SHELLFISH

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Clostridium perfringens is a plump, nonmotile, gram-positive, anaerobic rod. This microorganism is often found in the intestines of humans and animals as part of the normal microbiota and is therefore widely distributed in soil and water. This spore-forming microorganism is capable of surviving for long periods of time in the environment, and thus is often used in the detection of fecal contamination that is several years old. Enumeration of *Clostridium perfringens* using the most probable number method is a means of determining the sanitary quality of shellfish meats.

1.0 Necessary Materials and Equipment

1.1 Glassware, Plasticware, Equipment and Disposable Supplies

2 liter Erlenmeyer flasks
9 x 50 mm sterile petri dishes
16 x 150 mm test tubes
20 x 150 mm test tubes
16 and 20 mm test tube caps
16 and 20 mm test tube racks
1.0 and 10.0 ml sterile pipettes
Sterile transfer sticks
Heating mantle with magnetic stirrer and stir bars
Balance and weigh boats
Autoclave
pH meter
Cornwall syringe
Air incubators 44.5$\pm$0.2°C
Waterbath 44-46°C
Alcohol burner
Membranes, 0.45 micron
Membrane forceps
Anaerobic gaspack with gaspacks, indicator strips and catalyst
Sterile shucking knives

Sterile scrub brushes

1.0 Necessary Materials and Equipment (continued)

Waring blenders
Timer

1.2 Media and Diluent

Homogenized milk
Iron filings (fine grain)
Bacteriological grade agar
Tryptose
Yeast extract
Sucrose
L-cysteine hydrochloride
Bromocresol purple
Magnesium sulfate
Indoxyl-B-D-glucoside (IBDG)
D-Cycloserine
Polymyxin B sulfate
Ferric chloride
Phenolphthalein diphosphate
Ammonium hydroxide
Potassium phosphate
Sodium hydroxide
Deionized water

2.0 Media and Diluent Preparation

2.1 Enrichment Media Preparation: Single Strength Iron Milk Media

2.1.1 Iron milk media is prepared fresh, the day of the sample analysis.
2.1.2 Determine the number of test tubes of media to prepare by multiplying the number of samples to be analyzed by fifteen.
2.1.3 Add 0.2 g of iron filings to each 16 x 150 mm test tube.
2.1.4 Add 10.0 ml of homogenized milk to each test tube.
2.1.5 Cover each of the test tube racks with a sheet of aluminum foil and autoclave at 116°C for 10 minutes.
2.1.6 Temper the media to 44-46°C approximately 1 hour prior to assay.

2.2 Enrichment Media Preparation: Double Strength Iron Milk Media

2.2.1 Iron milk media is prepared fresh, the day of the sample analysis.
2.2.2 Determine the number of test tubes of media to prepare by multiplying the number of samples to be analyzed by five.
2.2.3 Add 0.4 g of iron filings to each 20 x 150 mm test tube.
2.2.4 Add 20.0 ml of homogenized milk to each test tube.

2.2.5 Cover each of the test tube racks with a sheet of aluminum foil and autoclave at 116°C for 10 minutes.

2.0 Media and Diluent Preparation (continued)

2.2.6 Temper the media to 44-46°C approximately 1 hour prior to assay.

2.3 Confirmation Media Preparation: Membrane Filtration Media (mCP)

2.3.1 Weigh 30.0 g of tryptose, 20.0 g of yeast extract, 5.0 g of sucrose, 1.0 g of L-cysteine hydrochloride, 0.1 g of magnesium sulfate, 0.04 g of bromocresol purple and 15.0 g of agar into a 2 liter Erlenmeyer flask. Add 900.0 ml of deionized water and mix well.

2.3.2 Heat with continuous mixing. Boil for approximately 1 minute to completely dissolve the powder.

2.3.3 Adjust the pH to 7.6 using 10N NaOH.

2.3.4 Autoclave at 121°C for 15 minutes.

2.3.5 Temper the media to 44-46°C for approximately 30 minutes.

2.3.6 Aseptically add:
0.4 g of D-cycloserine
0.025 g of polymyxin B sulfate
0.6 g of IBDG
2.0 ml of a 4.5% ferric chloride solution
20.0 ml of a 0.5% phenolphthalein solution

2.3.7 Dispense the medium into 9 x 50 mm petri dishes in 4.5 ml aliquots and allow to solidify.

2.3.8 Store mCP agar plates inverted at 4°C in the dark for up to one month.

2.4 Stock Phosphate Buffer Solution: Buffered Dilution Water

2.4.1 In a 1 liter polypropylene bottle, dissolve 34.0 g of potassium phosphate in 500 ml of deionized water.

2.4.2 Adjust to pH 7.2 with 10N sodium hydroxide.

2.4.3 Make up to 1 liter with deionized water.

2.4.4 Autoclave at 121°C for 15 minutes.

2.4.5 Store at 4°C in the dark for up to one month.

2.5 Diluent Preparation: Phosphate Buffered Dilution Water

2.5.1 Add 20 liters of deionized water to a 20 liter autoclavable carboy.

2.5.2 Add 25 ml of stock phosphate buffer solution.

2.5.3 Autoclave at 121°C for 45 minutes.

2.5.4 Store at room temperature for up to one month.

2.6 Diluent Preparation: Phosphate Buffered Dilution Blanks

2.6.1 Add 1.0 liter of deionized water to a 2 liter Erlenmeyer flask.

2.6.2 Add 1.25 ml of stock phosphate buffer solution.

2.6.3 Dispense the medium in 9.2 ml aliquots into 16 x 150 mm test tubes, 81.0 ml aliquots into 100 ml graduated dilution bottles and 91.0 ml aliquots into

100 ml graduated dilution bottles.

2.6.4 Cap the test tubes and/or dilution bottles and autoclave at 121°C for 15 minutes.

2.0 Media and Diluent Preparation (continued)

2.6.5 Refrigerate at 4°C in the dark for up to one month. **NOTE: Always check the volume of dilution water present in dilution blanks with each use. Discard any batch of buffered dilution water where evaporation has resulted in an unappropriate volume of buffered dilution water.**

3.0 Sample Storage

3.1 Shellfish Storage Containers

3.1.1 Use containers for shell-stock which are waterproof and durable enough to withstand the cutting action of the shellfish and abrasion during transport. Waterproof paper bags, paraffined cardboard cups or plastic bags are suitable containers.

3.1.2 Use sterile wide-mouth jars with watertight closure for freshly shucked shellfish samples. Transfer samples of the final product to the sample jar with sterile forceps or spoon.

3.1.3 Use one or two packages of frozen shucked shellfish, containing 10 to 12 animals each, as one sample. Transfer core samples taken from larger blocks to sterile wide-mouth jars for transportation to the laboratory.

3.2 Shellfish Storage Conditions and Temperature

3.2.1 Keep shell-stock samples in dry storage at a temperature above freezing but lower than 10°C until examination. Do not allow samples to come in contact with ice.

3.2.2 Refrigerate samples of shucked shellfish immediately after collection by packing in crushed ice until examination.

3.2.3 Keep samples of frozen shucked shellfish in the frozen state or at temperatures close to those at which the commercial stock was maintained. When this is not possible, pack samples of frozen shucked shellfish in crushed ice until examination.

3.3 Shellfish Identification Records

3.3.1 Maintain records of identification for each shellfish sample to enter the laboratory. Include the date, time, and place of collection, area the shellfish were harvested, the date and time of harvesting and the physical and chemical measurements of the harvesting water (if applicable). Also include the storage conditions between harvesting and collection.

3.3.2 Mark individual containers of shellfish samples for identification. Also, include identification information on a descriptive form to accompany the sample.

3.0 Sample Storage (continued)

3.3.3 Record the time elapsed between collection and examination for each shellfish sample examined in the laboratory. Examine samples of shell stock and shucked, unfrozen shellfish within 6 hours after collection and in no case examine shellfish if they have been held more than 24 hours after collection.

3.3.4 Record the identification of the shipper, the date of shipment, and the harvesting area as well as the date, time and place of collection for shellfish samples collected in market areas and when other specified information is not available.

4.0 Sample Preparation

4.1 Shellfish in the Shell - Cleaning the Shells

4.1.1 Use a minimum of 12 shellfish in order to obtain a representative sample (approximately 200 g of shellfish liquor and meats) and to allow for the selection of sound animals suitable for shucking. Collect at least 200 g of sample when examining shucked or frozen shellfish.

4.1.2 Scrub hands thoroughly with soap and water.

4.1.3 Scrape off all growth and loose material from the shell. Scrub the shell stock with a sterile stiff brush under running water of drinking-water quality, paying particular attention to the crevices at the junctions of the shells.

4.1.4 Place the cleaned shell stock in clean containers or on clean towels to drain in the air.

4.2 Removal of Shell Contents

4.2.1 Before starting the removal of shell contents, scrub hands thoroughly with soap and water and rinse with 70% alcohol.

4.2.2 **OYSTERS:** Hold the oyster in the hand or on a fresh clean paper towel on the bench with the deep shell on the bottom. Using a sterile oyster knife, insert the point between the shells on the ventral side (at the right when the hinge is pointed away from the examiner), about 1/4 the distance from the hinge to the bill. Entry may also be made at the bill. Cut the adductor muscle from the upper flat shell and pry the shell wide enough to drain the shell liquor into a sterile tared blender. The upper shell may then be pried loose at the hinge, discarded, and the meats transferred to a sterile tared blender after severing the muscle attachment to the lower shell.

4.0 Sample Preparation (continued)

4.2.3 **HARD CLAMS:** Enter the hard clam with a sterile, thin-bladed knife similar to a paring knife. To open the clam, hold it in the hand, place the edge of the knife at the junction of the bills, and force it between the shells with a squeezing motion. An alternative method is to nibble a small hole in the bill, and with the knife, severe the two adductor muscles. Drain the shell liquor into a sterile tared blender. Cut the adductor muscles from the shells and transfer the body of the animal to the blender.

4.2.4 **OTHER CLAMS:** Shuck soft clams, butter clams, surf clams and similar species with a sterile paring knife, entering at the siphon end and cutting the adductor muscles first from the top valve and then from the bottom valve. Drain the shell liquor into a sterile tared blender. Transfer the body of the animal to the blender.

4.2.5 **MUSSELS:** Remove the byssal threads during the cleansing of the shell. Enter the mussel at the byssal opening. Insert the knife and spread the shells apart with a twisting motion, draining the liquor of the shellfish into a sterile tared blender. Transfer the body of the animal to the blender.

4.3 Dilution and Grinding

4.3.1 Weigh the shellfish meats and liquors.

4.3.2 Add an equal amount, by weight, of phosphate buffered dilution water to the blender.

4.3.3 Grind for 60-120 sec in a sterile waring blender operating at approximately 14,000 RPM. Avoid excessive grinding to prevent overheating.

5.0 Sample Analyses

5.1 Presumptive Test Using Iron Milk Media

5.1.1 Inoculate each of 5 double strength iron milk media tubes with 2.0 ml of the prepared sample (equal to 1.0 g of shellfish), 5 single strength iron milk media tubes with 1.0 ml of a 10 fold dilution of the prepared sample (equal to 0.1 g of shellfish) and 5 single strength iron milk media tubes with 1.0 ml of a 100 fold dilution of the prepared sample (equal to 0.01 g of shellfish).

5.1.2 In order to avoid indeterminate results, perform extensions of the dilutions mentioned.

5.1.3 Incubate tubes at 44.5$\pm$0.2°C for 18 hours.

5.1.4 Examine tubes for the presence/absence of stormy fermentation/gas production.

5.0 Sample Analyses (continued)

5.1.5 Score tubes with stormy fermentation/gas production positive for presence of *Clostridium perfringens*.

5.2 *Clostridium perfringens* Confirmation Test Using mCP Agar

5.2.1 Mix the presumptive iron milk media tubes by gentle shaking

5.2.2 Place a sterile 0.45 micron membrane on a mCP agar plate.

5.2.3 Transfer sample using sterile transfer sticks from iron milk media tubes with stormy fermentation/gas production to the membrane of a mCP agar plate.

5.2.4 Repeat this process for each tube with stormy fermentation/gas production. Use one plate for each dilution (maximum 5 transfers/ plate).

5.2.5 Incubate the inverted plates anaerobically at 44.5$\pm$0.2°C for 18-24 hours.

5.2.6 After the incubation period, score all presumptive *Clostridium perfringens* transfers (yellow to greenish in color).

5.2.7 Hold plates over fresh ammonium hydroxide for approximately 20-30 seconds.

5.2.8 Score *Clostridium perfringens* transfers, which turn magenta.

6.0 Using the Most Probable Number Geometric Series

6.1 Count the number of positive tubes from each of the three dilutions performed.

6.2 Use the number of positive tubes from each dilution to form a 3 digit code.

6.3 Locate your three digit code on the most probable number geometric series chart.

6.4 Read the MPN number which corresponds to your three digit code. This is your density per 100 g of sample.

6.5 If, instead of 10, 1.0, and 0.1 ml a combination of portions of 100, 10, and 1 ml is used, record the MPN as 0.1 times the figure in the tabulation. On the other hand, should a combination of corresponding portions of 1.0, 0.1 and 0.01 ml be planted, record 10 times the figure in the tabulation; should a combination of portions of 0.1, 0.01, and 0.001 ml be planted, record 100 times the figure in the tabulation.

6.6 When more than 3 dilutions are employed in a decimal series of dilutions, the results from only 3 of them are significant. To select the 3 dilutions to be used in determining the MPN index, using the system of 5 tubes of each dilutions as an example, choose the highest dilution which gives positive results in all of the 5 portions tested (no lower dilution giving any negative results) and the 2 next succeeding high dilutions. The results of these 3 volumes should then be used in the computations of the MPN index. In examples given below, significant dilutions results are shown in boldface.

6.0 Using the Most Probable Number Geometric Series (continued)

The number in the numerator represents positive tubes; that in the denominator, the total tubes planted.

	1 ml or g	0.1 ml or g	0.01 ml or g	0.001 ml or g
(a)	5/5	**5/5**	**2/5**	**0/5**
(b)	**5/5**	**4/5**	**2/5**	0/5
(c)	**0/5**	**1/5**	**0/5**	0/5
(d)	**5/5**	**3/5**	**1/5**	1/5
(e)	**5/5**	**3/5**	**2/5**	0/5

In example (c) above, the first 3 dilutions are taken in order to throw the positive result into the middle dilution. When a case arises such as is shown in (d), where a positive occurs in a dilution higher than the 3 chosen according to the rule, it is included in the result of the highest chosen dilution (e).

7.0 Trouble Shooting

7.1 Thoroughly clean the shells of each shellfish, especially the hinge regions.

7.2 Adequately mix samples and dilutions of samples prior to addition to enrichment tubes.

7.3 Adequately mix presumptive enrichment tubes prior to transfer of sample to confirmation media.

8.0 Statistical Analysis and Data Usage

8.1 Tabulate and summarize the data.

8.2 Use data in conjunction with other indicator tests to determine sanitary quality.

9.0 References

9.1 American Public Health Association, Inc. 1970. Recommended Procedures for the Examination of Sea Water and Shellfish. Washington, DC. p. 1-105.

9.2 American Public Health Association, American Water Works Association, Water Pollution Control Federation. 1989. Standard Methods for the Examination of Water and Wastewater, Seventeenth Edition. Washington, DC. Chapter 9.

9.3 St. John, W.D., J.R. Matches and M.M. Wekell. 1982. Use of Iron Milk Medium for Enumeration of *Clostridium perfringens*. J. Assoc. Off. Anal. Chem. 65:1129-1133.

9.4 Bisson, J.W., V.J. Cabelli. 1978. Membrane filter enumeration method for *Clostridium perfringens*. J. Appl. Environ. Microbiol. 37:55-66.

9.5 Millipore Corporation. 1992. Water Microbiology/Laboratory and

Appendix B

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	—	—	—	—	—	0
	or 0.1 g	48	—	—	—	—	+	1
10^{-2} dilution	1 ml	24	—	—	—	—	—	0
	or 0.01 g	48	—	—	—	—	—	0
MPN Number	510							

Sample ID Number	OFFTA TO
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	23 June 1998 1030
Number of Animals Processed	20
Number of Grams of Material Processed	28 g
Analyst Signature	Brian Kgiol

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	—	—	—	—	1
	or 1 g	48	+	+	+	—	+	4
10^{-1} dilution	1 ml	24	—	—	—	—	—	0
	or 0.1 g	48	—	—	—	—	—	0
10^{-2} dilution	1 ml	24	—	—	—	—	—	0
	or 0.01 g	48	—	—	—	—	—	0
MPN Number	400							
Total Coliform Density/100 g						13		CFU

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	—	—	—	—	—	0
	or 1 g	48	—	—	—	—	—	0
10^{-1} dilution	1 ml	24	—	—	—	—	—	0
	or 0.1 g	48	—	—	—	—	—	0
10^{-2} dilution	1 ml	24	—	—	—	—	—	0
	or 0.01 g	48	—	—	—	—	—	0
MPN Number	000							
Fecal Coliform Density/100 g						< 1.8		CFU

TO

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							
Fecal Streptococci Density/100 g					23			CFU

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	+	–	1
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	510							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	–	–	–	–	–	0
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	000							
C. perfingens Density/100 g					<18			CFU

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	+	+	2
	or 0.1 g	48	+	–	–	+	+	3
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	+	–	–	–	–	1
MPN Number	531							

Sample ID Number	OFFTA OFF-13-DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Kozial

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	+	+	2
	or 0.1 g	48	+	–	–	+	+	3
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	530							
Total Coliform Density/100 g							79	CFU

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	+	+	2
	or 0.1 g	48	+	–	–	+	+	3
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	530							
Fecal Coliform Density/100 g							79	CFU

OFF 13 - DEP

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	+	+	+	+	+	5
	or 0 1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	+	–	1
MPN Number	551							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	–	–	0
	or 1 g	48	+	–	+	+	+	4
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	450							
Fecal Streptococci Density/100 g							41	CFU

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	+	1
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	+	+	2
MPN Number	512							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	–	–	–	–	–	0
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	000							
C. perfingens Density/100 g							<1.8	CFU

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	—	—	—	—	—	0
	or 0.1 g	48	—	—	+	—	+	2
10^{-2} dilution	1 ml	24	—	—	+	—	—	1
	or 0.01 g	48	—	—	+	—	—	1
MPN Number	521							

Sample ID Number	OFFTA OFF - 14- DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Nazial

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	~~145~~
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	—	—	—	—	+	Ø1
	or 0.1 g	48	—	—	—	—	+	1
10^{-2} dilution	1 ml	24	—	—	+	—	—	1
	or 0.01 g	48	—	—	+	—	—	1
MPN Number	511							
Total Coliform Density/100 g							46	CFU

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	—	—	+	—	2
	or 1 g	48	+	—	—	+	—	2
10^{-1} dilution	1 ml	24	—	—	—	—	+	Ø1
	or 0.1 g	48	—	—	—	—	+	1
10^{-2} dilution	1 ml	24	—	—	—	—	—	0
	or 0.01 g	48	—	—	—	—	—	0
MPN Number	210							
Fecal Coliform Density/100 g							6.8	CFU

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5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0 1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	+	1
MPN Number	551							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	–	–	0
	or 1 g	48	+	+	–	+	+	4
10^{-1} dilution	1 ml	24	–	+	–	+	+	3
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	+	1
	or 0.01 g	48	–	~~+~~ –	–	~~+~~ –	+	1
MPN Number	451							
Fecal Streptococci Density/100 g							48 CFU	

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	+	–	+	2
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	520							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	500							
C. perfingens Density/100 g							94 CFU	

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	+	–	+	2
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	520							

Sample ID Number	OFFTA OFF - 17 - DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Kozjol

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							
Total Coliform Density/100 g							23 CFU	

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							
Fecal Coliform Density/100 g							23 CFU	

OFF - 17 - DEP

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	+	–	–	–	–	1
MPN Number	551							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	–	–	0
	or 1 g	48	–	–	+	–	–	1
10^{-1} dilution	1 ml	24	–	+	–	+	+	3
	or 0.1 g	48	+	+	–	+	+	4
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	140							
Fecal Streptococci Density/100 g							11	CFU

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	+	+	+	3
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	530							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	–	–	–	–	–	0
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	000							
C. perfingens Density/100 g							218	CFU

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	+	−	+	+	+	4
	or 0.1 g	48	+	−	+	+	+	4
10^{-2} dilution	1 ml	24	−	−	−	−	−	0
	or 0.01 g	48	−	−	−	−	−	0
MPN Number	540							

Sample ID Number	OFFTA OFF-18-DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Kozial

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	+	−	+	+	+	4
	or 0.1 g	48	+	−	+	+	+	4
10^{-2} dilution	1 ml	24	−	−	−	−	−	0
	or 0.01 g	48	−	−	−	−	−	0
MPN Number	540							
Total Coliform Density/100 g							130 CFU	

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	+	−	−	+	−	2
	or 0.1 g	48	+	−	−	+	−	2
10^{-2} dilution	1 ml	24	−	−	−	−	−	0
	or 0.01 g	48	−	−	−	−	−	0
MPN Number	520							
Fecal Coliform Density/100 g							49 CFU	

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5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
		48	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	—	—	—	—	—	0
		48	+	+	+	+	+	5
10^{-2} dilution	1 ml or 0.01 g	24	—	—	—	—	—	0
		48	+	+	+	+	—	4
MPN Number	554							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	—	—	—	—	—	0
		48	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	+	—	—	+	—	2
		48	+	+	—	+	—	3
10^{-2} dilution	1 ml or 0.01 g	24	—	—	—	—	—	0
		48	+	—	+	—	—	2
MPN Number	532							
Fecal Streptococci Density/100 g							140 CFU	

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	+	+	—	—	+	3
10^{-2} dilution	1 ml or 0.01 g	24	—	—	—	—	—	0
MPN Number	530							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	—	—	—	—	—	0
10^{-1} dilution	1 ml or 0.1 g	24	—	—	—	—	—	0
10^{-2} dilution	1 ml or 0.01 g	24	—	—	—	—	—	0
MPN Number	000							
C. perfingens Density/100 g							<1.8 CFU	

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							

Sample ID Number	OFFTA OFF-19-DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Kogel

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							
Total Coliform Density/100 g							23 CFU	

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	–	4
	or 1 g	48	+	+	+	+	–	4
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	400							
Fecal Coliform Density/100 g							13 CFU	

OFF - 19 - DEP

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	+	+	+	+	+	5
MPN Number	555							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	–	–	0
	or 1 g	48	+	–	+	+	+	4
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	+	+	–	+	+	4
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	+	+	–	2
MPN Number	442							
Fecal Streptococci Density/100 g							47 CFU	

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	+	–	+	+	–	3
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	530							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	–	–	–	–	–	0
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	000							
C. perfingens Density/100 g							< 1.8 CFU	

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	+	–	–	–	1
	or 0.1 g	48	–	+	–	–	–	1
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	510							

Sample ID Number	OFFTA OFF - 20 - DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Kozik

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	–	–	–	–	1
	or 1 g	48	+	–	–	–	–	0
10^{-1} dilution	1 ml	24	–	+	–	–	–	1
	or 0.1 g	48	–	+	–	–	–	~~0~~ 1
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	110							
Total Coliform Density/100 g							4.0 CFU	

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	–	–	–	–	1
	or 1 g	48	+	–	–	–	–	1
10^{-1} dilution	1 ml	24	–	+	–	–	–	1
	or 0.1 g	48	–	+	–	–	–	1
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	110							
Fecal Coliform Density/100 g							4.0 CFU	

OFF - 20 - DEP

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	+	+	–	–	–	2
MPN Number	552							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+ ~~+~~ BL	–	4
	or 1 g	48	+	+	+	+	–	4
10^{-1} dilution	1 ml	24	–	–	–	–	+	~~0~~ 1 BL
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	+	+	–	–	–	2
MPN Number	452							
Fecal Streptococci Density/100 g						56 CFU		

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	+	–	1
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	+	1
MPN Number	511							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	BL ~~+~~ –	BL ~~+~~ –	BL ~~+~~ –	BL ~~+~~ –	BL ~~+~~ –	BL ~~50~~
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	BL ~~500~~ 000						21.8	
C. perfingens Density/100 g					BL	9.14 CFU		

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							

Sample ID Number	OFFTA OFF-21-DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Kizial

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	+	–	1
	or 1 g	48	+	–	–	+	–	2
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	200							
Total Coliform Density/100 g								4.5 CFU

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	–	–	0
	or 1 g	48	–	–	–	–	–	0
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	000							
Fecal Coliform Density/100 g								<1.8 CFU

OFF-21 - DEP

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	+	+	+	+	+	5
MPN Number	555							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	–	–	0
	or 1 g	48	+	+	–	–	+	3
10^{-1} dilution	1 ml	24	+	+	–	+	+	4
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	+	+	–	–	+	3
	or 0.01 g	48	+	+	–	+	+	4
MPN Number	354							
Fecal Streptococci Density/100 g							41	CFU

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	500							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	–	–	–	–	–	0
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	000							
C. perfingens Density/100 g							<1.8	CFU

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Total and Fecal Coliforms							
Presumptive Medium		Lauryl Tryptose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							

Sample ID Number	OFFTA OFF-23-DEP
Sample Type	Shellfish Tissues
Collection : Date and Time	
Analysis: Date and Time	
Number of Animals Processed	20
Number of Grams of Material Processed	
Analyst Signature	Brian Kyial

Indicator	Total Coliforms							
Confirmation Medium		Brilliant Green Bile 2%						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							
Total Coliform Density/100 g							23	CFU

Indicator	Fecal Coliforms							
Confirmation Medium		EC Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	–	–	–	–	–	0
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	500							
Fecal Coliform Density/100 g							23	CFU

OFF-23-DEP

5-Tube Most Probable Number (MPN) Data Sheet

Indicator	Fecal Streptococci							
Presumptive Medium		Azide Dextrose Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	+	+	+	+	+	5
	or 1 g	48	+	+	+	+	+	5
10^{-1} dilution	1 ml	24	–	–	–	–	–	0
	or 0.1 g	48	+	+	+	+	+	5
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	550							

Indicator	Fecal Streptococci							
Confirmation Medium		Ethyl Violet Azide Broth						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml	24	–	–	–	–	–	0
	or 1 g	48	+	–	+	–	–	2
10^{-1} dilution	1 ml	24	–	–	–	+	+	2
	or 0.1 g	48	–	+	+	+	+	4
10^{-2} dilution	1 ml	24	–	–	–	–	–	0
	or 0.01 g	48	–	–	–	–	–	0
MPN Number	240							
Fecal Streptococci Density/100 g							15	CFU

Indicator	*Clostridium perfringens*							
Presumptive Medium		Iron Milk Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	+	–	–	–	–	1
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	510							

Indicator	*Clostridium perfringens*							
Confirmation Medium		mCP Medium						
Dilution	Volume Planted	Time h	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	MPN #
50/50 dilution	2ml or 1 g	24	+	+	+	+	+	5
10^{-1} dilution	1 ml or 0.1 g	24	–	–	–	–	–	0
10^{-2} dilution	1 ml or 0.01 g	24	–	–	–	–	–	0
MPN Number	500							
C. perfingens Density/100 g							9.4	CFU

Appendix C

Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA ERA

Client Name and Contact: STEVE PARKER, TTNUS

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-7-BM-CI	1	BAG	5/26/98	1:34 pm	Eipline bag, 20+ mussels	CONDITION INDEX
OFF-6-BM-CI	1			1:44 pm		
OFF-5-BM-CI	1			2:00 pm		
OFF-4-BM-CI	1			2:20 pm		
OFF-3-BM-CI	1			2:30 pm		
OFF-2-BM-CI	1			2:45 pm		
OFF-1-BM-CI	1			3:05 pm		
OFF-22-BM-CI	1			3:20 pm		
Total :	8					

Packed/Released By	Received By
Signature: [signature] Date Time 5/26/98	Signature: [signature] SAIC ETC Date Time 5/27/98
Printed Name: GREG TRACEY, SAIC 4:20 pm	Printed Name: Cornelia Heller, 9 20 am
Released By: Signature: Printed Name: Date Time	Received By: Signature: Printed Name: Date Time
Final Destination: ~~SAIC~~ SAIC, ETC	Contact Name and Phone Number: SAIC ETC Cornelia Heller 401 782-1900
Shipping Method: Not required	Page 1 of 1

Remarks

Original Form Accompanies Shipment

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-13-DEP-A	1	mesh bag	8/17/98	08:35	Depurated Mussels	Contaminant analysis, microbiology, chemistry
OFF-13-DEP-B	1			08:36		
OFF-13-DEP-C	1			08:37		
OFF-13-DEP-D	1			08:38		
OFF-18-DEP-A	1			08:41		
OFF-18-DEP-B	1			08:42		
OFF-18-DEP-C	1			08:43		
OFF-18-DEP-D	1			08:44		
OFF-17-DEP-A	1			09:03		
OFF-17-DEP-B	1			09:04		
OFF-17-DEP-C	1			09:05		
OFF-17-DEP-D	1			09:06		
OFF-21-DEP-A	1			09:23		
OFF-21-DEP-B	1			09:24		
OFF-21-DEP-C	1			09:25		
Total:	15					

Packed/Released By: SAIC	Date Time	Received By: SAIC	Date Time	Remarks:
Signature: [signature]	8/17/98	Signature: [signature]	8/17/98	
Printed Name: John T. Morris	11:54	Printed Name: BRIAN KOZIOL	1205	
Released By	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name.		Printed Name:		
Final Destination:		Contact Name and Phone Number		
Shipping Method:		Page 1 of 3		

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Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Pirkum

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-21-DEP-D	1	mesh bag	8/17/98	09:26	Deployed Blue Mussels	conductivity, microbiology, chemistry
OFF-20-DEP-A	1			09:33		
OFF-20-DEP-B	1			09:34		
OFF-20-DEP C	1			09:35		
OFF-20-DEP D	1			09:36		
OFF-19-DEP-A	1			09:56		
OFF-19-DEP-B	1			09:57		
OFF-19-DEP-C	1			09:58		
OFF-19-DEP-D	1			09:59		
OFF-14-DEP-A	1			10:10		
OFF-14-DEP B	1			10:11		
OFF-14-DEP C	1			10:12		
OFF-14-DEP-D	1			10:13		
OFF-23 DEP-A	1			10:26		
OFF-23-DEP-B	1			10:27		
Total:	15					

Packed/Released By: SAIC Signature: [signature] Printed Name: John T. Morris	Date Time 8/17/98 11:58	Received By: SAIC Signature: [signature] Printed Name: BRIAN KEZIOL
Released By: Signature: Printed Name.	Date Time	Received By: Signature: Printed Name:
Final Destination:		Contact Name and Phone Number
Shipping Method:		Page 2 of 3

Date Time 8/17/98 1205

Remarks:

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Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782 1900 / Fax (401) 782 2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Pontius

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-23-DEP-C	1	mesh bag	8/17/98	10:28	Deployed Blue Mussels	Microbiology, Cadmium analysis, Chromium analysis
OFF-23 DEP-D	1	↓	↓	10:29	↓	
Total :	2					

Packed/Released By: SAIC Signature: John T. Morris Printed Name: John T. Morris	Date Time 8/17/98 11:58	Received By: SAIC Signature: Brian Kozial Printed Name: BRIAN KOZIAL	Date Time 8/17/98 1205
Released By: Signature: Printed Name.	Date Time	Received By: Signature: Printed Name:	Date Time
Final Destination:		Contact Name and Phone Number	
Shipping Method:		Page 3 of 3	

Remarks:

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Chain of Custody Record

Project: OFF TIA

Client Name and Contact: TTNUS Steve Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-13-DEP	1	BAG	8/17/98	08:35-08:38	MUSSELS, COMPOSITE SAMPLE	CHEMISTRY
OFF-14-DEP				10:10-10:13		
OFF-17-DEP				09:03-09:06		
OFF-18-DEP				08:41-08:44		
OFF-19-DEP				09:56-09:59		
OFF-20-DEP				09:33-09:36		
OFF-21-DEP				09:23-09:26		
OFF-23-DEP				10:26-10:29		
OFF-T8-DEP			6/22/98	NA	NA	
OFF-18-DEP FD			8/17/98	08:41-08:44		
Total :	10					

Packed/Released By: Christine Tietjen, SAIC

Signature: [signature]

Printed Name: Christine Tietjen

Date Time: 8/14/98 3:30pm

Released By:

Signature:

Printed Name:

Date Time

Final Destination:

Shipping Method:

Received By:

Signature:

Printed Name:

Date Time

Received By:

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Date Time

Contact Name and Phone Number

Remarks:

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APPENDIX B-2-5.
CYTOCHROME P450 ASSAY

EVALUATION
OF THE
CUUNER, TAUTOGOLABRUS ADSPERSUS
FROM NEWPORT, RI
FOR
P450 ACTIVITY
FOR THE
DRAFT ECOLOGICAL RISK ASSESSMENT
FOR
OFFTA, NETC

October 1998

Submitted to:

Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Submitted by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

SAIC Project No. 01-0440-04-9817-303
Task 4C

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Introduction

For every species evaluated toxicologically, there are common elements which must be considered. They include: chemical source; environmental transport and transformation; biological uptake; distribution; action; detoxication; and elimination of anthropogenic and natural toxic compounds. The biological process of transformation alters the structure of toxic compounds, thereby, altering the relationship between compound and cell. A variety of cellular enzymes are used to negotiate this process of biotransformation, including the cytochrome P450 containing monooxygenases. These enzymes convert toxic compounds into less toxic compounds by converting their lipophilic (fat-soluble) components into water soluble compounds which are more easily excreted.

The measurement of P450 has been used as a bioindicator, a subcellular warning of yet unobserved higher level effects, and as a biochemical marker of contaminant exposure. In the environment, aquatic species are exposed to aromatic contaminants such as PCBs, dioxins, and aromatic hydrocarbons, capable of inducing hepatic cytochrome P450 monooxygenase activity. Studies have shown that the degree of P450 induction is highly correlated with the degree of contamination in aquatic animals themselves, the surrounding biota or in the sediments (Stegeman and Hahn 1994).

In this study, cunner collected from Newport, RI were evaluated as part of the ecological risk assessment being conducted for the OFFTA study area. The response of this enzyme system is well established in both freshwater and marine fish exposed to a variety of contaminants in a number of laboratory and field studies. Results from these studies have indicated that this enzyme system in fish responds rapidly by inducing the P450 gene product, at very low levels of exposure, and is highly correlated with contaminant levels in the environment.

Methods

Currently, several methods are available to study the P450 induction response. They are based on molecular events at the DNA, mRNA (DNA probe), protein (antibody), and enzyme (catalytic assays) levels. The most common techniques used for determining the induction response are by catalytic assays, that is, by measuring the 7-ethoxyresorufin-*O*-deethylase (EROD) or aryl hydrocarbon hydroxylase (AHH) activity.

The EROD assay is an indirect measure of the P450 protein (enzyme) expressed. In this assay, the substrate 7-ethoxyresorufin is used and the enzymatic product, resorufin, is measured spectrophotometrically. The use of this assay to measure enzyme activity has been validated in a number of field and laboratory studies with fish monitored for biochemical effects of organic contaminants (Goksoyr and Husoy 1992). Therefore, the EROD assay was used in this study to determine the induction

response. The SOP for the method is attached (Appendix A).

Results and Discussion

Two composite replicates of three fish each collected from OFF-3 and three composites from OFF-22 were evaluated using the EROD assay (Table 1). The mean value of station OFF-22 composite A is 46.0 (± 64.9), for composite B is 16.0 (± 17.3), and for compoiste C is 3.50 (± 3.40). The mean value of station OFF-3 composite A is 16.9 (± 16.4) and for composite B is 18.8 (± 16.8). The mean value of OFF-22 for all composites is 18.8 (± 33.4) and of OFF-3 for both composites is 18.0 (± 15.2 SD).

Literature values for ethoxyresorufin activity in *Limanda limanda* collected by Renton and Addison from the North Sea ranged from >300 to <50 pmol/mg/min and ranged from 230 to 1292 pmol/mg/min in *Leiostomus xanthurus* collected from reference and contaminated sites in the Chesapeake Bay and Elizabeth River (Van Veld *et al.* 1990). Further comparisons of more recent literature data will be reviewed, and reported in the ERA (SAIC, in press) as available.

References

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Van Veld, P.A., D.J. Westbrook, B.R. Woodin, R.C. Hale, C.L. Smith, R.J. Huggett, and J.J. Stegeman. 1990. Induced cytochrome P-450 in intestine and liver of spot (*Leiostomus xanthus)* from a polycyclic aromatic hydrocarbon contaminated environment. *Aquatic Toxicology*, 17, 119-132.

Table 1. P450 results of cunner for OFFTA, NETC.

Site	Composite	Date Collected	Animal #	Liver Wt	BCA Protein µg/µl	Protein EROD (pmol/min/mg)	Limit of Detection	Mean of Each Composite	Std Dev of Each Composite	Mean of Station	Std Dev of Station
OFF-22	A	8/10/98	1	0.15	6.9	0.08		46.0	64.9	18.8	33.4
OFF-22	A	8/10/98	5	0.4	18.7	91.91					
OFF-22	B	8/11/98	1	0.11	5.6	35.93		16.0	17.3		
OFF-22	B	8/11/98	2	0.12	5.4	5.52					
OFF-22	B	8/11/98	3	0.05	1.9	6.41					
OFF-22	C	8/12/98	1	0.06	2.5	2.28		3.5	3.4		
OFF-22	C	8/12/98	2	0.1	2.7	ND	0.0002				
OFF-22	C	8/12/98	3	0.06	2.2	7.29					
OFF-22	C	8/12/98	4	0.18	7.5	0.84					
OFF-22	C	8/12/98	5	0.07	2.3	ND	0.0002				
OFF-3	A	8/5/98	1	0.03	1.6	0.87		16.9	16.4	18.0	15.2
OFF-3	A	8/5/98	2	0.09	4	ND	0.0001				
OFF-3	A	8/5/98	3	0.03	0.2	ND	0.003				
OFF-3	A	8/5/98	5	0.07	1.8	33.71					
OFF-3	A	8/5/98	6	0.03	0.6	16.23					
OFF-3	B	8/6/98	1	0.07	1.1	5.39		18.8	16.8		
OFF-3	B	8/6/98	3	0.09	4.5	32.37					
OFF-3	B	8/6/98	4	0.07	2.9	34.28					
OFF-3	B	8/6/98	5	0.15	2.4	ND	0.0002				
OFF-3	B	8/6/98	6	0.09	5.1	3.21					

Appendix A

KINETIC EROD MICROPLATE ASSAY

(48-Well Costar plate)
developed by B Woodin

ASSAY PROTOCOL

Assay is performed at RT (2012! C).
Prepare 7-ER buffer/substrate and NADPH cofactor as described below.
Dilute high activity samples 1:10 or greater with TEDG.
Low activity samples can be assayed neat.
  Add 150 5l of 7-ER buffer/substrate to wells of 48 well plate.
  Add 10 5l of microsomes (diluted as needed with TEDG). Samples and a positive control (BNF-treated scup microsomes) are assayed in duplicate.
  Initiate assay with 40 5l NADPH.
Briefly swirl plate and measure fluorescence in the Cytofluor* fluorometer once per minute over 6 min at sensitivities 2, 3 and 4 (530 nm excitation, 590 nm emission).

CALCULATIONS

Activities are calculated from the linear slopes of fluorescence vs time plots. Slopes of these plots (fluorescence units/min) are divided by the fluorescence units/pmol slope of the appropriate resorufin standard curve (determined as described below) to yield pmol/min activities. Final activities are expressed as pmol/min/mg of microsomal protein in the assay.

NOTES

- If nature of samples is known, put high activity samples (and positive control) last in the plate so less time elapses between initiation of reaction and scanning of plate.

- More than 10 5l of microsomes can be added for very low activity samples, but 7-ER buffer/substrate must be prepared at a higher concentration to yield a 2 5M final assay concentration.

- A BNF-treated scup sample of known activity is included in every plate.

BUFFERS AND REAGENTS

TEDG (resuspension buffer for microsomes, used for dilutions)
50 mM TRIS, 1 mM EDTA, 1 mM DTT, 20% (v/v) glycerol, pH 7.4-7.5
EROD assay buffer
50 mM Tris buffer, 0.1 M NaCl, pH = 7.8
NADPH (cofactor)
Final concentration in the assay is 1.34 mM.
Prepare a 6.68 mM NADPH (Sigma N-1630) working solution (5.57 mg/ml) in assay buffer.

7-ethoxyresorufin buffer/substrate solution (7-ER buffer/substrate)
Final concentration of 7-ethoxyresorufin (7-ER) in the assay is 2 5M.

Add a few crystals of 7-ER (Molecular Probes) to 1 ml methanol.
Warm 7-ER in methanol with hot tap water, vortex, and let settle. A saturated methanol solution of 7-ER is around 400 5M.
Prepare a 2.67 5M 7-ER/buffer solution using the 7-ER methanol solution:
For one 48-well plate, add 40 5l 7-ER methanol solution to 8 ml assay buffer.
Spectrophotometrically determine the Abs at 482 nm of the 7-ER/buffer.
Adjust absorbance of solution at 482 nm to 0.060 by adding more buffer or 7-ER in methanol as appropriate. 7-ER extinction coefficient at 482 nm = 22.5 mM-1 cm-1.
Wrap substrate/buffer in aluminum foil to protect from light.

