MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NAB-BAY9-SDB6-PRE	100	a	10	100.0	100.0	0.0	107.1	n/a	No
		b	10	100.0					
		c	10	100.0					
NAB-BAY18-SDB6-PRE	100	a	10	100.0	100.0	0.0	107.1	n/a	No
		b	10	100.0					
		c	10	100.0					
NAB-BAY9-SDB6-DUR	100	a	10	100.0	100.0	0.0	107.1	n/a	No
		b	10	100.0					
		c	10	100.0					
NAB-BAY18-SDB6-DUR	100	a	10	100.0	96.7	5.8	103.6	0.343	No
		b	10	100.0					
		c	9	90.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NAB-BAY9-SDB6-PRE	100	a	215	10	95.6	96.4	1.2	98.0	0.0470	No
		b	197	7	96.6					
		c	191	7	96.5					
		d	219	11	95.2					
		e	219	4	98.2					
NAB-BAY18-SDB6-PRE	100	a	164	9	94.8	97.3	1.5	98.9	0.3135	No
		b	218	7	96.9					
		c	213	4	98.2					
		d	243	4	98.4					
		e	216	4	98.2					
NAB-BAY9-SDB6-DUR	100	a	213	4	98.2	97.7	1.3	100.0	0.0670	Yes[c]
		b	208	6	97.2					
		c	200	2	99.0					
		d	207	3	98.6					
		e	221	10	95.7					
NAB-BAY18-SDB6-DUR	100	a	212	13	94.2	95.4	1.5	97.6	0.0384	Yes
		b	188	5	97.4					
		c	187	12	94.0					
		d	245	13	95.0					
		e	209	8	96.3					

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	5	100.0	100.0	0.0	100.0	n/a	n/a
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Salt Control	n/a	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Copper Ref. Tox.	50	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	100	a	5	100.0	70.0	47.6	70.0	0.148	No
		b	0	0.0					
		c	5	100.0					
		d	4	80.0					
	200	a	1	20.0	10.0	11.5	10.0	0.000	Yes
		b	0	0.0					
		c	0	0.0					
		d	1	20.0					
	400	a	0	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	0.0					
		c	0	0.0					
		d	0	0.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	8	80.0	93.3	11.5	100.0	n/a	n/a
		b	10	100.0					
		c	11	100.0					
Salt Control	n/a	a	10	100.0	100.0	0.0	107.1	0.211	No
		b	10	100.0					
		c	10	100.0					
Copper Ref. Tox.	100	a	10	100.0	100.0	0.0	107.1	0.371	No
		b	10	100.0					
		c	10	100.0					
	200	a	10	100.0	96.7	5.8	103.6	0.500	No
		b	10	100.0					
		c	9	90.0					
	400	a	3	30.0	33.3	5.8	35.7	0.005	Yes
		b	3	30.0					
		c	4	40.0					
	800	a	0	0.0	0.0	0.0	0.0	0.004	Yes
		b	0	0.0					
		c	0	0.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	160	4	97.6	97.7	1.0	100.0	n/a	No
		b	222	4	98.2					
		c	236	6	97.5					
		d	233	9	96.3					
		e	257	3	98.8					
Brine Control 1	n/a	a	204	3	98.6	98.4	0.8	100.7	0.119	No
		b	211	5	97.7					
		c	201	5	97.6					
		d	226	1	99.6					
		e	221	3	98.7					
Brine Control 2	n/a	a	189	3	98.4	97.8	1.1	100.1	0.440	No
		b	231	10	95.9					
		c	210	4	98.1					
		d	190	4	97.9					
		e	210	3	98.6					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Copper Ref. Tox.	2.9	a	231	5	97.9	98.6	0.7	101.0	0.057	No
		b	207	4	98.1					
		c	214	1	99.5					
		d	201	3	98.5					
		e	228	2	99.1					
	4.1	a	214	8	96.4	56.4	39.6	57.7	0.040	Yes
		b	205	21	90.7					
		c	-	-	-					
		d	-	-	-					
		e	-	-	-					
	5.9	a	125	101	55.3	49.3	10.8	50.5	0.000	Yes
		b	125	94	57.1					
		c	132	106	55.5					
		d	114	125	47.7					
		e	64	142	31.1					
	8.4	a	23	187	11.0	10.1	5.2	10.3	0.000	Yes
		b	24	173	12.2					
		c	4	210	1.9					
		d	32	170	15.8					
		e	21	200	9.5					
	12.0	a	0	195	0.0	0.3	0.2	0.3	0.000	Yes
		b	1	246	0.4					
		c	1	221	0.5					
		d	1	218	0.5					
		e	0	219	0.0					
	17.2	a	0	210	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	187	0.0					
		c	0	178	0.0					
		d	0	215	0.0					
		e	0	198	0.0					

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	100	200	123.5	103.3-147.5
MYSIDS	200	400	352.5	326.3-387.7
MUSSELS	4.1	5.9	6.0	5.9-6.1

Dash indicates no data (replicate was spilled or organisms not added)

[a]Controls (QA/QC) correspond to all samples from SDB6

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

WATER QUALITY

TOPSMELT (*A. affinis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NAB-OF9-SDB6-FF	12.5%	a	7.6	7.7	7.7	7.6	7.6	7.0	7.2	6.6	6.4	6.3	18.8	18.8	19.6	19.6	20.2	32.9	32.8	32.6	33.3	33.4
	25%	a	7.6	7.7	7.7	7.6	7.6	7.3	7.2	6.5	6.3	6.7	18.9	18.7	19.6	19.4	20.0	33.0	33.0	33.1	33.6	34.0
	50%	a	7.6	7.6	7.7	7.6	7.6	7.3	6.7	6.3	5.7	6.2	19.4	18.8	19.6	19.6	20.2	32.8	32.9	33.0	33.4	33.4
	100%	a	7.8	7.7	7.7	7.6	7.6	7.4	6.0	5.9	5.3	5.3	19.1	18.8	19.6	19.6	20.2	33.3	33.2	33.1	33.6	33.6
NAB-OF9-SDB6-COMP	12.5%	a	7.6	7.7	7.7	7.6	7.6	7.0	7.3	6.8	6.9	6.7	18.7	18.3	19.0	19.6	19.5	33.0	33.2	34.1	32.8	33.5
	25%	a	7.6	7.7	7.6	7.6	7.6	7.0	7.3	6.8	7.1	6.8	18.6	18.3	19.0	19.6	19.5	33.0	33.2	33.1	32.8	33.5
	50%	a	7.7	7.7	7.6	7.6	7.6	7.3	7.1	6.6	6.8	6.9	18.7	18.3	19.2	19.4	19.5	32.6	32.7	32.8	32.5	33.4
	100%	a	7.8	7.7	7.7	7.6	7.6	7.6	6.9	6.5	6.5	6.7	19.0	18.3	19.4	19.3	19.5	32.4	32.8	32.9	32.9	33.1
NAB-OF18-SDB6-FF	12.5%	a	7.6	7.6	7.6	7.6	7.6	7.1	7.0	6.5	6.8	6.6	18.8	18.0	19.4	19.4	19.8	32.9	32.9	32.9	33.1	33.7
	50%	a	7.6	7.6	7.6	7.5	7.5	7.1	6.6	6.1	5.7	6.1	18.8	18.6	19.4	19.6	20.0	32.8	32.8	32.9	33.1	33.2
	100%	a	7.7	7.7	7.7	7.5	7.5	7.9	6.0	5.5	5.3	5.9	18.9	18.6	19.4	19.5	19.9	32.7	32.6	32.9	33.0	33.1
NAB-BAY9-SDB6-PRE	100%	a	7.6	7.7	7.7	7.6	7.6	6.8	7.4	6.4	7.2	6.7	18.9	18.8	19.6	19.4	20.0	33.0	33.2	33.0	34.0	34.3
NAB-BAY18-SDB6-PRE	100%	a	7.6	7.6	7.7	7.6	7.6	6.9	7.5	6.7	7.4	7.0	18.6	18.2	19.0	19.6	19.4	32.7	32.8	32.9	33.6	34.1
NAB-BAY9-SDB6-DUR	100%	a	7.6	7.6	7.7	7.6	7.6	7.6	7.2	6.7	7.1	7.0	19.9	18.3	19.0	19.5	19.5	31.7	32.0	32.0	31.5	32.0
NAB-BAY18-SDB6-DUR	100%	a	7.6	7.6	7.6	7.6	7.6	7.6	7.2	6.4	7.0	6.6	19.6	18.7	19.5	19.3	19.9	33.1	33.2	33.0	33.2	33.8
Scripps Control	0	a	7.6	7.7	7.7	7.6	7.6	7.8	7.7	7.2	7.4	7.2	18.8	18.2	19.0	19.3	19.1	32.0	32.6	33.5	32.1	33.5
Scripps Cu Ref. Tox.	50 µg/l	a	7.6	7.7	7.7	7.6	7.6	6.8	7.3	7.2	7.4	7.1	18.5	18.7	19.3	19.3	19.4	32.2	32.9	33.1	31.7	32.4
	100 µg/l	a	7.6	7.7	7.6	7.6	7.6	6.9	7.7	7.2	6.9	7.1	18.6	18.5	19.0	19.6	19.5	32.5	32.9	33.1	31.9	32.4
	200 µg/l	a	7.6	7.7	7.6	7.7	7.7	6.9	7.8	7.2	7.9	7.0	18.6	18.1	19.3	19.4	19.4	32.1	32.9	33.0	32.5	32.6
	400 µg/l	a	7.6	7.7	7.6	N	N	6.9	7.9	7.1	N	N	18.6	18.1	19.1	N	N	32.1	32.9	33.0	N	N
Salt Control	n/a	a	7.6	7.7	7.4	7.3	7.3	5.9	7.1	6.9	7.2	6.9	18.8	18.3	19.0	19.4	19.5	31.6	32.7	33.1	32.0	32.7

MYSIDS (*A. bahia*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NAB-OF9-SDB6-FF	12.5%	a	7.5	7.6	7.5	7.5	7.5	7.0	7.5	5.1	5.5	5.2	18.9	18.5	19.4	19.5	19.4	32.9	32.9	32.6	33.2	33.3
	25%	a	7.6	7.6	7.6	7.5	7.5	7.4	7.3	5.1	5.8	5.7	19.0	18.5	19.5	19.4	19.2	32.9	32.9	32.9	33.5	33.5
	50%	a	7.7	7.6	7.6	7.5	7.5	7.4	6.3	5.0	5.3	5.5	19.0	18.6	19.5	19.4	19.3	33.1	32.7	32.6	33.4	33.3
	100%	a	7.8	7.6	7.6	7.6	7.6	7.7	5.9	4.9	5.0	4.8	19.3	18.6	19.4	19.5	19.3	32.9	33.3	33.3	33.5	33.6
NAB-OF9-SDB6-COMP	12.5%	a	7.7	7.7	7.6	7.5	7.6	7.1	7.0	5.4	6.3	6.1	19.2	18.7	19.5	19.5	19.4	32.4	32.8	32.7	32.9	33.2
	25%	a	7.8	7.7	7.6	7.6	7.6	7.3	6.5	5.2	6.1	6.1	18.8	18.8	19.5	19.5	19.4	32.8	33.0	32.9	32.9	33.3
	50%	a	7.8	7.7	7.6	7.6	7.6	7.4	6.3	5.0	6.0	6.1	19.3	18.8	19.5	19.5	19.3	32.4	32.5	32.6	33.4	33.1
	100%	a	7.9	7.7	7.6	7.6	7.6	7.6	5.3	4.6	5.4	5.5	19.9	18.8	19.5	19.6	19.4	32.3	32.3	32.4	32.5	32.6
NAB-OF18-SDB6-FF	12.5%	a	7.6	7.7	7.5	7.5	7.6	7.3	7.2	5.1	5.0	5.5	18.8	18.6	19.6	19.5	19.3	32.7	33.0	32.9	33.1	33.2
	50%	a	7.7	7.6	7.5	7.4	7.5	7.5	5.6	5.0	4.6	4.6	18.8	18.6	19.6	19.5	19.3	32.6	32.8	32.8	33.1	33.1
	100%	a	7.8	7.6	7.5	7.5	7.5	8.0	5.3	4.3	4.5	4.3	19.1	18.6	19.6	19.5	19.3	32.5	32.8	32.5	33.0	33.0
NAB-BAY9-SDB6-PRE	100%	a	7.5	7.7	7.5	7.5	7.5	7.3	7.0	5.0	5.9	6.7	19.1	18.6	19.6	19.6	19.4	32.6	33.0	32.6	33.4	34.0
NAB-BAY18-SDB6-PRE	100%	a	7.7	7.7	7.6	7.6	7.6	6.8	7.2	5.5	6.4	5.6	18.8	18.6	19.7	19.4	19.6	31.7	33.3	33.0	32.9	33.4
NAB-BAY9-SDB6-DUR	100%	a	7.5	7.6	7.5	7.5	ND	7.4	7.1	5.0	6.1	ND	18.9	18.6	19.6	19.5	ND	30.7	30.5	30.7	30.3	ND
NAB-BAY18-SDB6-DUR	100%	a	7.5	7.6	7.5	7.6	7.6	7.8	6.8	5.4	6.8	6.4	20.0	18.6	19.7	19.5	19.4	31.3	31.8	32.7	32.8	32.4
Scripps Control	0	a	7.7	7.7	7.6	7.6	7.6	6.8	7.3	5.4	6.1	6.4	19.3	18.8	19.8	19.8	18.9	32.1	32.1	32.3	31.9	32.1
Scripps Cu Ref. Tox.	100 µg/l	a	7.6	7.6	7.5	7.6	7.5	6.9	7.2	5.1	6.1	5.8	19.3	18.8	19.7	19.8	19.6	32.2	32.2	32.6	32.1	32.2
	200 µg/l	a	7.6	7.6	7.6	7.6	7.6	7.0	7.2	5.0	6.5	6.4	19.1	18.7	19.7	19.8	19.5	32.4	32.3	32.6	32.1	32.1
	400 µg/l	a	7.6	7.7	7.6	7.6	7.6	7.0	7.3	5.4	7.0	6.9	19.0	18.8	19.7	19.6	19.4	32.1	32.1	32.6	32.2	32.2
	800 µg/l	a	7.6	7.6	7.6	7.2	7.7	7.1	7.6	6.0	6.2	6.9	19.0	18.8	19.6	19.8	19.4	32.3	32.0	32.6	32.2	32.2
Salt Control	n/a	a	7.6	7.4	7.3	7.7	7.2	5.8	6.6	4.7	7.6	6.4	19.3	18.8	19.8	19.6	19.6	31.8	31.9	32.2	32.2	32.7

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep.	pH (SU)			Dissolved Oxygen (mg/l)			Temperature (°C)			Salinity (‰)		
			0	24	48	0	24	48	0	24	48	0	24	48
NAB-OF9-SDB6-FF	6.2%	f	7.7	7.8	7.8	8.1	7.1	7.1	15.1	15.7	15.3	32.7	32.2	32.6
	12.4%	f	7.8	7.8	7.8	8.0	7.1	7.4	15.2	15.7	15.3	32.4	32.1	32.0
	24.8%	f	7.8	7.8	7.8	8.1	7.2	7.4	15.0	15.7	15.3	31.5	31.8	32.0
	49.5%	f	7.9	7.8	7.8	8.0	7.2	7.3	15.1	15.7	15.3	32.3	31.9	31.5
NAB-OF9-SDB6-COMP	6.2%	f	7.8	7.7	7.8	8.0	7.0	7.0	15.2	15.6	15.6	32.9	32.2	32.2
	12.4%	f	7.8	7.7	7.8	7.4	7.1	7.0	15.2	15.8	15.6	32.6	32.3	32.3
	24.8%	f	7.8	7.7	7.8	7.7	7.1	7.0	15.1	15.8	15.4	32.8	32.4	32.4
	49.5%	f	7.8	7.8	7.8	7.8	7.2	7.0	15.0	15.5	15.4	32.2	32.0	32.0
NAB-OF18-SDB6-FF	6.4%	f	7.8	7.8	7.8	8.1	7.2	7.6	16.2	15.8	15.5	32.2	31.4	32.1
	12.9%	f	7.8	7.8	7.8	8.2	7.1	7.7	16.2	15.9	15.6	32.0	31.1	32.1
	25.7%	f	7.8	7.8	7.8	8.1	7.1	7.6	16.2	15.8	15.5	31.7	31.0	31.6
	51.4%	f	7.9	7.7	7.8	8.1	7.0	7.4	16.0	16.0	15.4	31.1	30.8	30.8
NAB-BAY9-SDB6-PRE	100%	f	7.8	7.7	7.8	7.9	7.1	7.3	15.2	15.6	15.3	32.5	32.2	32.4
NAB-BAY18-SDB6-PRE	100%	f	7.7	7.7	7.8	8.1	7.1	7.0	15.1	15.7	15.5	32.5	32.0	32.1
NAB-BAY9-SDB6-DUR	100%	f	7.8	7.8	7.8	8.1	7.0	7.1	16.3	15.7	15.6	29.8	29.7	30.5
NAB-BAY18-SDB6-DUR	100%	f	7.9	7.8	7.8	7.8	6.8	7.2	16.2	16.0	15.6	32.1	32.0	32.4
Scripps Control	0	f	7.9	7.7	7.7	7.5	6.8	7.6	15.1	15.8	15.3	28.2	28.0	27.8
Scripps Cu Ref. Tox.	2.9 µg/l	f	7.9	7.7	7.8	7.7	6.9	7.7	15.0	15.7	15.4	29.0	28.5	28.4
	4.1 µg/l	f	7.9	7.8	7.8	7.8	6.9	7.6	15.1	15.8	15.3	28.3	28.1	28.0
	5.9 µg/l	f	7.9	7.8	7.8	8.1	6.8	7.8	15.0	15.8	15.3	27.6	27.9	28.4
	8.4 µg/l	f	7.9	7.7	7.7	7.9	6.9	7.8	15.0	15.9	15.4	28.0	28.0	28.2
	12 µg/l	f	7.9	7.8	7.7	8.0	7.0	7.5	15.3	16.0	15.3	28.3	28.1	28.3
	17.2 µg/l	f	7.9	7.8	7.7	8.0	7.2	7.2	15.0	15.8	15.3	28.0	28.1	28.4
Brine Control 1	n/a	f	8.0	7.8	7.8	7.4	7.2	7.3	16.3	16.0	15.8	32.6	32.3	32.1
Brine Control 2	n/a	f	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

N - water quality not taken due to 100% mortality in treatment
ND - water quality not recorded

OUTFALLS

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NAB-OF9-TIE2-FF	25	95.0
	50	100.0
	100	95.0
NAB-OF18-TIE2-FF	25	95.0
	50	15.0
	100	0.0

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NAB-OF9-TIE2-FF	25	95.0
	50	90.0
	100	50.0
NAB-OF18-TIE2-FF	25	95.0
	50	20.0
	100	5.0

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	MEAN NORM DEV (%)
NAB-OF9-TIE2-FF	12.5	57.0
	25	0.0
	50	0.0
	61	0.0
NAB-OF18-TIE2-FF	12.5	81.0
	25	0.0
	57	0.0

Please refer to TIE 2 Report for raw data and water quality

BAY SAMPLES

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NAB-BAY9-TIE2-DUR	100	100.0
NAB-BAY18-TIE2-DUR	100	95.0

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NAB-BAY9-TIE2-DUR	100	100.0
NAB-BAY18-TIE2-DUR	100	100.0

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	MEAN NORM DEV (%)
NAB-BAY9-TIE2-DUR	100	96.0
NAB-BAY18-TIE2-DUR	100	96.0

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	MEAN SURVIVAL (%)
Scripps Control	n/a	100.0
Salt Control	n/a	100.0

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (% or µg/l Cu)	MEAN SURVIVAL (%)
Natural Seawater	n/a	100.0
Salt Control	n/a	95.0

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	MEAN NORM DEV (%)
Natural Seawater	n/a	96.0
Brine Control	n/a	95.0

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	DATE	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	4/6/2005	50	100	101.8	86.1-120.5
MYSIDS	5/19/2005	214.4	326	271.5	236.1-305.75
MUSSELS	3/19/2005	10	20.0	13.04	12.8-13.3

Reference Toxicant tests are within two standard deviations of Nautilus' control chart mean
Please refer to TIE II Report for raw data and water quality

SDB7– 04/27/2005

OUTFALLS

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NAB-OF9-SDB7-FF	12.5	a	4	80.0	90.0	11.5	94.7	0.500	No
		b	4	80.0					
		c	5	100.0					
		d	6	100.0					
	50	a	6	100.0	95.0	10.0	100.0	0.312	No
		b	5	100.0					
		c	4	80.0					
		d	5	100.0					
	100	a	4	80.0	85.0	10.0	89.5	0.104	No
		b	5	100.0					
		c	4	80.0					
		d	4	80.0					
NAB-OF9-SDB7-COMP	12.5	a	5	100.0	90.8	10.7	95.6	0.500	No
		b	4	80.0					
		c	5	100.0					
		d	5	83.3					
	50	a	4	66.7	81.7	13.7	86.0	0.104	No
		b	4	80.0					
		c	5	100.0					
		d	4	80.0					
	100	a	3	60.0	60.0	16.3	63.2	0.007	Yes
		b	4	80.0					
		c	3	60.0					
		d	2	40.0					
NAB-OF18-SDB7-FF	12.5	a	4	80.0	85.0	10.0	85.0	0.029	Yes
		b	5	100.0					
		c	4	80.0					
		d	4	80.0					
	50	a	5	100.0	90.0	11.5	90.0	0.091	No
		b	5	100.0					
		c	4	80.0					
		d	4	80.0					
	100	a	5	100.0	90.0	11.5	90.0	0.091	No
		b	4	80.0					
		c	5	100.0					
		d	4	80.0					
NAB-OF18-SDB7-COMP	12.5	a	5	100.0	95.0	10.0	95.0	0.196	No
		b	5	100.0					
		c	4	80.0					
		d	5	100.0					
	50	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	100	a	5	100.0	90.0	11.5	90.0	0.091	No
		b	5	100.0					
		c	4	80.0					
		d	4	80.0					

[a]Controls (QA/QC) correspond to all samples from SDB7

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

BAY SAMPLES

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NAB-BAY9-SDB7-PRE	100	a	4	80.0	95.0	10.0	100.0	0.500	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
NAB-BAY18-SDB7-PRE	100	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
NAB-BAY9-SDB7-DUR	100	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
NAB-BAY18-SDB7-DUR	100	a	4	80.0	95.0	10.0	100.0	0.500	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NAB-BAY9-SDB7-PRE	100	a	137	8	94.5	94.6	1.0	102.7	0.064	No
		b	115	7	94.3					
		c	133	9	93.7					
		d	134	5	96.4					
		e	135	8	94.4					
NAB-BAY18-SDB7-PRE	100	a	133	16	89.3	91.6	3.6	99.4	0.395	No
		b	116	15	88.5					
		c	138	7	95.2					
		d	138	6	95.8					
		e	129	16	89.0					
NAB-BAY9-SDB7-DUR	100	a	136	9	93.8	93.2	2.1	101.2	0.248	No
		b	125	13	90.6					
		c	128	11	92.1					
		d	122	5	96.1					
		e	117	8	93.6					
NAB-BAY18-SDB7-DUR	100	a	112	18	86.2	92.3	3.6	100.2	0.470	No
		b	136	9	93.8					
		c	139	10	93.3					
		d	128	10	92.8					
		e	124	6	95.4					

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	5	100.0	95.0	10.0	n/a	n/a	n/a
		b	5	100.0					
		c	5	100.0					
		d	4	80.0					
Salt Control	n/a	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Copper Ref. Tox.	50	a	3	60.0	85.0	19.1	89.5	0.201	No
		b	4	80.0					
		c	5	100.0					
		d	5	100.0					
	100	a	5	100.0	75.0	19.1	78.9	0.065	No
		b	3	60.0					
		c	4	80.0					
		d	3	60.0					
	200	a	2	40.0	70.0	34.6	73.7	0.124	No
		b	5	100.0					
		c	5	100.0					
		d	2	40.0					
	400	a	0	0.0	25.0	25.2	26.3	0.004	Yes
		b	3	60.0					
		c	1	20.0					
		d	1	20.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	153	12	92.7	92.1	2.4	100.0	n/a	n/a
		b	154	20	88.5					
		c	137	9	93.8					
		d	99	7	93.4					
Copper Ref. Tox.	2.9	a	120	18	87.0	82.7	8.5	89.8	0.034	Yes
		b	131	17	88.5					
		c	95	37	72.0					
		d	130	13	90.9					
		e	101	33	75.4					
	4.1	a	95	81	54.0	54.7	10.4	59.3	0.000	Yes
		b	87	50	63.5					
		c	-	-	-					
		d	-	-	-					
		e	-	-	-					
	5.9	a	0	131	0.0	2.3	3.2	2.5	0.000	Yes
		b	4	165	2.4					
		c	9	106	7.8					
		d	2	149	1.3					
		e	0	147	0.0					
	8.4	a	0	131	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	135	0.0					
		c	0	151	0.0					
		d	0	154	0.0					
		e	0	137	0.0					

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	200.0	400.0	268.2	160.3-506.5
MUSSELS	2.9	4.1	4.3	3.78-4.69

Dash indicates no data (replicate was spilled or organisms not added)

[a]Controls (QA/QC) correspond to all samples from SDB7

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

WATER QUALITY

TOPSMELT (*A. affinis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU) 0	24	48	72	96	Dissolved Oxygen (mg/l) 0	24	48	72	96	Temperature (°C) 0	24	48	72	96	Salinity (‰) 0	24	48	72	96
NAB-OF9-SDB7-FF	12.5%	a	7.9	7.8	7.7	7.8	7.7	7.4	6.8	6.6	7.2	7.1	18.9	18.6	19.3	19.0	19.1	33.1	33.3	33.3	33.6	33.6
	25%	a	8.0	7.8	7.7	7.8	7.7	7.9	6.5	6.4	7.0	7.0	18.8	18.6	19.3	19.0	19.1	32.9	32.9	32.9	33.2	33.1
	100%	a	8.1	7.9	7.7	7.8	7.7	7.9	6.2	6.5	6.4	6.4	18.6	18.5	19.3	18.9	19.0	32.1	32.2	32.2	32.3	33.4
NAB-OF9-SDB7-COMP	12.5%	a	7.8	7.8	7.7	7.8	7.6	7.6	6.3	6.1	6.6	6.1	19.2	18.3	19.4	18.6	19.3	33.4	33.3	33.3	33.2	33.7
	25%	a	7.9	7.8	7.6	7.7	7.7	7.8	5.5	5.8	7.0	6.6	18.6	18.3	19.4	18.6	19.2	33.1	33.0	33.1	33.2	33.3
	100%	a	8.1	7.9	7.7	7.8	7.8	8.2	5.6	6.0	6.3	6.6	18.2	18.3	19.4	18.3	19.2	32.5	32.6	32.8	32.9	33.0
NAB-OF18-SDB7-FF	12.5%	a	7.8	7.8	7.6	7.8	7.7	7.5	6.2	6.1	6.8	6.8	19.0	18.5	19.5	18.7	19.0	33.1	33.2	33.0	33.3	33.4
	50%	a	8.0	7.8	7.6	7.8	7.7	7.7	6.3	6.3	6.8	6.5	18.8	18.5	19.4	18.6	18.9	32.8	32.9	32.7	33.1	33.1
	100%	a	8.1	7.9	7.7	7.6	7.6	7.8	5.7	5.7	5.7	6.2	18.6	18.4	19.3	18.6	18.9	32.2	32.2	32.1	32.2	32.3
NAB-OF18-SDB7-COMP	12.5%	a	7.8	7.7	7.7	7.8	7.7	7.8	6.7	6.4	7.2	7.1	18.6	18.0	19.3	18.0	18.8	33.4	33.5	33.3	33.8	34.0
	50%	a	7.8	7.7	7.6	7.7	7.7	7.8	6.6	6.3	6.9	7.2	18.9	18.0	19.3	18.1	18.8	32.8	32.9	32.9	33.1	33.3
	100%	a	7.9	7.7	7.5	7.7	7.7	8.0	5.6	5.8	6.1	6.6	18.6	18.1	19.3	18.2	18.8	32.2	32.2	32.2	32.3	32.3
NAB-BAY9-SDB7-PRE	100%	a	7.8	7.8	7.7	7.8	7.8	7.4	6.9	6.3	7.3	6.8	19.0	18.6	19.3	18.8	19.3	33.6	33.7	33.9	33.9	33.8
NAB-BAY18-SDB7-PRE	100%	a	7.8	7.8	7.7	7.8	7.7	7.3	6.6	6.4	7.3	6.3	19.1	18.4	19.4	18.8	19.3	33.5	33.7	33.9	33.7	33.7
NAB-BAY9-SDB7-DUR	100%	a	7.7	7.6	7.7	7.7	7.7	7.3	7.0	6.4	7.3	6.2	18.6	18.3	19.3	18.6	19.1	32.2	32.2	32.3	32.2	32.2
NAB-BAY18-SDB7-DUR	100%	a	7.7	7.7	7.7	7.8	7.8	7.5	7.0	6.7	7.5	7.1	18.4	18.3	19.4	18.6	19.0	32.9	33.0	33.0	33.1	33.0
Scripps Control	0	a	7.8	7.8	7.6	7.8	7.7	7.7	6.9	6.6	7.5	7.2	18.6	18.3	19.3	18.3	19.1	31.6	31.5	31.7	31.7	31.9
Scripps Cu Ref. Tox.	50 µg/l	a	7.8	7.8	7.6	7.8	7.8	7.8	7.0	6.7	7.7	7.4	18.8	18.3	19.3	18.3	19.0	31.5	31.5	31.6	31.6	31.6
	100 µg/l	a	7.8	7.8	7.6	7.8	7.8	7.7	7.0	6.6	7.7	7.6	18.8	18.3	19.3	18.4	19.1	31.5	31.5	31.6	31.5	31.6
	200 µg/l	a	7.8	7.8	7.6	7.8	7.7	7.7	7.1	6.6	7.9	7.4	18.8	18.2	19.1	18.4	19.0	31.5	31.6	31.8	31.9	31.6
	400 µg/l	a	7.9	7.8	7.7	7.8	7.7	7.7	7.2	7.1	7.9	7.3	18.8	18.3	19.1	18.6	19.0	31.5	31.6	31.8	31.8	31.6
Salt Control	n/a	a	7.9	7.7	7.5	7.6	7.5	7.4	6.1	6.4	7.0	6.6	19.4	18.3	19.2	18.6	19.0	31.4	31.5	31.6	31.4	31.5

