

**Hylebos Fish Injury Study - Round II, Part 3
Individual Data and Quality Assurance Results
CASE NARRATIVE**

Juvenile Salmon Time Response Study

Laboratory Studies

Time-Response (Biomarker) Study:

General Comments

The time-response experiment started on July 9, 1997. Juvenile chinook from Soos Creeks Hatchery brought to the Mukilteo facility were sorted by size (85 ± 2 mm) a day prior to the experiment. Groups of three hundred fish each were injected with one of the following solutions, acetone/Emulphor, HWSE-M, PAHs, PCBs and HCBd. Only 279 fish were injected with NQSE and 182 fish were injected with HWSE-P because of insufficient NQSE and HWSE-P. Fish were sedated with (5 mg/L) metomidate in 5-gallon buckets (~ 20 fish at a time), lengths and weights were recorded, then test solution was administered at 1.5 $\mu\text{L/g}$ body wt. A total of 1961 fish were injected. After injection, fish were transferred to designated 750 gal. tanks equipped with flowing filtered seawater (Fig. A). Injections were completed in one day. Experimental fish were fed twice daily to satiation, except on Sunday.

Sampling Protocols

The first sampling to collect tissues and fluids for analyses of biomarker responses was conducted at 6 d, and the second at 20 d post injection. At each of these two time points, three composites (20 fish/comp.) of livers and bile were collected for CYP1A, DNA adducts (livers) and FACs (bile). Three composites (5 fish/comp.) of livers and whole gutted bodies were collected separately for CH analysis. This sampling protocol was not applied to the HWSE-P group due to the limited number of fish injected with this extract. For this group, three composites (10 fish/comp.) of livers and bile were collected for CYP1A, DNA adducts (livers) and FACs (bile). Three composites (5 fish/comp.) of livers and whole gutted bodies were collected separately for CH analysis.

Mid-way through the experiment, on a routine fish check, we discovered that some fish in several tanks disappeared and the loss was not a result of mortality. This fish loss was probably due to fish escaping either through the water standpipe or the cover gaps. When it became apparent that insufficient numbers of fish from several treatments would be available for the 60 d sampling time-point, we decided to change the sampling schedule. For example, on August 8, 1997 (33 d post injection), only 39 fish were sampled from each of the following treatments HWSE-M and NQSE. Three composites (10 fish/comp) of livers and bile each were collected for CYP1A, DNA adducts (livers) and FACs (bile). An additional three composites (3 fish/comp) of livers and whole gutted bodies were pooled separately for CH analysis. On August 13, 1997 (35 d post injection), A/E-injected group was sampled. Three composites (20 fish/comp.) of livers and bile each were collected for CYP1A, DNA adducts (livers) and FACs (bile). Livers and whole gutted bodies from 5 fish were pooled separately for CH analysis. On September 3, 1997 (56 d post injection), HWSE-P-injected group was sampled. Three composites (6 fish/comp.) of livers and bile each were collected for CYP1A, DNA adducts (livers) and FACs (bile). An additional three composites (3 fish/comp) of livers and whole gutted bodies were pooled separately for CH analysis. Fish injected with HCBD were also sampled on this day, five composites (10 fish/comp.) of livers and bile each were collected for CYP1A, DNA adducts (livers) and FACs (bile). An additional three composites (5 fish/comp) of livers and whole gutted bodies were pooled separately for CH analysis.

On September 9, 1997 (60 d post injection), we sampled the two remaining treatment groups (PAHs and PCBs). Three composites (10 fish/comp.) of livers and bile each were collected for CYP1A, DNA adducts (livers) and FACs (bile) from each treatment. An additional three composites (5 fish/comp) of livers and whole gutted bodies were pooled separately for CH analysis.

When the growth study was terminated at 60 d post injection (Aug. 25, 1997), we also collected samples from all seven treatments for biomarker analyses since these fish (in the growth study) were exposed to the same test solutions. For this report, results from the 60 d samples of

the growth study were used to replace the 60 d samples of the time-response (biomarker) study because only two treatment groups (PAHs and PCBs) had sufficient fish for sampling at this time-point.

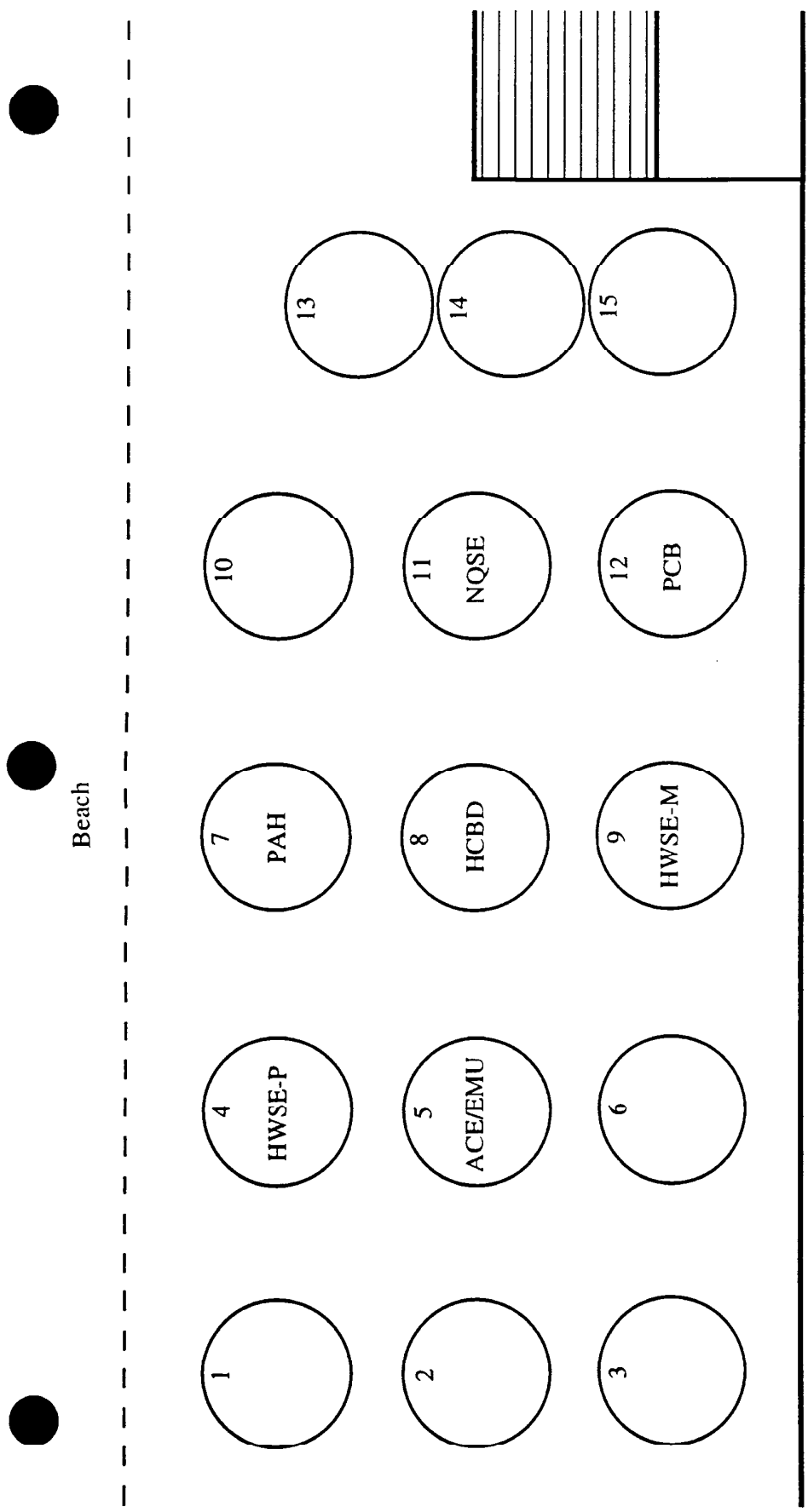


Fig. A Tank layout for Time-response Experiment at Mukilteo Field Facility, Mukilteo, WA.

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to acetone/Emulphor.

Treatment: Acetone/Emulphor
Date: 7/9/97

Tank: 5

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	87	6.6	39	83	5.3	77	80	4.7	115	86	6.0
2	88	6.0	40	83	5.2	78	85	6.4	116	80	4.3
3	91	7.7	41	92	7.9	79	81	5.4	117	90	7.0
4	91	7.4	42	86	6.0	80	86	7.1	118	82	5.2
5	88	6.2	43	90	7.7	81	83	6.0	119	95	8.2
6	92	8.2	44	92	7.3	82	88	6.8	120	85	6.1
7	86	7.4	45	85	5.6	83	82	5.1	121	80	5.0
8	89	6.7	46	89	7.6	84	88	7.2	122	80	6.6
9	86	7.5	47	83	5.6	85	93	7.7	123	87	5.6
10	89	8.3	48	89	6.6	86	89	6.8	124	87	6.5
11	88	6.1	49	88	7.0	87	84	5.7	125	85	6.2
12	85	5.7	50	88	6.3	88	90	7.5	126	89	6.8
13	85	7.4	51	80	4.8	89	90	7.4	127	93	7.7
14	80	5.7	52	89	7.5	90	80	5.1	128	87	6.5
15	82	5.2	53	88	5.2	91	89	6.5	129	83	5.5
16	81	6.2	54	86	6.6	92	89	6.7	130	85	6.6
17	80	5.0	55	84	5.4	93	82	5.4	131	81	5.5
18	91	6.9	56	87	6.5	94	88	6.4	132	90	7.6
19	94	7.8	57	85	6.1	95	87	6.8	133	92	8.6
20	84	5.2	58	83	5.5	96	80	4.8	134	82	5.8
21	83	4.9	59	88	6.0	97	87	6.0	135	82	6.1
22	82	5.3	60	80	5.0	98	80	4.6	136	86	6.6
23	87	6.5	61	81	5.4	99	84	5.0	137	87	7.0
24	86	5.9	62	86	5.8	100	88	5.5	138	95	8.2
25	88	7.0	63	86	6.0	101	84	5.3	139	82	5.5
26	92	7.5	64	86	6.3	102	84	5.3	140	95	8.2
27	84	4.9	65	89	6.5	103	87	5.8	141	88	6.7
28	81	4.9	66	88	6.5	104	81	5.0	142	83	6.0
29	80	4.5	67	88	6.2	105	81	5.7	143	98	9.2
30	82	5.0	68	81	5.1	106	83	5.5	144	82	5.4
31	85	5.5	69	92	7.1	107	87	6.0	145	85	5.9
32	88	6.5	70	85	5.3	108	86	6.1	146	88	6.2
33	82	5.0	71	84	6.2	109	88	6.3	147	88	6.0
34	86	5.8	72	81	5.2	110	87	6.5	148	82	5.3
35	80	4.9	73	87	5.8	111	83	5.6	149	85	6.8
36	81	4.7	74	88	6.0	112	88	6.8	150	92	7.1
37	92	8.0	75	80	5.0	113	85	6.5			
38	87	5.7	76	83	5.3	114	96	8.9			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to acetone/Emulphor.

Treatment: Acetone/Emulphor
Date: 7/9/97

Tank: 5

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
151	85	5.6	189	80	4.8	227	90	6.9	265	83	5.4
152	89	7.0	190	92	7.4	228	88	6.4	266	80	4.8
153	89	6.9	191	88	6.5	229	85	6.4	267	90	7.1
154	86	6.4	192	88	6.2	230	89	6.6	268	89	6.9
155	86	5.7	193	88	5.7	231	87	6.3	269	85	5.9
156	81	5.3	194	94	8.7	232	83	5.9	270	82	5.2
157	86	6.2	195	89	6.1	233	81	5.2	271	83	5.5
158	91	7.2	196	81	5.5	234	85	6.0	272	81	5.3
159	93	9.0	197	81	5.2	235	85	5.6	273	82	5.0
160	83	5.4	198	86	6.3	236	80	4.0	274	91	8.0
161	83	5.3	199	84	4.9	237	94	8.0	275	87	6.0
162	83	6.0	200	89	6.3	238	87	6.3	276	83	6.0
163	84	5.2	201	84	6.0	239	81	4.8	277	87	6.9
164	83	5.6	202	89	7.5	240	84	5.2	278	89	6.4
165	84	5.9	203	87	6.2	241	84	6.2	279	85	6.4
166	93	7.8	204	90	7.3	242	80	5.0	280	82	5.4
167	84	5.6	205	89	6.5	243	89	6.4	281	90	7.6
168	94	6.6	206	80	5.3	244	89	6.9	282	80	4.9
169	84	5.6	207	91	7.5	245	89	7.0	283	84	5.4
170	87	5.9	208	85	6.5	246	85	6.0	284	90	6.5
171	89	6.3	209	80	5.0	247	81	4.8	285	88	7.0
172	85	6.1	210	87	6.3	248	80	5.0	286	87	6.0
173	85	5.8	211	82	5.2	249	83	5.6	287	81	4.5
174	87	6.2	212	85	6.4	250	92	7.6	288	82	5.5
175	95	9.0	213	89	6.3	251	93	7.4	289	84	5.7
176	95	9.3	214	80	5.0	252	85	5.0	290	89	6.5
177	81	5.0	215	80	4.9	253	89	6.6	291	83	4.6
178	88	7.0	216	89	5.5	254	82	5.2	292	87	6.2
179	88	6.0	217	88	7.3	255	84	5.4	293	86	6.1
180	85	5.5	218	83	6.0	256	90	7.1	294	88	6.5
181	82	5.7	219	82	5.1	257	81	5.6	295	81	4.9
182	89	7.1	220	86	6.6	258	91	7.5	296	82	5.1
183	93	5.0	221	84	5.9	259	85	6.0	297	85	5.9
184	85	5.7	222	83	6.0	260	80	5.1	298	85	6.1
185	80	5.3	223	84	5.5	261	85	6.0	299	82	5.6
186	90	8.1	224	84	6.5	262	81	4.9	300	90	7.3
187	88	5.9	225	86	6.0	263	84	6.2			
188	89	6.0	226	80	4.7	264	86	6.3			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to acetone/Emulphor in the Biomarker study, sampled at 6 d post exposure.