Resorufin (RR) standard curves

Dissolve a few crystals of resorufin (RR, Molecular Probes) in methanol.
Determine RR/methanol concentration using absorbance at 574 nm (E = 0.04578 mM-1 cm-1).
Prepare 10.0 ml of 1 5M RR in assay buffer.
Prepare a series of standards containing 2 to 200 pmol per 200 5l of assay buffer.
Duplicate 200 5l volumes of the standards are aliquoted into wells of a 48 well plate and measured at sensitivities 2, 3, and 4 in the Cytofluor* fluorescent plate reader using 530 nm excitation and 590 nm emission filters. The slope of the standard curve (fluorescence units/pmol) at the appropriate sensitivity is used to calculate the activity of kinetic assays.
Standard curves can be determined in the absence of BSA, NADPH, 7-ER, cells or microsomes.

Protocol for microsome preparation

(Modified from Stegeman et al, 1979)

All procedures are performed at ice temperatures (12 ! C). Excised tissues are placed in ice cold homogenizing buffer consisting of 50 mM TRIS, 1.15 % KCl, pH 7.4, and homogenized in a minimum of 4 to 5 ml per gm of tissue wet weight using 8 passes of a teflon coated homogenizer at 1200 rpm in a glass homogenizing vessel. Resulting homogenates are centrifuged at 750 X g for 10 min to sediment nuclei and cell debris. Without transfer, samples are then centrifuged at 13,000 X g to sediment mitochondria. Resulting supernates are transferred to fresh tubes and subsequently centrifuged at 100,000 X g for 70 min. Final supernates are removed and remaining microsomal pellets are resuspended to 1 to 3 ml per gm of original tissue with TEDG (50 mM TRIS, 1 mM dithiothreitol, 1 mM EDTA, 20 % v/v glycerol, pH 7.4). A small manual homogenizer is used to resuspend the pellets. Microsomes are frozen and stored in liquid nitrogen.

Reference

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Appendix B

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetratech NUS

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-3	3	Bags	8/6	1:40	6 Fish (Cunner)	P450
Total :	3					

Packed/Released By: SAIC
Signature: Kt Rosenberger
Printed Name: Kurt J. Rosenberger
Date Time: 1:40 8/6/98

Released By:
Signature:
Printed Name
Date Time

Final Destination:

Shipping Method:

Received By: SAIC
Signature: Brian Kozol
Printed Name: BRIAN KOZOL
Date Time: 8/6/98 1342

Received By:
Signature.
Printed Name:
Date Time

Contact Name and Phone Number

Remarks.

Page 1 of 1

Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-REF	3	bags	8/12/98	12:05	5 Corner	P450

Total : 3

Packed/Released By: SAIC	Date Time	Received By:	Date Time	Remarks:
Signature [signature]	8/12/98	Signature		
Printed Name: John T. Morris	13.10	Printed Name:		
Released By:	Date Time	Received By:	Date Time	
Signature		Signature		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
Shipping Method:		Page 1 of 1		

Original Form Accompanies Shipment

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetratech NUS

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-B-N	2	Bags	8/10/98	2:30	4 dunner	P450
OFF-B-S	1	Bag	8/10/98	2:30	2 dunner	P450
OFF-B-N =	~~Ref~~	OFF Ref			CM + DM 8/11/98	
OFF-B-S =		OFF Ref				

Total : 3

Packed/Released By: SAIC Signature: Kurt R Printed Name: Kurt Rosenberger Date Time 8/10/98 3:00	Received By: SAIC Signature: Printed Name: 3:05 PM Cornelia Mee Date Time 8/10/98
Released By: Signature: Printed Name: Date Time	Received By: Signature: Printed Name: Date Time
Final Destination:	Contact Name and Phone Number
Shipping Method:	Page 1 of 1

Remarks:

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech NUS

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-3	3	Bags	8/5	12:50	6 fish (Carmer)	P450
Total :	3					

Packed/Released By: SAIC Signature: John T. Morris Printed Name: John T. Morris	Date Time 1:30 8/5/98	Received By: SAIC Signature: Cornelie Mueller Printed Name: Cornelie Mueller	Date Time 1:30 8/5/98
Released By: Signature: Printed Name:	Date Time	Received By: Signature: Printed Name:	Date Time
Final Destination:		Contact Name and Phone Number	
Shipping Method:		Page 1 of 1	

Remarks:

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: JFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-REF	2	bags	8/11/98	12:50	3 Cumner	PAH50
Total :	2					

Packed/Released By:	Date Time	Received By:	Date Time	Remarks:
Signature:	8/11/98 13.30	Signature: SAIC	8/11/98 13:35	
Printed Name: John T. Morris		Printed Name: Cornelia Mueller		
Released By:	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
Shipping Method:		Page 1 of		

Science Applications International Corporation

nvironmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

'roject: DFFTM

Client Name and Contact: Cornelia Mueller 401 782 1900

ample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
DFF REF (1)	2	sent vial + foil	8/12	na	frozen liver	enzymes on frozen tissues + formalin fixed tissue
DF REF (2)	2		8/11		formalin fixed liver, heart, gill, kidney	
DFF REF (2)	2		8/12			
DFF REF (3)	2		8/12			
DF-B-S (5)	2		8/10		all from cunner	
DF-B-N (1)	2		8/10			
DF-Ref (4)	2		8/12			
DF-Ref (5)	2		8/12			
DF-Ref (3)	2		8/11			
DF-Ref (1)	2		8/11			
Total :	20					

'd/Released By: SAIC
ture:
d Name: Cornelia Mueller
Date Time 9/29/98 4:30pm

ed By:
ure:
l Name:
Date Time

estination: LOTHOI

g Method: Fed Ex

Received By:
Signature:
Printed Name:
Date Time

Received By:
Signature:
Printed Name:
Date Time

Contact Name and Phone Number: Stegman / Woodin

Page 1 of 2

Remarks:

Science Applications International Corporation

nvironmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

roject: [illegible]

Client Name and Contact: [illegible]

ample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
FF-3 (2)	2	2ml vial + foil	8/5	na	(a) frozen liver	enzymes on frozen tissues + formalin fixed tissues
FF-83 (5)	2		8/6		(b) formalin fixed liver, heart, opel kidney, all from cunner	
f-3 (5)	2		8/5			
f-3 (6)	2		8/5			
f-3 (1)	2		8/6			
f-3 (1)	2		8/5			
f-3 (6)	2		8/6			
f-3 (4)	2		8/6			
f-3 (3)	2		8/6			
f-3 (3)	2		8/5			
Total :	22					

ed/Released By: SAIC ature: ed Name: Cornelia Mueller	Date Time 9/29/98 4:30pm	Received By: Signature: Printed Name:	Date Time
sed By: ature: d Name:	Date Time	Received By: Signature: Printed Name:	Date Time
Destination: WHOI		Contact Name and Phone Number: Stegmann Warden	
ing Method: Fed Ex		Page 2 of 2	

Remarks:

APPENDIX B-2-6.
SEDIMENT OXYGEN DEMAND TEST RESULTS

Sediment Oxygen Demand (SOD) Test Results

Draft Marine Ecological Risk Assessment
OFFTA, NETC
Newport, Rhode Island

October 1998

Submitted to:

Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Submitted by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

SAIC Project Number 01-0440-04-9817-307
Task 6

Tabl of Cont nts

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Results and Discussion 5

References 6

Appendix A. Water Column Oxygen Measurements Over Time with Regression Statistics

Appendix B. Sediment Oxygen Measurements Over Time with Regression Statistics

Appendix C. Sediment Oxygen Measurements as SOD ($O_2/m^2/day$)

Appendix D. Chain-of-Custody Forms

Introduction

Dissolved oxygen (DO) concentration is an important indicator of water quality. In addition, DO can be used as a principle indicator of ecological condition (USEPA-EMAP 1993), it is a key parameter affecting toxicity of chemical pollutant, and hypoxia can be important (1) in multiple stressor interactions and (2) as a mediator of bioavailability (Lloyd 1961). When oxygen demand exceeds supply, fish mortality and loss of recreational amenities can result. Therefore, its rate of production and depletion is frequently investigated.

Major oxygen consumers in the aquatic environment are water column microbes and macrophytes (i.e., respiration) and bottom sediments. While oxygen uptake in the water column often receives attention, sediment/benthic oxygen demand can represent a significant percentage of oxygen consumption/uptake in an aquatic system and can provide a good index of benthic community metabolism (Belanger 1980). In addition, sediment oxygen demand can be a more useful indicator for estimating the quality of a body of water because sediment populations remain relatively stable over time while the overlying water can be transient. Contributors to benthic sediment demand include settled waste components of organic material from discharges of solids, detritus discharged into the water by natural runoff, soluble organic substances in the water column, and naturally occurring sediments derived from aquatic plants and animals (Truax et al. 1995). The rate of dissolved oxygen consumption attributed to the benthic/sediment system is defined as the sediment oxygen demand (SOD) expressed in g O_2/m^2/day. Data indicate that in freshwater systems, sediment uptake has accounted for as much as 50% of the total oxygen depletion (Hanes and Irvine 1968). More current studies and past experience indicate that attempts to model/predict or understand water quality cannot be executed accurately without SOD measurements (Truax et al. 1995).

Several factors can influence oxygen depletion by sediments. These include: DO in the overlying water; sediment resuspension (SOD increases as sediments are resuspended because of higher water velocity); invertebrate activity (i.e. respiration); salinity (salinity and SOD increase monotonically); pH; temperature (increases in temperature are associated with increased rates of bacterial respiration yielding higher SODs); and chemical oxygen demand which considers the interaction between non-biological (i.e. chemical) oxygen demand and bacterial respiration by using bacterial inhibitors to measure non-biological demand while total oxygen demand is measured in uninhabited systems.

Two approaches have been developed to measure SOD. They include in-situ respirometry and laboratory respirometry. Both approaches entail the same basic concepts: a known amount of sediment is enclosed in a chamber with a known volume of water. The SOD rate is calculated based on the area of sediment enclosed, the volume of water within the chamber, and the rate of oxygen uptake. Although SOD is an important parameter, no accepted standard methods are available to evaluate it. Studies have indicated that laboratory techniques are more acceptable than in-situ techniques (Bowman and Delfino 1979). Despite this, comparisons of results among disparate techniques are routine.

M thods

Samples used for SOD determinations were collected from seven stations in Coasters Harbor on either 12 or 13 of August 1998 (OFF-13, OFF-18, OFF-19, OFF-20, OFF-21, OFF-22, and OFF-23). Ambient water temperatures were 18, 19, 21, and 22°C, respectively. Stations were chosen to represent each of the model segments in the Water Quality Model. Locations had been established using GPS and had been previously buoyed. The sediment collection method employed a Smith-Mac grab, but in all other respects followed EMAP field operation protocols (EPA 1993). Two cores per collection were obtained by directly inserting plexiglass core tubes (8.2 cm diameter) eight cm into the grab sediment. This process was repeated for each of three grabs per station. Core tubes were capped on the bottom and transported to the laboratory in iced ziplock bags. One water sample per station was taken through a weighted hose lowered to a 10 foot depth using a diaphragm pump delivering directly into twenty liter cubitainer. Aeration occurred in this process. Containers were stored with ice for return to the laboratory.

All incubations were initiated within 12 hours of sampling, and were carried out under dark conditions at ambient field temperatures. For each station there were six replicates with sediment and six site water-only capped tubes. Undisturbed cores were topped with 500 ml of site water. DO measurements were made at the following incubation intervals: 0, 2, 4, 20, and 48 hours with an Orion Model 820 meter and probe.

Measurements were converted to consumption rates according to the following steps:

1. Oxygen concentration over time was plotted for both sediment and water-only incubations.

2. Linear regression equations were used to estimate rate of oxygen consumption as mg/L/hr. Water volume was constant at 0.5L.

3. Water-only uptake (blank chamber) was subtracted from Sediment-water uptake to estimate Sediment Uptake. This was converted to g O_2/m^2/day to be consistent with standard practice and the WASP5 model. Sediment area was constant at 0.00535 m^2.

Note: In several cases oxygen measurements at 48 hours were <2 mg/L. It is likely that sediment oxygen demand values calculated for these sediments are underestimates due to the dependency of uptake on the overlying watercolumn concentration (Edwards and Rolley 1965).

Results and Discussion

Dissolved oxygen measurements for water column and sediment matrices over time are presented in Appendix A and B, respectively. Linear regression statistics, used to estimate the rate of oxygen consumption as mg/L/hr, are shown. Estimates of sediment uptake, as g O_2/m^2/day, are presented in Appendix C.

It is also important to recognize the possibility that any particular methodology to determine SOD in the lab yield results which do not represent in-situ conditions. Nixon et al. (1980) found that at their lower Narragansett Bay station SOD decreased as oxygen concentration in the overlying water decreased. This problem can be exaggerated in laboratory determinations. If absolute SOD is high, then a dependent relationship with water oxygen levels is important even in the high oxygen range because methane and ammonia oxidation are affected (DiToro 1990).

The precision of measurements taken from Coasters Harbor sediments was considered acceptable. The coefficient of variation ranged from 17-29% for 4 out of 7 stations. For comparison, Bowman and Delfino (1980) considered $\pm$ 20% among replicates to be good reproducibilty in their review of SOD techniques. Calibration of the WASP5 model will provide an important check by establishing the relationship between sediment oxygen flux and other water quality and hydrodynamic parameters.

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Appendix A

APPENDIX A

WATER COLUMN DISSOLVED OXYGEN TIME SERIES[1]
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

	Time (hours)				Linear Regression Statistics		
Sample ID	0	4	20	48	Slope	Intercept	R^2
OFF-13-A	5.80	5.70	5.10	3.90	-0.040	5.85	0.997
OFF-13-B	5.90	5.80	5.00	4.00	-0.040	5.90	0.994
OFF-13-C	5.80	5.00	4.50	3.20	-0.049	5.50	0.948
OFF-13-D	5.80	5.60	4.80	3.40	-0.050	5.80	1.000
OFF-13-E	5.80	5.40	4.60	2.50	-0.067	5.79	0.993
OFF-13-F	5.90	5.50	5.00	4.10	-0.035	5.76	0.979
OFF-18-A	5.90	5.60	4.30	2.50	-0.071	5.85	0.997
OFF-18-B	5.80	5.70	5.10	4.30	-0.032	5.79	0.996
OFF-18-C	5.80	5.70	5.10	4.40	-0.029	5.78	0.991
OFF-18-D	5.80	5.50	5.00	3.90	-0.038	5.74	0.994
OFF-18-E	5.80	5.50	4.80	3.00	-0.057	5.81	0.994
OFF-18-F	5.90	5.60	4.90	4.20	-0.034	5.77	0.967
OFF-19-A	6.20	6.10	5.30	4.20	-0.042	6.21	0.997
OFF-19-B	6.20	6.10	5.50	4.50	-0.036	6.22	0.999
OFF-19-C	6.20	5.90	5.20	4.50	-0.034	6.07	0.967
OFF-19-D	6.10	5.90	4.80	3.50	-0.055	6.06	0.991
OFF-19-E	6.10	5.90	5.00	4.10	-0.042	6.03	0.980
OFF-19-F	6.10	5.90	5.30	4.30	-0.037	6.07	0.999
OFF-20-A	6.00	4.70	5.40	4.50	-0.020	5.50	0.390
OFF-20-B	6.00	4.50	5.50	4.20	-0.024	5.48	0.381
OFF-20-C	5.80	4.90	5.00	2.90	-0.053	5.61	0.888
OFF-20-D	5.90	4.90	5.10	3.80	-0.036	5.56	0.800
OFF-20-E	5.60	5.00	5.70	4.00	-0.028	5.57	0.597
OFF-20-F	5.80	4.80	5.80	4.80	-0.011	5.50	0.180
OFF-21-A	6.40	4.40	5.40	4.20	-0.028	5.61	0.365
OFF-21-B	6.50	4.70	5.70	4.40	-0.028	5.82	0.394
OFF-21-C	6.50	4.50	5.90	4.00	-0.034	5.83	0.397
OFF-21-D	6.00	4.80	5.90	3.30	-0.045	5.81	0.614
OFF-21-E	6.10	4.70	6.10	4.60	-0.018	5.70	0.215
OFF-21-F	6.20	5.00	5.80	4.40	-0.027	5.83	0.520
OFF-22-A	6.90	6.40	5.50	3.90	-0.060	6.76	0.993
OFF-22-B	6.80	6.40	5.80	3.90	-0.059	6.78	0.987
OFF-22-C	6.90	6.40	5.90	4.20	-0.053	6.81	0.982
OFF-22-D	6.90	6.20	5.90	4.00	-0.056	6.75	0.956
OFF-22-E	6.90	6.40	6.00	3.90	-0.060	6.87	0.967
OFF-22-F	6.90	6.30	6.10	3.40	-0.069	6.92	0.934
OFF-23-A	5.60	4.80	5.40	2.50	-0.058	5.61	0.779
OFF-23-B	5.70	5.20	5.50	4.10	-0.029	5.65	0.788
OFF-23-C	5.50	4.90	5.40	3.20	-0.043	5.52	0.761
OFF-23-D	6.30	5.10	5.90	4.20	-0.033	5.97	0.600
OFF-23-E	6.50	4.90	5.90	4.40	-0.029	5.95	0.453
OFF-23-F	6.50	4.90	5.70	3.40	-0.051	6.04	0.698

1-units-mg/L.

Appendix B

APPENDIX B

SEDIMENT DISSOLVED OXYGEN TIME SERIES[1]

DRAFT MARINE ECOLOGICAL RISK ASSESSMENT

DERECKTOR SHIPYARD, NETC

NEWPORT, RHODE ISLAND

	Time (hours)				Linear Regression Statistics		
Sample ID	0	4	20	48	Slope	Intercept	R^2
OFF-13-A	4.80	4.40	2.50	1.60	-0.067	4.53	0.907
OFF-13-B	4.40	4.20	2.90	0.70	-0.078	4.46	0.999
OFF-13-C	4.60	3.80	0.80	0.60	-0.082	3.92	0.756
OFF-13-D	4.50	4.20	2.50	1.70	-0.059	4.28	0.909
OFF-13-E	3.60	3.90	1.80	0.50	-0.071	3.72	0.933
OFF-13-F	4.40	3.70	1.50	1.40	-0.060	3.84	0.741
OFF-18-A	5.10	4.40	2.50	0.40	-0.096	4.82	0.979
OFF-18-B	4.60	4.80	3.80	2.20	-0.054	4.82	0.978
OFF-18-C	5.10	4.30	3.40	0.80	-0.085	4.93	0.986
OFF-18-D	3.50	3.10	0.90	0.30	-0.067	3.16	0.850
OFF-18-E	4.80	4.70	3.80	1.70	-0.066	4.93	0.991
OFF-18-F	2.70	2.70	2.00	0.50	-0.047	2.83	0.988
OFF-19-A	4.00	4.50	3.00	0.30	-0.084	4.47	0.960
OFF-19-B	5.80	5.50	1.60	2.00	-0.083	5.22	0.656
OFF-19-C	5.80	5.60	3.60	1.90	-0.083	5.72	0.972
OFF-19-D	5.30	5.30	2.10	1.80	-0.078	5.03	0.773
OFF-19-E	5.80	3.70	1.70	0.30	-0.101	4.69	0.842
OFF-19-F	5.20	5.20	3.30	0.80	-0.095	5.34	0.993
OFF-20-A	5.20	5.60	3.80	0.50	-0.105	5.66	0.974
OFF-20-B	5.70	5.40	4.10	0.00	-0.119	5.95	0.980
OFF-20-C	6.00	5.50	4.50	1.60	-0.090	6.02	0.990
OFF-20-D	5.60	5.50	5.00	0.10	-0.116	6.13	0.908
OFF-20-E	5.10	5.10	4.20	0.00	-0.109	5.56	0.944
OFF-20-F	3.70	3.50	2.70	0.20	-0.073	3.84	0.982
OFF-21-A	5.40	4.40	3.80	0.00	-0.106	5.31	0.960
OFF-21-B	4.70	4.70	4.70	0.00	-0.099	5.31	0.843
OFF-21-C	5.00	4.60	4.40	0.00	-0.102	5.34	0.901
OFF-21-D	4.70	3.50	1.70	0.00	-0.091	4.12	0.935
OFF-21-E	4.00	2.70	0.50	0.00	-0.076	3.18	0.786
OFF-21-F	4.20	3.60	0.80	0.00	-0.087	3.72	0.852
OFF-22-A	6.50	4.90	4.60	2.60	-0.069	5.89	0.884
OFF-22-B	5.80	3.60	3.70	1.90	-0.063	4.89	0.750
OFF-22-C	6.50	4.90	3.50	n/a	-0.132	6.02	0.868
OFF-22-D	6.40	2.60	2.80	0.80	-0.086	4.69	0.633
OFF-22-E	5.80	4.80	4.40	1.90	-0.074	5.56	0.953
OFF-22-F	6.00	4.30	4.30	1.00	-0.091	5.54	0.898
OFF-23-A	5.10	4.80	3.70	0.20	-0.102	5.29	0.981
OFF-23-B	5.00	3.60	3.00	0.00	-0.094	4.60	0.952
OFF-23-C	5.60	5.30	4.00	0.20	-0.113	5.81	0.985
OFF-23-D	4.70	4.10	3.70	0.20	-0.090	4.80	0.944
OFF-23-E	2.80	3.30	3.00	0.10	-0.062	3.41	0.819
OFF-23-F	5.10	4.40	2.80	0.00	-0.104	4.94	0.997

N/A - no water in tank; 1-units-mg/L.

Appendix C

APPENDIX C
SEDIMENT OXYGEN DEMAND MEASUREMENTS
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Sample ID	Sediment Chamber Rate (mg/L/hr)	Blank Chamber Rate (mg/L/hr)	Sediment Uptake Rate (mg/L/hr)	SOD[1] (g O_2/m^2-day)	Mean	SD[2]	CV[3]
OFF-13-A	-0.067	-0.040	-0.027	0.060	0.050	0 030	60.1
OFF-13-B	-0.078	-0.040	-0.038	0.085			
OFF-13-C	-0.082	-0.049	-0.033	0.074			
OFF-13-D	-0.059	-0 050	-0.009	0 020			
OFF-13-E	-0.071	-0 067	-0.004	0.008			
OFF-13-F	-0.060	-0.035	-0.025	0.056			
OFF-18-A	-0 096	-0.071	-0.025	0.056	0.057	0.037	65 3
OFF-18-B	-0.054	-0.032	-0 022	0.049			
OFF-18-C	-0.085	-0.029	-0.056	0.125			
OFF-18-D	-0 067	-0.038	-0.029	0.065			
OFF-18-E	-0.066	-0 057	-0.008	0 019			
OFF-18-F	-0.047	-0.034	-0.013	0.029			
OFF-19-A	-0 084	-0 042	-0.042	0.094	0.104	0.029	28.1
OFF-19-B	-0.083	-0.036	-0.047	0.106			
OFF-19-C	-0.083	-0 034	-0.049	0 110			
OFF-19-D	-0.078	-0 055	-0 024	0.053			
OFF-19-E	-0.101	-0.042	-0.059	0.133			
OFF-19-F	-0.095	-0.037	-0.058	0.131			
OFF-20-A	-0 105	-0.020	-0.085	0 191	0.165	0.047	28.7
OFF-20-B	-0.119	-0.024	-0.096	0.214			
OFF-20-C	-0.090	-0.053	-0.037	0 082			
OFF-20-D	-0.116	-0.036	-0.080	0 180			
OFF-20-E	-0.109	-0.028	-0.081	0.182			
OFF-20-F	-0.073	-0 011	-0 062	0.139			
OFF-21-A	-0.106	-0.028	-0 078	0.175	0.143	0.025	17.6
OFF-21-B	-0.099	-0 028	-0 071	0.160			
OFF-21-C	-0.102	-0.034	-0.068	0.153			
OFF-21-D	-0.091	-0 045	-0.046	0 104			
OFF-21-E	-0.076	-0.018	-0.059	0 131			
OFF-21-F	-0 087	-0 027	-0.061	0.136			
OFF-22-A	-0.069	-0.060	-0.009	0.020	0 060	0 061	102.1
OFF-22-B	-0.063	-0.059	-0.005	0.011			
OFF-22-C	-0 132	-0.053	-0.079	0 177			
OFF-22-D	-0.086	-0.056	-0 030	0.067			
OFF-22-E	-0.074	-0.060	-0.015	0.033			
OFF-22-F	-0.091	-0.069	-0.022	0.049			
OFF-23-A	-0.102	-0.058	-0.045	0.100	0.121	0.031	25.9
OFF-23-B	-0.094	-0.029	-0.065	0.146			
OFF-23-C	-0.113	-0.043	-0 070	0.158			
OFF-23-D	-0.090	-0.033	-0.057	0.129			
OFF-23-E	-0.062	-0.029	-0.032	0.072			
OFF-23-F	-0.104	-0.051	-0.053	0.119			

(1) Water volume = 0.500 L, Sediment area = 0 0535 m^2
(2) SD = Standard deviation
(3) CV = Coefficient of variation

Appendix D

Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-13-H2O	1	Soil Core	8/12/98	9.10	Surface Water	BOD / SOD
OFF-13-SOD-A	1	Gravity tube		9.15	Sediment Sub-core	
-B	1			9:15		
-C	1			9:15		
-D	1			9:15		
E	1			9.27		
-F	1			9.27		
OFF-18-H2O	1	Soil core		9:42	Surface Water	
OFF-18-SOD-A	1	Gravity tube		9 50	Sediment Sub-core	
-B	1			9:52		
-C	1			10 05		
-D	1			10.05		
-E	1			10.12		
-F	1			10.12		
OFF-19-H2O	1	Soil core		10.25	Surface Water	
Total :	15					

Packed/Released By Signature Printed Name	Date Time 8/12/98 13.00	Received By Signature Printed Name	Date Time 8/12/98
Released By Signature Printed Name.	Date Time	Received By Signature Printed Name:	Date Time
Final Destination:		Contact Name and Phone Number	
Shipping Method		Page 1 of 2	

Remarks

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Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-19-SOD A	1	Gin tube	8/12/98	10:35	Sediment Sub-core	BOD / SOD
-B	1			10.36		
-C	1			10:41		
-D	1			10 47		
E	1			10.53		
-F	1			10.00		
OFF-22-HZW	1	Sgal cube		11.24	Surface Water	

Total : 7

Packed/Released By	Date Time	Received By:	Date Time	Remarks:
Signature [signature]	8/12/98	Signature [signature]	8/12/98	
Printed Name John T. Morris	13:00	Printed Name: Cornelia Muir	13:05	
Released By	Date Time	Received By:	Date Time	
Signature		Signature		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
Shipping Method		Page 2 of 2		

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Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA SOD/DO

Client Name and Contact: Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-22 A	1	BOD	8/12/98	12:42	BOD bottle	DO temp 71°F
OFF-22 B	1	"			"	DO
OFF-19 A	1			13:18		DO temp 69°F
OFF-19 B	1					DO
OFF-13 A	1	"		13:33		DO temp 72°F
OFF-13 B	1					DO
OFF-18 A	1			13:46		DO temp 70°F
OFF-18 B	1	BOD			BOD bottle	DO

Total: 8

Packed/Released By Signature: Michael Cole Printed Name: Michael Cole Date Time: 8/12/98 16:27	Received By Signature Printed Name Date Time	Remarks
Released By Signature Printed Name Date Time	Received By Signature Printed Name Date Time	
Final Destination	Contact Name and Phone Number	
Shipping Method	Page 1 of 1	

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Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech — Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-22-SOD-A	1	tube	8/13/98	07:05	Sediment Core	BOD / SOD
-B	1			07:07		
-C	1			07:10		
-D	1			07:12		
-E	1			07:15		
-F	1			07:20		
Total :	6					

Packed/Released By: SAIC Signature: John T. Morris Printed Name: John T. Morris	Date Time 8/13/98 08:10	Received By: SAIC Signature: Brian Kozik Printed Name: BRIAN KOZIOL	Date Time 8/13/98 0816
Released By: Signature: Printed Name:	Date Time	Received By: Signature: Printed Name:	Date Time
Final Destination:		Contact Name and Phone Number	
Shipping Method:		Page 1 of 1	

Remarks:

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Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA	Client Name and Contact: Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-21-H_2O	1	Plastic	8/13/98		5 gal water container	SOD
OFF-21-SOD-A	1	core tube			core tube w/ 3" of sed	
OFF-21-SOD-B	1	core tube				
OFF-21-SOD-C	1	core tube				
OFF-21-SOD-D	1	core tube				
OFF-21-SOD-E	1	core tube				
OFF-21-SOD-F	1	core tube				
OFF 20-H_2O	1	Plastic			5 gal water container	
OFF-20-SOD-A	1	core tube			core tube w/ 3" of sed	
OFF 20-SOD-B	1	core tube				
OFF 20-SOD-C	1	core tube				
OFF-20-SOD-D	1	core tube				
OFF 20-SOD-E	1	core tube				
OFF 20-SOD-F	1	core tube				
Total :	14					

Packed/Released By	Date Time	Received By	Date Time	Remarks
Signature [signature]	8/13/98	Signature	8/13/98	
Printed Name Dave Fischmann	1157	Printed Name [signature]	12:40	
Released By	Date Time	Received By	Date Time	
Signature.		Signature		
Printed Name		Printed Name:		
Final Destination:		Contact Name and Phone Number		
Shipping Method		Page 1 of 2		

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Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA

Client Name and Contact: Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-23-H2O	1	plastic	8/13/98		5 gal plastic container	SOP
OFF-23-SOD-A	1	core tube			core tube w/ 3" seal	
OFF-23-SOD-B	1	core tube				
OFF-23-SOD-C	1	core tube				
OFF-23-SOD-D	1	core tube				
OFF-23-SOD-E	1	core tube				
OFF-23-SOD-F	1	core tube				
Total :	7					

Packed/Released By:	Date Time	Received By:	Date Time	Remarks
Signature: [illegible]	8/13/98	Signature: [illegible]	8/13/98	
Printed Name: Dave Fischman	1200	Printed Name: Cornelius Hue	12:42	
Released By:	Date Time	Received By:	Date Time	
Signature		Signature		
Printed Name		Printed Name.		
Final Destination:		Contact Name and Phone Number		
Shipping Method:		Page 2 of 2		

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Science Applications International Corporation

Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA SOD/DO

Client Name and Contact: Tetra Tech Steve Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters	
OFF-23 A	1	BOD	8/13/98	10:53	BOD bottle	D.O	70°F
OFF-23 B	1	BOD			BOD	D.O	
OFF-20 A	1			1300	BOD	D.O	65°F questionable
OFF-20 B	1				BOD	D.O	+5°F
OFF-21 A	1			1310	BOD	D.O	66°F questionable
OFF-21 B	1				BOD	D.O	+5°F

Total :

Packed/Released By	Date Time	Received By:	Date Time	Remarks
Signature: Michael Cole	8/13/98	Signature		
Printed Name: Michael Cole		Printed Name:		
Released By	Date Time	Received By:	Date Time	
Signature.		Signature		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
Shipping Method:		Page _____ of _____		

APPENDIX B-2-7.
WATER QUALITY TEST RESULTS

Water Quality Results

Draft Marine Ecological Risk Assessment
OFFTA, NETC
Newport, RI

October 1998

Submitted to:

Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Submitted by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

SAIC Project Number 01-0440-04-9817-309
Task 6

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Methods 4

Results 6

References 8

Table 1. Sampling and Analysis Schedule
Table 2. Chlorophyll a Data Table
Table 3. Dissolved Oxygen Data Table
Table 4. Total Suspended Solids Data Table
Table 5. Ammonia Data Table

Appendix A. Chain of Custody Forms

Introduction

There are many important aspects of ecosystem integrity in aquatic systems, including maintenance of appropriate levels of critical water quality indicators such as chlorophyll-a, dissolved oxygen (DO), total suspended solids (TSS), and ammonia. Water quality parameters, which include chlorophyll a, DO, TSS, and ammonia, were measured at eight stations in Coasters Harbor, concurrent with mussel deployments. Water samples were collected on five separate occasions coincidental with deployments, and 24 and 37 days later. Each of these water quality parameters plays an integral role in the functioning of aquatic systems when present at "typical" concentrations. However, unusual values for any one of these parameters may be symptomatic of other forms of perturbation or stress in the system, such as point or non-point source discharge of excess nutrients.

Sources for nutrients of concern include point sources such as industrial discharges and municipal sewage treatment plants and non-point source runoff from agricultural and urban areas. Chlorophyll a is an excellent indicator of the general nutrient status of a body of water and of the algal populations which exist in the system. Increased concentrations of nutrients in a system can lead to excessive growth of algal populations which in turn would produce increased concentrations of chlorophyll-a. The increased growth of the algal populations can also produce adverse impacts on dissolved oxygen (DO) concentrations and increase the levels of total suspended solids in the system.

Maintenance of optimal DO concentrations in aquatic systems is important for all aerobic forms of life including benthic macroinvertebrates, zooplankton and fish. Excessive algal growth can produce large diurnal fluctuations in DO in the water column which may adversely affect aquatic organisms due to DO depletion caused by nighttime algal respiration. Excess algal productivity can also cause DO depletion in the water column and in or near the sediment due to decomposition of algae and other organic materials. The increased levels of TSS associated with excessive algal productivity may also reduce light penetration and shade aquatic vascular plants.

Suspended solids are comprised of any inorganic (e.g., silt) or organic (e.g., algal cells) material suspended in the water column. The presence of this material in the water column may affect various trophic levels or components of aquatic ecosystems. Increased levels of TSS may adversely affect primary productivity by decreasing light penetration into the water column. Alterations in light penetration may also affect both the environmental distribution and the structure (e.g., species richness, composition) of vascular plant and attached algal communities. Many aquatic vascular plants are intolerant of the shading produced by increased TSS. Alterations in phytoplankton community structure may in turn result in changes in the structure of the zooplankton communities which graze upon the phytoplankton and the fish communities which utilize both the phytoplankton and the zooplankton as a source of food.

High concentrations of TSS may also be detrimental to benthic invertebrate communities. Material suspended in the water column ultimately is deposited on the bottom of aquatic

ecosystems. This material generally serves as a principal source of nutrients for benthic organisms. However, when the deposited material consists primarily of inorganic sediments, its deposition may reduce the available habitat "structure", smother benthic invertebrate communities and ultimately produce a community of large numbers of individuals from relatively few species which are tolerant of siltation. Changes in benthic macroinvertebrate communities may also affect the higher organisms which rely upon them as a source of food.

The same sources which discharge nutrients into aquatic systems also may directly discharge ammonia, or the discharge of increased levels of organic materials may lead to the production of ammonia in the water column and/or the sediments through decomposition of organic material. Unionized ammonia is the more toxic form to aquatic organisms. The input and decomposition of excessive amounts of organic material in aquatic ecosystems frequently results in adverse conditions in or near the sediment due to decreased concentrations of DO and increased concentrations of ammonia.

In this study, ammonia and dissolved oxygen were measured because restricted circulation in the harbor as well as added biological oxygen demand caused by nutrient loading may affect important ecological communities. Ammonia is highly toxic to many marine organisms and dissolved oxygen levels below 5 mg/L (i.e. ppm) are considered hypoxic. These data were also used as companion data for similar measurements made in test chambers during laboratory exposures for the effects assessment phase of the ERA. In addition, dissolved oxygen data will be used to model O_2 concentrations under various scenarios (i.e. water temperature and stratification). The model was used to evaluate the "dead zone" along the water front in Coddington Cove to determine whether the primary stressor to the area is due to Navy-related contaminant input or hypoxia. Lastly, dissolved oxygen, suspended solids, and chlorophyll a measurements were used to provide background information on the environmental conditions under which deployed mussel bioaccumulation and growth are occurring.

Method

Samples were collected for analyses on 23 June, 6 July, 20 July, 3 August, and 17 August 1998 (Test Series 1-5). Samples were collected from 8 sites for chlorophyll a, dissolved oxygen, total suspended solids, and ammonia measurements.

Chlorophyll a methods, including sample collection and measurements are described in URI and SAIC (1995). Briefly, samples were collected on glass fiber filters and were transported on dry ice. At the laboratory, samples were frozen at -20°C for up to 30 days. Filters were macerated in a tissue grinder with 90% acetone to extract the pigments. After overnight storage at 4°C, the sample was centrifuged and the supernatant was decanted. Three milliliters of sample were transferred to a 1-cm cuvette and the optical density was read at 750 and 664 nm using a Schimadzu UV-1601 recording spectrophotometer. The sample was acidified and the optical density was read at 750 and 665 nm. WindowChem™ Software Chlorophyll Calculator™ was used to convert optical density readings to mg/m^3

chlorophyll a. Multiple subsamples of a 10 mg/m^3 chlorophyll standard were used to verify laboratory methods and to determine variability. Negative optical density values, used to calculate chlorophyll concentrations, were converted to zero.

Methods used to collect water samples and measure dissolved oxygen (DO) are described in the SOPs presented in URI and SAIC (1995). Briefly, water samples were collected in 300-mL BOD bottles for subsequent analysis using the Winkler method. Manganous sulfate and alkaline iodide-azide reagent were added, upon collection. The bottles were stoppered and inverted several times to mix. After the flocculent settled to 1/3 of the way down, the bottles were inverted again. Samples were transported on ice in insulated coolers and generally, were analyzed on the same day or held overnight in the dark at 4°C. For analysis, sulfumic acid was added to each sample and the bottles were stoppered and inverted several times. A 25-mL buret filled with sodium thiosulfate was used to titrate 200 mL of the prepared sample to a pale yellow color. Starch indicator solution was added and mixed. The titration continued to a colorless endpoint. The mL of titrant (mg/L of dissolved oxygen) was recorded.

Methods used to collect water samples and measure total suspended solids (TSS) are described in URI and SAIC (1995). Briefly, a Niskin Sampler was used to collect samples which were transferred to 1-gallon Cubitainers™. Samples were transferred to the laboratory on ice in insulated coolers. Samples were processed immediately or stored overnight, in the dark, at 4°C. Suspended solids were collected on glass fiber filters. The filters were dried in an oven at 103-105°C overnight, cooled in a dessicator, and weighed. The drying cycle was repeated until a constant weight was obtained. TSS was calculated according to the following equation:

$$\textit{Non-filterable residue (mg/L)} = \frac{(A-B) \times 1{,}000}{C}$$

where:

A = weight of filter (or filter and crucible) + residue in mg
B = weight of filter (or filter and crucible) in mg
C = ml of sample filtered

Total ammonia was measured spectrophotometrically using the salicylate-hypochlorite method described by Bower and Holm-Hansen (1980). Water samples were diluted 1 to 10 with deionized water. The dilutions ensured that ammonia concentrations were always within the measurable range of up to 2 mg ammonia nitrogen per liter and that sample and standard salinities were within the required 5 ppt of one another. Un-ionized ammonia was calculated using measured total ammonia values, concurrent measurements of pH and salinity, and mean test temperature. The calculations were based on information provided in Hampton (1977) and Whitfield (1978).

3. R sults

The sampling and analysis schedule used is presented in Table 1. Samples were collected for Test Series 1, 2, 3, 4, and 5, on 23 June, 6 July, 20 July, 3 August, and 17 August 1998 respectively. Samples were collected from 8 sites for chlorophyll a, dissolved oxygen, total suspended solids, and ammonia measurements. Collection-to-analysis holding requirements were within acceptable limits (URI and SAIC 1995). Chain of custody forms are attached in Appendix A.

Chlorophyll a measurements are presented in Table 2. Chlorophyll a mean levels ranged from 0.19 to 3.43 mg/m^3 during test series 1 (collected 23 June 1998). Mean level at the reference site, OFF-23, was 0.39 mg/m^3, respectively. During test series 2 (collected 6 July 1998), mean levels ranged from 0.13 to 3.71 mg/m^3. Mean level at the reference site, OFF-23, was 0.21 mg/m^3, respectively. During test series 3 (collected 20 July 1998), mean chlorophyll levels ranged from 0.09 to 0.50 mg/m^3. Mean value for the reference site, OFF-23, was 0.24 mg/m^3, respectively. During test series 4 (collected 3 August 1998), mean levels ranged from 0.17 to 1.30 mg/m^3. Mean level at the reference site, OFF-23, was 0.17 mg/m^3, respectively. During test series 5 (collected 17 August 1998), mean cholorphyll levels ranged from 0.62 to 4.57 mg/m^3. Mean level at the reference site, OFF-23, was 0.62 mg/m^3, respectively. These values were consistent with expectations for Coasters Harbor during late June through August. However, they may not be representative of values which would be obtained during late winter, spring, and early fall samplings and, alone, cannot be used to rule out eutrophication as a stressor in Coasters Harbor.

Dissolved oxygen measurements are presented in Table 3. Mean dissolved oxygen concentrations ranged from 6.08 to 8.15 mg/L in samples collected for test series 1, from 7.00 to 8.25 mg/L in samples collected for test series 2, from 5.60 to 7.10 mg/L for test series 3, from 6.20 to 7.15 mg/L in samples collected for test series 4, and from 6.18 to 7.00 mg/L in samples collected for test series 5. No apparent differences between the reference site, OFF-23, and each OFF station were noted during any sampling event. These data indicate nearly 100% saturation levels or greater and are well above the 2-3 mg/L level at which hypoxic effects are frequently observed. Values which would be obtained during late winter, spring, and early fall samplings would be expected to be higher, due to the higher solubility of oxygen in colder waters.

Mean total suspended solid measurements, presented in Table 4, ranged from 14.8 to 32.90 mg/L in test series 1, from 18.1 to 44.4 mg/L in test series 2, from 22.9 to 40.4 mg/L in test series 3, from 34.7 to 58.0 mg/L in test series 4, and from 18.7 to 44.5 mg/L in test series 5. No apparent differences between the reference site, OFF-23, and each OFF station were noted. These values were consistent with expectations for Coasters Harbor during late June through August. However, they may not be representative of values which would be obtained during late winter, spring, and early fall samplings.