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep.	pH (SU) 0	24	48	Dissolved Oxygen (mg/l) 0	24	48	Temperature (°C) 0	24	48	Salinity (‰) 0	24	48
NAB-BAY9-SDB7-PRE	100%	f	7.8	7.8	7.8	7.5	8.4	8.2	16.0	15.1	14.9	33.8	33.8	33.8
NAB-BAY18-SDB7-PRE	100%	f	7.8	7.8	7.8	7.9	8.5	8.4	16.0	15.3	15.1	29.7	30.0	30.2
NAB-BAY9-SDB7-DUR	100%	f	7.8	7.8	7.8	7.9	8.4	8.3	16.0	15.0	14.8	29.7	29.9	30.2
NAB-BAY18-SDB7-DUR	100%	f	7.9	7.8	7.8	7.8	8.5	8.6	16.0	15.1	15.0	29.6	29.6	29.7
Scripps Control	0	f	8.1	8.0	7.7	7.5	8.2	8.2	16.0	15.5	15.2	29.4	29.3	29.0
Scripps Cu Ref. Tox.	2.9 µg/l	f	7.9	7.9	7.9	7.2	8.3	8.5	15.8	15.2	15.0	29.5	29.6	29.7
	4.1 µg/l	f	7.8	7.8	7.7	7.9	8.4	8.4	15.8	15.2	15.3	29.5	29.6	29.7
	5.9 µg/l	f	7.8	7.8	7.7	7.8	8.3	8.4	15.9	15.2	15.4	29.5	29.6	29.6
	8.4 µg/l	f	7.8	7.8	7.7	7.9	8.6	8.2	15.9	15.2	15.2	29.6	29.5	29.6
	12 µg/l	f	7.8	7.8	7.7	7.9	8.5	8.3	15.8	15.0	15.1	29.6	29.5	29.6
	17.2 µg/l	f	7.8	7.8	7.8	7.7	8.2	8.5	15.8	15.0	15.1	29.6	29.6	29.7

Appendix C4

NI

SDB4- 10/17/2004
SDB5- 01/10/2005
SDB6- 2/10/2005
TIE2- 3/19/2005
SDB7- 4/17/2005

SDB4 – 10/17/2004

OUTFALLS

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB4-FF	12.5	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	25	a	5	100.0	85.0	19.1	85.0	0.108	No
		b	4	80.0					
		c	3	60.0					
		d	5	100.0					
	50	a	5	100.0	90.0	11.5	90.0	0.091	No
		b	4	80.0					
		c	5	100.0					
		d	4	80.0					
	100	a	3	60.0	80.0	16.3	80.0	0.046	Yes
		b	4	80.0					
		c	4	80.0					
		d	5	100.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB4-FF	12.5	a	9	90.0	96.7	5.8	96.7	0.211	No
		b	10	100.0					
		c	10	100.0					
	25	a	10	100.0	96.7	5.8	96.7	0.211	No
		b	9	90.0					
		c	10	100.0					
	50	a	8	80.0	76.7	17.3	76.7	0.048	**Yes**
		b	9	90.0					
		c	6	60.0					
	100	a	6	60.0	56.7	5.8	56.7	0.003	**Yes**
		b	5	50.0					
		c	6	60.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB4-FF	6.25	a	164	7	95.9	92.6	3.6	95.0	0.018	Yes
		b	164	13	92.7					
		c	168	6	96.6					
		d	137	17	89.0					
		e	145	18	89.0					
	12.5	a	121	41	74.7	83.2	7.3	85.3	0.006	Yes
		b	169	20	89.4					
		c	163	32	83.6					
		d	175	17	91.1					
		e	157	47	77.0					
	25	a	5	161	3.0	6.7	5.6	6.9	0.000	Yes
		b	1	170	0.6					
		c	10	146	6.4					
		d	13	140	8.5					
		e	27	152	15.1					
	50	a	1	200	0.5	0.3	0.5	0.3	0.000	Yes
		b	0	126	0.0					
		c	2	187	1.1					
		d	0	149	0.0					
		e	0	145	0.0					
	61.4	a	0	196	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	196	0.0					
		c	0	196	0.0					
		d	0	196	0.0					
		e	0	196	0.0					

[a]Controls (QA/QC) correspond to all samples from SDB4

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

BAY SAMPLES

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-BAY23A-SDB4-DUR	100	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-BAY23A-SDB4-DUR	100	a	10	100.0	100.0	0.0	100.0	n/a	No
		b	10	100.0					
		c	10	100.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-BAY23A-SDB4-DUR	100	a	167	5	97.1	97.6	0.5	100.1	0.3966	No
		b	162	3	98.2					
		c	187	4	97.9					
		d	167	5	97.1					
		e	188	4	97.9					

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	5	100.0	100.0	0.0	100.0	n/a	n/a
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Salt Control	n/a	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Copper Ref. Tox.	50	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	100	a	4	80.0	90.0	11.5	90.0	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	4	80.0					
	200	a	0	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	0.0					
		c	0	0.0					
		d	0	0.0					
	400	a	0	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	0.0					
		c	0	0.0					
		d	0	0.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	9	90.0	93.3	5.8	100.0	n/a	n/a
		b	9	90.0					
		c	10	100.0					
Salt Control	n/a	a	10	100.0	100.0	0.0	107.1	0.092	No
		b	10	100.0					
		c	10	100.0					
Copper Ref. Tox.	25	a	10	100.0	100.0	0.0	107.1	0.092	No
		b	10	100.0					
		c	10	100.0					
	50	a	10	100.0	100.0	0.0	107.1	0.092	No
		b	10	100.0					
		c	10	100.0					
	100	a	10	100.0	100.0	0.0	107.1	0.092	No
		b	10	100.0					
		c	10	100.0					
	200	a	9	90.0	83.3	5.8	89.3	0.051	No
		b	8	80.0					
		c	8	80.0					
	400	a	2	20.0	6.7	11.5	7.1	0.001	Yes
		b	0	0.0					
		c	0	0.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	148	25	85.5	94.5	5.4	100.0	n/a	No
		b	175	5	97.2					
		c	139	10	93.3					
		d	193	4	98.0					
		e	174	3	98.3					
Brine Control	n/a	a	177	6	96.7	95.7	1.1	98.1	0.323	No
		b	170	10	94.4					
		c	186	6	96.9					
		d	171	8	95.5					
		e	164	9	94.8					
Copper Ref. Tox.	2.9	a	167	9	94.9	95.1	0.7	100.7	0.397	No
		b	200	11	94.8					
		c	168	10	94.4					
		d	176	8	95.7					
		e	168	7	96.0					
	4.1	a	166	3	98.2	90.3	10.0	95.6	0.221	No
		b	202	7	96.7					
		c	164	17	90.6					
		d	118	43	73.3					
		e	141	11	92.8					
	5.9	a	178	9	95.2	79.0	14.3	83.7	0.036	**Yes**
		b	169	20	89.4					
		c	157	36	81.3					
		d	128	60	68.1					
		e	124	79	61.1					
	8.4	a	69	106	39.4	23.7	13.7	25.1	0.000	**Yes**
		b	56	141	28.4					
		c	58	126	31.5					
		d	12	177	6.3					
		e	24	162	12.9					
	12.0	a	1	177	0.6	1.3	1.3	1.3	0.000	**Yes**
		b	5	172	2.8					
		c	5	203	2.4					
		d	1	207	0.5					
		e	0	171	0.0					
	17.2	a	3	177	1.7	0.5	0.7	0.5	0.000	**Yes**
		b	1	167	0.6					
		c	0	191	0.0					
		d	0	175	0.0					
		e	0	199	0.0					

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	50	100	132.0	120.2-144.8
MYSIDS	200	400	265.3	232.5-302.4
MUSSELS	5.9	8.4	7.29	6.1-8.3

[a]Controls (QA/QC) correspond to all samples from SDB4

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

WATER QUALITY

TOPSMELT (*A. affinis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NI-OF23A-SDB4-FF	12.5%	a	7.9	7.7	7.6	7.7	7.6	6.8	5.2	5.1	5.2	6.0	19.9	18.3	19.3	19.3	19.6	33.9	34.2	34.3	34.3	34.2
	25%	a	8.1	7.8	7.8	7.8	7.9	6.8	6.6	7.0	7.0	7.0	19.7	18.2	19.6	19.3	19.3	33.7	34.0	34.2	34.3	34.5
	50%	a	8.3	7.8	7.8	7.8	7.9	7.1	6.8	6.9	6.6	7.0	19.1	17.7	18.9	18.8	18.9	33.6	33.9	34.2	34.2	34.7
	100%	a	8.7	7.6	7.8	7.7	7.7	7.4	6.0	6.4	6.5	6.3	18.4	18.3	19.3	19.0	19.0	33.2	33.4	33.5	33.7	33.9
NI-BAY23A-SDB4-DUR	100%	a	7.7	7.6	7.7	7.6	7.7	7.4	6.0	5.4	6.3	6.1	18.5	18.3	19.4	19.3	19.5	33.9	34.2	34.3	34.4	34.5
Scripps Control	0	a	7.8	7.8	7.7	7.8	7.7	6.9	5.9	5.5	6.0	6.0	19.1	18.3	19.7	19.0	19.5	33.8	34.0	34.0	34.3	34.3
Scripps Cu Ref. Tox.	50 µg/l	a	7.9	7.8	7.7	7.8	7.7	6.9	6.2	6.5	6.3	5.9	18.7	18.0	19.2	19.1	19.4	33.9	34.4	34.7	34.2	34.3
	100 µg/l	a	7.9	7.8	7.0	7.8	7.8	7.1	6.0	6.1	6.4	6.3	18.8	18.0	19.1	19.0	19.4	33.8	34.1	34.5	34.3	34.5
	200 µg/l	a	7.8	7.8	7.7	7.9	7.8	7.0	6.0	5.9	6.5	6.5	18.6	18.1	19.4	19.1	19.3	33.8	34.0	34.7	34.1	34.2
	400 µg/l	a	7.8	7.9	N	N	N	7.0	6.2	N	N	N	18.6	18.0	N	N	N	33.8	34.1	N	N	N
Salt Control	n/a	a	8.1	7.9	7.7	7.8	7.6	6.9	5.9	6.2	6.0	6.1	19.8	18.0	18.9	18.9	19.4	33.3	33.5	33.6	33.6	33.7

MYSIDS (*A. bahia*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NI-OF23A-SDB4-FF	12.5%	a	7.9	7.7	7.8	7.8	7.9	6.7	3.9	6.9	6.8	6.9	19.3	18.3	19.5	19.1	19.3	34.3	34.5	34.5	34.5	34.6
	25%	a	8.1	7.6	7.7	7.9	7.9	6.8	6.2	6.5	7.0	7.1	19.2	18.8	19.6	19.3	19.4	34.4	34.5	34.5	34.5	34.6
	50%	a	8.3	7.6	7.8	7.7	7.9	7.0	6.6	6.9	6.0	6.7	18.8	18.8	19.3	19.1	19.3	34.1	34.2	34.4	34.1	34.2
	100%	a	8.7	7.7	7.8	7.8	7.9	7.1	6.3	6.7	6.5	6.6	18.3	18.0	19.5	19.1	19.4	33.6	34.2	34.4	34.0	34.5
NI-BAY23A-SDB4-DUR	100%	a	7.8	7.7	7.6	7.7	7.7	7.2	5.6	5.3	5.9	6.4	18.6	18.3	19.7	19.5	19.7	34.3	34.5	34.5	34.4	34.6
Scripps Control	0	a	7.9	7.7	7.7	7.7	7.6	6.9	4.7	5.3	5.0	4.8	18.8	18.3	19.4	19.3	19.5	34.4	34.6	34.6	34.2	34.3
Scripps Cu Ref. Tox.	25 µg/l	a	7.9	7.7	7.7	7.8	7.6	6.9	5.4	5.7	5.4	5.2	18.8	18.6	19.4	19.3	19.6	34.3	34.4	34.6	34.3	34.3
	50 µg/l	a	7.9	7.7	7.6	7.7	7.6	7.1	5.3	5.3	5.0	4.5	18.7	18.6	19.5	19.3	19.6	34.4	34.5	34.5	34.2	34.2
	100 µg/l	a	7.9	7.7	7.6	7.7	7.7	7.1	5.7	4.9	5.6	5.1	18.6	18.5	19.4	19.3	19.6	34.2	34.4	34.5	34.3	34.3
	200 µg/l	a	7.9	7.8	7.8	7.8	7.7	7.0	5.9	6.3	6.1	5.7	18.7	18.6	19.1	19.3	19.6	34.4	34.6	34.2	34.3	34.4
	400 µg/l	a	7.9	7.8	7.6	7.9	7.8	7.0	6.1	5.5	6.4	6.1	18.7	18.6	19.4	19.3	19.6	34.3	34.5	34.6	34.2	34.2
Salt Control	n/a	a	7.9	7.8	7.6	7.9	7.8	7.0	6.1	5.5	6.4	6.1	18.7	18.6	19.4	19.3	19.6	34.3	34.5	34.6	34.2	34.2

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep.	pH (SU)		D.O. (mg/l)		Temp (°C)		Salinity (‰)	
			0	48	0	48	0	48	0	48
NI-OF23A-SDB4-FF	6.25%	f	7.7	7.6	7.0	6.6	15.7	15.7	33.6	33.8
	25%	f	7.7	7.6	7.0	5.8	15.5	15.7	34.0	33.9
	61.4%	f	7.7	7.3	6.9	3.3	15.6	15.7	33.6	34.0
NI-BAY23A-SDB4-DUR	100%	f	7.7	7.8	7.0	6.8	15.1	15.3	34.0	34.2
Scripps Control	0	f	7.8	7.6	6.9	6.8	15.6	15.7	34.0	34.2
Scripps Cu Ref. Tox.	2.9 µg/l	f	7.8	7.8	7.0	6.8	15.8	15.7	33.9	34.1
	8.4 µg/l	f	7.8	7.7	6.9	6.8	15.7	15.5	33.9	34.1
	24 µg/l	f	7.8	7.8	6.9	7.1	15.8	15.5	34.1	34.1
Brine Control	0	f	7.9	7.9	7.0	7.0	15.5	15.7	33.7	34.2

N - water quality not taken due to 100% mortality in treatment

SDB5 – 01/10/2005

BAY SAMPLES

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-DOWNTOWN PIER-SDB5-AFT	100	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-DOWNTOWN PIER-SDB5-AFT	100	a	10	100.0	93.3	5.8		n/a	No
		b	9	90.0					
		c	9	90.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB5-AFT	100	a	184	14	92.9	93.9	1.1	104.2	0.007	Yes
		b	144	7	95.4					
		c	116	9	92.8					
		d	178	11	94.2					
		e	164	10	94.3					
NI-DOWNTOWN PIER-SDB5-AFT	100	a	150	8	94.9	93.6	1.6	103.9	0.012	Yes
		b	170	11	93.9					
		c	139	7	95.2					
		d	144	11	92.9					
		e	155	15	91.2					

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	5	100.0	100.0	0.0	100.0	n/a	n/a
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Copper Ref. Tox.	25	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	50	a	4	80.0	95.0	10.0	95.0	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	100	a	4	80.0	90.0	11.5	94.7	0.091	No
		b	5	100.0					
		c	5	100.0					
		d	4	80.0					
	200	a	1	20.0	15.0	10.0	16.7	0.000	Yes
		b	1	20.0					
		c	1	20.0					
		d	0	0.0					
	400	a	0	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	0.0					
		c	0	0.0					
		d	0	0.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	9	90.0	93.3	5.8	n/a	n/a	n/a
		b	9	90.0					
		c	10	100.0					
Copper Ref. Tox.	25	a	9	90.0	93.3	5.8	100.0	0.500	No
		b	9	90.0					
		c	10	100.0					
	50	a	10	100.0	103.3	5.8	110.7	0.051	No
		b	10	100.0					
		c	11	110.0					
	100	a	10	100.0	100.0	0.0	96.8	0.092	No
		b	10	100.0					
		c	10	100.0					
	200	a	8	80.0	90.0	10.0	90.0	0.325	No
		b	9	90.0					
		c	10	100.0					
	400	a	2	20.0	26.7	11.5	29.6	0.002	Yes
		b	2	20.0					
		c	4	40.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	160	4	97.6	97.7	1.0	100.0	n/a	No
		b	222	4	98.2					
		c	236	6	97.5					
		d	233	9	96.3					
		e	257	3	98.8					
Brine Control 1	n/a	a	204	3	98.6	98.4	0.8	100.7	0.119	No
		b	211	5	97.7					
		c	201	5	97.6					
		d	226	1	99.6					
		e	221	3	98.7					
Brine Control 2	n/a	a	189	3	98.4	97.8	1.1	100.1	0.440	No
		b	231	10	95.9					
		c	210	4	98.1					
		d	190	4	97.9					
		e	210	3	98.6					
Copper Ref. Tox.	2.9	a	231	5	97.9	98.6	0.7	101.0	0.057	No
		b	207	4	98.1					
		c	214	1	99.5					
		d	201	3	98.5					
		e	228	2	99.1					
	4.1	a	214	8	96.4	56.4	39.6	57.7	0.040	Yes
		b	205	21	90.7					
		c	-	-	-					
		d	-	-	-					
		e	-	-	-					
	5.9	a	125	101	55.3	49.3	10.8	50.5	0.000	Yes
		b	125	94	57.1					
		c	132	106	55.5					
		d	114	125	47.7					
		e	64	142	31.1					
	8.4	a	23	187	11.0	10.1	5.2	10.3	0.000	Yes
		b	24	173	12.2					
		c	4	210	1.9					
		d	32	170	15.8					
		e	21	200	9.5					
	12.0	a	0	195	0.0	0.3	0.2	0.3	0.000	Yes
		b	1	246	0.4					
		c	1	221	0.5					
		d	1	218	0.5					
		e	0	219	0.0					
	17.2	a	0	210	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	187	0.0					
		c	0	178	0.0					
		d	0	215	0.0					
		e	0	198	0.0					

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	100	200	138.5	114.4-167.8
MYSIDS	200	400	324.9	276.2-379.8
MUSSELS[d]	4.1	5.9	6.0	5.9-6.1

Dash indicates no data (replicate was spilled or organisms not added)

[a]Controls (QA/QC) correspond to all samples from SDB5

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

[d] Copper reference toxicant test performed on 02/10/2005

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

WATER QUALITY

TOPSMELT (*A. affinis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NI-DOWNTOWN PIER-SDB5-AFT	100%	a	7.9	7.8	7.5	7.7	7.6	7.2	6.7	6.5	6.5	6.3	19.3	19.9	19.8	19.7	18.6	31.9	31.1	29.0	29.1	29.2
Scripps Control	n/a	a	7.9	7.8	7.6	7.8	7.7	7.5	6.2	6.4	6.1	6.3	19.0	18.8	19.7	19.8	18.2	32.7	30.9	30.7	30.7	30.9

MYSIDS (*A. bahia*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NI-DOWNTOWN PIER-SDB5-AFT	100%	a	8.0	7.8	7.6	7.8	7.7	7.6	6.1	5.0	5.8	5.4	18.9	18.8	19.6	19.6	18.3	33.1	31.1	30.8	30.8	31.0
Scripps Control	n/a	a	7.9	7.8	7.5	7.7	7.5	7.3	5.9	5.4	6.2	5.3	18.9	19.1	19.8	19.6	18.2	31.8	30.7	30.2	30.9	31.3

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep.	pH (SU)			D.O. (mg/l)			Temperature (°C)			Salinity (‰)		
			0	24	48	0	24	48	0	24	48	0	24	48
NI-OF23A-SDB5-AFT	100%	f	7.8	7.8	7.9	7.5	7.8	7.5	17.0	15.8	16.3	30.2	30.1	29.9
NI-DOWNTOWN PIER-SDB5-AFT	100%	f	7.8	7.8	7.7	7.4	7.7	7.4	17.0	16.3	16.3	27.0	26.7	26.7
Scripps Control	n/a	f	7.8	7.8	7.8	6.9	7.9	7.5	17.0	16.0	16.3	28.4	28.3	28.4

SDB6 – 02/10/2005

OUTFALLS

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB6-FF	12.5	a	5	100.0	95.0	10.0	95.0	0.196	No
		b	5	100.0					
		c	4	80.0					
		d	5	100.0					
	25	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	50	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	100	a	5	100.0	90.0	20.0	90.0	0.196	No
		b	5	100.0					
		c	3	60.0					
		d	5	100.0					
NI-OF26-SDB6-FF	12.5	a	4	80.0	95.0	10.0	100.0	0.500	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	25	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	50	a	5	100.0	95.0	10.0	100.0	0.500	No
		b	5	100.0					
		c	5	100.0					
		d	4	80.0					
	100	a	5	100.0	95.0	10.0	100.0	0.500	No
		b	5	100.0					
		c	5	100.0					
		d	4	80.0					
NI-OF26-SDB6-COMP	12.5	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	50	a	4	80.0	95.0	10.0	100.0	0.500	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	100	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB6-FF	12.5	a	10	100.0	93.3	5.8	93.3	0.092	No
		b	9	90.0					
		c	9	90.0					
	25	a	10	100.0	100.0	0.0	100.0	n/a	No
		b	10	100.0					
		c	10	100.0					
	50	a	10	100.0	100.0	0.0	100.0	n/a	No
		b	10	100.0					
		c	10	100.0					
	100	a	9	90.0	96.7	5.8	96.7	0.211	No
		b	10	100.0					
		c	10	100.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF26-SDB6-FF	12.5	a	10	100.0	100.0	0.0	100.0	0.211	No
		b	10	100.0					
		c	10	100.0					
	25	a	10	100.0	93.3	5.8	93.3	0.051	No
		b	9	90.0					
		c	9	90.0					
	50	a	10	100.0	96.7	5.8	96.7	0.115	No
		b	9	90.0					
		c	10	100.0					
	100	a	8	80.0	73.3	11.5	73.3	0.014	Yes
		b	8	80.0					
		c	6	60.0					
NI-OF26-SDB6-COMP	12.5	a	10	100.0	93.3	11.5	93.3	0.137	No
		b	8	80.0					
		c	10	100.0					
	50	a	10	100.0	100.0	0.0	100.0	0.211	No
		b	10	100.0					
		c	10	100.0					
	100	a	10	100.0	100.0	0.0	100.0	0.211	No
		b	10	100.0					
		c	10	100.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB6-FF	6.2	a	219	5	97.8	98.3	1.5	100.3	0.346	No
		b	244	1	99.6					
		c	215	9	96.0					
		d	230	2	99.1					
		e	229	2	99.1					
	12.4	a	210	6	97.2	96.7	1.0	98.7	0.034	Yes
		b	212	10	95.5					
		c	201	6	97.1					
		d	198	4	98.0					
		e	208	9	95.9					
	24.8	a	28	198	12.4	10.3	2.9	10.5	0.000	Yes
		b	22	208	9.6					
		c	15	199	7.0					
		d	34	206	14.2					
		e	21	226	8.5					
	49.5	a	0	221	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	203	0.0					
		c	0	219	0.0					
		d	0	219	0.0					
		e	0	235	0.0					
NI-OF26-SDB6-FF	6.2	a	207	4	98.1	97.7	0.7	100.3	0.358	No
		b	209	6	97.2					
		c	190	4	97.9					
		d	238	8	96.7					
		e	201	3	98.5					
	12.4	a	185	6	96.9	96.5	1.4	99.1	0.163	No
		b	214	13	94.3					
		c	229	8	96.6					
		d	212	7	96.8					
		e	215	4	98.2					
	24.8	a	172	22	88.7	92.6	2.5	95.0	0.004	Yes
		b	185	10	94.9					
		c	200	16	92.6					
		d	201	17	92.2					
		e	196	11	94.7					
	49.5	a	1	144	0.7	0.1	0.3	0.1	0.000	Yes
		b	0	218	0.0					
		c	0	231	0.0					
		d	0	222	0.0					
		e	0	215	0.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL [1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF26-SDB6-COMP	7.0	a	238	8	96.7	97.7	1.2	100.2	0.398	No
		b	216	7	96.9					
		c	203	2	99.0					
		d	191	2	99.0					
		e	207	7	96.7					
	13.9	a	215	9	96.0	97.0	1.4	99.6	0.319	No
		b	213	5	97.7					
		c	228	2	99.1					
		d	196	8	96.1					
		e	207	8	96.3					
	27.9	a	237	13	94.8	95.8	2.1	98.3	0.095	No
		b	202	6	97.1					
		c	218	14	94.0					
		d	181	2	98.9					
		e	218	13	94.4					
	55.7	a	198	14	93.4	95.5	1.8	97.9	0.042	**Yes**
		b	212	8	96.4					
		c	201	8	96.2					
		d	201	5	97.6					
		e	210	14	93.8					

[a]Controls (QA/QC) correspond to all samples from SDB6

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

BAY SAMPLES

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-BAY23A-SDB6-PRE	100	a	5	100	100.0	0.0	100.0	n/a	No
		b	5	100					
		c	5	100					
		d	5	100					
NI-BAY26-SDB6-PRE	100	a	4	80	95.0	10.0	95.0	0.196	No
		b	5	100					
		c	5	100					
		d	5	100					
NI-OF23A-SDB6-DUR	100	a	5	100	100.0	0.0	100.0	n/a	No
		b	5	100					
		c	5	100					
		d	5	100					
NI-BAY26-SDB6-DUR	100	a	5	100	100.0	0.0	100.0	n/a	No
		b	5	100					
		c	5	100					
		d	5	100					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-BAY23A-SDB6-PRE	100	a	10	100	100.0	0.0	107.1	n/a	No
		b	10	100					
		c	10	100					
NI-BAY26-SDB6-PRE	100	a	10	100	100.0	0.0	107.1	n/a	No
		b	11	100					
		c	10	100					
NI-OF23A-SDB6-DUR	100	a	10	100	100.0	0.0	107.1	n/a	No
		b	10	100					
		c	10	100					
NI-BAY26-SDB6-DUR	100	a	10	100	100.0	0.0	107.1	n/a	No
		b	10	100					
		c	10	100					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB6-PRE	100.0	a	221	4	98.2	98.0	0.8	99.6	0.294	No
		b	203	5	97.6					
		c	214	4	98.2					
		d	188	6	96.9					
		e	234	2	99.2					
NI-BAY26-SDB6-PRE	100	a	213	3	98.6	97.5	1.3	99.0	0.377	No
		b	234	6	97.5					
		c	211	3	98.6					
		d	203	6	97.1					
		e	208	10	95.4					
NI-OF23A-SDB6-DUR	100	a	207	4	98.1	97.1	1.5	99.4	0.130	No
		b	154	3	98.1					
		c	193	6	97.0					
		d	205	5	97.6					
		e	193	11	94.6					
NI-BAY26-SDB6-DUR	100	a	218	9	96.0	96.4	0.8	98.6	0.079	No
		b	219	8	96.5					
		c	233	8	96.7					
		d	221	11	95.3					
		e	183	5	97.3					

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	5	100.0	100.0	0.0	100.0	n/a	n/a
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Salt Control	n/a	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
Copper Ref. Tox.	50	a	5	100	100.0	0.0	100.0	n/a	No
		b	5	100					
		c	5	100					
		d	5	100					
	100	a	5	100	70.0	47.6	70.0	0.148	No
		b	0	0					
		c	5	100					
		d	4	80					
	200	a	1	20	10.0	11.5	10.0	0.000	Yes
		b	0	0					
		c	0	0					
		d	1	20					
	400	a	0	0	0.0	0.0	0.0	0.000	Yes
		b	0	0					
		c	0	0					
		d	0	0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	8	80.0	93.3	11.5	100.0	n/a	n/a
		b	10	100.0					
		c	11	100.0					
Salt Control	n/a	a	10	100.0	100.0	0.0	107.1	0.211	No
		b	10	100.0					
		c	10	100.0					