Treatment: Acetone/Emulphor Tank: 5
Date: 7/15/97

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	91	8.5	38	83	6.1	75	93	8.3
2	89	7.0	39	86	7.1			
3	80	5.1	40	80	4.3			
4	82	5.7	41	81	5.7			
5	82	5.0	42	85	7.3			
6	90	7.6	43	90	7.1			
7	90	7.6	44	89	6.8			
8	87	7.1	45	81	5.7			
9	89	7.1	46	89	6.8			
10	92	7.9	47	84	5.7			
11	80	5.4	48	90	7.4			
12	81	5.2	49	92	8.1			
13	88	7.1	50	85	6.1			
14	90	7.4	51	87	6.2			
15	80	5.0	52	85	6.4			
16	89	8.4	53	90	8.6			
17	86	6.4	54	85	6.1			
18	85	6.9	55	83	5.7			
19	80	5.7	56	89	6.7			
20	85	6.6	57	88	6.8			
21	85	6.2	58	80	5.8			
22	90	7.5	59	90	7.5			
23	89	6.9	60	81	5.9			
24	90	7.3	61	90	7.3			
25	85	6.1	62	86	6.5			
26	87	6.7	63	89	6.8			
27	85	6.7	64	86	6.7			
28	83	6.2	65	80	6.3			
29	85	6.4	66	81	6.2			
30	86	7.2	67	89	6.8			
31	90	7.3	68	82	5.8			
32	83	5.3	69	86	6.2			
33	97	9.6	70	87	7.2			
34	87	7.5	71	79	5.0			
35	80	5.4	72	85	6.4			
36	86	7.0	73	82	4.9			
37	87	6.3	74	93	8.3			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to acetone/Emulphor in the Biomarker study, sampled at 20 d post exposure.

Treatment: Acetone/Emulphor Tank: 5
Date: 7/29/97

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	92	7.9	38	88	7.0	75	92	7.7
2	94	8.9	39	93	9.0	76	84	6.2
3	98	10.0	40	100	11.3	77	87	6.8
4	94	8.7	41	96	9.2	78	95	9.9
5	ND	ND	42	83	5.6	79	85	6.3
6	92	8.6	43	92	8.5	80	103	12.0
7	92	8.9	44	97	9.2	81	96	9.5
8	92	8.2	45	100	9.4	82	92	8.2
9	90	7.5	46	87	6.6	83	93	8.8
10	87	7.6	47	94	8.7	84	96	9.6
11	92	7.4	48	95	8.9	85	97	9.7
12	94	8.5	49	90	7.4			
13	83	6.2	50	95	9.4			
14	95	9.7	51	95	9.1			
15	86	6.7	52	90	7.9			
16	94	9.1	53	101	11.3			
17	90	8.3	54	95	9.2			
18	92	8.2	55	92	7.5			
19	93	8.4	56	105	12.0			
20	87	7.3	57	87	6.3			
21	87	5.8	58	96	9.6			
22	90	7.5	59	88	7.4			
23	102	10.6	60	84	8.6			
24	91	7.6	61	91	8.6			
25	85	6.4	62	88	7.5			
26	93	8.3	63	89	7.7			
27	88	7.0	64	90	7.7			
28	86	6.8	65	103	11.4			
29	92	8.1	66	94	9.1			
30	90	7.0	67	90	7.4			
31	98	10.0	68	87	7.8			
32	94	9.3	69	90	7.0			
33	90	7.7	70	87	7.0			
34	90	7.8	71	95	9.5			
35	88	6.7	72	90	7.8			
36	90	7.9	73	97	9.4			
37	98	10.1	74	92	7.8			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to acetone/Emulphor in the Biomarker study, sampled at 35 d post exposure.

Treatment: Acetone/Emulphor Tank: 5
Date: 8/13/97

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	96	9.5	38	90	7.6	75	103	10.8
2	109	14.9	39	87	6.9	76	106	12.1
3	96	9.7	40	109	14.0	77	95	8.4
4	104	12.1	41	100	11.5	78	91	7.4
5	99	11.8	42	85	6.2	79	96	8.8
6	100	12.2	43	98	10.4	80	98	9.3
7	107	14.1	44	102	11.3	81	107	13.5
8	103	11.7	45	92	7.6	82	94	9.3
9	95	9.3	46	99	9.5	83	108	14.5
10	94	9.0	47	101	11.3	84	104	13.2
11	106	13.6	48	100	10.5	85	99	11.5
12	98	9.6	49	105	13.2	86	96	9.5
13	102	11.7	50	95	10.0	87	100	10.8
14	101	12.5	51	103	12.7	88	102	11.7
15	101	11.1	52	98	9.6			
16	100	10.0	53	105	12.3			
17	100	10.5	54	94	7.9			
18	106	11.9	55	103	10.7			
19	100	11.2	56	99	10.1			
20	88	6.6	57	96	9.7			
21	108	17.2	58	104	11.9			
22	97	9.8	59	93	8.4			
23	104	12.2	60	107	13.5			
24	105	12.9	61	98	9.5			
25	101	11.5	62	103	11.3			
26	104	12.1	63	95	8.5			
27	100	11.0	64	100	10.0			
28	103	11.5	65	101	11.6			
29	101	11.1	66	107	13.7			
30	109	14.8	67	105	12.2			
31	103	11.3	68	113	15.4			
32	100	10.2	69	99	10.0			
33	107	13.5	70	91	8.7			
34	111	14.7	71	98	9.3			
35	94	8.9	72	98	9.5			
36	97	9.5	73	101	10.7			
37	100	11.1	74	94	10.8			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to extract of reference sediment from the Nisqually River Estuary (NQSE).

Treatment: NQSE
Date: 7/9/97

Tank: 11

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	81	5.5	39	89	7.0	77	92	7.8	115	89	7.8
2	89	6.9	40	85	5.8	78	92	7.3	116	91	7.3
3	83	5.6	41	86	5.9	79	95	7.8	117	89	6.8
4	86	6.2	42	87	5.6	80	82	5.6	118	86	6.1
5	87	6.3	43	82	5.5	81	81	5.7	119	92	7.7
6	90	6.6	44	80	4.6	82	81	5.5	120	88	5.9
7	97	8.8	45	94	8.1	83	80	4.8	121	80	4.4
8	94	7.8	46	81	5.2	84	86	5.6	122	89	7.4
9	83	5.6	47	81	4.7	85	86	6.4	123	83	5.5
10	93	8.1	48	82	5.3	86	90	6.7	124	89	6.5
11	90	6.5	49	88	7.3	87	91	8.1	125	82	5.1
12	82	5.6	50	95	8.0	88	82	4.8	126	80	5.0
13	81	4.7	51	86	5.7	89	81	5.2	127	93	8.3
14	89	6.8	52	93	7.1	90	82	5.3	128	81	4.8
15	84	5.7	53	84	5.8	91	85	5.7	129	80	5.5
16	87	6.0	54	80	5.3	92	80	5.0	130	82	4.5
17	90	7.2	55	87	6.4	93	81	5.3	131	82	5.7
18	92	7.3	56	89	6.5	94	80	5.1	132	90	6.6
19	85	5.6	57	86	6.4	95	85	5.1	133	86	6.1
20	88	7.0	58	91	6.7	96	83	5.5	134	81	4.3
21	83	5.2	59	81	5.1	97	86	5.8	135	85	6.3
22	80	4.6	60	80	4.9	98	88	6.8	136	87	6.4
23	85	5.6	61	86	5.9	99	90	6.6	137	90	7.4
24	82	5.6	62	89	6.1	100	84	5.7	138	84	5.7
25	80	4.9	63	90	7.2	101	89	7.3	139	82	4.2
26	94	9.1	64	86	6.2	102	81	5.0	140	82	5.4
27	83	4.9	65	84	4.9	103	89	7.5	141	84	6.2
28	89	7.0	66	82	5.1	104	89	7.2	142	89	6.5
29	80	5.1	67	87	6.9	105	83	6.0	143	86	7.1
30	80	5.1	68	88	6.7	106	87	5.4	144	89	7.1
31	82	5.4	69	89	7.2	107	80	5.0	145	87	5.6
32	90	7.4	70	85	6.0	108	87	6.1	146	80	5.5
33	88	6.9	71	82	5.7	109	83	5.1	147	86	5.5
34	83	5.1	72	84	5.3	110	89	7.1	148	83	5.7
35	90	6.3	73	92	7.3	111	85	6.1	149	82	5.2
36	85	6.1	74	86	6.4	112	89	7.2	150	87	6.1
37	94	8.8	75	86	5.6	113	83	5.3			
38	96	9.1	76	85	5.9	114	82	5.5			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to extract of reference sediment from the Nisqually River Estuary (NQSE).

Treatment: NQSE
Date: 7/9/97

Tank: 11

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
151	80	4.9	189	81	5.3	227	91	7.5	265	83	6.1
152	90	7.8	190	86	6.0	228	88	6.4	266	90	7.0
153	96	9.3	191	85	5.5	229	82	5.0	267	87	6.6
154	82	5.3	192	80	4.9	230	86	6.0	268	90	7.1
155	93	7.6	193	85	5.6	231	82	5.4	269	81	5.6
156	80	5.1	194	82	5.7	232	94	8.4	270	85	5.9
157	88	6.0	195	86	5.9	233	85	5.8	271	83	5.8
158	82	4.8	196	90	6.2	234	86	6.3	272	83	5.8
159	84	6.0	197	87	6.0	235	86	6.0	273	84	5.8
160	85	6.1	198	83	5.2	236	92	7.2	274	80	4.6
161	85	5.8	199	83	5.4	237	89	6.6	275	91	7.3
162	87	6.6	200	83	4.9	238	87	6.1	276	89	6.6
163	90	7.1	201	87	6.6	239	81	5.1	277	90	6.7
164	80	5.2	202	82	5.1	240	93	8.6	278	82	5.1
165	84	5.3	203	93	7.7	241	80	4.9	279	80	5.0
166	84	5.8	204	84	5.6	242	85	6.2			
167	95	8.5	205	81	5.6	243	83	5.4			
168	89	6.3	206	83	5.4	244	81	4.7			
169	90	6.7	207	84	5.5	245	82	4.7			
170	83	5.0	208	82	5.4	246	85	6.3			
171	84	5.7	209	82	5.3	247	80	5.0			
172	83	6.2	210	82	5.0	248	83	5.6			
173	91	8.0	211	80	5.2	249	90	7.6			
174	84	6.0	212	81	5.1	250	82	5.5			
175	81	5.3	213	88	6.5	251	83	5.8			
176	80	5.1	214	82	5.7	252	85	6.2			
177	88	6.3	215	85	5.9	253	91	7.3			
178	82	5.2	216	89	6.4	254	92	7.0			
179	80	5.1	217	86	5.7	255	85	5.9			
180	93	7.9	218	91	7.2	256	87	6.4			
181	89	6.3	219	84	6.0	257	91	7.0			
182	83	5.3	220	85	6.8	258	87	6.5			
183	85	6.4	221	89	7.0	259	90	7.0			
184	84	6.0	222	83	5.3	260	92	7.3			
185	82	5.6	223	80	5.4	261	81	5.6			
186	82	5.7	224	89	7.3	262	93	7.8			
187	83	5.7	225	80	5.2	263	94	8.7			
188	99	9.2	226	85	6.0	264	96	8.8			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon exposed to NQSE and sampled at 6 d post exposure.