Ammonia measurements are presented in Table 5. Mean total ammonia ranged from 0.00

to 0.056 mg/L in test series 1, from 0.006 to 0.041 mg/L in test series 2, from 0.011 to 0.044 mg/L in test series 3, from 0.009 to 0.012 mg/L in test series 4, and from 0.070 to 0.255 mg/L in test series 5. Mean un-ionized ammonia ranged from 0.0002 to 0.002 mg/L in test series 1, from 0.0001 to 0.0005 mg/L in test series 2, from 0.0002 to 0.0007 mg/L in test series 3, from 0.0002 to 0.0003 mg/L in test series 4, and from 0.001 to 0.005 mg/L in test series 5. The acute toxicity of ammonia to marine organisms has been studied in crustaceans, bivalve mollusks, and fishes. Acute values are summarized for 21 species in 18 genera by U.S. EPA (1989). The median lethal concentration (LC50), the concentration of material in water to which test organisms are exposed that is estimated to be lethal to 50% of the test organisms, or the median effective concentration (EC50), the concentration of material in water to which test organisms are exposed that is estimated to effective in producing some sublethal response in 50% of the test organisms, for total ammonia ranged from 0.14 mg/L total ammonia to 43.00 mg/L. Of these only five species had LC50 or EC50 > 3.50 mg/L and only one species had a value < 0.15 mg/L. The larval winter flounder, *Pseudopleuronectes americanus*, represents the most sensitive species, with a species mean acute value (SMAV) of 0.492 mg/L total ammonia. Fourteen of the remaining 17 genera have Genus Mean Acute Values within an order of magnitude of that for the winter flounder. The three most tolerant species were the mollusks, the Eastern oyster (*Crassostrea virginica*), the quahog clam (*Mercenaria mercenaria*), and the brackish water clam (*Rangia cuneata*), with SMAVs of 19.1, 5.36, and 3.08 mg/L, respectively. The ammonia measured in the water column samples for this study do not indicate adverse effects attributable to ammonia. However, these values are not necessarily representative of values which would be obtained during late winter, spring, and early fall samplings. Ammonia is less readily converted to nitrate and nitrite in colder water, so the levels of ammonia reported here probably do not represent annual high conditions.

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TABLE 1
SAMPLING AND ANALYSIS SCHEDULE
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Sample ID	Replicate	Date Collected	Test Series	Analysis							
				Chlorophyll	Date	DO[1]	Date	TSS[2]	Date	Ammonia	Date
OFF-13	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-13	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-14	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-14	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-17	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-17	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-18	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-18	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-19	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-19	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-20	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-20	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-21	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-21	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-23	A	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98
OFF-23	B	6/23/98	1	x	7/2/98	x	6/23/98	x	6/23/98	x	6/23/98

(1) DO = Dissolved Oxygen
(2) TSS = Total Suspended Solids

TABLE 1
SAMPLING AND ANALYSIS SCHEDULE
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Sample ID	Replicate	Date Collected	Test Series	Chlorophyll	Date	DO[1]	Date	TSS[2]	Date	Ammonia	Date
						Analysis					
OFF-13	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-13	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98
OFF-14	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-14	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98
OFF-17	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-17	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98
OFF-18	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-18	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98
OFF-19	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-19	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98
OFF-20	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-20	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98
OFF-21	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-21	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98
OFF-23	A	7/6/98	2	x	7/6/98	x	7/6/98	x	7/6/98	x	7/6/98
OFF-23	B	7/6/98	2	x	7/6/98	x	7/6/98		7/6/98		7/6/98

(1) DO = Dissolved Oxygen
(2) TSS = Total Suspended Solids

TABLE 1
SAMPLING AND ANALYSIS SCHEDULE
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Sample ID	Replicate	Date Collected	Test Series	Analysis							
				Chlorophyll	Date	DO[1]	Date	TSS[2]	Date	Ammonia	Date
OFF-13	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-13	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-14	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-14	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-17	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-17	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-18	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-18	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-19	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-19	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-20	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-20	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-21	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-21	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-23	A	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98
OFF-23	B	7/20/98	3	x	7/20/98	x	7/20/98	x	7/20/98	x	7/20/98

(1) DO = Dissolved Oxygen
(2) TSS = Total Suspended Solids

TABLE 1
SAMPLING AND ANALYSIS SCHEDULE
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Sample ID	Replicate	Date Collected	Test Series	Analysis Chlorophyll	Date	DO[1]	Date	TSS[2]	Date	Ammonia	Date
OFF-13	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-13	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-14	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-14	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-17	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-17	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-18	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-18	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-19	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-19	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-20	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-20	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-21	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-21	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-23	A	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98
OFF-23	B	8/3/98	3	x	8/3/98	x	8/3/98	x	8/3/98	x	8/3/98

(1) DO = Dissolved Oxygen
(2) TSS = Total Suspended Solids

TABLE 1
SAMPLING AND ANALYSIS SCHEDULE
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Sample ID	Replicate	Date Collected	Test Series	Analysis							
				Chlorophyll	Date	DO[1]	Date	TSS[2]	Date	Ammonia	Date
OFF-13	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-13	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-14	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-14	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-17	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-17	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-18	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-18	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-19	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-19	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-20	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-20	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-21	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-21	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-23	A	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98
OFF-23	B	8/17/98	3	x	8/17/98	x	8/17/98	x	8/17/98	x	8/17/98

(1) DO = Dissolved Oxygen
(2) TSS = Total Suspended Solids

TABLE 2
CHLOROPHYLL
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 1

Sample ID	Rep	Chlorophyll (mg/m^3)	Mean	SD
OFF-13	A	5.26	3.07	3.10
OFF-13	B	0.87		
OFF-14	A	0.09	0.19	0.13
OFF-14	B	0.28		
OFF-17	A	0.11	0.29	0.25
OFF-17	B	0.46		
OFF-18	A	0.20	0.68	0.68
OFF-18	B	1.16		
OFF-19	A	0.27	0.26	0.01
OFF-19	B	0.25		
OFF-20	A	2.33	1.82	0.73
OFF-20	B	1.30		
OFF-21	A	6.54	3.43	4.41
OFF-21	B	0.31		
OFF-23	A	0.09	0.39	0.42
OFF-23	B	0.68		

TABLE 2
CHLOROPHYLL
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 2

Sample ID	Rep	Chlorophyll (mg/m^3)	Mean	SD
OFF-13	A	0.36	0.81	0.63
OFF-13	B	1.25		
OFF-14	A	0.16	0.13	0.05
OFF-14	B	0.09		
OFF-17	A	7.05	3.71	4.72
OFF-17	B	0.37		
OFF-18	A	0.53	0.52	0.02
OFF-18	B	0.50		
OFF-19	A	0.09	0.19	0.14
OFF-19	B	0.29		
OFF-20	A	0.13	0.39	0.36
OFF-20	B	0.64		
OFF-21	A	0.11	0.14	0.04
OFF-21	B	0.16		
OFF-23	A	0.19	0.21	0.02
OFF-23	B	0.22		

TABLE 2
CHLOROPHYLL
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 3

Sample ID	Rep	Chlorophyll (mg/m^3)	Mean	SD
OFF-13	A	0.10	0.09	0.01
OFF-13	B	0.08		
OFF-14	A	0.25	0.20	0.08
OFF-14	B	0.14		
OFF-17	A	0.09	0.31	0.30
OFF-17	B	0.52		
OFF-18	A	0.11	0.10	0.02
OFF-18	B	0.08		
OFF-19	A	0.39	0.47	0.11
OFF-19	B	0.54		
OFF-20	A	0.33	0.50	0.23
OFF-20	B	0.66		
OFF-21	A	0.15	0.16	0.01
OFF-21	B	0.16		
OFF-23	A	0.35	0.24	0.16
OFF-23	B	0.13		

TABLE 2
CHLOROPHYLL
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 4

Sample ID	Rep	Chlorophyll (mg/m^3)	Mean	SD
OFF-13	A	0.19	0.17	0.04
OFF-13	B	0.14		
OFF-14	A	0.13	1.30	1.65
OFF-14	B	2.46		
OFF-17	A	0.08	0.20	0.16
OFF-17	B	0.31		
OFF-18	A	0.14	0.25	0.15
OFF-18	B	0.35		
OFF-19	A	0.61	0.35	0.37
OFF-19	B	0.08		
OFF-20	A	0.50	0.46	0.06
OFF-20	B	0.41		
OFF-21	A	0.57	0.51	0.08
OFF-21	B	0.45		
OFF-23	A	0.20	0.17	0.04
OFF-23	B	0.14		

TABLE 2
CHLOROPHYLL
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 5

Sample ID	Rep	Chlorophyll (mg/m^3)	Mean	SD
OFF-13	A	0.99	0.72	0.38
OFF-13	B	0.45		
OFF-14	A	0.49	0.34	0.22
OFF-14	B	0.18		
OFF-17	A	8.47	4.57	5.52
OFF-17	B	0.67		
OFF-18	A	0.40	0.63	0.33
OFF-18	B	0.86		
OFF-19	A	1.26	0.78	0.69
OFF-19	B	0.29		
OFF-20	A	1.08	2.97	2.67
OFF-20	B	4.85		
OFF-21	A	6.16	3.75	3.41
OFF-21	B	1.34		
OFF-23	A	0.13	0.62	0.69
OFF-23	B	1.11		

TABLE 3
DISSOLVED OXYGEN (DO)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 1

Sample ID	Rep	DO (mg/L)	Mean	SD
OFF-13	A	8.10	8.05	0.071
OFF-13	B	8.00		
OFF-14	A	7.50	7.45	0.071
OFF-14	B	7.40		
OFF-17	A	6.50	6.78	0.389
OFF-17	B	7.05		
OFF-18	A	7.85	7.93	0.106
OFF-18	B	8.00		
OFF-19	A	7.75	7.78	0.035
OFF-19	B	7.80		
OFF-20	A	7.40	7.73	0.460
OFF-20	B	8.05		
OFF-21	A	8.20	8.15	0.071
OFF-21	B	8.10		
OFF-23	A	7.70	7.75	0.071
OFF-23	B	7.80		

TABLE 3
DISSOLVED OXYGEN (DO)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 2

Sample ID	Rep	DO (mg/L)	Mean	SD
OFF-13	A	7.40	7.50	0.14
OFF-13	B	7.60		
OFF-14	A	7.00	7.00	0
OFF-14	B	7.00		
OFF-17	A	8.00	7.90	0.141
OFF-17	B	7.80		
OFF-18	A	7.20	7.65	0.636
OFF-18	B	8.10		
OFF-19	A	7.20	7.45	0.354
OFF-19	B	7.70		
OFF-20	A	8.20	8.00	0.283
OFF-20	B	7.80		
OFF-21	A	7.80	7.30	0.707
OFF-21	B	6.80		
OFF-23	A	8.30	8.25	0.071
OFF-23	B	8.20		

TABLE 3
DISSOLVED OXYGEN (DO)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 3

Sample ID	Rep	DO (mg/L)	Mean	SD
OFF-13	A	6.60	6.70	0.141
OFF-13	B	6.80		
OFF-14	A	7.00	7.10	0.141
OFF-14	B	7.20		
OFF-17	A	7.20	7.10	0.141
OFF-17	B	7.00		
OFF-18	A	6.70	6 95	0.354
OFF-18	B	7.20		
OFF-19	A		5.60	
OFF-19	B	5.60		
OFF-20	A	7.10	7.05	0.071
OFF-20	B	7.00		
OFF-21	A	6.90	6.80	0.141
OFF-21	B	6.70		
OFF-23	A	7.75	7.08	0.955
OFF-23	B	6.40		

TABLE 3
DISSOLVED OXYGEN (DO)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 4

Sample ID	Rep	DO (mg/L)	Mean	SD
OFF-13	A	6.10	6.20	0.141
OFF-13	B	6.30		
OFF-14	A	6.50	6.58	0.106
OFF-14	B	6.65		
OFF-17	A	6.40	6.40	0
OFF-17	B	6.40		
OFF-18	A	6.40	6.40	0
OFF-18	B	6.40		
OFF-19	A	6.90	6.30	0.849
OFF-19	B	5.70		
OFF-20	A	7.20	7.15	0.071
OFF-20	B	7.10		
OFF-21	A	6.85	6.83	0.035
OFF-21	B	6.80		
OFF-23	A	7.05	7.13	0.106
OFF-23	B	7.20		

TABLE 3
DISSOLVED OXYGEN (DO)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 5

Sample ID	Rep	DO (mg/L)	Mean	SD
OFF-13	A	6.40	6.75	0.495
OFF-13	B	7.10		
OFF-14	A	6.80	6.90	0.141
OFF-14	B	7.00		
OFF-17	A	6.20	6.18	0.035
OFF-17	B	6.15		
OFF-18	A	6.50	6.50	0.000
OFF-18	B	6.50		
OFF-19	A	6.70	6.68	0.035
OFF-19	B	6.65		
OFF-20	A	6.35	6.35	0
OFF-20	B	6.35		
OFF-21	A	6.65	6.65	0
OFF-21	B	6.65		
OFF-23	A	7.00	7.00	0
OFF-23	B	7.00		

TABLE 4
TOTAL SUSPENDED SOLIDS (TSS)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 1

Sample ID	Rep	TSS (mg/L)	Mean	SD
OFF-13	A	20.30	14.80	7.78
OFF-13	B	9.30		
OFF-14	A	21.90	19.75	3.04
OFF-14	B	17.60		
OFF-17	A	16.30	17.45	1.63
OFF-17	B	18.60		
OFF-18	A	21.20	19.05	3.04
OFF-18	B	16.90		
OFF-19	A	20.70	24.50	5.37
OFF-19	B	28.30		
OFF-20	A	35.20	32.90	3.25
OFF-20	B	30.60		
OFF-21	A	15.70	22.20	9.19
OFF-21	B	28.70		
OFF-23	A	34.30	27.30	9.90
OFF-23	B	20.30		

TABLE 4
TOTAL SUSPENDED SOLIDS (TSS)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 2

Sample ID	Rep	TSS (mg/L)	Mean	SD
OFF-13	A	38.3	44.4	8.63
OFF-13	B	50.5		
OFF-14	A	16.6	19.7	4.38
OFF-14	B	22.8		
OFF-17	A	16.3	20.2	5.52
OFF-17	B	24.1		
OFF-18	A	28.8	27.1	2.40
OFF-18	B	25.4		
OFF-19	A	30.0	24.5	7.71
OFF-19	B	19.1		
OFF-20	A	22.1	24.8	3.82
OFF-20	B	27.5		
OFF-21	A	20.2	18.1	2.97
OFF-21	B	16.0		
OFF-23	A	31.6	25.6	8.49
OFF-23	B	19.6		

TABLE 4
TOTAL SUSPENDED SOLIDS (TSS)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 3

Sample ID	Rep	TSS (mg/L)	Mean	SD
OFF-13	A	41.9	40.4	2.12
OFF-13	B	38.9		
OFF-14	A	36.6	38.2	2.26
OFF-14	B	39.8		
OFF-17	A	30.0	30.4	0.566
OFF-17	B	30.8		
OFF-18	A	23.0	33.1	14.3
OFF-18	B	43.2		
OFF-19	A	19.1	22.9	5.37
OFF-19	B	26.7		
OFF-20	A	30.8	29.6	1.70
OFF-20	B	28.4		
OFF-21	A	28.0	29.5	2.19
OFF-21	B	31.1		
OFF-23	A	37.9	34.2	5.23
OFF-23	B	30.5		

TABLE 4
TOTAL SUSPENDED SOLIDS (TSS)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 4

Sample ID	Rep	TSS (mg/L)	Mean	SD
OFF-13	A	28.8	39.7	15.4
OFF-13	B	50.6		
OFF-14	A	45.8	48.1	3.25
OFF-14	B	50.4		
OFF-17	A	43.5	44.3	1.13
OFF-17	B	45.1		
OFF-18	A	48.1	51.1	4.24
OFF-18	B	54.1		
OFF-19	A	38.8	41.0	3.11
OFF-19	B	43.2		
OFF-20	A	53.3	58.0	6.58
OFF-20	B	62.6		
OFF-21	A	34.3	34.7	0.495
OFF-21	B	35.0		
OFF-23	A	47.3	42.2	7.21
OFF-23	B	37.1		

TABLE 4
TOTAL SUSPENDED SOLIDS (TSS)
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 5

Sample ID	Rep	TSS (mg/L)	Mean	SD
OFF-13	A	46.0	44.5	2.05
OFF-13	B	43.1		
OFF-14	A	32.6	35.3	3.82
OFF-14	B	38.0		
OFF-17	A	17.5	18.7	1.63
OFF-17	B	19.8		
OFF-18	A	21.4	19.8	2.26
OFF-18	B	18.2		
OFF-19	A	26.6	29.1	3.46
OFF-19	B	31.5		
OFF-20	A	24.1	21.4	3.75
OFF-20	B	18.8		
OFF-21	A	24.8	27.3	3.54
OFF-21	B	29.8		
OFF-23	A	23.1	24.2	1.56
OFF-23	B	25.3		

TABLE 5
AMMONIA
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 1[1]

Sample ID	Rep	Total Ammonia (mg/L)	Mean	SD	Un-Ionized Ammonia (mg/L)	Mean	SD
OFF-13	A	0	6.9E-3	0.010	0	1.7E-4	2.4E-4
OFF-13	B	0.014			3.5E-4		
OFF-14	A	0	0	0.00	0		
OFF-14	B	0			0		
OFF-17	A	0	0	0.001	0	2.5E-5	3.5E-5
OFF-17	B	0.002			4.9E-5		
OFF-18	A	0.032	1.6E-2	0.022	7.3E-4	3.7E-4	0.001
OFF-18	B	0			0		
OFF-19	A	0.032	0.016	0.022	6.7E-4	3.4E-4	4.8E-4
OFF-19	B	0			0		
OFF-20	A	0.044	0.053	0.013	0.001	0.001	3.2E-4
OFF-20	B	0.062			0.001		
OFF-21	A	0.050	0.056	0.008	0.001	0.001	2.3E-4
OFF-21	B	0.062			0.002		
OFF-23	A	0.050	0.056	0.008	0.001	0.002	2.3E-4
OFF-23	B	0.062			0.002		

1 - Total Ammonia are blank corrected;
nominal blank concentration of .0202 = y.

TABLE 5
AMMONIA
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 2[1]

Sample ID	Rep	Total Ammonia (mg/L)	Mean	SD	Un-Ionized Ammonia (mg/L)	Mean	SD
OFF-13	A	0.010	0.008	0.003	2.5E-4	2.1E-4	6.7E-5
OFF-13	B	0.006			1.6E-4		
OFF-14	A	0.046	0.041	0.006	5.8E-4	5.0E-4	1.2E-4
OFF-14	B	0.037			4.2E-4		
OFF-17	A	0.015	0.010	0.006	3.4E-4	2.5E-4	1.4E-4
OFF-17	B	0.006			1.5E-4		
OFF-18	A	0.006	0.006	0	1.7E-4	1.6E-4	5.1E-6
OFF-18	B	0.006			1.6E-4		
OFF-19	A	0.024	0.026	0.003	3.9E-4	3.9E-4	6.1E-6
OFF-19	B	0.028			4.0E-4		
OFF-20	A	0.006	0.006	0	1.3E-4	1.3E-4	1.3E-6
OFF-20	B	0.006			1.3E-4		
OFF-21	A	0.019	0.017	0.003	4.0E-4	3.5E-4	7.1E-5
OFF-21	B	0.015			3.0E-4		
OFF-23	A	0.010	0.008	0.003	4.2E-4	2.9E-4	1.8E-4
OFF-23	B	0.006			1.6E-4		

1 - Total Ammonia are blank corrected;
nominal blank concentration of 0.022 = y.

TABLE 5
AMMONIA
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 3[1]

Sample ID	Rep	Total Ammonia (mg/L)	Mean	SD	Un-Ionized Ammonia (mg/L)	Mean	SD
OFF-13	A	0.021	0.021	0	3.6E-4	3.7E-4	6.1E-6
OFF-13	B	0.021			3.7E-4		
OFF-14	A	0.026	0.044	0.025	4.1E-4	6.9E-4	4.1E-4
OFF-14	B	0.062			9.8E-4		
OFF-17	A	0.013	0.013	0	2.5E-4	2.4E-4	2.0E-5
OFF-17	B	0.013			2.2E-4		
OFF-18	A	0.021	0.018	0.004	4.1E-4	3.6E-4	8.0E-5
OFF-18	B	0.016			3.0E-4		
OFF-19	A	0.016	0.017	0.002	2.8E-4	3.0E-4	3.7E-5
OFF-19	B	0.018			3.3E-4		
OFF-20	A	0.010	0.011	0.002	2.0E-4	2.2E-4	3.9E-5
OFF-20	B	0.013			2.5E-4		
OFF-21	A	0.013	0.014	0.002	2.4E-4	2.7E-4	4.2E-5
OFF-21	B	0.016			3.0E-4		
OFF-23	A	0.016	0.018	0.004	2.8E-4	3.5E-4	9.0E-5
OFF-23	B	0.021			4.1E-4		

1 - Total Ammonia are blank corrected;
nominal blank concentration of 0.0121 = y.

TABLE 5
AMMONIA
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 4[1]

Sample ID	Rep	Total Ammonia (mg/L)	Mean	SD	Un-Ionized Ammonia (mg/L)	Mean	SD
OFF-13	A	0	0	0	0	0	0
OFF-13	B	0			0		
OFF-14	A	0	0.009	0.012	0	1.7E-4	2.4E-4
OFF-14	B	0.017			3.4E-4		
OFF-17	A	0	0	0	0	0	0
OFF-17	B	0			0		
OFF-18	A	0	0	0	0	0	0
OFF-18	B	0			0		
OFF-19	A	0.017	0.012	0.007	4.9E-4	3.4E-4	2.1E-4
OFF-19	B	0.007			1.9E-4		
OFF-20	A	0.017	0.009	0.012	4.8E-4	2.4E-4	3.4E-4
OFF-20	B	0			0		
OFF-21	A	0.017	0.009	0.012	4.1E-4	2.0E-4	2.9E-4
OFF-21	B	0			0		
OFF-23	A	0.017	0.009	0.012	3.9E-4	2.0E-4	2.8E-4
OFF-23	B	0			0		

1 - Total Ammonia are blank corrected;
nominal blank concentration of 0.0354 = y.

TABLE 5
AMMONIA
DRAFT MARINE ECOLOGICAL RISK ASSESSMENT
OFFTA, NETC
NEWPORT, RHODE ISLAND

Test Series 5[1]

Sample ID	Rep	Total Ammonia (mg/L)	Mean	SD	Un-Ionized Ammonia (mg/L)	Mean	SD
OFF-13	A	0.126	0.118	0.012	0.002	2.0E-3	1.4E-4
OFF-13	B	0.109			1.9E-3		
OFF-14	A	0.152	0.076	0.107	0.003	1.5E-3	2.1E-3
OFF-14	B	0			0		
OFF-17	A	0.100	0.092	0.012	0.002	1.6E-3	2.7E-4
OFF-17	B	0.083			1.4E-3		
OFF-18	A	0.169	0.255	0.122	3.3E-3	4.6E-3	0.002
OFF-18	B	0.341			0.006		
OFF-19	A	0.290	0.199	0.128	5.9E-3	4.1E-3	2.7E-3
OFF-19	B	0.109			0.002		
OFF-20	A	0	0	0	0	0	0
OFF-20	B	0			0		
OFF-21	A	0.118	0.105	0.018	0.002	0.002	4.1E-4
OFF-21	B	0.092			0.002		
OFF-23	A	0.040	0.070	0.043	0.001	0.001	8.4E-4
OFF-23	B	0.100			0.002		

1 - Total Ammonia are blank corrected;
nominal blank concentration of 0.0301 = y.

Appendix A

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

page 1 of 2

Project: OFFTA Coasters Island

Client Name and Contact: Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-20-DO A	1	BOD	6/23/98	9:20	BOD bottle 18°C	D.O
OFF-20-DO B	1	BOD		"	BOD "	D.O
OFF-20-TSS A	1	plastic		"	plastic bottle	TSS, Clorp A, Ammonia
OFF-20-TSS B	1	"		"	" "	" "
OFF-19-DO A	1	BOD		9:50	BOD 18°C	D.O
OFF-19-DO B	1	BOD		"	BOD	D.O
OFF-19-~~DO A~~ TSS A	1	plastic		"	plastic bottle	TSS, Clorp A, Ammonia
OFF-19-~~DO B~~ TSS B	1	"		"	" "	" "
OFF-21-DO A	1	BOD		10:12	BOD 18°C	DO
OFF-21-DO B	1	BOD		"	BOD	DO
OFF-21-TSS A	1	plastic		"	plastic bottle	~~plastic bottle~~ TSS, Clorp A, ~~Ammonia~~
OFF-21-TSS B	1	"		"	" "	TSS, Clorp A, Ammonia
OFF-17 DO A	1	BOD		10:34	BOD 18°C	DO
OFF-17 DO B	1	BOD		"	BOD	DO
OFF-17-TSS A	1	plastic		"	plastic bottle	TSS Ammonia, Clorp A
OFF-17-TSS B	1	plastic		"	"	" " "
Total	16					

Packed/Released By: SAIC
Signature: Michael Cole
Printed Name: Michael Cole
Date Time: 6/27/98

Received By: Brian Koziol SAIC
Signature: Brian Koziol
Printed Name: Brian Koziol
Date Time: 1440 23 June 1998

Released By:
Signature:
Printed Name:
Date Time

Received By:
Signature:
Printed Name:
Date Time

Final Destination: SAIC ETC

Contact Name and Phone Number: Carolyn Mueller 401 782 1900

Shipping Method: na

Page 1 of 2

Remarks:

Original Form Accompanies Shipment

Science Applications International Corporation

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Chain of Custody Record

page 2 of 2

Project:

Client Name and Contact:

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-18-DO A	1	BOD	6/23/98	11:15	BOD 18°C	D.O.
OFF-18-DO B	1	BOD		"	BOD "	D.O
OFF-18-TSS A	1	plastic		"	plastic bottle	TSS, clorO A, ammonia
OFF-18-TSS B	1	plastic		"	"	" " "
OFF-13-DO-A	1	BOD		11:25	BOD 18°C	D.O
OFF-13-DO-B	1	BOD		"	BOD	D.O
OFF-13-TSS A	1	plastic		"	plastic bottle	TSS, clorO A, ammonia
OFF-13-TSS B	1	plastic		"	plastic bottle	" " "
OFF-14-DO-A	1	BOD		12:00	BOD 16°C	D.O
OFF-14-DO B	1	BOD		"	BOD	D.O
OFF-14-TSS A	1	plastic		"	plastic bottle	TSS, clorO A, ammonia
OFF-14-TSS B	1	plastic		"	plastic bottle	" " "
OFF-23-DO-A	1	BOD		12:20	BOD 18.5°C	D.O
OFF-23-DO B	1	BOD		"	DOD	D.O
OFF-23-TSS A	1	plastic		"	plastic bottle	TSS, clorO A, Ammonia
OFF-23-TSS B	1	plastic		"	plastic bottle	" " "
Total:	16					

Packed/Released By: SAIC
Signature: Michael Cole
Printed Name: Michael Cole
Date Time

Received By: BRIAN KOZIOL SAIC
Signature: Brian Koziol
Printed Name: BRIAN KOZIOL
Date Time 1440 23 JUNE 1998

Released By:
Signature:
Printed Name:
Date Time

Received By:
Signature:
Printed Name:
Date Time

Final Destination: SAIC

Contact Name and Phone Number: Cornelia Mueller (401) 282-1900

Shipping Method: NA

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Chain of Custody Record

Environmental Testing Center / 165 Dean Knauss Dr. / Narragansett, RI 02882 / Tel. (401) 782-1900 / Fax (401) 782-2330

Project: OFFTA - Mussel Water Quality

Client Name and Contact: Tetra tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
14A	1	BOD	7/6	09:45	B.O.D Bottle	D.O. Temp = 15°C
14B	1	BOD		9:45	"	" T = 15°C
OFF-TSS-14A	1	Nalgene		"	Nalgene Plastic 1 l	TSS, chloro A, NH4
OFF-TSS-14B	1	"		"	"	"
19A	1	B.O.D		10:00	BOD Bottle	D.O. T = 19°C
19B	1	BOD		"	"	" T = 19°C
OFF-TSS-19A	1	Nalgene		"	Nalgene Plastic 1 l	TSS, chloro A, NH4
OFF-TSS-19B	1	"		"	"	"
20A		B.O.D		10:15	B.O.D. Bottle	D.O. T = 21°C
20B		B.O.D.		"	"	" T = 21°C
OFF-TSS-20A		Nalgene		"	Nalgene Plastic 1 l	TSS, chloroA, NH4
OFF-TSS-20B		"		"	"	"
21A		B.O.D		10:22	B.O.D. Bottle	D.O T = 22°C
21B		B.O.D		"	"	" T = 22°C
OFF-TSS-21A		Nalgene		"	Nalgene Plastic 1 l	TSS chloro, NH4
Total :						

Packed/Released By:	Date Time	Received By:	Date Time	Remarks:
Signature: KR	7/6/98 12:30	Signature: Brian Kozial	7/6/98 12:35	
Printed Name: Kurt Rosenberger		Printed Name: BRIAN KOZIAL		
Released By:	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
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SAIC, Science Applications International Corporation

Chain of Custody Record

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Project: OFFTA - Mussel Water Quality

Client Name and Contact: tetra tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-TSS-21B		Nalgene	7/6	10:22	Nalgene Plastic 1 l	TSS - chloroA - NH4
17A		B.O.D		10:35	B.O.D. Bottle	D.O. T = 22°C
17B		"		"	"	D.O. T = 22°C
OFF-TSS-17A		Nalgene		"	Nalgene Plastic 1 l	TSS - chloroA - NH4
OFF-TSS-17B		"		"		"
18A		B.O.D		10:45	B.O.D. Bottle	D.O T = 22°C
18B		"		"	"	" T = 22°C
OFF-TSS-18A		Nalgene		"	Nalgene Plastic 1 l	TSS - chloroA - NH4
OFF-TSS-18B		"		"		"
13A		B.O.D.		10:55	B.O.D. Bottle	D.O. T = 22°C
13B		"		"		" T = 22°C
OFF-TSS-13A		Nalgene		"	Nalgene Plastic 1 l	TSS - chloroA - NH4
OFF-TSS-13B		"		"		"
23A		B.O.D.		11:40	BOD Bottle	D.O. T = 22°C
23B		"		"	"	" T = 22°C

Total :

Packed/Released By:	Date Time	Received By:	Date Time	Remarks:
Signature: [signature]	7/6/98 12:30	Signature: [signature]	7/6/98 1235	
Printed Name: Kurt Rosenberger		Printed Name: BRIAN KOZIA		
Released By:	Date Time	Received By:	Date Time	
Signature.		Signature		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
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Chain of Custody Record

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Project: OFFTA - Mussel Water Quality

Client Name and Contact: tetra tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-TSS-23A		Nalgen	7/6	11:40	Nalgen Plastic 1l	TSS- ChloroA - NH_4
OFF-TSS-23B		"		"	"	"
Total :						

Packed/Released By: Signature: Printed Name: Kurt Rosenberger	Date Time 7/6/98 12:30	Received By: BRIAN KOZIOL Signature: Brian Koziol Printed Name: BRIAN KOZIOL
Released By Signature Printed Name.	Date Time	Received By: Signature: Printed Name:
Final Destination:		Contact Name and Phone Number
Shipping Method:		Page _____ of _____

Date Time 7/6/98 1235

Remarks:

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Chain of Custody Record

Project: OFFTA Coaster Island

Client Name and Contact: Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
23 A	1	BOD	7/20/98		BOD bottle	D. Oxygen 21°C
23 B	1	BOD			BOD bottle	D. Oxygen
OFF-TSS-23 A	1	plastic			plastic bottle	TSS, Clora A, NAY, salinity
OFF-TSS-23 B	1	plastic			plastic bottle	TSS, Clora A, NAY, salinity
14 A	1	BOD			BOD "	D. Oxygen 62°F
14 B	1	BOD			BOD "	D. Oxygen
OFF-TSS-14 A	1	Plastic			Plastic "	TSS, Clora A, NAY, salinity
OFF-TSS 14 B	1	Plastic			" "	TSS Clora A NAY, salinity
19 A	1	BOD			BOD "	D-Oxygen 68°F
19 B	1	BOD			BOD "	D-Oxygen
OFF-TSS-19 A	1	Plastic			Plastic "	TSS, Clora A, NAY, salinity
OFF-TSS 19 B	1	Plastic			Plastic "	TSS, Clora A, NAY, salinity
20 A	1	BOD			Bod "	D-Oxygen 70°F
20 B	1	BOD			BOD "	D-Oxygen
OFF-TSS-20 A	1	Plastic			Plastic	TSS, Clora A, NAY, salinity
Total:	15					

Packed/Released By: SAIC Signature: [signature] Printed Name: Michael Cole Date Time 7/20/98 14:30	Received By: SAIC Signature: [signature] Printed Name: BRIAN KEIPL Date Time 7/20/98 1440
Released By: Signature: Printed Name: Date Time	Received By: Signature: Printed Name: Date Time
Final Destination:	Contact Name and Phone Number
Shipping Method:	Page 1 of 3

Remarks:

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Chain of Custody Record

Project: OFFTA Coaster Island

Client Name and Contact: Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-TSS-20B	1	Plastic	7/20/98		Plastic Bottle	TSS, Clora A, NAY, Salinity
21A	1	BOD			BOD	D-Oxygen
21B	1	BOD			BOD	D-Oxygen 70°F
OFF-TSS-21A	1	Plastic			Plastic	TSS, ClorA, NAY, Salinity
OFF-TSS-21B	1	Plastic			Plastic	TSS, ClorA, NAY, Salinity
17A	1	BOD			BOD	D-Oxygen 70°F
17B	1	BOD			BOD	D-Oxygen
OFF-TSS-17A	1	Plastic			Plastic	TSS-ClorA, NAY, Salinity
OFF-TSS-17B	1	Plastic			Plastic	TSS-ClorA, NAY, Salinity
18A	1	BOD			BOD	D-Oxygen 70°F
18B	1	BOD			BOD	D-Oxygen
OFF-TSS-18A	1	Plastic			Plastic	TSS-ClorA, NAY, Salinity
OFF-TSS-18B	1	Plastic			Plastic	TSS, ClorA, NAY, Salinity
13A	1	BOD			BOD	D-Oxygen 70°F
13B	1	BOD			BOD	D-Oxygen
Total :	15					

Packed/Released By: Signature: Michael Cole Printed Name: Michael Cole	Date Time 7/20/98 14:30	Received By: SAIC Signature: Brian Koziol Printed Name: BRIAN KOZIOL
Released By: Signature: Printed Name:	Date Time	Received By: Signature: Printed Name:
Final Destination:		Contact Name and Phone Number
Shipping Method:		Page 2 of 3

Date Time 7/20/98 1440

Remarks:

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Chain of Custody Record

Project: OFFTA Coaster Island

Client Name and Contact: Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-TSS-13A	1	Plastic	7/20/98		Plastic Bottle	TSS, ClorA, NAY, Salinity
OFF-TSS-13B	1	Plastic	7/20/98		Plastic Bottle	TSS, ClorA, NAY, Salinity
Total :	2					

Packed/Released By: Signature: Michael Cole Printed Name: Michael Cole Date Time 7/20/98 14:30	Received By: SAIC Signature: Brian Kozik Printed Name: BRIAN KOZIC Date Time 7/20/98 1440	Remarks:
Released By: Signature: Printed Name: Date Time	Received By: Signature: Printed Name: Date Time	
Final Destination:	Contact Name and Phone Number	
Shipping Method:	Page 2 of 3	

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Chain of Custody Record

Project: OFFTA - Coasters Island

Client Name and Contact: Testing Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
0-20 B	1	BOD	8/3/98		BOD	DO
OFF-21-TSS-A	1	Plastic			Plastic	TSS, chloro A, NHy, Salinity
OFF-21-TSS-A	1	Plastic			Plastic	TSS, chloro A, NHy, Salinity
0-21 A	1	BOD			BOD	DO
0 21 B	1	BOD			BOD	DO
OFF-17-TSS-A	1	Plastic			Plastic	TSS, chloro A, NHy, salinity
OFF-17-TSS-B	1	Plastic			Plastic	TSS, chloro A, NHy, salinity
0-17A	1	BOD			BOD	DO
0-17B	1	BOD			BOD	DO
OFF-18-TSS A	1	Plastic			Plastic	TSS, chloro A, NHy, salinity
OFF 18 TSS-B	1	Plastic			Plastic	TSS, chloro A, NHy, salinity
0-18 A	1	BOD			BOD	DO
0 18 B	1	BOD			BOD	DO
OFF-13-TSS-A	1	Plastic			Plastic	TSS, chloro A, NHy, salinity
OFF-13-TSS B	1	Plastic			Plastic	TSS, chloro A, NHy, salinity
Total :	15	OFFTA total 32				

Packed/Released By:	Date Time	Received By:	Date Time	Remarks:
Signature: [signature]		Signature: SAIC	8/3/98	
Printed Name: Dave Fischman	8/3/98 1539	Printed Name: Cornelia Mueller	1539	
Released By:	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name:		Printed Name:		
Final Destination: SAIC ETC		Contact Name and Phone Number: Carol Mueller 401 782 1900		
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Chain of Custody Record

Project: OFFTA Coasters Island

Client Name and Contact: Tectra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-23-TSSA		Plastic	8/3/98		Plastic	TSS, chloro A, NH4, salinity
OFF 23-TSSB		Plastic			Plastic	TSS, chloro A, NH4, salinity
BOD-23-A		BOD			glass Bottle	DO
O-23-B		BOD			glass Bottle	DO
OFF-14-TSSA		Plastic			Plastic	TSS, chloro A, NH4, salinity
OFF-14 TSSB		Plastic			Plastic	TSS, chloro A, NH4, salinity
O-14 A		BOD			BOD	DO
O-14B		BOD			BOD	DO
OFF 19-TSSA		Plastic			Plastic	TSS, chloro A, NH4, salinity
OFF 19 TSSB		Plastic			Plastic	TSS, chloro A, NH4 salinity
O-19A		BOD			BOD	DO
O-19B		BOD			BOD	DO
OFF 20 TSS-A		Plastic			Plastic	TSS, chloro A, NH4, salinity
OFF 20 TSS-B		Plastic			Plastic	TSS, chloro A, NH4, salinity
O-20A		BOD			BOD	DO
Total :	15					

Packed/Released By: Signature: Dave Fi Printed Name: DAVID Fischman — Date Time 8/3/98 1540	**Received By:** Signature: Cornelia Mullen Printed Name: SAIC — Date Time 8/3/98 1540	**Remarks:**
Released By: Signature: Printed Name: — Date Time	**Received By:** Signature: Printed Name: — Date Time	
Final Destination: SAIC ETC	**Contact Name and Phone Number** 401 782 1900	
Shipping Method: Hand carried	**Page** 2 **of** 3	

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Chain of Custody Record

Project: OFFTA - Coasters Island

Client Name and Contact: TECTRA Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
0-13 A	1	BOD	8/3/98		BOD	DO
0-13-B	1	BOD	8/3/98		BOD	DO
Total :	2					

Packed/Released By:
Signature: [signature]
Printed Name: DAVID Fischman
Date Time: 8/3/98 1537

Released By:
Signature:
Printed Name:
Date Time:

Final Destination: SAIC ETC

Shipping Method: Hand Delivered

Received By: [signature]
Signature: [signature]
Printed Name: Cornelia Huell
Date Time: 8/3/98 1537

Received By:
Signature:
Printed Name:
Date Time:

Contact Name and Phone Number: Cornelia Huell 401 782 1900

Page 2 of 3

Remarks:

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Science Applications International Corporation

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Chain of Custody Record

Project: OFFT A

Client Name and Contact: Steve Porter Tetra Tech

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF 23 A	1	BOD	8/17/98	13:45	BOD	DO temp 21°C
OFF 23 B	1	BOD	↓	↓	BOD	DO
OFF-TSS-23A	1	plastic			Plastic vial	TSS NH4, Chlor A, salinity
OFF-TSS 23 B	1	plastic			" "	TSS NH4, Chlor A, salinity
Total :	4					

Packed/Released By:	Date Time	Received By:	Date Time	Remarks:
Signature: Michael Cole	8/17/98 14:47	Signature: Cornelia Miller	8/17/98 14:50	
Printed Name: Michael Cole		Printed Name: Cornelia Miller		
Released By:	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
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Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-TSS-21A	1	1L poly	8/17/98	12:11	Bottom Water	CHLa, NH4, TSS
OFF-TSS-21B	1	1L poly		12:11		
OFF-20A	1	BOD		12:22	DO Sample	DO 22°C
OFF-20B	1	BOD				DO
OFF-TSS-20A	1	1L poly			Bottom Water	CHLa, NH4, TSS
OFF-TSS-20B	1	1L poly				
OFF-19A	1	BOD		12:35	DO Sample	DO 22°C
OFF-19B	1	BOD				DO
OFF-TSS-19A	1	1L poly			Bottom Water	CHLa, NH4, TSS
OFF-TSS-19B	1	1L poly				
OFF-14A	1	BOD		12:57	DO Sample	DO 20°C
OFF-14B	1	BOD				DO
OFF-TSS-14A	1	1L poly			Bottom Water	CHLa, NH4, TSS
OFF-TSS-14B	1	1L poly				

Total : 14

Packed/Released By: SAIC	Date Time	Received By: SAIC	Date Time	Remarks:
Signature: [signature]	8/17/98 14:20	Signature: [signature]	8/17/98 1425	
Printed Name: John T. Morris		Printed Name: BRIAN KOZIOL		
Released By:	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
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Chain of Custody Record

Project: OFFTA

Client Name and Contact: Tetra Tech Stephen Parker

Sample No.	Containers No.	Containers Type	Collection Date	Collection Time	Sample Description	Requested Parameters
OFF-13A	1	BOD	8/17/98	11:24	BOD	DO 21-22 °C
OFF-13B	1	BOD				DO
OFF-TSS-13A	1	1L poly			Bottom Water	CHLa, NH4, TSS
OFF-TSS-13B	1	1L poly				
OFF-18A	1	BOD		11:43	BOD	DO 22 °C
OFF-18B	1	BOD			BOD	DO
OFF-TSS-18A	1	1L poly			Bottom Water	CHLa, NH4, TSS
OFF-TSS 18B	1	1L poly				
OFF-17A	1	BOD		11:55	BOD	DO 21-22 °C
OFF 17B	1	BOD			BOD	DO
OFF-TSS-17A	1	1L poly			Bottom Water	CHLa, NH4, TSS
OFF-TSS-17B	1	1L poly				
OFF-21A	1	BOD		12:11	BOD	DO. 22 °C
OFF 21B	1	BOD			BOD	DO
Total :	14					

Packed/Released By: SAIC	Date Time	Received By: SAIC	Date Time	Remarks:
Signature: John T. Morris	8/17/98 14:20	Signature: Brian Kozial	8/17/98 1425	
Printed Name: John T. Morris		Printed Name: BRIAN KOZIOL		
Released By:	Date Time	Received By:	Date Time	
Signature:		Signature:		
Printed Name:		Printed Name:		
Final Destination:		Contact Name and Phone Number		
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APPENDIX C
QA/QC AND DATA VALIDATION

APPENDIX C-1
SEDIMENT AND ELUTRIATE

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-8-98-1229W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP.