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Copper Ref. Tox.	100	a	10	100	100.0	0.0	107.1	0.371	No
		b	10	100					
		c	10	100					
	200	a	10	100	96.7	5.8	103.6	0.500	No
		b	10	100					
		c	9	90					
	400	a	3	30	33.3	5.8	35.7	0.005	**Yes**
		b	3	30					
		c	4	40					
	800	a	0	0	0.0	0.0	0.0	0.004	**Yes**
		b	0	0					
		c	0	0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP.	# NORMAL	ABNORMA	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	160	4	97.6	97.7	1.0	100.0	n/a	n/a
		b	222	4	98.2					
		c	236	6	97.5					
		d	233	9	96.3					
		e	257	3	98.8					
Brine Control 1	n/a	a	204	3	98.6	98.4	0.8	100.7	0.119	No
		b	211	5	97.7					
		c	201	5	97.6					
		d	226	1	99.6					
		e	221	3	98.7					
Brine Control 2	n/a	a	189	3	98.4	97.8	1.1	100.1	0.440	No
		b	231	10	95.9					
		c	210	4	98.1					
		d	190	4	97.9					
		e	210	3	98.6					
Copper Ref. Tox.	2.9	a	231	5	97.9	98.6	0.7	101.0	0.057	No
		b	207	4	98.1					
		c	214	1	99.5					
		d	201	3	98.5					
		e	228	2	99.1					
	4.1	a	214	8	96.4	56.4	39.6	57.7	0.040	**Yes**
		b	205	21	90.7					
		c	-	-	-					
		d	-	-	-					
		e	-	-	-					
	5.9	a	125	101	55.3	49.3	10.8	50.5	0.000	**Yes**
		b	125	94	57.1					
		c	132	106	55.5					
		d	114	125	47.7					
		e	64	142	31.1					
	8.4	a	23	187	11.0	10.1	5.2	10.3	0.000	**Yes**
		b	24	173	12.2					
		c	4	210	1.9					
		d	32	170	15.8					
		e	21	200	9.5					
	12.0	a	0	195	0.0	0.3	0.2	0.3	0.000	**Yes**
		b	1	246	0.4					
		c	1	221	0.5					
		d	1	218	0.5					
		e	0	219	0.0					
	17.2	a	0	210	0.0	0.0	0.0	0.0	0.000	**Yes**
		b	0	187	0.0					
		c	0	178	0.0					
		d	0	215	0.0					
		e	0	198	0.0					

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	100.0	200.0	123.5	103.3-147.5
MYSIDS	200.0	400.0	352.5	326.3-387.7
MUSSELS	4.1	5.9	6.0	5.9-6.1

Dash indicates no data (replicate was spilled or organisms not added)

[a]Controls (QA/QC) correspond to all samples from SDB6

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

WATER QUALITY

TOPSMELT (*A. affinis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NI-OF23A-SDB6-FF	12.5%	a	7.6	7.7	7.7	7.7	7.4	7.0	7.3	6.5	6.1	5.5	19.5	18.6	19.6	19.6	20.0	33.4	33.4	33.4	33.6	33.8
	25%	a	7.6	7.7	7.7	7.6	7.5	7.0	7.4	6.5	6.5	6.3	19.2	18.6	19.6	19.7	20.0	33.4	33.4	33.4	34.0	34.1
	50%	a	7.7	7.7	7.7	7.6	7.5	7.2	7.0	6.4	6.2	6.1	18.9	18.7	19.6	19.6	20.1	33.4	33.4	33.5	33.9	34.0
	100%	a	7.7	7.7	7.7	7.6	7.6	7.5	6.9	6.5	6.3	6.5	18.8	18.7	19.5	19.5	19.9	33.0	33.2	33.2	34.1	34.4
NI-OF26-SDB6-FF	12.5%	a	7.6	7.7	7.7	7.6	7.5	7.1	7.4	6.5	6.7	6.5	18.9	18.8	19.6	19.5	19.9	33.3	33.3	33.0	33.6	33.7
	25%	a	7.6	7.7	7.7	7.6	7.6	7.3	7.4	6.5	6.7	6.7	18.9	18.4	19.5	19.4	19.9	33.2	33.3	33.3	33.6	33.8
	50%	a	7.6	7.6	7.7	7.6	7.6	7.2	7.0	6.5	6.4	6.9	19.0	18.5	19.6	19.3	19.8	32.9	32.9	32.9	33.5	33.8
	100%	a	7.8	7.7	7.6	7.6	7.6	7.5	6.9	6.4	6.0	6.4	19.1	18.4	19.5	19.4	19.8	32.9	32.8	32.9	33.1	33.3
NI-OF26-SDB6-COMP	12.5%	a	7.7	7.7	7.7	7.6	7.6	7.3	7.3	6.5	6.3	6.6	18.8	18.4	19.6	19.5	19.7	32.9	32.9	33.0	33.7	33.8
	50%	a	7.6	7.7	7.7	7.6	7.6	7.3	7.3	6.5	6.4	6.7	18.8	18.4	19.6	19.5	19.8	33.1	32.9	33.1	33.4	33.5
	100%	a	7.8	7.7	7.6	7.6	7.6	7.8	7.3	6.7	6.7	6.8	18.9	18.3	19.5	19.0	19.6	33.2	33.1	33.6	34.1	34.8
NI-OF23A-SDB6-PRE	100%	a	7.6	7.7	7.7	7.6	7.5	6.8	7.4	6.6	7.3	5.8	19.1	18.7	19.6	19.4	20.0	33.5	33.5	33.3	33.5	34.1
NI-BAY26-SDB6-PRE	100%	a	7.6	7.7	7.7	7.6	7.6	7.2	7.2	6.6	7.3	6.4	18.9	18.8	19.6	19.3	19.9	33.0	33.3	33.3	33.3	33.8
NI-OF23A-SDB6-DUR	100%	a	7.6	7.6	7.7	7.6	7.5	7.3	7.6	6.7	7.2	6.3	19.7	18.8	19.5	19.4	19.9	32.9	32.9	33.0	33.2	33.7
NI-BAY26-SDB6-DUR	100%	a	7.6	7.7	7.7	7.5	7.5	7.3	7.2	6.5	7.0	6.6	18.8	18.8	19.7	19.6	20.3	30.7	30.8	30.4	31.2	31.2
Scripps Control	0	a	7.6	7.7	7.7	7.6	7.6	7.8	7.7	7.2	7.4	7.2	18.8	18.2	19.0	19.3	19.1	32.0	32.6	33.5	32.1	33.5
Scripps Cu Ref. Tox.	50 µg/l	a	7.6	7.7	7.7	7.6	7.6	6.8	7.3	7.2	7.4	7.1	18.5	18.7	19.3	19.3	19.4	32.2	32.9	33.1	31.7	32.4
	100 µg/l	a	7.6	7.7	7.6	7.6	7.6	6.9	7.7	7.2	6.9	7.1	18.6	18.5	19.0	19.6	19.5	32.5	32.9	33.1	31.9	32.4
	200 µg/l	a	7.6	7.7	7.6	7.7	7.7	6.9	7.8	7.2	7.9	7.0	18.6	18.1	19.3	19.4	19.4	32.1	32.9	33.0	32.5	32.6
	400 µg/l	a	7.6	7.7	7.6	N	N	6.9	7.9	7.1	N	N	18.6	18.1	19.1	N	N	32.1	32.9	33.0	N	N
Salt Control	n/a	a	7.6	7.7	7.4	7.3	7.3	5.9	7.1	6.9	7.2	6.9	18.8	18.3	19.0	19.4	19.5	31.6	32.7	33.1	32.0	32.7

MYSIDS (*A. bahia*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NI-OF23A-SDB6-FF	12.5%	a	7.7	7.6	7.4	7.5	7.5	7.0	6.7	5.0	6.0	5.2	20.3	18.6	19.5	19.4	19.3	33.2	33.4	33.1	33.5	33.7
	25%	a	7.7	7.5	7.4	7.5	7.5	6.9	5.6	4.4	5.3	5.0	19.9	18.8	19.5	19.4	19.4	33.1	33.4	33.3	33.7	33.8
	50%	a	7.8	7.6	7.6	7.5	7.5	7.3	6.7	5.0	5.5	5.3	19.1	18.8	19.5	19.5	19.4	33.0	33.4	33.3	33.7	33.7
	100%	a	7.9	7.7	7.5	7.6	7.6	7.7	6.3	4.7	4.8	5.2	18.6	18.8	19.5	19.6	19.3	33.0	33.4	33.3	33.6	33.6
NI-OF26-SDB6-FF	12.5%	a	7.7	7.6	7.5	7.5	7.5	7.0	6.9	5.0	5.5	5.7	19.2	18.6	19.4	19.6	19.3	32.3	33.1	33.0	33.4	33.6
	25%	a	7.7	7.6	7.5	7.5	7.6	7.4	6.5	4.9	5.4	5.8	19.4	18.6	19.4	19.6	19.4	32.6	32.9	32.9	33.4	33.5
	50%	a	7.8	7.7	7.5	7.5	7.5	7.6	6.2	4.8	4.8	5.2	19.5	18.7	19.4	19.7	19.4	32.6	32.7	32.7	33.1	33.2
	100%	a	7.9	7.7	7.5	7.6	7.6	7.2	5.8	4.9	5.2	5.2	19.8	18.7	19.4	19.4	19.3	31.7	32.7	32.6	32.8	33.0
NI-OF26-SDB6-COMP	12.5%	a	7.7	7.7	7.6	7.5	7.5	7.3	6.9	5.0	5.9	5.8	18.9	18.7	19.7	19.6	19.4	32.9	33.0	33.0	33.8	33.5
	50%	a	7.7	7.7	7.6	7.5	7.6	7.4	6.4	4.8	5.5	5.2	18.8	18.4	19.7	19.5	19.3	32.9	33.0	33.1	33.3	33.4
	100%	a	7.8	7.7	7.6	7.6	7.5	7.8	6.2	4.4	4.9	5.1	19.2	18.6	19.7	19.6	19.4	33.0	33.2	33.1	33.1	33.4
NI-OF23A-SDB6-PRE	100%	a	7.7	7.7	7.6	7.5	7.5	6.7	7.3	5.5	5.9	4.4	20.2	18.7	19.6	19.4	19.6	33.1	33.7	33.4	33.8	34.2
NI-BAY26-SDB6-PRE	100%	a	7.7	7.6	7.5	7.5	7.6	7.1	6.8	5.3	6.2	6.0	19.3	18.6	19.6	19.6	19.4	33.1	33.4	33.3	33.8	33.8
NI-OF23A-SDB6-DUR	100%	a	7.5	7.7	7.5	7.5	7.6	7.4	7.0	5.7	6.3	5.4	19.8	18.8	19.5	19.5	19.3	32.6	33.0	33.0	33.8	33.5
NI-BAY26-SDB6-DUR	100%	a	7.6	7.7	7.6	7.6	7.6	7.9	6.9	4.7	5.5	5.5	19.9	18.6	19.7	19.7	19.4	32.6	32.9	32.9	33.3	33.4
Scripps Control	0	a	7.7	7.7	7.6	7.6	7.6	6.8	7.3	5.4	6.1	6.4	19.3	18.8	19.8	19.8	18.9	32.1	32.1	32.3	31.9	32.1
Scripps Cu Ref. Tox.	100 µg/l	a	7.6	7.6	7.5	7.6	7.5	6.9	7.2	5.1	6.1	5.8	19.3	18.8	19.7	19.8	19.6	32.2	32.2	32.6	32.1	32.2
	200 µg/l	a	7.6	7.6	7.6	7.6	7.6	7.0	7.2	5.0	6.5	6.4	19.1	18.7	19.7	19.8	19.5	32.4	32.3	32.6	32.1	32.1
	400 µg/l	a	7.6	7.7	7.6	7.6	7.6	7.0	7.3	5.4	7.0	6.9	19.0	18.8	19.7	19.6	19.4	32.1	32.1	32.6	32.2	32.2
	800 µg/l	a	7.6	7.6	7.6	7.2	7.7	7.1	7.6	6.0	6.2	6.9	19.0	18.8	19.6	19.8	19.4	32.3	32.0	32.6	32.2	32.2
Salt Control	n/a	a	7.6	7.4	7.3	7.7	7.2	5.8	6.6	4.7	7.6	6.4	19.3	18.8	19.8	19.6	19.6	31.8	31.9	32.2	32.2	32.7

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep.	pH (SU)			D.O. (mg/l)			Temperature (°C)			Salinity (‰)		
			0	24	48	0	24	48	0	24	48	0	24	48
NI-OF23A-SDB6-FF	6.2%	f	7.8	7.8	7.8	8.0	6.9	7.5	15.2	15.8	15.5	32.5	32.6	32.5
	12.4%	f	7.8	7.8	7.8	8.0	7.0	7.7	16.2	15.8	15.4	32.9	32.0	32.6
	24.8%	f	7.8	7.8	7.8	7.8	7.0	7.6	16.2	15.7	15.4	31.6	31.7	32.9
	49.5%	f	7.8	7.8	7.8	8.0	7.0	7.7	16.3	15.8	15.5	31.5	31.5	32.0
NI-OF26-SDB6-FF	6.2%	f	7.8	7.8	7.8	7.8	7.2	7.5	15.0	15.8	15.4	32.7	32.6	32.4
	12.4%	f	7.8	7.8	7.8	7.9	7.2	7.7	15.0	15.9	15.4	31.5	32.5	32.3
	24.8%	f	7.8	7.8	7.8	8.0	7.1	7.6	15.1	15.8	15.4	32.5	32.1	31.9
	49.5%	f	7.8	7.8	7.8	7.9	7.2	7.7	15.0	15.7	15.5	32.4	31.9	31.9
NI-OF26-SDB6-COMP	7.0%	f	7.8	7.8	7.8	8.2	7.1	7.5	16.3	15.9	15.7	32.4	32.6	33.0
	13.9%	f	7.9	7.8	7.8	8.2	7.1	7.6	16.2	15.9	15.7	32.7	32.5	32.5
	27.9%	f	7.9	7.7	7.8	8.2	7.1	7.3	16.2	16.0	15.6	32.2	31.9	32.3
	55.7%	f	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI-OF23A-SDB6-PRE	100%	f	7.8	7.8	7.8	7.8	6.9	7.5	15.3	15.8	15.5	33.2	32.9	32.5
NI-BAY26-SDB6-PRE	100%	f	7.8	7.8	7.8	7.7	7.1	7.6	15.3	15.8	15.4	32.4	32.9	32.5
NI-OF23A-SDB6-DUR	100%	f	7.8	7.8	7.8	8.3	7.2	7.4	16.3	15.8	15.5	31.6	31.5	31.7
NI-BAY26-SDB6-DUR	100%	f	7.8	7.8	7.8	8.1	6.8	7.6	16.3	15.7	15.6	31.2	31.2	31.2
Scripps Control	0	f	7.9	7.7	7.7	7.5	6.8	7.6	15.1	15.8	15.3	28.2	28.0	27.8
Scripps Cu Ref. Tox.	2.9 µg/l	f	7.9	7.7	7.8	7.7	6.9	7.7	15.0	15.7	15.4	29.0	28.5	28.4
	4.1 µg/l	f	7.9	7.8	7.8	7.8	6.9	7.6	15.1	15.8	15.3	28.3	28.1	28.0
	5.9 µg/l	f	7.9	7.8	7.8	8.1	6.8	7.8	15.0	15.8	15.3	27.6	27.9	28.4
	8.4 µg/l	f	7.9	7.7	7.7	7.9	6.9	7.8	15.0	15.9	15.4	28.0	28.0	28.2
	12 µg/l	f	7.9	7.8	7.7	8.0	7.0	7.5	15.3	16.0	15.3	28.3	28.1	28.3
	17.2 µg/l	f	7.9	7.8	7.7	8.0	7.2	7.2	15.0	15.8	15.3	28.0	28.1	28.4
Brine Control 1	n/a	f	8.0	7.8	7.8	7.4	7.2	7.3	16.3	16.0	15.8	32.6	32.3	32.1
Brine Control 2	n/a	f	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

N - water quality not taken due to 100% mortality in treatment
ND - water quality not recorded

TIE2 – 03/19/2005

OUTFALLS

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NI-OF23A-TIE2-FF	25	100.0
	50	95.0
	100	65.0
NI-OF26-TIE2-FF	25	95.0
	50	100.0
	100	100.0

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NI-OF23A-TIE2-FF	25	100.0
	50	100.0
	100	65.0
NI-OF26-TIE2-FF	25	95.0
	50	100.0
	100	95.0

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	MEAN NORM DEV (%)
NI-OF23A-TIE2-FF	12.50	95.0
	25	24.0
	50	0.0
	57	0.0
NI-OF26-TIE2-FF	12.50	96.0
	25	94.0
	50	94.0
	69	89.0

BAY SAMPLES

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NI-BAY23A-TIE2-DUR	100	95.0
NI-BAY26-TIE2-DUR	100	100.0

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (%)	MEAN SURVIVAL (%)
NI-BAY23A-TIE2-DUR	100	100.0
NI-BAY26-TIE2-DUR	100	95.0

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	MEAN NORM DEV (%)
NI-BAY23A-TIE2-DUR	100	96.0
NI-BAY26-TIE2-DUR	100	95.0

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	MEAN SURVIVAL (%)
Scripps Control	n/a	100.0
Salt Control	n/a	100.0

MYSIDS (*A. bahia*)

SAMPLE ID	CONC (% or µg/l Cu)	MEAN SURVIVAL (%)
Scripps Control	n/a	100.0
Salt Control	n/a	95.0

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	MEAN NORM DEV (%)
Natural Seawater	n/a	96.0
Brine Control	n/a	95.0

Please refer to TIE II Report for raw data and water quality

[a]Controls (QA/QC) correspond to all samples from TIE2
[b]Student's t-test with a one tailed distribution and two sample unequal variance
[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control
n/a - t-test not used since control and treatment have same percentage survival
[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID
[2]Controls were Scripps filtered seawater

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	DATE	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	4/6/2005	50	100	101.8	86.1-120.5
MYSIDS	5/19/2005	214.4	326	271.5	236.1-305.75
MUSSELS	3/19/2005	10	20.0	13.04	12.8-13.3

Reference Toxicant tests are within two standard deviations of Nautilus' control chart mean

SDB7 – 04/27/2005

OUTFALLS

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[1]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB7-FF	12.5	a	5	100.0	100.0	0.0	100.0	n/a	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	50	a	5	100.0	95.0	10.0	95.0	0.196	No
		b	5	100.0					
		c	4	80.0					
		d	5	100.0					
	100	a	4	80.0	95.0	10.0	95.0	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
NI-OF26-SDB7-FF	12.5	a	5	100.0	100.0	0.0	111.1	0.091	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	50	a	5	100.0	100.0	0.0	111.1	0.091	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	100	a	4	80.0	80.0	16.3	88.9	0.180	No
		b	5	100.0					
		c	3	60.0					
		d	4	80.0					
NI-OF26-SDB7-COMP	12.5	a	5	100.0	100.0	0.0	111.1	0.091	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
	50	a	5	100.0	90.0	20.0	100.0	0.500	No
		b	5	100.0					
		c	3	60.0					
		d	5	100.0					
	100	a	5	100.0	100.0	0.0	111.1	0.091	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					

[a]Controls (QA/QC) correspond to all samples from SDB7

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

BAY SAMPLES

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (%)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-BAY23A-SDB7-PRE	100	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
NI-BAY26-SDB7-PRE	100	a	4	80.0	90.0	11.5	94.7	0.269	No
		b	5	100.0					
		c	5	100.0					
		d	4	80.0					
NI-OF23A-SDB7-DUR	100	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					
NI-BAY26-SDB7-DUR	100	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (%)	REP.	# NORMAL	# ABNORMAL	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
NI-OF23A-SDB7-PRE	100.0	a	128	16	88.9	90.0	2.8	97.7	0.135	No
		b	106	17	86.2					
		c	148	17	89.7					
		d	122	11	91.7					
		e	116	8	93.5					
NI-BAY26-SDB7-PRE	100	a	133	2	98.5	96.8	2.1	105.0	0.012	Yes[c]
		b	124	2	98.4					
		c	128	4	97.0					
		d	112	4	96.6					
		e	126	9	93.3					
NI-OF23A-SDB7-DUR	100	a	117	17	87.3	91.8	3.2	99.7	0.443	No
		b	130	13	90.9					
		c	136	12	91.9					
		d	150	11	93.2					
		e	141	6	95.9					
NI-BAY26-SDB7-DUR	100	a	130	8	94.2	95.7	2.7	103.9	0.0393	Yes[c]
		b	139	3	97.9					
		c	142	1	99.3					
		d	98	7	93.3					
		e	104	7	93.7					

QA/QC SAMPLES[a]

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	5	100.0	95.0	10.0	n/a	n/a	n/a
		b	5	100.0					
		c	5	100.0					
		d	4	80.0					
Salt Control	n/a	a	5	100.0	100.0	0.0	105.3	0.196	No
		b	5	100.0					
		c	5	100.0					
		d	5	100.0					

TOPSMELT (*A. affinis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP	SURVIVAL (#)	SURVIVAL (%)	MEAN SURVIVAL (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Copper Ref. Tox.	50	a	3	60.0	85.0	19.1	89.5	0.201	No
		b	4	80.0					
		c	5	100.0					
		d	5	100.0					
	100	a	5	100.0	75.0	19.1	78.9	0.065	No
		b	3	60.0					
		c	4	80.0					
		d	3	60.0					
	200	a	2	40.0	70.0	34.6	73.7	0.124	No
		b	5	100.0					
		c	5	100.0					
		d	2	40.0					
	400	a	0	0.0	25.0	25.2	26.3	0.004	Yes
		b	3	60.0					
		c	1	20.0					
		d	1	20.0					

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	CONC (% or µg/l Cu)	REP.	# NORMAL	ABNORMA	NORM DEVEL (%)	MEAN NORM DEV (%)	STD DEV	% of CONTROL[2]	P-VALUE[b]	SIG DIFF FROM CONTROL?
Scripps Control	n/a	a	153	12	92.7	92.1	2.4	100.0	n/a	n/a
		b	154	20	88.5					
		c	137	9	93.8					
		d	99	7	93.4					
Copper Ref. Tox.	2.9	a	120	18	87.0	82.7	8.5	89.8	0.034	Yes
		b	131	17	88.5					
		c	95	37	72.0					
		d	130	13	90.9					
		e	101	33	75.4					
	4.1	a	95	81	54.0	54.7	10.4	59.3	0.000	Yes
		b	87	50	63.5					
		c	-	-	-					
		d	-	-	-					
		e	-	-	-					
	5.9	a	0	131	0.0	2.3	3.2	2.5	0.000	Yes
		b	4	165	2.4					
		c	9	106	7.8					
		d	2	149	1.3					
		e	0	147	0.0					
	8.4	a	0	131	0.0	0.0	0.0	0.0	0.000	Yes
		b	0	135	0.0					
		c	0	151	0.0					
		d	0	154	0.0					
		e	0	137	0.0					

SUMMARY RESULTS- QA/QC

COPPER REFERENCE TOXICANT TEST

SPECIES	NOEC (µg/l)	LOEC (µg/l)	EC50 (µg/l)	95% C.L. (µg/l)
TOPSMELT	200	400.0	268.18	160.3-506.5
MUSSELS	2.9	4.1	4.30	3.78-4.69

Dash indicates no data (replicate was spilled or organisms not added)

[a]Controls (QA/QC) correspond to all samples from SDB7

[b]Student's t-test with a one tailed distribution and two sample unequal variance

[c] p-value is significant because treatment had a significantly greater proportion normal compared to the control

n/a - t-test not used since control and treatment have same percentage survival

[1]Controls were the Bay water samples taken prior to storm (PRE) with comparable sample ID

[2]Controls were Scripps filtered seawater

WATER QUALITY

TOPSMELT (*A. affinis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep	pH (SU)					Dissolved Oxygen (mg/l)					Temperature (°C)					Salinity (‰)				
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
NI-OF23A-SDB7-FF	12.5%	a	7.7	7.7	7.6	7.7	7.7	7.5	6.8	6.4	7.3	6.8	18.8	18.6	19.3	18.6	19.1	33.6	33.8	33.9	34.1	34.2
	50%	a	7.7	7.7	7.6	7.7	7.6	7.7	6.4	6.5	7.4	6.4	18.6	18.6	19.4	18.8	19.2	34.0	34.2	34.1	34.3	34.3
	100%	a	7.8	7.7	7.6	7.6	7.6	8.1	6.3	6.5	7.2	7.0	18.2	18.6	19.4	18.8	19.1	34.4	34.4	34.5	34.6	34.8
NI-OF26-SDB7-FF	12.5%	a	7.7	7.7	7.6	7.7	7.7	7.5	6.3	6.1	7.2	6.7	18.8	18.3	19.4	18.6	19.2	33.1	33.3	33.4	33.6	33.6
	50%	a	7.7	7.6	7.5	7.6	7.6	7.5	5.5	5.6	6.1	6.1	18.6	18.4	19.4	18.6	19.3	32.7	32.8	32.8	33.1	33.1
	100%	a	7.8	7.5	7.5	7.5	7.6	7.8	4.8	5.0	5.7	5.6	18.1	18.6	19.4	18.7	19.3	31.6	31.8	31.9	32.0	32.1
NI-OF26-SDB7-COMP	12.5%	a	7.8	7.7	7.6	7.7	7.7	7.6	6.4	6.3	7.0	6.6	19.3	18.2	19.3	18.3	19.1	33.4	33.3	33.4	33.3	33.6
	50%	a	7.9	7.7	7.6	7.7	7.7	7.8	6.3	6.0	7.0	6.8	19.1	18.1	19.3	18.2	18.9	32.8	32.8	32.9	33.1	33.3
	100%	a	8.0	7.8	7.6	7.7	7.6	8.1	5.9	6.0	6.6	6.5	18.6	18.0	19.1	18.1	18.8	32.0	32.2	32.5	32.5	32.7
NI-OF23A-SDB7-PRE	100%	a	7.7	7.7	7.7	7.7	7.8	7.5	6.7	6.3	7.4	6.5	19.0	18.6	19.4	18.7	19.3	33.7	33.9	33.9	34.1	33.9
NI-BAY26-SDB7-PRE	100%	a	7.7	7.7	7.7	7.7	7.8	7.3	6.6	6.5	7.2	6.5	19.3	18.3	19.3	18.4	19.3	33.2	33.8	33.9	34.1	34.0
NI-OF23A-SDB7-DUR	100%	a	7.7	7.7	7.7	7.7	7.6	7.3	6.6	6.4	7.3	5.8	18.4	18.3	19.3	18.6	19.0	33.4	33.4	33.4	33.2	33.1
NI-BAY26-SDB7-DUR	100%	a	7.7	7.5	7.7	7.8	7.7	7.5	6.9	6.6	7.3	6.1	18.4	18.3	19.3	18.6	19.1	33.5	33.5	33.5	33.4	33.4
Scripps Control	0	a	7.8	7.8	7.6	7.8	7.7	7.7	6.9	6.6	7.5	7.2	18.6	18.3	19.3	18.3	19.1	31.6	31.5	31.7	31.7	31.9
Scripps Cu Ref. Tox.	50 µg/l	a	7.8	7.8	7.6	7.8	7.8	7.8	7.0	6.7	7.7	7.4	18.8	18.3	19.3	18.3	19.0	31.5	31.5	31.6	31.6	31.6
	100 µg/l	a	7.8	7.8	7.6	7.8	7.8	7.7	7.0	6.6	7.7	7.6	18.8	18.3	19.3	18.4	19.1	31.5	31.5	31.6	31.5	31.6
	200 µg/l	a	7.8	7.8	7.6	7.8	7.7	7.7	7.1	6.6	7.9	7.4	18.8	18.2	19.1	18.4	19.0	31.5	31.6	31.8	31.9	31.6
	400 µg/l	a	7.9	7.8	7.7	7.8	7.7	7.7	7.2	7.1	7.9	7.3	18.8	18.3	19.1	18.6	19.0	31.5	31.6	31.8	31.8	31.6
Salt Control	n/a	a	7.9	7.7	7.5	7.6	7.5	7.4	6.1	6.4	7.0	6.6	19.4	18.3	19.2	18.6	19.0	31.4	31.5	31.6	31.4	31.5

MUSSELS (*M. galloprovincialis*)

SAMPLE ID	Effluent Concentration (% or µg/l Cu)	Rep.	pH (SU)			D.O. (mg/l)			Temperature (°C)			Salinity (‰)		
			0	24	48	0	24	48	0	24	48	0	24	48
NI-OF23A-SDB7-PRE	100%	f	7.7	7.8	7.7	7.8	8.6	8.4	16.0	15.3	15.1	33.9	33.9	33.8
NI-BAY26-SDB7-PRE	100%	f	7.7	7.8	7.7	8.0	8.4	8.3	16.0	15.2	15.6	33.6	33.3	33.0
NI-OF23A-SDB7-DUR	100%	f	7.7	7.8	7.8	7.9	8.7	8.5	16.0	15.2	14.9	33.5	33.5	33.5
NI-BAY26-SDB7-DUR	100%	f	7.7	7.8	7.8	8.0	8.3	8.4	16.0	15.3	15.0	33.7	33.4	33.3
Scripps Control	0	f	8.1	8.0	7.7	7.5	8.2	8.2	16.0	15.5	15.2	29.4	29.3	29.0
Scripps Cu Ref. Tox.	2.9 µg/l	f	7.9	7.9	7.9	7.2	8.3	8.5	15.8	15.2	15.0	29.5	29.6	29.7
	4.1 µg/l	f	7.8	7.8	7.7	7.9	8.4	8.4	15.8	15.2	15.3	29.5	29.6	29.7
	5.9 µg/l	f	7.8	7.8	7.7	7.8	8.3	8.4	15.9	15.2	15.4	29.5	29.6	29.6
	8.4 µg/l	f	7.8	7.8	7.7	7.9	8.6	8.2	15.9	15.2	15.2	29.6	29.5	29.6
	12 µg/l	f	7.8	7.8	7.7	7.9	8.5	8.3	15.8	15.0	15.1	29.6	29.5	29.6
	17.2 µg/l	f	7.8	7.8	7.8	7.7	8.2	8.5	15.8	15.0	15.1	29.6	29.6	29.7

Appendix D

Chemistry

Table of Data Qualifiers

Flag	Application
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank
D	Dilution Run. Initial run outside linear range of instrument
E	Estimate, result is greater than the highest concentration level in the calibration
H	Surrogate diluted out. Used when surrrogate rocovery is afftected by excessive dilution of the sample extract
J	Analyte detected below the sample-specific Reporting Limit (RL)
ME	Significant matrix Interference – Estimated value
MI	Significant Matrix Interference – value could not be determined or estimated
n	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO), but meets the contingency criteria
N	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO)
NA	Not applicable
T	Holding Time (HT) exceeded
U	Analyte not detected at 3:1 signal:noise ratio. The sample-specific method detection limit (MDL) reported