Treatment: NQSE
Date: 7/15/97

Tank: 11

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	84	5.6	38	80	5.6	75	91	8.6
2	80	4.9	39	82	5.2			
3	93	8.2	40	84	6.3			
4	84	6.2	41	90	6.6			
5	86	7.4	42	80	5.5			
6	82	4.5	43	87	6.4			
7	87	6.9	44	82	5.7			
8	80	5.2	45	86	7.2			
9	86	6.3	46	94	8.5			
10	85	6.4	47	81	5.5			
11	93	8.4	48	83	6.1			
12	85	5.4	49	85	6.0			
13	90	7.3	50	84	6.2			
14	80	5.4	51	83	5.4			
15	86	6.7	52	80	5.0			
16	94	9.3	53	84	6.1			
17	82	5.4	54	82	5.0			
18	93	8.5	55	83	6.1			
19	89	7.1	56	93	8.3			
20	91	7.5	57	83	5.4			
21	80	5.2	58	83	5.3			
22	80	5.1	59	83	6.0			
23	93	7.9	60	83	5.9			
24	82	5.4	61	83	5.4			
25	86	6.6	62	81	5.6			
26	91	8.2	63	93	8.1			
27	85	5.7	64	82	5.0			
28	83	5.7	65	88	7.8			
29	87	6.9	66	83	5.5			
30	81	6.2	67	89	6.7			
31	87	7.0	68	94	7.8			
32	92	7.8	69	90	7.1			
33	83	4.7	70	90	7.2			
34	90	7.5	71	84	6.2			
35	88	6.9	72	82	5.8			
36	81	5.8	73	94	8.5			
37	82	5.0	74	86	6.3			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon exposed to NQSE in the Biomarker study and sampled at 20 d post exposure.

Treatment: NQSE
Date: 7/29/97

Tank: 11

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	94	8.1	38	88	6.8	75	91	8.2
2	93	8.2	39	89	7.5	76	93	8.3
3	94	9.3	40	89	7.6	77	94	8.6
4	86	7.0	41	84	6.1	78	89	7.1
5	89	8.5	42	86	6.7	79	96	9.1
6	92	8.1	43	90	7.7	80	100	9.4
7	88	8.0	44	92	8.3	81	85	6.5
8	95	9.2	45	92	7.9	82	87	7.1
9	93	8.8	46	99	10.9	83	97	9.9
10	88	7.0	47	94	9.4	84	89	7.8
11	103	12.4	48	94	9.4	85	85	6.6
12	95	8.7	49	88	7.3			
13	89	7.5	50	85	7.0			
14	89	7.8	51	88	7.6			
15	94	8.8	52	96	9.6			
16	96	9.6	53	94	8.7			
17	93	8.2	54	95	8.6			
18	104	11.6	55	92	8.5			
19	91	7.2	56	92	8.5			
20	95	9.6	57	93	8.0			
21	97	7.0	58	95	8.9			
22	91	7.7	59	99	10.5			
23	93	8.9	60	88	7.0			
24	84	6.1	61	87	7.5			
25	88	7.6	62	91	7.7			
26	94	8.3	63	95	8.5			
27	98	9.9	64	93	8.7			
28	89	8.9	65	88	7.5			
29	96	10.1	66	85	6.7			
30	101	10.4	67	93	8.5			
31	100	11.1	68	89	7.7			
32	90	8.6	69	106	13.9			
33	94	8.8	70	87	6.5			
34	102	12.0	71	90	7.5			
35	89	7.0	72	98	9.3			
36	99	9.7	73	90	7.9			
37	90	7.6	74	95	9.1			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon exposed to NQSE in the Biomarker study and sampled at 33 d post exposure.

NQSE
Date: 8/11/97

Tank: 11

Fish#	Length	Weight	Fish#	Length	Weight
1	95	9.4	38	83	5.7
2	110	17.0	39	96	9.1
3	100	12.1			
4	109	18.6			
5	109	15.2			
6	100	12.3			
7	100	11.7			
8	104	12.7			
9	101	11.8			
10	102	13.6			
11	105	14.3			
12	104	13.3			
13	109	17.3			
14	96	9.6			
15	110	16.4			
16	106	14.7			
17	107	14.1			
18	94	10.0			
19	97	9.3			
20	92	9.3			
21	96	9.8			
22	96	9.7			
23	93	8.3			
24	108	15.0			
25	106	13.2			
26	99	11.8			
27	105	12.7			
28	94	9.0			
29	86	5.9			
30	111	15.4			
31	111	14.6			
32	105	14.4			
33	93	9.2			
34	90	7.3			
35	97	10.4			
36	83	6.7			
37	94	8.7			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to HWSE-M.

Treatment: HWSE-M
Date: 7/9/97

Tank: 9

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	91	6.9	39	86	6.0	77	89	6.8	115	86	6.4
2	93	6.2	40	83	5.4	78	85	6.2	116	88	6.4
3	88	7.2	41	88	5.5	79	84	5.4	117	90	6.5
4	85	5.8	42	85	6.2	80	86	5.5	118	81	4.7
5	82	6.9	43	88	6.6	81	80	4.2	119	89	6.8
6	84	5.5	44	80	4.4	82	85	6.2	120	81	4.8
7	83	5.4	45	84	5.8	83	81	5.0	121	80	4.7
8	92	6.9	46	87	6.6	84	86	6.5	122	84	5.9
9	91	7.9	47	81	4.7	85	87	6.5	123	80	4.6
10	82	5.2	48	81	5.9	86	84	6.1	124	85	6.4
11	80	4.9	49	85	5.7	87	87	6.0	125	82	5.2
12	87	6.0	50	89	7.0	88	83	6.1	126	86	5.9
13	87	6.4	51	91	6.6	89	92	7.3	127	82	4.5
14	89	6.6	52	88	7.0	90	89	7.5	128	84	5.8
15	82	5.4	53	89	6.8	91	80	4.5	129	90	6.8
16	81	5.5	54	87	5.9	92	87	6.4	130	94	7.3
17	86	7.1	55	82	5.1	93	87	6.1	131	82	5.6
18	89	6.0	56	81	5.1	94	88	6.0	132	91	7.3
19	89	6.8	57	90	7.0	95	88	6.2	133	95	8.6
20	86	6.6	58	86	6.1	96	84	5.6	134	83	5.3
21	84	5.4	59	85	6.1	97	82	5.4	135	84	5.3
22	92	7.6	60	87	6.3	98	82	5.2	136	83	5.6
23	95	7.4	61	89	7.4	99	80	4.9	137	84	4.9
24	92	7.7	62	82	5.6	100	91	7.5	138	86	6.1
25	80	4.9	63	88	6.3	101	90	7.0	139	85	5.0
26	85	5.6	64	91	6.5	102	86	6.4	140	82	5.0
27	89	6.7	65	85	6.1	103	89	6.7	141	81	5.1
28	89	6.0	66	90	6.9	104	87	5.8	142	91	7.0
29	87	7.1	67	82	5.6	105	84	6.0	143	80	4.7
30	90	7.0	68	84	4.9	106	81	5.0	144	87	6.2
31	85	5.5	69	87	5.9	107	85	6.1	145	94	8.2
32	83	5.3	70	89	6.2	108	84	5.6	146	85	5.2
33	85	6.2	71	87	5.8	109	87	6.0	147	80	5.7
34	87	5.9	72	82	5.4	110	91	7.5	148	89	7.2
35	84	5.7	73	80	5.3	111	86	5.8	149	81	4.9
36	85	5.7	74	80	5.4	112	87	6.8	150	87	6.1
37	81	5.4	75	82	5.5	113	85	4.9			
38	80	4.7	76	88	7.4	114	89	6.3			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to HWSE-M.

Treatment: HWSE-M
Date: 7/9/97

Tank: 9

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
151	85	5.9	189	88	5.1	227	87	6.3	265	82	5.0
152	88	5.8	190	89	6.1	228	85	5.9	266	87	6.3
153	91	7.3	191	86	6.1	229	97	8.1	267	90	6.5
154	94	7.7	192	82	5.3	230	87	7.7	268	90	8.0
155	83	5.7	193	82	5.6	231	83	5.2	269	87	6.3
156	87	6.6	194	86	5.4	232	82	4.6	270	85	6.0
157	83	5.2	195	80	4.4	233	82	5.6	271	80	4.6
158	82	5.8	196	92	7.1	234	86	6.1	272	88	5.8
159	98	9.7	197	93	7.6	235	89	6.8	273	81	5.0
160	88	6.7	198	81	5.0	236	88	6.4	274	84	5.1
161	86	5.7	199	85	6.4	237	92	7.0	275	86	6.2
162	89	7.0	200	85	5.8	238	86	5.8	276	86	6.3
163	90	7.0	201	98	9.1	239	90	6.8	277	89	6.5
164	86	6.1	202	90	6.7	240	89	6.7	278	84	5.1
165	89	6.8	203	94	8.2	241	82	5.4	279	86	6.2
166	87	6.1	204	92	7.3	242	87	6.1	280	86	6.2
167	85	5.0	205	94	8.0	243	89	6.7	281	94	8.0
168	89	6.6	206	97	8.9	244	80	5.4	282	88	5.3
169	82	5.5	207	93	7.8	245	89	7.0	283	92	7.8
170	84	5.6	208	83	5.2	246	80	5.3	284	87	6.2
171	80	4.6	209	86	6.0	247	87	6.7	285	83	5.6
172	85	5.7	210	90	7.5	248	84	5.4	286	84	5.5
173	83	5.0	211	88	6.3	249	85	6.6	287	91	7.2
174	82	5.1	212	85	5.7	250	86	6.4	288	90	6.9
175	83	5.0	213	81	5.7	251	89	6.7	289	97	9.0
176	89	6.9	214	86	6.0	252	84	6.0	290	91	7.1
177	83	5.4	215	87	6.4	253	83	5.7	291	84	4.8
178	90	6.8	216	91	7.8	254	88	6.2	292	90	7.4
179	88	6.0	217	82	4.7	255	82	5.2	293	83	5.7
180	84	4.3	218	93	7.7	256	80	5.6	294	97	9.0
181	85	6.2	219	92	7.3	257	89	6.7	295	80	5.1
182	85	6.2	220	80	4.7	258	86	6.6	296	84	5.3
183	87	5.8	221	92	7.8	259	97	9.7	297	93	7.5
184	88	6.5	222	87	6.7	260	93	7.5	298	85	6.2
185	87	5.9	223	85	6.0	261	83	5.3	299	92	7.1
186	85	5.2	224	89	6.6	262	89	6.6	300	89	6.1
187	94	7.7	225	89	7.5	263	86	5.2			
188	82	5.0	226	80	4.8	264	85	6.0			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HWSE-M in the Biomarker study, sampled at 6 d post exposure.

Treatment: HWSE-M
Date: 7/15/97

Tank: 9

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	80	5.1	38	90	7.4	75	90	7.9
2	84	5.0	39	88	7.1			
3	87	7.1	40	94	8.6			
4	80	5.5	41	87	7.3			
5	88	7.4	42	80	4.9			
6	86	6.9	43	88	7.0			
7	84	6.0	44	90	7.9			
8	85	6.0	45	86	6.2			
9	80	5.7	46	97	8.0			
10	94	8.8	47	92	8.2			
11	90	7.2	48	94	8.5			
12	90	7.9	49	90	8.2			
13	87	6.9	50	86	5.9			
14	80	5.5	51	95	8.7			
15	80	6.5	52	82	5.9			
16	80	5.8	53	82	6.2			
17	80	5.5	54	90	7.1			
18	82	6.4	55	94	8.4			
19	80	5.6	56	85	6.0			
20	88	7.7	57	81	5.2			
21	92	7.9	58	84	6.3			
22	85	5.7	59	85	6.4			
23	90	7.8	60	85	6.5			
24	84	6.5	61	90	7.7			
25	92	8.1	62	81	4.9			
26	85	5.7	63	87	6.8			
27	91	7.7	64	86	6.8			
28	84	5.4	65	96	9.9			
29	88	6.6	66	82	5.9			
30	85	6.2	67	86	6.9			
31	89	6.4	68	81	5.1			
32	80	5.4	69	81	5.3			
33	85	6.5	70	84	5.6			
34	80	5.6	71	80	4.4			
35	80	5.4	72	85	5.9			
36	87	6.0	73	88	7.0			
37	80	5.6	74	89	6.8			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HWSE-M in the Biomarker study, sampled at 20 d post exposure.

Treatment: HWSE-M

Tank. 9

Date: 7/29/97

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	91	7.6	38	89	7.3	75	88	7.2
2	88	7.1	39	82	5.2	76	90	7.6
3	84	5.8	40	93	8.4	77	79	4.0
4	85	6.3	41	89	7.9	78	92	8.7
5	92	8.7	42	92	8.8	79	105	12.5
6	90	7.3	43	88	6.9	80	84	5.5
7	96	10.2	44	86	6.6	81	94	8.5
8	87	6.9	45	91	8.6	82	87	6.7
9	97	9.7	46	98	9.9	83	88	6.9
10	83	5.9	47	85	6.7	84	80	4.7
11	95	8.5	48	93	8.3	85	87	6.7
12	90	7.9	49	86	6.6			
13	94	9.0	50	99	10.2			
14	98	10.9	51	94	9.2			
15	93	8.5	52	94	9.1			
16	85	6.7	53	98	11.1			
17	94	9.1	54	82	5.9			
18	91	8.3	55	96	9.9			
19	102	10.4	56	86	6.8			
20	92	8.7	57	96	9.5			
21	87	7.3	58	84	5.5			
22	86	7.3	59	91	7.8			
23	92	8.4	60	91	8.5			
24	87	6.9	61	96	10.1			
25	86	6.8	62	92	8.5			
26	85	6.2	63	96	10.2			
27	84	6.4	64	95	9.0			
28	85	7.0	65	81	5.6			
29	91	7.6	66	89	7.4			
30	93	9.8	67	93	8.4			
31	93	8.8	68	87	7.3			
32	95	8.8	69	94	8.2			
33	86	6.9	70	88	7.8			
34	96	9.8	71	89	7.5			
35	97	9.2	72	92	9.3			
36	89	8.4	73	82	5.7			
37	95	9.8	74	82	5.2			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HWSE-M in the Biomarker study, sampled at 33 d post exposure.