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397
University of Rhode Island
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

PAHs/PCBs/OCPs:/ 16 /Sediments/
OFF-1-SUR, OFF-2-SUR, OFF-3-SUR, OFF-4-SUR, OFF-5-SUR, OFF-6-SUR, OFF-10-SUR, OFF-11-SUR, OFF-12-SUR, OFF-13-SUR, OFF-16-SUR, OFF-17-SUR, OFF-18-SUR, OFF-20-SUR, OFF-21-SUR, OFF-22-SUR

Date: August 28, 1998

Tetra Tech NUS Inc. (TtNUS) formerly Brown and Root Environmental (B&RE) performed tier II data validation on the polycyclic aromatic hydrocarbon compounds (PAH), polychlorinated biphenyl compounds (PCB) and organo-chlorine pesticide compounds (OCP) data from Project 7397, sediment samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The samples were analyzed according to URI/GSO Standard Operating Procedures 2.04.002 (PAHs) and 2.04.003 (PCBs/OCPs). The data were evaluated based on data completeness; holding times; calibrations; laboratory and field blank results, laboratory blank spike analysis, matrix spike analysis, laboratory duplicate analysis, and internal standard recoveries. The data validation were performed according to the Region I, EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November 1988 criteria.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted by e-mail on August 5, 1998 regarding a transcription error for the result for p,p'-DDT in sample OFF-21-SUR. A corrected summary table was faxed to TtNUS on August 6, 1998. The laboratory was contacted on August 11, 1998 regarding the laboratory qualifications for the NIST SRM data. The laboratory qualifier "Q" was not included for two compounds which were outside the acceptable range. TtNUS added the "Q" qualifier to the data results at Jim Quinn's request.

Holding Times

The PAH analysis holding time exceeded the 40 day analysis holding time criteria for samples OFF-13-SUR and OFF-16-SUR. The positive and non-detected results for samples OFF-13-SUR and OFF-16-SUR are qualified as estimated, (J and UJ) respectively.

Calibrations

PAHs

The following table summarizes the polycyclic aromatic hydrocarbons continuing calibration (CC) compounds which failed to meet the calibration criteria of %D <25%:

		Action		Affected Samples
Compound	CC 5/13/98	(+)	NDs	
Dibenz[a,h] anthracene	%D = 30.5	J		OFF-3-SUR, OFF-5-SUR, OFF-6-SUR

The positive results for dibenz[a,h]anthracene are qualified as estimated (J) in affected samples.

Blanks

The following contaminants at the maximum concentrations were found in the laboratory blanks associated with the sediment samples:

Compound	Maximum Concentration	Action Level
2,4'-dichlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',5-trichlorobiphenyl	0.2 ng/g	1.0 ng/g
2,4,5-trichlorobiphenyl	0.2 ng/g	1.0 ng/g
2,4,4'-trichlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',5,5'-tetrachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,3',4,4'-tetrachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',4,5,5'-pentachlorobiphenyl	0.5 ng/g	2.5 ng/g
2,2',3,4,5'-pentachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,3',4,4',5-pentachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,4',5,6,6'-heptachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',4,4',5,5'-hexachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,3,3',4,4'-pentachlorobiphenyl	0.3 ng/g	1.5 ng/g
2,2'3,4,4',5'-hexachlorobiphenyl	0.1 ng/g	0.5 ng/g

Compound	Maximum Concentration	Action Level
3,3'4,4'5-pentachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,3',4,4'-hexachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,4,4',5,5'-heptachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,3',4,4',5-heptachlorobiphenyl	0.3 ng/g	1.5 ng/g
2,2',3,3',4,4',5,6-octachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	0.5 ng/g	2.5 ng/g
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	0.2 ng/g	1.0 ng/g
hexachlorobenzene	0.2 ng/g	1.0 ng/g
gamma BHC	0.1 ng/g	0.5 ng/g
heptachlor	0.3 ng/g	1.5 ng/g
aldrin	0.1 ng/g	0.5 ng/g
heptachlor epoxide	0.1 ng/g	0.5 ng/g
o,p'-DDE	0.1 ng/g	0.5 ng/g
cis-chlordane	0.1 ng/g	0.5 ng/g
trans-nonachlor	0.1 ng/g	0.5 ng/g
p,p'-DDE	0.6 ng/g	3.0 ng/g
p,p'-DDD	0.2 ng/g	1.0 ng/g
o,p'-DDT	0.1 ng/g	0.5 ng/g
p,p'-DDT	0.1 ng/g	0.5 ng/g
phenanthrene	1.2 ng/g	6.0 ng/g
fluoranthene	0.8 ng/g	4.0 ng/g
pyrene	0.8 ng/g	4.0 ng/g
benzo(a)anthracene	1.4 ng/g	7.0 ng/g
chrysene/triphenylene	1.2 ng/g	6.0 ng/g
benzo(b+j+k)fluoranthene	5.1 ng/g	25.5 ng/g
benzo(e)pyrene	1.8 ng/g	9.0 ng/g
benzo(a)pyrene	2.4 ng/g	12.0 ng/g
perylene	0.9 ng/g	4.5 ng/g
indeno[1,2,3-cd]pyrene	1.7 ng/g	8.5 ng/g
benzo[ghi]perylene	1.6 ng/g	8.0 ng/g

Blank actions are taken for most of the PCB/OCP compounds in affected samples. No blank qualifications were necessary for the PAH compounds since all the results wer above the action levels.

Sample results less than five times the blank contaminant concentration but greater than the MDL are qualified (U). Sample contaminant results < MDL are qualified MDL (U). Data may be biased high or be false positive.

Internal Standard Performance

PCB/OCP/PAH

The following table summarizes the PCB/OCP/PAH internal standards that failed to meet the laboratory quality control criteria of 30 - 130%:

Internal Standard	IS %Recovery	Acceptable Range	Action		Affected Samples
			(+)	NDs	
2,2',3,3'4,5,5',6-octachlorobiphenyl	131%	30 - 130%	J	UJ	OFF-6-SUR
Benzo[a]pyrene-d12	29%	30 - 130%	J		OFF-3-SUR

The positive and non-detected results for the compounds quantitated using the internal standards with a percent recovery outside the QC range are qualified as estimated (J and UJ) in the affected samples.

Matrix Spike Analysis

PCB/OCP/PAH

The following table summarizes the matrix spike compound recoveries which did not meet laboratory QC limits of 50-150%:

Compound	SPIKE %REC	QC Limits	Action*	
			(+)	ND
heptachlor	181%	50-150%		A
heptachlor epoxide	48.6%	50-150%		A
p,p'-DDD	-40.1%	50-150%	J	
o,p'-DDT	161%	50-150%	*	
fluoranthene	221%	50-150%	J	
pyrene	197%	50-150%	J	
chrysene/triphenylene	178%	50-150%	J	

The positive results for several compounds are estimated (J) in sample OFF-17-SUR due to matrix spike results outside the laboratory QC criteria.

A - Accept the data.
* - Positive results below MDL already estimated (J).

Laboratory Blank Spike Analysis

PCB/OCP/PAH

The following table summarizes the laboratory blank spike compound recoveries which did not meet laboratory QC limits of 70-130%:

Compound	BLANK %REC	QC Limits	Action*	
			(+)	ND
gamma-BHC	39.7%	70-130%	J	A
heptachlor	137%	70-130%		A
heptachlor epoxide	17.6%	70-130%	J	A
p,p'-DDD	40.7%	70-130%	J	A
2-methylnaphthalene	155%	70-130%	J	
1-methylnaphthalene	165%	70-130%	J	
2,6-dimethylnaphthalene	171%	70-130%	J	
2,3,5-trimethylnaphthalene	135%	70-130%	J	A
benzo[ghi]perylene	134%	70-130%	J	

The positive results for several compounds are estimated (J) in all samples due to laboratory blank spike results outside the laboratory QC criteria.

Laboratory Duplicate Analysis

The following table summarizes the laboratory duplicate relative percent differences which did not meet laboratory QC limits of < 35% for sample OFF-22-SUR:

Compound	OFF-22-SUR (ng/g)	OFF-22-SUR DUP (ng/g)	RPD	Action		Affected Samples
				(+)	NDs	
2-Methylnaphthalene	4.6	3.1 J	38.9 %	J	A	All
2,6-Dimethylnaphthalene	14.6	5.8 J	85.8 %	J	A	All
Anthracene	14.0	9.5	38.4 %	J	A	All

The positive results for above compounds are estimated (J) in all samples due to laboratory duplicate results outside the laboratory QC criteria.

The following table summarizes the laboratory duplicate relative percent differences which did not meet laboratory QC limits of < 35% for sample OFF-17-SUR:

Compound	OFF-17-SUR (ng/g)	OFF-17-SUR DUP (ng/g)	RPD	Action		Affected Samples
				(+)	NDs	
2,2',3,5-Tetrachlorobiphenyl	0.8	0.5 J	46.0 %	J	A	All
3,3',4,4'5'-Pentachlorobiphenyl	0.9	1.3	35.6 %	J	A	All

The positive results for above compounds are estimated (J) in all samples due to laboratory duplicate results outside the laboratory QC criteria.

NIST SRM Standards Data

The following table summarizes the NIST SRM recoveries which were outside the acceptable range:

Compound	SRM Result	Acceptable Range	Action		Affected Samples
			(+)	NDs	
2,2',5,5'-tetrachlorobiphenyl	10.9	4.4 - 9.7	J	A	All
2,2',3,4,5'-pentachlorobiphenyl	3.9	4.4 - 9.2	J	UJ	All
fluorene	49.2	62 - 138	J		All
benzo (e) pyrene	804	346 - 796	J		All
dibenzo[a,h + a,c] anthracene	175	75 - 166	J		All

The positive and non-detected results for these compounds are estimated (J and UJ) due to poor NIST SRM recoveries.

Overall Assessment

The results should be used as qualified. The PAH analysis holding time exceeded the 40 day analysis holding time criteria for samples OFF-13-SUR and OFF-16-SUR. The positive and non-detected results for samples OFF-13-SUR and OFF-16-SUR are estimated.
Blank actions were taken for several compounds in affected samples due to field blank contamination. The positive result for dibenz[a,h]anthracene is estimated in several samples due to a continuing calibration %D >25. Compounds associated with internal standards 2,2',3,3',4,5,5',6-octachlorobiphenyl and benzo[a]pyrene-d12 are estimated in several samples due to poor internal standard percent recovery. Heptachlor; heptachlor epoxide; p,p'-DDD;

o,p'-DDT; fluoranthene; pyrene; chrysene/triphenylene are estimated due to poor matrix spike recoveries. Gamma BHC; heptachlor; heptachlor epoxide; p,p'-DDD; 2-methylnaphthalene; 1-methylnaphthalene; 2,6-dimethlnaphthalene; 2,3,5-trimethylnaphthalene and benzo[g,h,i]perylene are estimated due to poor laboratory blank spike recoveries. 2-Methylnaphthalene; 2,6-dimethylnaphthalene; anthracene; 2,2',3,5-tetrachlorobiphenyl and 3,3',4,4',5'-pentachlorobiphenyl are estimated due to poor laboratory duplicate precision. 2,2',5,5'-Tetrachlorobiphenyl; 2,2',3,4,5'-pentachlorobiphenyl; fluorene; benzo(e)pyrene and dibenz[a,h, + a,c]anthracene are estimated due to poor NIST SRM recoveries.

NOTE: Several analytes in several samples are qualified as estimated, (J) due to laboratory reported analytical interference with the analyte. They include 2,4-dichlorobiphenyl, 2,4,5-trichlorobiphenyl, 2,3,3'4,4'-pentachlorobiphenyl, 3,3',4,4',5-pentachlorobiphenyl, 2,2',3,4',5,5',6-heptachlorobiphenyl, 2,2',3,4,4',5'-hexachlorobiphenyl, 2,2',3,3',4,4'-hexachlorobiphenyl, 2,2',3,3',4,4',5,6-octachlorobiphenyl, 2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl, gamma BHC, heptachlor, aldrin, heptachlor epoxide, o,p'-DDE and trans-nonachlor.

Attachments
cc: File 7397-4.10

SEDIMENT POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -1- SUR 03/27/98	OFF -2- SUR 03/27/98	OFF -3- SUR 03/27/98	OFF -5- SUR 03/27/98	OFF -6- SUR 03/27/98	OFF -12- SUR 04/03/98	OFF -13- SUR 04/03/98	OFF -16- SUR 04/03/98
OGL Lab ID			FF20	FF21	FF22	FF24	FF25	FF46	FF47	FF48
PCBs/OCPs	units		Sediment	------ ---	------ ---	------ ---	------ ----	------ ---	------ ---	------ --
2,4'-dichlorobiphenyl (CB008)	ng/g	0 32	8.5 J	0 3 U	0 9 J	0.3 U	0.6	1.5	0 9	0 6
2,2',5-trichlorobiphenyl (CB018)	ng/g	0 69	1.3 J	0 7 U	1.7	1.4	2.8	2.4	0.5 J	0.3 J
2,4,5-trichlorobiphenyl (CB029)	ng/g	0 67	0.7 U	0 7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	0.45	0 5 U	0.5 U	0 5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/g	0.72	0.7	0.7 U	0.6 J	1 8	2.7	4.2	1.3	0.7 U
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/g	0.73	0.8 U	0 7 U	1.0 U	1.8 J	2.6 J	3.2 J	2.9 J	0.8 U
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	0.6 J	0 4 J	1.4 J	1.4 J	1.8 J	2.0 J	2.4 J	0 8 J
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0.53	1.1	1.4	2.0	3.9	3.4	5.0	4.6	1.7
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0 59	1.2 U	2.1 U	2 4 U	2.2 U	2.0 U	4.1	5.9	1.9 U
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/g	0.55	0.6 UJ	0.9 J	0 8 J	0.8 J	1.6 J	1.6 J	2.5 J	0 7 J
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	0.7 J	2.1	1.8	1.1	1.6	3.2	6.6	2 3
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	0.6 U	0.6 U	0.8	1.3	2.6	1.0	1.6	1.0
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	1 5	2 5	2 5	4.0	2.7	5.4	9.3	3.3
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	0.6 U	1.2 U	1 4 U	1.7 J	0.7 U	1.7 J	3.5 J	0.9 U
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	1.9	10.7 J	11 2 J	16.2 J	3.0 J	7.7	13.3	4.9
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	0.5 U	0 9 J	1 3 J	2.5 J	0.5 UJ	1.8 J	4.9 J	1 2 J
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159	ng/g	0.47	0.6	0.7	0 6	1.6	1.9 J	3.7	5 5	1 7
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	0 6	0 6 J	0 8 J	0.9 J	1.8 J	1.8	4.0	1 0
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	0 3 J	1 2	1 0	2.0	1.1 J	1.6	0.5 U	0 5 U
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0 53	1.1	1.5	2.4	3.9	2.1 J	6.4	9.3	1 7
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	0 9 U	0.7 U	0.7 U	1 8	1.8 J	3.8	5.8	1 5
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	0.5 U	0.6 U	0 6 U	3.5	0.6 UJ	0.8 J	3.7	0 6 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0.51	0.5 U	0.5 U	0 5 U	0.6 U	0.6 UJ	1.9 U	4.0	0.6 U
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	0.5 U	0.5 U	0.5 U	0.7 U	4.1 J	2.2	3.0	0.8 U
CBs	ng/g		15	29	36	55	42	68	96	28
PCBs	ng/g		31	58	71	111	84	135	192	57

* - Co lution

SEDIMENT POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -1- SUR 03/27/98	OFF -2- SUR 03/27/98	OFF -3- SUR 03/27/98	OFF -5- SUR 03/27/98	OFF -6- SUR 03/27/98	OFF -12- SUR 04/03/98	OFF -13- SUR 04/03/98	OFF -16- SUR 04/03/98
OGL Lab ID			FF20	FF21	FF22	FF24	FF25	FF46	FF47	FF48
PCBs/OCPs	units		Sediment	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ --
hexachlorobenzene (HCB)	ng/g	0.41	0.4 U	0.4 U	0.4 U	0.5 U	0.6 U	0.8 U	0.4 U	0.4 U
(g-HCH) 1a,2a,3B,4a,5a,6B-hexachlorocyclohexane	ng/g	0.62	0 6 U	0.6 U	0.6 U	0.6 U	0.8 J	0 6 U	0.6 U	0.6 U
heptachlor (HEPT)	ng/g	0.47	0.5 U	0 5 U	0.5 U	0 5 U	0.5 U	0.5 U	1.3 U	0 5 U
aldrin (Aldrin)	ng/g	0.73	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
heptachlor epoxide (HEPT E)	ng/g	0.48	0.5 U	0 5 U	0.5 U	0.5 U	0.5 U	2.4 J	1.1 J	0.5 U
(o,p'-DDE) o,p'-(dichlorodiphenyldichloro)ethene	ng/g	0.78	0.5 U	0.8 U	0 8 U	0.8 U	0.8 U	0.9	0.8 U	0.8 U
cis-chlordane (a-CHLDA)	ng/g	0.79	0.8	0.7 J	0 7 J	1 4	0.6 J	1.2	1.4	0.9
trans-nonachlor (TRANSNON)	ng/g	0.75	0.6 J	0.8 U	0 7 J	1.3	0.8 U	0.6 J	1 0 J	0.8 U
(p,p'-DDE) p,p'-(dichlorodiphenyldichloro)ethene	ng/g	0.91	2.5 U	2.5 U	2 2 U	3.0 U	3.8	6.2	10.8	1.8 U
(p,p'-DDD) p,p'-(dichlorodiphenyldichloro)ethane	ng/g	0.85	3.0 J	1.4 J	1.8 J	2.0 J	3.8 J	11.2 J	19.7 J	2.2 J
(o,p'-DDT) o,p'-(dichlorodiphenyltrichloro)ethane	ng/g	0.95	1 1	1 8	0.7 J	1 7	1.4	0.6 J	1.2	1.2
(p,p'-DDT) p.p'-(dichlorodiphenyltrichloro)ethane	ng/g	0.63	4 3	10 0	4 0	11.3	9.8	4.8	10.9	1 6
mirex (Mirex)	ng/g	0.55	0.3 J	0.6 U	0 6 U	0.6	0.5 J	0 6 U	0 6 U	0 6 U

* - Coelution

SEDIMENT POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -20- SUR 04/03/98	OFF -21- SUR 04/03/98	OFF -10- SUR 04/03/98	OFF -11- SUR 04/03/98	OFF -18- SUR 04/03/98	OFF -17- SUR 04/03/98	OFF -22- SUR 03/27/98	OFF -4- 03/27/98
OGL Lab ID			FF50	FF51	FF56	FF58	FF64	FF75	FF78	FF79
PCBs/OCPs	units		Sediment	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ --
2,4'-dichlorobiphenyl (CB008)	ng/g	0.32	0 3 U	0.3 U	0 3 U	0.8	0.8	0.3 U	0.3 U	0 3 U
2,2',5-trichlorobiphenyl (CB018)	ng/g	0.69	0.7 U	0.7 U	0.7 U	3.5	0.7 U	0.7 U	0.7 U	0.7 U
2,4,5-trichlorobiphenyl (CB029)	ng/g	0.67	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	0 45	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0 5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/g	0.72	0.7 U	0.7 U	0.7 U	7.4	0.7	0.7 U	0.7 U	0 7 U
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/g	0.73	0.7 U	0.9 U	0 7 U	3.4 J	1.2 J	0.7 U	0 7 U	1.4 J
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	0.4 J	0.5 J	0.3 J	3 3 J	1.2 J	0.5 J	0.2 J	1.4 J
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0 53	1.4	1.6	0 6	6.5	3.9	1.3	1.0 U	1.7
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0 59	1.9 U	2.2 U	0 7 U	2.2 U	4.5	2.1 U	0 7 U	2.9
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/g	0 55	0.6 UJ	0.6 J	0 6 UJ	0.8 J	1.6 J	0.6 J	0.6 UJ	0.7 J
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	1.8	2.0	0 7 J	2.0	5.5	1.7	0.7 U	1.3
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	0.6	0.6	0.6 U	0.6 J	1.5	0.6 U	0.6 U	0.6 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	3.6	2.7	1.1	3.3	7.5	2.8	0.7	1.9
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	0.6 U	0 9 U	0.3 U	1 3 U	2.4 J	1.0 U	0.2 U	0.7 U
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	4.1	2.9	1.2	3 5	12.2	3.2	0.9	11.4
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	1.1 J	0.7 J	0 5 U	0.7 J	1.8 J	1.3 J	0 5 U	1 7 J
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159	ng/g	0.47	1.4	1 5 J	0 6	2.0	3.8	1.3	0.5	2.8
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	0.7	0.9	0 5 U	0.6	2.4	0 9	0.5 U	2.1
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	0.4 J	0.3 J	0 4 J	0.4 J	1.2	0 3 J	0.2 J	1.8
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	1.9	1.3	0 6	3.2	5.2	1.3	0 3 J	2 0
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	1.5	1.1 U	0 7 U	1.5	2.9	1.3 U	0.5 U	1 8
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	0.6 U	0.6 U	0 6 U	0.7	0.6 U	0 6 U	0.6 U	1.2
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0.51	1.0 U	1.1 U	1.3 U	1.5 U	2.3 U	1.5 U	1.0 U	2.4 U
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	1.0 U	0.7 U	0.7 U	0.5 U	2.6	1.4	0 5 U	0.5 U
CBs	ng/g		25	23	11	50	66	24	8	41
PCBs	ng/g		51	46	22	99	131	49	16	81

* - C elution

SEDIMENT POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed	OFF -20- SUR 04/03/98	OFF -21- SUR 04/03/98	OFF -10- SUR 04/03/98	OFF -11- SUR 04/03/98	OFF -18- SUR 04/03/98	OFF -17- SUR 04/03/98	OFF -22- SUR 03/27/98	OFF -4- 03/27/98
OGL Lab ID			FF50	FF51	FF56	FF58	FF64	FF75	FF78	FF79
PCBs/OCPs	units		Sediment	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ --
hexachlorobenzene (HCB)	ng/g	0.41	0.4 U	0 4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0 4 U
(g-HCH) 1a,2a,3B,4a,5a,6B-hexachlorocyclohexane	ng/g	0.62	0.6 U	0 6 U	0 6 U	0.6 U	0.6 U	0.6 U	0 6 U	0 6 U
heptachlor (HEPT)	ng/g	0 47	0.5 U	0.5 U	0.5 U	0 5 U	0.5 U	0.5 U	0.5 U	1.4 U
aldrin (Aldrin)	ng/g	0.73	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0 7 U
heptachlor epoxide (HEPT E)	ng/g	0.48	0.5 U	0.5 U	0.5 U	2.8 J	1.0 J	0.5 U	0.5 U	0.6 J
(o,p'-DDE) o,p'-(dichlorodiphenyldichloro)ethene	ng/g	0.78	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0 8 U	0.8 U
cis-chlordane (a-CHLDA)	ng/g	0.79	0.8 U	0 8 U	0 8 U	0 8 U	1.1	0.8 U	0 8 U	1.2
trans-nonachlor (TRANSNON)	ng/g	0.75	0.8 U	0 8 U	0 8 U	0 8 U	1.0 J	0.8 U	0 8 U	0.8 U
(p,p'-DDE) p,p'-(dichlorodiphenyldichloro)ethene	ng/g	0 91	1.1 U	1 8 U	0 9 U	0.9 U	10.5	2 3 U	0 9 U	2 0 U
(p,p'-DDD) p,p'-(dichlorodiphenyldichloro)ethane	ng/g	0.85	1.1 J	2.4 J	0.8 U	0.8 U	15.8 J	12.9 J	0 8 U	2.4 J
(o,p'-DDT) o,p'-(dichlorodiphenyltrichloro)ethane	ng/g	0.95	1.0 U	1.0 U	1.0 U	1.0 U	1 8	0.7 J	1.0 U	2 6
(p,p'-DDT) p.p'-(dichlorodiphenyltrichloro)ethane	ng/g	0.63	1.7	2.1	0 7	1.6	9.5	4.1	0 6 J	11.5
mirex (Mirex)	ng/g	0.55	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0 6 U	0 6 U

* - C elution

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) (ng/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -1- SUR 03/27/98	OFF -2- SUR 03/27/98	OFF -3- SUR 03/27/98	OFF -5- SUR 03/27/98	OFF -6- SUR 03/27/98	OFF -12- SUR 04/03/98	OFF -13- SUR 04/03/98	OFF -16- SUR 04/03/98
OGL Lab ID			FF20	FF21	FF22	FF24	FF25	FF46	FF47	FF48
PAHs	units		Sediment--	---	---	---	---	---	---	---
* naphthalene (NAP)	ng/g	3 6	31 9	171	149	258	161	128	61.2 J	19.9 J
* 2-methylnaphthalene (2MN)	ng/g	3 6	26.0 J	77.6 J	89.2 J	330 J	170 J	117 J	65 6 J	23 9 J
1-methylnaphthalene (1MN)	ng/g	7.1	14.8 J	52.4 J	62.2 J	278 J	132 J	78.8 J	43.2 J	17 6 J
biphenyl (BIP)	ng/g	6.4	7.2	22.1	38.6	151	46 7	28.8	20.5 J	9.1 J
2,6- dimethylnaphthalene (DMN)	ng/g	8 6	18.9 J	103 J	66.9 J	476 J	148 J	88.9 J	55.2 J	37.8 J
* acenaphthylene (ACL)	ng/g	4 6	93.0	488	350	509	195	58.3	156 J	35 8 J
* acenaphthene (ACT)	ng/g	8 2	23.0	88.1	371	966	344	321	110 J	37 6 J
2,3,5-trimethylnaphthalene (TMN)	ng/g	4 8	7 7 J	45.2 J	22.0 J	121 J	36.3 J	20.8 J	12.9 J	6.0 J
* fluorene (FLU)	ng/g	7 0	40.3 J	303 J	598 J	1360 J	392 J	271 J	123 J	34.1 J
* phenanthrene (PHE)	ng/g	10 0	1060	5610	10700	14600	9470	2510	1440 J	331 J
* anthracene (ANT)	ng/g	8.4	255 J	1100 J	1460 J	2810 J	1170 J	572 J	482 J	88.0 J
1-methylphenanthrene (1MP)	ng/g	6 2	132	364	539	1460	680	220	177 J	43.6 J
† fluoranthene (FLA)	ng/g	9.2	1950	8350	14600	19200	11200	3120	2600 J	444 J
† pyrene (PYR)	ng/g	7 6	1780	6750	10700	16900	9770	3020	2530 J	513 J
† benzo (a) anthracene (BAA)	ng/g	7 7	100	3600	5690	9300	4250	1200	1160 J	195 J
† chrysene/triphenylene (CHR)	ng/g	9 9	790	2340	4560	7300	3350	998	774 J	151 J
benzo (b+j+k) fluoranthene (BBF)	ng/g	8 8	2780	7710	17300 J	25000	9390	2730	2430 J	435 J
benzo (e) pyrene (BEP)	ng/g	6 0	910 J	2370 J	5250 J	7590 J	3270 J	1080 J	939 J	187 J
† benzo (a) pyrene (BAP)	ng/g	3 0	595	2410	3450 J	4830	1990	1420	1150 J	220 J
perylene (PER)	ng/g	2 7	225	818	1490 J	1460	734	257	253 J	62 9 J
indeno [1,2,3-cd] pyrene (INP)	ng/g	4 7	1010	3070	6560 J	7390	3030	777	646 J	156 J
† dibenzo [a,h] anthracene (DBA)	ng/g	2 8	441 J	1290 J	2810 J	3410 J	1390 J	280 J	213 J	49.6 J
benzo [ghi] perylene (BPE)	ng/g	4 7	876 J	2520 J	5370 J	5990 J	2630 J	815 J	744 J	181 J
Sum PAHs (NOAA Status &Trends)	ng/g		14200	49600	92100	132000	64000	20100	16200	3280
Sum PAHs (7 Low Molecular Weight *)	ng/g		1530	7830	13700	20800	11900	3980	2440	570
Sum PAHs (6 High Molecular Weight †)	ng/g		6660	24700	41800	60900	32000	10000	8430	1570

SEDIME[illegible]LYCYCLIC AROMATIC HYDROCARBONS (PAHs) (ng/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -20- SUR 04/03/98	OFF -21- SUR 04/03/98	OFF -10- SUR 04/03/98	OFF -11- SUR 04/03/98	OFF -18- SUR 04/03/98	OFF -17- SUR 04/03/98	OFF -22- SUR 03/27/98	OFF -4- SUR 03/27/98
OGL Lab ID			FF50	FF51	FF56	FF58	FF64	FF75	FF78	FF79
PAHs	units		Sediment	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ --
* naphthalene (NAP)	ng/g	3.6	40.1	8.7	4.0	9.8	68.1	25.0	3.2 J	136
* 2-methylnaphthalene (2MN)	ng/g	3.6	40.4 J	13.1 J	3.1 J	17.5 J	63 8 J	19.7 J	3.1 J	38.1 J
1-methylnaphthalene (1MN)	ng/g	7.1	43.7 J	7.7 J	2 2 J	6.2 J	31.4 J	11.0 J	2.0 J	35.8 J
biphenyl (BIP)	ng/g	6.4	17.9	5.9 J	1.2 J	3.7 J	17 3	5.6 J	0.8 J	6.6
2,6- dimethylnaphthalene (DMN)	ng/g	8.6	43.9 J	13.7 J	9.0 J	18.5 J	45.3 J	22.1 J	5.8 J	53.5 J
* acenaphthylene (ACL)	ng/g	4 6	14.8	18.3	4.1 J	9.0	141	41.1	4 4 J	424
* acenaphthene (ACT)	ng/g	8.2	75 3	9.4	2.5 J	27.9	59.7	25.6	1.8 J	54 0
2,3,5-trimethylnaphthalene (TMN)	ng/g	4 8	5.6 J	2.4 J	4.8 U	2.0 J	11 5 J	2.5 J	0.3 J	22.6 J
* fluorene (FLU)	ng/g	7.0	92.6 J	11.3 J	2.8 J	25 1 J	74 8 J	30.9 J	2.4 J	177 J
* phenanthrene (PHE)	ng/g	10.0	828	126	31 3	238	918	271	23.5	3030
* anthracene (ANT)	ng/g	8.4	217 J	47.9 J	9.8 J	64.0 J	340 J	120 J	9.5 J	774 J
1-methylphenanthrene (1MP)	ng/g	6.2	44.4	19.3	3.0 J	14.8	108	25.3	2.6 J	282
† fluoranthene (FLA)	ng/g	9.2	882	291	86.2	388	1880	528 J	65.9	5580
† pyrene (PYR)	ng/g	7.6	751	334	87.5	337	1810	544 J	69.2	4810
† benzo (a) anthracene (BAA)	ng/g	7.7	320	151	35.2	168	730	251	35.6	2280
† chrysene/triphenylene (CHR)	ng/g	9.9	296	151	31.8	117	631	203 J	26.7	1850
benzo (b+j+k) fluoranthene (BBF)	ng/g	8.8	588	375	94 6	284	2290	654	78.6	3500
benzo (e) pyrene (BEP)	ng/g	6.0	197 J	158 J	41.3 J	107 J	963 J	273 J	49.3 J	1310 J
† benzo (a) pyrene (BAP)	ng/g	3 0	257	176	45.1	148	964	333	38.8	2090
perylene (PER)	ng/g	2 7	63.4	43.3	12 8	34.8	276	80.5	12.9	607
indeno [1,2,3-cd] pyrene (INP)	ng/g	4.7	150	126	35 3	86.3	785	237	33.9	1200
† dibenzo [a,h] anthracene (DBA)	ng/g	2 8	50 3 J	40.4 J	8 6 J	23.9 J	273 J	76.1 J	12.2 J	352 J
benzo [ghi] perylene (BPE)	ng/g	4.7	131 J	133 J	40.5 J	95.2 J	899 J	270 J	60.4 J	1290 J
Sum PAHs (NOAA Status &Trends)	ng/g		5150	2250	592	2230	13400	4050	543	29900
Sum PAHs (7 Low Molecular Weight *)	ng/g		1310	234	58	391	1670	533	48	4640
Sum PAHs (6 High Molecular Weight †)	ng/g		2560	1140	294	1180	6290	1930	248	16700

Brown & Root Environmental **INTERNAL CORRESPONDENCE**

C-Navy-7-98-1212W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397
University of Rhode Island
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

PAHs/PCBs/OCPs:/ 15 /Elutriates/
OFF-1-ELU, OFF-2-ELU, OFF-3-ELU, OFF-4-ELU, OFF-5-ELU, OFF-6-ELU, OFF-7-ELU, OFF-8-SUR, OFF-9-SUR, OFF-14-SUR, OFF-15-SUR, OFF-19-SUR, OFF-21-SUR, OFF-22-SUR, OFF-23-SUR

Date: July 21, 1998

Brown and Root Environmental (B&RE) performed tier II data validation on the polycyclic aromatic hydrocarbon compounds (PAH), polychlorinated biphenyl compounds (PCB) and organo-chlorine pesticide compounds (OCP) data from Project 7397, elutriate samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The samples were analyzed according to URI/GSO Standard Operating Procedures 2.04.002 (PAHs) and 2.04.003 (PCBs/OCPs). The data were evaluated based on data completeness; holding times; calibrations; field blank results, laboratory blank spike analysis and internal standard recoveries only. The laboratory did not perform laboratory blank analyses, matrix spike recoveries or laboratory duplicate samples for this data package so the data will not be evaluated for these parameters. The data validation were performed according to the Region I, EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November 1988 criteria.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted by e-mail on July 15, 1998 regarding the missing quality control parameters listed above. Dr. Jim Quinn responded verbally on July 17, 1998 that the quality control parameters for matrix spike samples and laboratory duplicate samples could not be performed because there was not enough sample collected. No laboratory blanks were analyzed although Jim Quinn agreed that laboratory blanks should have been analyzed. SAIC was contacted on July 21, 1998 regarding the elutriate generation date. SAIC submitted a table of the elutriate preparation dates on July 21, 1998.

Calibrations

PAHs

The following tables summarize the polycyclic aromatic hydrocarbons continuing calibration (CC) compounds which failed to meet the calibration criteria of %D <25%:

			Action		Affected Samples
Compound	CC 5/26/98	CC 6/01/98	(+)	NDs	
1,2-Benzanthracene	%D= -39.9	%D= -43.0	J		OFF-23-SUR, OFF-8-SUR, OFF-9-SUR, OFF-15-SUR, OFF-19-SUR, OFF-21-SUR, OFF-3-ELU, OFF-4-ELU, OFF-5-ELU, OFF-6-ELU
Chrysene	%D= -43.4	%D=-40.7	J		OFF-23-SUR, OFF-8-SUR, OFF-9-SUR, OFF-15-SUR, OFF-19-SUR, OFF-21-SUR, OFF-3-ELU, OFF-4-ELU, OFF-5-ELU, OFF-6-ELU
Benzo[e]pyrene		%D=28.3	J		OFF-21-SUR, OFF-3-ELU, OFF-4-ELU, OFF-5-ELU, OFF-6-ELU
Benzo[g,h,i] perylene		%D=27.2	J		OFF-21-SUR, OFF-3-ELU, OFF-4-ELU, OFF-5-ELU, OFF-6-ELU

The positive results for benzo(a)anthracene, chrysene/triphenylene, benzo(e)pyrene and benzo[g,h,i]perylene are qualified as estimated (J) in affected samples.

		Action		Affected Samples
Compound	CC 6/2/98	(+)	NDs	
Benzo[g,h,i] perylene	%D= 26.8	J	UJ	OFF-1-ELU, OFF-14-SUR, OFF-2-ELU

The positive and non-detected results for benzo[g,h,i]perylene are qualified as estimated (J and UJ) in affected samples.

Blanks

The laboratory did not analyze laboratory blanks with this data set. The sample results of low value should be used with caution due to the possibility of false positive values because of laboratory contamination.

The following contaminants at the maximum concentrations were found in the elutriate field blank associated with the elutriate samples:

Compound	Maximum Concentration	Action Level
2,4'-dichlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',5-trichlorobiphenyl	0.2 ng/L	1.0 ng/L
2,4,5-trichlorobiphenyl	0.3 ng/L	1.5 ng/L
2,2',4,6-tetrachlorobiphenyl	0.2 ng/L	1.0 ng/L
2,3',4,4'-tetrachlorobiphenyl	0.2 ng/L	1.0 ng/L
2,2',4,4',5,5'-hexachlorobiphenyl	0.3 ng/L	1.5 ng/L
2,2',3,4,4',5'-hexachlorobiphenyl	0.4 ng/L	2.0 ng/L
3,3',4,4',5-pentachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,4',5,5',6-heptachlorobiphenyl	0.6 ng/L	3.0 ng/L
2,2',3,3',4,4'-hexachlorobiphenyl	0.3 ng/L	1.5 ng/L
2,2',3,3',4,5,6,6'-octachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,4,4',5,5'-heptachlorobiphenyl	0.3 ng/L	1.5 ng/L
2,2',3,3',4,4',5-heptachlorobiphenyl	0.2 ng/L	1.0 ng/L
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	0.4 ng/L	2.0 ng/L
hexachlorobenzene	0.1 ng/L	0.5 ng/L
aldrin	0.1 ng/L	0.5 ng/L
p,p'-DDD	0.1 ng/L	0.5 ng/L
p,p'-DDT	0.3 ng/L	1.5 ng/L
naphthalene	4.8 ng/L	24 ng/L
phenanthrene	2.9 ng/L	14.5 ng/L
fluoranthene	3.2 ng/L	16.0 ng/L
pyrene	2.5 ng/L	12.5 ng/L
benzo(a)anthracene	2.9 ng/L	14.5 ng/L
chrysene/triphenylene	8.1 ng/L	40.5 ng/L
benzo(b+j+k)fluoranthene	10.2 ng/L	51 ng/L

Blank actions are taken for most of the above compounds in affected samples. Sample results less than five times the blank contaminant concentration but greater than the MDL are qualified (U). Sample contaminant results < MDL are qualified MDL (U). Data may be biased high or be false positive.

Internal Standard Performance

PAH

The following table summarizes the PAH internal standards that failed to meet the laboratory quality control criteria of 30 - 130%:

Internal Standard	IS %Recovery	Acceptable Range	Action		Affected Samples
			(+)	NDs	
2,2',4,5'6-pentachlorobiphenyl	27%	30 - 130%	J	UJ	OFF-15-SUR
Dibromooctafluorobiphenyl	27%	30 - 130%	J	UJ	OFF-5-ELU
2,2',3,3',4,5,5',6-octachlorobiphenyl	23%	30 - 130%	J	UJ	OFF-6-ELU
2,2',3,3',4,5,5',6-octachlorobiphenyl	29%	30 - 130%	J	UJ	OFF-7-ELU
2,2',3,3',4,5,5',6-octachlorobiphenyl	27%	30 - 130%	J	UJ	OFF-22-ELU
Naphthalene-d8	24%	30 - 130%		UJ	OFF-21-SUR
Benzo[a]pyrene-d12	26%	30 - 130%	J		OFF-21-SUR
Naphthalene-d8	21%	30 - 130%	J	UJ	OFF-23-SUR
Naphthalene-d8	27%	30 - 130%	J	UJ	OFF-9-SUR
Benzo[a]pyrene-d12	28%	30 - 130%	J		OFF-9-SUR
Naphthalene-d8	21%	30 - 130%		UJ	OFF-1-ELU
Benzo[a]pyrene-d12	15%	30 - 130%	J	UJ	OFF-1-ELU
Benzo[a]pyrene-d12	23%	30 - 130%	J		OFF-14-SUR
Naphthalene-d8	23%	30 - 130%	J	UJ	OFF-15-SUR
Naphthalene-d8	6%	30 - 130%		Reject	OFF-19-SUR
Benzo[a]pyrene-d12	27%	30 - 130%	J		OFF-2-ELU
Naphthalene-d8	25%	30 - 130%		UJ	OFF-3-ELU
Naphthalene-d8	26%	30 - 130%	J	UJ	OFF-5-ELU
Naphthalene-d8	27%	30 - 130%		UJ	OFF-6-ELU
Benzo[a]pyrene-d12	22%	30 - 130%	J	UJ	OFF-6-ELU
Benzo[a]pyrene-d12	27%	30 - 130%	J	UJ	OFF-7-ELU
Benzo[a]pyrene-d12	23%	30 - 130%	J		OFF-22-ELU

The positive and non-detected results for the compounds quantitated using the internal standards with a percent recovery outside the QC range are qualified as estimated

(J and UJ) in the affected samples. The non-detected results associated with the internal standard naphthalene-d8 for sample OFF-19-SUR are rejected due to a less than 10% recovery.