Table of Acronyms

Acronym	Definition
CVAF	Cold Vapor Atomic Fluorescence
FIAS	Field Injection Atomic Spectroscopy
GFAA	Graphite Furnace-Atomic Absorption
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
ICP-OES	Inductively Coupled Plasma – Optical Emission Spectrometry
LCS	Laboratory Control Sample
MB	Matrix Blank
MSL	Battelle/Marine Sciences Laboratory
NS	Not Spiked
NS&T	National Standards and Trends
OPR	On-going Precision and Recovery
PB	Procedural Blank
PD	Percent Difference
RIS	Recovery Internal Standard
RPD	Relative Percent Difference
SRM	Standard Reference Material

Appendix D1

NAV

SDB1- 11/7/2002
SDB2- 2/24/2003
SDB4- 10/17/2004
SDB45- 10/26/2004

SDB1-11/7/2002

METALS

MSL CHEMISTRY CODE	CLIENT CODE	PARAMETER	Ag (µg/L)		Cu (µg/L)		Pb (µg/L)		Hg (µg/L)		Zn (µg/L)	
1919-1	NAV-OF9-SDB1-COMP (T)	Total metals	0.215		123		23.5		0.0441		969	
1919-13	NAV-OF9-SDB1-COMP (D)	Dissolved metals	0.0113	J	59.6		0.437		0.00676		776	
1919-2	NAV-OF11-SDB1-DUR (T)	Total metals	0.100	J	136		6.50		0.266		407	
1919-14	NAV-OF11-SDB1-DUR (D)	Dissolved metals	0.0250	J	58.8		0.536		0.0116		499	
1919-3 R1	NAV-OF14-SDB1-DUR (T)	Total metals	0.0688	J	75.7		8.93		0.0732		573	
1919-3 R2	NAV-OF14-SDB1-DUR (T)	Total metals	--		--		--		0.0732		--	
1919-3 MEAN	*NAV-OF14-SDB1-DUR (T)*	*Total metals*	--		--		--		*0.0732*		--	
1919-15	NAV-OF14-SDB1-DUR (D)	Dissolved metals	0.0125	J	51.9		0.602		0.0123		366	
1919-4 R1	NAV-BAY9-SDB1-PRE (T)	Total metals	0.0225	J	4.53		0.235		0.00358		9.06	
1919-4 R2	NAV-BAY9-SDB1-PRE (T)	Total metals	0.0275	J	4.50		0.223		--		9.42	
1919-4 MEAN	*NAV-BAY9-SDB1-PRE (T)*	*Total metals*	*0.0250*	J	*4.52*		*0.229*		--		*9.24*	
1919-16	NAV-BAY9-SDB1-DUR (D)	Dissolved metals	0.0225	J	3.42		0.0749	J	0.00457		8.55	
1919-5	NAV-BAY9-SDB1-DUR (T)	Total metals	0.0163	J	4.91		0.200		0.00292		10.4	
1919-17	NAV-BAY9-SDB1-DUR (D)	Dissolved metals	0.0175	J	3.52		0.0897	J	0.00457		10.7	
1919-9	NAV-BAY9-SDB1-AFT (T)	Total metals	0.0188	J	4.79		0.151		0.00244		10.4	
1919-21	NAV-BAY9-SDB1-AFT (D)	Dissolved metals	0.0175	J	4.10		0.0771	J	0.00322		10.8	
1919-6	NAV-BAY11-SDB1-DUR (T)	Total metals	0.0163	J	4.72		0.219		0.00329		10.1	
1919-18	NAV-BAY11-SDB1-DUR (D)	Dissolved metals	0.0301	J	3.55		0.0716	J	0.00459		10.9	
1919-10	NAV-BAY11-SDB1-AFT (T)	Total metals	0.0238	J	4.59		0.140		0.00197		9.91	
1919-22	NAV-BAY11-SDB1-AFT (D)	Dissolved metals	0.0163	J	3.52		0.0794	J	0.00284		10.3	
1919-7	NAV-BAY14-SDB1-DUR (T)	Total metals	0.0200	J	5.21		0.217		0.00279		11.3	
1919-19	NAV-BAY14-SDB1-DUR (D)	Dissolved metals	0.0213	J	3.66		0.0733	J	0.00403		10.1	
1919-11 R1	NAV-BAY14-SDB1-AFT (T)	Total metals	0.0225	J	4.86		0.169		0.00214		10.3	
1919-11 R2	NAV-BAY14-SDB1-AFT (T)	Total metals	--		--		--		0.00205		--	
1919-11 MEAN	NAV-BAY14-SDB1-AFT (T)	Total metals	--		--		--		*0.00210*		--	
1919-23	NAV-BAY14-SDB1-AFT (D)	Dissolved metals	0.0188	J	3.97		0.0847	J	0.00387		10.2	
1919-8 R1	NAV-BAY14A-SDB1-DUR (T)	Total metals	0.0225	J	4.69		0.208		0.00228		10.2	
1919-8 R2	NAV-BAY14A-SDB1-DUR (T)	Total metals	0.0213	J	4.69		0.201		--		8.90	
1919-8 MEAN	*NAV-BAY14A-SDB1-DUR (T)*	*Total metals*	*0.0219*	J	*4.69*		*0.205*		--		*9.55*	
1919-20	NAV-BAY14A-SDB1-DUR (D)	Dissolved metals	0.0188	J	3.59		0.0889	J	0.00331		9.28	
1919-12	NAV-BAY14A-SDB1-AFT (T)	Total metals	0.0238	J	5.08		0.162		0.00174		10.4	
1919-24	NAV-BAY14A-SDB1-AFT (D)	Dissolved metals	0.0125	J	3.93		0.0722	J	0.00328		9.76	

METALS QA/QC

PROJECT: Contaminant Analyses of Storm water and San Diego Bay Seawater
PARAMETER: Metals
LABORATORY: Battelle Marine Sciences Laboratory, Sequim, Washington
MATRIX: Seawater

SAMPLE CUSTODY AND PROCESSING: Twenty-four seawater samples (12 total and 12 dissolved) for metals analysis were received on 11/13/02. All samples were received in good condition (i.e., all sample containers were intact). Dissolved metals were received in polyethylene containers, which are not suitable for Hg analysis. The client was informed of the potentially compromised dissolved Hg data.

Samples were assigned a Battelle Central File (CF) identification number (1919) and were entered into Battelle's log-in system.

The following lists information on sample receipt and processing activities:

Lab Sample IDs:	1907-1 through –24
Description:	Seawater/seawater samples
Collection dates	11/07/02, 11/09/02, 11/10/02
Laboratory arrival date	11/13/02
Cooler temperature on arrival	12.5°C [(1)]
CVAA analysis (Hg)	12/03/02, 12/04/02
Fe-Pd preconcentration	12/18/02
ICP-MS analysis (Cu, Pb, Zn)	12/30/02, 01/17/03 reruns
GFAA analysis (Ag)	12/31/02, 01/02/03

(1) Cooler temperature outside the acceptable range of 4±2°C, however samples were not compromised as they were already acidified, see note on Log-in Checklist.

DATA QUALITY OBJECTIVES:

Analyte	Analytical Method	Range of Recovery	Relative Precision	SRM Accuracy	Project Reporting Limits (µg/L)[a]	Achieved Detection Limits (µg/L)[b]
Ag	GFAA	75-125%	±20%	±20%	0.1	0.01
Cu	ICP-MS	75-125%	±20%	±20%	0.1	0.028
Hg	CVAF	75-125%	±20%	±20%	0.001	0.00016
Pb	ICP-MS	75-125%	±20%	±20%	0.1	0.0059
Zn	ICP-MS	75-125%	±20%	±20%	0.1	0.11

(a) Extracted from the statement of work
(b) Achieved MDLs from Fe/Pd seawater MDL, Ag from GFAA report, Hg from 2002 MDL Study

METHODS: Five metals were analyzed: silver (Ag), copper (Cu), lead (Pb), mercury (Hg), and zinc (Zn).

Samples were preconcentrated using iron (Fe) and palladium (Pd) according to Battelle SOP MSL-I-025, *Methods of Sample Preconcentration*, which is derived from EPA Method 1640. Samples were then submitted for analysis for Cu, Pb and Zn by inductively coupled plasma-mass spectrometry (ICP-MS) following Battelle SOP MSL-I-022, *Determination of Elements in Aqueous and Digestate Samples by ICP-MS*, derived from EPA Method 1638. Six samples identified as OF9-SDB1, OF11-SDB1, OF14-SDB1, both dissolved and total fractions, were analyzed at a ten fold dilution directly by ICP-MS for Cu and Zn, as the preconcentrated samples were outside the calibration range of the instrument.

These results are reported.

METHODS:

Ag was analyzed in the Fe-Pd preconcentrate by graphite furnace atomic absorption (GFAA) following Battelle SOP MSL-I-029, *Determination of Metals in Aqueous and Digestate Samples by GFAA*, derived from EPA Method 200.9.

Hg was analyzed directly (with no preconcentration step) using cold-vapor atomic fluorescence (CVAF) spectroscopy according to Battelle SOP MSL-I-013, *Total Mercury in Aqueous Samples by CVAF*, which directly follows EPA Method 1631.

All results were reported in units of µg/L. Data are not blank corrected.

HOLDING TIMES:

The recommended holding times for metals analyses are 28 days from sample collection for Hg analysis and 6 months for analysis of all other metals. All samples were analyzed within their respective holding times.

DETECTION LIMITS:

Laboratory-achieved detection limits reported are from the Fe/Pd seawater MDL for Cu, Pb and Zn; GFAA daily analysis for Ag; and the 2002 MDL Study for Hg. MDLs were less than target reporting limits for all metals. The data are flagged by the following criteria:

U Analyte not detected above the laboratory achieved MDL, which is reported

J Analyte detected above the MDL, but below the reporting limit

Data quality precision or accuracy outside the criteria of ±20% or recoveries outside criteria of ±25%

METHOD BLANKS:

Three method blanks were analyzed for all metals. Blank concentrations for all metals were below or less than three times the project reporting limits. Data were not blank corrected.

LABORATORY CONTROL SAMPLE ACCURACY:

Four blank spike (LCS) samples were analyzed with the set of water samples. Recoveries were reported for samples spiked at approximately 0.005 µg/L for Hg and 10 µg/L for Ag, Cu, Pb, and Zn in the preconcentrated samples. LCS samples analyzed with the reanalysis of Cu and Zn by direct ICP-MS were spiked at 3.2 µg/L for Cu and 29.4 µg/L for Zn. LCS recoveries ranged from 82% to 118% and were within the QC acceptance criteria of 75% to 125% for all metals.

MATRIX SPIKE ACCURACY:

Two samples were selected as a matrix spike sample for each analyte. Recoveries were reported for samples spiked at approximately 0.02 µg/L Hg and 10 µg/L for Ag, Cu, Pb, and Zn. Matrix spike recoveries ranged from 77% to 104% and were within QC acceptance criteria of 75%-125% recovery for all metals, except one replicate for Zn (64%). Acceptable accuracy for Zn analysis is demonstrated in the three alternate MS samples.

REPLICATE PRECISION:

Replicate precision was assessed by duplicate sample analysis and expressed as the relative percent deviation (RPD) of replicate results. RPDs ranged from 0% to 20% and were within the QC acceptance criteria of 20% for all metals.

STANDARD REFERENCE MATERIAL ACCURACY:

Three SRMs were analyzed with this set of samples. CASS-4, SLRS-3 and 1640 were analyzed for ICP-MS metals and SRM 1641d was analyzed for Hg. SRM accuracy was expressed as the percent difference (PD) between the measured and certified or laboratory consensus value within the certified range.

The SRM CASS-4 is a nearshore seawater reference material, which is not certified for Ag or Hg. The certified values for CASS-4 are generally less than five times the laboratory achieved detection limit, therefore not a useful indicator of data set accuracy. However, CASS-4 was analyzed with this set because a alternate seawater SRM is not available. Laboratory consensus values were determined as CASS-4 is certified at concentrations near the detection limit. Laboratory consensus values were determined from multiple analyses of CASS-4 conducted over the past year. The target QC acceptance criterion is 20% PD, which was achieved from either end of the certified or consensus value range for all metals, except Pb (153%, 33%) and one replicate of Zn (182%). Acceptable analysis accuracy for Pb and Zn is demonstrated in the four alternate SRM recoveries.

The SRM SLRS-3 is a riparian reference material, which is not certified for Ag or Hg. The percent differences ranged from 1% to 18% and were within the QC acceptance criteria of 20% for all certified metals.

SRM 1640 and 1641 are freshwater reference materials used as instrument check samples. Data accuracy for mercury is evaluated in SRM 1641. SRM percent differences ranged from 0% to 14% and were within QC acceptance criteria of 20% (PD) for all metals.

METALS QA/QC (CONT.)

MSL CHEMISTRY CODE	CLIENT CODE	PARAMETER	Ag (µg/L)		Cu (µg/L)		Pb (µg/L)		Hg (µg/L)		Zn (µg/L)	
DETECTION LIMITS												
Project Reporting Limit			0.1		0.1		0.1		0.001		0.1	
Laboratory Achieved MDL[1]			0.010		0.028		0.0059		0.00016		0.11	
METHOD BLANKS												
blkr1			0.010	U	0.127		0.0429	J	0.000594	J	0.174	
blkr2			0.010	U	0.131		0.0248	J	0.000299	J	0.137	
blank trm r1 (reruns)					0.028	U					0.11	U
Mean			*0.010*	U	*0.0953*	J	*0.0339*	J	*0.000446*	J	*0.140*	
LABORATORY CONTROL SAMPLE (LCS) ACCURACY												
OPR120202run1 (Hg)	LCS R1		9.02		9.31		8.46		0.00523		10.1	
OPR120202run2 (Hg)	LCS R2		9.24		9.18		8.23		0.00532		9.87	
OPR120203run1 (Hg)	LCS R3 (reruns)		--		3.56		--		0.00593		32.3	
OPR120203run2 (Hg)	LCS R4 (reruns)		--		3.51		--		0.00590		32.4	
OPR120202run1 (Hg)	LCS R1	% Rec (10 or Hg 0.005 ppb)	90%		92%		84%		98%		99%	
OPR120202run2 (Hg)	LCS R2	% Rec (10 or Hg 0.005 ppb)	92%		90%		82%		100%		97%	
OPR120203run1 (Hg)	LCS R3 (reruns)	% Rec (3.2 Cu, 29.4 Zn or Hg 0.005 ppb)			110%				118%		110%	
OPR120203run2 (Hg)	LCS R4 (reruns)	% Rec (3.2 Cu, 29.4 Zn or Hg 0.005 ppb)			106%				112%		110%	
MATRIX SPIKE ACCURACY												
1919-4	NAV-BAY9-SDB1-PRE	Total metals	0.0225	J	4.53		0.235		0.00358		9.06	
1919-4 MS			NS		NS		NS		0.0210		NS	
1919-4 MSD			NS		NS		NS		0.0203		NS	
1919-4 MS		% Rec (0.017ppb)							102%			
1919-4 MSD		% Rec (0.017ppb)							98%			
1919-5	NAV-BAY9-SDB1-DUR	Total metals	0.0163	J	4.91		0.200		NS		10.4	
1919-5 MS			9.81		13.8		8.22		NS		18.8	
1919-5 MSD			10.35		14.4		8.46		NS		19	
1919-5 MS		% Rec (10ppb)	98%		89%		80%				84%	
1919-5 MSD		% Rec (10ppb)	103%		95%		83%				86%	
1919-7	NAV-BAY14-SDB1-DUR	Total metals	0.0200	J	5.21		0.217		0.00279		11.3	
1919-7 MS			NS		NS		NS		0.0198		NS	
1919-7 MSD			NS		NS		NS		0.0209		NS	
1919-7 MS		% Rec (0.018ppb)							97%			
1919-7 MSD		% Rec (0.018ppb)							100%			
1919-8	NAV-BAY14A-SDB1-DUR	Total metals	0.0225	J	4.69		0.208		0.00228		10.2	
1919-8 MS			NS		NS		NS		0.0217		NS	
1919-8 MSD			NS		NS		NS		0.0203		NS	
1919-8 MS		% Rec (0.018ppb)							105%			
1919-8 MSD		% Rec (0.018ppb)							102%			
1919-11	NAV-BAY14-SDB1-AFT	Total metals	0.0225	J	4.86		0.169		NS		10.3	
1919-11 MS			9.46		13		7.85		NS		18.9	
1919-11 MSD			10.4		13.9		8.28		NS		16.7	
1919-11 MS		% Rec (10ppb)	94%		81%		77%				86%	
1919-11 MSD		% Rec (10ppb)	104%		90%		81%				64%	#
REPLICATE PRECISION												
1919-3 R1	NAV-OF14-SDB1-DUR (T)	Total metals	0.0688	J	73.6		8.93		0.0732		588	
1919-3 R2	NAV-OF14-SDB1-DUR (T)	Total metals	--		--		--		0.0732		--	
1919-3 MEAN	NAV-OF14-SDB1-DUR (T)	*Total metals*	--		--		--		*0.0732*		--	
		RPD							0%			
1919-4r1	NAV-BAY9-SDB1-PRE	Total metals	0.0225	J	4.53		0.235				9.06	
1919-4r2	NAV-BAY9-SDB1-PRE	Total metals	0.0275	J	4.5		0.223				9.42	
1919-4 MEAN	*NAV-BAY-SDB1-PRE*	*Total metals*	*0.0250*	J	*4.515*		*0.229*				*9.24*	
		RPD	20%		1%		5%				4%	
1919-8r1	NAV-BAY14A-SDB1-DUR	Total metals	0.0225	J	4.69		0.208				10.2	
1919-8r2	NAV-BAY14A-SDB1-DUR	Total metals	0.0213	J	4.69		0.201				8.90	
1919-8 MEAN	*NAV-BAY14A-SDB1-DUR*	*Total metals*	*0.0219*	J	*4.69*		*0.205*				*9.55*	
		RPD	6%		0%		3%				14%	
1919-11 R1	NAV-BAY14-SDB1-AFT	Total metals	0.0225	J	4.86		0.169		0.00214		10.3	
1919-11 R2	NAV-BAY14-SDB1-AFT	Total metals	--		--		--		0.00205		--	
1919-11 MEAN	NAV-BAY14-SDB1-AFT	Total metals	--		--		--		*0.00210*		--	

METALS QA/QC (CONT.)

MSL CHEMISTRY CODE	CLIENT CODE	PARAMETER	Ag (µg/L)		Cu (µg/L)		Pb (µg/L)		Hg (µg/L)		Zn (µg/L)	
STANDARD REFERENCE MATERIAL ACCURACY												
cass4r1			--		0.692		0.0541	J	--		1.16	
cass4r2			--		0.676		0.0285	J	--		0.526	
	SRM Certified or *Laboratory Consensus* Value		*NC*		0.592		*0.0214*	J	*NC*		0.412	
		Range			±0.055		*±0.01*				±0.055	
PD CASS-4 r1					17%		153%	#			182%	#
PD CASS-4 r2					14%		33%	#			13%	
slrs3r1			--		1.36		0.0747	J	--		1.20	
slrs3r2			--		1.38		0.0691	J	--		1.23	
		SRM Certified Value	*NC*		1.35		0.068		*NC*		1.04	
		Range			±0.07		±0.007				±0.09	
PD SLRS3 r1					1%		10%				15%	
PD SLRS3 r2					2%		2%				18%	
1640Direct R1 or 1641 R1 for Hg			--		86.5		26.8		1624		60.7	
1640Direct R2 or 1641 R2 for Hg			--		76.6		24.0		1603		56.5	
1640 TRM			--		86.0		--		--		53.0	
certified value			--		85.2		27.9		1590		53.2	
Range			--						±40			
PD 1640 Direct R1					2%		4%		2%		14%	
PD 1640 Direct R2					10%		14%		1%		6%	
PD 1640 TRM					1%						0%	

(1)= Fe/Pd MDL Study, Ag from Graphite Furnace report, and Hg from 2002 MDL Study; NC = Analyte not certified; NS= Analyte not spike; # = Data quality outside the accuracy criteria of ±20% or precision/MS recovery criteria of ±25%; U= Analyte not detected above the laboratory achieved MDL, which is reported; J = Anlayte detected above the MDL, but below the reporting limit.

PAHs

CLIENT SAMPLE ID	NAV-OF9-SDB1-COMP		NAV-OF11-SDB1-COMP		NAV-OF14-SDB1-COMP		NAV-BAY9-SDB1-PRE		NAV-BAY9-SDB1-DUR		NAV-BAY9-SDB1-AFT		NAV-BAY11-SDB1-DUR		NAV-BAY11-SDB1-AFT		NAV-BAY14-SDB1-DUR		NAV-BAY14-SDB1-AFT		NAV-BAY14A-SDB1-DUR		NAV-BAY14A-SDB1-AFT	
Battelle Sample ID	V9897		V9898		V9899		V9900		V9901		V9905		V9902		V9906		V9903		V9907		V9904		V9908	
Battelle Batch ID	02-634		02-634		02-634		02-634		02-634		02-634		02-634		02-634		02-634		02-634		02-634		02-634	
Associated Blank	AB383PB		AB383PB		AB383PB		AB383PB		AB383PB		AB383PB		AB383PB		AB383PB		AB383PB		AB383PB		AB383PB		AB383PB	
QC Type	N		N		N		N		N		N		N		N		N		N		N		N	
Data File	A0409.D		A0412.D		A0413.D		A0414.D		A0416.D		A0420.D		A0417.D		A0421.D		A0418.D		A0422.D		A0419.D		A0423.D	
Extraction Date	11/14/02		11/14/02		11/14/02		11/14/02		11/14/02		11/14/02		11/14/02		11/14/02		11/14/02		11/14/02		11/14/02		11/14/02	
Acquired Date	11/26/02		11/26/02		11/26/02		11/26/02		11/26/02		11/26/02		11/26/02		11/26/02		11/26/02		11/26/02		11/26/02		11/26/02	
Matrix	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Sample Size	1	L	2.64	L	2.63	L	2.65	L	2.64	L	2.62	L	2.63	L	2.62	L	2.64	L	2.65	L	2.64	L	2.64	L
Dilution Factor	1.667		1.667		1.667		1.667		2		1.667		1.667		1.667		1.667		1.667		1.667		1.667	
PIV	1	mL	1	mL	1	mL	1	mL	1	mL	1	mL	1	mL	1	mL	1	mL	1	mL	1	mL	1	mL
Min Reporting Limit	16.7		6.31		6.34		6.29		7.58		6.36		6.34		6.36		6.31		6.29		6.31		6.31	
Amount Units	ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L	
Naphthalene	11.70	J	5.47	J	5.84	J	2.07	J	17.10		1.58	J	1.58	J	1.98	J	1.09	J	2.39	J	1.90	J	1.43	J
C1-Naphthalenes	7.61	J	2.76	J	4.11	J	3.34	J	27.00		0.51	U	1.69	J	0.51	U	1.64	J	2.97	J	0.50	U	0.50	U
C2-Naphthalenes	1.33	U	0.50	U	0.50	U	0.50	U	43.50		0.51	U	0.50	U	0.51	U	0.50	U	0.50	U	0.50	U	0.50	U
C3-Naphthalenes	1.33	U	0.50	U	0.50	U	0.50	U	19.00		0.51	U	0.50	U	0.51	U	0.50	U	0.50	U	0.50	U	0.50	U
C4-Naphthalenes	1.33	U	0.50	U	0.50	U	0.50	U	5.66	J	0.51	U	0.50	U	0.51	U	0.50	U	0.50	U	0.50	U	0.50	U
Biphenyl	0.83	U	0.32	U	1.54	J	0.31	U	4.13	J	0.32	U	0.32	U	0.32	U	0.32	U	0.31	U	0.32	U	0.32	U
Acenaphthylene	3.70	J	1.27	J	0.80	J	0.76	J	2.10	J	0.32	U	0.31	U	0.32	U	0.31	U	0.31	U	0.31	U	0.31	U
Acenaphthene	1.07	U	4.41	J	3.76	J	5.44	J	5.55	J	4.92	J	7.39		5.46	J	5.03	J	5.09	J	3.76	J	4.57	J
Fluorene	5.51	J	2.41	J	2.54	J	2.18	J	4.07	J	1.78	J	2.68	J	2.58	J	2.02	J	4.00	J	1.24	J	1.41	J
C1-Fluorenes	0.98	U	0.37	U	0.37	U	0.37	U	3.60	J	0.37	U	0.37	U	0.37	U	0.37	U	4.21	J	0.37	U	0.37	U
C2-Fluorenes	0.98	U	0.37	U	0.37	U	0.37	U	0.45	U	0.37	U	0.37	U	0.37	U	0.37	U	16.70		0.37	U	0.37	U
C3-Fluorenes	0.98	U	0.37	U	0.37	U	0.37	U	0.45	U	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U
Phenanthrene	56.20		10.30		16.20		2.39	J	7.50	J	1.36	J	4.48	J	3.91	J	3.55	J	19.80		1.40	J	1.86	J
Anthracene	3.08	J	1.98	J	2.37	J	0.26	U	3.07	J	0.76	J	1.11	J	2.04	J	1.16	J	2.92	J	1.19	J	0.64	J
C1-Phenanthrenes/Anthracenes	36.20		11.80		19.00		0.26	U	5.76	J	0.27	U	3.49	J	0.27	U	6.03	J	20.50		0.26	U	0.26	U
C2-Phenanthrenes/Anthracenes	105.00		35.80		56.10		0.26	U	0.32	U	0.27	U	0.26	U	0.27	U	26.50		48.80		0.26	U	0.26	U
C3-Phenanthrenes/Anthracenes	89.90		16.30		40.70		0.26	U	0.32	U	0.27	U	0.26	U	0.27	U	23.20		32.20		0.26	U	0.26	U
Dibenzothiophene	24.80		14.00		19.00		0.35	U	1.18	J	0.35	U	0.82	J	0.35	U	0.69	J	2.18	J	0.35	U	0.35	U
C1-Dibenzothiophenes	64.20		33.40		42.70		0.35	U	5.55	J	0.35	U	0.35	U	0.35	U	5.86	J	14.20		0.35	U	0.35	U
C2-Dibenzothiophenes	104.00		40.70		57.80		0.35	U	0.42	U	0.35	U	0.35	U	0.35	U	8.19		28.90		0.35	U	0.35	U
C3-Dibenzothiophenes	113.00		29.30		55.80		0.35	U	0.42	U	0.35	U	0.35	U	0.35	U	13.20		32.70		0.35	U	0.35	U
Fluoranthene	99.30		13.50		26.00		9.17		18.00		11.00		17.50		15.20		12.60		53.50		10.10		9.38	
Pyrene	129.00		17.00		33.90		4.66	J	9.91		5.85	J	9.61		8.25		10.90		152.00		5.44	J	4.33	J
C1-Fluoranthenes/Pyrenes	52.30		10.70		22.80		0.36	U	8.47		0.37	U	4.93	J	0.37	U	13.20		8.88		0.36	U	0.36	U
C2-Fluoranthenes/Pyrenes	73.30		14.60		26.20		0.36	U	0.43	U	0.37	U	0.36	U	0.37	U	19.70		9.50		0.36	U	0.36	U
C3-Fluoranthenes/Pyrenes	84.30		12.10		27.60		0.36	U	0.43	U	0.37	U	0.36	U	0.37	U	14.40		6.95		0.36	U	0.36	U
Benzo(a)anthracene	22.90		2.71	J	6.75		0.52	U	2.93	J	0.53	U	1.85	J	1.36	J	1.94	J	0.52	U	0.53	U	1.52	J
Chrysene	81.60		10.40		25.60		0.28	U	4.57	J	0.28	U	1.86	J	2.03	J	3.88	J	2.50	J	1.28	J	2.08	J
C1-Chrysenes	68.10		11.00		21.20		0.28	U	0.33	U	0.28	U	0.28	U	0.28	U	7.07		0.28	U	0.28	U	0.28	U
C2-Chrysenes	118.00		0.28	U	34.60		0.28	U	0.33	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
C3-Chrysenes	0.73	U	0.28	U	0.28	U	0.28	U	0.33	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
C4-Chrysenes	0.73	U	0.28	U	0.28	U	0.28	U	0.33	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
Benzo(b)fluoranthene	56.70		5.00	J	18.10		0.32	U	0.39	U	0.33	U	0.33	U	0.33	U	0.33	U	0.32	U	0.33	U	0.33	U
Benzo(k)fluoranthene	42.20		3.41	J	8.22		0.33	U	0.39	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Benzo(e)pyrene	63.90		6.61		18.80		0.34	U	0.41	U	0.35	U	0.34	U	0.35	U	0.34	U	0.34	U	0.34	U	0.34	U
Benzo(a)pyrene	52.90		4.16	J	9.28		0.49	U	0.59	U	0.50	U	0.49	U	0.50	U	0.49	U	0.49	U	0.49	U	0.49	U
Perylene	26.70		0.53	U	3.53	J	0.53	U	0.63	U	0.53	U	0.53	U	0.53	U	0.53	U	0.53	U	0.53	U	0.53	U
Indeno(1,2,3-c,d)pyrene	64.60		4.00	J	8.96		0.69	U	0.83	U	0.70	U	0.69	U	0.70	U	0.69	U	0.69	U	0.69	U	0.69	U
Dibenz(a,h)anthracene	10.60	J	0.79	U	0.79	U	0.79	U	0.95	U	0.80	U	0.79	U	0.80	U	0.79	U	0.79	U	0.79	U	0.79	U
Benzo(g,h,i)perylene	91.80		6.20	J	17.50		0.43	U	0.51	U	0.43	U	0.43	U	0.43	U	0.43	U	5.02	J	0.43	U	0.43	U
Total Priority Pollutant PAHs	731.79		92.22		185.82		26.67		74.80		27.25		48.06		42.81		42.17		247.22		26.31		27.22	
Total PAH	1763.10		331.29		637.30		30.01		198.65		27.25		58.99		42.81		181.85		475.91		26.31		27.22	

PAHs (CONT.)