Treatment: HWSE-M
Date: 8/11/97

Tank: 9

Fish#	Length	Weight	Fish#	Length	Weight
1	98	10.5	38	98	11.3
2	115	19.0	39	85	6.7
3	94	10.1			
4	94	9.3			
5	103	12.5			
6	95	9.7			
7	108	14.0			
8	93	9.0			
9	98	11.4			
10	99	10.1			
11	99	10.4			
12	95	10.4			
13	101	10.8			
14	109	16.5			
15	93	8.9			
16	118	19.9			
17	105	13.0			
18	102	12.5			
19	98	11.4			
20	105	12.5			
21	100	11.3			
22	90	8.7			
23	94	8.2			
24	91	7.5			
25	88	7.0			
26	107	13.9			
27	94	8.8			
28	99	9.9			
29	97	10.6			
30	97	9.2			
31	96	8.8			
32	90	10.3			
33	98	10.1			
34	102	13.3			
35	100	9.8			
36	95	9.5			
37	96	10.1			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to HWSE-P.

Treatment: HWSE-P
Date: 7/9/97

Tank: 4

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	88	6.7	38	81	4.9	75	83	6.0	112	94	8.5	149	89	6.5
2	98	8.8	39	92	7.5	76	85	6.4	113	85	5.5	150	89	7.1
3	87	7.1	40	86	5.8	77	80	4.3	114	88	6.8	151	85	5.9
4	83	5.7	41	89	6.9	78	84	6.1	115	84	5.8	152	93	8.4
5	87	6.9	42	87	5.9	79	84	5.9	116	81	5.5	153	89	7.1
6	83	4.5	43	95	8.2	80	82	4.8	117	80	4.9	154	82	5.9
7	88	6.0	44	94	7.4	81	81	5.0	118	83	5.6	155	84	6.0
8	85	5.9	45	82	5.0	82	89	6.6	119	83	5.4	156	80	5.6
9	83	5.8	46	87	6.4	83	90	7.1	120	82	5.5	157	86	6.7
10	80	4.8	47	87	6.5	84	90	6.7	121	83	5.3	158	82	5.2
11	85	5.4	48	81	5.3	85	85	6.2	122	81	4.9	159	87	6.2
12	83	5.2	49	87	6.0	86	85	5.7	123	85	5.3	160	88	6.7
13	86	5.5	50	80	4.5	87	100	10.4	124	93	8.7	161	83	5.7
14	88	6.0	51	86	5.7	88	85	5.9	125	89	6.6	162	87	6.7
15	80	4.9	52	86	5.5	89	85	5.6	126	86	5.6	163	82	5.1
16	83	5.2	53	96	7.7	90	87	6.6	127	83	5.2	164	80	5.4
17	86	5.9	54	82	5.1	91	80	5.0	128	84	5.6	165	87	6.4
18	92	7.3	55	81	5.0	92	82	5.1	129	85	6.6	166	85	5.9
19	85	6.0	56	82	4.9	93	87	7.1	130	84	4.7	167	81	4.8
20	83	5.9	57	81	4.8	94	84	5.5	131	85	6.1	168	89	7.7
21	85	5.7	58	84	6.0	95	81	4.8	132	85	6.2	169	82	5.7
22	91	6.5	59	89	6.0	96	86	6.4	133	84	5.0	170	80	5.1
23	90	7.0	60	80	5.0	97	81	4.9	134	87	6.1	171	82	5.6
24	87	6.5	61	81	5.0	98	88	7.1	135	90	7.7	172	81	4.7
25	88	6.6	62	80	5.4	99	82	5.2	136	83	5.3	173	84	5.9
26	82	4.8	63	83	6.3	100	84	4.9	137	83	5.8	174	82	5.0
27	88	6.2	64	86	5.8	101	85	6.5	138	88	6.3	175	86	6.2
28	81	5.2	65	94	8.1	102	85	5.4	139	90	7.2	176	81	5.2
29	82	5.0	66	85	5.3	103	85	6.3	140	84	5.9	177	80	4.5
30	89	6.6	67	82	5.5	104	81	5.2	141	84	6.0	178	82	5.5
31	84	5.7	68	88	6.7	105	84	5.3	142	87	6.0	179	84	5.0
32	97	9.3	69	89	7.1	106	80	4.8	143	86	5.9	180	91	6.3
33	82	5.2	70	88	6.4	107	81	4.8	144	85	6.8	181	84	4.3
34	95	8.2	71	98	9.5	108	86	5.9	145	94	8.4	182	82	5.0
35	83	5.9	72	91	7.0	109	88	6.5	146	83	5.8			
36	95	8.0	73	89	7.0	110	85	5.9	147	82	5.2			
37	87	6.1	74	82	5.3	111	83	5.0	148	80	4.7			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HWSE-P in the Biomarker study, sampled at 6 d post exposure.

Treatment: HWSE-P
Date: 7/15/97

Tank:

Fish#	Length	Weight	Fish#	Length	Weight
1	83	5.9	38	84	6.2
2	85	5.7	39	93	8.6
3	85	6.7	40	88	7.3
4	85	6.2	41	85	7.4
5	84	5.7	42	82	6.0
6	85	7.3	43	84	6.1
7	93	9.0	44	82	5.8
8	99	10.9	45	92	7.9
9	82	7.1			
10	82	5.7			
11	84	6.4			
12	88	7.5			
13	102	12.4			
14	81	5.9			
15	85	6.4			
16	90	8.8			
17	81	5.7			
18	97	10.0			
19	88	8.1			
20	88	7.0			
21	85	6.4			
22	96	10.3			
23	88	8.1			
24	83	6.2			
25	87	7.7			
26	84	7.3			
27	86	7.5			
28	83	6.0			
29	82	5.6			
30	84	6.5			
31	ND	ND			
32	83	5.3			
33	85	6.6			
34	81	5.9			
35	84	6.0			
36	80	5.1			
37	90	8.0			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HWSE-P in the Biomarker study, sampled at 20 d post exposure.

Treatment: HWSE-P
Date: 7/29/97

Tank: 4

Fish#	Length	Weight	Fish#	Length	Weight
1	90	7.5	38	91	8.2
2	96	10.0	39	93	8.3
3	98	10.3	40	86	7.0
4	84	6.2	41	92	8.8
5	93	8.5	42	93	7.9
6	88	7.5	43	97	10.0
7	94	8.0	44	81	5.2
8	97	10.5	45	91	7.9
9	85	6.4	46	101	12.0
10	97	10.3	47	88	7.8
11	87	7.5	48	97	9.9
12	88	7.4	49	92	8.2
13	89	7.6	50	88	7.2
14	87	7.1	51	89	10.8
15	100	11.7	52	98	11.0
16	93	9.1	53	100	12.5
17	93	8.6	54	87	7.5
18	95	10.3	55	91	8.2
19	96	9.4			
20	85	6.6			
21	103	11.7			
22	85	6.2			
23	95	9.1			
24	95	9.5			
25	92	8.0			
26	87	6.7			
27	90	7.8			
28	90	8.8			
29	92	8.3			
30	91	8.6			
31	90	6.6			
32	97	10.6			
33	98	9.9			
34	98	9.8			
35	94	10.1			
36	94	9.6			
37	90	8.2			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HWSE-P in the Biomarker study, sampled at 56 d post exposure.

Treatment: HWSE-P
Date: 9/3/97

Tank: 4

Fish#	Length	Weight
1	112	18.5
2	132	29.0
3	101	13.2
4	117	19.0
5	113	16.2
6	99	11.0
7	90	7.4
8	93	9.2
9	98	10.2
10	104	12.9
11	99	10.4
12	110	15.8
13	97	9.5
14	98	9.3
15	102	13.2
16	99	11.9
17	108	15.2
18	136	28.7
19	106	18.7
20	105	19.0
21	110	16.2
22	97	10.5
23	122	24.2
24	106	14.3
25	94	9.1
26	128	25.4
27	109	11.3
28	110	14.9
29	115	18.3
30	105	13.4
31	103	12.2
32	110	11.9
33	103	11.7
34	108	14.3

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to HCB.

Treatment: HCB
Date: 7/9/97

Tank: 8

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	89	7.4	39	93	7.6	77	81	4.8	115	88	6.9
2	83	4.8	40	84	5.7	78	83	4.9	116	86	5.6
3	90	7.5	41	95	8.2	79	84	6.0	117	91	7.1
4	96	7.5	42	94	8.8	80	88	6.4	118	98	8.5
5	96	8.4	43	86	6.5	81	95	8.1	119	90	7.1
6	98	9.0	44	88	6.8	82	93	7.0	120	85	5.7
7	87	6.2	45	81	4.9	83	85	6.0	121	80	5.6
8	85	5.4	46	86	5.6	84	91	7.1	122	92	7.2
9	93	7.7	47	86	5.7	85	82	4.8	123	81	5.0
10	84	5.8	48	91	7.4	86	88	5.8	124	88	6.5
11	88	6.1	49	89	6.2	87	87	5.2	125	92	7.4
12	88	6.6	50	91	7.3	88	84	5.9	126	85	5.7
13	89	5.6	51	89	6.7	89	93	8.0	127	84	5.3
14	84	5.6	52	86	5.8	90	85	5.7	128	93	7.7
15	94	7.5	53	86	6.5	91	85	5.9	129	80	5.4
16	87	6.4	54	84	5.5	92	95	7.9	130	86	6.3
17	91	7.1	55	92	7.1	93	86	5.8	131	91	6.9
18	81	5.0	56	93	8.1	94	82	5.1	132	82	5.2
19	85	5.8	57	88	6.3	95	92	7.5	133	98	8.5
20	87	7.0	58	85	5.4	96	88	6.5	134	94	8.3
21	83	5.3	59	91	7.9	97	84	5.6	135	85	5.6
22	89	6.1	60	84	5.7	98	87	5.8	136	87	6.3
23	89	6.9	61	86	6.2	99	86	5.9	137	89	7.0
24	89	6.9	62	89	6.1	100	90	7.3	138	89	6.6
25	84	5.3	63	80	5.3	101	91	7.2	139	93	8.0
26	89	6.3	64	85	5.6	102	82	5.5	140	95	7.6
27	91	6.8	65	89	6.9	103	83	6.1	141	89	7.1
28	83	5.3	66	85	5.9	104	86	6.4	142	94	8.5
29	86	6.4	67	90	6.9	105	82	5.6	143	88	5.9
30	88	6.5	68	85	5.9	106	88	6.8	144	88	6.2
31	90	7.0	69	83	5.4	107	89	6.6	145	86	6.3
32	83	5.7	70	89	6.7	108	83	6.0	146	89	6.4
33	90	6.3	71	83	5.0	109	90	7.0	147	86	5.3
34	95	8.2	72	96	9.4	110	87	6.3	148	94	7.5
35	91	6.8	73	89	6.5	111	81	4.9	149	90	7.2
36	88	6.4	74	97	8.9	112	81	5.1	150	87	5.9
37	88	6.3	75	87	6.0	113	91	7.1			
38	92	7.7	76	82	4.6	114	87	6.4			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to HCBd.