Laboratory Blank Spike Analysis

PCB/OCP/PAH

The following table summarizes the laboratory blank spike compound recoveries which did not meet laboratory QC limits of 70-130%:

Compound	BLANK %REC	QC Limits	Action*	
			(+)	ND
2,4'-dichlorobiphenyl	62%	70-130%	*	A
2,4,5-trichlorobiphenyl	64.9%	70-130%	*	A
2,4,4'-trichlorobiphenyl	62%	70-130%	J	A
2,3,4,4'-tetrachlorobiphenyl	64.2%	70-130%	J	A
2,3',4,4',5-pentachlorobiphenyl	66%	70-130%	J	A
2-methylnaphthalene	153%	70-130%	J	A
1-methylnaphthalene	164%	70-130%	*	A
biphenyl	207%	70-130%	J	A
2,6-dimethylnaphthalene	228%	70-130%	J	A
2,3,5-trimethylnaphthalene	137%	70-130%	*	A

The positive results for several compounds are estimated (J) in all samples due to laboratory blank spike results outside the laboratory QC criteria.

* - Positive results below MDL already estimated (J).

Overall Assessment

The results should be used as qualified. Blank actions were taken for several compounds in affected samples due to field blank contamination. The positive results for benzo(a)anthracene, chrysene/triphenylene, benzo(e)pyrene and benzo[g,h,i]perylene are estimated in several samples due to a continuing calibration %D >25. Compounds associated with several internal standards are estimated in several samples due to poor internal standard percent recovery. Compounds associated with naphthalene-d8 are rejected in samples OFF-19-SUR due to internal standard percent recovery less than 10%. Several compounds are estimated due to poor laboratory blank spike recoveries.

NOTE: Several analytes in several samples are qualified as estimated, (J) due to laboratory reported analytical interference with the analyte. They include 2,4-dichlorobiphenyl, 2,4,5-trichlorobiphenyl, 2,4,4'-trichlorobiphenyl, 2,2',3,5-tetrachlorobiphenyl, 2,3,3',4,4'-pentachlorobiphenyl, 2,2',3,3',4,4',5,6-octachlorobiphenyl, 1a,2a,3B,4a,5a,6B-hexachlorocyclohexane, heptachlor, aldrin, o,p'-DDE and trans-nonachlor.

Attachments
cc: File 7397-4.10

ELUTRIATE POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF -21- SUR 04/3/98	OFF -23- SUR 04/3/98	OFF -8- SUR 04/7/98	OFF -9- SUR 04/7/98	OFF -1- ELU 04/27/98	OFF -14- SUR 04/7/98	OFF -15- SUR 04/7/98	OFF -19- SUR 04/7/98	OFF -2- ELU 04/27/98	OFF -3- ELU 04/27/98	OFF -4- ELU 04/27/98	OFF -5- ELU 04/27/98	OFF -6- ELU 04/27/98
OGL Lab ID			FF26	FF27	FF28	FF29	FF30	FF31	FF32	FF33	FF34	FF35	FF36	FF37	FF38
PCBs/OCPs	units		Elutriate	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ --
2,4'-dichlorobiphenyl (CB008)	ng/L	2 35	1.0 J	0.5 J	0 6 J	1.5 J	1 3 J	0.9 J	2.4 U	2.4 U	0.9 J	2 4 U	2.4 U	1.1 J	2 0 J
2,2',5-trichlorobiphenyl (CB018)	ng/L	2.87	2.9 U	2.9 U	2 9 U	2.9 U	2 9 U	2.9 U	2 9 U	2 9 U	1.1 J	2 9 U	2.9 U	2 9 U	2 3 J
2,4,5-trichlorobiphenyl (CB029)	ng/L	2.25	2.3 U	2 3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2 3 U	2 3 U	2.3 U	2.3 U	2.3 U	2 3 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/L	2.89	2.9 U	2.9 U	2.9 U	2 9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2 9 UJ	2.9 U
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/L	1 50	0 6 J	0 9 J	0 5 J	1.7 J	0.5 J	0.4 J	0.1 J	0 4 J	0 3 J	0 1 J	0 3 J	0.5 J	1.6 J
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/L	2.69	1.3 J	0.8 J	0 7 J	0 6 J	0.7 J	0.9 J	0.2 J	0.9 J	1.5 J	0.4 J	0 9 J	1 0 J	2 4 J
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/L	1.57	1.0 J	0.5 J	0.5 J	0.4 J	0.4 J	0 7 J	1.6 UJ	0.2 J	0 5 J	0.1 J	0.3 J	0 7 J	2.7
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/L	1.44	1.8 J	1.6 J	1.0 J	1.1 J	1 4 U	1.3 J	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2 1 J
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/L	1 67	2 1	1.8	1.2 J	1.2 J	1.2 J	1.8	1.5 J	1.1 J	1.9	0.7 J	0.9 J	1.4 J	2.0
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/L	1.17	0.7 J	0.7 J	0.2 J	0.2 J	0.1 J	0 5 J	0.1 J	0.1 J	0.6 J	0.1 J	0.1 J	0.3 J	0.5 J
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/L	1 02	1.5 J	1.8 J	0.6 J	0.5 J	0.2 J	2.1 J	1.0 UJ	0.1 J	1 0 U	1.0 U	0 2 J	0 5 J	1 0 J
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/L	1.41	1.0 J	0.7 J	0.3 J	0.4 J	0.4 J	0.5 J	0.1 J	0.2 J	1.1 J	0.1 J	0 1 J	0.1 J	0 1 J
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/L	1.24	2.4	2.9	1.2 U	1.8	1.2 U	2.0	1.2 U	1.2 U	4.3	1.2 U	2 5	1.2 U	1.2 U
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/L	1.02	1.3 J	1.1 J	0.5 J	0.4 J	0 3 J	0 4 J	0.1 J	1.0 U	1.0 U	1 0 U	0.1 J	0.3 J	0.4 J
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/L	0.93	3.0	3.2	1.7 U	1.9 U	1 9 U	1.7 U	0.9 U	1.1 U	2.2	0.9 U	0.9 UJ	3.7	1.3 UJ
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/L	1 28	1 9	1.2 J	0.5 J	1.6	1 3 U	0.5 J	1.3 U	1.3 U	1 3 U	1.3 U	1 3 U	1 2 J	0.6 J
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/L	0 89	2 9 U	1.4 U	0 9 U	1.6 U	1 5 U	0 9 U	1.0 U	0.9 U	2.2 U	0 9 U	0.9 U	0 9 UJ	0 9 U
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/L	1 10	2.1	1.3 U	1.1 U	1.1 U	1.9	1.1 U	1.1 U	1.1 U	2.1	1.1 U	1.1 U	1.1 U	1.1 U
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/L	0.57	1.9	0.9	0 6 J	1 2	0 6 U	0 6 U	0.6 U	0.6 U	2.2	0.7 J	0.6 U	0 6 U	0 6 UJ
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/L	0 70	3 3	2.6	2.3	3.5	2.5	0.8 U	0.7 U	1.2 U	1 0 U	0.7 U	0.7 U	0.8 U	0.7 UJ
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/L	1 22	2 4	1.7	1.2 U	1.6	1.3	1.2 U	1.2 U	1.2 U	3.4	1.2 U	1.2 U	1.2 U	1.6 J
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/L	1.05	2.7	1.9	2.7	3.4	2 8	0.2 J	0.6 J	1.0 J	3.2	1.1 U	0.1 J	1.1 U	1.8 J
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/L	1.39	2.5	1.8 U	1.5 U	2.1	1.4 U	4 7	1.3 U	1.6 U	2.9	2.1	1.9 U	2.5	2.9 J
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/L	1 13	1.5	2.6	1.0 J	1 1	0.7 J	1 8	3.1	1.3	4.7	1.1 U	0.4 J	0.7 J	0 8 J
CBs	ng/L		40	33	20	31	23	25	12	13	37	8	12	19	30
PCBs	ng/L		80	65	41	61	45	50	24	27	73	15	23	38	60

ELUTRIATE POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF -21- SUR 04/3/98	OFF -23- SUR 04/3/98	OFF -8- SUR 04/7/98	OFF -9- SUR 04/7/98	OFF -1- ELU 04/27/98	OFF -14- SUR 04/7/98	OFF -15- SUR 04/7/98	OFF -19- SUR 04/7/98	OFF -2- ELU 04/27/98	OFF -3- ELU 04/27/98	OFF -4- ELU 04/27/98	OFF -5- ELU 04/27/98	OFF -6- ELU 04/27/98
OGL Lab ID			FF26	FF27	FF28	FF29	FF30	FF31	FF32	FF33	FF34	FF35	FF36	FF37	FF38
PCBs/OCPs	units		Elutriate	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ ---	------ --
hexachlorobenzene (HCB)	ng/L	3.79	3 8 U	3 8 U	3.8 U	3.8 U	3 8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3 8 U	3 8 U
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/L	1.81	0 5 J	0.2 J	0.1 J	0.5 J	0.3 J	1.8 U	0.4 J	0.5 J	2.2 J	0 3 J	0 1 J	0 3 J	0 3 J
heptachlor (HEPT)	ng/L	1.19	0.2 J	0.1 J	1.2 U	0.4 J	0 2 J	1.2 U	1.2 U	1.2 U	0.3 J	1.2 U	0.2 J	1.1 J	1.2 U
aldrin (Aldrin)	ng/L	3.29	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
heptachlor epoxide (HEPT E)	ng/L	2 88	1.0 J	0.6 J	2.9 U	2.9 U	0.5 J	0.6 J	2.9 UJ	0.5 J	0.8 J	2.9 U	0.3 J	0.5 J	1.5 J
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/L	1.79	0.6 J	0.2 J	0.1 J	0.1 J	0.1 J	0 2 J	0.1 J	0.1 J	0.7 J	1.8 U	1.8 U	0.4 J	0.1 J
cis-chlordane (a-CHLDA)	ng/L	1 94	0.6 J	0 4 J	0 3 J	0.3 J	0.3 J	0 3 J	0.2 J	0.2 J	0.5 J	0.1 J	0 2 J	0 7 J	0 3 J
trans-nonachlor (TRANSNON)	ng/L	1.74	0.6 J	0 6 J	1.7 U	0.3 J	0.1 J	0 1 J	0.1 J	1.7 UJ	0.4 J	0.1 J	0 1 J	0 2 J	0.2 J
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/L	2.41	1.1 J	1.9 J	0.4 J	0.3 J	0.4 J	0 6 J	0.2 J	0.2 J	1.1 J	0.2 J	0.4 J	0 6 J	0.6 J
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/L	2.40	2.3 J	3 2	0.6 J	0.7 J	0.8 J	0 8 J	0.5 J	2.4 U	0.7 J	2.4 U	2.4 U	0.6 J	0.8 J
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/L	2 86	0.6 J	0.4 J	0.3 J	2.9 U	1.2 J	2 9 U	2.9 UJ	2.9 U	0 2 J	0.1 J	0.2 J	0.2 J	0 3 J
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/L	3.72	1.5 J	3.7 J	1.7 J	1 5 J	3.7 U	2.0 J	3.7 U	2.0 J	1.9 J	3.7 U	3.7 U	2.8 J	2.1 J
mirex (Mirex)	ng/L	2 06	2.1 U	2.1 U	2.1 U	2 1 U	2.1 U	2.1 U	0 5 J	2.1 U	2.1 U	2 1 U	2 1 U	2.1 U	2 1 UJ

ELUTRIATE POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF -7- ELU 04/27/98	OFF -22- ELU 04/27/98
OGL Lab ID			FF39	FF40
PCBs/OCPs	units		Elutriate	------ --
2,4'-dichlorobiphenyl (CB008)	ng/L	2.35	0 8 J	1.3 J
2,2',5-trichlorobiphenyl (CB018)	ng/L	2 87	2 9 U	2.9 U
2,4,5-trichlorobiphenyl (CB029)	ng/L	2 25	2 3 U	2.3 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/L	2 89	2 9 U	2.9 U
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/L	1 50	0 4 J	0.4 J
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/L	2.69	0 8 J	0.7 J
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/L	1.57	0.7 J	0.7 J
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/L	1.44	1.4 U	1.0 J
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/L	1.67	1.4 J	1.8
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/L	1.17	0 4 J	0.4 J
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/L	1.02	0.5 J	0.6 J
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/L	1.41	0.1 J	0.1 J
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/L	1.24	1.2 U	1.2 U
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/L	1.02	0 4 J	0 2 J
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/L	0 93	0.9 U	1.0 UJ
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/L	1 28	1 3 U	1 3 UJ
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/L	0.89	0.9 U	0.9 U
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/L	1.10	1.1 U	1.1 U
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/L	0.57	0 6 U	0.5 J
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/L	0.70	0.7 U	0.8 UJ
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/L	1 22	1 2 U	1.2 U
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/L	1 05	1 1 UJ	1.2 UJ
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/L	1 39	3.5 J	4.5 J
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/L	1 13	0.8 J	0.5 J
CBs	ng/L		15	18
PCBs	ng/L		30	35

ELUTRIATE POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) (ng/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF -7- ELU 04/27/98	OFF -22- ELU 04/27/98
OGL Lab ID			FF39	FF40
PCBs/OCPs	units		Elutriate	------ --
hexachlorobenzene (HCB)	ng/L	3.79	3 8 U	3.8 U
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/L	1.81	0 2 J	1.8 U
heptachlor (HEPT)	ng/L	1.19	1.2 U	1.2 U
aldrin (Aldrin)	ng/L	3.29	3.3 U	3.3 U
heptachlor epoxide (HEPT E)	ng/L	2 88	0.3 J	0 2 J
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/L	1.79	0 2 J	0.2 J
cis-chlordane (a-CHLDA)	ng/L	1 94	0 6 J	0 5 J
trans-nonachlor (TRANSNON)	ng/L	1.74	0 1 J	0.2 J
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/L	2.41	0 5 J	0 9 J
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/L	2 40	0 7 J	0.5 J
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/L	2.86	0.4 J	0.2 J
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/L	3.72	3.7 U	3.7 U
mirex (Mirex)	ng/L	2 06	2.1 UJ	2 1 UJ

ELUTRIATE POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) (ng/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF -21- SUR 04/03/98	OFF -23- SUR 04/03/98	OFF -8- SUR 04/07/98	OFF -9- SUR 04/07/98	OFF -1- ELU 04/27/98	OFF -14- SUR 04/07/98	OFF -15- SUR 04/07/98	OFF -19- SUR 04/07/98	OFF -2- ELU 04/27/98	OFF -3- ELU 04/27/98	OFF -4- ELU 04/27/98	OFF -5- ELU 04/27/98	OFF -6- ELU 04/27/98
OGL Lab ID			FF26	FF27	FF28	FF29	FF30	FF31	FF32	FF33	FF34	FF35	FF36	FF37	FF38
PAHs	units		Elutriate-	------- ---	------- ---	------- ---	------- ---	------- ---	------- ---	------- ---	------- ---	------- ---	------- ---	------- ---	------- --
* naphthalene (NAP)	ng/L	6.6	6.6 UJ	24 0 J	26.6	36.1 J	6.6 UJ	9 6 U	12 3 UJ	R	14.9 U	6.6 U	21.8 U	22.4 UJ	14 1 UJ
* 2-methylnaphthalene (2MN)	ng/L	8 7	8.7 UJ	15 2 J	8 4 J	13.2 J	8.7 UJ	8 7 U	3 3 J	R	8.7 U	8.7 UJ	8.7 U	6.7 J	8 7 UJ
1-methylnaphthalene (1MN)	ng/L	15.9	15.9 UJ	10 0 J	7 7 J	8.2 J	15.9 UJ	15 9 U	3.1 J	R	15.9 U	15.9 UJ	15.9 U	14.6 J	15 9 UJ
biphenyl (BIP)	ng/L	10.6	10 6 UJ	6.9 J	7.8 J	11.2 J	10.6 UJ	7.1 J	2.6 J	R	14.6 J	10 6 UJ	4.0 J	5.3 J	10 6 UJ
2,6- dimethylnaphthalene (DMN)	ng/L	5.7	5.7 UJ	6.9 J	5.7 U	5.7 UJ	5 7 UJ	5.7 U	5 7 UJ	R	5.7 U	5 7 UJ	2 0 J	5 7 UJ	5 7 UJ
* acenaphthylene (ACL)	ng/L	8.3	2.2 J	11.0	2.9 J	2.1 J	8.3 U	1.9 J	3.9 J	7 3 J	1.1 J	3.0 J	20.0	28.0	8 3 U
* acenaphthene (ACT)	ng/L	8 1	8.1 U	7.0 J	2.1 J	3.5 J	8.1 U	8 1 U	8 1 U	8 1 U	5.8 J	1.5 J	6.4 J	13.5	6 8 J
2,3,5-trimethylnaphthalene (TMN)	ng/L	5.7	5.7 U	0.8 J	0 4 J	5 7 U	5.7 U	5.7 U	5.7 U	5.7 U	5.7 U	5.7 U	5.7 U	3.5 J	5 7 U
* fluorene (FLU)	ng/L	4.2	4.2 U	7.2	2 8 J	3.8 J	4.2 U	4.2 U	2 2 J	4.2 U	3.2 J	4.2 U	6.3	22.2	5 9
* phenanthrene (PHE)	ng/L	2 8	11.7 U	21.5	14.3 U	14.3 U	9.5 U	22 6	14 1 U	10.0 U	26.2	31.3	153	206	45.5
* anthracene (ANT)	ng/L	1.9	6.4	25.2	5 1	4 6	1.9 U	1.9 U	4.6	5.3	3.0	4.8	17 3	53 7	8.3
1-methylphenanthrene (1MP)	ng/L	4 5	4.5 U	1.7 J	2.0 J	2.0 J	4.5 U	4.5 U	1.6 J	4.5 U	4.5 U	4.6	16.0	32.2	4.5 U
† fluoranthene (FLA)	ng/L	4 4	37.5	58.7	20.5	24.5	45 6	55.2	23.8	18.3	74.0	154	289	659	134
† pyrene (PYR)	ng/L	5.4	79 2	132	25 3	22.1	41.9	71.5	27.5	24.5	81.5	122	237	565	141
† benzo (a) anthracene (BAA)	ng/L	7.0	31 5 J	36 1 J	8.3 UJ	7.3 UJ	8.9 U	22.5	8 9 UJ	9.3 UJ	19.5	28.0 J	83.3 J	184 J	29.1 J
† chrysene/triphenylene (CHR)	ng/L	10.7	16.3 UJ	28.8 UJ	10.7 U	10.7 U	10.7 U	31.7 U	10 7 U	10.7 U	18.5 U	30.5 UJ	83.9 J	163 J	21 1 UJ
benzo (b+j+k) fluoranthene (BBF)	ng/L	13.3	198 J	204	68.9	109 J	55.3 J	160 J	74.1	39.9 U	92.3 J	107	214	717	161 J
benzo (e) pyrene (BEP)	ng/L	8.5	76.3 J	118	39.0	42.8 J	24.6 J	69.9 J	40.6	24.6	42.0 J	50 2 J	85.3 J	280 J	80.6 J
† benzo (a) pyrene (BAP)	ng/L	5.7	46.1 J	58.5	12.1	35.2 J	6 8 J	27.6 J	19.2	12.0	29.0 J	26.2	79.7	250	29.4 J
perylene (PER)	ng/L	6.1	26.1 J	11.1	5.4 J	17.0 J	6.1 UJ	4.0 J	2 6 J	3 9 J	7.5 J	7.5	24.2	73.2	6 UJ
indeno [1,2,3-cd] pyrene (INP)	ng/L	7.4	66.5 J	64.9	24.5	62.0 J	7.4 UJ	64.1 J	36 0	19.7	29.2 J	26.0	80 4	222	49 5 J
† dibenzo [a,h] anthracene (DBA)	ng/L	9.5	15.6 J	36.1	9.3 J	79.0 J	9.5 UJ	51 1 J	9 5 U	9.5 U	23.3 J	9.5 U	37.5	119	9.5 UJ
benzo [ghi] perylene (BPE)	ng/L	4.6	96.4 J	109	38 0	68.2 J	4.6 UJ	85.9 J	32.5	28.8	34.0 J	25.1 J	99.1 J	249 J	69 2 J
Sum PAHs (NOAA Status &Trends)	ng/L		720	994	335	572	202	685	319	209	520	626	1560	3890	796
Sum PAHs (7 Low Molecular Weight *)	ng/L		20	111	62	78	10	34	40	23	54	45	225	352	81
Sum PAHs (6 High Molecular Weight †)	ng/L		236	351	79	174	113	260	86	69	246	360	810	1940	355

ELUTRIATE POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) (ng/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF -7- ELU 04/27/98	OFF -22- ELU 04/27/98
OGL Lab ID			FF39	FF40
PAHs	units		Elutriate-	------- ---
* naphthalene (NAP)	ng/L	6 6	8.4 U	28 0
* 2-methylnaphthalene (2MN)	ng/L	8.7	8 7 U	10.7 J
1-methylnaphthalene (1MN)	ng/L	15.9	9.7 J	6 2 J
biphenyl (BIP)	ng/L	10.6	3 5 J	3 7 J
2,6- dimethylnaphthalene (DMN)	ng/L	5.7	5 7 U	2 0 J
* acenaphthylene (ACL)	ng/L	8 3	2 0 J	3 2 J
* acenaphthene (ACT)	ng/L	8.1	5 2 J	6.3 J
2,3,5-trimethylnaphthalene (TMN)	ng/L	5.7	5.7 U	5.7 U
* fluorene (FLU)	ng/L	4.2	5.2	10.0
* phenanthrene (PHE)	ng/L	2.8	23 2	27.4
* anthracene (ANT)	ng/L	1.9	1 2 J	3 8
1-methylphenanthrene (1MP)	ng/L	4.5	4.5 U	4 5 U
† fluoranthene (FLA)	ng/L	4.4	54.6	40.4
† pyrene (PYR)	ng/L	5.4	98 3	37.3
† benzo (a) anthracene (BAA)	ng/L	7.0	15.7	10.9 U
† chrysene/triphenylene (CHR)	ng/L	10 7	13.7 U	10.7 U
benzo (b+j+k) fluoranthene (BBF)	ng/L	13.3	61.5 J	62.8 J
benzo (e) pyrene (BEP)	ng/L	8.5	25 0 J	34.4 J
† benzo (a) pyrene (BAP)	ng/L	5.7	11.9 J	15.1 J
perylene (PER)	ng/L	6.1	1 4 J	4.4 J
indeno [1,2,3-cd] pyrene (INP)	ng/L	7.4	21.8 J	23.0 J
† dibenzo [a,h] anthracene (DBA)	ng/L	9 5	9.5 UJ	3 4 J
benzo [ghi] perylene (BPE)	ng/L	4.6	21.4 J	33 3 J
Sum PAHs (NOAA Status &Trends)	ng/L		384	376
Sum PAHs (7 Low Molecular Weight *)	ng/L		45	90
Sum PAHs (6 High Molecular Weight †)	ng/L		194	116

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-9-98-1244W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397
University of Rhode Island Laboratory
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

PAHs/PCBs/OCPs:/ 12 /Sediment Cores/
OFF-10-COR(15-20), OFF-10-COR(25-30), OFF-11-COR(50-55), OFF-11-COR(105-110), OFF-18-COR(50-55), OFF-18-COR(105-110), OFF-5-COR(20-25), OFF-5-COR(55-60), OFF-5E-COR(20-25), OFF-5E-COR(55-60), OFF-6-COR(20-25), OFF-6-COR(35-40)

Date: September 17, 1998

Tetra Tech NUS Inc. (TtNUS) formerly Brown and Root Environmental (B&RE) performed tier II data validation on the polycyclic aromatic hydrocarbon compounds (PAH), polychlorinated biphenyl compounds (PCB) and organo-chlorine pesticide compounds (OCP) data from Project 7397, sediment core samples collected by Science Applications International Corporation (SAIC) at the Old Firefighting Training Area site. The samples were analyzed according to URI/GSO Standard Operating Procedures 2.04.002 (PAHs) and 2.04.003 (PCBs/OCPs) by the University of Rhode Island laboratory (URI). The data were evaluated based on data completeness; holding times; calibrations; laboratory blank results, laboratory duplicate analysis, and internal standard recoveries. The data validation were performed according to the Region I, EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November 1988 criteria.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted by e-mail on September 9, 1998 regarding the storage of six core samples prior to analysis. Jim Quinn replied by e-mail that the six samples were stored at 0 degrees celsius at SAIC until receipt at URI at which point the samples were stored at -20 degrees celsius until extraction.

Calibrations

PCB/OCPs

The following table summarizes the PCB/OCP continuing calibration (CC) compound which failed to meet the calibration criteria of %D <25%:

		Action		Affected Samples
Compound	CC 8/13/98	(+)	NDs	
Heptachlor	%D = -30.7			OFF-18-COR(50-55)

No action is necessary since no positive results are reported for heptachlor in sample OFF-18-COR.

Blanks

The following contaminants at the maximum concentrations were found in the laboratory blanks associated with the sediment samples:

Compound	Maximum Concentration	Action Level
2,4'-dichlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',5-trichlorobiphenyl	0.2 ng/g	1.0 ng/g
2,4,5-trichlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',5,5'-tetrachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,3',4,4'-tetrachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',4,5,5'-pentachlorobiphenyl	0.5 ng/g	2.5 ng/g
2,2',3,4,5'-pentachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,3',4,4',5-pentachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,4',5,6,6'-heptachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',4,4',5,5'-hexachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,3,3',4,4'-pentachlorobiphenyl	0.3 ng/g	1.5 ng/g
2,2'3,4,4',5'-hexachlorobiphenyl	0.1 ng/g	0.5 ng/g
3,3'4,4'5-pentachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2'3,4',5,5'6-heptachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,3',4,4'-hexachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,4,4',5,5'-heptachlorobiphenyl	.0.1 ng/g	0.5 ng/g
2,2',3,3',4,4',5-heptachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',3,3',4,4',5,6-octachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	0.9 ng/g	4.5 ng/g
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	0.2 ng/g	1.0 ng/g
hexachlorobenzene	0.2 ng/g	1.0 ng/g

Compound	Maximum Concentration	Action Level
gamma BHC	0.1 ng/g	0.5 ng/g
heptachlor	0.3 ng/g	1.5 ng/g
aldrin	0.1 ng/g	0.5 ng/g
heptachlor epoxide	0.1 ng/g	0.5 ng/g
o,p'-DDE	0.1 ng/g	0.5 ng/g
cis-chlordane	0.1 ng/g	0.5 ng/g
trans-nonachlor	0.1 ng/g	0.5 ng/g
p,p'-DDE	0.6 ng/g	3.0 ng/g
p,p'-DDD	0.2 ng/g	1.0 ng/g
o,p'-DDT	0.1 ng/g	0.5 ng/g
p,p'-DDT	0.1 ng/g	0.5 ng/g
phenanthrene	1.0 ng/g	5.0 ng/g
fluoranthene	0.5 ng/g	2.5 ng/g
pyrene	0.3 ng/g	1.5 ng/g
benzo(a)anthracene	0.3 ng/g	1.5 ng/g
chrysene/triphenylene	0.5 ng/g	2.5 ng/g
benzo(b+j+k)fluoranthene	1.5 ng/g	7.5 ng/g
benzo(e)pyrene	0.9 ng/g	4.5 ng/g
benzo(a)pyrene	0.6 ng/g	3.0 ng/g
perylene	0.9 ng/g	4.5 ng/g

Blank actions are taken for most of the PCB/OCP compounds in affected samples. No blank qualifications were necessary for the PAH compounds since all the sample results were above the action levels.

Sample results less than five times the blank contaminant concentration but greater than the MDL are qualified (U). Sample contaminant results < MDL are qualified MDL (U). Data may be biased high or be false positive.

Internal Standard Performance

PAH

The following table summarizes the PAH internal standard that failed to meet the laboratory quality control criteria of 30 - 130%:

Internal Standard	IS %Recovery	Acceptable Range	Action		Affected Samples
			(+)	NDs	
naphthalene-d8	27%	30 - 130%	*		OFF-10-COR(25-30)

* - Positive results below MDL already estimated (J).

Laboratory Duplicate Analysis

The following table summarizes the laboratory duplicate relative percent differences which did not meet laboratory QC limits of < 35% for sample OFF-18-COR(50-55):

Compound	OFF-18-COR (50-55) (ng/g)	OFF-18-COR (50-55)DUP (ng/g)	RPD	Action		Affected Samples
				(+)	NDs	
2,4'-dichlorobiphenyl	0.6	0.4	54.1%	J	A	All
2,3,3',4,4'-pentachlorobiphenyl	1.4	1.0	36.3%	*	A	All
3,3',4,4',5-pentachlorobiphenyl	4.1	1.4	96.6%	J	A	All
p,p'-DDT	79.5	17.3	129%	J	A	All
acenaphthene	77.1	52.8	37.4 %	J	A	All
fluorene	143	100	35.2 %	J	A	All
chrysene/triphenylene	310	491	45.4 %	J	A	All

The positive results for above compounds are estimated (J) in all samples due to laboratory duplicate results outside the laboratory QC criteria.

* - Positive results below MDL already estimated (J).

NIST SRM Standards Data

The following table summarizes the NIST SRM recoveries which were outside the acceptable range:

Compound	SRM Result	Acceptable Range	Action		Affected Samples
			(+)	NDs	
2,2',4,4',5,5'-hexachlorobiphenyl	10.9	11 - 25.4	J	UJ	All
2,2',3,4,4'5,5'-heptachlorobiphenyl	8.6	3.7 - 8.3	J	A	All
biphenyl	90.8	110 - 251	J	UJ	All
fluorene	58.9	62-138	J	UJ	All
chrysene/triphenylene	343	385-784	J	UJ	All

The positive and non-detected results for these compounds are estimated (J and UJ) due to poor NIST SRM recoveries.

Overall Assessment

The results should be used as qualified. Blank actions were taken for several compounds in affected samples due to laboratory blank contamination. 2,4'-Dichlorobiphenyl, 3,3',4,4',5-pentachlorobiphenyl, p,p'-DDT, acenaphthene, fluorene and chrysene/triphenylene are estimated due to poor laboratory duplicate precision. 2,2',4,4',5,5'-Hexachlorobiphenyl, 2,2',3,4,4',5,5'-heptachlorobiphenyl, biphenyl, fluorene and chrysene/triphenylene are estimated due to poor NIST SRM recoveries.

NOTE: Several analytes in several samples are qualified as estimated, (J) due to laboratory reported analytical interference with the analyte. They include 2,2',3,4,5'-pentachlorobiphenyl, 2,3,3',4,4'-pentachlorobiphenyl, 2,2',3,3',4,4'-hexachlorobiphenyl, 3,3',4,4',5-pentachlorobiphenyl, 2,2',3,3',4,4',5,6-octachlorobiphenyl.

Attachments
cc: File 7397-4.10

SEDIMENT CORES POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) ANALYSIS (ng/g dry wt)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -10- COR 15-20 cm 04/07/98	OFF -10- COR 25-30 cm 04/07/98	OFF -11- COR 50-55 cm 04/07/98	OFF -11- COR 105-110 cm 04/07/98	OFF -18- COR 50-55 cm 04/07/98	OFF -18- COR 105-110 cm 04/07/98	OFF -5- COR 20-25 cm 04/27/98	OFF -5- COR 55-60 cm 04/27/98	OFF -6- COR 20-25 cm 04/27/98	OFF -6- COR 35-40 cm 04/27/98	OFF -5E- COR 20-25 cm 04/27/98	OFF -5E- COR 55-60 cm 04/27/98
OGL Lab ID			FF55	FF57	FF59	FF60	FF85	FF66	FF67	FF68	FF69	FF70	FF76	FF77
PAHs	units		Core------	------- --	Core- ---	------- --	Core--- ---	--------- --	Core--- ---	------- --	Core--- ---	------- ---	--------- ---	------- -->
* naphthalene (NAP)	ng/g	3.6	3.5 J	2.7 J	3.6 U	3.6 U	158	157	88.3	3.6 U	174	10.0	8.8	3.6 U
* 2-methylnaphthalene (2MN)	ng/g	3.6	3.0 J	2.6 J	3.6 U	3.6 U	210	91.1	42.5	3.6 U	280	9.6	18.7	3.6 U
1-methylnaphthalene (1MN)	ng/g	7.1	2.1 J	0.7 J	7.1 U	7.1 U	64.4	59.0	35.0	7.1 U	120	7.9	40.8	7.1 U
biphenyl (BIP)	ng/g	6.4	1.4 J	1.6 J	2.4 J	6.4 UJ	38.3 J	32.1 J	8.9 J	6.4 UJ	42.0 J	3.0 J	6.5 J	6.4 UJ
2,6- dimethylnaphthalene (DMN)	ng/g	8.6	6.2 J	2.5 J	15.9	5.0 J	245	82.4	30.3	8.6 U	261	10.0	39.9	8 6 U
* acenaphthylene (ACL)	ng/g	4.6	3.0 J	2.1 J	1.1 J	4.6 U	210	80.2	144	4.6 U	95.8	3.1 J	11.0	0 2 J
* acenaphthene (ACT)	ng/g	8.2	1.8 J	0.9 J	13.4 J	8.2 U	52.8 J	208 J	132 J	8.2 U	249 J	52.5 J	267 J	8 2 U
2,3,5-trimethylnaphthalene (TMN)	ng/g	4.8	0.3 J	0.7 J	1.8 J	4.8 U	13.6	17.7	13.0	4.8 U	48.1	1.7 J	22.6	4.8 U
* fluorene (FLU)	ng/g	7.0	2.0 J	1.6 J	12.0 J	0.3 J	100 J	302 J	124 J	7 0 UJ	253 J	25.7 J	205 J	7.0 UJ
* phenanthrene (PHE)	ng/g	10.0	26.7	16.2	136	1.0 U	528	1930	1440	10.0 U	2040	249	1950	10.0 U
* anthracene (ANT)	ng/g	8.4	8.9	3.5 J	21.4	0.4 J	741	799	380	8.4 U	629	61.5	390	8.4 U
1-methylphenanthrene (1MP)	ng/g	6.2	3.3 J	1.9 J	7.9	6.2 U	359	168	121	6.2 U	185	9.8	274	6.2 U
† fluoranthene (FLA)	ng/g	9.2	70.4	35.7	146	9.0 U	1350	3020	2300	9.0 U	2840	322	2050	9.0 U
† pyrene (PYR)	ng/g	7.6	63.5	40.2	125	8.0 U	1500	2520	2090	8.0 U	3340	286	1910	8.0 U
† benzo (a) anthracene (BAA)	ng/g	7.7	23.4	15.5	44.7	8.0 U	787	1260	882	8.0 U	988	118	829	8.0 U
† chrysene/triphenylene (CHR)	ng/g	9.9	31.0 J	15.0 J	44.2 J	10.0 U	491 J	951 J	790 J	10.0 U	791 J	103 J	710 J	10.0 U
benzo (b+j+k) fluoranthene (BBF)	ng/g	8.8	70.8	34.2	71.1	9.0 U	1790	2190	1610	9.0 U	3580	237	1130	9.0 U
benzo (e) pyrene (BEP)	ng/g	6 0	31.2	16.5	22.5	6.0 U	772	841	616	6 0 U	1490	81 2	404	6.0 U
† benzo (a) pyrene (BAP)	ng/g	3 0	31.3	19.8	37.5	3.0 U	931	1170	973	3.0 U	1750	116	648	3.0 U
perylene (PER)	ng/g	2.7	8.9	6.3	40.2	6.4	295	864	262	4.4 U	407	32.9	175	6.9
indeno [1,2,3-cd] pyrene (INP)	ng/g	4 7	26.9	14 8	23.1	1.5 J	821	619	524	1.2 J	1140	72.2	302	1.5 J
† dibenzo [a,h] anthracene (DBA)	ng/g	2.8	6 6	4.8	4.8	0.8 J	248	204	345	2 8 U	357	22.3	115	1.0 J
benzo [ghi] perylene (BPE)	ng/g	4.7	31.8	18.6	25.2	1.8 J	944	643	547	2 2 J	1260	74 3	293	1.9 J
Sum PAHs (NOAA Status &Trends)	ng/g		458	258	796	25	12700	18200	13500	27	22300	1910	11800	22
Sum PAHs (7 Low Molecular Weight *)	ng/g		49	30	184	1	2000	3570	2350	1	3720	412	2850	1
Sum PAHs (6 High Molecular Weight †)	ng/g		226	131	402	6	5310	9110	7370	9	10100	966	6260	7

Date is date sample collected.

SEDIMENT CORES POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) ANALYSIS (ng/g dry
SITE: FIRE FIGHTING TRAINING AREA
PROJ: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -10- COR 15-20 cm 04/07/98	OFF -10- COR 25-30 cm 04/07/98	OFF -11- COR 50-55 cm 04/07/98	OFF -11- COR 105-110 cm 04/07/98	OFF -18- COR 50-55 cm 04/07/98	OFF -18- COR 105-110 cm 04/07/98	OFF -5- COR 20-25 cm 04/27/98	OFF -5- COR 55-60 cm 04/27/98	OFF -6- COR 20-25 cm 04/27/98	OFF -6- COR 35-40 cm 04/27/98	OFF -5E- COR 20-25 cm 04/27/98	OFF -5E- COR 55-60 cm 04/27/98
OGL Lab ID			FF55	FF57	FF59	FF60	FF85	FF66	FF67	FF68	FF69	FF70	FF76	FF77
PAHs	units		Core------	-------- --	Core- ---	-------- --	Core--- ---	--------- --	Core--- ---	-------- --	Core--- ---	------- ---	--------- ---	------- -->
* naphthalene (NAP)	ng/g	3.6	3.5 J	2.7 J	3.6 U	3.6 U	158	157	88.3	3.6 U	174	10.0	8.8	3 6 U
* 2-methylnaphthalene (2MN)	ng/g	3.6	3.0 J	2.6 J	3.6 U	3.6 U	210	91.1	42.5	3.6 U	280	9.6	18.7	3.6 U
1-methylnaphthalene (1MN)	ng/g	7.1	2.1 J	0.7 J	7.1 U	7.1 U	64 4	59.0	35.0	7.1 U	120	7.9	40.8	7.1 U
biphenyl (BIP)	ng/g	6 4	1.4 J	1.6 J	2.4 J	6.4 UJ	38.3 J	32.1 J	8.9 J	6.4 UJ	42.0 J	3.0 J	6.5 J	6.4 UJ
2,6- dimethylnaphthalene (DMN)	ng/g	8 6	6.2 J	2.5 J	15.9	5 0 J	245	82 4	30.3	8.6 U	261	10.0	39 9	8.6 U
* acenaphthylene (ACL)	ng/g	4 6	3.0 J	2.1 J	1.1 J	4.6 U	210	80 2	144	4.6 U	95.8	3.1 J	11.0	0.2 J
* acenaphthene (ACT)	ng/g	8 2	1.8 J	0.9 J	13.4 J	8.2 U	52.8 J	208 J	132 J	8.2 U	249 J	52.5 J	267 J	8.2 U
2,3,5-trimethylnaphthalene (TMN)	ng/g	4.8	0.3 J	0.7 J	1.8 J	4 8 U	13.6	17.7	13.0	4.8 U	48.1	1.7 J	22.6	4.8 U
* fluorene (FLU)	ng/g	7.0	2.0 J	1.6 J	12.0 J	0 3 J	100 J	302 J	124 J	7.0 UJ	253 J	25.7 J	205 J	7.0 UJ
* phenanthrene (PHE)	ng/g	10.0	26.7	16.2	136	1.0 U	528	1930	1440	10.0 U	2040	249	1950	10.0 U
* anthracene (ANT)	ng/g	8.4	8.9	3.5 J	21.4	0.4 J	741	799	380	8.4 U	629	61.5	390	8.4 U
1-methylphenanthrene (1MP)	ng/g	6.2	3.3 J	1 9 J	7 9	6.2 U	359	168	121	6.2 U	185	9.8	274	6.2 U
† fluoranthene (FLA)	ng/g	9.2	70.4	35.7	146	9.0 U	1350	3020	2300	9.0 U	2840	322	2050	9.0 U
† pyrene (PYR)	ng/g	7.6	63.5	40.2	125	8.0 U	1500	2520	2090	8.0 U	3340	286	1910	8.0 U
† benzo (a) anthracene (BAA)	ng/g	7.7	23.4	15.5	44.7	8.0 U	787	1260	882	8.0 U	988	118	829	8.0 U
† chrysene/triphenylene (CHR)	ng/g	9.9	31.0 J	15.0 J	44.2 J	10.0 U	491 J	951 J	790 J	10.0 U	791 J	103 J	710 J	10.0 U
benzo (b+j+k) fluoranthene (BBF)	ng/g	8.8	70.8	34.2	71.1	9.0 U	1790	2190	1610	9.0 U	3580	237	1130	9.0 U
benzo (e) pyrene (BEP)	ng/g	6.0	31.2	16.5	22.5	6.0 U	772	841	616	6.0 U	1490	81.2	404	6.0 U
† benzo (a) pyrene (BAP)	ng/g	3.0	31.3	19.8	37.5	3.0 U	931	1170	973	3.0 U	1750	116	648	3.0 U
perylene (PER)	ng/g	2.7	8.9	6.3	40.2	6.4	295	864	262	4.4 U	407	32.9	175	6.9
indeno [1,2,3-cd] pyrene (INP)	ng/g	4.7	26.9	14 8	23.1	1.5 J	821	619	524	1.2 J	1140	72.2	302	1.5 J
† dibenzo [a,h] anthracene (DBA)	ng/g	2.8	6.6	4.8	4.8	0.8 J	248	204	345	2.8 U	357	22.3	115	1.0 J
benzo [ghi] perylene (BPE)	ng/g	4.7	31.8	18.6	25.2	1.8 J	944	643	547	2.2 J	1260	74.3	293	1.9 J
Sum PAHs (NOAA Status &Trends)	ng/g		458	258	796	25	12700	18200	13500	27	22300	1910	11800	22
Sum PAHs (7 Low Molecular Weight *)	ng/g		49	30	184	1	2000	3570	2350	1	3720	412	2850	1
Sum PAHs (6 High Molecular Weight †)	ng/g		226	131	402	6	5310	9110	7370	9	10100	966	6260	7

U-Not Detected; UJ-Detection Limit approximate; J-Quantitation approximate; Date is date collected.