CLIENT SAMPLE ID	NAV-OF9-SDB1-COMP	NAV-OF11-SDB1-COMP	NAV-OF14-SDB1-COMP	NAV-BAY9-SDB1-PRE	NAV-BAY9-SDB1-DUR	NAV-BAY9-SDB1-AFT	NAV-BAY11-SDB1-DUR	NAV-BAY11-SDB1-AFT	NAV-BAY14-SDB1-DUR	NAV-BAY14-SDB1-AFT	NAV-BAY14A-SDB1-DUR	NAV-BAY14A-SDB1-AFT
Surrogate Recoveries (%)												
Naphthalene-d8	56	60	56	56	52	57	60	56	47	52	61	54
Phenanthrene-d10	71	71	59	62	60	65	66	67	57	65	64	63
Chrysene-d12	81	77	66	72	73	77	79	83	72	73	78	74

PAHs QA/QC

PROJECT: Contamination Analysis of Stormwater and San Diego Seawater
PARAMETER: PAH
LABORATORY: Battelle, Duxbury, MA
MATRIX: Waters
SAMPLE CUSTODY: Water samples were collected between November 7 – 10, 2002, shipped on November 12, 2002, and received at Battelle Duxbury on November 13, 2002. All samples were received in good condition. The cooler temperature on arrival was 0.8°C. Samples were stored refrigerated until processing.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Surrogate Recovery	Procedural Blank	LCS/MS Recovery	MS/MSD Relative Precision	Achieved Detection Limit (ng/L)
PAH	General NS&T	40-120% Recovery	Less than 5X MDL	40-120% Recovery (for at least 80% of analytes; analyte conc. in MS must be >10x background	▸30% RPD (analyte conc. in MS must be >10x background)	PAH Naphthalene ~ 17.0 Other PAHs ~0.5

METHOD: Water samples were extracted for PAHs following general NS&T methodologies. A volume of ~2 L of sample was extracted three times with dichloromethane using separatory funnel techniques. The combined extract was dried over anhydrous sodium sulfate, concentrated and processed through alumina column and HPLC/GPC. The extract was concentrated, fortified with RIS and submitted for GC/MS analysis. Water extracts were analyzed directly using gas chromatography/mass spectrometry (GC/MS) following general NS&T methods. Sample data were quantified by the method of internal standards, using the Recovery Internal Standard (RIS) compounds.

HOLDING TIMES: Water samples for PAH were stored refrigerated until extraction. There is a 7-day holding time associated with these samples.

Samples were prepared for analysis in one analytical batch and were extracted within 7 days of sample collection and analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
02-634	11/14/02	11/26/02 -11/26/02

BLANKS: A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

02-634 – The blank was void of contamination.

Comments – None.

LABORATORY CONTROL SAMPLE: A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of PAH analytes were calculated to measure data quality in terms of accuracy.

02-634 – All PAHs were recovered within the laboratory control limits specified by the method (40 – 120%) ranging from 58 – 82% recovery.

Comments – None.

MATRIX SPIKES: A matrix spike (MS) sample was prepared with each analytical batch. The percent recoveries of PAH analytes were calculated to measure data quality in terms of accuracy.

02-634 – All PAHs were recovered within the laboratory control limits specified by the method (40 – 120%) and ranged from 61 – 89% recovery for the matrix spike. All PAHs were recovered within the laboratory control limits specified by the method (40 – 120%) and ranged from 59 – 86% recovery for the matrix spike duplicate.

Comments – None.

SURROGATES: Three surrogate compounds were added prior to extraction, including Naphthalene-d8, Phenanthrene-d10, and Chrysene-d12. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

02-634 – Surrogate recovery for all PAH surrogate compounds were within the laboratory control limits specified by the method (40 – 120% recovery).

Comments – None.

REPLICATES: Replicate samples for waters were prepared with each analytical batch as an MS and MSD. The RPD between replicate analyses for PAH analytes is calculated to measure data quality in terms of precision.

02-634 – All PAH analytes were recovered within the laboratory control limits specified by the method (<30%) and ranged from 0 – 6.6 % RPD.
Comments – None.

PAHs QA/QC (CONT.)

CLIENT SAMPLE ID	LAB CONTROL SAMPLE				MATRIX SPIKE-NAV-OF9-SDB1-COMP		MATRIX SPIKE DUPLICATE- NAV-OF9-SDB1-COMP		PROCEDURAL BLANK	
Battelle Sample ID	AB384LCS				V9897MS		V9897MSD		AB383PB	
Battelle Batch ID	02-634				02-634		02-634		02-634	
Associated Blank	AB383PB				AB383PB		AB383PB		NA	
QC Type	LCS				MS		MSD		PB	
Data File	A0408.D				A0410.D		A0411.D		A0407.D	
Extraction Date	14-Nov-02				11/14/02		11/14/02		14-Nov-02	
Acquired Date	26-Nov-02				11/26/02		11/26/02		26-Nov-02	
Matrix	Water				Water		Water		Water	
Sample Size	2	L			0.81	L	0.81	L	2	L
Dilution Factor	1.667				1.667		1.667		1.667	
PIV	1	mL			1	mL	1	mL	1	mL
Min Reporting Limit	8.34				20.6		20.6		8.34	
Amount Units	ng/L		Rec%	Q	ng/L		ng/L		ng/L	
Naphthalene	291.00		58		763.00		744.00		0.66	U
C1-Naphthalenes	0.66	U	NA		950.00		942.00		0.66	U
C2-Naphthalenes	0.66	U	NA		1.64	U	1.64	U	0.66	U
C3-Naphthalenes	0.66	U	NA		1.64	U	1.64	U	0.66	U
C4-Naphthalenes	0.66	U	NA		1.64	U	1.64	U	0.66	U
Biphenyl	313.00		62		833.00		833.00		0.42	U
Acenaphthylene	309.00		62		854.00		828.00		0.41	U
Acenaphthene	321.00		64		885.00		863.00		0.54	U
Fluorene	332.00		66		962.00		925.00		0.49	U
C1-Fluorenes	0.49	U	NA		1.21	U	1.21	U	0.49	U
C2-Fluorenes	0.49	U	NA		1.21	U	1.21	U	0.49	U
C3-Fluorenes	0.49	U	NA		1.21	U	1.21	U	0.49	U
Phenanthrene	370.00		74		1090.00		1060.00		0.38	U
Anthracene	330.00		66		948.00		909.00		0.35	U
C1-Phenanthrenes/Anthracenes	0.35	U	NA		70.00		56.00		0.35	U
C2-Phenanthrenes/Anthracenes	0.35	U	NA		140.00		141.00		0.35	U
C3-Phenanthrenes/Anthracenes	0.35	U	NA		132.00		122.00		0.35	U
Dibenzothiophene	3.84	J	NA		43.00		38.80		0.46	U
C1-Dibenzothiophenes	0.46	U	NA		86.90		78.00		0.46	U
C2-Dibenzothiophenes	0.46	U	NA		131.00		118.00		0.46	U
C3-Dibenzothiophenes	0.46	U	NA		131.00		120.00		0.46	U
Fluoranthene	399.00		80		1160.00		1120.00		0.44	U
Pyrene	397.00		79		1180.00		1150.00		0.48	U
C1-Fluoranthenes/Pyrenes	0.48	U	NA		64.60		72.10		0.48	U
C2-Fluoranthenes/Pyrenes	0.48	U	NA		98.80		105.00		0.48	U
C3-Fluoranthenes/Pyrenes	0.48	U	NA		97.90		100.00		0.48	U
Benzo(a)anthracene	**399.00**		80		1070.00		1050.00		0.69	U
Chrysene	392.00		78		1120.00		1090.00		0.37	U
C1-Chrysenes	0.37	U	NA		88.30		90.60		0.37	U
C2-Chrysenes	0.37	U	NA		151.00		153.00		0.37	U
C3-Chrysenes	0.37	U	NA		0.90	U	0.90	U	0.37	U
C4-Chrysenes	0.37	U	NA		0.90	U	0.90	U	0.37	U
Benzo(b)fluoranthene	404.00		81		1120.00		1060.00		0.43	U
Benzo(k)fluoranthene	423.00		85		1100.00		1100.00		0.43	U
Benzo(e)pyrene	369.00		75		1020.00		969.00		0.45	U
Benzo(a)pyrene	380.00		76		1010.00		965.00		0.65	U
Perylene	343.00		69		972.00		920.00		0.70	U
Indeno(1,2,3-c,d)pyrene	394.00		79		1060.00		1020.00		0.91	U
Dibenz(a,h)anthracene	412.00		82		1110.00		1050.00		1.04	U
Benzo(g,h,i)perylene	313.00		63		905.00		853.00		0.57	U
Total Priority Pollutant PAHs					16337.00		15787.00			
Surrogate Recoveries (%)										
Naphthalene-d8	61				60		61		61	
Phenanthrene-d10	66				77		73		66	
Chrysene-d12	79				85		82		81	

PCBs

CLIENT SAMPLE ID:	NAV-OF9-SDB1-COMP		NAV-OF11-SDB1-COMP		NAV-OF14-SDB1-COMP	
Battelle Sample ID:	V9897		V9898		V9899	
Client Description:	Seawater/ Stormwater		Seawater/ Stormwater		Seawater/ Stormwater	
Battelle Batch ID:	02-634		02-634		02-634	
Sample Volume (L):	1.000		2.640		2.630	
Units:	ng/L		ng/L		ng/L	
Cl2 08	2.197		0.100	U	0.100	U
Cl3 18	0.100	U	0.100	U	0.100	U
Cl3 28	0.969		0.100	U	0.100	U
Cl4 44	1.484		0.100	U	0.243	
Cl4 49	2.929		0.100	U	0.100	U
Cl4 52	2.274		0.100	U	0.100	U
Cl4 66	0.812		0.100	U	0.100	U
Cl5 77	0.100	U	0.100	U	0.100	U
Cl5 87	1.110		0.195		0.376	
Cl5 101	1.880		0.517		0.624	
Cl5 105	0.600		0.272		0.296	
Cl5 118	1.617		0.473		0.383	
Cl6 126	0.100	U	0.100	U	0.100	U
Cl6 128	1.010		0.155		0.348	
Cl6 138	3.824		0.568		1.472	
Cl6 153	3.627		0.514		1.625	
Cl6 156	0.100	U	0.100	U	0.100	U
Cl7 169	0.100	U	0.100	U	0.100	U
Cl7 170	1.285		0.100	U	0.264	
Cl7 180	3.166		0.212		1.026	
Cl7 183	1.317		0.147		0.344	
Cl7 184	0.100	U	0.100	U	0.100	U
Cl7 187	1.382		0.096	J	0.636	
Cl8 195	0.432		0.058	J	0.139	
Cl9 206	0.182		0.047	J	0.120	
Cl10 209	1.472		0.100	U	0.100	U
Total PCB	33.568		3.253		7.896	
Surrogate Recoveries:						
Cl3(34)	84		84		69	
Cl5(112)	87		82		70	

PCBs QA/QC

PROJECT: Contamination Analysis of Stormwater and San Diego Seawater
PARAMETER: PCB
LABORATORY: Battelle, Duxbury, MA
MATRIX: Waters
SAMPLE CUSTODY: Water samples were collected between November 7 – 10, 2002, shipped on November 12, 2002, and received at Battelle Duxbury on November 13, 2002. All samples were received in good condition. The cooler temperature on arrival was 0.8 C. Samples were stored refrigerated until processing.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Surrogate Recovery	Procedural Blank	LCS/MS Recovery	MS/MSD Relative Precision	Achieved Detection Limit (ng/L)
PCB	General NS&T	40-120% Recovery	Less than 5X MDL	40-120% Recovery (for at least 80% of analytes; analyte conc. in MS must be >10x background	▸30% RPD (analyte conc. in MS must be >10x background)	PCB ~ 0.1

METHOD: Water samples were extracted for PCBs following general NS&T methodologies. A volume of ~2 L of sample was extracted three times with dichloromethane using separatory funnel techniques. The combined extract was dried over anhydrous sodium sulfate, concentrated and processed through alumina column and HPLC/GPC. The extract was concentrated, fortified with RIS, solvent exchanged, and submitted for GC/ECD analysis. Water extracts were analyzed directly using gas chromatography/electron capture detector (GC/ECD) following general NS&T methods. Sample data were quantified by the method of internal standards, using the Recovery Internal Standard (RIS) compounds.

HOLDING TIMES: Water samples for PCB were stored refrigerated until extraction. There is a 7-day holding time associated with these samples.

Samples were prepared for analysis in one analytical batch and were extracted within 7 days of sample collection.

Batch	Extraction Date	Analysis Date
02-634	11/14/02	12/11/02 -1/7/03

The original instrumental runs of the procedural blank in December yielded a cross-contamination of the procedural blank due to a calibration standard run just prior to the procedural blank. Archive extracts of the blank and samples were run in January (outside the 40 day extract holding time), and the blank was void of contamination. This data is reported. Therefore the extract analysis was outside the 40-day holding time for extracts. The QC data is acceptable so there is no impact on the reported data.

BLANKS: A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

02-634 – No analytes were detected in the blank.

Comments – None.

LABORATORY CONTROL A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of PCB analytes were calculated to measure data quality in terms of accuracy.

SAMPLE:

02-634 – All PCBs were recovered within the laboratory control limits specified by the method (40 – 120 and ranged from 51 – 108% recovery.

Comments – None.

MATRIX SPIKES:

A matrix spike (MS) sample was prepared with each analytical batch. The percent recoveries of PCB analytes were calculated to measure data quality in terms of accuracy.

02-634 – All PCBs were recovered within the laboratory control limits specified by the method (40 – 120%) and ranged from 58 – 115% recovery for the matrix spike. All PCBs were recovered within the laboratory control limits specified by the method (40 – 120%) and ranged from 56 – 105% recovery for the matrix spike duplicate.

Comments – None.

SURROGATES:

Two surrogate compounds were added prior to extraction, including PCB34 and PCB112. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

02-634 – Surrogate recovery for all PCB surrogate compounds was within the laboratory control limits specified by the method (40 – 120% recovery).

Comments – None.

REPLICATES:

Replicate samples for waters were prepared with each analytical batch as an MS and MSD. The RPD between replicate analyses for PCB analytes is calculated to measure data quality in terms of precision.

02-634 – All PCB analytes were recovered within the laboratory control limits specified by the method (<30%) and ranged from 0 – 5 % RPD.

Comments – None.

PCBs QA/QC (CONT.)

CLIENT SAMPLE ID:	LAB CONTROL SAMPLE		MATRIX SPIKE-NAV-OF9-SDB1-COMP		MATRIX SPIKE DUPLICATE-NAV-OF9-SDB1-COMP			PROCEDURAL BLANK	
Battelle Sample ID:	AB384LCS		V9897MS		V9897MSD			AB383PB	
Client Description:	NA		Seawater/ Stormwater		Seawater/ Stormwater			NA	
Battelle Batch ID:	02-634		02-634		02-634			02-634	
Sample Volume (L):	NA		0.810		0.810			2.000	
Units:	ng	% Recovery	ng/L	% Recovery	ng/L	% Recovery	% RPD	ng/L	
Cl2 08	32.495	108	38.940	99	38.761	99	0	0.100	U
Cl3 18	15.448	51	21.597	58	20.784	56	4	0.100	U
Cl3 28	21.306	71	32.103	84	30.401	79	6	0.100	U
Cl4 44	23.283	78	33.239	86	31.348	81	6	0.100	U
Cl4 49	22.610	75	35.044	86	33.163	81	6	0.100	U
Cl4 52	23.756	79	34.663	87	32.879	83	6	0.100	U
Cl4 66	22.233	74	32.694	86	30.833	81	6	0.100	U
Cl5 77	29.721	99	42.657	115	39.109	105	9	0.100	U
Cl5 87	26.402	88	36.435	95	36.024	94	1	0.100	U
Cl5 101	23.748	79	33.167	84	32.124	82	3	0.100	U
Cl5 105	24.910	83	34.939	93	34.363	91	2	0.100	U
Cl5 118	25.245	84	33.772	87	32.764	84	3	0.100	U
Cl6 126	23.713	79	35.130	95	34.350	93	2	0.100	U
Cl6 128	25.318	84	34.923	92	33.682	88	4	0.100	U
Cl6 138	25.607	85	36.596	88	36.781	89	1	0.100	U
Cl6 153	25.238	84	38.724	95	37.542	92	3	0.100	U
Cl6 156	NS	NA	NS	NA	NS	NA	NA	0.100	U
Cl7 169	26.460	88	36.201	97	35.542	96	2	0.100	U
Cl7 170	25.218	84	35.203	91	34.149	89	3	0.100	U
Cl7 180	25.032	83	40.609	101	41.735	104	3	0.100	U
Cl7 183	25.920	86	36.061	94	34.618	90	4	0.100	U
Cl7 184	28.021	93	35.550	96	36.625	98	3	0.100	U
Cl7 187	25.135	84	34.984	91	34.066	88	3	0.100	U
Cl8 195	23.998	80	32.706	87	32.072	85	2	0.100	U
Cl9 206	17.842	59	24.040	64	22.982	62	5	0.100	U
Cl10 209	22.546	75	30.938	80	29.570	76	5	0.100	U
Total PCB	611.206	NA	860.915	NA	836.266	NA	NA	0.000	
Surrogate Recoveries:									
Cl3(34)	70		80		57			75	
Cl5(112)	82		88		85			83	

TSS

SAMPLE LABEL	TSS (mg/L)
NAV-OF9-SDB1-COMP	170.267
NAV-OF11-SDB1-COMP	122.600
NAV-OF14-SDB1-COMP	126.800
NAV-BAY-PRE	0.72
NAV-BAY9-SDB1-PRE	1.44
NAV-BAY9-SDB1-DUR	0.72
NAV-BAY9-SDB1-AFT	0.65
NAV-BAY11-SDB1-PRE	1.38
NAV-BAY11-SDB1-DUR	1.00
NAV-BAY11-SDB1-AFT	0.52
NAV-BAY14-SDB1-PRE	0.85
NAV-BAY14-SDB1-DUR	1.21
NAV-BAY14-SDB1-AFT	0.65
NAV-BAY14A-SDB1-PRE	1.18
NAV-BAY14A-SDB1-DUR	0.93
NAV-BAY14A-SDB1-AFT	0.67

SDB2- 2/24/2003

METALS

MSL		Instrument:	GFAA		ICP-MS		FIAS		ICP-MS		ICP-MS		ICP-MS		ICP-MS		CVAF		ICP-MS		ICP-MS		ICP-MS		FIAS		ICP-MS		ICP-MS	
Code	Rep	Sponsor I.D.	Ag (µg/L)		Al (µg/L)		As (µg/L)		Cd (µg/L)		Cr (µg/L)		Cu (µg/L)		Fe (µg/L)		Hg (µg/L)		Mn (µg/L)		Ni (µg/L)		Pb (µg/L)		Se (µg/L)		Sn (µg/L)		Zn (µg/L)	
1979-7		NAV-PR5-SDB2-FF (T)	0.192	J	320		1.49		5.49		3.33		84.7		515		0.00555	J	22.4		7.72		20.5		0.671		0.715		521	
1979-22		NAV-PR5-SDB2-FF (D)	0.0150	J	39.6	J	1.23		4.97		1.30		69.4		22.9		0.00273	J	14.4		5.22		11.8		0.367		0.0859	J	458	
1979-9		NAV-PR5-SDB2-COMP (T)	0.247	J	1025		1.78		2.27		7.19		104		1417		0.0213		31.5		11.2		23.4		0.102	J	1.13		391	
1979-24		NAV-PR5-SDB2-COMP (D)	0.00809	J	15.1	J	1.18		0.303		1.12		14.2		17.6		0.00219	J	5.94		1.88		0.533		0.247		0.0603	J	80.8	
1979-8		NAV-PR6-SDB2-FF (T)	0.0522	J	179		1.66		1.37		4.24		183		426		0.0188		84.2		17.2		4.06		1.08		0.205	J	314	
1979-23		NAV-PR6-SDB2-FF (D)	0.0266	J	30.4	J	1.41		1.23		3.58		177		161		0.0133		81.5		17.2		0.879		1.33		0.289	J	288	
1979-10		NAV-PR6-SDB2-COMP (T)	0.132	J	722		1.36		1.12		6.67		66.2		1149		0.0189		32.9		7.33		14.6		0.161	J	0.816		249	
1979-25		NAV-PR6-SDB2-COMP (D)	0.0119	J	32.2	J	1.04		0.265		1.69		33.0		27.5		0.00412	J	14.1		4.11		0.281		0.257		0.101	J	78.2	

MSL		Instrument:	GFAA		ICP-MS		FIAS		ICP-MS		ICP-MS		ICP-MS		ICP-MS		CVAF		ICP-MS		ICP-MS		ICP-MS		FIAS		ICP-MS		ICP-MS	
Code	Rep	Sponsor I.D.	Ag (µg/L)		Al (µg/L)		As (µg/L)		Cd (µg/L)		Cr (µg/L)		Cu (µg/L)		Fe (µg/L)		Hg (µg/L)		Mn (µg/L)		Ni (µg/L)		Pb (µg/L)		Se (µg/L)		Sn (µg/L)		Zn (µg/L)	
1979-1		NAV-OF9-SDB2-FF (T)	0.168	J	1840		1.58		0.987		6.56		54.2		2390		0.0173		92.6		12.5		22.7		0.187	J	1.00		433	
1979-16		NAV-OF9-SDB2-FF (D)	0.0203	J	16.6	J	0.695		0.388		1.22		25.8		18.5		0.00367	J	28.7		6.95		0.369		0.132	J	0.165	J	218	
1979-4		NAV-OF9-SDB2-COMP (T)	0.185	J	1050		1.42		0.659		8.56		36.1		1610		0.0151		50.0		7.93		15.9		0.0660	J	1.12		233	
1979-19		NAV-OF9-SDB2-COMP (D)	0.010	U	8.25	J	0.820		0.386		2.32		9.88		62.1		0.00186	J	11.8		2.83		0.156		0.0352	U	0.266	J	112	
1979-2		NAV-OF11-SDB2-FF (T)	0.175	J	1690		1.18		1.23		5.55		68.4		2250		0.0508		75.8		9.32		22.4		0.169	J	0.924		555	
1979-17		NAV-OF11-SDB2-FF (D)	0.0293	J	18.0	J	0.366	J	0.756		0.803	J	33.9		31.2		0.00605	J	34.9		5.27		0.541		0.0927	J	0.122	J	393	
1979-5		NAV-OF11-SDB2-COMP (T)	0.107	J	777		1.33		0.776		4.70		46.9		1390		0.0541		55.5		4.48		14.1		0.108	J	0.872		298	
1979-20		NAV-OF11-SDB2-COMP (D)	0.0130	J	18.7	J	0.814		0.669		1.20		15.1		68.7		0.00314	J	25.1		2.21		0.247		0.0703	J	0.227	J	179	
1979-11		NAV-BAY11-SDB2-DUR (T)	0.0293	J	74.9		1.15		0.105		1.96		4.73		129		0.00216	J	10.7		2.06		0.428		0.0435	J	0.201	J	23.5	
1979-26		NAV-BAY11-SDB2-DUR (D)	0.010	U	13.7	J	1.13		0.100		0.219	J	3.16		88.5		0.000973	J	9.01		1.17		0.0789		0.0352	U	0.228	J	21.6	
1979-3		NAV-OF14-SDB2-FF (T)	0.229	J	2640		2.92		2.59		13.7		72.6		3940		0.0536		131		15.7		43.8		0.149	J	1.44		797	
1979-18		NAV-OF14-SDB2-FF (D)	0.0267	J	10.5	J	0.781		0.983		0.804	J	22.1		18.6		0.00374	J	31.5		5.78		0.916		0.0873	J	0.0945	J	310	
1979-6		NAV-OF14-SDB2-COMP (T)	0.0680	J	1270		2.02		0.673		7.24		28.9		1870		0.0314		56.5		5.34		15.0		0.0352	U	0.945		200	
1979-21		NAV-OF14-SDB2-COMP (D)	0.010	U	39.9	J	1.24		0.533		1.73		7.23		70.8		0.00177	J	15.9		1.80		0.330		0.0352	U	0.124	J	110	
1979-12		NAV-BAY14-SDB2-DUR (T)	0.0324	J	107		1.17		0.109		1.75		5.01		152		0.00229	J	12.5		1.93		0.623		0.0539	J	0.253	J	24.7	
1979-27		NAV-BAY14-SDB2-DUR (D)	0.0111	J	2.32	J	1.11		0.106		0.242	J	3.53		125		0.00102	J	10.0		1.21		0.137		0.0640	J	0.235	J	24.9	

METALS (CONT.)

MSL CHEMISTRY CODE	CLIENT CODE	PARAMETER	GFAA Ag (µg/L)		ICP-MS Cu (µg/L)		ICP-MS Pb (µg/L)		CVAF Hg (µg/L)		ICP-MS Zn (µg/L)	
1919-25	NAV-BAY9-SDB2-PRE (T)	*Total metals*	0.0254	J	5.70		0.0828	J	0.00102		11.8	
1919-39	NAV-BAY9-SDB2-PRE (D)	*Dissolved metals*	0.0227	J	3.89		0.0541	J	0.0130		5.23	
1919-29	NAV-BAY9-SDB2-DUR (T)	*Total metals*	0.0581	J	6.13		0.0602	J	0.00904		12.7	
1919-43	NAV-BAY9-SDB2-DUR (D)	*Dissolved metals*	0.0138	J	3.92		0.0592	J	0.00134		3.09	
1919-31 r1	NAV-BAY9-SDB2-AFT (T)	*Total metals*	0.0241	J	5.00		0.0988	J	0.000979	J	16.0	
1919-31 r2	NAV-BAY9-SDB2-AFT (T)	*Total metals*	--		--		0.0892	J	0.00123		15.0	
1919-45	NAV-BAY9-SDB2-AFT (D)	*Dissolved metals*	0.0226	J	4.25		0.100		0.000876	J	14.8	
1919-26	NAV-BAY11-SDB2-PRE (T)	*Total metals*	0.0310	J	5.82		0.516		0.00210		16.5	
1919-40	NAV-BAY11-SDB2-PRE (D)	*Dissolved metals*	0.0329	J	3.74		0.318		0.00129		14.9	
1919-32	NAV-BAY11-SDB2-AFT (T)	*Total metals*	0.0151	J	5.10		0.151		--		12.5	
1919-46	NAV-BAY11-SDB2-AFT(D)	*Dissolved metals*	0.0303	J	4.13		0.629		0.00227		20.5	
1919-27	NAV-BAY14-SDB2-PRE (T)	*Total metals*	0.0368	J	4.86		0.0541	J	0.00139		18.2	
1919-41	NAV-BAY14-SDB2-PRE (D)	*Dissolved metals*	0.0246	J	3.87		0.0772	J	0.000830	J	15.2	
1919-33	NAV-BAY14-SDB2-AFT (T)	*Total metals*	0.0196	J	5.24		0.110		0.00101		4.82	
1919-47	NAV-BAY14-SDB2-AFT (D)	*Dissolved metals*	0.0240	J	4.24		0.106		--		4.79	
1919-28 r1	NAV-BAY14A-SDB2-PRE (T)	*Total metals*	0.0235	J	4.97		0.159		0.00158		10.6	
1919-28 r2	NAV-BAY14A-SDB2-PRE (T)	*Total metals*	0.0283	J	5.00		0.116		0.00115		2.83	
1919-42	NAV-BAY14A-SDB2-PRE (D)	*Dissolved metals*	0.0312	J	4.31		0.558		0.0101		14.2	
1919-30	NAV-BAY14A-SDB2-DUR (T)	*Total metals*	0.0280	J	5.89		0.293		0.00166		14.9	
1919-44	NAV-BAY14A-SDB2-DUR (D)	*Dissolved metals*	0.0178	J	3.80		0.290		0.00134		13.8	
1919-34	NAV-BAY14A-SDB2-AFT (T)	*Total metals*	0.0201	J	4.95		--		0.00129		--	
1919-48	NAV-BAY14A-SDB2-AFT (D)	*Dissolved metals*	0.0186	J	3.95		0.293		0.00176		15.8	

METALS QA/QC

PROJECT: SPAWARS Task 11, San Diego Bay Stormwater
PARAMETER: Metals
LABORATORY: Battelle Marine Sciences Laboratory, Sequim, Washington
MATRIX: Seawater and Freshwater

SAMPLE CUSTODY AND PROCESSING: Eighteen seawater and twelve freshwater samples were received in on 03/03/03. All samples were received in good condition (i.e., all sample containers were intact). Samples were assigned a Battelle Central File (CF) identification number (1979) and were entered into Battelle's sample tracking system.

The following lists information on sample receipt and processing activities:

Chemistry Lab ID	1979-1 through –30
Collection dates	02/25/03
Laboratory arrival dates	03/03/03
Cooler temperatures, on arrival	NA – Samples arrived preserved
Fe/Pd Preconcentration (seawater)	03/14/03
FIAS (As – seawater)	03/14/03
FIAS (Se – seawater)	03/17/03
GFAA (Ag – seawater)	03/20/03
CVAA analyses (Hg)	03/13/03, 03/14/03, 03/18/03
ICP-MS analyses:	
Fe/Pd Seawater (Cd, Cr, Cu, Ni, Pb)	03/18/03
Direct Seawater (Al, Fe, Mn, Sn, Zn)	03/27/03
Freshwater (Ag, Al, As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, Se, Sn, Zn)	03/24/03
Rerun Freshwater (Al, Fe)	04/11/03

QA/QC DATA QUALITY OBJECTIVES:

Analyte	Analytical Method Seawater	Analytical Method Freshwater	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limits (µg/L) Target MDL (1)	Achieved MDL Seawater(2)	Achieved MDL Freshwater (2)
Silver	GFAA	ICP-MS	50-150%	≤20%	≤50%	0.50	0.010	0.0038
Aluminum	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	50.0	0.823	0.823
Arsenic	FIAS	ICP-MS	50-150%	≤20%	≤30%	0.50	0.0275	0.0087
Cadmium	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	0.05	0.0094	0.0008
Chromium	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	1.00	1.00	0.024
Copper	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	0.05	0.05	0.0029
Iron	ICP-MS	ICP-MS	50-150%	≤20%	≤50%	10.0	0.983	0.983
Mercury	CVAA	CVAA	50-150%	≤25%	≤30%	0.01	0.00014	0.00014
Manganese	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	0.50	0.50	0.003
Nickel	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	0.05	0.05	0.0114
Lead	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	0.05	0.0035	0.0044
Selenium	FIAS	ICP-MS	50-150%	≤20%	≤30%	0.20	0.0352	0.0991
Tin	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	0.50	0.0024	0.0024
Zinc	ICP-MS	ICP-MS	50-150%	≤20%	≤30%	0.50	0.50	0.0493

(1) As stated in the Statement of Work for Chemical Analysis of Marine and Estuarine Samples 15 May 2001.
(2) Reported from the 2003 MDL study.

METHODS:

Battelle MSL analyzed both seawater and freshwater samples for fourteen metals: silver (Ag), aluminum (Al), arsenic (As), cadmium (Cd), chromium (Cr) copper (Cu), iron (Fe), mercury (Hg), manganese (Mn), nickel (Ni), lead (Pb), selenium (Se), tin (Sn) and zinc (Zn). The samples were submitted for analyses by four analytical methods: GFAA, ICP-MS, FIAS and CVAA.

Seawater samples were preconcentrated using iron (Fe) and palladium (Pd) in accordance with the Battelle SOP MSL-I-025, *Methods of Sample Preconcentration*, which is derived from EPA Method 1640. The sample preconcentration was submitted for analysis by ICP-MS and GFAA.

Seawater samples were analyzed by inductively coupled plasma-mass spectrometry (ICP-MS) in accordance with Battelle SOP MSL-I-022, *Determination of Elements in Aqueous and Digestate Samples by ICP-MS.* This method is based on two EPA Methods: 200.8 and 1638. Analytes reported from the preconcentrated seawater samples include: Cd, Cr, Cu, Ni, and Pb. Analytes reported from the direct analysis of the seawater samples include: Al, Fe, Mn, Sn, and Zn. Freshwater samples were analyzed directly by ICP-MS for all analytes, except Hg.

Ag was analyzed in the Fe-Pd preconcentrate by graphite furnace atomic absorption (GFAA) following Battelle SOP MSL-I-029, *Determination of Metals in Aqueous and Digestate Samples by GFAA*, which is derived from EPA Method 200.9.

Seawater samples were analyzed by hydride generation flow injection atomic spectroscopy (FIAS) for As and Se according to Battelle SOP MSL-I-030 *Determination of Metals in Aqueous and Digestate Samples by HGAA-FIAS.*

Seawater and freshwater samples were analyzed by cold-vapor atomic fluorescence spectroscopy (CVAF) for Hg according to Battelle SOP MSL-I-013, *Total Mercury in Aqueous Samples by CVAF*, which is derived from EPA Method 1631.

All results are reported in units of µg/L.

HOLDING TIMES:

The holding times for metals analyses are 90 days from sample collection for Hg analysis, and 6 months from sample collection for analysis of all other metals. The holding times for all metals were achieved.

DETECTION LIMITS:

Target detection limits (TDL) were achieved for all analytes. Achieved method detection limits are reported from the 2003 MDL study. Sample concentrations were evaluated and flagged to the following criteria:

- U Analyte not detected at or above the detection limit, MDL reported
- J Analyte detected above MDL, but below TDL
- * Duplicate out of QC criteria
- e SRM recovery out of QC criteria
- w Spike recovery out of QC criteria due to inappropriate spiking level
- # Continuing calibration recovered outside of acceptable method criteria

NOTE ON Hg QA/QC SAMPLES:

Seawater and freshwater samples were analyzed concurrently for Hg. The QC samples are reported in both the seawater and freshwater tables.

METHOD BLANKS:

Seawater: A minimum of one method blank was analyzed with each analysis batch. Metals concentrations in the method blanks were below the TDL, with the exception of one method blank for Ni and Cu. All sample concentrations for Ni and Cu are greater than five times the detected blank. No corrective action was required. The data were not blank-corrected.

Freshwater: A minimum of one method blank was analyzed with each analysis batch. All metals concentrations in the method blanks were below the TDL. The data were not blank-corrected.

BLANK SPIKE or OPR ACCURACY:

Seawater: A minimum of one blank spike or on-going precision and recovery (OPR) sample was analyzed with each analysis batch. Recoveries were reported for spikes at approximate concentrations of 0.005 µg/L for Hg; 5 µg/L for As and Se; and 10 µg/L for Ag, Cd, Cr, Cu, Ni, and Pb. BS recoveries among all metals analyzed ranged from 82% to 107% and were within the QC acceptance criteria of 50% to 150% for all metals.

Freshwater: A minimum of one blank spike or on-going precision and recovery (OPR) sample was analyzed with each analysis batch. Recoveries were reported for spikes at approximate concentrations of 0.005 µg/L for Hg; 10 µg/L for Cr, Mn, Ni, Cu, Zn, As, Se, Ag, Cd, Sn, and Pb; and 100 µg/L for Al and Fe. BS recoveries among all metals analyzed ranged from 91% to 119% and were within the QC acceptance criteria of 50% to 150% for all metals.

MATRIX SPIKE ACCURACY:

Seawater: A minimum of one matrix spike was analyzed with each analysis batch. Recoveries were reported for spikes at approximate concentrations of 0.01 µg/L for Hg; 5 µg/L for As and Se; 10 µg/L for Cr, Ni, Cu, Ag, Cd, Sn, and Pb; and 100 µg/L for Al, Fe, Mn and Zn. Matrix spike recoveries among all metals analyzed ranged from 83% to 117% and were within the QC acceptance criteria of 50% to 150% for all metals, with the exception of one MS for Al (240%) and two replicates for Fe (0%, 220%). Low recoveries for the matrix spikes are due to an inappropriate spiking level relative to the native sample concentration. Spiking levels were less than 10% of the native sample concentration, therefore not appropriate for evaluating matrix spike accuracy. Acceptable MS accuracy for Al and Fe was demonstrated in the alternate matrix spike samples.

Freshwater: A minimum of one matrix spike was analyzed with each analysis batch. Recoveries were reported for spikes at approximate concentrations of 0.01 µg/L for Hg; 10 µg/L for Cr, Mn, Ni, Cu, As, Se, Ag, Cd, Sn, and Pb; and 100 µg/L for Al, Fe and Zn. Matrix spike recoveries among all metals analyzed ranged from 94% to 118% and were within the QC acceptance criteria of 50% to 150% for all metals.

REPLICATE PRECISION:

Analytical precision for each analysis batch was evaluated by the analysis of laboratory duplicates and expressed as the relative percent deviation (RPD) of duplicate results.

Seawater: A minimum of one set of laboratory duplicates was analyzed with each analysis batch. Precision for all metals, except Fe, ranged from 0% to 18% RPD and were within the QC limits of ≤ 30%. RPD values for Fe were 9% and 32% and were within the QC limits of ≤ 50%.

Freshwater: A minimum of one set of laboratory duplicates was analyzed with each analysis batch. Precision for all metals ranged from 1% to 19% RPD and

were within the QC limits of ≤ 30%.

STANDARD REFERENCE MATERIAL ACCURACY:

Accuracy of recovery of SRM analytes was expressed as the percent difference (PD) between the measured and certified SRM concentrations. The target QC criterion is ≤20% PD.

Seawater: Standard reference material analyzed for seawater samples include: SRM 1640, SRM CASS-4, and SRM 1641 for Hg. The SRM 1640 is not certified for Sn and the certified value for Fe in not at a level appropriate for data quality evaluation. Percent differences for SRM 1640 and SRM 1641 ranged from 0% to 17% and were within the QC criterion.

The SRM CASS-4 is a low-level seawater reference material. Analytes of interest certified in CASS-4 are less than 10 times the laboratory achieved MDL for all metals except Cu. Currently, there is not seawater SRM certified at a practical quantification level for all analytes of interest. The SRM CASS-4 was analyzed with the preconcentrated seawater samples, and applies only to the metals obtained from this method (Ag, Cr, Ni, Cu, Cd, Pb). Percent differences for analytes within the QC criteria for CASS-4 include As (9%) and Cd (15%). The required preconcentration procedure for low level seawater samples includes the addition of chelating agents to induce precipitation of metals under specific conditions. Subsequently, reagents added to the samples should be of the purest quality to result in zero addition of metals to the samples. The current reagents available contain traces of Cr, Cu and Ni. Correcting CASS-4 results for reagent contributions provide PD values within the QC criterion for Cr (9%), Ni (2%), and Cu (1%). Since CASS-4 is not certified for Ag or Hg and is not certified at practical levels for a majority of the analytes of interest, the alternate SRM (1640 or 1641, respectively) should be used to evaluate the accuracy of this data set. The data were not blank corrected, as the sample concentrations are greater than five times the detected blank for these analytes.

Freshwater: Standard reference material analyzed for freshwater samples include: SRM 1640, SLRS-3 for Fe, and SRM 1641 for Hg. The SRM 1640 is not certified for Sn and the certified value for Fe in not at a level appropriate for data quality evaluation. Percent differences for all SRMs ranged from 0% to 19% and were within the QC acceptance criterion for all metals, with the following exceptions. One replicate of 1640 for Se (28%) and one replicate of 1640 for Zn (21%). In both cases, an alternate replicate of SRM 1640 was analyzed within the batch, which demonstrated acceptable accuracy for Se (0% PD) and Zn (3% PD).

METALS QA/QC (CONT.)

MSL		Instrument:	GFAA	ICP-MS	FIAS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	CVAF	ICP-MS	ICP-MS	ICP-MS	FIAS	ICP-MS	ICP-MS
Code	Rep	Sponsor I.D.	Ag (µg/L)	Al (µg/L)	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Fe (µg/L)	Hg (µg/L)	Mn (µg/L)	Ni (µg/L)	Pb (µg/L)	Se (µg/L)	Sn (µg/L)	Zn (µg/L)
METHOD BLANK																
Method Blank		Hg- 03/13/03	NA	NA	NA	NA	NA	NA	NA	0.00014 U	NA	NA	NA	NA	NA	NA
Method Blank		Hg- 03/14/03	NA	NA	NA	NA	NA	NA	NA	0.00014 U	NA	NA	NA	NA	NA	NA
Method Blank		Hg- 03/18/03	NA	NA	NA	NA	NA	NA	NA	0.00014 U	NA	NA	NA	NA	NA	NA
1979-blk TRM r1		ICP-MS	0.0038 U	NA	0.0087 U	0.0008 U	0.245 J	0.0029 U	NA	NA	0.003 U	0.0114 U	0.0044 U	0.0991 U	0.0185 J	0.0493 U
1979-blk TRM r2		ICP-MS	0.0038 U	NA	0.00929 J	0.0008 U	0.321 J	0.0029 U	NA	NA	0.003 U	0.0114 U	0.0044 U	0.0991 U	0.00810 J	0.0493 U
1979- dissolved Blank		ICP-MS	0.00463 J	0.823 U	0.0087 U	0.0039 J	0.024 U	0.0029 U	0.983 U	NA	0.003 U	0.0259 J	0.0044 U	0.0991 U	0.0103 J	0.0493 U
Blank trm r1		ICP-MS (Al, Fe)	NA	0.823 U	NA	NA	NA	NA	0.983 U	NA	NA	NA	NA	NA	NA	NA
METHOD DETECTION LIMIT [1]			0.0038	0.823	0.0087	0.0008	0.024	0.0029	0.983	0.00014	0.003	0.0114	0.0044	0.0991	0.0024	0.0493
Project Target Detection Limit			0.50	50.0	0.50	0.05	1.00	0.05	10.0	0.01	0.5	0.5	0.05	0.20	0.50	0.50
STANDARD REFERENCE MATERIAL																
1979-1640 TRM		ICP-MS	7.49	58.2	28.3	23.1	41.5	87.8	NA	NA	132	29.2	27.7	21.9	1.54	54.9
1640 Direct		ICP-MS	7.63	53.7	30.8	25.3	40.4	89.9	NA	NA	127	29.2	27.6	28.2	1.56	64.4
1640 TRM		ICP-MS (Al, Fe)	NA	50.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1640		certified value	7.6	52.0	26.7	22.8	38.6	85.2	34.3	NC	122	27.4	27.9	22.0	NC	53.2
1640		range	±0.25	±1.5	±0.73	±0.96	±1.6	±1.2	±1.6	NC	±1.1	±0.8	±0.14	±0.51	NC	±1.1
		% difference	2%	12%	6%	1%	8%	3%	NA	NA	9%	7%	1%	0%	NA	3%
		% difference	0%	3%	15%	11%	5%	6%	NA	NA	9%	7%	1%	28% e	NA	21% e
		% difference	NA	3%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SLRS-3 (Fe)		ICP-MS	NA	NA	NA	NA	NA	NA	119	NA	NA	NA	NA	NA	NA	NA
SLRS-3 (Fe)		ICP-MS (Al, Fe)	NA	NA	NA	NA	NA	NA	92.2	NA	NA	NA	NA	NA	NA	NA
		certified value	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	NA
		range	NA	NA	NA	NA	NA	NA	±2	NA	NA	NA	NA	NA	NA	NA
		% difference	NA	NA	NA	NA	NA	NA	19%	NA	NA	NA	NA	NA	NA	NA
		% difference	NA	NA	NA	NA	NA	NA	8%	NA	NA	NA	NA	NA	NA	NA
1641d031203		Hg- 03/13/03	NA	NA	NA	NA	NA	NA	NA	1565	NA	NA	NA	NA	NA	NA
1641d031303		Hg- 03/14/03	NA	NA	NA	NA	NA	NA	NA	1466	NA	NA	NA	NA	NA	NA
1641d031703		Hg- 03/18/03	NA	NA	NA	NA	NA	NA	NA	1573	NA	NA	NA	NA	NA	NA
1641d		certified value	NC	NC	NC	NC	NC	NC	NC	1590	NC	NC	NC	NC	NC	NC
1641d		range	NC	NC	NC	NC	NC	NC	NC	±4.00	NC	NC	NC	NC	NC	NC
		% difference	NA	NA	NA	NA	NA	NA	NA	2%	NA	NA	NA	NA	NA	NA
		% difference	NA	NA	NA	NA	NA	NA	NA	8%	NA	NA	NA	NA	NA	NA
		% difference	NA	NA	NA	NA	NA	NA	NA	1%	NA	NA	NA	NA	NA	NA
ICV,CCV RESULTS																
ICV		ICP-MS or Hg 1	102%	102%	103%	100%	103%	102%	104%	93%	103%	103%	101%	104%	101%	102%
CCV		ICP-MS or Hg 1	103%	113%	107%	102%	109%	105%	110%	100%	110%	106%	100%	104%	102%	107%
CCV		ICP-MS or Hg 1	104%	113%	105%	102%	108%	106%	115%	98%	109%	106%	98%	104%	102%	105%
CCV		ICP-MS or Hg 1	103%	113%	105%	100%	108%	106%	113%	101%	109%	106%	98%	104%	101%	105%
CCV		ICP-MS or Hg 1	101%	114%	104%	100%	108%	103%	111%	94%	108%	104%	98%	101%	100%	105%
ICV		ICP-MS (Al, Fe) or Hg 2	NA	97%	NA	NA	NA	NA	92%	94%	NA	NA	NA	NA	NA	NA
CCV		ICP-MS (Al, Fe) or Hg 2	NA	101%	NA	NA	NA	NA	96%	92%	NA	NA	NA	NA	NA	NA
CCV		ICP-MS (Al, Fe) or Hg 2	NA	NA	NA	NA	NA	NA	NA	94%	NA	NA	NA	NA	NA	NA
CCV		ICP-MS (Al, Fe) or Hg 2	NA	NA	NA	NA	NA	NA	NA	97%	NA	NA	NA	NA	NA	NA
ICV		Hg 3	NA	NA	NA	NA	NA	NA	NA	100%	NA	NA	NA	NA	NA	NA
CCV		Hg 3	NA	NA	NA	NA	NA	NA	NA	101%	NA	NA	NA	NA	NA	NA
CCV		Hg 3	NA	NA	NA	NA	NA	NA	NA	103%	NA	NA	NA	NA	NA	NA
CCV		Hg 3	NA	NA	NA	NA	NA	NA	NA	98%	NA	NA	NA	NA	NA	NA

METALS QA/QC (CONT.)

MSL		Instrument:	GFAA		ICP-MS		FIAS		ICP-MS		ICP-MS		ICP-MS		CVAF		ICP-MS		ICP-MS		ICP-MS		FIAS		ICP-MS		ICP-MS	
Code	Rep	Sponsor I.D.	Ag (µg/L)		Al (µg/L)		As (µg/L)		Cd (µg/L)		Cr (µg/L)		Cu (µg/L)		Fe (µg/L)		Hg (µg/L)		Mn (µg/L)		Ni (µg/L)		Pb (µg/L)		Se (µg/L)		Sn (µg/L)		Zn (µg/L)	
BLANK SPIKE RESULTS																														
		Amount Spiked	10		100		10		10		10		10		100		0.00497		10		10		10		10		10		10	
1979-blk TRM r1 or BLANK031203			0.0038	U	0.823	U	0.0087	U	0.0008	U	0.245	J	0.0029	U	36.7		0.000419	J	0.003	U	0.0114	U	0.0044	U	0.0991	U	0.0185	J	0.0493	U
1979-blk spike r1 or OPR031203run1			10.6		114		9.40		9.96		12.1		10.9		149		0.00569		11.7		11		10.8		9.56		11.6		10.2	
		Amount Recovered	10.6		114		9.40		9.96		11.9		10.9		112		0.00527		7-Nov		11		10.8		9.56		11.6		10.2	
		Percent Recovery	106%		114%		94%		100%		119%		109%		112%		106%		117%		110%		108%		96%		116%		102%	
		Amount Spiked	10		100		10		10		10		10		100		0.00497		10		10		10		10		10		10	
1979-blk TRM r2 or BLANK031203			0.0038	U	0.823	U	0.00929	J	0.0008	U	0.321	J	0.0029	U	36.5		0.000419	J	0.003	U	0.0114	U	0.0044	U	0.0991	U	0.00810	J	0.0493	U
1979-blk spike r2 or OPR031203run2			10.7		113		9.30		9.89		12.1		10.9		150		0.00545		11.8		11		10.6		9.05		11.7		9.76	
		Amount Recovered	10.7		113		9.29		9.89		11.8		10.9		114		0.00503		11.8		11		10.6		9.05		11.7		9.76	
		Percent Recovery	107%		113%		93%		99%		118%		109%		114%		101%		118%		110%		106%		91%		117%		98%	
		Amount Spiked	NS		NS		NS		NS		NS		NS		NS		0.00487		NS		NS		NS		NS		NS		NS	
BLANK031303																	0.000172	J												
OPR031303run1																	0.00490	J												
		Amount Recovered	NA		NA		NA		NA		NA		NA		NA		0.00473						NA		NA		NA		NA	
		Percent Recovery	NA		NA		NA		NA		NA		NA		NA		97%						NA		NA		NA		NA	
		Amount Spiked	NS		NS		NS		NS		NS		NS		NS		0.00487		NS		NS		NS		NS		NS		NS	
BLANK031303																	0.000172	J												
OPR031303run2																	0.00502													
		Amount Recovered	NA		NA		NA		NA		NA		NA		NA		0.00485		NA		NA		NA		NA		NA		NA	
		Percent Recovery	NA		NA		NA		NA		NA		NA		NA		100%		NA		NA		NA		NA		NA		NA	
		Amount Spiked	NS		NS		NS		NS		NS		NS		NS		0.00491						NS		NS		NS		NS	
BLANK031403																	0.000202	J												
OPR031403run1																	0.00528													
		Amount Recovered	NA		NA		NA		NA		NA		NA		NA		0.00508		NA		NA		NA		NA		NA		NA	
		Percent Recovery	NA		NA		NA		NA		NA		NA		NA		103%		NA		NA		NA		NA		NA		NA	
		Amount Spiked	NS		NS		NS		NS		NS		NS		NS		0.00491		NS		NS		NS		NS		NS		NS	
BLANK031403																	0.000202	J												
OPR031403run2																	0.00547													
		Amount Recovered	NA		NA		NA		NA		NA		NA		NA		0.00527		NA		NA		NA		NA		NA		NA	
		Percent Recovery	NA		NA		NA		NA		NA		NA		NA		107%		NA		NA		NA		NA		NA		NA	
MATRIX SPIKE RESULTS																														
		Amount Spiked	NS		NS		NS		NS		NS		NS		NS		0.0161		NS		NS		NS		NS		NS		NS	
1979-15		NAV-OF24-SDB2-FF															0.00679	J												
		MS															0.0223													
		Amount Recovered	NA		NA		NA		NA		NA		NA		NA		0.0155		NA		NA		NA		NA		NA		NA	
		Percent Recovery	NA		NA		NA		NA		NA		NA		NA		96%		NA		NA		NA		NA		NA		NA	
		Amount Spiked	NS		NS		NS		NS		NS		NS		NS		0.0157		NS		NS		NS		NS		NS		NS	
1979-15		NAV-OF24-SDB2-FF															0.00679	J												
		MSD															0.0215													
		Amount Recovered	NA		NA		NA		NA		NA		NA		NA		0.0147		NA		NA		NA		NA		NA		NA	
		Percent Recovery	NA		NA		NA		NA		NA		NA		NA		94%		NS		NS		NA		NA		NA		NA	
		Amount Spiked	10		100		10		10		10		10		100		NS		10		10		10		10		10		100	
1979-24		NAV-PR5-SDB2-Comp	0.00809	J	15.1		1.18		0.303		1.12		14.2		17.6				5.94		1.88		0.533		0.247		0.0603	J	80.8	
		MS	10.6		131		11.4		10.7		12.6		24.3		130				17.3		12.8		10.5		11.0		11.6		185	
		Amount Recovered	10.6		116		10.2		10.4		11.5		10.1		112		NA		11.4		10.9		10.0		10.8		11.5		104	
		Percent Recovery	106%		116%		102%		104%		115%		101%		112%		NA		114%		109%		100%		108%		115%		104%	
		Amount Spiked	10		100		10		10		10		10		100		NS		10		10		10		10		10		100	
1979-24		NAV-PR5-SDB2-Comp	0.00809	J	15.1		1.18		0.303		1.12		14.2		17.6				5.94		1.88		0.533		0.247		0.0603	J	80.8	
		MSD	10.7		129		11.7		10.8		12.7		24.5		132				17.3		12.9		10.9		11.1		11.9		184	
		Amount Recovered	10.7		114		10.5		10.5		11.6		10.3		114		NA		11.4		11		10.4		10.9		11.8		103	
		Percent Recovery	107%		114%		105%		105%		116%		103%		114%		NA		114%		110%		104%		109%		118%		103%	
REPLICATE RESULTS																														
1979-23		NAV-PR6-SDB2-FF	0.0266		30.4		1.41		1.23		3.58		177		161		0.0133		81.5		17.2		0.879		1.33		0.289	J	288	
1979-23	2	NAV-PR6-SDB2-FF	NA		NA		NA		NA		NA		NA		NA		0.0132		NA		NA		NA		NA		NA		NA	
		% difference	NA		NA		NA		NA		NA		NA		NA		1%		NA		NA		NA		NA		NA		NA	
1979-24		NAV-PR5-SDB2-Comp	0.00809		15.1		1.18		0.303		1.12		14.2		17.6		0.00219	J	5.94	2			0.533		0.247		0.0603	J	80.8	
1979-24	2	NAV-PR5-SDB2-Comp	0.00670		14.8		1.10		0.295		1.14		13.6		16.2		NA		5.88		1.91		0.502		0.0991	U	0.0688	J	79.7	
		% difference	19%		2%		7%		3%		2%		4%		8%		NA		1%		2%		6%		NA		13%		1%	

1= Seawater MDLs reported from the 2003 MDL Study; U= Analyte not detected at or above detection limit, MDL reported; NC = SRM not certified; NA= Not analyzed or applicable; B = Sample results are less than 5x the blank; J= Analyste detected bove the MDL, but below the TDL; e= SRM recovery out of QC criteria; w= Spike recovery out of QC criteria due to inappropriate spiking level; # = continuing calibration recovered outside of acceptable method criteria.

METALS QA/QC (CONT.)

MSL		Instrument:	GFAA	ICP-MS	FIAS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	CVAF	ICP-MS	ICP-MS	ICP-MS	FIAS	ICP-MS	ICP-MS
Code	Rep	Sponsor I.D.	Ag (µg/L)	Al (µg/L)	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Fe (µg/L)	Hg (µg/L)	Mn (µg/L)	Ni (µg/L)	Pb (µg/L)	Se (µg/L)	Sn (µg/L)	Zn (µg/L)
METHOD BLANK																
blk TRM r1		ICP-MS Direct	NA	0.823 U	NA	NA	NA	NA	0.983 U	NA	0.003 U	NA	NA	NA	0.00578 J	0.5 U
blk TRM r2		ICP-MS Direct	NA	0.823 U	NA	NA	NA	NA	0.983 U	NA	0.003 U	NA	NA	NA	0.00754 J	0.5 U
1979-blk		Fe/Pd ICP-MS or GFAA-Ag	0.0174 J	NA	NA	0.0094 U	0.0913 J	0.151	NA	NA	NA	0.105	0.0203 J	NA	NA	NA
Method Blank		Hg- 03/13/03	NA	NA	NA	NA	NA	NA	NA	0.00014 U	NA	NA	NA	NA	NA	NA
Method Blank		Hg- 03/14/03	NA	NA	NA	NA	NA	NA	NA	0.00014 U	NA	NA	NA	NA	NA	NA
Method Blank		Hg- 03/18/03	NA	NA	NA	NA	NA	NA	NA	0.00014 U	NA	NA	NA	NA	NA	NA
BLANK		FIAS - As	NA	NA	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BLANK		FIAS - Se	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0352 U	NA	NA
METHOD DETECTION LIMIT [1]			0.010	0.823	0.0275	0.0094	0.0218	0.0540	0.983	0.00014	0.003	0.0286	0.0035	0.0352	0.0024	0.5
Project Target Detection Limit			0.50	50.0	0.50	0.05	1.00	0.05	10.0	0.01	0.50	0.05	0.05	0.20	0.50	0.50
STANDARD REFERENCE MATERIAL																
1640 Direct		ICP-MS Direct	NA	51.8	NA	NA	NA	NA	N/A	NA	123	NA	NA	NA	1.58	62.3
1640 TRM		ICP-MS Direct	NA	48.8	NA	NA	NA	NA	N/A	NA	117	NA	NA	NA	1.52	50.6
1640 Direct		Fe/Pd ICP-MS or GFAA-Ag	6.96	NA	NA	24.7	39.4	87.2	N/A	NA	NA	28.2	28.0	NA	NA	NA
1640 Direct		Fe/Pd ICP-MS or GFAA-Ag	NA	NA	NA	24.5	37.1	83.0	N/A	NA	NA	26.7	27.3	NA	NA	NA
1641 Direct		FIAS- Se	NA	NA	NA	NA	NA	NA	N/A	NA	NA	NA	NA	21.0	NA	NA
1640		certified value	7.6	52.0	26.7	22.8	38.6	85.2	34.3	NC	122	27.4	27.9	22.0	NC	53.2
1640		range	±0.25	±1.5	±0.73	±0.96	±1.6	±1.2	±1.6	NC	±1.1	±0.8	±0.14	±0.51	NC	±1.1
		% difference	NA	0%	NA	NA	NA	NA	N/A	NA	1%	NA	NA	NA	NA	17%
		% difference	NA	6%	NA	NA	NA	NA	N/A	NA	4%	NA	NA	NA	NA	5%
			9%	NA	NA	8%	2%	2%	N/A	NA	NA	3%	0%	NA	NA	NA
			NA	NA	NA	8%	4%	3%	N/A	NA	NA	3%	2%	NA	NA	NA
			NA	NA	NA	NA	NA	NA	N/A	NA	NA	NA	NA	4%	NA	NA
1979-cass4		Fe/Pd ICP-MS or GFAA-Ag	0.0369	N/A	N/A	0.0299	0.222	0.749	N/A	N/A	N/A	0.425	0.0265	N/A	N/A	N/A
CASS-4		FIAS - As	N/A	N/A	1.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CASS-4		certified value	NC	NC	1.11	0.026	0.144	0.592	0.71	N/A	2.78	0.314	0.0098	NC	NC	0.381
CASS-4		range	NC	NC	±0.16	±0.003	±0.029	±0.055	±0.058	N/A	±0.19	±0.030	±0.0036	NC	NC	±0.057
		% difference	N/A	N/A	N/A	15%	54% e	27% e	N/A	N/A	N/A	35% e	170% e	N/A	N/A	N/A
		% difference	N/A	N/A	9%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1641d031203		Hg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1565	N/A	N/A	N/A	N/A	N/A	N/A
1641d031303		Hg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1466	N/A	N/A	N/A	N/A	N/A	N/A
1641d031703		Hg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1573	N/A	N/A	N/A	N/A	N/A	N/A
1641d		certified value	NC	NC	NC	NC	NC	NC	NC	1590	NC	NC	NC	NC	NC	NC
1641d		range	NC	NC	NC	NC	NC	NC	NC	±4.00	NC	NC	NC	NC	NC	NC
		% difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2%	N/A	N/A	N/A	N/A	N/A	N/A
		% difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8%	N/A	N/A	N/A	N/A	N/A	N/A
		% difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1%	N/A	N/A	N/A	N/A	N/A	N/A
ICV,CCV RESULTS																
ICV		ICP-MS Direct or Hg		101%					109%	93%	104%				108%	105%
CCV		ICP-MS Direct or Hg		98%					99%	100%	105%				104%	105%
CCV		ICP-MS Direct or Hg		106%					113%	98%	104%				105%	107%
CCV		ICP-MS Direct or Hg		101%					101%	101%	104%				101%	100%
CCV		ICP-MS Direct or Hg		107%					112%	94%	100%				101%	98%
ICV		Fe/Pd ICP-MS or Hg	102%			102%	103%	102%		94%		102%	100%			
CCV		Fe/Pd ICP-MS or Hg	104%			100%	99%	98%		92%		97%	102%			
CCV		Fe/Pd ICP-MS or Hg	101%			101%	98%	96%		94%		97%	105%			
CCV		Fe/Pd ICP-MS or Hg	101%			100%	98%	96%		97%		96%	102%			
CCV		Fe/Pd ICP-MS	N/A			99%	96%	95%		NA		94%	100%			
ICV		FIAS-As or Hg			103%					100%						
CCV		FIAS-As or Hg			100%					101%						
CCV		FIAS-As or Hg			96%					103%						
CCV		FIAS-As or Hg			99%					98%						
ICV		FIAS-Se												104%		
CCV		FIAS-Se												100%		
CCV		FIAS-Se												99%		
CCV		FIAS-Se												95%		

METALS QA/QC (CONT.)

SDG Code	Rep	Parameter Sample ID	Ag (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)	Hg (mg/L)	Mn (mg/L)	Ni (mg/L)	Pb (mg/L)	Se (mg/L)	Sn (mg/L)	Zn (mg/L)
BLANK SPIKE RESULTS																
		Amount Spiked	10	NS	NS	10	10	10	NS	0.00497	NS	10	10	NS	NS	NS
1979-SB Blk or BLANK031203			0.0246 J			0.0721	0.180 J	0.488		0.000419 J		0.475	0.0279 J			
1979-SB LCS or OPR031203run1																
			9.30			8.94	9.54	9.21		0.00569		9.19	8.20			
		Amount Recovered	9.28	N/A	N/A	8.94	9.36	8.72	N/A	0.00527	N/A	8.72	8.23	N/A	N/A	N/A
		Percent Recovery	93%	N/A	N/A	89%	94%	87%	N/A	106%	N/A	87%	82%	N/A	N/A	N/A
		Amount Spiked	NS	NS	NS	NS	NS	NS	NS	0.00487	NS	NS	NS	NS	NS	NS
BLANK031203										0.000419 J						
OPR031203run2										0.00545						
		Amount Recovered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.00503	N/A	N/A	N/A	N/A	N/A	N/A
		Percent Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	101%	N/A	N/A	N/A	N/A	N/A	N/A
		Amount Spiked	NS	NS	NS	NS	NS	NS	NS	0.00487	NS	NS	NS	NS	NS	NS
BLANK031303										0.000172 J						
OPR031303run1										0.00490						
		Amount Recovered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.00473	N/A	N/A	N/A	N/A	N/A	N/A
		Percent Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	97%	N/A	N/A	N/A	N/A	N/A	N/A
		Amount Spiked	NS	NS	NS	NS	NS	NS	NS	0.00487	NS	NS	NS	NS	NS	NS
BLANK031303										0.000172 J						
OPR031303run2										0.00502						
		Amount Recovered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.00485	N/A	N/A	N/A	N/A	N/A	N/A
		Percent Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100%	N/A	N/A	N/A	N/A	N/A	N/A
		Amount Spiked	NS	NS	5	NS	NS	NS	NS	0.00491	NS	NS	NS	NS	NS	NS
BLANK (FIAS As) or Blank031403 (Hg)					0.0275 U					0.000202 J						
LCS or OPR031403run1					5.14					0.00528						
		Amount Recovered	N/A	N/A	5.14	N/A	N/A	N/A	N/A	0.00508	N/A	N/A	N/A	N/A	N/A	N/A
		Percent Recovery	N/A	N/A	107%	N/A	N/A	N/A	N/A	103%	N/A	N/A	N/A	N/A	N/A	N/A
		Amount Spiked	NS	NS	NS	NS	NS	NS	NS	0.00491	NS	NS	NS	5.0	NS	NS
BLANK(FIAS) Se) or Blank031403 (Hg)										0.000202 J				0.0352 U		
LCS or OPR031403run2										0.00547				4.92		
		Amount Recovered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.00527	N/A	N/A	N/A	4.92	N/A	N/A
		Percent Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	107%	N/A	N/A	N/A	98%	N/A	N/A
MATRIX SPIKE RESULTS																
		Amount Spiked	NS	100	NS	NS	NS	NS	100	NS	100	NS	NS	NS	10	100
1979-1		NAV-OF9-SDB2-FF		1840					2990		92.6				1.00	433
		MS		1920					2990		192				9.29	534
		Amount Recovered	N/A	80.0	N/A	N/A	N/A	N/A	-30	N/A	99.4	N/A	N/A	N/A	8.29	101
		Percent Recovery	N/A	80%	N/A	N/A	N/A	N/A	0% w	N/A	99%	N/A	N/A	N/A	83%	101%
		Amount Spiked	NS	100	NS	NS	NS	NS	100	NS	100	NS	NS	NS	10	100
1979-1		NAV-OF9-SDB2-FF		1840					2990		92.6				1.00	433
		MSD		2080					3010		189				9.70	540
		Amount Recovered	N/A	240	N/A	N/A	N/A	N/A	220	N/A	96.4	N/A	N/A	N/A	8.70	107
		Percent Recovery	N/A	240% w	N/A	N/A	N/A	N/A	220% w	N/A	96%	N/A	N/A	N/A	87%	107%
		Amount Spiked	NS	100	5.0	NS	NS	NS	100	NS	100	NS	NS	5.0	10	100
1979-16		NAV-OF9-SDB2-FF		16.6 J	0.695				18.5		28.7			0.132 J	0.165 J	218
		MS		119	5.38				104		138			4.80	10.6	338
		Amount Recovered	N/A	102	4.69	N/A	N/A	N/A	85.5	N/A	109	N/A	N/A	4.67	10.4	117
		Percent Recovery	N/A	102%	94%	N/A	N/A	N/A	86%	N/A	109%	N/A	N/A	93%	104%	117%
		Amount Spiked	NS	100	NS	NS	NS	NS	100	NS	100	NS	NS	NS	10	100
1979-16		NAV-OF9-SDB2-FF		16.6 J					18.5		28.7				0.165 J	218
		MSD		125					102		133				10.5	328
		Amount Recovered	N/A	108	N/A	N/A	N/A	N/A	83.5	N/A	104	N/A	N/A	N/A	10.3	110
		Percent Recovery	N/A	106%	N/A	N/A	N/A	N/A	84%	N/A	104%	N/A	N/A	N/A	103%	110%
		Amount Spiked	10	NS	NS	10	10	10	NS	NS	NS	10	10	NS	NS	NS
1979-18		NAV-OF14-SDB2-FF	0.0267 J			0.983	0.804 J	22.1				5.78	0.916			
		MS	9.90			9.46	9.46	30.3				14.6	9.47			
		Amount Recovered	9.87	N/A	N/A	8.48	8.66	8.20	N/A	N/A	N/A	8.82	8.55	N/A	N/A	N/A
		Percent Recovery	99%	N/A	N/A	85%	87%	82%	N/A	N/A	N/A	88%	86%	N/A	N/A	N/A
		Amount Spiked	NS	NS	NS	NS	NS	NS	NS	0.0158	NS	NS	NS	NS	NS	NS
1979-12		NAV-BAY14-SDB2-D								0.00229 J						
		MS								0.0168						
		Amount Recovered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0165	N/A	N/A	N/A	N/A	N/A	N/A
		Percent Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	104%	N/A	N/A	N/A	N/A	N/A	N/A
		Amount Spiked	NS	NS	NS	NS	NS	NS	NS	0.0155	NS	NS	NS	NS	NS	NS
1979-12		NAV-BAY14-SDB2-D								0.00229 J						
		MSD								0.01820						
		Amount Recovered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0159	N/A	N/A	N/A	N/A	N/A	N/A
		Percent Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	103%	N/A	N/A	N/A	N/A	N/A	N/A

METALS QA/QC (CONT.)

MSL		Instrument:	GFAA	ICP-MS	FIAS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	CVAF	ICP-MS	ICP-MS	ICP-MS	FIAS	ICP-MS	ICP-MS
Code	Rep	Sponsor I.D.	Ag (µg/L)	Al (µg/L)	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Fe (µg/L)	Hg (µg/L)	Mn (µg/L)	Ni (µg/L)	Pb (µg/L)	Se (µg/L)	Sn (µg/L)	Zn (µg/L)
REPLICATE RESULTS																
1979-1		NAV-OF9-SDB2-FF	0.168 J	1840	1.58	0.987	6.56	54.2	2390	0.0173	92.6	12.5	22.7	0.187 J	1.00	433
1979-1	2	NAV-OF9-SDB2-FF	NA	1790	NA	NA	NA	NA	2180	0.0174	87.8	NA	NA	NA	1.02	422
		% difference	NA	3%	NA	NA	NA	NA	9%	1%	5%	NA	NA	NA	2%	3%
1979-12		NAV-BAY14-SDB2-D	0.0324 J	107	1.17	0.109	1.75	5.01	152	0.00230 J	12.5	1.93	0.623	0.0539 J	0.253 J	24.7
1979-12	2	NAV-BAY14-SDB2-D	0.0388 J	NA	1.20	0.113	1.74	4.99	NA	NA	NA	1.94	0.602	0.0352 U	NA	NA
		% difference	18%	NA	3%	4%	1%	0%	NA	NA	NA	1%	3%	NA	NA	NA
1979-16		NAV-OF9-SDB2-FF	0.0203 J	16.6 J	0.695	0.388	1.22	25.8	18.5	0.00367 J	28.7	6.95	0.369	0.132 J	0.165 J	218
1979-16	2	NAV-OF9-SDB2-FF	NA	16.4 J	NA	NA	NA	NA	25.5	NA	29.9	NA	NA	NA	0.149 J	229
		% difference	NA	1%	NA	NA	NA	NA	32%	NA	4%	NA	NA	NA	10%	5%

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METALS QA/QC (CONT.)

MSL CHEMISTRY CODE	CLIENT CODE	PARAMETER	GFAA Ag (µg/L)	ICP-MS Cu (µg/L)	ICP-MS Pb (µg/L)	CVAF Hg (µg/L)	ICP-MS Zn (µg/L)
DETECTION LIMITS							
Project Reporting Limit			0.1	0.1	0.1	0.001	0.1
Laboratory Achieved MDL[1]			0.0125	0.028	0.0056	0.00016	0.11
METHOD BLANKS							
Blank (1)			0.0140	0.317	0.0231	0.000367	0.292
Blank (2)			0.0252	0.254	0.0186	0.000419	0.271
		Mean	*0.0196*	*0.286*	*0.0209*	*0.000393*	*0.282*
LABORATORY CONTROL SAMPLE (LCS) ACCURACY							
Blank (1)	SB Blank (1)		0.0136	0.628	0.0243	0.000367	1.73
OPR030603run1 (Hg)	SB LCS R1		9.30	10.4	8.67	0.00528	11.6
		Amount Recovered	9.29	9.77	8.65	0.00493	9.87
		Percent Recovery	NS	NS	NS	NS	NS
		Amount Spiked	NS	NS	NS	0.00487	NS
Blank (1)						0.000367	
OPR030603run2 (Hg)						0.00542	
		Amount Recovered	NA	NA	NA	0.00506	NA
		Percent Recovery	NA	NA	NA	104%	NA
		Amount Spiked	10	10	10	0.00497	10
Blank (2)	SB Blank (2)		0.0155	0.647	0.0284	0.000419	1.07
OPR031203run1 (Hg)	SB LCS R2		9.26	10.1	8.28	0.00566	11.3
		Amount Recovered	9.24	9.45	8.25	0.00527	10.2
		Percent Recovery	92%	95%	83%	106%	102%
		Amount Spiked	NS	NS	NS	0.00497	NS
Blank (2)						0.000419	
OPR031203run2 (Hg)						0.00545	
		Amount Recovered	NA	NA	NA	0.00503	NA
		Percent Recovery	NA	NA	NA	101%	NA
MATRIX SPIKE ACCURACY							
1919-27	NAV-BAY14-SDB2-PRE	*Total metals*	0.0368	4.86	0.155	--	13.1
1919-27 MS			9.09	14.2	8.66	--	21.1
1919-27 MSD			9.23	14.5	8.73	--	21.5
		% Rec (10ppb)	91%	93%	85%	--	80%
		% Rec (10ppb)	92%	96%	86%	--	84%
1919-37	NAV-BAY11B-SDB2-AFT	*Total metals*	0.0126 U	2.84	0.556	--	14.2
1919-37 MS			9.55	12.3	9.06	--	22.7
1919-37 MSD			9.29	12.3	8.90	--	22.7
		% Rec (10ppb)	95%	95%	85%	--	85%
		% Rec (10ppb)	92%	95%	83%	--	85%
1919-38 r1	NAV-BAY26-SDB2-AFT	*Total metals*	--	--	--	0.00101	--
1919-38 MS			--	--	--	0.0117	--
1919-38 MSD			--	--	--	0.0125	--
		% Rec (0.0102ppb)	--	--	--	105%	--
		% Rec (0.0108ppb)	--	--	--	106%	--
REPLICATE PRECISION							
1919-28 r1	NAV-BAY14A-SDB2-PRE	*Total metals*	0.0235 J	4.97	0.153	0.00131	13.1
1919-28 r2	NAV-BAY14A-SDB2-PRE	*Total metals*	0.0283 J	5.00	0.151	--	12.9
		MEAN	*0.0259*	*4.99*	*0.152*	--	*12.8*
		RPD	18%	1%	1%	--	5%
1919-31 r1	NAV-BAY9-SDB2-AFT	*Total metals*	0.0241 J	5.00	0.318	0.00129	14.9
1919-31 r2	NAV-BAY9-SDB2-AFT	*Total metals*	--	--	--	0.00129	--
		MEAN	--	--	--	*0.00129*	--
		RPD	--	--	--	0%	--
1919-38 r1	NAV-BAY26-SDB2-AFT	*Total metals*	0.0183 J	1.59	0.110	0.00101	4.82
1919-38 r2	NAV-BAY26-SDB2-AFT	*Total metals*	0.0191 J	1.54	0.106	--	4.79
		MEAN	*0.0187 J*	*1.55*	*0.108*	--	*4.81*
		RPD	4%	1%	4%	--	1%
STANDARD REFERENCE MATERIAL ACCURACY							
CASS-4 r1			NA	0.871	0.0234	--	0.888
CASS-4 r2			NA	0.825	0.0223	--	0.700
		Laboratory Consensus Values	NC	0.693	0.0214 J	NC	0.412
		Range		±0.080	±0.01		±0.05
		PD CASS-4 R1	NA	26%#	9%	--	116%#
		PD CASS-4 R2	NA	19%	4%	--	13%
1640 Direct R1	Freshwater SRM		7.31	92.0	27.2	1550	66.7
1640 Direct R2	Freshwater SRM		7.66	89.8	28.8	1570	64.3
		certified value	7.62	85.2	27.9	1590	53.2
		Range	± 0.25	± 1.2	± 0.14	±40	± 1.1
		PD 1640 Direct R1	4%	8%	3%	3%	25%
		PD 1640 Direct R2	1%	5%	3%	1%	21%

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PAHs

CLIENT SAMPLE ID	NAV-PR5-SDB2-FF		NAV-PR5-SDB2-COMP		NAV-PR6-SDB2-FF		NAV-PR6-SDB2-COMP	
Battelle Sample ID	U7089		U7091		U7090		U7092	
Battelle Batch ID	03-0203		03-0203		03-0203		03-0203	
Data File	A1884.D		A1886.D		A1885.D		A1887.D	
Extraction Date	03/04/03		03/04/03		03/04/03		03/04/03	
Acquired Date	03/20/03		03/20/03		03/20/03		03/20/03	
Matrix	Water		Water		Water		Water	
Sample Size (L)	2.62		2.64		2.66		2.66	
Dilution Factor	1.667		1.667		1.667		1.667	
PIV (mL)	0.3		0.3		0.3		0.3	
Min Reporting Limit	0.95		0.95		0.94		0.94	
Amount Units	ng/L		ng/L		ng/L		ng/L	
Naphthalene	6.33	B	545.51		7.70		10.74	
C1-Naphthalenes	4.17		2246.10		6.50		8.58	
C2-Naphthalenes	5.15		1886.51		9.47		13.41	
C3-Naphthalenes	4.38		784.87		8.81		6.71	
C4-Naphthalenes	0.51	U	301.05		0.50	U	0.50	U
2-Methylnaphthalene	3.62		2088.87		4.74		8.10	
1-Methylnaphthalene	2.60		1449.34		4.68		5.34	
2,6-Dimethylnaphthalene	1.27		860.28		1.50		2.66	
2,3,5-Trimethylnaphthalene	0.82	J	150.84		0.72	J	1.20	
Biphenyl	2.18		472.71		7.14		4.17	
Acenaphthylene	1.25		15.67		1.05		2.69	
Acenaphthene	2.42		29.29		1.94		1.67	
Fluorene	3.27		94.48		2.90		3.50	
C1-Fluorenes	1.95	B	108.44		4.84		4.77	
C2-Fluorenes	10.13	B	63.38		59.86		24.62	
C3-Fluorenes	14.05	B	81.06		24.82	B	62.85	
Phenanthrene	29.86		54.65		15.88	B	34.46	
Anthracene	1.79	B	4.14		1.00	B	2.72	
C1-Phenanthrenes/Anthracenes	21.63	B	49.05		10.27	B	28.98	B
C2-Phenanthrenes/Anthracenes	56.76	B	59.66	B	22.81	B	49.46	B
C3-Phenanthrenes/Anthracenes	54.90	B	44.74	B	11.21	B	38.07	B
C4-Phenanthrenes/Anthracenes	24.81	B	15.45	B	0.28	U	14.00	B
1-Methylphenanthrene	5.84	B	12.86		3.65	B	8.78	
Dibenzothiophene	7.87		11.22		19.20		9.80	
C1-Dibenzothiophenes	14.21		19.15		30.88		20.81	
C2-Dibenzothiophenes	49.50	B	41.42	B	59.11	B	64.18	B
C3-Dibenzothiophenes	48.76	B	39.87	B	37.56	B	52.76	B
Fluoranthene	29.72		48.56		9.44	B	34.66	
Pyrene	31.48	B	56.25		8.35	B	38.24	B
C1-Fluoranthenes/Pyrenes	34.42	B	24.86	B	9.16	B	21.00	B
C2-Fluoranthenes/Pyrenes	27.19	B	26.14	B	7.14	B	26.09	B
C3-Fluoranthenes/Pyrenes	17.20	B	24.23	B	5.11	B	25.04	B
Benzo(a)anthracene	3.58		12.42		0.75	J	4.00	
Chrysene	21.51		30.86		4.84		30.12	
C1-Chrysenes	14.05	B	23.82		4.46	B	20.74	
C2-Chrysenes	17.70	B	33.07	B	0.28	U	27.39	B
C3-Chrysenes	13.41	B	31.09	B	0.28	U	27.34	B
C4-Chrysenes	0.28	U	0.28	U	0.28	U	0.28	U
Benzo(b)fluoranthene	10.84		18.72		2.12		10.57	
Benzo(k)fluoranthene	7.08		13.96		1.21		6.19	
Benzo(e)pyrene	10.01		16.44		1.93	B	10.36	
Benzo(a)pyrene	4.99		11.68		0.72	J	4.32	
Perylene	1.48		3.60		0.53	U	1.86	
Indeno(1,2,3-cd)pyrene	6.91		12.53		1.13	B	6.08	
Dibenz(a,h)anthracene	1.23		2.44		0.78	U	1.17	
Benzo(g,h,i)perylene	15.16		25.43		2.48		13.59	
Total Priority Pollutant PAHs	177.42		976.59		61.51		204.72	
Naphthalene-d8	60		64		63		60	
Phenanthrene-d10	75		76		76		79	
Chrysene-d12	81		85		80		91	

PAHs (CONT.)

CLIENT SAMPLE ID	NAV-BAY9-SDB2-PRE		NAV-BAY9-SDB2-DUR		NAV-BAY9-SDB2-AFT		NAV-BAY11-SDB2-PRE		NAV-BAY11-SDB2-DUR		NAV-BAY11-SDB2-AFT		NAV-BAY14-SDB2-PRE	
Battelle Sample ID	U7067		U7071		U7075		U7068		U7072		U7076		U7069	
Battelle Batch ID	03-0200		03-0200		03-0200		03-0200		03-0200		03-0200		03-0200	
Data File	A1850.D		A1857.D		A1861B.D		A1854.D		A1858.D		A1863.D		A1855.D	
Extraction Date	03/03/03		03/03/03		03/03/03		03/03/03		03/03/03		03/03/03		03/03/03	
Acquired Date	03/18/03		03/18/03		03/18/03		03/18/03		03/18/03		03/18/03		03/18/03	
Matrix	Water		Water		Water		Water		Water		Water		Water	
Sample Size (L)	1.3		2.64		2.65		2.64		2.66		2.64		2.62	
Dilution Factor	1.667		1.667		1.667		1.667		1.667		1.667		1.667	
PIV (mL)	0.3		0.3		0.3		0.3		0.3		0.3		0.3	
Min Reporting Limit	1.92		0.95		0.94		0.95		0.94		0.95		0.95	
Amount Units	ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L	
Naphthalene	3.89	B	1.74	B	1.48	B	1.43	B	1.36	B	1.26	B	1.26	B
C1-Naphthalenes	2.45	B	0.91	JB	0.66	JB	1.27	B	0.70	JB	0.75	JB	0.73	JB
C2-Naphthalenes	1.02	U	2.90		0.50	U	0.50	U	0.50	U	2.46		2.18	
C3-Naphthalenes	1.02	U	2.10		1.62		0.50	U	0.50	U	2.15		1.41	
C4-Naphthalenes	1.02	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.51	U
2-Methylnaphthalene	2.00	B	0.83	JB	0.61	JB	1.12	B	0.64	JB	0.77	JB	0.67	JB
1-Methylnaphthalene	1.69	JB	0.57	JB	0.35	JB	0.94	JB	0.31	JB	0.55	JB	0.32	JB
2,6-Dimethylnaphthalene	0.73	U	0.70	J	0.36	U	0.93	J	0.36	U	1.03		0.78	J
2,3,5-Trimethylnaphthalene	0.77	U	0.78	J	0.38	U	1.37		0.37	U	0.64	J	0.48	J
Biphenyl	0.60	J	0.89	J	0.31	U	0.79	J	0.31	U	0.57	J	0.41	J
Acenaphthylene	1.37	J	0.89	J	0.65	J	1.74		0.63	J	1.04		0.66	J
Acenaphthene	6.51		6.44		3.08		4.74		4.91		10.63		3.13	
Fluorene	2.63		2.70		1.03		2.03		1.84		3.98		0.90	J
C1-Fluorenes	0.75	U	1.38		1.22		0.37	U	0.37	U	1.79		0.99	
C2-Fluorenes	0.75	U	0.37	U	0.37	U	0.37	U	0.37	U	2.71		0.37	U
C3-Fluorenes	0.75	U	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U
Phenanthrene	2.74		7.01		1.11	B	1.87		3.32		5.05		0.89	JB
Anthracene	1.27	J	1.93		1.08		2.00		1.60		2.23		0.83	J
C1-Phenanthrenes/Anthracenes	0.58	U	4.31		2.31		0.28	U	2.98		4.02		0.29	U
C2-Phenanthrenes/Anthracenes	0.58	U	3.18		1.79		0.28	U	1.81		2.51		0.29	U
C3-Phenanthrenes/Anthracenes	0.58	U	3.52		1.48		0.28	U	1.97		1.76		0.29	U
C4-Phenanthrenes/Anthracenes	0.58	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.29	U
1-Methylphenanthrene	0.67	U	1.02		0.47	J	1.39		0.57	J	0.81	J	0.33	U
Dibenzothiophene	0.90	J	1.52		0.69	J	1.62		0.78	J	1.23		0.36	J
C1-Dibenzothiophenes	0.71	U	1.96		0.89	J	0.35	U	0.83	J	1.03		0.35	U
C2-Dibenzothiophenes	0.71	U	3.64		1.99		0.35	U	1.91		2.57		0.35	U
C3-Dibenzothiophenes	0.71	U	3.23		1.15		0.35	U	1.33		1.12		0.35	U
Fluoranthene	10.18		20.21		10.58		10.30		13.99		25.73		6.95	
Pyrene	4.90		13.05		5.34		5.41		8.43		14.77		3.31	
C1-Fluoranthenes/Pyrenes	0.68	U	4.93		2.23		1.70		3.50		5.70		1.70	
C2-Fluoranthenes/Pyrenes	0.68	U	3.42		0.33	U	0.33	U	1.91		1.76		0.34	U
C3-Fluoranthenes/Pyrenes	0.68	U	2.92		0.33	U	0.33	U	0.33	U	0.33	U	0.34	U
Benzo(a)anthracene	1.07	U	2.63		0.75	J	1.62		1.28		3.30		0.34	J
Chrysene	0.56	U	5.87		1.60		2.14		2.34		4.52		0.78	J
C1-Chrysenes	0.56	U	3.33		0.28	U	0.28	U	1.60		1.79		0.28	U
C2-Chrysenes	0.56	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
C3-Chrysenes	0.56	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
C4-Chrysenes	0.56	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
Benzo(b)fluoranthene	0.66	U	3.49		1.15		2.56		1.93		2.73		0.33	U
Benzo(k)fluoranthene	0.67	U	2.44		1.08		1.91		1.45		2.48		0.33	U
Benzo(e)pyrene	0.70	U	3.04		1.06		2.08		1.27		1.62		0.88	J
Benzo(a)pyrene	1.00	U	2.19		0.74	J	1.85		1.15		1.92		0.50	U
Perylene	1.07	U	0.67	J	0.53	U	1.51		0.53	U	0.53	U	0.53	U
Indeno(1,2,3-cd)pyrene	0.82	JB	2.10	B	0.66	JB	2.13	B	0.85	JB	0.81	JB	0.35	JB
Dibenz(a,h)anthracene	1.60	U	0.58	J	0.79	U	1.21		0.78	U	0.79	U	0.80	U
Benzo(g,h,i)perylene	2.31	B	2.63	B	0.92	JB	2.49	B	1.22	B	1.10	B	0.66	JB
Total Priority Pollutant PAHs	36.62		75.89		31.26		45.41		46.29		81.56		20.07	
Naphthalene-d8	65		53		54		62		54		63		70	
Phenanthrene-d10	82		72		70		73		71		72		74	
Chrysene-d12	92		87		86		83		76		88		79	

PAHs (CONT.)

CLIENT SAMPLE ID	NAV-BAY14-SDB2-DUR		NAV-BAY14-SDB2-AFT		NAV-BAY14A-SDB2-PRE		NAV-BAY14A-SDB2-DUR		NAV-BAY14A-SDB2-AFT	
Battelle Sample ID	U7073		U7077		U7070		U7074		U7078	
Battelle Batch ID	03-0200		03-0200		03-0200		03-0200		03-0200	
Data File	A1861.D		A1864.D		A1856.D		A1861A.D		A1866.D	
Extraction Date	03/03/03		03/03/03		03/03/03		03/03/03		03/03/03	
Acquired Date	03/18/03		03/19/03		03/18/03		03/18/03		03/19/03	
Matrix	Water		Water		Water		Water		Water	
Sample Size (L)	2.65		2.66		2.64		2.66		2.64	
Dilution Factor	1.667		1.667		1.667		1.667		1.667	
PIV (mL)	0.3		0.3		0.3		0.3		0.3	
Min Reporting Limit	0.94		0.94		0.95		0.94		0.95	
Amount Units	ng/L		ng/L		ng/L		ng/L		ng/L	
Naphthalene	1.30	B	1.18	B	1.38	B	1.27	B	1.31	B
C1-Naphthalenes	0.76	JB	0.57	JB	0.76	JB	0.70	JB	0.64	JB
C2-Naphthalenes	0.50	U	0.50	U	1.45		0.50	U	0.50	U
C3-Naphthalenes	1.55		1.08		1.11		1.13		1.50	
C4-Naphthalenes	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
2-Methylnaphthalene	0.60	JB	0.48	JB	0.73	JB	0.60	JB	0.65	JB
1-Methylnaphthalene	0.46	JB	0.27	JB	0.42	JB	0.34	JB	0.30	JB
2,6-Dimethylnaphthalene	0.36	U	0.36	U	0.73	J	0.36	U	0.36	U
2,3,5-Trimethylnaphthalene	0.38	U	0.37	U	0.38	U	0.37	U	0.38	U
Biphenyl	0.25	J	0.24	J	0.28	J	0.31	U	0.34	J
Acenaphthylene	0.54	J	0.49	J	0.54	J	0.41	J	0.64	J
Acenaphthene	2.46		2.36		2.53		2.45		3.99	
Fluorene	0.82	J	0.85	J	0.78	J	0.70	J	1.28	
C1-Fluorenes	0.37	U	0.37	U	0.37	U	1.03		1.12	
C2-Fluorenes	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U
C3-Fluorenes	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U
Phenanthrene	2.16		1.18	B	0.79	JB	1.54	B	1.37	B
Anthracene	1.09		0.78	J	0.68	J	1.22		1.09	
C1-Phenanthrenes/Anthracenes	2.93		2.14		1.41		2.08		2.49	
C2-Phenanthrenes/Anthracenes	2.31		1.85		0.28	U	1.45		2.30	
C3-Phenanthrenes/Anthracenes	1.85		0.28	U	0.28	U	2.01		1.59	
C4-Phenanthrenes/Anthracenes	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
1-Methylphenanthrene	0.60	J	0.48	J	0.39	J	0.43	J	0.54	J
Dibenzothiophene	0.88	J	0.60	J	0.44	J	0.72	J	0.68	J
C1-Dibenzothiophenes	1.48		0.72	J	0.35	U	1.13		0.78	J
C2-Dibenzothiophenes	2.81		1.81		0.35	U	1.62		1.74	
C3-Dibenzothiophenes	1.86		0.35	U	0.35	U	1.13		1.45	
Fluoranthene	12.93		10.43		7.22		10.95		11.65	
Pyrene	8.05		5.43		3.11		6.32		5.89	
C1-Fluoranthenes/Pyrenes	4.06		2.58		1.26		3.47		2.48	
C2-Fluoranthenes/Pyrenes	1.98		0.33	U	0.33	U	0.33	U	0.33	U
C3-Fluoranthenes/Pyrenes	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Benzo(a)anthracene	1.37		0.62	J	0.34	J	1.08		0.69	J
Chrysene	3.40		1.54		0.69	J	2.24		1.41	
C1-Chrysenes	2.64		0.28	U	0.28	U	0.28	U	0.28	U
C2-Chrysenes	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
C3-Chrysenes	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
C4-Chrysenes	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
Benzo(b)fluoranthene	2.98		1.34		0.33	U	2.17		1.23	
Benzo(k)fluoranthene	2.47		1.02		0.33	U	1.75		0.89	J
Benzo(e)pyrene	2.03		1.46		0.34	U	1.59		1.00	
Benzo(a)pyrene	1.84		0.49	U	0.49	U	1.50		0.74	J
Perylene	0.53	U	0.53	U	0.53	U	0.53	U	0.53	U
Indeno(1,2,3-cd)pyrene	1.43	B	0.69	JB	0.45	JB	0.97	B	0.56	JB
Dibenz(a,h)anthracene	0.79	U	0.78	U	0.79	U	0.78	U	0.79	U
Benzo(g,h,i)perylene	1.54	B	0.68	JB	0.54	JB	1.27	B	0.48	JB
Total Priority Pollutant PAHs	44.36		28.59		19.04		35.84		33.23	
Naphthalene-d8	54		57		69		55		65	
Phenanthrene-d10	70		69		77		70		72	
Chrysene-d12	85		88		81		85		86	

PAHs QA/QC

PROJECT: SPAWAR TO0011, Contaminant Analysis of Stormwater and San Diego Bay Seawater
PARAMETER: PAH
LABORATORY: Battelle, Duxbury, MA
MATRIX: Water
SAMPLE CUSTODY: The water samples were collected February 25, 2003. They were received in Duxbury on February 28, 2003 in good condition in six coolers. The cooler temperature on arrival ranged from 0.2 °C to 1.3 °C. Samples were stored at 4 °C until processing.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Surrogate Recovery	LCS/MS Recovery	Sample Replicate Relative Precision	Procedural Blank
PAH	General NS&T	30-130% Recovery	LCS: 40-120% Recovery for at least 80% of analytes MS: 50-150% Recovery for at least 70% of analytes; analyte conc. in MS must be >5x background	≤30% RSD analyte conc. in MS must be <5x background	<3X MDL

METHOD: Water samples were extracted for PAH following general NS&T methods. Full water samples were spiked with surrogates and extracted three times with dichloromethane using separatory funnel techniques. The combined extract was dried over anhydrous sodium sulfate, concentrated, processed through alumina cleanup column, concentrated, and further purified by GPC/HPLC. The post-HPLC extract was concentrated, fortified with Recovery Internal Standard (RIS) and split for analysis. Extracts were analyzed using gas chromatography/mass spectrometry (GC.MS) with the MS operating in the selected ion monitoring (SIM) mode, following general NS&T methods. Sample data were quantified by the method of internal standards, using the RIS compounds.

HOLDING TIMES: Samples were prepared for analysis in one analytical batch.

Samples were extracted with in the 7-day holding time for waters. Extracts were analyzed within the 40-day holding time for extracts

Batch	Extraction Date	Analysis Date
03-0203	3/4/2003	3/19/2003 – 3/20/2003

BLANKS: A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

03-0203 – Several target analytes were detected at concentrations greater than 3X the MDL.

Comments – ~~All samples are appropriately flagged. The contamination in the blank does not appear to have the same PAH homologue pattern as the samples indicating that the contamination is likely isolated to the blank and that the samples are not impacted by the blank contamination. This is supported by the fact that no alkyl homologues were detected in the LCS (blank spike) sample – the LCS is prepared in the same manner as the blank, with the addition of a spike of the target analytes of interest (in this case, the parent PAH).~~

Note: The 2003 MDL for substituted naphthalenes were updated.

LABORATORY CONTROL A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target PAH were calculated to measure data quality in terms of accuracy.

SAMPLE:

03-0203 – All target analytes were recovered within the laboratory control limits specified by the client.

Comments – None.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

A matrix spike (MS)/matrix spike duplicate (MSD) pair was prepared with each analytical batch. The percent recoveries of target PAH were calculated to measure data quality in terms of accuracy; the relative percent difference between the pair was calculated to measure data quality in terms of precision.

03-0203 – All target analytes were recovered within the laboratory control limits specified by the client. The relative percent differences between the MS and MSD recoveries were within the laboratory control limits for all target PAH.

Comments – None.

SURROGATES:

Three surrogate compounds were added prior to extraction, including naphthalene-d8, phenanthrene-d10, and chrysene-d12. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

03-0203 – All surrogate percent recoveries were within the laboratory control limits specified by the client.

Comments – None.

PAHs QA/QC (CONT.)

CLIENT SAMPLE ID	LABORATORY CONTROL SAMPLE				MATRIX SPIKE-NAV-BAY9-SDB2-PRE			MATRIX SPIKE DUPLICATE-NAV-BAY9-SDB2-PRE			PROCEDURAL BLANK	
Battelle Sample ID	BB584LCS				U7067MS			U7067MSD			BB583PB	
Battelle Batch ID	03-0200				03-0200			03-0200			03-0200	
Data File	A1849.D				A1851.D			A1852.D			A1848.D	
Extraction Date	03/03/03				3/3/2003			03/03/03			03/03/03	
Acquired Date	03/18/03				3/18/2003			37698			03/18/03	
Matrix	Water				Water			Water			Water	
Sample Size (L)	2				0.65			0.65			2	
Dilution Factor	1.667				1.667			1.667			1.667	
PIV (mL)	0.3				0.30			0.30			0.3	
Min Reporting Limit	1.25				3.85			3.85			1.25	
Amount Units	ng		Rec%	Q	ng/L		Rec%	ng/L		Rec%	ng/L	
Naphthalene	368.77		74		1019.92		66	1010.15		65	1.89	
C1-Naphthalenes	0.66	U	NA		2.04	U	NA	2.04	U	NA	1.14	J
C2-Naphthalenes	0.66	U	NA		2.04	U	NA	2.04	U	NA	0.66	U
C3-Naphthalenes	0.66	U	NA		2.04	U	NA	2.04	U	NA	0.66	U
C4-Naphthalenes	0.66	U	NA		2.04	U	NA	2.04	U	NA	0.66	U
2-Methylnaphthalene	371.20		74		983.20		64	982.48		64	0.95	J
1-Methylnaphthalene	347.39		69		946.06		61	940.09		61	0.63	J
2,6-Dimethylnaphthalene	354.90		71		916.90		60	894.33		58	0.47	U
2,3,5-Trimethylnaphthalene	378.08		76		1001.89		65	975.25		63	0.50	U
Biphenyl	373.48		74		958.19		62	931.34		60	0.42	U
Acenaphthylene	384.65		77		1086.17		70	1084.45		70	0.41	U
Acenaphthene	369.53		74		1021.95		66	1027.95		66	0.54	U
Fluorene	399.58		80		1119.79		73	1121.97		73	0.49	U
C1-Fluorenes	0.49	U	NA		1.51	U	NA	1.51	U	NA	0.49	U
C2-Fluorenes	0.49	U	NA		1.51	U	NA	1.51	U	NA	0.49	U
C3-Fluorenes	0.49	U	NA		1.51	U	NA	1.51	U	NA	0.49	U
Phenanthrene	416.86		83		1205.14		78	1189.70		77	0.53	J
Anthracene	418.43		84		1193.24		77	1170.26		76	0.35	U
C1-Phenanthrenes/Anthracenes	0.38	U	NA		1.15	U	NA	1.15	U	NA	0.38	U
C2-Phenanthrenes/Anthracenes	0.38	U	NA		1.15	U	NA	1.15	U	NA	0.38	U
C3-Phenanthrenes/Anthracenes	0.38	U	NA		1.15	U	NA	1.15	U	NA	0.38	U
C4-Phenanthrenes/Anthracenes	0.38	U	NA		1.15	U	NA	1.15	U	NA	0.38	U
1-Methylphenanthrene	409.14		82		1204.04		78	1194.14		78	0.43	U
Dibenzothiophene	0.46	U	NA		1.43	U	NA	1.43	U	NA	0.46	U
C1-Dibenzothiophenes	0.46	U	NA		1.43	U	NA	1.43	U	NA	0.46	U
C2-Dibenzothiophenes	0.46	U	NA		1.43	U	NA	1.43	U	NA	0.46	U
C3-Dibenzothiophenes	0.46	U	NA		1.43	U	NA	1.43	U	NA	0.46	U
Fluoranthene	447.78		90		1342.42		87	1330.47		86	0.39	J
Pyrene	460.98		92		1406.44		91	1361.94		88	0.48	J
C1-Fluoranthenes/Pyrenes	0.44	U	NA		1.35	U	NA	1.35	U	NA	0.44	U
C2-Fluoranthenes/Pyrenes	0.44	U	NA		1.35	U	NA	1.35	U	NA	0.44	U
C3-Fluoranthenes/Pyrenes	0.44	U	NA		1.35	U	NA	1.35	U	NA	0.44	U
Benzo(a)anthracene	466.38		93		1434.42		93	1368.53		89	0.69	U
Chrysene	467.52		93		1447.34		94	1385.71		90	0.37	U
C1-Chrysenes	0.37	U	NA		1.13	U	NA	1.13	U	NA	0.37	U
C2-Chrysenes	0.37	U	NA		1.13	U	NA	1.13	U	NA	0.37	U
C3-Chrysenes	0.37	U	NA		1.13	U	NA	1.13	U	NA	0.37	U
C4-Chrysenes	0.37	U	NA		1.13	U	NA	1.13	U	NA	0.37	U
Benzo(b)fluoranthene	456.45		91		1398.10		91	1354.66		88	0.43	U
Benzo(k)fluoranthene	458.55		92		1408.51		92	1333.50		87	0.43	U
Benzo(e)pyrene	404.89		82		1251.12		82	1188.80		78	0.45	U
Benzo(a)pyrene	440.30		88		1348.53		88	1269.82		82	0.65	U
Perylene	399.28		80		1197.11		78	1158.92		75	0.70	U
Indeno(1,2,3-cd)pyrene	422.43		84		1254.97		81	1235.79		80	0.80	J
Dibenz(a,h)anthracene	456.49		91		1395.33		91	1356.43		88	1.04	U
Benzo(g,h,i)perylene	342.98		69		1035.28		67	1012.59		66	1.31	
Total Priority Pollutant PAHs												
Naphthalene-d8	74				69			72			76	
Phenanthrene-d10	77				72			73			75	
Chrysene-d12	90				88			86			91	

PCBs

CLIENT SAMPLE ID:	NAV-PR5-SDB2-FF		NAV-PR5-SDB2-COMP		NAV-PR6-SDB2-FF		NAV-PR6-SDB2-COMP		NAV-OF9-SDB2-FF		NAV-OF9-SDB2-COMP		NAV-OF11-SDB2-FF		NAV-OF11-SDB2-COMP		NAV-OF14-SDB2-FF		NAV-OF14-SDB2-COMP	
Battelle Sample ID:	U7089		U7091		U7090		U7092		U7083		U7086		U7084		U7087		U7085		U7088	
Battelle Batch ID:	03-0203		03-0203		03-0203		03-0203		03-0203		03-0203		03-0203		03-0203		03-0203		03-0203	
Data File:	sc0382,49,1		sc0382,51,1		sc0382,50,1		sc0382,52,1		sc0382,39,1		sc0382,44,1		sc0382,42,1		sc0382,47,1		sc0382,45,1		sc0382,48,1	
Extraction Date:	3/04/03		3/04/03		3/04/03		3/04/03		3/04/03		3/04/03		3/04/03		3/04/03		3/04/03		3/04/03	
Aquired Date:	3/19/03		3/19/03		3/19/03		3/19/03		3/18/03		3/18/03		3/18/03		3/18/03		3/18/03		3/18/03	
Matrix:	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Sample Volume (L):	2.620		2.640		2.660		2.660		1.350		2.660		2.660		2.660		2.660		2.620	
Dilution Factor:	1.667		1.667		1.667		1.667		1.667		1.667		1.667		1.667		1.667		1.667	
Pre Injection Volume (µL):	300		300		300		300		300		300		300		300		300		300	
Minimum Reporting Limit (ng/L):	**0.191**		0.189		0.188		0.188		0.370		0.188		0.188		0.188		0.188		0.191	
Units:	ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L		ng/L	
Cl2 08	1.833	U	11.781	NC	1.805	U	1.805	U	3.557	U	1.805	U	1.805	U	1.805	U	0.277	NC	15.762	
Cl3 18	0.159	U	0.157	U	7.223		0.156	U	2.993		2.485		6.150		0.156	U	0.156	U	0.159	U
Cl3 28	0.198	U	0.197	U	0.195	U	0.195	U	0.385	U	0.195	U	0.195	U	0.195	U	0.195	U	0.198	U
Cl4 44	0.634		0.521		0.663		0.546		0.323	U	2.330		4.776	NC	0.649		1.120		0.166	U
Cl4 49	0.170	U	0.169	U	0.168	U	0.168	U	0.330	U	0.168	U	11.503	NC	0.168	U	0.168	U	0.170	U
Cl4 52	0.164	U	0.163	U	0.162	U	0.162	U	0.319	U	1.088	NC	0.162	U	0.162	U	0.162	U	0.164	U
Cl4 66	0.171	U	0.169	U	0.168	U	0.168	U	0.331	U	0.168	U	0.168	U	0.168	U	0.168	U	0.171	U
Cl4 77	0.243	U	0.489	NC	0.239	U	1.887	NC	1.361	NC	1.565	NC	3.689	NC	1.640	NC	1.375		1.171	NC
Cl5 87	0.177	NC	0.350	NC	0.127	U	0.152	NC	0.704		0.894		4.045	NC	0.232	NC	0.848		0.940	NC
Cl5 101	0.131	U	0.922	NC	0.129	U	1.659	NC	2.055	NC	2.818		11.255		1.184		3.290		0.131	U
Cl5 105	0.066	U	0.065	U	0.065	U	0.065	U	0.353	NC	1.513		2.188	NC	0.167	NC	1.153		**0.215**	**NC**
Cl5 114	0.113	U	0.112	U	0.111	U	0.111	U	0.219	U	0.111	U	1.623		0.111	U	0.111	U	**0.113**	**U**
Cl5 118	2.355		1.733	NC	3.206	NC	3.620	NC	0.808	NC	1.753	NC	5.469	NC	0.333	NC	3.117	NC	0.374	NC
Cl5 123	0.113	U	0.112	U	0.111	U	0.111	U	0.219	U	0.111	U	0.111	U	0.111	U	0.111	U	0.113	U
Cl5 126	0.141	U	0.140	U	0.139	U	0.139	U	0.273	U	0.139	U	0.139	U	0.139	U	0.139	U	0.141	U
Cl6 128	0.160	U	0.485	NC	0.508	NC	0.893	NC	1.336	NC	1.265	NC	4.836	NC	0.597	NC	2.128	NC	1.203	NC
Cl6 138	0.321	NC	0.814	NC	0.133	NC	0.504		2.362		3.719	NC	17.547	NC	1.316	NC	3.099	NC	1.803	NC
Cl6 153	0.122	U	0.231		0.120	U	1.069		1.883		5.412		21.543	NC	1.226		3.269		1.728	
Cl6 156	0.137	U	0.136	U	0.135	U	0.130	J	0.265	U	0.226		0.786		0.135	U	0.612		0.137	U
Cl6 157	0.137	U	0.136	U	0.135	U	0.135	U	0.265	U	0.135	U	0.135	U	0.135	U	0.135	U	0.137	U
Cl6 167	0.137	U	0.426		0.135	U	0.389		1.059		2.020		5.665		0.889		3.229		0.137	U
Cl6 169	0.109	U	0.109	U	0.238	NC	0.108	U	0.212	U	0.108	U	0.108	U	0.108	U	0.108	U	0.109	U
Cl7 170	0.116	U	0.115	U	0.290	NC	0.114	U	0.861		1.424		8.071	NC	0.420		0.473		0.216	
Cl7 180	0.110	U	0.109	U	0.427		0.108	U	2.074		3.483		18.727	NC	1.264		1.565		**0.110**	U
Cl7 183	0.107	U	0.106	U	0.105	U	0.105	U	0.207	U	0.466		5.751	NC	0.105	U	0.105	U	0.107	U
Cl7 184	0.105	U	0.104	U	0.104	U	0.104	U	0.204	U	0.104	U	**0.104**	U	0.104	U	0.119	NC	0.105	U
Cl7 187	0.099	U	0.182	J	0.097	U	0.384		0.694		0.887		7.818		0.345		0.466		0.247	
Cl7 189	0.108	U	0.107	U	0.106	U	0.106	U	0.209	U	0.106	U	0.106	U	0.106	U	0.106	U	0.108	U
Cl8 195	0.124	U	0.123	U	0.122	U	0.122	U	0.241	U	0.236	NC	1.453	NC	0.061	NC	0.122	U	0.095	NC
Cl9 206	0.139	U	0.138	U	0.371		0.137	U	0.270	U	0.137	U	2.957		0.137	U	0.457		0.139	U
Cl10 209	0.702		0.772		0.593		0.143	U	1.427	NC	0.143	U	6.227		0.143	U	1.794		0.145	U
Total PCB	4.190		18.281		13.652		10.846		18.911		31.563		144.788		9.432		25.162		23.753	
Surrogate Recoveries:																				
Cl3(34)	80		79		75		83		86		81		91		91		**85**		82	
Cl5(112)	79		80		71		80		78		76		93		81		**78**		82	

PCBs QA/QC

PROJECT: SPAWAR TO0011, Contaminant Analysis of Stormwater and San Diego Bay Seawater
PARAMETER: PCB Congener
LABORATORY: Battelle, Duxbury, MA
MATRIX: Water
SAMPLE CUSTODY: The water samples were collected on February 25, 2003. They were received in Duxbury on February 28, 2003 in good condition in six coolers. The cooler temperature on arrival ranged from 0.2 °C to 1.3 °C. Samples were stored at 4 °C until processing.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Surrogate Recovery	LCS/MS Recovery	Sample Replicate Relative Precision	Procedural Blank
PAH	General NS&T	30-130% Recovery	LCS: 40-120% Recovery for at least 80% of analytes MS: 50-150% Recovery for at least 70% of analytes; analyte conc. in MS must be >5x background	≤30% RSD analyte conc. in MS must be <5x background	<3X MDL

METHOD: Water samples were extracted for PCB Congener following general NS&T methods. Full water samples were spiked with surrogates and extracted three times with dichloromethane using separatory funnel techniques. The combined extract was dried over anhydrous sodium sulfate, concentrated, processed through alumina cleanup column, concentrated, and further purified by GPC/HPLC. The post-HPLC extract was concentrated, fortified with Recovery Internal Standard (RIS) and split for analysis. Extracts were analyzed using gas chromatography/electron capture detection (GC/ECD), following general NS&T methods. Sample data were quantified by the method of internal standards, using the RIS compounds.

HOLDING TIMES: Samples were prepared for analysis in one analytical batch.

Samples were extracted with in the 7-day holding time for waters. Extracts were analyzed within the 40-day holding time for extracts

Batch	Extraction Date	Analysis Date
03-0203	3/4/2003	3/17/2003 – 3/22/2003

BLANKS: A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

03-0203 – No analytes identified at greater than 3X the MDL.

Comments – None.

LABORATORY CONTROL SAMPLE: A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target PCB Congeners were calculated to measure data quality in terms of accuracy.

03-0203 – All target analytes were recovered within the laboratory control limits specified by the client.

Comments – None.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

A matrix spike (MS)/matrix spike duplicate (MSD) pair was prepared with each analytical batch. The percent recoveries of target PCB Congeners were calculated to measure data quality in terms of accuracy; the relative percent difference between the pair was calculated to measure data quality in terms of precision.

03-0203 – All target analytes were recovered within the laboratory control limits specified by the client. The relative percent differences between the MS and MSD recoveries were within the laboratory control limits for all target PCB Congeners.

Comments – None.

SURROGATES:

Two surrogate compounds were added prior to extraction, including PCB34 and PCB112. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

03-0203 – All surrogate percent recoveries were within the laboratory control limits specified by the client.

Comments – None.

Samples:

The condition of the confirmation column was in question after the analysis. It was decided to report all "hits" from the primary column regardless if confirmed or not confirmed. The analytes are appropriately flagged if reported, but not confirmed.

PCBs QA/QC (CONT.)

CLIENT SAMPLE ID:	LABORATORY CONTROL SAMPLE		MATRIX SPIKE-NAV-OF9-SDB2-FF		MATRIX SPIKE DUPLICATE-NAV-OF9-SDB2-FF			PROCEDURAL BLANK	
Battelle Sample ID:	BB593LCS		U7083MS		U7083MSD			BB592PB	
Battelle Batch ID:	03-0203		03-0203		03-0203			03-0203	
Data File:	sc0382,38,1		sc0382,40,1		sc0382,41,1			sc0382,37,1	
Extraction Date:	3/04/03		3/04/03		3/04/03			3/04/03	
Aquired Date:	3/17/03		3/18/03		3/18/03			03/17/03	
Matrix:	Water		Water		Water			Water	
Sample Volume (L):	2.000		1.175		1.175			2.000	
Dilution Factor:	1.667		1.667		1.667			1.667	
Pre Injection Volume (µL):	300		300		300			300	
Minimum Reporting Limit (ng/L):	0.250		0.426		0.426			0.250	
Units:	ng	% Recovery	ng/L	% Recovery	ng/L	% Recovery	% RPD	ng/L	
Cl2 08	20.509	68	17.345	68	20.449	80	16	2.401	U
Cl3 18	21.498	72	19.854	66	20.959	70	6	0.208	U
Cl3 28	35.064	117	21.372	84	25.258	99	17	0.260	U
Cl4 44	25.535	85	21.262	83	23.531	92	10	0.218	U
Cl4 49	25.348	84	24.907	97	25.302	99	2	0.223	U
Cl4 52	24.280	81	20.705	81	21.345	84	3	0.215	U
Cl4 66	27.632	92	22.603	89	25.267	99	11	0.224	U
Cl4 77	24.023	80	20.028	73	22.256	82	11	0.318	U
Cl5 87	24.470	82	20.388	77	21.738	82	7	0.169	U
Cl5 101	25.400	85	21.352	76	23.998	86	13	0.172	U
Cl5 105	26.157	87	20.806	80	21.916	84	5	0.086	U
Cl5 114	NA	NA	NS	NA	NS	NA	NA	0.148	U
Cl5 118	23.286	78	19.969	75	21.834	82	9	0.130	U
Cl5 123	NA	NA	NS	NA	NS	NA	NA	0.148	U
Cl5 126	28.227	94	19.566	77	20.869	82	6	0.184	U
Cl6 128	26.487	88	23.105	85	21.485	79	8	0.210	U
Cl6 138	25.310	84	22.841	80	24.760	88	9	0.199	U
Cl6 153	22.656	76	22.155	79	23.904	86	8	0.160	U
Cl6 156	NA	NA	NS	NA	NS	NA	NA	0.179	U
Cl6 157	NA	NA	NS	NA	NS	NA	NA	0.179	U
Cl6 167	NA	NA	NS	NA	NS	NA	NA	0.179	U
Cl6 169	28.949	96	23.429	91	25.035	98	7	0.143	U
Cl7 170	25.778	86	22.468	85	24.052	91	7	0.152	U
Cl7 180	25.907	86	23.798	85	26.011	94	10	0.144	U
Cl7 183	25.158	84	21.384	84	22.322	87	4	0.140	U
Cl7 184	23.828	79	19.885	78	20.606	80	4	0.138	U
Cl7 187	23.085	77	19.872	75	20.867	79	5	0.129	U
Cl7 189	NA	NA	NS	NA	NS	NA	NA	0.141	U
Cl8 195	25.317	84	20.354	80	21.844	86	7	0.163	U
Cl9 206	23.978	80	20.081	79	21.885	86	9	0.183	U
Cl10 209	23.396	78	18.226	66	19.594	71	8	0.190	U
Total PCB	631.280	NA	527.755	NA	567.085	NA	NA	0.000	
Surrogate Recoveries:									
Cl3(34)	84		90		99			78	
Cl5(112)	78		74		77			78	

SDB4- 10/17/2004

METALS

SAMPLE ID	DISSOLVED Cu (µg/L)	TOTAL Cu (µg/L)	DISSOLVED Zn (µg/L)	TOTAL Zn (µg/L)
NAV-BAY SDB4 PRE	3.0	3.5	9.5	12
NAV-OF11-SDB4-FF	89	244	2453	3631
NAV-BAY14-SDB4-DUR	14	21	182	238

TSS

SAMPLE LABEL	TSS (mg/L)
NAV-OF14-SDB4-FF	838.75
NAV-BAY14-SDB4-DUR	20.66

SDB45- 10/26/2004

METALS

MSL Code	Rep	Sponsor I.D.	Al (µg/L) ICP-OES		Fe (µg/L) ICP-OES		Cr (µg/L) ICP-MS		Mn (µg/L) ICP-OES		Ni (µg/L) ICP-MS		Cu (µg/L) ICP-MS	
SAMPLE RESULTS														
2173*27		NAV-OF14-SD45-FF	1322		2138		6.93		66.2		7.19		45.3	
2173*28		NAV-OF14-SD45-FF (F)	14.7		26.4		2.22		29.2		3.67		18.9	
2173*29		NAV-OF14-SD45-COMP	2618		4481		12.9		71.5		4.81		38.0	
2173*30		NAV-OF14-SD45-COMP (F)	17.7		25.0		9.99		13.2		1.66		9.89	
2173*31		NAV-OF14-SD45-Blank (F)	3.36	U	2.51	U	0.724		0.025	U	0.009	U	0.008	U

MSL Code	Rep	Sponsor I.D.	Zn (µg/L) ICP-MS		As (µg/L) ICP-MS		Se (µg/L) ICP-MS		Ag (µg/L) ICP-MS		Cd (µg/L) ICP-MS		Sn (µg/L) ICP-MS		Pb (µg/L) ICP-MS		Hg (µg/L) CVAF	
SAMPLE RESULTS																		
2173*27		NAV-OF14-SD45-FF	362		3.20		1.30		0.0741		1.18		0.663		21.7		0.0629	
2173*28		NAV-OF14-SD45-FF (F)	175		2.04		0.848		0.00601		0.492		0.50	U	0.493		0.00597	
2173*29		NAV-OF14-SD45-COMP	220		2.39		0.530		0.0632		0.871		0.536		21.6		0.0694	
2173*30		NAV-OF14-SD45-COMP (F)	68.4		1.72		0.356		0.00378		0.244		0.50	U	0.441		0.00330	
2173*31		NAV-OF14-SD45-Blank (F)	0.0713		0.015	U	0.101	U	0.002	U	0.002	U	0.50	U	0.00266		0.000510	

SAMPLE ID	DISSOLVED COPPER (µg/L)	TOTAL COPPER (µg/L)	DISSOLVED ZINC (µg/L)	TOTAL ZINC (µg/L)
NAV-BAY-SD45-PRE	3.94	6.97	7.79	8.42
NAV-BAY14-SD45-DUR 1	4.32	7.05	10.21	12.79
NAV-BAY14-SD45-DUR 2	4.32	6.19	9.15	9.26
NAV-BAY14-SD45-DUR 3	4.55	6.82	9.06	9.51
NAV-BAY14-SD45-DUR 4	3.32	5.89	7.70	8.60
NAV-BAY14-SD45-AFT 1	3.41	6.05	8.07	8.98
NAV-BAY14-SD45-AFT 2	3.66	5.97	7.89	8.98
NAV-BAY14-SD45-AFT 3	3.98	6.26	10.08	11.22