Treatment: HCBd
Date: 7/9/97

Tank: 8

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
151	83	5.3	189	88	6.4	227	91	7.7	265	88	6.0
152	93	7.6	190	86	5.8	228	80	4.9	266	86	6.0
153	80	4.5	191	88	7.2	229	83	5.2	267	84	5.0
154	84	5.5	192	80	4.8	230	98	9.5	268	90	6.9
155	94	8.3	193	85	5.6	231	86	6.5	269	87	6.4
156	88	5.9	194	96	8.1	232	87	7.0	270	93	7.6
157	88	6.8	195	84	5.8	233	88	6.7	271	82	5.8
158	91	7.1	196	93	7.8	234	94	8.2	272	83	5.4
159	88	6.4	197	89	7.1	235	80	4.9	273	82	5.2
160	82	4.9	198	86	5.8	236	89	6.6	274	81	4.5
161	81	5.3	199	89	6.7	237	82	4.9	275	92	7.4
162	89	6.3	200	91	7.3	238	93	7.9	276	81	4.9
163	82	5.1	201	84	5.7	239	83	6.9	277	84	6.4
164	96	8.9	202	91	7.1	240	88	7.0	278	84	5.5
165	81	4.9	203	80	4.9	241	87	6.7	279	81	4.9
166	89	6.4	204	90	7.0	242	89	6.5	280	86	5.5
167	83	5.1	205	83	5.0	243	81	5.6	281	89	6.6
168	86	6.3	206	82	5.2	244	86	6.1	282	84	5.7
169	80	4.8	207	88	5.9	245	92	7.5	283	89	6.7
170	84	6.1	208	87	6.2	246	89	6.6	284	86	6.3
171	84	5.8	209	91	7.5	247	87	7.4	285	93	7.7
172	89	6.6	210	86	6.0	248	86	5.1	286	88	6.3
173	95	8.3	211	89	6.8	249	84	5.5	287	85	5.8
174	85	6.1	212	87	6.5	250	94	8.0	288	90	8.1
175	80	5.0	213	92	7.1	251	83	6.0	289	90	7.6
176	81	4.7	214	84	6.3	252	86	6.3	290	84	5.3
177	97	9.0	215	94	7.6	253	95	7.7	291	81	5.3
178	87	6.8	216	82	5.6	254	87	6.4	292	88	6.6
179	89	7.2	217	86	6.0	255	82	5.7	293	86	6.3
180	87	6.8	218	86	6.9	256	86	6.2	294	87	6.1
181	92	8.0	219	80	4.7	257	86	5.6	295	90	7.1
182	91	7.3	220	83	4.8	258	83	6.0	296	83	5.2
183	85	5.1	221	86	6.0	259	90	7.1	297	83	4.8
184	87	6.2	222	93	8.3	260	85	5.6	298	85	6.1
185	96	8.0	223	83	5.3	261	84	5.3	299	89	6.5
186	86	5.6	224	91	7.7	262	82	5.9	300	85	6.0
187	90	6.8	225	86	6.1	263	84	5.8			
188	87	6.0	226	86	5.8	264	85	5.6			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HCBd in the Biomarker study, sampled at 6 d post exposure.

Treatment: HCBd
Date: 7/15/97

Tank: 8

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	89	7.1	38	95	8.3	75	85	5.8
2	90	7.5	39	88	6.6			
3	86	6.7	40	85	6.4			
4	83	7.6	41	90	6.1			
5	91	7.6	42	85	6.1			
6	84	5.9	43	82	5.6			
7	89	6.6	44	90	7.5			
8	84	5.6	45	81	5.0			
9	92	8.2	46	92	7.1			
10	86	6.1	47	90	6.6			
11	89	6.5	48	93	7.8			
12	92	7.5	49	86	6.0			
13	95	8.6	50	85	6.3			
14	94	8.1	51	91	7.8			
15	98	9.9	52	93	7.5			
16	82	5.4	53	92	7.4			
17	90	7.5	54	91	6.6			
18	85	6.0	55	85	6.0			
19	87	6.2	56	88	7.1			
20	85	6.0	57	88	6.7			
21	86	6.3	58	84	5.6			
22	83	5.8	59	91	7.8			
23	83	6.0	60	79	4.7			
24	95	7.9	61	85	6.4			
25	83	8.2	62	87	6.5			
26	85	5.9	63	88	6.1			
27	81	5.2	64	88	6.7			
28	83	5.1	65	95	8.7			
29	86	6.4	66	86	6.0			
30	84	5.6	67	87	9.4			
31	91	8.0	68	89	6.7			
32	90	8.0	69	87	6.0			
33	86	6.5	70	90	7.3			
34	80	5.4	71	93	7.6			
35	91	7.4	72	93	6.7			
36	86	6.0	73	94	7.3			
37	85	5.6	74	90	6.9			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HCBd in the Biomarker study, sampled at 20 d post exposure.

Treatment: HCBd
Date: 7/29/97

Tank: 8

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	85	6.2	38	83	6.0	75	90	7.4
2	87	8.4	39	102	11.7	76	87	7.3
3	95	9.4	40	88	7.7	77	86	6.5
4	86	5.6	41	93	8.7	78	84	6.4
5	101	11.1	42	93	8.7	79	98	10.2
6	100	11.1	43	87	6.8	80	88	7.5
7	85	7.1	44	93	8.3	81	96	9.5
8	87	6.8	45	87	7.6	82	90	7.5
9	98	10.6	46	92	8.9	83	83	5.8
10	95	9.2	47	89	7.9	84	91	8.4
11	88	7.8	48	92	9.5	85	94	8.4
12	88	6.8	49	94	8.9			
13	94	9.5	50	87	7.2			
14	94	8.9	51	87	6.9			
15	93	8.8	52	84	6.3			
16	89	7.7	53	96	9.9			
17	95	8.7	54	96	9.8			
18	91	8.5	55	93	8.8			
19	89	8.1	56	86	6.5			
20	87	6.8	57	85	6.6			
21	93	8.9	58	97	10.5			
22	94	9.2	59	92	8.7			
23	91	8.1	60	97	9.7			
24	92	8.4	61	92	9.1			
25	91	8.1	62	80	5.1			
26	90	7.2	63	97	9.9			
27	88	7.7	64	88	6.8			
28	97	10.4	65	87	7.0			
29	88	7.2	66	89	7.6			
30	88	8.1	67	85	6.3			
31	94	9.2	68	91	8.7			
32	97	10.0	69	87	7.0			
33	94	9.0	70	93	8.8			
34	89	7.3	71	92	7.5			
35	88	6.8	72	98	10.7			
36	91	8.3	73	97	10.6			
37	92	8.9	74	90	7.6			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to HCBd in the Biomarker study, sampled at 56 d post exposure.

Treatment: HCBd
Date: 9/3/97

Tank: 8

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	120	15.4	38	110	15.0	75	124	22.1
2	103	17.8	39	104	12.9	76	98	11.0
3	100	11.7	40	112	16.5	77	97	9.8
4	110	17.1	41	93	9.2	78	111	16.0
5	111	12.0	42	92	8.9	79	106	14.0
6	114	16.3	43	93	8.8	80	130	27.5
7	115	18.6	44	122	24.6	81	112	16.4
8	105	12.1	45	108	15.0	82	99	10.3
9	104	12.8	46	106	13.0			
10	98	11.3	47	110	16.3			
11	112	16.2	48	110	14.2			
12	91	8.4	49	122	20.4			
13	108	15.5	50	110	15.6			
14	115	17.2	51	108	12.4			
15	117	18.5	52	107	12.9			
16	99	11.1	53	110	13.6			
17	118	18.6	54	97	10.3			
18	94	9.7	55	90	7.7			
19	108	14.8	56	108	14.6			
20	98	10.5	57	105	13.6			
21	97	10.3	58	115	19.1			
22	115	18.9	59	88	7.5			
23	107	13.7	60	104	12.6			
24	104	17.6	61	97	10.0			
25	103	14.7	62	103	11.7			
26	103	12.5	63	107	14.4			
27	124	24.5	64	102	11.5			
28	121	21.6	65	110	15.6			
29	111	17.2	66	118	19.0			
30	115	17.7	67	101	12.7			
31	100	10.3	68	119	20.8			
32	118	22.7	69	100	10.3			
33	110	17.3	70	89	8.1			
34	109	16.8	71	110	16.0			
35	110	16.6	72	108	13.5			
36	113	16.9	73	110	12.2			
37	95	9.8	74	108	14.3			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to PCBs.

Treatment: PCBs
Date: 7/9/97

Tank: 12

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	87	6.3	39	85	5.5	77	88	7.2	115	87	5.4
2	86	6.4	40	80	5.2	78	80	4.6	116	83	5.2
3	89	6.2	41	83	5.6	79	91	6.8	117	92	7.6
4	86	6.0	42	83	5.4	80	87	6.4	118	93	7.5
5	84	5.9	43	86	5.5	81	81	5.3	119	82	4.7
6	81	5.7	44	89	6.4	82	80	5.2	120	83	4.8
7	85	5.9	45	88	6.2	83	80	5.0	121	85	6.0
8	80	5.1	46	87	6.2	84	86	6.4	122	85	4.9
9	83	5.5	47	83	5.4	85	85	6.0	123	81	4.7
10	91	7.4	48	88	5.9	86	88	6.2	124	85	5.6
11	82	5.3	49	86	6.4	87	81	5.0	125	86	5.8
12	89	6.1	50	86	5.5	88	92	7.7	126	86	6.4
13	84	5.9	51	85	6.1	89	85	5.6	127	82	5.2
14	83	5.5	52	88	6.6	90	82	4.8	128	87	6.5
15	82	5.1	53	86	5.2	91	88	6.5	129	82	5.4
16	88	6.0	54	83	5.7	92	83	5.8	130	83	4.7
17	91	6.6	55	85	5.4	93	89	6.3	131	85	6.0
18	84	5.6	56	86	5.9	94	83	5.0	132	80	4.6
19	90	6.2	57	80	4.8	95	83	5.5	133	84	5.6
20	80	4.9	58	85	5.6	96	83	5.5	134	81	4.8
21	85	5.8	59	82	4.3	97	87	6.3	135	80	4.5
22	83	5.5	60	80	5.4	98	83	5.5	136	83	5.4
23	80	4.8	61	90	6.7	99	87	6.6	137	85	6.1
24	91	7.6	62	90	7.0	100	89	6.7	138	81	4.9
25	90	5.0	63	85	5.7	101	86	6.1	139	81	5.0
26	91	7.0	64	85	5.4	102	88	6.4	140	85	5.1
27	81	5.1	65	82	5.3	103	90	6.9	141	83	5.0
28	89	6.1	66	84	5.7	104	89	7.1	142	85	6.0
29	90	6.1	67	86	5.6	105	87	6.4	143	83	5.0
30	86	6.6	68	80	4.9	106	82	5.2	144	89	6.2
31	85	6.0	69	80	4.9	107	90	6.8	145	90	6.4
32	89	6.8	70	86	5.6	108	80	5.0	146	83	5.3
33	80	4.7	71	80	4.9	109	86	5.9	147	85	5.4
34	86	6.5	72	90	6.3	110	91	6.7	148	84	5.1
35	82	5.3	73	83	5.2	111	89	6.6	149	80	4.7
36	82	5.8	74	94	8.0	112	86	5.8	150	88	6.8
37	86	6.7	75	85	5.5	113	89	6.0			
38	82	5.4	76	90	6.2	114	92	7.7			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to PCBs.

Treatment: PCBs
Date: 7/9/97

Tank: 12

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
151	83	5.6	189	83	5.7	227	85	6.0	265	80	4.9
152	83	5.4	190	83	5.5	228	91	6.8	266	86	5.7
153	95	8.8	191	85	5.4	229	89	6.5	267	89	6.5
154	86	6.0	192	80	4.7	230	84	5.3	268	83	5.5
155	90	6.8	193	84	5.5	231	83	5.2	269	84	5.4
156	85	5.4	194	83	5.3	232	85	5.8	270	88	6.2
157	87	5.9	195	87	6.6	233	90	7.3	271	98	9.1
158	85	5.8	196	88	6.9	234	81	4.5	272	88	6.6
159	88	6.4	197	90	7.1	235	88	6.8	273	80	4.4
160	86	5.8	198	84	4.9	236	86	5.9	274	93	7.8
161	92	6.9	199	80	5.1	237	90	7.7	275	88	7.0
162	82	4.8	200	82	4.3	238	90	7.0	276	88	6.2
163	85	5.7	201	80	4.7	239	84	5.6	277	87	6.0
164	85	5.9	202	81	4.7	240	86	5.6	278	80	5.0
165	89	6.6	203	86	5.8	241	84	5.8	279	87	6.3
166	84	5.5	204	89	6.7	242	86	5.5	280	84	5.5
167	91	6.6	205	82	5.0	243	80	4.9	281	88	6.6
168	90	7.1	206	80	4.9	244	96	8.2	282	91	7.3
169	82	5.6	207	91	7.3	245	84	5.4	283	82	4.9
170	84	5.0	208	85	5.7	246	88	6.6	284	87	6.0
171	90	7.0	209	89	6.2	247	81	5.0	285	89	6.3
172	86	5.9	210	81	5.0	248	86	5.9	286	90	7.3
173	91	7.1	211	89	6.5	249	87	6.5	287	87	6.5
174	83	5.5	212	87	6.3	250	81	4.6	288	85	5.5
175	81	4.6	213	88	6.5	251	86	6.0	289	94	8.5
176	82	4.4	214	81	4.7	252	88	6.6	290	86	5.6
177	93	7.7	215	87	6.3	253	80	4.8	291	90	6.0
178	92	7.0	216	86	5.0	254	91	7.4	292	94	8.1
179	80	4.8	217	80	4.7	255	90	6.7	293	96	9.0
180	81	4.7	218	87	6.0	256	86	6.0	294	95	7.1
181	80	5.1	219	90	6.4	257	91	6.5	295	90	7.3
182	87	6.0	220	85	6.8	258	82	5.1	296	92	7.3
183	83	5.8	221	90	7.4	259	85	6.1	297	84	6.1
184	85	6.4	222	83	5.1	260	90	7.0	298	88	5.9
185	82	5.6	223	87	6.5	261	82	5.3	299	95	7.9
186	85	5.5	224	95	8.4	262	83	5.3	300	91	7.8
187	87	5.9	225	84	6.0	263	87	5.9			
188	83	5.8	226	89	6.3	264	83	5.5			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to PCBs in the Biomarker study, sampled at 6 d post exposure.