SEDIMENT CORES POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/g dry wt)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -10- COR 15-20 cm 04/07/98	OFF -10- COR 25-30 cm 04/07/98	OFF -11- COR 50-55 cm 04/07/98	OFF -11- COR 105-110 cm 04/07/98	OFF -18- COR 50-55 cm 04/07/98	OFF -18- COR 105-110 cm 04/07/98	OFF -5- COR 20-25 cm 04/27/98	OFF -5- COR 55-60 cm 04/27/98	OFF -6- COR 20-25 cm 04/27/98	OFF -6- COR 35-40 cm 04/27/98
OGL Lab ID			FF55	FF57	FF59	FF60	FF85	FF66	FF67	FF68	FF69	FF70
PCBs/OCPs	units		Core------	------- --	Core-- ----	------- --	Core-- ---	------- --	Core-- ---	------- --	Core-- ---	------- ---
2,4'-dichlorobiphenyl (CB008)	ng/g	0.32	0.3 U	0.3 U	0.3 U	0.3 U	0.4 U	0.3 U	0.7 J	0.3 U	4.4 J	0.3 U
2,2',5-trichlorobiphenyl (CB018)	ng/g	0 69	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	11.6	0.7 U
2,4,5-trichlorobiphenyl (CB029)	ng/g	0 67	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	0.45	0.5 U	0.5 U	0 5 U	0 5 U	0.5 U	0.6 U	0.5 U	0.5 U	0.5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/g	0.72	0.1 J	0.1 J	0.7 U	0.7 U	0.6 J	0.2 J	1.2	0.7 U	20.0	1.0
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/g	0.73	0.7 U	0.7 U	0.7 U	0 7 U	1.4	0.7 U	2.8	0.7 U	8.1	0.7 U
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	0.2 J	0.2 J	0.5 U	0 5 U	0.7	0.7	1.2	0.5 U	6.9	0.5
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0.53	0.5 U	0.5 U	0 5 U	0.5 U	2.2	0.5 U	4.2	0.5 U	10.7	0.5 U
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0 59	0.6 U	0.6 U	0.6 U	0.6 U	3.5	0.6 U	4.6	0.6 U	3.3	0.6 U
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/g	0.55	0.6 U	0.6 U	0.6 U	0.6 U	1.2 J	0.6 U	1.0	0.6 U	1.6	0.6 U
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	0.6 J	0.7 U	0.7 U	0 7 U	2.0	0.7 U	3.6	0.7 U	3.1	0.7 U
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	0.6 U	0.6 U	0.6 U	0.6 U	0.8	0.6 U	0.6	0.6 U	0.7	0 6 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	0.9 J	0.4 UJ	0.4 UJ	0.4 UJ	3.7 J	0.4 UJ	3.6 J	0.4 UJ	3.6 J	0.4 UJ
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0 56	0.6 U	0.6 U	0.6 U	0.6 U	1.0 U	0.6 U	1.1 U	0.6 U	2.0 J	0.6 U
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	1.0	0.6 U	0.6 U	0.6	5.1	4.3	7.2	0.6 U	9.7	0.6
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	0.5 U	0.5 U	0.5 U	0 5 U	1.4 J	0.5 U	1.0 J	0.5 U	2.0 J	0.5 U
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	0.47	0.5 U	0.5 U	0.5 U	0.5 U	2.9	5.9 J	1.0	0.5 U	4.3	0.6
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	0.4 U	0.4 U	0.4 U	0.4 U	2.5	0.9	1.4	0.4 U	2.2	0.4 U
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	0.1 J	0.1 J	0.5 U	0.1 J	0.5	0.5 U	0.5 U	0.5 U	1.2	0.5 U
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	0.5 U	0.5 U	0.5 U	0.5 U	3.1	0.5 U	1.1	0.5 U	5.5	0.5 U
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	0.5 U	0.5 U	0.5 U	0.5 U	1.1	0.5 U	1.1	0.5 U	2.5	0.6 U
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	0.6 U	0.6 U	0 6 U	0.6 U	0.6 U	0.6 U	0.7 J	0.6 U	0.6 U	0.6 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0 51	1.0 U	1.3 U	0.5 U	0.5 U	4.8	1.4 U	0.8 U	0.7 U	2.7 U	0.7 U
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	0 5 U	0.5 U	0.5 U	0.5 U	9.3	0.9 U	0.6 U	0.5 U	3.5	0.5 U
CBs	ng/g		9	6	2	2	48	18	40	3	110	9
PCBs	ng/g		17	11	4	3	97	36	81	5	221	17

* - Coelution

MPSNOF~1

SEDIMENT CORES POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/g dry wt)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -10- COR 15-20 cm 04/07/98	OFF -10- COR 25-30 cm 04/07/98	OFF -11- COR 50-55 cm 04/07/98	OFF -11- COR 105-110 cm 04/07/98	OFF -18- COR 50-55 cm 04/07/98	OFF -18- COR 105-110 cm 04/07/98	OFF -5- COR 20-25 cm 04/27/98	OFF -5- COR 55-60 cm 04/27/98	OFF -6- COR 20-25 cm 04/27/98	OFF -6- COR 35-40 cm 04/27/98
OGL Lab ID			FF55	FF57	FF59	FF60	FF85	FF66	FF67	FF68	FF69	FF70
PCBs/OCPs	units		Core-- --	-- --	Core-- --	-- --	Core-- --	-- --	Core-- --	-- --	Core-- --	-- --
hexachlorobenzene (HCB)	ng/g	0.41	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	0.62	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
heptachlor (HEPT)	ng/g	0.47	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.8 U
aldrin (Aldrin)	ng/g	0.73	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
heptachlor epoxide (HEPT E)	ng/g	0.48	0.5 U	0.5 U	0.5 U	0.5 U	0.8	0.5 U	0.7	0.5 U	4.7	0.5 U
,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	0.78	0.8 U	0.8 U	0.8 U	0.5 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
cis-chlordane (a-CHLDA)	ng/g	0.79	0.8 U	0.8 U	0.8 U	0.8 U	0.7 J	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
trans-nonachlor (TRANSNON)	ng/g	0 75	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	0 91	0.9 U	0.9 U	0.9 U	1.0 U	9.5	0.9 U	1.1 U	0.9 U	3.1	0.9 U
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	0.85	0.9 U	0.9 U	0.9 U	0.8 U	46.2 J	0.9 U	1.1	0.9 U	2.2	0.9 U
,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	0.95	1.0 U	1.0 U	1.0 U	1.0 U	0.7 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	0.63	0.6 J	0.6 U	0.6 U	0.6 U	17.3 J	1.1 J	1.8 J	2.0 J	2.2 J	0.6 U
mirex (Mirex)	ng/g	0 55	0.6 U	0.6 U	0 6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U

Note: U-Not Detected; UJ-Detection Limit approximate; J-Quantitation approximate; Date is date collected.

* - Coelution

SEDIMENT CORES POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/g dry wt)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -5E- COR 20-25 cm 04/27/98	OFF -5E- COR 55-60 cm 04/27/98
OGL Lab ID			FF76	FF77
PCBs/OCPs	units		------- --	------- --
2,4'-dichlorobiphenyl (CB008)	ng/g	0.32	0.7 J	0.3 U
2,2',5-trichlorobiphenyl (CB018)	ng/g	0.69	1.0 U	0.7 U
2,4,5-trichlorobiphenyl (CB029)	ng/g	0.67	0.7 U	0.7 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	0 45	0.5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/g	0.72	0.8	0.7 U
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/g	0.73	0.7 U	0.7 U
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	0.7	0.5 U
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0.53	0.5 U	0.5 U
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0.59	0.6 U	0.6 U
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/g	0.55	0.6 U	0.6 U
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	0.7 U	0.7 U
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	0.6 U	0.6 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	0 4 UJ	0.4 UJ
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	0.6 U	0.6 U
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	0.6 U	0.6 U
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	0.6 J	0.5 U
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	0.47	0.5 U	0.5 U
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	1.5	0.4 U
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	0.5 U	0.5 J
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	0.5 U	0.5 U
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	0.5 U	1.0 U
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	0.6 U	0.6 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0.51	0.5 U	1.0 U
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	0.7 U	0.5 U
CBs	ng/g		10	5
PCBs	ng/g		20	9

* - Coelution

MPSNOF~1

SEDIMENT CORES POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/g dry wt)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -5E- COR 20-25 cm 04/27/98	OFF -5E- COR 55-60 cm 04/27/98
OGL Lab ID			FF76	FF77
PCBs/OCPs	units		------ ---	------ --
hexachlorobenzene (HCB)	ng/g	0.41	0.4 U	0.4 U
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	0.62	0.6 U	0.6 U
heptachlor (HEPT)	ng/g	0.47	0.5 U	0.6 U
aldrin (Aldrin)	ng/g	0.73	0.7 U	0.7 U
heptachlor epoxide (HEPT E)	ng/g	0.48	0.5 U	0.5 U
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	0.78	0.8 U	0.8 U
cis-chlordane (a-CHLDA)	ng/g	0.79	0.8 U	0.8 U
trans-nonachlor (TRANSNON)	ng/g	0.75	0.8 U	0.8 U
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	0.91	0.9 U	0.9 U
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	0.85	0.9 U	0.9 U
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	0.95	1.0 U	1.0 U
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	0.63	0.8 J	0.6 U
mirex (Mirex)	ng/g	0.55	0 6 U	0.6 U

Note: U-Not Detected; UJ-Detection Limit approximate; J-Quantitation approximate; Date is date collected.

* - Coelution

Brown & Root Environmental **INTERNAL CORRESPONDENCE**

C-Navy-7-98-1197W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397
University of Rhode Island
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

PAHs/PCBs/OCPs:/ 8 /Elutriates/
OFF-10-SUR, OFF-11-SUR, OFF-12-SUR-C, OFF-13-SUR-C,
OFF-16-SUR-C, OFF-17-SUR-C, OFF-18-SUR, OFF-20-SUR

PAHs/PCBs/OCPs:/ 7 /Sediments/
OFF-7-SUR, OFF-8-SUR, OFF-9-SUR, OFF-14-SUR,
OFF-19-SUR, OFF-23-SUR, OFF-15-SUR

Date: July 2, 1998

Brown and Root (B&R) Environmental performed tier II data validation on the polycyclic aromatic hydrocarbon (PAH) compounds, polychlorinated biphenyl (PCB) compounds and organo-chlorine pesticide (OCP) compounds data from Project 7397, elutriate and sediment samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The samples were analyzed according to URI/GSO Standard Operating Procedures 2.04.002 (PAHs) and 2.04.003 (PCBs/OCPs). The data were evaluated based on data completeness; calibrations; laboratory blank results and internal standard recoveries only. The laboratory did not perform matrix spike recoveries, laboratory duplicate precision, or sediment NIST standard recoveries for this data package so the data will not be evaluated for these parameters. The data validation were performed according to the Region I, EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November 1988 criteria.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted on June 15, 1998 regarding the missing quality control parameters listed above. Dr. Jim Quinn responded that the quality control parameters for matrix spike recoveries, laboratory duplicate precision, or sediment NIST standard recoveries would be included in the next data package due July 7, 1998.

Calibrations

PAHs

The following tables summarize the polycyclic aromatic hydrocarbons continuing calibration (CC) compounds which failed to meet the calibration criteria of %D <25:

			Action		Affected Samples
Compound	CC 4/17/98	CC 4/27/98	(+)	NDs	
Chrysene	%D = 49		J		OFF-7-SUR
Dibenz[a,h] anthracene		%D = 94.5	J		OFF-17-SUR-C

The positive results for chrysene and dibenz[a,h]anthracene are qualified as estimated (J) in affected samples.

		Action		Affected Samples
Compound	CC 5/1/98	(+)	NDs	
Chrysene	%D = 25.2	J		OFF-13-SUR-C, OFF-18-SUR, OFF-20-SUR
Indeno[1,2,3-cd] pyrene	%D = 39.3	J		OFF-13-SUR-C, OFF-18-SUR, OFF-20-SUR
Dibenz[a,h] anthracene	%D = 62.7	J		OFF-13-SUR-C, OFF-18-SUR, OFF-20-SUR

The positive results for chrysene, indeno[1,2,3-cd]pyrene and dibenz[a,h]anthracene are qualified as estimated (J) in affected samples.

Blanks

The following contaminants at the maximum concentrations were found in the laboratory and field blanks associated with the sediment samples:

Compound	Maximum Concentration	Action Level
2,4'-dichlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',5-trichlorobiphenyl	0.1 ng/g	0.5 ng/g
2,4,5-trichlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',5,5'-tertachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',3,5-tetrachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,3',4,4'-tetrachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',4,5,5'-pentachlorobiphenyl	0.3 ng/g	1.5 ng/g
2,2',3,4,5'-pentachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',3,4',5,6,6'-heptachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,2',4,4',5,5'-hexachlorobiphenyl	0.1 ng/g	0.5 ng/g
2,3,3',4,4'-pentachlorobiphenyl	0.3 ng/g	1.5 ng/g
2,2',3,4,4',5'-hexachlorobiphenyl	0.2 ng/g	1.0 ng/g
3,3',4,4',5-pentachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',3,4',5,5',6-heptachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',3,3',4,4'-hexachlorobiphenyl	0.2 ng/g	1.0 ng/g
2,2',3,3',4,4',5-heptachlorobiphenyl	0.3 ng/g	1.5 ng/g
2,2',3,3',4,4',5,6-octtachlorobiphenyl	0.6 ng/g	3.0 ng/g
hexachlorobenzene	0.1 ng/g	0.5 ng/g
heptachlor epoxide	0.1 ng/g	0.5 ng/g
o,p'-DDE	0.2 ng/g	1.0 ng/g
p,p'-DDE	0.1 ng/g	0.5 ng/g
p,p'-DDD	0.1 ng/g	0.5 ng/g
o,p'-DDT	0.1 ng/g	0.5 ng/g
biphenyl	1.8 ng/g	9.0 ng/g
phenanthrene	0.9 ng/g	4.5 ng/g
benzo(a)anthracene	0.5 ng/g	2.5 ng/g
chrysene/triphenylene	1.9 ng/g	9.5 ng/g
benzo(b+j+k)fluoranthene	4.0 ng/g	20 ng/g
benzo(e)pyrene	1.3 ng/g	6.5 ng/g
benzo(a)pyrene	2.3 ng/g	11.5 ng/g
perylene	0.7 ng/g	3.5 ng/g
indeno[1,2,3-cd]pyrene	1.7 ng/g	8.5 ng/g
dibenzo[a,h+a,c]anthracene	3.3 ng/g	16.5 ng/g
benzo[ghi]perylene	0.9 ng/g	4.5 ng/g

Blank actions are taken for most of the above compounds in affected samples.

The following contaminants at the maximum concentrations were found in the laboratory blank associated with the elutriate samples:

2,2',5-trichlorobiphenyl	0.1 ng/L	0.5 ng/L
2,4,5-trichlorobiphenyl	0.1 ng/L	0.5 ng/L
2,4,4'-trichlorobiphenyl	0.2 ng/L	1.0 ng/L
2,2',5,5'-tertachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,5-tetrachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,3',4,4'-tetrachlorobiphenyl	0.4 ng/L	2.0 ng/L
2,2',4,5,5'-pentachlorobiphenyl	0.6 ng/L	3.0 ng/L
2,2',3,4,5'-pentachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,3',4,4',5-pentachlorobiphenyl	0.2 ng/L	1.0 ng/L
2,2',3,4',5,6,6'-heptachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',4,4',5,5'-hexachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,3,3',4,4'-pentachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,4,4',5'-hexachlorobiphenyl	0.5 ng/L	2.5 ng/L
3,3',4,4',5-pentachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,4',5,5',6-heptachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,3',4,4'-hexachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,3',4,5,6,6'-octachlorobiphenyl	0.1 ng/L	0.5 ng/L
2,2',3,3',4,4',5,6-octachlorobiphenyl	0.7 ng/L	3.5 ng/L
hexachlorobenzene	0.1 ng/L	0.5 ng/L
o,p'-DDE	0.2 ng/L	1.0 ng/L
cis-chlordane	0.1 ng/L	0.5 ng/L
p,p'-DDE	0.1 ng/L	0.5 ng/L
p,p'-DDD	0.1 ng/L	0.5 ng/L
p,p'-DDT	0.1 ng/L	0.5 ng/L
biphenyl	4.4 ng/L	22 ng/L
phenanthrene	2.2 ng/L	11 ng/L
fluoranthene	0.4 ng/L	2.0 ng/L
pyrene	0.3 ng/L	1.5 ng/L
benzo(b+j+k)fluoranthene	12.1 ng/L	60.5 ng/L
benzo(e)pyrene	5.8 ng/L	29.5 ng/L
benzo(a)pyrene	3.5 ng/L	17.5 ng/L
perylene	3.3 ng/L	16.5 ng/L
indeno[1,2,3-cd]pyrene	18.3 ng/L	91.5 ng/L
dibenzo[a,h+a,c]anthracene	10.3 ng/L	51.5 ng/L
benzo[ghi]perylene	24.7 ng/L	123.5 ng/L

Blank actions are taken for most of the above compounds in affected samples.

Int rnal Standard Performance

The following internal standard areas did not meet the acceptable quality control percent recovery:

INTERNAL STANDARD	% RECOVERY	QC Range	Action (+)	Action NDs	Affected Samples
Naphthalene-d8	29%	30-130%	J	UJ	OFF-13-SUR-C
Benzo[a]pyrene-d12	22%	30-130%	J		OFF-12-SUR-C
Benzo[a]pyrene-d12	11%	30-130%	J		OFF-16-SUR-C
Benzo[a]pyrene-d12	16%	30-130%	J		OFF-17-SUR-C
Benzo[a]pyrene-d12	27%	30-130%	J		OFF-18-SUR

The positive and non-detected results for the compounds quantitated using the internal standards with a percent recovery outside the QC range are qualified as estimated (J and UJ) in the affected samples.

Overall Assessment

The results should be used as qualified. Blank actions were taken for several compounds in affected samples. The positive results for chrysene, dibenz[a,h]anthracene and indeno[1,2,3-cd]pyrene are estimated in several samples due to a continuing calibration %D >25. Compounds associated with naphthalene-d8 are estimated in sample OFF-13-SUR-C due to poor internal standard percent recovery. Compounds associated with benzo[a]pyrene-d12 are estimated in samples OFF-12-SUR-C, OFF-16-SUR-C, OFF-17-SUR-C and OFF-18-SUR due to poor internal standard percent recovery.

NOTE: Several analytes in several samples are qualified as estimated, (J) due to laboratory reported analytical interference with the analyte. They include 2,4,4'-trichlorobiphenyl, 2,2',5,5'-tertrachlorobiphenyl, 2,2',3,5-tetrachlorobiphenyl, 2,3,3',4,4'-pentachlorobiphenyl, 2,2',3,3',4,4',5,6-octachlorobiphenyl, 2,2',3,3',4,5,6,6'-octachlorobiphenyl and mirex.

Attachments
cc: File 7397-4.10

ELUTRIATE POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) ANALYSIS
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF -10- SUR 4/3/98	OFF -11- SUR 4/3/98	OFF -12- SUR -C 4/3/98	OFF -13- SUR -C 4/3/98	OFF -16- SUR -C 4/3/98	OFF -17- SUR -C 4/3/98	OFF -18- SUR 4/3/98	OFF -20- SUR 4/3/98
OGL Lab ID			FF09	FF10	FF11	FF12	FF13	FF14	FF15	FF16
PAHs	units		Elutriate--	------- -----	-------- -----	------- -----	------- -----	------- -----	------- -----	------- -->
* naphthalene (NAP)	ng/L	6.6	17.9	15.6	24.9	6.6 UJ	11.5	9.5	6.6 U	6.6 U
* 2-methylnaphthalene (2MN)	ng/L	8.7	7.2 J	8.2 J	23.4	14.2 J	4.8 J	5.8 J	5.2 J	1.1 J
1-methylnaphthalene (1MN)	ng/L	15.9	13.2 J	16.6	16.2	13.1 J	6.2 J	8.1 J	4.3 J	2.2 J
biphenyl (BIP)	ng/L	10.6	10.6 U	10.6 U	10.6 U	10.6 UJ	10.6 U	10.6 U	10.6 U	10.6 U
2,6- dimethylnaphthalene (DMN)	ng/L	5.7	9.3	14.4	19.9	12.5 J	6.2	4.8 J	5.2 J	1.4 J
* acenaphthylene (ACL)	ng/L	8.3	11.0	9.4	8.3 J	14.8	3.2 J	3.5 J	6.7 J	1.4 J
* acenaphthene (ACT)	ng/L	8.1	3.3 J	5.0 J	29.0	5.4 J	2.7 J	1.5 J	3.4 J	8.1 U
2,3,5-trimethylnaphthalene (TMN)	ng/L	5.7	0.8 J	0.4 J	2.2 J	1.3 J	5.7 U	1.0 J	0.6 J	5.7 U
* fluorene (FLU)	ng/L	4.2	5.4	6.4	23.2	6.1	2.2 J	3.1 J	4.8	0.9 J
* phenanthrene (PHE)	ng/L	2.8	16.0	13.9	42.5	16.2	6.7 U	9.4 U	16.0	4.5 U
* anthracene (ANT)	ng/L	1.9	11.7	10.8	42.0	21.2	3.7	6.8	13.4	1.4 J
1-methylphenanthrene (1MP)	ng/L	4.5	2.6 J	2.0 J	4.5 U	4.5 U	1.2 J	4.5 U	4.5 U	1.2 J
† fluoranthene (FLA)	ng/L	4.4	38.6	41.1	55.1	39.7	15.1	26.5	60.0	12.1
† pyrene (PYR)	ng/L	5.4	39.8	42.3	191	100	23.1	41.8	80.7	13.8
† benzo (a) anthracene (BAA)	ng/L	7.0	14.4	11.7	20.1	39.7	5.2 J	10.8	30.1	6.0 J
† chrysene/triphenylene (CHR)	ng/L	10.7	20.9	17.5	27.1	17.3 J	5.0 J	8.1 J	16.2 J	2.9 J
benzo (b+j+k) fluoranthene (BBF)	ng/L	13.3	66.5	61.1	191 J	141	38.9 UJ	172 J	162 J	34.8 U
benzo (e) pyrene (BEP)	ng/L	8.5	35.2	34.5	115 J	90.2	22.0 UJ	99.5 J	87.2 J	18.1 U
† benzo (a) pyrene (BAP)	ng/L	5.7	21.2	23.3	57.1 J	41.4	13.3 UJ	39.6 J	41.2 J	10.7 U
perylene (PER)	ng/L	6.1	6.1 U	6.7 U	7.8 UJ	10.6 U	6.1 UJ	21.5 J	15.3 UJ	6.1 U
indeno [1,2,3-cd] pyrene (INP)	ng/L	7.4	28.3 U	28.1 U	78.3 UJ	52.7 UJ	15.4 UJ	120 J	79.4 UJ	38.5 UJ
† dibenzo [a,h] anthracene (DBA)	ng/L	9.5	9.6 U	9.5 U	21.2 UJ	17.2 UJ	9.5 UJ	54.3 J	52.4 J	36.5 UJ
benzo [ghi] perylene (BPE)	ng/L	4.6	45.1 U	40.7 U	119 UJ	97.7 U	25.0 UJ	225 J	117 UJ	39.8 U
Sum PAHs (NOAA Status &Trends)	ng/L		428	423	1120	761	222	881	807	233
Sum PAHs (7 Low Molecular Weight *)	ng/L		73	69	193	78	35	40	50	9
Sum PAHs (6 High Molecular Weight †)	ng/L		145	145	372	255	66	181	281	82

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) ANALYSIS
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -7- SUR 3/27/98	OFF -8- SUR 4/7/98	OFF -9- SUR 4/7/98	OFF -14- SUR 4/7/98	OFF -19- SUR 4/7/98	OFF -23- SUR 4/3/98	OFF -15- SUR 4/7/98
OGL Lab ID			FF02	FF03	FF04	FF05	FF07	FF08	FF19
PAHs	units		Sediment----	--------- -----	--------- -----	--------- -----	--------- -----	--------- -----	--------- -->
* naphthalene (NAP)	ng/g	3.6	70 0	22.8	4.3	20.6	53.3	41.6	11 3
* 2-methylnaphthalene (2MN)	ng/g	3.6	54.9	14.4	3.1 J	15.5	31.5	43.4	9.5
1-methylnaphthalene (1MN)	ng/g	7.1	34.6	11.0	1.7 J	9.4	18.9	27.8	4.6 J
biphenyl (BIP)	ng/g	6.4	14.7	6.4 U	6.4 U	6.4 U	18.2	12.8	6.4 U
2,6- dimethylnaphthalene (DMN)	ng/g	8.6	59.8	24.5	12 4	15.6	54.3	38.6	7.3 J
* acenaphthylene (ACL)	ng/g	4 6	169	18.5	5.7	25.2	40.6	77 5	11.9
* acenaphthene (ACT)	ng/g	8.2	120	34 0	4 1 J	11.4	43.8	89.5	5.1 J
2,3,5-trimethylnaphthalene (TMN)	ng/g	4.8	17.7	2.3 J	0 4 J	2.6 J	3.6 J	8.2	0.8 J
* fluorene (FLU)	ng/g	7.0	160	34.7	5.3 J	17.2	51.3	106	7.6
* phenanthrene (PHE)	ng/g	10.0	1320	261	46.3	130	294	770	87.4
* anthracene (ANT)	ng/g	8.4	393	70.1	11.3	51.8	104	348	35.0
1-methylphenanthrene (1MP)	ng/g	6.2	104	22.0	4 4 J	20.1	20.2	49.9	11.4
† fluoranthene (FLA)	ng/g	9.2	2190	455	117	308	542	1560	185
† pyrene (PYR)	ng/g	7.6	2120	401	102	344	523	1420	187
† benzo (a) anthracene (BAA)	ng/g	7.7	1160	214	57 3	216	316	616	106
† chrysene/triphenylene (CHR)	ng/g	9.9	519 J	196	59.6	190	277	540	87.3
benzo (b+j+k) fluoranthene (BBF)	ng/g	8.8	2850	411	152	457	618	1540	366
benzo (e) pyrene (BEP)	ng/g	6.0	966	161	58 4	213	234	688	140
† benzo (a) pyrene (BAP)	ng/g	3.0	1330	218	76.1	255	322	758	103
perylene (PER)	ng/g	2.7	363	60.4	21.4	79.4	85.6	205	32.9
indeno [1,2,3-cd] pyrene (INP)	ng/g	4.7	968	136	48.1	172	195	511	116
† dibenzo [a,h] anthracene (DBA)	ng/g	2.8	293	41.5	13.6 U	52.2	57.4	179	44.0
benzo [ghi] perylene (BPE)	ng/g	4.7	1020	141	52.5	195	201	700	100
Sum PAHs (NOAA Status &Trends)	ng/g		16300	2960	858	2800	4110	10300	1660
Sum PAHs (7 Low Molecular Weight *)	ng/g		2280	456	80	271	619	1480	168
Sum PAHs (6 High Molecular Weight †)	ng/g		7620	1530	425	1360	2040	5080	712

ELUTRIATE POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF - 10- SUR 4/3/98	OFF - 11- SUR 4/3/98	OFF - 12- SUR -C 4/3/98	OFF - 13- SUR C 4/3/98	OFF - 16- SUR C 4/3/98	OFF - 17- SUR C - 4/3/98	OFF - 18- SUR 4/3/98	OFF - 20- SUR 4/3/98
OGL Lab ID			FF09	FF10	FF11	FF12	FF13	FF14	FF15	FF16
PCBs/OCPs	units		Elutriate---	-------- ----	-------- ----	-------- ----	-------- ----	-------- ----	-------- ----	-------- --
2,4'-dichlorobiphenyl (CB008)	ng/L	2.35	2.4 U	2.4 U	0.6 J	0.5 J	0.4 J	0.3 J	2.4 U	0.3 J
2,2',5-trichlorobiphenyl (CB018)	ng/L	2.87	2.9 U	2.9 U	0.8 J	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
2,4,5-trichlorobiphenyl (CB029)	ng/L	2.25	2.3 U	2.3 U	2.3 U	0.5 J	2.3 U	2.3 U	2.3 U	2.3 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/L	2.89	0.5 J	0.6 J	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	0.2 J
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/L	1.50	1.8 J	1.8 J	1.2 J	1.1 J	1.5 U	1.5 U	1.5 U	1.5 U
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/L	2.69	0.8 J	0.9 J	1.3 J	1.2 J	2.7 U	2.7 U	1.2 J	0.5 J
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/L	1.57	0.9 J	0.6 J	1.0 J	1.1 J	0.6 J	1.6 U	1.6 U	1.6 U
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/L	1.44	1.5 U	1.7 U	2.7	1.9 U	1.4 U	1.4 U	2.0	1.4 U
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/L	1.67	1.7 U	1.7 U	3.4	2.6 U	1.7 U	1.7 U	2.5 U	1.7 U
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/L	1.17	1.2 U	0.5 J	0.8 J	0.9 J	1.2 U	1.2 U	0.6 J	1.2 U
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/L	1.02	1.1	1.2	2.0	2.1	1.0 U	1.0 U	1.8	1.0 U
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/L	1.41	0.9 J	1.4 U	1.0 J	1.0 J	1.4 U	1.4 U	0.7 J	1.4 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/L	1.24	2.1	1.7	3.8	3.9	1.4	1.1 J	2.9	1.1 J
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/L	1.02	0.9 J	0.6 J	1.2 J	1.7 J	1.3 J	1.0 U	1.2 J	0.9 J
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/L	0.93	2.0 U	1.9 U	3.7	4.4	2.3 U	1.8 U	2.8	1.3 U
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/L	1.28	0.9 J	1.3 U	0.8 J	2.7	0.5 J	3.9	0.7 J	1.2 J
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/L	0.89	0.8 J	0.7 J	1.8	1.9	1.4	0.8 J	1.4	0.7 J
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/L	1.10	1.2	0.9 J	0.9	2.2	1.2	0.8 J	1.0 J	0.7 J
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/L	0.57	0.5 J	0.6 U	0.7 J	1.3	0.6 U	0.7 J	0.5 J	0.6 U
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/L	0.70	1.2	1.3	3.0	2.5	1.9	1.1	2.3	2.2
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/L	1.22	1.2 J	0.6 J	1.3	1.0 J	1.4	0.4 J	1.2	1.4
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/L	1.05	1.0 U	0.6 J	0.9 J	1.1 U	2.4 U	1.1 U	1.9 U	1.1 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/L	1.39	0.4 J	0.7 J	2.4	1.3 J	1.0 J	1.1 J	1.6	1.1 J
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/L	1.13	0.9 J	0.9 J	2.2	2.0	1.2 J	1.8	1.3	1.1 U
CBs	ng/L		23	20	38	40	22	20	29	16
PCBs	ng/L		45	41	76	39	45	41	57	31

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ELUTRIATE POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Aqueous	OFF - 10-SUR 4/3/98	OFF - 11-SUR 4/3/98	OFF - 12-SUR -C 4/3/98	OFF - 13-SUR C 4/3/98	OFF - 16-SUR C 4/3/98	OFF - 17-SUR C - 4/3/98	OFF - 18-SUR 4/3/98	OFF - 20-SUR 4/3/98
OGL Lab ID			FF09	FF10	FF11	FF12	FF13	FF14	FF15	FF16
PCBs/OCPs	units		Elutriate---	-------- ----	-------- ----	-------- ----	-------- ----	-------- ----	-------- ----	-------- --
hexachl robenzene (HCB)	ng/L	3.79	0.5 J	3.8 U	2.4 J	0.7 J	3.8 U	0.9 J	2.5 J	3.8 U
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/L	1.81	1.8 U	0.9 J	1.5 J	1.8 U	0.3 J	1.8 U	1.8 U	1.8 U
heptachl r (HEPT)	ng/L	1.19	0.1 J	0.1 J	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	0.2 J
aldrin (Aldrin)	ng/L	3.29	0.1 J	0.3 J	3.3 U	0.1 J	3.3 U	3.3 U	3.3 U	3.3 U
heptachlor epoxide (HEPT E)	ng/L	2.88	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/L	1.79	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U
cis-chl rdane (a-CHLDA)	ng/L	1.94	1.9 U	1.9 U	0.8 J	1.3 J	0.5 J	0.6 J	0.7 J	1.9 U
trans-nonachlor (TRANSNON)	ng/L	1.74	0.3 J	0.3 J	1.7 U	1.6 J	0.9 J	0.6 J	0.9 J	0.4 J
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/L	2.41	0.7 J	0.9 J	3.4	3.2	0.6 J	1.2 J	2.3 J	2.4 U
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/L	2.40	2.5	1.8 J	9.2	8.8	3.0	1.8 J	5.1	0.8 J
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/L	2.86	0.3 J	2.9 U	0.4 J	2.9 U	2.9 U	2.9 U	0.3 J	2.9 U
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/L	3.72	1.0 J	0.8 J	1.3 J	2.7 J	6.9	0.8 J	2.8 J	3.8
mirex (Mirex)	ng/L	2.06	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U

SEDIMENT POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -7- SUR 3/27/98	OFF -8- SUR 4/7/98	OFF -9- SUR 4/7/98	OFF -14- SUR 4/7/98	OFF -19- SUR 4/7/98	OFF -23- SUR 4/3/98	OFF 15- SUR 4/7/98
OGL Lab ID			FF02	FF03	FF04	FF05	FF07	FF08	FF19
PCBs/OCPs	units		Sediment---	-------- -----	-------- -----	-------- -----	-------- -----	-------- -----	-------- -->
2,4'-dichlorobiphenyl (CB008)	ng/g	0.32	0.3 U	0.3 U	0.3 U	0.5 U	8.5	0.6 U	0.3 U
2,2',5-trichlorobiphenyl (CB018)	ng/g	0.69	0.6 J	0.7 U	0.7 U	1.1	1.3 J	0.7 U	0.7 U
2,4,5-trichlorobiphenyl (CB029)	ng/g	0.67	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	0.45	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028/050)*	ng/g	0.72	1.0	0.3 J	0.5 J	0.9	0.4 J	1.5	0.3 J
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/g	0.73	1.4	0.7 U	0.7 U	1.1	0.9 UJ	1.4	0.7 U
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	1.9	0.5 U	0.5 U	0.6	1.1 J	1.1	0.5 U
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0.53	3.3	1.1	0.5 UJ	2.2	2.3	2.7	0.9 U
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0.59	2.7	1.1 U	0.6 U	2.2	1.8	2.9	0.9 U
2,2',3,4,5'-pentachlorobipehenyl (CB087)	ng/g	0.55	1.0	0.6 U	0.6 U	0.6 U	0.5 J	1.1	0.6 U
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	2.3	1.1	0.5 J	2.3	1.4	2.7	0.8
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	0.7	0.5 J	0.6 U	0.8	0.5 J	1.0	0.6 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	3.5	2.0	1.0	3.4	2.4	4.2	1.7
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	1.3 UJ	0.6 U	0.6 U	0.9 UJ	0.6 U	1.7 J	0.6 U
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	5.2	2.4	1.0	3.1	3.0	7.6	1.7
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	0.8 U	0.5 UJ	0.5 U	1.1	0.7 U	2.0	0.5 UJ
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	0.47	1.6	0.9 U	0.6 U	1.8	1.1	3.1	0.7 U
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	1.0	0.6 U	0.4 UJ	0.8 U	0.5 U	2.3	0.4 UJ
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	0.4 J	0.4 J	0.3 J	0.4 J	0.6	1.1	0.4 J
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	2.5	1.2	0.7	1.6	1.8	3.4	1.1
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	1.2 U	0.9 U	0.5 UJ	0.9 U	0.9 U	2.1	0.6 U
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	1.5 UJ	0.6 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0.51	0.6	0.8	0.4 J	1.0	0.8	1.2	0.7
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	0.8	0.8	0.3 J	1.2	0.9	1.5	0.6
CBs	ng/g		35	17	9	28	32	47	14
PCBs	ng/g		69	33	19	57	65	94	27

SEDIMENT POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Chain of Custody		MDL Sed.	OFF -7- SUR 3/27/98	OFF -8- SUR 4/7/98	OFF -9- SUR 4/7/98	OFF -14- SUR 4/7/98	OFF -19- SUR 4/7/98	OFF -23- SUR 4/3/98	OFF 15- SUR 4/7/98
OGL Lab ID			FF02	FF03	FF04	FF05	FF07	FF08	FF19
PCBs/OCPs	units		Sediment---	-------- -----	-------- -----	-------- -----	-------- -----	-------- -----	-------- -->
hexachlorobenzene (HCB)	ng/g	0.41	0.4 U	0.4 U	0.4 U	0.4 U	0.9	0.5	0.4 U
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	0.62	0.2 J	0.3 J	0.1 J	0.6 U	0.9	0.6 U	0.5 J
heptachlor (HEPT)	ng/g	0.47	0.3 J	0.5 U	0.5 U	0.2 J	0.5 U	0.5 U	0.1 J
aldrin (Aldrin)	ng/g	0.73	0.7 U	0.1 J	0.7 U	0.7 U	0.2 J	0.7 U	0.7 U
heptachlor epoxide (HEPT E)	ng/g	0.48	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	0.78	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
cis-chlordane (a-CHLDA)	ng/g	0.79	0.7 J	0.1 J	0.1 J	0.2 J	0.8	0.8 J	0.1 J
trans-nonachlor (TRANSNON)	ng/g	0.75	0.8	0.2 J	0.1 J	0.4 J	0.7 J	1.2	0.2 J
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	0.91	3.1	0.7 J	0.9 U	0.9 J	1.2	3.2	0.5 J
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	0.85	3.8	0.8 J	0.9 U	1.4	1.1	7.3	0.6 J
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	0.95	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.8	1.0 U
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	0.63	2.7	1.1	0.8	2.0	1.8	4.1	0.8
mirex (Mirex)	ng/g	0.55	0.4 J	0.6 U	0.6 U	0.4 J	0.6 U	1.1 J	0.4 J

TETRA TECH NUS, INC.

INTERNAL CORRESPONDENCE

C-Navy-9-98-1248W

To: Stephen Parker

cc: File N7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397
University of Rhode Island
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals:/35/Sediments/
OFF-1-SUR, OFF-2-SUR, OFF-3-SUR, OFF-4-SUR,
OFF-5-SUR, OFF-5(20-25), OFF5(55-60), OFF-5E(20-25),
OFF-5E(55-60), OFF-6-SUR, OFF-6(20-25), OFF-6(35-40), OFF-7-SUR,
OFF-8-SUR, OFF-9-SUR, OFF-10-SUR, OFF-10(15-20), OFF-10(25-30),
OFF-11-SUR, OFF-11(50-55), OFF-11(105-110), OFF-12-SUR,
OFF-13-SUR, OFF-14-SUR, OFF-15-SUR, OFF-16-SUR,
OFF-17-SUR, OFF-18-SUR, OFF-18(50-55), OFF-18(105-110),
OFF-19-SUR, OFF-20-SUR, OFF-21-SUR, OFF-22-SUR, OFF-23-SUR

Date: September 23, 1998

Tetra Tech NUS (TtNUS) formerly Brown and Root Environmental (B&RE) performed tier II data validation on the trace metals data from Project 7397, sediment samples collected by Science Applications International Corporation at the Old Fire Fighting Training Area site. The trace metals samples were analyzed by University of Rhode Island according to URI/GSO Standard Operating Procedure ERL-N SOP 2.03.008. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory duplicat precision; matrix spike recoveries and internal standards recoveries.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. On September 17, 1998 the laboratory was contacted regarding several questions about the data. The unit of measurement for the batch blanks was requested and it was stated that the batch blanks were reported in ug/L. Sample storage was also discussed and the laboratory stated that the samples were stored at 0 degrees celcius until being frozen at -20 degrees celcius.

Blanks

The following table summarizes the level of blank contamination detected in the trace metals procedural blanks affecting the samples:

Compound	Type of Blank	Maximum Concentration	Action Level (µg/g)
Nickel	procedural	2.4 µg/g	12.0
Zinc	procedural	21.3 µg/L	106.5

Nickel and zinc were detected in the trace metals procedural blanks associated with these samples. The positive nickel and zinc results below the action level are qualified, (U). Blank actions were applied to nickel and zinc results in affected samples.

Standard Reference Material Recoveries

The percent recoveries (%Rs) for silver, arsenic, iron and aluminum were outside the 75-125% quality control criteria for the standard reference materials (SRMs) PACS-1 and SRM 2711. The positive results for iron and aluminum, and the positive and non-detected results for arsenic and silver are qualified as estimated (J and UJ), respectively.

Overall Assessment

The results should be used as qualified. Blank actions were taken for nickel and zinc in affected trace metals samples. The positive results for iron and aluminum and the positive and non-detected results for arsenic and silver are estimated due to poor SRM recoveries.

Attachments
cc: File N7397-4.10

SEDIMENT TRACE METALS ANALYSES (ug/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

STATION	DESCRIPTION	Interval (cm)	Collection Date	Aluminum		Arsenic		Cadmium	Chromium	Copper	Iron		Lead	Mercury		Manganese	Nickel		Silver		Zinc	
OFF-1	Surface	0-15	3/27/98	21671.8	J	6.3	J	0.31	31.1	58.3	24310.0	J	131.4	0.371		353.6	34.0		0.46	J	156.4	
OFF-2	Surface	0-15	3/27/98	26983.7	J	8.0	J	0.14	36.6	23.7	29486.5	J	90.2	0.081		302.2	26.2		0.13	U	314.8	
OFF-3	Surface	0-15	3/27/98	23218.6	J	3.6	J	0.18	26.5	12.3	22871.7	J	60.1	0.050	U	387.4	22.2		0.13	U	100.8	U
OFF-4	Surface	0-15	3/27/98	16491.8	J	4.3	J	0.06	24.3	31.4	22907.6	J	95.5	0.050	U	369.0	20.2		0.13	U	106.0	
OFF-5	Surface	0-15	3/27/98	16256.3	J	3.6	J	0.23	27.4	16.9	17649.2	J	138.7	0.050	U	166.8	19.0		0.13	U	79.8	U
OFF-5	Core	20-25	4/27/98	25226.7	J	4.9	J	0.55	17.6	13.5	21741.8	J	59.8	0.071		282.0	22.8		0.13	U	105.2	U
OFF-5	Core	55-60	4/27/98	32802.5	J	5.3	J	1.29	29.5	5.7	22845.6	J	12.2	0.050	U	345.0	24.5		0.13	U	53.7	U
OFF-5E	Core	20-25	4/27/98	15734.0	J	7.3	J	0.11	19.7	6.0	11871.7	J	13.2	0.062		179.9	16.6		0.13	U	35.5	U
OFF-5E	Core	55-60	4/27/98	26601.5	J	4.6	J	0.10	23.2	2.5	13658.9	J	14.6	0.050	U	262.6	15.7		0.13	U	29.5	U
OFF-6	Surface	0-15	3/27/98	22706.9	J	4.1	J	0.15	23.0	11.0	19992.8	J	47.2	0.050	U	257.5	19.3		0.13	U	105.7	U
OFF-6	Core	20-25	4/27/98	24964.6	J	7.5	J	0.68	35.3	42.0	23113.2	J	156.3	0.176		285.1	24.8		0.19	J	267.1	
OFF-6	Core	35-40	4/27/98	26685.6	J	3.7	J	0.14	29.7	6.6	18709.0	J	18.7	0.050	U	211.9	21.6		0.13	U	75.8	U
OFF-7	Surface	0-15	3/27/98	21885.3	J	6.8	J	0.29	43.1	32.8	27506.2	J	294.0	0.119		331.6	28.1		0.18	J	155.5	
OFF-8	Surface	0-15	4/7/98	27137.0	J	4.3	J	0.19	42.3	11.0	21704.3	J	37.9	0.148		356.2	15.8		0.17	J	93.4	U
OFF-9	Surface	0-15	4/7/98	26673.4	J	4.3	J	0.11	38.6	6.9	24714.0	J	25.2	0.050	U	515.8	18.3		0.13	U	79.9	U
OFF-10	Surface	0-15	4/3/98	26243.8	J	3.4	J	0.15	32.1	9.8	17984.9	J	27.3	0.070		357.1	12.5		0.13	U	53.3	U
OFF-10	Core	15-20	4/7/98	28365.8	J	2.9	J	0.18	30.1	9.0	18630.6	J	17.1	0.070		409.5	14.1		0.13	U	60.6	U
OFF-10	Core	25-30	4/7/98	32370.2	J	3.3	J	0.07	39.2	7.7	21863 5	J	16.9	0.073		252.6	19.7		0.13	U	48.5	U
OFF-11	Surface	0-15	4/3/98	19537.4	J	2.7	J	0.22	30.2	9.1	14918.6	J	38.7	0.125		331.0	10.9	U	0.17	J	55.5	U
OFF-11	Core	50-55	4/7/98	25777.2	J	5.0	J	0.27	32.1	4.9	20471.9	J	11.6	0.050	U	364.0	75.8		0.13	U	257.3	
OFF-11	Core	105-110	4/7/98	28758.7	J	4.7	J	0.20	231.7	5.3	17217.0	J	12.7	0.051		290.0	12.8		0.13	U	26.3	U
OFF-12	Surface	0-15	4/3/98	35681.1	J	5.2	J	0.53	58.6	37.0	27717.3	J	114.2	0.376		368.1	21.4		0.48	J	146.5	
OFF-13	Surface	0-15	4/3/98	40998.8	J	6.0	J	0.80	73.7	80.8	33406.4	J	201.9	1.355		335.9	29.7		1.06	J	263.4	
OFF-14	Surface	0-15	4/7/98	28275.6	J	8.5	J	0.12	44.9	18.9	21879.0	J	44.6	0.196		324.0	15.9		0.23	J	96.8	U
OFF-15	Surface	0-15	4/7/98	26842.7	J	3.7	J	0.18	41.0	11.6	21010.4	J	33.1	0.100		366.5	14.2		0.19	J	73.3	U
OFF-16	Surface	0-15	4/3/98	29666.5	J	5.0	J	0.36	48.0	23.9	24706.3	J	61.2	0.208		341.6	18.2		0.44	J	101.8	U
OFF-17	Surface	0-15	4/3/98	32010.6	J	4.7	J	0.38	44.1	26.4	24563.5	J	71.4	0.225		312.4	18.7		0.40	J	125.7	
OFF-18	Surface	0-15	4/3/98	40749.6	J	6.3	J	0.69	73.6	83.5	31884.5	J	190.4	0.562		332.9	28.4		1.08	J	248.3	
OFF-18	Core	50-55	4/7/98	47170.2	J	5.6	J	1.12	79.7	84 9	33905.8	J	249.5	0.970		305.1	28.3		1.17	J	305.9	
OFF-18	Core	105-110	4/7/98	41021 5	J	6.4	J	0.50	76.4	66.2	32905.4	J	202.0	1.901		279.7	25.7		0.28	J	250.3	
OFF-19	Surface	0-15	4/7/98	37769.6	J	5.8	J	0.21	55.6	30.3	29787.1	J	56.0	0.299		362.9	24.0		0.18	J	166.3	
OFF-20	Surface	0-15	4/3/98	33977.0	J	4.2	J	0.25	52.5	19.0	28354.6	J	40 6	0.171		368.4	21.0		0.19	J	108.5	
OFF-21	Surface	0-15	4/3/98	37829.4	J	4.9	J	0.39	52.9	22.7	25992.7	J	46.2	0.112		377.9	26.9		0.16	J	143.9	
OFF-22	Surface	0-15	3/27/98	36057.5	J	3.8	J	0.19	47.8	18.3	28735.9	J	21.7	0.111		318.5	21.2		0.13	U	78.3	U
OFF-23	Surface	0-15	4/3/98	92357.6	J	4.8	J	0.43	53.2	44.7	51702.9	J	74.2	0.387		669.7	42.7		0.27	J	306.2	

NOTE: U- Not Detected; UJ- Detection Limit approximate; J- Quantitation approximate

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-Navy-7-98-1196W

To: Stephen Parker

cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397
University of Rhode Island
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

LOI/TOC:/35/Sediments/
OFF-1-SUR, OFF-2-SUR, OFF-3-SUR, OFF-4-SUR,
OFF-5-SUR, OFF-6-SUR, OFF-7-SUR, OFF-8-SUR
OFF-9-SUR, OFF-10-SUR, OFF-11-SUR, OFF-12-SUR,
OFF-13-SUR, OFF-14-SUR, OFF-15-SUR, OFF-16-SUR
OFF-17-SUR, OFF-18-SUR, OFF-19-SUR, OFF-20-SUR,
OFF-21-SUR, OFF-22-SUR, OFF-23-SUR, OFF-5:20-25,
OFF-5:55-60, OFF-5E:20-25, OFF-5E:55-60, OFF-6:20-35,
OFF-6:35-40, OFF-10:15-20, OFF-10:25-30, OFF-11:50-55,
OFF-11:105-110, OFF-18:50-55, OFF-18:105-110

SEM/AVS:/ 23 /Sediments/
OFF-1-SUR, OFF-2-SUR, OFF-3-SUR, OFF-4-SUR,
OFF-5-SUR, OFF-6-SUR, OFF-7-SUR, OFF-8-SUR
OFF-9-SUR, OFF-10-SUR, OFF-11-SUR, OFF-12-SUR,
OFF-13-SUR, OFF-14-SUR, OFF-15-SUR, OFF-16-SUR
OFF-17-SUR, OFF-18-SUR, OFF-19-SUR, OFF-20-SUR,
OFF-21-SUR, OFF-22-SUR, OFF-23-SUR

Date: July 2, 1998

Brown and Root (B&R) Environmental performed tier II data validation on the Simultaneously Extracted Metals/Acid Volatile Sulfide (SEM/AVS) and Loss on Ignition/Total Organic Carbon (LOI/TOC) data from Project 7397, sediment samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The samples were analyzed according to URI/GSO Standard Operating Procedures 1.02 (SEM/AVS) and 1.05 (LOI/TOC). The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; calibrations; laboratory blank results; laboratory duplicate precision and SEM matrix spike recoveries only.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted on June 15, 1998 regarding a typographical error for the date of the LOI/TOC analyses for several samples on the technical holding times form. The corrected technical holding times form was received at Brown and Root Environmental (B&RE) on June 30, 1998.

The calibration correlation coefficient results for the AVS analyses were also requested as they were not included in the data package. The calibration data was received at B&RE on June 19, 1998. The laboratory was questioned as to why mercury was not included in the SEM analyses and it was stated that the low results for mercury did not influence the AVS/SEM ratio and therefore mercury was no longer included in the SEM analysis.

Blanks

SEM/AVS Analysis:

The following table summarizes the level of blank contamination detected in the SEM procedural blanks affecting the samples:

Compound	Type of Blank	Maximum Concentration	Action Level (ug/g)
Cadmium	procedural	0.01 ug/g	0.05
Copper	procedural	2.6 ug/g	13.0
Nickel	procedural	1.4 ug/g	7.0
Lead	procedural	0.3 ug/g	1.5
Zinc	procedural	1.5 ug/g	7.5

Cadmium, copper, nickel, lead and zinc were detected in the SEM procedural blanks associated with these samples. The positive cadmium, copper, nickel, lead and zinc SEM results below the action level are qualified, (U). Blank actions were applied to copper and nickel results in affected samples. Blank actions for copper and nickel do not affect the SEM/AVS ratio data usability. The only SEM/AVS ratio above 1.0 for sample OFF-3-SUR is still above 1.0 after applying blank actions. The SEM/AVS ratios for all other samples are all below 1.0 and thus will be even smaller after applying blank actions for copper and nickel. Cosequently, the data results reported by the laboratory for SEM/AVS and SEM - AVS will be reported as estimated (J) in the summary data tables to indicate the possibility of a biased high SEM value due to laboratory contamination. The ratios and results may be slightly biased high.

No blanks were analyzed for LOI/TOC.

Laboratory Duplicate Precision

SEM:

The relative percent differences (RPDs) for copper, lead and zinc in the laboratory duplicate pair OFF-1-SUR/OFF-1-SURDUP and for copper and nickel in the laboratory duplicate pair OFF-10-SUR/OFF-10-SURDUP were above the 30% quality control criterion. Based on discussions with the analyst, professional judgement is used to estimate the field sample associated with the lab duplicate only due to the heterogeneity of the samples. Positive results for copper, lead and zinc are qualified as estimated, (J) in sample OFF-1-SUR. Positive results for copper and nickel are qualified as estimated, (J) in sample OFF-10-SUR. Due to these qualifications the AVS/SEM ratios and the SEM - AVS results, which are based on these results, are qualified as estimated, (J) in samples OFF-1-SUR and OFF-10-SUR.

AVS and LOI/TOC: No action required.

Overall Assessment

The results should be used as qualified. Blank actions were taken for copper and nickel in affected SEM samples. Due to this blank contamination, the corresponding AVS/SEM ratios and SEM-AVS results are qualified as estimated (J). Results may be biased high. Positive results for copper, lead, zinc and nickel are qualified as estimated, (J) in samples OFF-1-SUR and OFF-10-SUR due to poor laboratory duplicate precision. Due to these qualifications the AVS/SEM ratios and SEM - AVS results which are based on these results are qualified as estimated (J) in these two samples.

Attachments
cc: File 7397-4.10

SEDIMENT TOTAL ORGANIC CARBON/LOSS ON IGNITION ANALYSES (%)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Station	Lab #	Collection Date	Interval(cm)	% Water	Loss on Ignition	Total Organic Carbon
OFF-1	OFF-1-SUR	3/27/98	0-15	32.0	4.1	1.8
OFF-2	OFF-2-SUR	3/27/98	0-15	19.4	2.5	1.1
OFF-3	OFF-3-SUR	3/27/98	0-15	20.0	2.2	0.9
OFF-4	OFF-4-SUR	3/27/98	0-15	20.1	2.1	0.9
OFF-5	OFF-5-SUR	3/27/98	0-15	26.2	2.4	1.0
OFF-5	OFF-5: 20-25	4/27/98	20-25	17.3	1.9	0.8
OFF-5	OFF-5: 55-60	4/27/98	55-60	19.4	1.6	0.7
OFF-5 east	OFF-5E: 20-25	4/27/98	20-25	39.9	6.8	2.9
OFF-5 east	OFF-5E: 55-60	4/27/98	55-60	16.9	1.7	0.7
OFF-6	OFF-6-SUR	3/27/98	0-15	31.7	4.2	1.8
OFF-6	OFF-6: 20-35	4/27/98	20-25	22.5	3.1	1.3
OFF-6	OFF-6: 35-40	4/27/98	35-40	18.0	1.7	0.7
OFF-7	OFF-7-SUR	3/27/98	0-15	34.0	4.5	1.9
OFF-8	OFF-8-SUR	4/7/98	0-15	34.9	3.0	1.3
OFF-9	OFF-9-SUR	4/7/98	0-15	28.0	2.7	1.2
OFF-10	OFF-10-SUR	4/3/98	0-15	31.4	2.5	1.1
OFF-10	OFF-10: 15-20	4/7/98	15-20	17.1	1.6	0.7
OFF-10	OFF-10: 25-30	4/7/98	25-30	15.2	1.9	0.8
OFF-11	OFF-11-SUR	4/3/98	0-15	33.4	2.4	1.1
OFF-11	OFF-11: 50-55	4/7/98	50-55	28.7	3.1	1.3
OFF-11	OFF-11: 105-110	4/7/98	105-110	33.6	3.7	1.6
OFF-12	OFF-12-SUR	4/3/98	0-15	48.9	5.7	2.5
OFF-13	OFF-13-SUR	4/3/98	0-15	60.2	9.3	4.0
OFF-14	OFF-14-SUR	4/7/98	0-15	41.6	4.5	2.0
OFF-15	OFF-15-SUR	4/7/98	0-15	32.3	2.8	1.2
OFF-16	OFF-16-SUR	4/3/98	0-15	49.0	5.9	2.6
OFF-17	OFF-17-SUR	4/3/98	0-15	47.4	6.0	2.6
OFF-18	OFF-18-SUR	4/3/98	0-15	59.7	9.3	4.0
OFF-18	OFF-18: 50-55	4/7/98	50-55	46.5	8.3	3.6
OFF-18	OFF-18: 105-110	4/7/98	105-110	54.0	11.7	5.1
OFF-19	OFF-19-SUR	4/7/98	0-15	46.7	6.6	2.9
OFF-20	OFF-20-SUR	4/3/98	0-15	48.9	5.2	2.3
OFF-21	OFF-21-SUR	4/3/98	0-15	49.3	5.4	2.3
OFF-22	OFF-22-SUR	3/27/98	0-15	33.3	3.1	1.3
OFF-23	OFF-23-SUR	4/3/98	0-15	49.8	6.1	2.7

SEDIMENT SIMULTANEOUSLY EXTRACTED METALS (SEM) (ug/g)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Station	Collection Date	Description	Copper		Zinc		Lead		Nickel		Cadmium	
OFF-1-SUR	3/27/98	Surface	21.7	J	26.6	J	104.5	J	3.0	U	0.1	
OFF-2-SUR	3/27/98	Surface	7.4	U	35.9		44.6		2.3	U	0.1	
OFF-3-SUR	3/27/98	Surface	6.8	U	34.4		24.7		2.1	U	0.2	
OFF-4-SUR	3/27/98	Surface	26.2		33.8		105.0		7.4		0.1	
OFF-5-SUR	3/27/98	Surface	9.9	U	64.2		79.9		8.9		0.2	
OFF-6-SUR	3/27/98	Surface	11.3	U	51.9		34.8		4 5	U	0.2	
OFF-7-SUR	3/27/98	Surface	5.7	U	32.6		45.7		4.0	U	0.2	
OFF-8-SUR	4/7/98	Surface	25.2		63.8		25.2		3.8	U	0.3	
OFF-9-SUR	4/7/98	Surface	17.1		28.5		12 7		2.9	U	0.2	
OFF-10-SUR	4/3/98	Surface	13.5	J	37.4		16.3		3.7	UJ	0.2	
OFF-11-SUR	4/3/98	Surface	11.6	U	43.6		19.4		3.8	U	0.3	
OFF-12-SUR	4/3/98	Surface	5.0	U	41.3		51.6		2.4	U	0.5	
OFF-13-SUR	4/3/98	Surface	3.9	U	73.2		122.0		7.8		1.0	
OFF-14-SUR	4/7/98	Surface	26.5		83.4		31.0		6.4	U	0.2	
OFF-15-SUR	4/7/98	Surface	25.0		62.6		25.1		4.2	U	0.3	
OFF-16-SUR	4/3/98	Surface	19.3		71.3		35.1		3.1	U	0.6	
OFF-17-SUR	4/3/98	Surface	7.1	U	72.6		39.9		3.5	U	0.5	
OFF-18-SUR	4/3/98	Surface	14.0		138 8		98.6		3.3	U	1.3	
OFF-19-SUR	4/7/98	Surface	14.7		64 3		35.8		2.7	U	0.2	
OFF-20-SUR	4/3/98	Surface	18.1		76 2		26.9		4.3	U	0.4	
OFF-21-SUR	4/3/98	Surface	11.1	U	68.1		30.7		5.4	U	0.5	
OFF-22-SUR	3/27/98	Surface	14.9		66.4		8.1		2.5	U	0.1	
OFF-23-SUR	4/3/98	Surface	10.5	U	114.6		48.9		4.4	U	0.6	

SEDIMENT SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE (SEM/AVS)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

			AVS Concentration	SEM Concentration (µMole/gram dry wt)					SEM/AVS			
Station	Description	Collection Date	(µmole/gram dry wt)	Copper	Zinc	Lead	Nickel	Cadmium	ratio		SEM-AVS	
OFF-1-SUR	Surface	3/27/98	0 1 U	0.341	0.407	0.505	0 052	0.001	N/A		N/A	
OFF-2-SUR	Surface	3/27/98	0.1 U	0.117	0.549	0.215	0 040	0.001	N/A		N/A	
OFF-3-SUR	Surface	3/27/98	0 23	0.108	0.527	0.119	0.036	0.001	3.442	J	0.562	J
OFF-4-SUR	Surface	3/27/98	0.1 U	0.413	0.517	0.507	0.126	0.000	N/A		N/A	
OFF-5-SUR	Surface	3/27/98	23.82	0.156	0.982	0.386	0.152	0.002	0.070	J	-22.144	J
OFF-6-SUR	Surface	3/27/98	26 06	0 177	0 794	0 168	0 077	0.002	0.047	J	-24 841	J
OFF-7-SUR	Surface	3/27/98	38.21	0.090	0 499	0 221	0 068	0.002	0.023	J	-37 331	J
OFF-8-SUR	Surface	4/7/98	6 21	0.397	0.976	0.122	0.065	0.003	0.252	J	-4 647	J
OFF-9-SUR	Surface	4/7/98	4 44	0.269	0.435	0 061	0 049	0.001	0.184	J	-3.624	J
OFF-10-SUR	Surface	4/3/98	7.29	0.212	0 572	0.079	0 062	0.002	0.127	J	-6.363	J
OFF-11-SUR	Surface	4/3/98	13.03	0.183	0.667	0.094	0 066	0.002	0.078	J	-12.018	J
OFF-12-SUR	Surface	4/3/98	24.03	0.079	0.632	0 249	0 041	0 005	0.042	J	-23.024	J
OFF-13-SUR	Surface	4/3/98	48.59	0.062	1.120	0 589	0.132	0.009	0.039	J	-46.678	J
OFF-14-SUR	Surface	4/7/98	10.30	0.417	1.277	0.150	0.108	0.002	0.190	J	-8.347	J
OFF-15-SUR	Surface	4/7/98	7 10	0.393	0 957	0.121	0 071	0.002	0 218	J	-5.555	J
OFF-16-SUR	Surface	4/3/98	23.68	0.303	1.091	0.170	0.053	0.005	0.069	J	-22.058	J
OFF-17-SUR	Surface	4/3/98	14 13	0.111	1.110	0 192	0.060	0 005	0 105	J	-12.651	J
OFF-18-SUR	Surface	4/3/98	39.00	0.220	2 123	0 476	0 056	0.011	0 074	J	-36.114	J
OFF-19-SUR	Surface	4/7/98	17.26	0.232	0.984	0.173	0.046	0.001	0.083	J	-15.824	J
OFF-20-SUR	Surface	4/3/98	29.52	0.285	1.166	0.130	0.072	0.004	0.056	J	-27.863	J
OFF-21-SUR	Surface	4/3/98	12.93	0.175	1.042	0.148	0.091	0.004	0.113	J	-11.470	J
OFF-22-SUR	Surface	3/27/98	2 74	0.234	1 015	0.039	0.043	0.001	0 486	J	-1.408	J
OFF-23-SUR	Surface	4/3/98	32 95	0.165	1.753	0.236	0.075	0.006	0.068	J	-30.715	J

NOTE: " N/A " denotes samples where the SEM/AVS ratio could not be calculated because the AVS concentration is below the detection limit.

SEDIMENT ACID VOLATILE SULFIDE ANALYSIS (μmole/gram dry weight)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Station	Description	Collection Date	Lab #	AVS (μmole/gram dry weight)
OFF-1-SUR	Surface	3/27/98	OFF-1	0.1 U
OFF-2-SUR	Surface	3/27/98	OFF-2	0.1 U
OFF-3-SUR	Surface	3/27/98	OFF-3	0.23
OFF-4-SUR	Surface	3/27/98	OFF-4	0.1 U
OFF-5-SUR	Surface	3/27/98	OFF-5	23.82
OFF-6-SUR	Surface	3/27/98	OFF-6	26.06
OFF-7-SUR	Surface	3/27/98	OFF-7	38.21
OFF-8-SUR	Surface	4/7/98	OFF-8	6.21
OFF-9-SUR	Surface	4/7/98	OFF-9	4.44
OFF-10-SUR	Surface	4/3/98	OFF-10	7.29
OFF-11-SUR	Surface	4/3/98	OFF-11	13.03
OFF-12-SUR	Surface	4/3/98	OFF-12	24.03
OFF-13-SUR	Surface	4/3/98	OFF-13	48.59
OFF-14-SUR	Surface	4/7/98	OFF-14	10.30
OFF-15-SUR	Surface	4/7/98	OFF-15	7.10
OFF-16-SUR	Surface	4/3/98	OFF-16	23.68
OFF-17-SUR	Surface	4/3/98	OFF-17	14.13
OFF-18-SUR	Surface	4/3/98	OFF-18	39.00
OFF-19-SUR	Surface	4/7/98	OFF-19	17.26
OFF-20-SUR	Surface	4/3/98	OFF-20	29.52
OFF-21-SUR	Surface	4/3/98	OFF-21	12.93
OFF-22-SUR	Surface	3/27/98	OFF-22	2.74
OFF-23-SUR	Surface	4/3/98	OFF-23	32.95

Brown & Root Environmental **INTERNAL CORRESPONDENCE**

C-Navy-7-98-1210W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397
University of Rhode Island
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Grain Size:/35/Sediments/
OFF-1-SUR, OFF-2-SUR, OFF-3-SUR, OFF-4-SUR,
OFF-5-SUR, OFF-6-SUR, OFF-7-SUR, OFF-8-SUR
OFF-9-SUR, OFF-10-SUR, OFF-11-SUR, OFF-12-SUR,
OFF-13-SUR, OFF-14-SUR, OFF-15-SUR, OFF-16-SUR
OFF-17-SUR, OFF-18-SUR, OFF-19-SUR, OFF-20-SUR,
OFF-21-SUR, OFF-22-SUR, OFF-23-SUR, OFF-5:20-25,
OFF-5:55-60, OFF-5E:20-25, OFF-5E:55-60, OFF-6:20-35,
OFF-6:35-40, OFF-10:15-20, OFF-10:25-30, OFF-11:50-55,
OFF-11:105-110, OFF-18:50-55, OFF-18:105-110

Trace Metals:/ 23 /Elutriates/
OFF-1-SUR, OFF-2-SUR, OFF-3-SUR, OFF-4-SUR,
OFF-5-SUR, OFF-6-SUR, OFF-7-SUR, OFF-8-SUR
OFF-9-SUR, OFF-10-SUR, OFF-11-SUR, OFF-12-SUR,
OFF-13-SUR, OFF-14-SUR, OFF-15-SUR, OFF-16-SUR
OFF-17-SUR, OFF-18-SUR, OFF-19-SUR, OFF-20-SUR,
OFF-21-SUR, OFF-22-SUR, OFF-23-SUR

Date: July 16, 1998

Brown and Root Environmental (B&RE) performed tier II data validation on the grain size and trace metals data from Project 7397, sediment and elutriate samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed according to URI/GSO Standard Operating Procedure ERL-N SOP 2.03.008 and the grain size samples were analyzed according to URI/GSO Standard Operating Procedure 1.03. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory duplicate precision and matrix spike recoveries only.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted on July 10, 1998 regarding the collection dates of the field duplicate samples. The laboratory confirmed that the field duplicate samples were collected several days after the original samples due to an oversight. These samples are colocated samples and will not be compared as field duplicate samples. The sample results will not be evaluated for field duplicate precision.

The mercury analyses dates were also discussed on July 10, 1998. The laboratory discussed the collection and analysis procedures indicating that the samples were collected by a team including URI and SAIC laboratory personnel. The elutriate was mixed and centrifuged by SAIC and given to URI for trace metals analyses. The elutriates were preserved upon receipt at URI. The samples were then sent to Ceimic for mercury analysis.

The laboratory was contacted on July 14,1998 regarding several inconsistencies on the trace metals QA/QC summary forms. The corrected summary forms were received at B&RE on July 14, 1998.

Stephen Parker discussed the procedure for preparation of the elutriate samples with SAIC on July 16, 1998. No secondary chain of custody between SAIC and URI for sample transfers are available. The samples were stored unpreserved at the SAIC lab at 4 degrees Celsius for several weeks after collection due to a backlog at the URI laboratory. The samples were mixed and centrifuged at SAIC when the URI lab had availability for analyses.

Holding Times

The mercury analyses were performed after the 28-day holding time for elutriate generation for all samples. All sample results are non-detected; the non-detected results for mercury were qualified as estimated, (UJ).

Blanks

The following table summarizes the level of blank contamination detected in the trace metals procedural blanks affecting the samples:

Compound	Type of Blank	Maximum Concentration	Action Level (µg/L)
Lead	procedural	2.9 µg/L	14.5
Manganese	procedural	4.7 µg/L	23.5
Zinc	batch	9.0 µg/L	45
Arsenic	batch	5.5 µg/L	25.5

Lead and manganese were detected in the trace metals procedural blanks and zinc and arsenic were detected in the batch blanks associated with these samples. The positive lead, manganese, zinc and arsenic results below the action level are qualified, (U). Blank actions were applied to lead, manganese, zinc and arsenic results in affected samples.

Matrix Spike/Matrix Spike Duplicate

The matrix spike (MS) %R for lead in sample OFF-1-SUR did not meet the laboratory established quality control criteria of 50 - 150% recovery. No action is required since all positive lead results were qualified as non-detected due to blank contamination.

Laboratory Duplicate Precision

Trace Metals:

The relative percent differences (RPDs) for zinc in the laboratory duplicate pairs OFF-1-SUR/OFF-1-SURDUP and OFF-10-SUR/OFF-10-SURDUP were above the laboratory established 30% quality control criterion. No action is required since all positive zinc results were qualified as non-detected due to blank contamination.

Grain Size: No action required.

Overall Assessment

The results should be used as qualified. Non-detected mercury results are qualified as estimated, (UJ) due to analysis after the 28-day elutriate generation holding time. Blank actions were taken for lead, manganese, zinc and arsenic in affected trace metals samples.

Attachments
cc: File 7397-4.10

ELUTRIATE TRACE METAL ANALYSIS (μg/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Station	Description	Interval (cm)	Date Coll	Aluminum	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
OFF-1	Surface	0-15	3/27/98	48.1	10 0 U	0.2 U	0.8 U	5.3	200	3.4 U	58	0.42 UJ	8.0 U	0 5 U	13.4 U
OFF-2	Surface	0-15	3/27/98	73.2	10.0 U	0.2 U	0.8 U	6.3	672	4.2 U	71	0.42 UJ	8.0 U	0.5 U	14.6 U
OFF-3	Surface	0-15	3/27/98	20.4	10.0 U	0.2	0.8 U	4.7	527	3.5 U	348	0.42 UJ	8 0 U	0.5 U	8.3 U
OFF-4	Surface	0-15	3/27/98	55.5	10 0 U	0.3	0.8 U	37.3	72	7.2 U	371	0.42 UJ	8.0 U	0.5 U	8 0 U
OFF-5	Surface	0-15	3/27/98	156.1	10.0 U	0.2 U	1.1	3 7	335	6.9 U	21 U	0.42 UJ	8.0 U	0 5 U	13 U
OFF-6	Surface	0-15	3/27/98	126.2	26.1	0.2 U	0.8 U	2.5 U	1102	5.3 U	364	0.42 UJ	8 0 U	0.5 U	8.0 U
OFF-7	Surface	0-15	3/27/98	66 7	10.0 U	0.2	0.8 U	2.5 U	225	5.5 U	265	0.42 UJ	8 0 U	0.5 U	4.3 U
OFF-8	Surface	0-15	4/7/98	61.2	21.9 U	0.2 U	0.8 U	2.5 U	82	6.3 U	461	0.42 UJ	8.0 U	0.5 U	7.0 U
OFF-9	Surface	0-15	4/7/98	86.6	36.4	0 2 U	0.8	2.5 U	238	5.8 U	691	0.42 UJ	8.3	0.5 U	11.5 U
OFF-10	Surface	0-15	4/3/98	176.9	10.0 U	0.2 U	0.8 U	2.6	277	6.1 U	627	0.42 UJ	8.0 U	0.5 U	5.3 U
OFF-11	Surface	0-15	4/3/98	134.2	10.0 U	0 2 U	0.8 U	2.6	161	5.3 U	353	0.42 UJ	8.0 U	0.5 U	17.5 U
OFF-12	Surface	0-15	4/3/98	65.0	20.5 U	0 2 U	1.6	5.1	690	4.4 U	121	0.42 UJ	8.0 U	0 5 U	18.9 U
OFF-13	Surface	0-15	4/3/98	134.0	10.0 U	0.2 U	2.3	13.2	451	5.1 U	79	0.42 UJ	8.0 U	0.5 U	18.4 U
OFF-14	Surface	0-15	4/7/98	126 1	20.4 U	0.2	0.8 U	7.0	66	4.4 U	797	0.42 UJ	8.0 U	0.5 U	3.0 U
OFF-15	Surface	0-15	4/7/98	110.4	16.0 U	0 2	0.8	3.8	77	4.8 U	543	0.42 UJ	8.0 U	0.5 U	3.0 U
OFF-16	Surface	0-15	4/3/98	106 1	17.6 U	0.2 U	0.8 U	3.1	137	5.6 U	393	0.42 UJ	8.0 U	0.5 U	3.0 U
OFF-17	Surface	0-15	4/3/98	150 8	10.0 U	0 2 U	0.8 U	2.5 U	127	5.8 U	196	0.42 UJ	8.0 U	0.5 U	4.7 U
OFF-18	Surface	0-15	4/3/98	210	10.0 U	0.2 U	2.5	3.4	693	6.2 U	41	0.42 UJ	8.0 U	0.5 U	6.3 U
OFF-19	Surface	0-15	4/7/98	36.5	11.2 U	0.2 U	0 8 U	2.5 U	206	5.6 U	448	0.42 UJ	8.0 U	0.5 U	6.1 U
OFF-20	Surface	0-15	4/3/98	45.9	10.0 U	0.2 U	0.8 U	2.5 U	25	4.0 U	529	0.42 UJ	8.0 U	0.5 U	3.0 U
OFF-21	Surface	0-15	4/3/98	119.2	10.0 U	0.2 U	4.4	2.5 U	109	5.8 U	292	0.42 UJ	8.0 U	0.5 U	11.7 U
OFF-22	Surface	0-15	3/27/98	235.5	18.3 U	0.2 U	0.8	11.4	504	6.3 U	343	0.42 UJ	8.0 U	0.5 U	3.0 U
OFF-23	Surface	0-15	4/3/98	171	11.1 U	0.2 U	1.8	5.2	502	6.2 U	92	0.42 UJ	8.0 U	0.5	14.5 U

NOTE:

1. U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

SEDIMENT GRAIN SIZE ANALYSIS
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397
LAB: URI

Station	Description	Interval (cm)	Collection Date	% SAND	% SILT	%CLAY
OFF-1	Surface	0-15	3/27/98	96.0	3.9	0.2
OFF-2	Surface	0-15	3/27/98	97.1	2.8	0.1
OFF-3	Surface	0-15	3/27/98	95.2	4.6	0.2
OFF-4	Surface	0-15	3/27/98	98.5	1.5	0.1
OFF-5	Surface	0-15	3/27/98	97.1	2.6	0.3
OFF-5	Core	20-25	4/27/98	91.4	8.3	0.3
OFF-5	Core	55-60	4/27/98	89.6	9.9	0.5
OFF-5 (east)	Core	20-25	4/27/98	82.3	17.1	0.5
OFF-5 (east)	Core	55-60	4/27/98	81.0	18.1	0.9
OFF-6	Surface	0-15	3/27/98	94.2	5.5	0.3
OFF-6	Core	20-25	4/27/98	81.8	17.2	1.0
OFF-6	Core	35-40	4/27/98	90.6	8.6	0.8
OFF-7	Surface	0-15	3/27/98	86.7	12.7	0.6
OFF-8	Surface	0-15	4/7/98	72.8	26.7	0.4
OFF-9	Surface	0-15	4/7/98	88.1	11.5	0.4
OFF-10	Surface	0-15	4/3/98	85.7	10.7	3.7
OFF-10	Core	15-20	4/7/98	89.0	10.5	0.5
OFF-10	Core	25-30	4/7/98	94.3	5.3	0.4
OFF-11	Surface	0-15	4/3/98	87.8	11.4	0.8
OFF-11	Core	50-55	4/7/98	79.8	19.3	0.9
OFF-11	Core	105-110	4/7/98	49.8	49.9	0.3
OFF-12	Surface	0-15	4/3/98	44.2	54.7	1.0
OFF-13	Surface	0-15	4/3/98	14.5	79.5	6.1
OFF-14	Surface	0-15	4/7/98	59.1	39.7	1.3
OFF-15	Surface	0-15	4/7/98	87.3	12.2	0.5
OFF-16	Surface	0-15	4/3/98	3.3	92.8	3.9
OFF-17	Surface	0-15	4/3/98	46.2	51.6	2.3
OFF-18	Surface	0-15	4/3/98	6.9	90.4	2.7
OFF-18	Core	50-55	4/7/98	6.4	90.9	2.7
OFF-18	Core	105-110	4/7/98	6.1	90.3	3.6
OFF-19	Surface	0-15	4/7/98	1.7	48.1	50.2
OFF-20	Surface	0-15	4/3/98	1.2	38.3	60.4
OFF-21	Surface	0-15	4/3/98	1.8	47.2	51.1
OFF-22	Surface	0-15	3/27/98	0.3	8.0	91.7
OFF-23	Surface	0-15	4/3/98	1.3	44.1	54.5

APPENDIX C-2
POREWATER

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-10-98-1257W

To: Stephen Parker cc: File N7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT05
University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals: /10/Porewater/
OF-SS3, OF-SS4, OF-SS5, OF-SS6, OF-SS7, OF-SS22, OF-1SS, OF-2SS, OFF-10-SUR, OFF-11-SUR

Date: October 5, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT05, porewater samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results and matrix spike recoveries.

Data Completeness

This data validation was performed on the summary QC forms, raw data will be submitted for the internal standard and samples at a later date. The method detection limit (MDL) (U) was used by the data validator to replace the laboratory reported N/D results in the summary tables. The laboratory was contacted on September 21, 1998 regarding a request for chain-of-custody forms. The chain-of-custody forms were received at TtNUS on September 24, 1998. The laboratory was contacted on September 24, 1998 regarding the results for lead reported for this SDG GT05. The correct results for lead for this SDG were faxed to TtNUS on September 24, 1998.

The laboratory was previously contacted regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Overall Assessment

The data are reported without qualification.

Attachments
cc: File 7397-4.10

POREWATER TRACE METAL ANALYSIS (µg/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT05
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium		Chromium		Copper	Iron	Lead	Manganese	Barium		Mercury	Nickel		Silver		Zinc
OFF-SS3	porewater	3/27/98	61.2		3.4	0 8		18.6		23 0	120	14 62	NA	20	U	45 0	2.0		1.4		100
OFF-SS4	porewater	3/27/98	54 9		2 8	0 9		22 4		28.0	200	18.66	NA	20	U	68 0	1 3		1.7		130
OFF-SS5	porewater	3/27/98	63.8		1 0	0 5		21.8		84 0	170	18 24	NA	20	U	64.0	1.1		1.3		260
OFF-SS6	porewater	3/27/98	43 2		2 9	0 6		15.4		19 0	220	15 83	NA	20	U	59.0	1.5		0.1	U	420
OFF-SS7	porewater	3/27/98	58.7		3.2	0 5		19 0		15.0	120	16 41	NA	20	U	44.0	0.5	U	1.7		170
OFF-SS22	porewater	3/27/98	49.2		2.6	0 9		17.2		18.0	250	17.14	NA	20	U	55 0	1.5		1.2		200
OF-1SS	porewater	4/7/98	55.9		1.1	0 1	J	28 6		26 0	610	18 22	NA	20	U	45 0	0.5	U	1.6		170
OF-2SS	porewater	4/7/98	67 4		5.5	0 5		19.2		21.0	310	16 43	NA	20	U	43 0	0.7		1.8		140
OFF-10-SUR	porewater	4/7/98	48.1		2.6	0 4		22.3		30 0	340	15 71	NA	20	U	68.0	3.1		1.6		270
OFF-11-SUR	porewater	4/7/98	53.8		2 0	0 4		20 8		31.0	470	13 24	NA	20	U	61.0	0 9		1.4		260

NOTE:

1. U - Not detected, UJ - Detection limit approximate; J - Quantitation approximate, NA - Not Analyzed

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-10-98-1258W

To: Stephen Parker cc: File N7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT06
University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals: /13/Porewater/
OFF-8-SUR, OFF-9-SUR, OFF-12-SUR, OFF-13-SUR, OFF-14-SUR, OFF-15-SUR, OFF-16-SUR, OFF-17-SUR, OFF-18-SUR, OFF-19-SUR, OFF-20-SUR, OFF-21-SUR, OFF-23-SUR

Date: October 5, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT06, porewater samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results and matrix spike recoveries.

Data Completeness

This data validation was performed on the summary QC forms, raw data will be submitted for the internal standard and samples at a later date. The method detection limit (MDL) (U) was used by the data validator to replace the laboratory reported N/D results in the summary tables. The laboratory was contacted on September 21, 1998 regarding a request for chain-of-custody forms. The chain-of-custody forms were received at TtNUS on September 24, 1998.

The laboratory was previously contacted regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Overall Assessment

The data are reported without qualification.