Treatment: PCBs
Date: 7/15/97

Tank: 12

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	85	6.8	38	89	7.3	75	84	6.5
2	96	9.5	39	91	7.7			
3	89	7.8	40	90	7.6			
4	88	6.8	41	85	5.4			
5	89	7.3	42	80	5.0			
6	87	6.7	43	91	8.3			
7	ND	ND	44	91	8.7			
8	87	6.5	45	89	7.2			
9	88	7.1	46	80	5.7			
10	83	6.1	47	92	8.6			
11	85	6.7	48	93	8.7			
12	88	7.0	49	86	6.2			
13	85	6.7	50	80	5.2			
14	89	6.6	51	87	7.9			
15	90	6.7	52	82	5.5			
16	81	5.4	53	95	9.1			
17	82	5.2	54	90	7.3			
18	85	6.8	55	81	5.5			
19	90	7.2	56	80	5.5			
20	90	7.6	57	80	5.4			
21	80	5.5	58	88	6.7			
22	89	6.8	59	87	7.0			
23	90	8.0	60	89	7.1			
24	89	6.7	61	85	6.3			
25	85	7.3	62	86	6.8			
26	84	6.6	63	81	5.5			
27	87	7.3	64	91	7.3			
28	89	7.6	65	89	6.9			
29	80	6.4	66	87	7.0			
30	86	7.3	67	91	7.8			
31	84	5.9	68	80	5.4			
32	90	7.6	69	84	5.9			
33	81	5.7	70	86	7.0			
34	90	5.7	71	80	5.2			
35	97	8.1	72	82	4.7			
36	84	6.4	73	84	6.0			
37	82	6.2	74	80	4.4			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to PCBs in the Biomarker study, sampled at 20 d post exposure.

Treatment: PCBs
Date: 7/29/97

Tank: 12

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	95	9.6	38	89	8.0	75	100	11.7
2	92	7.8	39	92	8.5	76	87	7.3
3	100	11.3	40	93	9.6	77	88	7.1
4	85	5.8	41	90	8.1	78	96	9.7
5	87	7.5	42	97	9.4	79	91	7.8
6	90	8.4	43	90	8.2	80	83	6.4
7	95	9.3	44	97	9.5	81	89	7.5
8	90	7.6	45	95	9.7	82	95	9.5
9	95	9.5	46	91	8.0	83	90	7.9
10	85	6.9	47	88	7.5	84	94	8.8
11	91	8.5	48	90	8.1	85	93	9.3
12	85	6.8	49	90	8.0			
13	95	8.7	50	87	6.7			
14	90	8.1	51	85	6.4			
15	94	9.0	52	82	5.5			
16	84	6.5	53	83	5.4			
17	96	9.6	54	88	7.8			
18	89	8.1	55	93	7.9			
19	86	6.2	56	85	6.8			
20	88	8.3	57	95	9.1			
21	93	8.9	58	91	8.1			
22	93	9.6	59	88	7.6			
23	90	8.2	60	83	6.0			
24	94	9.6	61	88	8.2			
25	89	7.4	62	85	6.5			
26	90	8.6	63	92	8.2			
27	89	7.7	64	93	8.7			
28	84	5.9	65	98	11.2			
29	92	8.6	66	89	8.1			
30	85	6.7	67	86	6.7			
31	87	7.7	68	88	7.2			
32	93	7.8	69	88	7.3			
33	84	5.8	70	87	7.0			
34	88	7.9	71	99	10.7			
35	82	6.3	72	103	12.1			
36	85	5.7	73	93	7.8			
37	90	8.1	74	94	8.9			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to PCBs in the Biomarker study, sampled at 60 d post exposure.

Treatment: PCBs
Date: 9/9/97

Tank: 12

Fish#	Length	Weight	Fish#	Length	Weight
1	98	12.2	38	116	18.3
2	101	12.0	39	103	13.4
3	115	17.1	40	101	12.2
4	118	19.9	41	102	12.1
5	118	20.4	42	128	24.8
6	112	17.8	43	117	17.8
7	110	16.4	44	140	32.0
8	100	12.3	45	100	11.2
9	111	16.8	46	111	17.2
10	116	19.6	47	114	18.6
11	131	31.4	48	122	25.0
12	120	20.5	49	122	20.2
13	122	22.2	50	118	18.1
14	111	16.3	51	122	23.9
15	102	12.5	52	96	10.2
16	113	18.6	53	98	11.6
17	95	10.1	54	128	26.9
18	105	14.1	55	109	15.0
19	118	19.4			
20	113	18.4			
21	92	8.8			
22	111	16.5			
23	97	10.4			
24	105	15.2			
25	96	11.1			
26	116	21.1			
27	107	13.9			
28	106	12.8			
29	103	13.2			
30	108	15.1			
31	115	16.6			
32	114	18.3			
33	87	7.3			
34	103	13.1			
35	90	8.4			
36	103	12.3			
37	111	12.8			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to PAHs.

Treatment: PAHs
Date: 7/9/97

Tank: 7

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	86	6.3	39	88	6.6	77	81	4.5	115	83	5.2
2	93	8.4	40	95	8.7	78	82	5.0	116	80	4.9
3	95	8.1	41	87	6.8	79	83	5.1	117	83	5.2
4	91	8.0	42	88	6.5	80	91	7.4	118	90	7.3
5	86	7.3	43	89	6.9	81	93	7.9	119	82	5.4
6	87	6.9	44	80	5.1	82	86	6.1	120	92	7.6
7	90	7.1	45	80	4.3	83	95	8.8	121	85	6.2
8	84	6.0	46	90	7.2	84	83	5.1	122	83	5.3
9	88	6.8	47	81	5.9	85	84	6.3	123	90	7.0
10	88	6.7	48	86	6.0	86	89	6.8	124	94	7.7
11	86	6.5	49	92	7.9	87	84	6.0	125	84	6.1
12	86	5.8	50	89	7.1	88	87	6.3	126	88	6.0
13	87	6.2	51	90	6.7	89	90	7.2	127	82	5.3
14	87	6.4	52	85	5.5	90	90	7.1	128	85	6.5
15	86	6.1	53	80	4.5	91	83	5.8	129	87	5.8
16	88	6.5	54	80	4.7	92	92	7.5	130	80	4.5
17	82	5.2	55	90	9.2	93	89	6.8	131	83	5.6
18	85	5.9	56	93	7.6	94	84	6.0	132	84	5.2
19	81	5.2	57	83	4.7	95	85	6.0	133	80	4.6
20	84	5.8	58	84	5.9	96	81	5.7	134	80	5.3
21	84	6.0	59	86	6.1	97	82	5.0	135	91	7.5
22	81	5.0	60	85	7.4	98	87	6.6	136	82	5.1
23	89	6.8	61	84	5.8	99	89	6.5	137	89	6.6
24	82	5.5	62	87	6.6	100	84	6.0	138	84	4.5
25	85	6.2	63	82	5.0	101	89	6.3	139	83	6.0
26	88	6.0	64	81	6.1	102	80	4.8	140	80	4.7
27	86	5.5	65	86	6.3	103	82	5.5	141	85	5.2
28	82	5.5	66	82	4.6	104	80	4.4	142	85	5.0
29	82	4.8	67	87	6.6	105	94	7.9	143	86	6.5
30	83	5.5	68	86	5.9	106	85	5.4	144	86	5.9
31	90	7.9	69	88	6.2	107	88	6.2	145	89	7.3
32	92	8.2	70	80	5.1	108	86	6.1	146	81	4.6
33	80	5.2	71	88	7.0	109	88	7.6	147	86	6.3
34	81	5.2	72	83	5.3	110	80	4.6	148	95	8.1
35	95	8.6	73	89	6.8	111	80	4.7	149	87	5.9
36	88	7.0	74	81	4.9	112	86	6.4	150	82	5.0
37	94	7.8	75	81	5.5	113	80	5.2			
38	88	6.5	76	80	4.5	114	83	5.3			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon for the injection exposure to PAHs.

Treatment: PAHs
Date: 7/9/97

Tank: 7

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
151	80	4.7	189	81	4.9	227	90	6.6	265	86	6.3
152	89	6.9	190	85	6.0	228	81	5.2	266	81	4.7
153	85	5.0	191	83	5.5	229	85	6.0	267	89	6.8
154	80	5.0	192	84	5.3	230	86	6.3	268	88	6.1
155	83	6.0	193	88	7.3	231	83	5.6	269	89	6.8
156	82	5.4	194	83	6.0	232	86	6.3	270	92	8.0
157	85	5.5	195	89	7.0	233	86	6.0	271	81	5.4
158	87	7.2	196	91	7.6	234	95	8.2	272	83	6.0
159	81	4.6	197	94	8.4	235	88	6.9	273	86	6.0
160	83	5.7	198	94	8.0	236	90	6.8	274	84	5.2
161	92	7.1	199	86	5.6	237	82	4.9	275	86	6.6
162	91	7.8	200	89	7.3	238	85	6.2	276	84	5.7
163	89	6.8	201	86	6.5	239	88	6.6	277	82	5.2
164	85	5.3	202	90	7.8	240	83	4.5	278	81	4.6
165	83	5.8	203	88	7.6	241	80	5.1	279	81	5.2
166	81	5.0	204	82	5.6	242	88	7.0	280	90	6.8
167	82	5.0	205	82	5.8	243	83	5.2	281	88	5.9
168	82	5.6	206	88	7.1	244	83	5.7	282	85	5.9
169	88	6.4	207	82	5.2	245	95	8.5	283	88	6.5
170	85	6.1	208	86	4.9	246	84	5.2	284	83	5.8
171	87	6.4	209	84	5.7	247	89	6.8	285	88	6.7
172	84	6.3	210	82	5.0	248	87	5.8	286	81	5.1
173	87	7.1	211	85	6.1	249	88	6.0	287	89	7.1
174	87	6.5	212	84	6.2	250	88	6.9	288	80	4.9
175	92	8.6	213	80	5.0	251	90	6.9	289	80	5.1
176	82	5.5	214	87	5.7	252	84	5.6	290	89	7.1
177	80	4.7	215	82	5.0	253	85	5.5	291	84	5.6
178	92	7.3	216	86	6.4	254	90	6.8	292	87	6.3
179	82	5.2	217	81	5.0	255	81	5.0	293	84	6.3
180	86	6.4	218	84	5.8	256	86	5.9	294	81	4.7
181	87	6.2	219	83	5.3	257	85	5.7	295	90	6.4
182	91	7.7	220	89	6.9	258	82	5.4	296	85	5.9
183	82	5.5	221	84	5.7	259	87	6.2	297	97	8.4
184	82	5.3	222	87	7.0	260	81	5.3	298	81	4.9
185	83	5.3	223	84	6.5	261	81	5.0	299	90	6.6
186	89	6.7	224	91	7.3	262	80	5.6	300	95	8.2
187	89	6.5	225	83	5.8	263	84	6.2			
188	91	6.8	226	87	6.8	264	86	5.8			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to PAHs in the Biomarker study, sampled at 6 d post exposure.

Treatment: PAHs
Date: 7/15/97

Tank: 7

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	83	5.8	38	86	7.4	75	90	7.2
2	90	7.9	39	80	5.5			
3	81	4.9	40	83	6.8			
4	84	5.9	41	82	5.7			
5	86	7.5	42	85	5			
6	89	7.5	43	81	5.3			
7	88	7	44	80	5.2			
8	97	9.2	45	87	6.6			
9	90	9.2	46	80	5			
10	88	6.6	47	98	11			
11	93	8.9	48	80	5.2			
12	92	8.4	49	89	7.1			
13	87	6.1	50	92	6.2			
14	83	6.2	51	92	8.4			
15	81	5.3	52	95	8.8			
16	90	7.8	53	81	5.8			
17	89	8	54	81	6.1			
18	82	6.4	55	85	6.3			
19	90	7.5	56	84	6.9			
20	80	4.8	57	85	7.6			
21	81	5.7	58	85	6.5			
22	88	7.3	59	85	6.4			
23	89	6.1	60	85	7.3			
24	89	7.1	61	85	7.2			
25	83	6.2	62	80	5			
26	81	5.9	63	86	7			
27	90	6.8	64	86	7.1			
28	87	6.6	65	83	6.2			
29	86	6.2	66	83	5.5			
30	88	6.8	67	84	6			
31	80	6	68	90	8			
32	82	6.6	69	90	8.5			
33	89	7.5	70	81	5.8			
34	82	5.8	71	83	6			
35	83	6.1	72	85	6.2			
36	86	7.3	73	82	6.1			
37	93	9.6	74	80	5			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to PAHs in the Biomarker study, sampled at 20 d post exposure.

Treatment: PAHs
Date: 7/29/97

Tank: 7

Fish#	Length	Weight	Fish#	Length	Weight	Fish#	Length	Weight
1	82	5.3	38	85	6.6	75	83	5.7
2	92	7.9	39	90	7.9	76	90	7.4
3	89	6.4	40	84	6.7	77	85	6.6
4	88	7.2	41	93	6.1	78	94	9.5
5	87	6.6	42	95	9.8	79	94	9.3
6	84	5.8	43	91	8.2	80	89	8.2
7	86	7.0	44	85	6.9	81	95	9.9
8	87	6.7	45	89	8.0	82	85	5.8
9	101	10.5	46	86	6.7	83	88	7.1
10	98	10.5	47	85	6.6	84	94	8.8
11	94	9.3	48	89	7.2	85	92	9.0
12	93	8.9	49	87	7.4			
13	92	8.4	50	97	10.4			
14	87	7.0	51	82	5.8			
15	92	8.9	52	90	8.8			
16	88	7.8	53	91	8.1			
17	92	8.6	54	87	5.9			
18	90	7.5	55	93	8.3			
19	86	7.1	56	90	7.6			
20	85	5.5	57	86	7.1			
21	93	8.8	58	89	7.3			
22	94	8.9	59	81	5.0			
23	86	6.8	60	88	6.6			
24	86	6.8	61	86	6.4			
25	92	8.3	62	91	8.0			
26	92	8.7	63	95	9.6			
27	95	9.2	64	83	5.7			
28	93	8.3	65	105	13.1			
29	96	9.8	66	84	5.9			
30	94	8.7	67	88	7.4			
31	94	9.0	68	82	5.3			
32	93	9.0	69	83	5.7			
33	89	7.7	70	92	8.6			
34	83	6.0	71	89	8.4			
35	87	6.8	72	84	6.6			
36	84	6.6	73	89	7.7			
37	92	8.4	74	90	7.4			

Persistence and selectivity of biomarker responses in juvenile chinook salmon exposed to chemical contaminants specific to the Hylebos Waterway.

Lengths and weights of juvenile chinook salmon, exposed to PAHs in the Biomarker study, sampled at 60 d post exposure.

Treatment: PAHs
Date: 9/9/97

Tank: 7

Fish#	Length	Weight	Fish#	Length	Weight
1	116	17.8	38	104	13.2
2	119	21.5	39	108	15.5
3	91	9.3	40	102	12.0
4	114	17.7	41	118	20.0
5	111	17.3	42	99	12.2
6	106	16.4	43	111	17.3
7	95	12.2	44	103	13.5
8	114	17.6	45	114	17.4
9	101	12.0	46	111	16.8
10	111	17.5	47	109	14.8
11	118	17.8	48	108	14.5
12	101	12.6	49	109	15.0
13	113	18.2	50	114	17.8
14	114	19.4	51	98	12.3
15	115	19.2	52	114	19.5
16	119	21.0	53	103	12.8
17	107	14.4	54	113	16.7
18	116	20.1	55	116	18.5
19	109	16.5	56	99	10.4
20	124	22.7	57	97	11.6
21	112	16.9	58	97	11.7
22	112	16.9	59	95	10.7
23	92	9.5	60	96	10.1
24	113	18.7	61	106	14.2
25	116	18.7	62	111	15.6
26	106	14.0	63	104	12.7
27	105	16.3	64	98	11.4
28	111	16.8	65	106	14.9
29	104	13.8	66	117	18.3
30	100	11.8	67	101	12.4
31	96	10.8	68	92	9.3
32	109	15.9	69	116	18.7
33	125	24.2	70	115	18.8
34	121	21.2	71	106	13.8
35	101	11.8	72	113	17.1
36	116	21.1	73	108	14.3
37	104	13.3	74	93	9.3

**Hylebos Fish Injury Study - Round II, Part 3
Individual Data and Quality Assurance Results
CASE NARRATIVE**

Juvenile Salmon Biomarker Response Studies

Biliary FACs - measured as benzo[a]pyrene equivalents (Table 1)

Composites of bile samples from juvenile chinook salmon (*Oncorhynchus tshawytscha*) for the Biomarker study part of the Puget Sound Salmon Damage Assessment 1997 study were analyzed by HPLC with fluorescence detection in one set. Benzo(a)pyrene- (BaP), naphthalene- (NPH) and phenanthrene- (PHN) like fluorescence responses were measured. In accordance with the Sampling and Analysis Plan (SAP), analytical quality control (identified by QCBatch) was assessed with each analysis. For the salmon studies, the QCBatch identification for the analysis set is BILE428+/433/436.

Method Blank

Results of the HPLC analysis of the methods for QCBatch showed fluorescence responses of BaP, NPH and PHN met the following criteria: BaP, NPH, or PHN equivalents in the method blanks were less than 10% of concentrations in any bile sample analyzed in the same set.

Initial Calibration Standards

An initial calibration standard consisting of known concentrations of BaP, NPH and PHN was analyzed in duplicate at the start of each sample set. The relative standard deviation (RSD) for each individual PAH for the two analyses met the criteria ($\leq 15\%$) set in the quality control section (Table 4) of the SAP.

Continuing Calibration Standards

The calibration standard was analyzed periodically throughout the sample sets. The relative standard deviation for the analyses was within the 25% RSD limit set for each individual PAH (Table 4, SAP).

Bile Reference Material

A bile reference material was analyzed near the beginning and end of each sample set and compared to historical interlaboratory means of this reference (see Quality Assurance section in SAP). The measured fluorescence responses of this bile sample were determined to be within the upper and lower control limit of the interlaboratory mean value for this reference bile (see Quality Assurance Results).

Replicates

Selected bile samples were analyzed in duplicate for every ten fish analyzed. The RSDs ranged from 2 to 37 %, which is within the 50% RSD set in the SAP.

Commentary on Sample Analyses

Samples DA01-0715, DA08-0715, DA10-0715, DA100-0813 and DA101-0813 were reanalyzed because the chromatograms were not sufficiently resolved for quantitation. The reanalyzed samples are covered under QCBatch identification BILE433+. Results of FAC analyses shown in Table 1 are from fish sampled at different time points in the biomarker study, and 60 d post exposure (8/25/97) in the growth study (labeled as 60 days growth study).

Table 1
Hylebos Waterway Fish Injury Studies
A/E

<i>06 days</i>			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
			Rep#	BaP	NPH	PHN	PROTEIN	BaP	NPH
DA01_0715	B43342	1	521	165,164	88,361	13.7	38	12,056	6,450
DA02	B42807	1	205	37,327	14,446	9.9	21	3,770	1,459
DA03	B42808	1	248	45,133	15,714	6.2	40	7,280	2,535
Average			325	82,541	39,507		33	7,702	3,481
± SD			140	58,510	34,549		9	3,396	2,145

<i>20 days</i>			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
			Rep#	BaP	NPH	PHN	PROTEIN	BaP	NPH
DA43_0729	B42830	1	57	44,944	12,999	5.0	11	8,989	2,600
DA44	B42832	1	149	37,268	11,328	5.0	30	7,454	2,266
DA45	B42834	1	111	59,325	18,032	5.0	22	11,865	3,606
Average			106	47,179	14,120		21	9,436	2,824
± SD			38	9,142	2,849		8	1,828	570

<i>35 days</i>			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
			Rep#	BaP	NPH	PHN	PROTEIN	BaP	NPH
DA100_813	B43348	1	337	48,700	23,161	7.7	44	6,325	3,008
DA101_813	B43350	1	302	38,567	20,266	7.0	43	5,510	2,895
DA102	B43009	1	235	53,291	19,860	6.3	37	8,459	3,152
Average			291	46,853	21,096		41	6,764	3,018
± SD			42	6,151	1,470		3	1,244	105

<i>60 days growth</i>			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
			Rep#	BaP	NPH	PHN	PROTEIN	BaP	NPH
23_0825 60 days	B43120	1	163	42,926	11,604	2.9	56	14,802	4,001
24_0825 60 days	B43121	1	155	40,397	10,290	3.5	44	11,542	2,940
25_0825 60 days	B43122	1	121	36,423	9,126	2.8	43	13,008	3,259
26_0825 60 days	B43123	1	124	41,774	10,480	5.4	23	7,736	1,941
Average			141	40,380	10,375		42	11,772	3,035
± SD			18	2,454	879		12	2,601	740

HCB D									
<i>06 days</i>			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
			Rep#	BaP	NPH	PHN	PROTEIN	BaP	NPH
DA13	B42820	1	240	38,391	13,309	7.4	32	5,188	1,799
DA14	B42821	1	219	52,821	19,234	6.9	32	7,655	2,788
DA15	B42822	1	241	54,027	13,871	8.3	29	6,509	1,671
Average			233	48,413	15,471		31	6,451	2,086
± SD			10	7,104	2,670		1	1,008	499

<i>20 days</i>			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
			Rep#	BaP	NPH	PHN	PROTEIN	BaP	NPH
DA58	B42919	1	123	34,702	7,885	3.9	32	8,898	2,022
DA59	B42920	1	137	35,246	8,061	3.3	42	10,681	2,443
DA60	B42921	1	143	38,829	7,462	5.1	28	7,614	1,463

Table 1

		Average	134	36,259	7,803		34	9,064	1,976
		± SD	8	1,831	251		6	1,258	401
			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
56 days	Rept	BaP	NPH	PHN	PROTEIN	BaP	NPH	PHN	
DA118	B43014	1	35	15,174	1,402	10.4	3	1,459	135
DA120	B43015	1	30	14,974	1,340	14.3	2	1,047	94
		Average	33	15,074	1,371		3	1,253	114
		± SD	3	100	31		1	206	21
			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
60 days growth	Rept	BaP	NPH	PHN	PROTEIN	BaP	NPH	PHN	
970825-31	B43648	1	259	45,451	11,052	10.7	24	4,248	1,033
970825-32	B43649	1	214	23,434	5,439	5.8	37	4,040	938
970825-33	B43650	1	194	29,202	5,459	4.4	44	6,637	1,241
970825-34	B43651	1	152	19,867	4,651	5.2	29	3,821	894
		Average	205	29,489	6,650		34	4,686	1,026
		± SD	38	9,799	2,562		8	1,136	133
HWSE-M									
			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
06 days	Rept	BaP	NPH	PHN	PROTEIN	BaP	NPH	PHN	
DA07	B42813	1	317	61,762	18,316	8.4	38	7,353	2,180
DA08_0715	B43346	1	396	32,578	17,059	8.2	48	3,973	2,080
		Average	357	47,170	17,688		43	5,663	2,130
		± SD	40	14,592	629		5	1,690	50
			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
20 days	Rept	BaP	NPH	PHN	PROTEIN	BaP	NPH	PHN	
DA55	B42915	1	181	49,456	10,563	6.3	29	7,850	1,677
DA56	B42916	1	218	59,562	12,653	5.9	37	10,095	2,145
DA57	B42918	1	164	47,273	9,057	6.8	24	6,952	1,332
		Average	188	52,097	10,758		30	8,299	1,718
		± SD	23	5,353	1,474		5	1,322	333
			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
33 days	Rept	BaP	NPH	PHN	PROTEIN	BaP	NPH	PHN	
DA85	B42926	1	184	51,496	10,784	13.0	14	3,961	830
DA86	B42927	1	328	68,074	15,791	13.5	24	5,043	1,170
DA87	B42928	1	205	48,503	11,028	9.6	21	5,052	1,149
		Average	239	56,024	12,534		20	4,685	1,049
		± SD	64	8,608	2,305		4	512	156
			ng/gm bile				PROTEIN CORRECTED (ng/mg protein)		
60 days growth	Rept	BaP	NPH	PHN	PROTEIN	BaP	NPH	PHN	
11_0825 60 days	B43030	1	109	31,251	7,739	5.1	21	6,128	1,517
12_0825 60 days	B43032	1	97	41,286	6,874	3.7	26	11,158	1,858
13_0825 60 days	B43034	1	106	53,867	7,412	4.1	26	13,138	1,808
14_0825 60 days	B43036	1	100	43,814	6,010	3.4	29	12,886	1,768

Table 1

3

			Average	103	42,555	7,009		26	10,828	1,738
			± SD	5	8,046	654		3	2,819	131
HWSE-P										
06 days			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
DA11	B42818	1	173	33,377	9,994	3.7	47	9,021	2,701	
DA12	B42819	1	156	34,441	12,127	7.4	21	4,654	1,639	
			Average	165	33,909	11,061		34	6,838	2,170
			± SD	9	532	1,067		13	2,183	531
20 days			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
DA52	B42912	1	205	42,362	8,308	7.1	29	5,966	1,170	
DA53	B42913	1	127	39,343	7,579	9.7	13	4,056	781	
DA54	B42914	1	170	45,654	9,922	6.0	28	7,609	1,654	
			Average	167	42,453	8,603		23	5,877	1,202
			± SD	32	2,577	979		7	1,452	357
56 days			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
DA106_0903	B43011	1	112	35,512	9,803	4.7	24	7,556	2,086	
DA107	B43012	1	83	38,799	6,441	7.0	12	5,543	920	
DA108	B43013	1	113	47,570	9,375	4.6	25	10,341	2,038	
			Average	103	40,627	8,540		20	7,813	1,681
			± SD	14	5,090	1,494		6	1,967	539
60 days growth			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
15_0825 60 days	B43111	1	137	44,991	12,412	4.1	33	10,973	3,027	
16_0825 60 days	B43112	1	126	48,781	13,412	4.8	26	10,163	2,794	
17_0825 60 days	B43113	1	149	45,584	12,459	4.3	35	10,603	2,897	
18_0825 60 days	B43114	1	116	31,619	7,577	3.2	36	9,881	2,368	
			Average	132	42,746	11,465		33	10,405	2,772
			± SD	12	6,584	2,280		4	417	247
None										
0			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
01_0626	B43018	1	152	40,262	6,453	3.6	42	11,184	1,793	
02_0626	B43019	1	175	41,672	7,528	4.5	39	9,260	1,672	
03_0626	B43020	1	157	42,445	6,891	5.6	28	7,579	1,231	
DA001_0710	B43021	1	146	44,052	8,608	5.0	29	8,810	1,722	
DA002	B43022	1	138	50,315	8,088	5.2	27	9,676	1,555	
DA003	B43023	1	150	38,307	9,914	4.9	31	7,818	2,023	
			Average	153	42,842	7,913		33	9,055	1,666
			± SD	11	3,787	1,144		6	1,206	241

Table 1
NQSE

06 days	Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)			
		BaP	NPH	PHN		BaP	NPH	PHN	
DA04	B42809	1	206	49,273	14,076	8.2	25	6,009	1,717
DA05	B42811	1	297	48,918	14,498	7.4	40	6,611	1,959
DA06	B42812	1	281	52,064	16,401	10.4	27	5,006	1,577
Average			261	50,085	14,992		31	5,875	1,751
± SD			40	1,407	1,011		7	662	158

20 days	Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)			
		BaP	NPH	PHN		BaP	NPH	PHN	
DA46	B42929	1	164	47,206	9,116	8.2	20	5,757	1,112
DA47	B42836	1	94	44,939	13,660	7.1	13	6,329	1,924
DA48 R	B43007	1	139	45,309	9,541	5.2	27	8,713	1,835
Average			132	45,818	10,772		20	6,933	1,623
± SD			29	993	2,049		6	1,280	364

33 days	Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)			
		BaP	NPH	PHN		BaP	NPH	PHN	
DA91_0811	B42930	1	286	68,018	14,293	11.7	24	5,814	1,222
DA92	B42932	1	151	45,511	8,638	5.9	26	7,714	1,464
DA93	B42934	1	629	135,756	25,398	6.0	105	22,626	4,233
Average			355	83,095	16,110		52	12,051	2,306
± SD			201	38,354	6,962		38	7,518	1,366

60 days growth	Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)			
		BaP	NPH	PHN		BaP	NPH	PHN	
27_0825 60 days	B43125	1	135	38,324	9,836	3.4	40	11,272	2,893
28_0825 60 days	B43126	1	148	47,860	13,249	9.3	16	5,146	1,425
29_0825 60 days	B43127	1	126	44,094	11,498	8.5	15	5,188	1,353
30_0825 60 days	B43128	1	125	41,923	10,907	2.9	43	14,456	3,761
Average			134	43,050	11,373		28	9,015	2,358
± SD			9	3,458	1,236		13	4,010	1,017

PAHs

06 days	Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)			
		BaP	NPH	PHN		BaP	NPH	PHN	
DA16	B42823	1	452	47,309	12,107	4.8	94	9,856	2,522
DA17	B42825	1	273	47,238	15,357	7.5	36	6,298	2,048
DA18	B42826	1	291	35,269	10,720	4.5	65	7,838	2,382
Average			339	43,272	12,728		65	7,997	2,317
± SD			80	5,669	1,943		24	1,457	199

20 days	Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)			
		BaP	NPH	PHN		BaP	NPH	PHN	
DA49	B42908	1	145	41,046	8,975	4.6	32	8,923	1,951
DA50	B42909	1	186	44,214	9,116	6.9	27	6,408	1,321
DA51	B42911	1	188	48,635	10,528	7.0	27	6,948	1,504

Table 1

			Average	173	44,632	9,540		28	7,426	1,592
			± SD	20	3,112	701		2	1,081	265
<i>60 days growth</i>			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
19_0825	60 days	B43115	1	133	38,170	9,908	2.9	46	13,162	3,417
20_0825	60 days	B43116	1	121	44,240	11,792	5.8	21	7,628	2,033
21_0825	60 days	B43118	1	154	41,893	11,227	2.6	59	16,113	4,318
22_0825	60 days	B43119	1	155	45,336	11,874	3.4	46	13,334	3,482
			Average	141	42,410	11,200		43	12,559	3,315
			± SD	14	2,746	787		14	3,079	820
<i>62 days</i>			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
DA121_0909	B43016	1	106	42,408	8,052	8.2	13	5,172	982	
DA122_0909	B43025	1	109	49,685	6,370	7.4	15	6,714	861	
DA123	B43026	1	97	49,335	6,453	6.3	15	7,831	1,024	
			Average	104	47,143	6,958		14	6,572	956
			± SD	5	3,351	774		1	1,090	69
PCBs										
<i>06 days</i>			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
DA19	B42827	1	206	40,919	12,438	6.0	34	6,820	2,073	
DA20	B42828	1	231	52,371	13,567	7.2	32	7,274	1,884	
DA21	B42829	1	242	49,462	11,315	5.2	47	9,512	2,176	
			Average	226	47,584	12,440		38	7,869	2,044
			± SD	15	4,860	919		6	1,177	121
<i>20 days</i>			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
DA61	B42922	1	153	36,205	7,967	3.5	44	10,344	2,276	
DA62	B42923	1	143	44,283	9,980	5.0	29	8,857	1,996	
DA63	B42925	1	150	36,586	9,104	3.9	38	9,381	2,334	
			Average	149	39,025	9,017		37	9,527	2,202
			± SD	4	3,721	824		6	616	148
<i>60 days growth</i>			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
970825-07	B43642	1	185	21,738	6,446	5.5	35	3,952	1,172	
970825-08	B43643	1	137	21,408	4,730	7.2	19	2,973	657	
970825-09	B43644	1	166	23,847	6,842	5.9	28	4,042	1,160	
970825-10	B43645	1	114	26,959	6,158	3.3	35	8,169	1,866	
			Average	153	23,488	6,044		29	4,784	1,214
			± SD	30	2,212	797		7	1,999	430
<i>62 days</i>			Rept	ng/gm bile			PROTEIN	PROTEIN CORRECTED (ng/mg protein)		
				BaP	NPH	PHN		BaP	NPH	PHN
DA124	B43027	1	92	41,561	5,062	3.9	24	10,657	1,298	

Table 1

DA125	B43028	1	88	39,438	5,282	6.6	13	5,975	800
DA126	B43029	1	119	50,385	8,330	6.8	18	7,410	1,225
			Average	100	43,795	6,225	18	8,014	1,108
			± SD	14	4,740	1,491	4	1,958	219

ANOVA Output: Biliary FAC levels of biomarker study samples (6, 20, 33, 35, 56, and 60 d post exposure) and growth study samples (60 d post exposure).

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Treatment	6	1656.239	276.040	1.727	.1284
Time	6	6026.264	1004.377	6.285	.0001
Treatment * Time	15	4669.636	311.309	1.948	.0335
Residual	66	10546.333	159.793		

Dependent: BAP/Prot

Means Table

Effect: Treatment * Time

Dependent: BAP/Prot

	Count	Mean	Std. Dev.	Std. Error	
None, 0 day	6	32.667	6.282	2.565	from both biomarker and growth studies
A/E, 06 days	3	33.000	10.440	6.028	
A/E, 20 days	3	21.000	9.539	5.508	
A/E, 35 days	3	41.333	3.786	2.186	
A/E, 60 days	4	41.500	13.675	6.837	
HCBD, 06 days	3	31.000	1.732	1.000	
HCBD, 20 days	3	34.000	7.211	4.163	
HCBD, 60 days	4	33.500	8.813	4.406	
HCBD, 56 days	2	2.500	.707	.500	
HWSE-M, 06 days	2	43.000	7.071	5.000	
HWSE-M, 20 days	3	30.000	6.557	3.786	
HWSE-M, 60 days	4	25.500	3.317	1.658	
HWSE-M, 33 days	3	19.667	5.132	2.963	
HWSE-P, 06 days	2	34.000	18.385	13.000	
HWSE-P, 20 days	3	23.667	9.238	5.333	
HWSE-P, 60 days	4	32.500	4.509	2.255	
HWSE-P, 56 days	3	20.333	7.234	4.177	
NQSE, 06 days	3	30.667	8.145	4.702	
NQSE, 20 days	3	20.000	7.000	4.041	
NQSE, 60 days	4	28.500	15.067	7.533	
NQSE, 33 days	3	51.667	46.199	26.673	
PAHs, 06 days	3	65.000	29.000	16.743	
PAHs, 20 days	3	28.667	2.887	1.667	
PAHs, 60 days	4	43.000	15.895	7.948	
PAHs, 62 days	3	14.333	1.155	.667	
PCBs, 06 days	3	37.667	8.145	4.702	
PCBs, 20 days	3	37.000	7.550	4.359	
PCBs, 60 days	4	29.250	7.588	3.794	
PCBs, 62 days	4	18.250	4.500	2.250	

ANOVA Output: Treatment Effects (SuperANOVA, Abacus Concepts Inc., Berkeley, CA).
 Biliary FAC levels at 6 d post exposure.

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Treatment	6	2622.351	437.058	2.049	.1367
Residual	12	2559.333	213.278		

Dependent: BAP/Prot

Means Table

Effect: Treatment

Dependent: BAP/Prot

	Count	Mean	Std. Dev.	Std. Error
A/E	3	33.000	10.440	6.028
HCBD	3	31.000	1.732	1.000
HWSE-M	2	43.000	7.071	5.000
HWSE-P	2	34.000	18.385	13.000
NOSE	3	30.667	8.145	4.702
PAHs	3	65.000	29.000	16.743
PCBs	3	37.667	8.145	4.702

Dunnett Two-Tailed

Effect: Treatment

Dependent: BAP/Prot

Significance level: .05

	Vs.	Diff.	Crit. diff.
A/E	NOSE	-2.333	35.534
	HCBD	-2.000	35.534
	HWSE-P	1.000	39.728
	PCBs	4.667	35.534
	HWSE-M	10.000	39.728
	PAHs	32.000	35.534

None were significantly different at this level.

ANOVA Output: Treatment Effects (SuperANOVA, Abacus Concepts Inc., Berkeley, CA).
 Biliary FAC levels at 20 d post exposure.

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Treatment	6	758.476	126.413	2.294	.0941
Residual	14	771.333	55.095		

Dependent: BAP/Prot

Means Table

Effect: Treatment

Dependent: BAP/Prot

	Count	Mean	Std. Dev.	Std. Error
A/E	3	21.000	9.539	5.508
HCBD	3	34.000	7.211	4.163
HWSE-M	3	30.000	6.557	3.786
HWSE-P	3	23.667	9.238	5.333
NOSE	3	20.000	7.000	4.041
PAHs	3	28.667	2.887	1.667
PCBs	3	37.000	7.550	4.359

Dunnnett Two-Tailed

Effect: Treatment

Dependent: BAP/Prot

Significance level: .05

	Vs.	Diff.	Crit. diff.
A/E	NOSE	-1.000	17.636
	HWSE-P	2.667	17.636
	PAHs	7.667	17.636
	HWSE-M	9.000	17.636
	HCBD	13.000	17.636
	PCBs	16.000	17.636

None were significantly different at this level.

ANOVA Output: Treatment Effects (SuperANOVA, Abacus Concepts Inc., Berkeley, CA).
 Biliary FAC levels at 60 d post exposure.

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Treatment	6	1048.929	174.821	1.469	.2368
Residual	21	2499.750	119.036		

Dependent: BAP/Prot

Means Table

Effect: Treatment

Dependent: BAP/Prot

	Count	Mean	Std. Dev.	Std. Error
A/E	4	41.500	13.675	6.837
HCBD	4	33.500	8.813	4.406
HWSE-M	4	25.500	3.317	1.658
HWSE-P	4	32.500	4.509	2.255
NOSE	4	28.500	15.067	7.533
PAHs	4	43.000	15.895	7.948
PCBs	4	29.250	7.588	3.794

Dunnett Two-Tailed

Effect: Treatment

Dependent: BAP/Prot

Significance level: .05

	Vs.	Diff.	Crit. diff.
A/E	HWSE-M	-16.000	21.523
	NOSE	-13.000	21.523
	PCBs	-12.250	21.523
	HWSE-P	-9.000	21.523
	HCBD	-8.000	21.523
	PAHs	1.500	21.523

None were significantly different at this level.