Attachments
cc: File 7397-4.10

POREWATER TRACE METAL ANALYSIS (µg/L)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT06
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium		Chromium		Copper	Iron	Lead	Manganese	Barium		Mercury	Nickel	Silver		Zinc
OFF-12-SUR	porewater	4/7/98	54.2		2.6	0 7		14.7		17.0	210	21.4	NA	20	U	38.0	1.3	1.3		140
OFF-13-SUR	porewater	4/7/98	47.3		2.7	0.8		19.6		21.0	230	18.5	NA	20	U	41.0	1.7	1.9		160
OFF-16-SUR	porewater	4/7/98	49.2		2.9	0.9		23.8		19.0	340	12.0	NA	20	U	49.0	1.5	1.6		210
OFF-17-SUR	porewater	4/7/98	58.7		3.9	0.6		17.3		24.0	180	18.1	NA	20	U	36.0	1.0	1.2		240
OFF-18-SUR	porewater	4/7/98	63.4		1.5	0.7		19.5		28.0	270	12.5	NA	20	U	38.0	1.9	1.8		180
OFF-20-SUR	porewater	4/7/98	49.8		2.4	0.9		18.5		21.0	110	15.9	NA	20	U	32.0	1.4	1.6		150
OFF-21-SUR	porewater	4/7/98	65.1		3.0	0.4		25.6		18.0	530	11.3	NA	20	U	44.0	1.3	1.4		220
OFF-23-SUR	porewater	4/7/98	59.7		1.8	0.4		19.7		11.0	390	27.9	NA	20	U	43.0	1.6	1.8		160
OFF-8-SUR	porewater	4/14/98	51.2		2.4	0.7		20.1		19.0	280	15.8	NA	20	U	40.0	2.4	1.5		180
OFF-9-SUR	porewater	4/14/98	69.3		2.1	0.8		23.9		31.0	410	12.4	NA	20	U	47.0	1.9	1.5		200
OFF-14-SUR	porewater	4/14/98	52.7		2.8	0.7		18 6		18.0	160	19.9	NA	20	U	69.0	2.1	1.4		110
OFF-15-SUR	porewater	4/14/98	59.6		3.4	0.6		21.3		26.0	230	14.3	NA	20	U	32 0	2.5	1.2		190
OFF-19-SUR	porewater	4/14/98	51.3		3.0	0.8		17.4		20.0	290	11.7	NA	20	U	45.0	1.3	1.5		150

NOTE:

1. U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate, NA - Not Analyzed

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-10-98-1261W

To: **Stephen Parker** cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG GT06
University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

PAHs/PCBs/OCPs: /13/Porewater/
OFF-8-SUR, OFF-9-SUR, OFF-12-SUR, OFF-13-SUR, OFF-14-SUR, OFF-15-SUR, OFF-16-SUR, OFF-17-SUR, OFF-18-SUR, OFF-19-SUR, OFF-20-SUR, OFF-21-SUR, OFF-23-SUR

Date: October 5, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the polycyclic aromatic hydrocarbon compounds (PAH), polychlorinated biphenyl compounds (PCB) and organo-chlorine pesticide compounds (OCP) data from Project 7397, SDG GT06 porewater samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The samples were analyzed by the University of Mississippi laboratory according to Method ETRL-110-91 (PAHs) and Method ETRL-101-91 (PCBs/OCPs). The data were evaluated based on data completeness; holding times; calibrations; laboratory blank results, field duplicate analysis, matrix spike analysis and laboratory control matrix analysis. The data validation were performed according to the Region I, EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November 1988 criteria.

Data Completeness

This data validation was performed on the summary QC forms, raw data will be submitted for the internal standard and samples at a later date. The method detection limit (MDL) (U) was used by the data validator to replace the laboratory reported N/D results in the summary tables.

The laboratory was contacted on September 21, 1998 regarding a request for chain-of-custody forms and extraction dates for PCB/OCP and PAH samples. The chain-of-custody forms were received at TtNUS on September 24, 1998. The extraction records were received at TtNUS on September 29, 1998.

Overall Assessment

The results are reported without qualification.

Attachments
cc: File 7397-4.10

POREWATER POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT06
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OFF 12-SUR 04/07/98	OFF 13-SUR 04/07/98	OFF 16-SUR 04/07/98	OFF 17-SUR 04/07/98	OFF 18-SUR 04/07/98	OFF 20-SUR 04/07/98	OFF 21-SUR 04/07/98	OFF 23-SUR 04/07/98	OFF 8-SUR 04/14/98	OFF 9-SUR 04/14/98	OFF 14-SUR 04/14/98
PCBs/OCPs	units		Aqueous	------ ---	------ ---	------ ---	------ ---	------ ---	------ -	------ -	------ -	------ -	------ -
2,4'-dichlorobiphenyl (CB008)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	2.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',5-trichlorobiphenyl (CB018)	ng/ml	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.2	0 5 U	0.5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028)	ng/ml	1.0	2.7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.4	1.0 U	1.0 U
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/ml	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 3
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/ml	1.0	1.0 U	1.0 U	1.9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1	1.0 U
3,3',4,4'-tetrachlorobiphenyl (C77)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1 4	1.0 U	1.0 U	1.0 U	1.0 U	1.7	1.0 U	1.0 U
2,3',4,4'-tetrachlorobiphenyl (CB066)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.7	1.0 U	1.0 U	1.0 U	1.0 U
2,2',4,5,5'-pentachlorobiphenyl (CB101)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U	2.5	1.0 U	1.0 U	1.0 U
2,2',4,4',5-pentachlorobiphenyl(C99)	ng/ml	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/ml	1.0	1.0 U	1.0 U	4.9	1.0 U	1.0 U	1.0 U	1.1	1.0 U	1.0 U	1.0 U	1.0 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/ml	1.0	1.0 U	1.0 U	1 0 U	1 0 U	2 1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',3,4,4',5'-hexachlorobiphenyl (CB138)	ng/ml	1.0	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/ml	1.0	1.4	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1 0 U	1.0 U	2.4	1.0 U	1.0 U
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187)	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/ml	1 0	1.0 U	1.0 U	1 0 U	1 0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.1	2.8
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/ml	1.0	1 0 U	1.0 U	1 0 U	1 0 U	1 1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170)	ng/ml	1 0	1.0 U	2.3	2.1	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/ml	1 0	3.5	1.0 U	1.0 U	2 4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.7	1.0 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/ml	1.0	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/ml	1.0	3.7	1.0 U	1.0 U	1 0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.7

POREWATER POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT06
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OFF 12-SUR 04/07/98	OFF 13-SUR 04/07/98	OFF 16-SUR 04/07/98	OFF 17-SUR 04/07/98	OFF 18-SUR 04/07/98	OFF 20-SUR 04/07/98	OFF 21-SUR 04/07/98	OFF 23-SUR 04/07/98	OFF 8-SUR 04/14/98	OFF 9-SUR 04/14/98	OFF 14-SUR 04/14/98
PCBs/OCPs	units		Aqueous	------ ---	------ ---	------ ---	------ ---	------ ---	------ -	------ -	------ -	------ -	------ -
hexachl robenzene (HCB)	ng/ml	1 0	1.0 U	1.0 U	1 0 U	1 0 U	1 8	1.0 U	1.0 U	1 0 U	1.0 U	1 0 U	1.0 U
heptachlor (HEPT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1 3	1.0 U	1.0 U	1 0 U	1.0 U	1 0 U	1.0 U	1.0 U
aldrin (Aldrin)	ng/ml	0.5	0 5 U	0.5 U	0.5 U	0 5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.5 U
heptachl r epoxide (HEPT E)	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-chlordane (a-CHLDA)	ng/ml	0 5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-nonachlor (TRANSNON)	ng/ml	0 5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0 5 U	0.5 U
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o,p'-(dichlorodiphenyldichloro)ethane (o,p'-DDD)	ng/ml	1.0	1 0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U
dieldrin	ng/ml	1.0	1.3	2 3	1.0 U	1.0 U	1.0 U	1.0 U	1.8	1.0 U	1.0 U	1.0 U	1.3
endrin	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.4	1.0 U	1.0 U	1.0 U
endosulfan	ng/ml	0.5	0.5 U	0 5 U	0.5 U	0.5 U	0 5 U	0.5 U	0.5 U	0.5 U	0.5 U	0 5 U	0.5 U
lindane	ng/ml	1 0	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
toxaphene	ng/ml	500	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
mirex (Mirex)	ng/ml	0.5	0 5 U	0.5 U	0 5 U	0.5 U	0.5 U	0 5 U	2 4	0 5 U	0.5 U	0 5 U	0.5 U

U - Not Detected, UJ - Detection Limit approximate, J - Quantitation approximate
Date is date collected.

POREWATER POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT06
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OFF 15-SUR 04/14/98	OFF 19-SUR 04/14/98
PCBs/OCPs	units		------ -	------ -
2,4'-dichlorobiphenyl (CB008)	ng/ml	1 0	2.1	1.0 U
2,2',5-trichlorobiphenyl (CB018)	ng/ml	0.5	0.5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028)	ng/ml	1.0	1.0 U	3.6
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/ml	0.5	0.5 U	0 5 U
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/ml	1.0	1.0 U	1.0 U
3,3',4,4'-tetrachlorobiphenyl (C77)	ng/ml	1.0	1.0 U	1.0 U
2,3',4,4'-tetrachlorobiphenyl (CB066)	ng/ml	1.0	1.0 U	1.0 U
2,2',4,5,5'-pentachlorobiphenyl (CB101)	ng/ml	1.0	1.0 U	1.0 U
2,2',4,4',5-pentachlorobiphenyl(C99)	ng/ml	0.5	0.5 U	2.5
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/ml	1.0	1.0 U	1.0 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/ml	1.0	1.0 U	2.7
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/ml	1.0	2.6	1.0 U
2,2',3,4,4',5'-hexachlorobiphenyl (CB138)	ng/ml	1 0	1.0 U	1.0 U
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/ml	1.0	1.0 U	1.0 U
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187)	ng/ml	1.0	1 0 U	1 0 U
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/ml	1.0	1.0 U	1.0 U
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/ml	1.0	2 4	1 0 U
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170)	ng/ml	1.0	1 0 U	1.0 U
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/ml	1.0	1.0 U	1 0 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/ml	1.0	1.0 U	1.0 U
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/ml	1.0	1 0 U	1 0 U

POREWATER POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT06
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OFF 15-SUR 04/14/98	OFF 19-SUR 04/14/98
PCBs/OCPs	units		------ -	------ -
hexachlorobenzene (HCB)	ng/ml	1.0	1.0 U	1.0 U
heptachlor (HEPT)	ng/ml	1.0	1.0 U	1.0 U
aldrin (Aldrin)	ng/ml	0.5	0.5 U	0.5 U
heptachlor epoxide (HEPT E)	ng/ml	1.0	1.0 U	1.0 U
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/ml	1.0	1.0 U	1.0 U
cis-chlordane (a-CHLDA)	ng/ml	0.5	0.5 U	1.1
trans-nonachlor (TRANSNON)	ng/ml	0.5	0.5 U	0.5 U
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/ml	1 0	1.0 U	1 0 U
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/ml	1 0	1.0 U	1 0 U
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/ml	1 0	1.0 U	1.0 U
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/ml	1 0	1.0 U	1.0 U
o,p'-(dichlorodiphenyldichloro)ethane (o,p'-DDD)	ng/ml	1.0	1.0 U	1.0 U
dieldrin	ng/ml	1 0	1 0 U	1.0 U
endrin	ng/ml	1 0	1.1	1.0 U
endosulfan	ng/ml	0.5	0.5 U	0.5 U
lindane	ng/ml	1.0	1 0 U	1.0 U
toxaphene	ng/ml	500	500 U	500 U
mirex (Mirex)	ng/ml	0.5	0.5 U	0.5 U

U - Not Detected, UJ - Detection Limit approximate, J - Qua
Date is date collected.

POREWA[illegible]OLYCYCLIC AROMATIC HYDROCARBONS (PAHs) ANALYSIS (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT06
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OFF-12-SUR 04/07/98	OFF-13-SUR 04/07/98	OFF-16-SUR 04/07/98	OFF-17 SUR 04/07/98	OFF-18-SUR 04/07/98	OFF-20 SUR 04/07/98	OFF-21 SUR 04/07/98	OFF-23 SUR 04/07/98	OFF-8-SUR 04/14/98	OFF-9-SUR 04/14/98	OFF-14 SUR 04/14/98	OFF-15 SUR 04/14/98
PAHs	units		Aqueous---	----	----	----	----	----	----	----	----	----	----	----
* naphthalene (NAP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* 2-methylnaphthalene (2MN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1-methylnaphthalene (1MN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
biphenyl (BIP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,6- dimethylnaphthalene (DMN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* acenaphthylene (ACL)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* acenaphthene (ACT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,3,5-trimethylnaphthalene (TMN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* fluorene (FLU)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* phenanthrene (PHE)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* anthracene (ANT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1-methylphenanthrene (1MP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† fluoranthene (FLA)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† pyrene (PYR)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† benzo (a) anthracene (BAA)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† chrysene/triphenylene (CHR)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
benzo (b+j+k) fluoranthene (BBF)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
benzo (e) pyrene (BEP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† benzo (a) pyrene (BAP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
perylene (PER)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
indeno [1,2,3-cd] pyrene (INP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† dibenzo [a,h] anthracene (DBA)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
benzo [ghi] perylene (BPE)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

NOTE:
U-Not Detected; UJ-Detection Limit approximate; J-Quantitation approximate;Date is date collected.

POREWATER POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) ANALYSIS (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT06
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OFF-19 SUR 04/14/98
PAHs	units		
* naphthalene (NAP)	ng/ml	1.0	1.0 U
* 2-methylnaphthalene (2MN)	ng/ml	1.0	1.0 U
1-methylnaphthalene (1MN)	ng/ml	1.0	1.0 U
biphenyl (BIP)	ng/ml	1 0	1.0 U
2,6- dimethylnaphthalene (DMN)	ng/ml	1.0	1.0 U
* acenaphthylene (ACL)	ng/ml	1.0	1.0 U
* acenaphthene (ACT)	ng/ml	1.0	1.0 U
2,3,5-trimethylnaphthalene (TMN)	ng/ml	1.0	1.0 U
* fluorene (FLU)	ng/ml	1.0	1.0 U
* phenanthrene (PHE)	ng/ml	1.0	1.0 U
* anthracene (ANT)	ng/ml	1.0	1.0 U
1-methylphenanthrene (1MP)	ng/ml	1.0	1.0 U
† fluoranthene (FLA)	ng/ml	1.0	1.0 U
† pyrene (PYR)	ng/ml	1.0	1.0 U
† benzo (a) anthracene (BAA)	ng/ml	1.0	1.0 U
† chrysene/triphenylene (CHR)	ng/ml	1.0	1.0 U
benzo (b+j+k) fluoranthene (BBF)	ng/ml	1.0	1.0 U
benzo (e) pyrene (BEP)	ng/ml	1 0	1.0 U
† benzo (a) pyrene (BAP)	ng/ml	1 0	1.0 U
perylene (PER)	ng/ml	1 0	1.0 U
indeno [1,2,3-cd] pyrene (INP)	ng/ml	1.0	1 0 U
† dibenzo [a,h] anthracene (DBA)	ng/ml	1.0	1.0 U
benzo [ghi] perylene (BPE)	ng/ml	1.0	1 0 U

NOTE:
U-Not Detected; UJ-Detection Limit approximate; J-Quantitation approximate;Date is date collected.

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-10-98-1260W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG GT05
University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

PAHs/PCBs/OCPs: /10/Porewater/
OF-SS3, OF-SS4, OF-SS5, OF-SS6, OF-SS7, OF-SS22, OF-1SS, OF-2SS, OFF-10-SUR, OFF-11-SUR

Date: October 5, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the polycyclic aromatic hydrocarbon compounds (PAH), polychlorinated biphenyl compounds (PCB) and organo-chlorine pesticide compounds (OCP) data from Project 7397, SDG GT05 porewater samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The samples were analyzed by the University of Mississippi laboratory according to Method ETRL-110-91 (PAHs) and Method ETRL-101-91 (PCBs/OCPs). The data were evaluated based on data completeness; holding times; calibrations; laboratory blank results, field duplicate analysis, matrix spike analysis and laboratory control matrix analysis. The data validation were performed according to the Region I, EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November 1988 criteria.

Data Completeness

This data validation was performed on the summary QC forms, raw data will be submitted for the internal standard and samples at a later date. The method detection limit (MDL) (U) was used by the data validator to replace the laboratory reported N/D results in the summary tables.

The laboratory was contacted on September 21, 1998 regarding a request for chain-of-custody forms and extraction dates for PCB/OCP and PAH samples. The chain-of-custody forms were received at TtNUS on September 24, 1998. The extraction records were received at TtNUS on September 29, 1998.

Overall Assessment

The results are reported without qualification.

Attachments
cc: File 7397-4.10

POREWATER POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT05
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OF-SS3 03/27/98	OF-SS4 03/27/98	OF-SS5 03/27/98	OF-SS6 03/27/98	OF-SS7 03/27/98	OF-SS22 03/27/98	OF-1SS 04/07/98	OF-2SS 04/07/98	OFF 10-SUR 04/07/98	OFF 11-SUR 04/07/98
PCBs/OCPs	units		Aqueous	------ ---	------ ---	------ ---	------ ---	------ ---	------ -	------ -	------ -	------ -
2,4'-dichlorobiphenyl (CB008)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',5-trichlorobiphenyl (CB018)	ng/ml	0.5	0.5 U	3.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,4,4'-trichlorobiphenyl (CB028)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.2
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/ml	0.5	1.0	0.5 U	0.5 U	0.5 U	0.5 U	2.4	0.5 U	0.5 U	0.5 U	0 5 U
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	2.5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
3,3',4,4'-tetrachlorobiphenyl (C77)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.7	1.0 U	2.5
2,3',4,4'-tetrachlorobiphenyl (CB066)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',4,5,5'-pentachlorobiphenyl (CB101)	ng/ml	1.0	1.0 U	1 0 U	2.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.1	1.0 U
2,2',4,4',5-pentachlorobiphenyl(C99)	ng/ml	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/ml	1.0	1.0 U	5.7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.5	1.0 U	1.0 U
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/ml	1 0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.3	1.0 U	1.0 U	1.4
2,2',3,4,4',5'-hexachlorobiphenyl (CB138)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/ml	1.0	2.9	1 0 U	1.0 U	2.1	1.0 U	1.0 U	1.0 U	2.4	1.0 U	1.0 U
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187)	ng/ml	1.0	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	2.5	1.0 U	1.0 U	1.0 U
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.2	1.0 U
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170)	ng/ml	1.0	3 6	1.0 U	1.0 U	1.0 U	1.0 U	1.2	1.0 U	1.0 U	1.0 U	1 0 U
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/ml	1.0	1.0 U	1 0 U	1.0 U	1.1	1 7	1.0 U	1.0 U	1 0 U	3 4	1.0 U
2,2',3,3'4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/ml	1.0	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/ml	1.0	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U

POREWATER POLYCHLORINATED BIPHENYLS (PCBs) and ORGANO-CHLORINE PESTICIDES (OCPs) ANALYSES (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT05
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OF-SS3 03/27/98	OF-SS4 03/27/98	OF-SS5 03/27/98	OF-SS6 03/27/98	OF-SS7 03/27/98	OF-SS22 03/27/98	OF-1SS 04/07/98	OF-2SS 04/07/98	OFF 10-SUR 04/07/98	OFF 11-SUR 04/07/98
PCBs/OCPs	units		Aqueous	------ ---	------ ---	------ ---	------ ---	------ ---	------ -	------ -	------ -	------ -
hexachlorobenzene (HCB)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
heptachlor (HEPT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
aldrin (Aldrin)	ng/ml	0.5	0.5 U	0.5 U	0.5 U	0 5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
heptachlor epoxide (HEPT E)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/ml	1 0	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U
cis-chlordane (a-CHLDA)	ng/ml	0 5	2.6	0.5 U	1.0	0.5 U	0.5 U	0.5 U	1.6	0.5 U	0.5 U	0.5 U
trans-nonachlor (TRANSNON)	ng/ml	0.5	0.5 U	0.5 U	0.5 U	0 5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p.p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o,p'-(dichlorodiphenyldichloro)ethane (o,p'-DDD)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
dieldrin	ng/ml	1.0	1.0 U	1.6	1 0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.3	1.0 U
endrin	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
endosulfan	ng/ml	0.5	0.5 U	0.5 U	0.5 U	0 5 U	0 5 U	0 5 U	0 5 U	0.5 U	0.5 U	0.5 U
lindane	ng/ml	1.0	1 0 U	1 0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
toxaphene	ng/ml	500	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
mirex (Mirex)	ng/ml	0.5	0.5 U	0.5 U	0 5 U	0.5 U	0 5 U	0.5 U	0.5 U	0 5 U	0.5 U	0 5 U

U - Not Detected, UJ - Detection Limit approximate, J - Quantitation approximate
Date is date collected.

POREWATER POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) ANALYSIS (ng/ml)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT05
LAB: UNIVERSITY OF MISSISSIPPI

Chain of Custody		MDL AQ	OF-SS3 03/27/98	OF-SS4 03/27/98	OF-SS5 03/27/98	OF-SS6 03/27/98	OF-SS7 03/27/98	OF-SS22 03/27/98	OF-1SS 04/07/98	OF-2SS 04/07/98	OFF-10 SUR 04/07/98	OFF-11 SUR 04/07/98
PAHs	units		Aqueous									
* naphthalene (NAP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* 2-methylnaphthalene (2MN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1-methylnaphthalene (1MN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
biphenyl (BIP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,6- dimethylnaphthalene (DMN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* acenaphthylene (ACL)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* acenaphthene (ACT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,3,5-trimethylnaphthalene (TMN)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* fluorene (FLU)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* phenanthrene (PHE)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
* anthracene (ANT)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1-methylphenanthrene (1MP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† fluoranthene (FLA)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† pyrene (PYR)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† benzo (a) anthracene (BAA)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† chrysene/triphenylene (CHR)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
benzo (b+j+k) fluoranthene (BBF)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
benzo (e) pyrene (BEP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† benzo (a) pyrene (BAP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
perylene (PER)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
indeno [1,2,3-cd] pyrene (INP)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
† dibenzo [a,h] anthracene (DBA)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
benzo [ghi] perylene (BPE)	ng/ml	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

NOTE:
U-Not Detected; UJ-Detection Limit approximate; J-Quantitation approximate; Date is date collected.

APPENDIX C-3
TISSUE (CLAM, MUSSEL, LOBSTER)

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-10-98-1259W

To: Stephen Parker cc: File N7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT07
University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals: /5/Fish/
OFF-1-TA-CN, OFF-2-TA-CN, OFF-3-TA-CN,
OFF-4-TA-CN, OFF-7-TA-CN

Date: October 5, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT07, fish samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results and matrix spike recoveries.

Data Completeness

This data validation was performed on the summary QC forms, raw data will be submitted for the internal standard and samples at a later date. The method detection limit (MDL) (U) was used by the data validator to replace the laboratory reported N/D results in the summary tables. Sample OFF-7-TA-CN could not be analyzed by the laboratory due to insufficient sample volume. The laboratory was contacted on September 21, 1998 regarding a request for chain-of-custody forms. The chain-of-custody forms were received at TtNUS on September 24, 1998.

The laboratory was previously contacted regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Calibrations

The initial calibration verification (ICV) for mercury was greater than the 125% quality control criteria. The positive results for mercury were rejected (R) in all the samples.

Overall Assessment

The data should be used as qualified. The positive results for mercury are rejected in all samples due to an initial calibration verification greater than 125%.

Attachments
cc: File 7397-4.10

FISH TRACE METAL ANALYSIS (ng/g dry wt)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT07
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium		Chromium		Copper	Iron	Lead	Manganese	Barium		Mercury	Nickel		Silver		Zinc
OFF-1-TA-CN	fish	7/20,22,24/98	124 6		4 6	2 3		36 9		32 4	78.1	4 4	NA	32	U	R	0 5	U	0 9		18 1
OFF-2-TA-CN	fish	7/13,17,20,22,24	141 6		5 2	2.9		28.5		25.6	66 4	5 1	NA	32	U	R	0 5	U	1 0		22 7
OFF-4-TA-CN	fish	7/17/98	115.9		4 2	2.9		21 7		29.4	70.3	4.7	NA	32	U	R	0.5	U	0 8		20.9
OFF-3-TA-CN	fish	7/13,20,22,24	134.7		3 9	2.5		25 4		30 4	68 1	5 0	NA	32	U	R	0 5	U	0.9		23 9

NOTE:

1. U - Not detected; UJ - Detection limit approximate, J - Quantitation approximate, NA - Not Analyzed, R - Rejected

TETRA TECH NUS, INC.

INTERNAL CORRESPONDENCE

C-Navy-9-98-1243W

To: Stephen Parker

cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT04
University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals: /14/Lobster/Tissue/
OFF-13, OFF-14, OFF-15, OFF-16(6/8/98), OFF-16(6/10/98), OFF-17(6/10/98), OFF-17(6/12/98), OFF-18, OFF-19, OFF-20, OFF-21(6/8/98), OFF-21(6/15/98), OFF-23(6/8/98), OFF-23(6/10/98)

Date: September 17, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT04, lobster tissue samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results and matrix spike recoveries only.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted on September 1, 1998 regarding a request for chain-of-custody forms. The chain-of-custody forms were received on September 1, 1998.

Samples OFF-16, OFF-17, OFF-21 and OFF-23 were received by the University of Mississippi laboratory in broken/cracked glass containers. The laboratory was contacted on September 1, 1998, regarding this issue and they stated that the broken sample containers did not impact the quality and integrity of the samples.

Samples OFF-16, OFF-17, OFF-21 and OFF-23 were collected on two days and the two samples for each location were analyzed and reported as separate samples. Since they were collected on different days these samples were not considered field duplicates.

The laboratory was previously contacted regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Overall Assessment

The data are reported without qualification.

Attachments
cc: File 7397-4.10

BIOTA TRACE METAL ANALYSIS (ng/g dry wt.)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT04
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium		Chromium		Copper	Iron	Lead	Manganese	Barium		Mercury	Nickel	Silver		Zinc
OFF-13	lobster	6/10/98	382.4		7.7	13.3		14.3		163.7	97 7	14.7	NA	32	U	5.4	32.6	2.6		231
OFF-14	lobster	6/12/98	361.4		8.5	0.5	U	11.4		141.2	113.7	11.3	NA	32	U	7.2	37.4	3.8		271.4
OFF-15	lobster	6/8/98	397.3		7.2	1.5		18.9		157.0	84.2	19	NA	32	U	2.5	31.7	2.6		256.3
OFF-16	lobster	6/8/98	321.5		6.9	2.1		14.2		138.6	76.4	17.2	NA	32	U	2.0	28.5	2.3		241.8
OFF-16	lobster	6/10/98	356.9		6.6	2.4		15.4		120.4	89.6	16.3	NA	32	U	1.7	41.6	2.5		297.5
OFF-17	lobster	6/10/98	364.9		9.3	7.4		11.1		172.6	127 4	18.5	NA	32	U	1.4	38.7	2.4		281.4
OFF-17	lobster	6/12/98	386.6		10.2	7.4		10.5		194.2	116	12 3	NA	32	U	1.9	32.6	2.7		276.3
OFF-18	lobster	6/8/98	367.2		5.7	4.7		17.0		154.9	157.6	15.4	NA	32	U	1.6	35.9	2.4		266.8
OFF-19	lobster	6/8/98	327.9		8.5	3 9		17.5		143.6	149.3	16.7	NA	32	U	1.8	40.2	3.8		278
OFF-20	lobster	6/8/98	364.3		7.2	5.1		21.1		101.3	160.3	13.8	NA	32	U	1.8	44.9	5.0		241.8
OFF-21	lobster	6/8/98	381.2		8.3	1.9		17.5		147.3	137.9	18.9	NA	32	U	2.1	39 6	3.2		263.1
OFF-21	lobster	6/15/98	373.4		8.7	1 6		16 2		162.1	122.4	16.5	NA	32	U	1.8	34.8	3.3		255.1
OFF-23	lobster	6/8/98	330.2		9.0	3.7		13 8		112.4	168 8	12.9	NA	32	U	2.4	28.7	2.7		236.6
OFF-23	lobster	6/10/98	314.2		9.3	3.4		15.1		106.5	160.1	14.8	NA	32	U	1.9	30.5	2.5		274.1

NOTE:

1. U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-11-98-1269W

To: Stephen Parker cc: File N7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT08
University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals: /10/Mussels/(DEPLOYED)
OFF-13-DEP, OFF-14-DEP, OFF-17-DEP, OFF-18-DEP, OFF-19-DEP, OFF-20-DEP, OFF-21-DEP, OFF-23-DEP, OFF-T0-DEP, OFF-18-DEP-FD
(Field Duplicate Pair: OFF-18-DEP/OFF-18-DEP-FD)

Date: November 2, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT08, mussel samples collected by Science Applications International Corporation at the Old Fire Fighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results; matrix spike recoveries and field duplicate precision.

Data Completeness

This data validation was performed on the summary QC forms only. The method detection limit (MDL) value qualified with a "U" was used by the data validator to replace the laboratory reported N/D results in the summary tables.

The laboratory was previously contacted regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Overall Assessment

The data is reported without qualification.

Attachments
cc: File 7397-4.10

BIOTA TRACE METAL ANALYSIS (ng/g dry wt)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT08
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium		Chromium		Copper	Iron	Lead	Manganese	Barium		Mercury	Nickel	Silver		Zinc
OFF-18-DEP	mussels	8/17/98	165.3		1.0	8 6		15.4		10 4	412.5	8 5	NA	32	U	4.3	13 3	0 5	U	198.2
OFF-14-DEP	mussels	8/17/98	147.8		1 4	11 3		18 7		5 5	446 2	4 3	NA	32	U	2.8	10 7	0.5	U	174 4
OFF-13-DEP	mussels	8/17/98	193 2		1 5	14.3		26.4		8.7	387.6	6.9	NA	32	U	2 0	15 8	0 5	U	202.6
OFF-21-DEP	mussels	8/17/98	185.2		1 3	9.7		11.7		6 5	402.5	7.2	NA	32	U	3.5	17.3	0.5	U	167.6
OFF-20-DEP	mussels	8/17/98	140.3		1.7	8.2		18 3		8.3	515.9	6 1	NA	32	U	2.7	10 6	0.5	U	192.7
OFF-18-DEP-FD	mussels	8/17/98	152 4		1.1	9.2		13.9		9 7	428 1	6 9	NA	32	U	3.7	14.2	0.5	U	210.4
OFF-23-DEP	mussels	8/17/98	136 8		1.6	10 3		21 0		7 0	455	5.3	NA	32	U	1.8	11.2	0 5	U	157.6
OFF-17-DEP	mussels	8/17/98	179.5		1.2	7.9		17 8		8.1	493 4	7 0	NA	32	U	2.4	17	0 5	U	181.4
OFF-TO-DEP	mussels	6/22/98	137 9		0 9	7 6		12 4		5.3	380 1	5 8	NA	32	U	1 9	10 3	0.5	U	164.1
OFF-19-DEP	mussels	8/17/98	182 4		1.6	8 1		16 4		9 2	411.5	9.2	NA	32	U	3.6	15.6	0 5	U	188 5

NOTE:

1. U - Not detected, UJ - Detection limit approximate; J - Quantitation approximate, NA - Not Analyzed

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-9-98-1230W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT01
SAIC/University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals:/9/Tissue/Blue Mussel/
OFF-1-BM-TIS, OFF-2-BM-TIS, OFF-3-BM-TIS, OFF-4-BM-TIS, OFF-5-BM-TIS, OFF-5-BM-TIS-FD, OFF-6-BM-TIS, OFF-7-BM-TIS, OFF-22-BM-TIS
(Field Duplicate Pair: OFF-5-BM-TIS/OFF-5-BM-TIS-FD)

Date: September 1, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT01, blue mussel tissue samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results; field duplicate precision and matrix spike recoveries only.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted on July 28, 1998 regarding a request for readable chain-of-custody forms, an explanation of several acronyms used, mercury analysis dates, method detection limits, quality control limits and names of the methods used. The laboratory faxed the chain-of-custody forms and mercury analysis dates on August 4, 1998. The method detection limits, names of methods used, and quality control limits were e-mailed to TtNUS on August 11 and 12, 1998.

The laboratory was later contacted on August 14, 1998 regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Field Duplicate Precision

The relative percent differences (RPDs) for aluminum and mercury in the field duplicate pair OFF-5-BM-TIS/OFF-5-BM-TIS-FD were above the 50% quality control criterion. The positive results for aluminum and mercury and the non-detected results for aluminum are qualified as estimated (J and UJ), respectively.

Overall Assessment

The results should be used as qualified. The positive results for mercury and the positive and non-detected results for aluminum are estimated due to poor field duplicate precision.

Note: The assets of Brown & Root Environmental were purchased on January 1, 1998 by Tetra Tech NUS, Inc.

Attachments
cc: File 7397-4.10

BIOTA TRACE METAL ANALYSIS (ng/g dry wt.)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT01
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium	Chromium		Copper		Iron	Lead	Manganese	Barium		Mercury	Nickel	Silver		Zinc
OFF-5	bm-tis	5/26/98	20 0	UJ	2.7	6.6	0.5	U	10.0		538.2	5.2	NA	32	U	1.6	7.5	0.5	U	143.5
OFF-3	bm-tis	5/26/98	20.0	UJ	1.8	9.3	0.5	U	5.0	U	378.7	6.3	NA	32	U	2 9	12.4	0.5	U	148 0
OFF-2	bm-tis	5/26/98	58.3	J	2.0	13.2	0.5	U	6.1		466.1	3.0	NA	32	U	1.3	7.3	0.5	U	157.3
OFF-6	bm-tis	5/26/98	20.0	UJ	1.4	11.4	35.3		4.0		333.4	5.8	NA	32	U	1.9	9.0	0.5	U	103.4
OFF-22	bm-tis	5/26/98	69.8	J	2.0	13.8	0.5	U	1.7	J	453.8	5.6	NA	32	U	1.7	11.9	0.5	U	153.6
OFF-7	bm-tis	5/26/98	212.6	J	2.5	17.0	40.5		5.0	U	498.2	3.7	NA	32	U	2.1	10.3	0.5	U	119.6
OFF-4	bm-tis	5/26/98	128.2	J	0.9	5.0	10.3		1.4	J	484.3	4.1	NA	32	U	1.9	5.7	0.5	U	94.0
OFF-5	fd-bm-tis	5/26/98	101	J	1.9	5.5	0.5	U	6.2		476.9	3.6	NA	32	U	2.7	8.1	0.5	U	148.7
OFF-1	bm-tis	5/26/98	189.2	J	1.4	9.1	0 5	U	6.7		320.6	4.2	NA	32	U	3.0	7.1	0.5	U	105.8

NOTE:

1. U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-9-98-1232W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker mp

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT02
SAIC/University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals:/8/Tissue/Hard Clams/
OFF-10-HC-TIS, OFF-10-HC-TIS-FD, OFF-8-HC-TIS, OFF-20-HC-TIS, OFF-16-HC-TIS, OFF-15-PM-TIS, OFF-15-HC-TIS, OFF-21-HC-TIS
(Field Duplicate Pairs: OFF-10-HC-TIS/OFF-10-HC-TIS-FD, OFF-15-HC-TIS/OFF-15-HC-TIS-FD from SDG GT03)

Date: September 1, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT02, tissue samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results; field duplicate precision and matrix spike recoveries only.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted on July 28, 1998 regarding a request for readable chain-of-custody forms, an explanation of several acronyms used, mercury analysis dates, method detection limits, quality control limits and names of the methods used. The laboratory faxed the chain-of-custody forms and mercury analysis dates on August 4, 1998. The method detection limits, names of methods used, and quality control limits were e-mailed to TtNUS on August 11 and 12, 1998.

The laboratory was later contacted on August 14, 1998 regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Field Duplicate Precision

The relative percent differences (RPDs) for chromium and iron in the field duplicate pair OFF-10-HC-TIS/OFF-10-HC-TIS-FD were above the 50% quality control criterion. The positive results for iron and the positive and non-detected results for chromium are qualified as estimated (J and UJ), respectively.

The relative percent differences (RPDs) for aluminum and chromium in the field duplicate pair OFF-15-HC-TIS/OFF-15-HC-TIS-FD (from SDG GT03) were above the 50% quality control criterion. The positive results for aluminum and the positive and non-detected results for chromium are qualified as estimated (J and UJ), respectively.

Overall Assessment

The results should be used as qualified. The positive results for aluminum and iron and the positive and non-detected results for chromium are estimated due to poor field duplicate precision.

Attachments
cc: File 7397-4.10

BIOTA TRACE METAL ANALYSIS (ng/g dry wt.)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT02
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium	Chromium		Copper		Iron	Lead	Manganese	Barium		Mercury	Nickel	Silver		Zinc
OFF-10	hc-tis	5/14/98	474.1	J	5.5	6.1	0.5	UJ	5.0	U	241.9	5.0	NA	32	U	2.8	20.5	0.5	U	87.1
OFF-10	fd-hc-tis	5/21/98	574.3	J	5.4	8.3	11.6	J	5.0	U	421.5	6 2	NA	32	U	3.7	29 3	0.5	U	100.1
OFF-8	hc-tis	5/14/98	536.1	J	4.5	5.3	0.5	UJ	4.2	J	186.5	4.4	NA	32	U	1.9	19.5	0.5	U	83.9
OFF-20	hc-tis	5/14/98	730.7	J	4.4	8.7	3.1	J	5.0	U	153.3	7.9	NA	32	U	2.5	16.6	0.5	U	61.3
OFF-16	hc-tis	5/21/98	984.8	J	5.5	9.8	0.5	UJ	5.0	U	314.3	6.6	NA	32	U	4 0	20.4	0 5	U	73 3
OFF-15	pm-tis	5/14/98	750.5	J	5.5	7.0	30.2	J	5.0	U	438.6	7.0	NA	32	U	2.4	21.8	0.5	U	82.8
OFF-15	hc-tis	5/14/98	1203.8	J	7.2	11.2	64.4	J	5.0	U	224	8.2	NA	32	U	2.0	24.1	0.5	U	112
OFF-21	hc-tis	5/14/98	1163.5	J	4.3	7.9	0.5	UJ	8.7		307.5	4 9	NA	32	U	2.9	25 7	0 5	U	92.3

NOTE:

1. U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TETRA TECH NUS, INC. **INTERNAL CORRESPONDENCE**

C-Navy-9-98-1234W

To: Stephen Parker cc: File 7397-4.10

From: Maureen Parker MP

Subject: Tier II Data Validation, Navy CLEAN CTO 0269
Project No. 7397, SDG: GT03
SAIC/University of Mississippi
Old Fire Fighting Training Area, NETC, Newport, Rhode Island

Trace Metals:/7/Tissue/Hard Clams/
OFF-11-HC-TIS, OFF-12-HC-TIS, OFF-14-PM-TIS, OFF-15-HC-TIS-FD,
OFF-19-PM-TIS, OFF-17-HC-TIS, OFF-23-HC-TIS
(Field Duplicate Pair: OFF-15-HC-TIS from SDG GT02/OFF-15-HC-TIS-FD)

Date: September 1, 1998

Tetra Tech NUS (TtNUS) (formerly Brown and Root Environmental) performed tier II data validation on the trace metals data from Project 7397, SDG GT03, tissue samples collected by Science Applications International Corporation at the Old Firefighting Training Area site. The trace metals samples were analyzed by the University of Mississippi according to trace metals Method ETRL-200-91 and total mercury by Method ETRL-210-91. The data were validated according to the EPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989. The data were evaluated based on the following parameters: data completeness; holding times; calibrations; laboratory blank results; laboratory control matrix results; field duplicate precision and matrix spike recoveries only.

Data Completeness

This data validation was performed on the summary QC forms, no raw data was submitted. The laboratory was contacted on July 28, 1998 regarding a request for readable chain-of-custody forms, an explanation of several acronyms used, mercury analysis dates, method detection limits, quality control limits and names of the methods used. The laboratory faxed the chain-of-custody forms and mercury analysis dates on August 4, 1998. The method detection limits, names of methods used, and quality control limits were e-mailed to TtNUS on August 11 and 12, 1998.

The laboratory was later contacted on August 14, 1998 regarding the inclusion of the element barium and the exclusion of the element manganese in the trace metals analysis. The laboratory will analyze for manganese and submit the data as a separate report.

Field Duplicate Precision

The relative percent differences (RPDs) for aluminum and chromium in the field duplicate pair OFF-15-HC-TIS (from SDG GT02) / OFF-15-HC-TIS-FD were above the 50% quality control criterion. The positive results for aluminum and the positive and non-detected results for chromium are qualified as estimated (J and UJ), respectively.

Overall Assessment

The results should be used as qualified. The positive results for aluminum and the positive and non-detected results for chromium are estimated due to poor field duplicate precision.

Attachments
cc: File 7397-4.10

BIOTA TRACE METAL ANALYSIS (ng/g dry wt.)
SITE: OLD FIRE FIGHTING TRAINING AREA
PROJECT: 7397 SDG: GT03
LAB: UNIVERSITY OF MISSISSIPPI

Station	Description	Date Coll	Aluminum		Arsenic	Cadmium	Chromium		Copper	Iron	Lead	Manganese	Barium		Mercury	Nickel	Silver		Zinc
OFF-11	hc-tis	5/14/98	508.7	J	4 4	6.7	6 6	J	5 0 U	183 3	3 9	NA	32	U	2 1	18.1	0 5	U	68 7
OFF-12	hc-tis	5/14/98	518 7	J	5 4	8 2	0 5	UJ	5.0 U	154 1	6 9	NA	32	U	2.6	24 8	0 5	U	87 3
OFF-14	pm-tis	5/21/98	637.8	J	4 6	6 0	4 1	J	5 0 U	243.4	5 2	NA	32	U	2.5	23	0.5	U	63 3
OFF-15	fd-hc-tis	5/14/98	664.5	J	6 3	8 4	6.3	J	5.0 U	321.5	9 9	NA	32	U	2.1	18.8	0 5	U	101 8
OFF-19	pm-tis	5/21/98	771.1	J	6 1	5.3	0 5	UJ	5 0 U	245 6	7 1	NA	32	U	3.7	14	0 5	U	58.9
OFF-17	hc-tis	5/14/98	622.7	J	4 7	6.2	3.2	J	5 0 U	320.5	5 6	NA	32	U	3.2	15.7	0.5	U	64.1
OFF-23	hc-tis	5/14/98	821.8	J	4.9	6 4	0 5	UJ	5.0 U	106.7	8 6	NA	32	U	2.8	15 3	0 5	U	80

NOTE:

1 U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate