APPENDIX 17

BATHYMETRIC SURVEY

OF

GARROW LAKE

HYDROGRAPHIC / TOPOGRAPHIC SURVEY
of Garrow Lake
Polaris Mine Closure Project
Nunavut

DATE of SURVEY = August 24-26, 2003
CONTOUR INTERVAL = 2.0 m.
DATUM FOR ELEVATIONS IS MINE CONTROL POINT 84
Depth Sounding & Surveyed Topo Point shown thus.....
Survey Control Points shown thus..... ▲
Spot Elevation shown thus..... x (Typ.)
May.97 (typ.) indicates date of tailing pile derived from Teck Cominco records

This drawing is based on the Polaris Mine datum - Subtract 1000m from elevations to approximate geodetic elevation datum.

teckcominco

DATE	REVISIONS	DR/CK

Focus Surveys
A DIVISION OF THE FOCUS CORPORATION LTD.
Edmonton (780) 486-6555
Calgary (403) 269-2262
Grande Prairie (780) 539-3222
Medicine Hat (403) 527-3707
Regina (306) 586-0837
Fort St.John (250) 785-7776

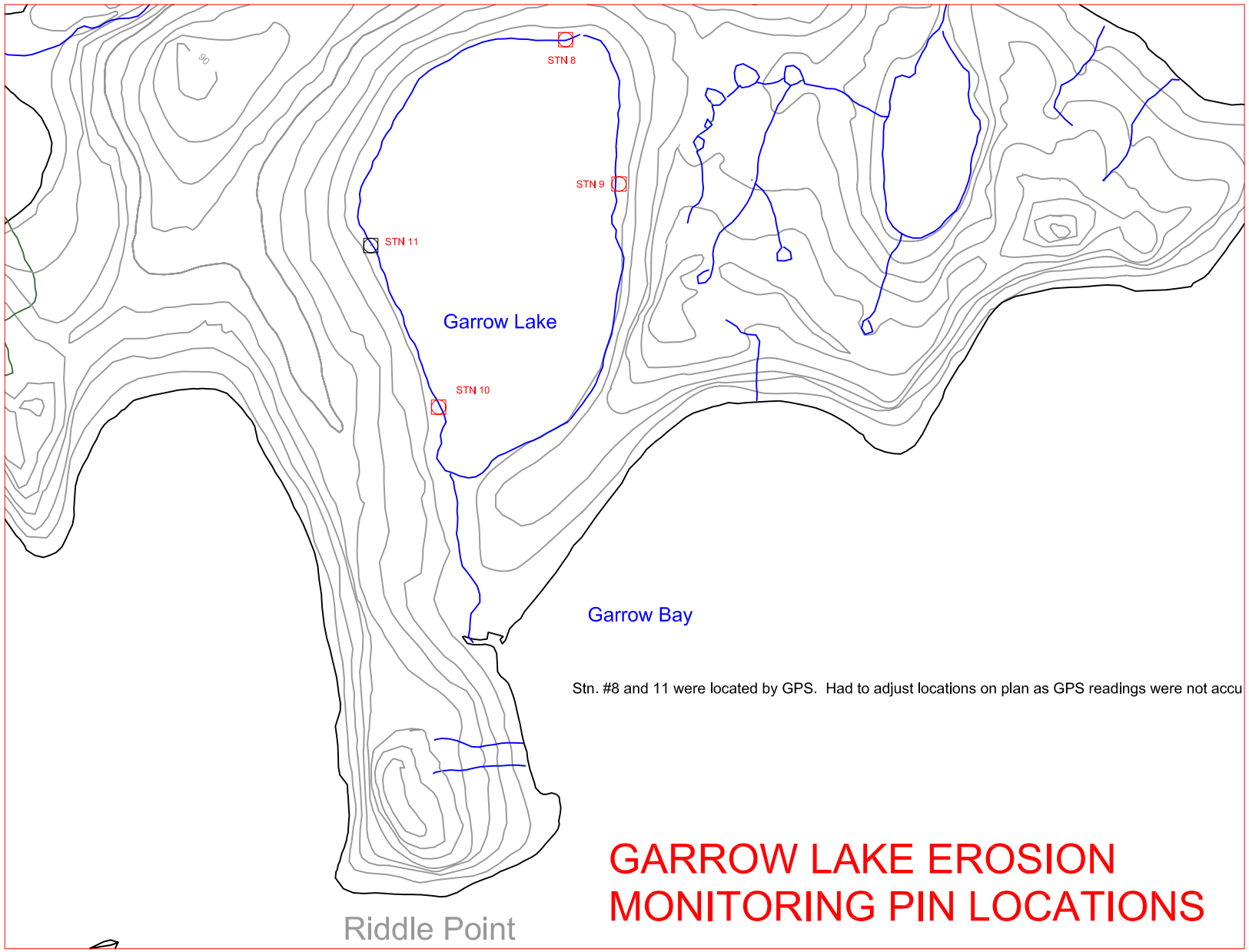
Drawn by : KK	Chk'd by : MT
Date : October 16/03	Scale: 1:5000
Job : 322789-00	FILE No.
Dwg : 322789-00-TP2-0	

APPENDIX 18

RECORD OF

GARROW LAKE

EROSION PIN MONITORING



Stn. #8 and 11 were located by GPS. Had to adjust locations on plan as GPS readings were not accu

GARROW LAKE EROSION MONITORING PIN LOCATIONS

GARROW LAKE EROSION MONITORING PINS

Month	Distance (cm) - Top of Pin to Ground				Photographs Taken
	Stn. 8	Stn. 9	Stn. 10	Stn. 11	
Jul-03	56.5	45.0	61.5	50.0	Yes
Aug-03	56.5	45.0	61.5	50.0	Yes
Sep-03	56.5	44.0	61.0	50.0	Yes
Jul-04					
Aug-04					
Sep-04					

Station # 8 - Garrow Lake North Quadrant
Station # 9 - Garrow Lake East Quadrant
Station # 10 - Garrow Lake South Quadrant
Station # 11 - Garrow Lake West Quadrant

Note - Distance measured is along the side of the pin (not vertical distance)
- Photographs are required of each pin location at the time the measurements are taken

GARROW LAKE

EROSION MONITORING

PHOTOGRAPHS

JULY 2003

JULY 2003

STN 8

STN 9

JULY 2003

STN 10

STN 11

GARROW LAKE

EROSION MONITORING

PHOTOGRAPHS

AUGUST 2003

AUGUST 2003

STN 8

STN 9

AUGUST 2003

STN 10

STN 11

GARROW LAKE

EROSION MONITORING

PHOTOGRAPHS

SEPTEMBER 2003

SEPTEMBER 2003

STN 8

STN 9

SEPTEMBER 2003

STN 10

STN 11

APPENDIX 19

RECORD OF THE

MARINE DOCK AND ADJACENT FORESHORE

EROSION MONITORING

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
Note from July 14 to July 27 Used Improper methodology for analyzing sea water. No rinsing of sample to dissolve salt. Resulted in overstatement of TSS							
DS2-800	14/07/2003	1.76	NA		light wind	N	Turbidity measured 16 hours after collecting the sample. Sample Lost
DS2-1000	14/07/2003	3.53	33.8		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1200	14/07/2003	1.54	31.0		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1400	14/07/2003	4.98	39.0		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1600	14/07/2003	2.53	33.0		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1800	14/07/2003	2.33	32.4		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-600	16/07/2003	2.03	15.7	SW		N	
DS2-800	16/07/2003	0.55	14.4	SW		N	
DS2-1000	16/07/2003	1.1	15.4	SW		N	
DS2-1200	16/07/2003	0.93	16.9	SW		N	
DS2-1400	16/07/2003	1.41	14.8	SW		N	
DS2-1400 QA/QC Duplicate	16/07/2003	0.79	18.9	SW		N	
DS3-1425	16/07/2003	2.66	16.8	SW		N	
DS3-1425 QA/QC Duplicate	16/07/2003	0.9	19.4	SW		N	
DS2-1600	16/07/2003	1.04	19.2	SW		N	
DS2-1800	16/07/2003	1.07	17.8	SW		N	
DS2-600	17/07/2003	1.14	18.5	S	13	N	
DS2-800	17/07/2003	0.55	16.3	S	13	N	
DS2-1000	17/07/2003	0.66	17.9	S	13	N	
DS2-1200	17/07/2003	1.46	18.2	S	13	N	
DS2-1400	17/07/2003	1.55	20.5	S	13	N	
DS3-1425	17/07/2003	0.65	20.9	S	13	N	
DS3-1425 QA/QC Duplicate	17/07/2003	na	20.9	S	13	N	
DS2-1600	17/07/2003	0.86	20	S	13	N	
DS2-1800	17/07/2003	0.41	18.7	S	13	N	
DS2-1800 QA/QC Duplicate	17/07/2003	na	17.9	S	13	N	
DS2-600	18/07/2003	0.71	16.8	SW	20	N	
DS2-800	18/07/2003	0.62	17.3	SW	20	N	
DS2-1000	18/07/2003	1.25	16.2	SW	20	N	
DS2-1200	18/07/2003	0.57	17.3	SW	20	N	
DS2-1400	18/07/2003	0.41	20.3	SW	20	N	
DS3-1425	18/07/2003	0.68	17.6	SW	20	N	
DS3-1425 QA/QC Duplicate	18/07/2003	na	18.4	SW	20	N	
DS2-1600	18/07/2003	0.92	17.9	SW	20	N	
DS2-1800	18/07/2003	0.92	18.1	SW	20	N	
DS2-1800 QA/QC Duplicate	18/07/2003	na	17.9	SW	20	N	
DS2-600	19/07/2003	1.14	14.9	SW	20	N	Ice packed along shore & light rain
DS2-800	19/07/2003	1.13	14.1	SW	20	N	Ice packed along shore & light rain
DS2-1000	19/07/2003	1.7	15.1	SW	20	N	Ice packed along shore & light rain
DS2-1200	19/07/2003	1.11	17.2	SW	20	N	Ice packed along shore & light rain
DS2-1400	19/07/2003	5.77	21.7	SW	20	N	Big waves icy & light rain
DS3-1425	19/07/2003	3.17	19.3	SW	20	N	Big waves icy & light rain
DS3-1425 QA/QC Duplicate	19/07/2003	4.46	20.4	SW	20	N	Big waves icy & light rain
DS2-1600	19/07/2003	5.26	27.1	SW	20	N	Caused by wave action
DS2-1800	19/07/2003	2.35	19.7	SW	20	N	Big waves icy & light rain

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	20/07/2003	1.79	15.2	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-800	20/07/2003	1.17	17	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1000	20/07/2003	0.84	18.8	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1200	20/07/2003	1.31	14.7	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1400	20/07/2003	0.69	19.6	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS3-1425	20/07/2003	0.91	19.2	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS3-1425 QA/QC Duplicate	20/07/2003	1.63	13	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1600	20/07/2003	0.7	19.2	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1800	20/07/2003	0.36	10.8	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-600	21/07/2003	0.55	16.8	S	6	S	clear sky, ice moving, small waves
DS2-800	21/07/2003	0.95	18	S	6	S	clear sky, ice moving, small waves
DS2-1000	21/07/2003	0.78	16.4	S	6	S	clear sky, ice moving, small waves
DS2-1200	21/07/2003	0.84	19.8	S	6	S	wind fr N, clear sky, ice moving, waves getting bigger
DS2-1400	21/07/2003	0.48	16.3	S	6	S	clear sky, ice moving,
DS3-1425	21/07/2003	3.06	18.8	S	6	S	clear sky, ice moving,
DS3-1425 QA/QC Duplicate	21/07/2003	0.73	17	S	6	S	clear sky, ice moving,
DS2-1600	21/07/2003	0.69	17.8	S	6	S	clear sky, ice moving, bigger waves from N
DS2-1800	21/07/2003	1.44	19.2	S	6	S	clear sky, ice moving, bigger waves from N
DS2-600	22/07/2003	13.3	36.2	N	13	N	clear sky, windy, small waves
DS2-800	22/07/2003	4.38	24.9	N	13	N	clear sky, windy, small waves
DS2-1000	22/07/2003	19	46.2	N	13	N	clear sky, windy, small waves
DS2-1200	22/07/2003	9.13	33.4	N	13	N	clear sky, windy, small waves
DS2-1400	22/07/2003	0.99	20.4	N	13	N	clear sky, windy, small waves
DS3-1425	22/07/2003	1.05	21.7	N	13	N	clear sky, windy, small waves
DS3-1425 QA/QC Duplicate	22/07/2003	1.89	21.1	N	13	N	clear sky, windy, small waves
DS2-1600	22/07/2003	2.27	22.8	N	13	N	clear sky, windy, small waves
DS2-1800	22/07/2003	5.07	22.3	N	13	N	clear sky, windy, small waves
DS2-600	23/07/2003	0.55	10.7	SW	4	N	foggy, high tide
DS2-800	23/07/2003	0.55	15.9	SW	4	N	foggy, high tide
DS2-1000	23/07/2003	0.46	na	SW	4	N	not measured
DS2-1200	23/07/2003	0.41	7.6	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1400	23/07/2003	0.84	9.8	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS3-1425	23/07/2003	0.61	15.7	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1600	23/07/2003	0.42	15.8	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1600 QA/QC Duplicate	23/07/2003	0.42	4.2	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1800	23/07/2003	0.49	5	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-600	24/07/2003	0.53	7.2	S	3	N	clear sky, high tide
DS2-800	24/07/2003	0.51	6.7	S	3	N	clear sky, high tide
DS2-1000	24/07/2003	0.67	7.3	S	3	N	clear sky, high tide
DS2-1200	24/07/2003	1.56	7.6	S	3	N	clear sky, high tide
DS2-1400	24/07/2003	2.05	8.3	S	3	N	clear sky, high tide
DS3-1425	24/07/2003	1.14	7.2	S	3	N	clear sky, high tide
DS2-1600	24/07/2003	0.93	8.7	S	3	N	clear sky, high tide
DS2-1800	24/07/2003	0.94	8.4	S	3	N	clear sky, high tide
DS2-600	25/07/2003	0.82	6.2	S	12	N	light rain, foggy, ice along shore
DS2-800	25/07/2003	0.42	6.4	S	12	N	light rain, foggy, ice along shore
DS2-1000	25/07/2003	0.75	7.5	S	12	N	light rain, foggy, ice along shore
DS2-1200	25/07/2003	0.78	8.2	S	12	N	light rain, foggy, ice along shore
DS2-1400	25/07/2003	1.36	9.3	S	12	N	light rain, foggy, ice along shore,slushy ice front of dock, water from the dock sediment pond silting the water between 1200 and 1400
DS3-1425	25/07/2003	0.71	9.3	S	12	N	light rain, foggy, ice along shore, slushy ice front of dock
DS2-1600	25/07/2003	0.63	7.7	S	12	N	light rain, foggy, ice along shore
DS2-1800	25/07/2003	0.55	7.2	S	12	N	light rain, foggy, ice along shore

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	26/07/2003	1.01	5.3	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-800	26/07/2003	1.04	2.6	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1000	26/07/2003	2.78	7.7	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1200	26/07/2003	0.65	6	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1400	26/07/2003	1.5	9.5	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS3-1425	26/07/2003	1.2	8.3	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1600	26/07/2003	0.54	4.7	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1600 QA/QC Duplicate	26/07/2003	0.5	4.4	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1800	26/07/2003	0.54	5.1	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-600	27/07/2003	2.11	11.9	S	5	N	High tide,calm water, cloudy, silting between 600 & 800
DS2-800	27/07/2003	0.81	10.3	S	5	N	High tide,calm water, cloudy, silting between 600 & 801
DS2-1000	27/07/2003	0.69	9.1	S	5	N	High tide, calm water,cloudy
DS2-1200	27/07/2003	0.48	10.4	S	5	N	High tide, calm water,cloudy
DS2-1400	27/07/2003	0.57	9.5	S	5	N	High tide, calm water,cloudy
DS2-1600	27/07/2003	0.58	5.2	S	5	N	High tide, calm water,cloudy,ice packed along shore
DS2-1800	27/07/2003	0.56	2	S	5	N	High tide, calm water,cloudy,ice packed along shore
DS2-1800 QA/QC Duplicate	27/07/2003	0.69	2.3	S	5	N	High tide, calm water,cloudy,ice packed along shore
Changed methodology, started rinsing with 1L distilled water to remove salt from filter paper before weighing.							
DS2-600 Rinsed	28/7/2003	6.17	6.2	S	13	N	600 & 800/ 1L rinsed distilled
DS2-600 Not rinsed	28/7/2003	6.17	20.2	S	13	N	Ice packed in the Bay and shore, raining, high tide
DS2-800 Rinsed	28/7/2003	92.1	***67.2***	S	13	N	Not due to construction activities, Ice packed in bay, should revisit southern silt fence
DS2-800 Not rinsed	28/7/2003	92.1	84	S	13	N	Ice packed in the Bay,and shore,wtaer flow Fr. S to N. Raining, high tide
DS2-1000 Rinsed	28/7/2003	13	9.6	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1000 Not rinsed	28/7/2003	13	25.2	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1200 Rinsed	28/7/2003	7.9	6.6	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1400 Rinsed	28/7/2003	3.46	4.2	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1400 Not rinsed	28/7/2003	3.46	20	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1425 Rinsed	28/7/2003	8.08	5.8	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1425 Not rinsed	28/7/2003	8.08	18	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1600 Rinsed	28/7/2003	1.66	3.4	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1600 Not rinsed	28/7/2003	1.66	17.4	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1800 Rinsed	28/7/2003	1.1	1	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1800 Not rinsed	28/7/2003	1.1	7.2	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1800 QA/QC Rinsed	28/7/2003	1.68	0.8	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1800 QA/QC Not rinsed	28/7/2003	1.68	6.4	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-600 Rinsed	29/7/2003	9.99	9.9	W	15	N	Ice packed in the Bay and shore, snowing
DS2-600 Not rinsed	29/7/2003	9.99	18.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-800 Rinsed	29/7/2003	3.95	4.6	W	15	N	Ice packed in the Bay and shore, snowing
DS2-800 Not rinsed	29/7/2003	3.64	33.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1000 Rinsed	29/7/2003	4.04	4.7	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1000 Not rinsed	29/7/2003	3.63	23.6	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1200 Rinsed	29/7/2003	2.92	3.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1200 Not rinsed	29/7/2003	2.78	23.2	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1400 Rinsed	29/7/2003	1.91	5.2	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1400 Not rinsed	29/7/2003	1.39	34.2	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1425 Rinsed	29/7/2003	3.01	5.3	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1425 Not rinsed	29/7/2003	2.65	***35.6***	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1600 Rinsed	29/7/2003	4.47	4.1	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1600 Not rinsed	29/7/2003	2.12	30.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1800 Rinsed	29/7/2003	4.11	2.1	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1800 Not rinsed	29/7/2003	5.79	11.6	W	15	N	Ice packed in the Bay and shore, snowing

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600 Rinsed	30/07/2003	5.28	7	SW	25	N	Ice packed in the Bay and shore
DS2-600 Not rinsed	30/07/2003	5.28	21.6	SW	25	N	Ice packed in the Bay and shore
DS2-800 Rinsed	30/07/2003	6.08	6	SW	25	N	Ice packed in the Bay and shore
DS2-800 Not Rinsed	30/07/2003	6.08	19.6	SW	25	N	Ice packed in the Bay and shore
DS2-1000 Rinsed	30/07/2003	3.92	8.4	SW	25	N	Ice packed in the Bay and shore
DS2-1000 Not rinsed	30/07/2003	3.92	33	SW	25	N	Ice packed in the Bay and shore
DS2-1200 Rinsed	30/07/2003	2.53	4.4	SW	25	N	Ice packed in the Bay and shore
DS2-1200 Not rinsed	30/07/2003	2.53	22.4	SW	25	N	Ice packed in the Bay and shore
DS2-1400 Rinsed	30/07/2003	3.64	7.6	SW	25	N	Ice packed in the Bay and shore
DS2-1400 Not rinsed	30/07/2003	3.64	4.4	SW	25	N	Ice packed in the Bay and shore
DS2-1425 Rinsed	30/07/2003	4.51	11.4	SW	25	N	Ice packed in the Bay and shore
DS2-1425 Not rinsed	30/07/2003	4.51	***38.8***	SW	25	N	Ice packed in the Bay and shore
DS2-1600 Rinsed	30/07/2003	0.63	3.8	SW	25	N	Ice packed in the Bay and shore
DS2-1600 Not rinsed	30/07/2003	0.63	17.8	SW	25	N	Ice packed in the Bay and shore
DS2-1800 Rinsed	30/07/2003	0.88	3.4	SW	25	N	Ice packed in the Bay and shore
DS2-1800 Not rinsed	30/07/2003	0.88	13.8	SW	25	N	Ice packed in the Bay and shore
DS2-1800 QA/QC Rinsed	30/07/2003	1.27	2.6	SW	25	N	Ice packed in the Bay and shore
DS2-1800 QA/QC Not rinsed	30/07/2003	1.27	15.8	SW	25	N	Ice packed in the Bay and shore
DS2-600	01/08/2003	1.4	2	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-800	01/08/2003	1.36	5.9	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1000	01/08/2003	3.03	5.9	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1200	01/08/2003	1.12	2.8	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1400	01/08/2003	5.3	6.3	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS3-1425	01/08/2003	NA	NA	W	9	N	Too much water on dock DS2-1425
DS2-1600	01/08/2003	0.88	10.2	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1800	01/08/2003	0.68	2.1	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1800 QA/QC Duplicate	01/08/2003	0.72	1.5	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-600	02/08/2003	0.77	0.6	NW	10	N	Low tide, fogged in, picture taken
DS2-800	02/08/2003	2.79	1.5	NW	10	N	Low tide, fogged in, picture taken
DS2-1000	02/08/2003	1.91	2	NW	10	N	Low tide, fogged in, picture taken
DS2-1200	02/08/2003	1.27	1.1	NW	10	N	Low tide, fogged in, picture taken
DS2-1400	02/08/2003	50.9	***36.2***	NW	10	N	Work stopped during break, loading from stockpile during night shift
DS3-1425	02/08/2003	NA	NA	NW	10	N	Too much water on dock DS2-1425
DS2-1600	02/08/2003	1.3	1.9	NW	10	N	Low tide, fogged in, picture taken
DS2-1800	02/08/2003	0.62	2.3	NW	10	N	Low tide, fogged in, picture taken
DS2-1800 QA/QC Duplicate	02/08/2003	0.9	1.9	NW	10	N	Low tide, fogged in, picture taken
DS2-600	03/08/2003	1.4	1.6	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-800	03/08/2003	0.8	0.9	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1000	03/08/2003	1.07	1.1	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1200	03/08/2003	2.07	3.7	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1400	03/08/2003	NA	NA	NW	10	NA	Too much water on dock DS2-1400
DS3-1425	03/08/2003	3.17	2.2	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1600	03/08/2003	2.25	3.5	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1800	03/08/2003	2.02	3.7	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1800 QA/QC Duplicate	03/08/2003	2.27	26	NW	10	NA	Forgot to rinse sample with distilled water
DS2-600	04/08/2003	35.6	***39.3***	NE	25	S	Wave action, not due to construction activities
DS2-800	04/08/2003	2.33	4.3	NE	25	S	Ice along shore, open water in bay
DS2-1000	04/08/2003	1.02	NA	NE	25	S	Forgot to wiegh empty filter
DS2-1200	04/08/2003	1.31	24.8	NE	25	S	Wave action, not due to construction activities
DS2-1400	04/08/2003	NA	NA	NE	25	S	Too much water on dock DS2-1400
DS3-1425	04/08/2003	0.81	1.9	NE	25	S	Ice along shore, open water in bay
DS2-1600	04/08/2003	2.16	4.4	NE	25	S	Ice along shore, open water in bay
DS2-1800	04/08/2003	2.87	7.2	NE	25	S	Ice along shore, open water in bay
DS2-1800 QA/QC Duplicate	04/08/2003	2.4	5.7	NE	25	S	Ice along shore, open water in bay

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

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Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	05/08/2003	2.84	5	NE	15	NA	Ice along shore, open water in bay
DS2-800	05/08/2003	0.85	2.4	NE	15	NA	Ice along shore, open water in bay
DS2-1000	05/08/2003	1.56	3.7	NE	15	NA	Ice along shore, open water in bay
DS2-1200	05/08/2003	3.47	5.9	NE	15	NA	Ice along shore, open water in bay
DS2-1400	05/08/2003	NA	NA	NE	15	NA	Too much water on dock DS2-1400
DS3-1425	05/08/2003	2.04	3.8	NE	15	NA	Ice along shore, open water in bay
DS2-1600	05/08/2003	1.48	3.6	NE	15	NA	Ice along shore, open water in bay
DS2-1800	05/08/2003	2.48	4.2	NE	15	NA	Ice along shore, open water in bay
DS2-1800 QA/QC Duplicate	05/08/2003	2.16	6.9	NE	15	NA	Ice along shore, open water in bay
DS2-600	06/08/2003	1.75	1.8	NA	NA	S	Partly cloudy, calm water
DS2-800	06/08/2003	0.64	0.9	NA	NA	S	Partly cloudy, calm water
DS2-1000	06/08/2003	0.75	1	NA	NA	S	Partly cloudy, calm water
DS2-1200	06/08/2003	0.77	1.9	NA	NA	S	Partly cloudy, calm water
DS2-1400	06/08/2003	0.85	1.3	NA	NA	S	Partly cloudy, calm water
DS3-1425	06/08/2003	NA	NA	NA	NA	S	Too much water to access station
DS2-1600	06/08/2003	NA	NA	NA	NA	S	Forgot to write the wieght,filter empty
DS2-1800	06/08/2003	0.97	1.4	NA	NA	S	Partly cloudy, calm water
DS2-1800 QA/QC Duplicate	06/08/2003	1.07	2.8	NA	NA	S	Partly cloudy, calm water
DS2-600	07/08/2003	60.5	93.7	SW	30	N	Cloudy, big waves from SW
DS2-800	07/08/2003	110	***177.2***	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1000	07/08/2003	85	112.4	SW	30	N	Cloudy, big waves from SW
DS2-1200	07/08/2003	84.5	***119.6***	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1400	07/08/2003	139	***206***	SW	30	N	Washing of fines from within cells, asked to reinforce silt fencing along dock cells
DS3-1425	07/08/2003	NA	NA	SW	30	N	Cloudy, big waves from SW
DS2-1600	07/08/2003	54.6	103.2	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1800	07/08/2003	58.5	106.8	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1800 QA/QC Duplicate	07/08/2003	61.5	78.4	SW	30	N	Cloudy, big waves from SW
DS2-600	08/08/2003	2.73	2	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-800	08/08/2003	1.75	3.1	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1000	08/08/2003	1.32	3.3	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1200	08/08/2003	1.97	2.2	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1400 at 1325	08/08/2003	81.2	***61.2***	S	10	N	Work stopped during break and did not continue during night shift.
DS3-1425 at 1450	08/08/2003	1.38	2.7	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1600	08/08/2003	1.34	3	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1800	08/08/2003	1.13	***27.1***	S	10	N	Work stopped during break and did not continue during night shift.
DS2-1800 QA/QC Duplicate	08/08/2003	1.23	7.1	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-600	09/08/2003	5.79	14	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-800	09/08/2003	6.04	18.8	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1000	09/08/2003	7.7	17.4	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1200	09/08/2003	8.82	18	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1400 at 1325	09/08/2003	132	***126***	SW	15	N	Caused by construction activities. Stop work order issued
DS3-1425 at 1450	09/08/2003	2.02	15.2	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1600	09/08/2003	5.04	13.6	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1800	09/08/2003	10	31	SW	15	N	Stop work order issued
DS2-1800 QA/QC Duplicate	09/08/2003	14.2	27.6	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-600	10/08/2003	84.6	107.6	W	24	N	Big waves from the South
DS2-800	10/08/2003	18.8	31	W	24	N	Big waves from the South
DS2-1000	10/08/2003	26.6	33.6	W	24	N	Big waves from the South
DS2-1200	10/08/2003	46.2	80	W	24	N	Big waves from the South
DS2-1400 at 1325	10/08/2003	33.5	67.2	W	24	N	Big waves from the South
DS3-1425 at 1450	10/08/2003	25.1	50.8	W	24	N	Big waves from the South
DS2-1600	10/08/2003	41.9	66.4	W	24	N	Big waves from the South
DS2-1800	10/08/2003	6.88	24.8	W	24	N	Big waves from the South
DS2-1800 QA/QC Duplicate	10/08/2003	7.78	24.4	W	24	N	Big waves from the South

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

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Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	11/08/2003	30.6	21.8	S	17	N	Big waves from the South
DS2-800	11/08/2003	23	22.2	S	17	N	Big waves from the South
DS2-1000	11/08/2003	22.4	29.4	S	17	N	Big waves from the South
DS2-1200	11/08/2003	24.7	26.8	S	17	N	Big waves from the South
DS2-1400 at 1325	11/08/2003	15	24.2	S	17	N	Big waves from the South
DS3-1425 at 1450	11/08/2003	2.3	7	S	17	N	Big waves from the South
DS2-1600	11/08/2003	16.1	22.8	S	17	N	Big waves from the South
DS2-1800	11/08/2003	32.5	40.2	S	17	N	Not due to construction activities, not working in area along exposed shoreline.
DS2-1800 QA/QC Duplicate	11/08/2003	32.5	43	S	17	N	Big waves from the South
DS2-600	12/08/2003	4.76	16.6	S	14	S	
DS2-800	12/08/2003	1.18	3.3	S	14	S	
DS2-1000	12/08/2003	2.68	0.2	S	14	S	
DS2-1200	12/08/2003	3.44	0	S	14	S	
DS2-1400 at 1325	12/08/2003	48.1	***46.6***	S	14	S	Not due to construction activities, not working at dock or along expoosed shoreline
DS3-1425 at 1450	12/08/2003	12.1	17.4	S	14	S	
DS2-1600	12/08/2003	10.6	15.2	S	14	S	
DS2-1800	12/08/2003	11.2	22.5	S	14	S	
DS2-1800 QA/QC Duplicate	12/08/2003	11.9	20.6	S	14	S	
DS2-600	13/08/2003	25.5	25.9	W	20	N	
DS2-800	13/08/2003	15.8	19.4	W	20	N	
DS2-1000	13/08/2003	32	33.4	W	20	N	
DS2-1200	13/08/2003	35.2	39.8	W	20	N	
DS2-1400 at 1325	13/08/2003	187	***224***	W	20	N	Work stopped during break, loading stockpile during night shift
DS3-1425 at 1450	13/08/2003	35.8	41.8	W	20	N	
DS2-1600	13/08/2003	56	***71.8***	W	20	N	Work stopped during break, loading stockpile during night shift
DS2-1800	13/08/2003	37.6	***53***	W	20	N	Work stopped during break, loading stockpile during night shift
DS2-1800 QA/QC Duplicate	13/08/2003	34.7	49	W	20	N	
DS2-600	15/08/2003	0.87	3.6	W	5	S	
DS2-800	15/08/2003	0.6	4	W	5	S	
DS2-1000	15/08/2003	0.58	3.4	W	5	S	
DS2-1200	15/08/2003	0.74	3.4	W	5	S	
DS2-1400 at 1325	15/08/2003	0.95	4.1	W	5	S	
DS3-1425 at 1450	15/08/2003	0.82	4.5	W	5	S	
DS2-1600	15/08/2003	0.79	2.8	W	5	S	
DS2-1800	15/08/2003	0.67	4.1	W	5	S	
DS2-1800 QA/QC Duplicate	15/08/2003	0.81	4	W	5	S	
DS2-600	16/08/2003	1.87	5.1	NA	NA	NA	
DS2-800	16/08/2003	1.77	3.3	NA	NA	NA	
DS2-1000	16/08/2003	4.68	6	NA	NA	NA	
DS2-1200	16/08/2003	3.16	4.7	NA	NA	NA	
DS2-1400 at 1325	16/08/2003	3.4	5.3	NA	NA	NA	
DS3-1425 at 1450	16/08/2003	2.69	5.2	NA	NA	NA	
DS2-1600	16/08/2003	5.46	6.5	NA	NA	NA	
DS2-1800	16/08/2003	2.65	3.7	NA	NA	NA	
DS2-1800 QA/QC Duplicate	16/08/2003	2.77	5.2	NA	NA	NA	
DS2-600	17/08/2003	1.14	4.5	NW	12	S	
DS2-800	17/08/2003	0.59	3.8	NW	12	S	
DS2-1000	17/08/2003	0.86	3.3	NW	12	S	
DS2-1200	17/08/2003	1.02	3.5	NW	12	S	
DS2-1400 at 1325	17/08/2003	1.11	4.1	NW	12	S	
DS3-1425 at 1450	17/08/2003	1.73	3.1	NW	12	S	
DS2-1600	17/08/2003	1.14	3.9	NW	12	S	
DS2-1800	17/08/2003	0.93	3.9	NW	12	S	
DS2-1800 QA/QC Duplicate	17/08/2003	0.82	4.9	NW	12	S	

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

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Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	18/08/2003	0.82	4.5	S	13	S	
DS2-800	18/08/2003	0.76	3.6	S	13	S	
DS2-1000	18/08/2003	0.51	3	S	13	S	
DS2-1200	18/08/2003	1.03	6.1	S	13	S	
DS2-1400 at 1325	18/08/2003	1.29	4.5	S	13	S	
DS3-1425 at 1450	18/08/2003	1.92	4.3	S	13	S	
DS2-1600	18/08/2003	1.98	5.6	S	13	S	
DS2-1800	18/08/2003	1.81	5.5	S	13	S	
DS2-1800 QA/QC Duplicate	18/08/2003	1.71	4.6	S	13	S	
DS2-600	19/08/2003	1.58	3.7	N	6	NA	
DS2-800	19/08/2003	1.97	3.7	N	6	NA	
DS2-1000	19/08/2003	2.56	4.2	N	6	NA	
DS2-1200	19/08/2003	2.47	4.5	N	6	NA	
DS2-1400 at 1325	19/08/2003	3.58	6.8	N	6	NA	
DS2-1400 at 1325 QA/QC Duplicate	19/08/2003	2.28	5.4	N	6	NA	
DS3-1425 at 1450	19/08/2003	1.9	3.6	N	6	NA	
DS2-1600	19/08/2003	0.64	2.9	N	6	NA	
DS2-1800	19/08/2003	1.07	18.7	N	6	NA	Forgot to rinse filter
DS2-600	20/08/2003	1.11	4.3	SW	12	NA	
DS2-600 QA/QC duplicate	20/08/2003	0.98	4.4	SW	12	NA	
DS2-800	20/08/2003	0.99	4.9	SW	12	NA	
DS2-1000	20/08/2003	1.59	4	SW	12	NA	
DS2-1200	20/08/2003	1.58	5.4	SW	12	NA	
DS2-1400 at 1325	20/08/2003	1.12	5.3	SW	12	NA	
DS3-1425 at 1450	20/08/2003	1.5	3.8	SW	12	NA	
DS2-1600	20/08/2003	0.95	4.5	SW	12	NA	
DS2-1800	20/08/2003	0.99	-2.7	SW	12	NA	Filter ripped on tin plate
DS2-600	21/08/2003	1.19	9.5	NW	12	NA	
DS2-800	21/08/2003	1.52	5.4	NW	12	NA	
DS2-800 QA/QC Duplicate	21/08/2003	1.54	4.1	NW	12	NA	
DS2-1000	21/08/2003	0.69	4.7	NW	12	NA	
DS2-1200	21/08/2003	3.14	7	NW	12	NA	
DS2-1400 at 1325	21/08/2003	3.5	6	NW	12	NA	
DS3-1425 at 1450	21/08/2003	2.75	5	NW	12	NA	
DS2-1600	21/08/2003	0.88	5.2	NW	12	NA	
DS2-1800	21/08/2003	1.41	4.2	NW	12	NA	
DS2-600	22/08/2003	1.05	5.3	W	15	NA	
DS2-800	22/08/2003	1.06	17.6	W	15	NA	Forgot to rinse filter
DS2-1000	22/08/2003	1.7	4.9	W	15	NA	
DS2-1200	22/08/2003	2.88	4.3	W	15	NA	
DS2-1400	22/08/2003	5.11	8	W	15	NA	
DS3-1425	22/08/2003	2.3	4.8	W	15	NA	
DS2-1600	22/08/2003	0.92	4.7	W	15	NA	
DS2-1800	22/08/2003	1.31	5.3	W	15	NA	
DS3-1425 QA/QC	22/08/2003	2.21	7.6	W	15	NA	
DS2-600	23/08/2003	2.92	2.1	SW	15	N	waves from SW to NE
DS2-800	23/08/2003	26.1	24.1	SW	15	N	Caused by wave action
DS2-1000	23/08/2003	17.6	17.5	SW	15	N	Caused by wave action
DS2-1200	23/08/2003	29.1	10.1	SW	15	N	waves from SW to NE
DS2-1400 at south side of dock cell	23/08/2003	3.18	1	SW	15	N	waves from SW to NE
DS3-1425 at north side of dock cell	23/08/2003	3.02	12.5	SW	15	N	Caused by wave action
DS2-1600	23/08/2003	2.61	8.6	SW	15	N	waves from SW to NE
DS2-1800	23/08/2003	2.39	0.8	SW	15	N	waves from SW to NE
DS2-1800 QA/QC Duplicate	23/08/2003	2.39	2.3	SW	15	N	waves from SW to NE

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

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Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	24/08/2003	1.89	5.7	SE	15	N	waves from SW to NE
DS2-800	24/08/2003	2.3	1.2	SE	15	N	waves from SW to NE
DS2-1000	24/08/2003	6.73	3.8	SE	15	N	waves from SW to NE
DS2-1200	24/08/2003	5.21	3.7	SE	15	N	waves from SW to NE
DS2-1200 QA/QC duplicate	24/08/2003	3.74	4.3	SE	15	N	waves from SW to NE
DS2-1400 at south side of dock cell	24/08/2003	8.76	8.9	SE	15	N	waves from SW to NE
DS3-1425 at north side of dock cell	24/08/2003	3.86	3	SE	15	N	waves from SW to NE
DS2-1600	24/08/2003	2.88	6.2	SE	15	N	waves from SW to NE
DS2-1800	24/08/2003	1.26	2.7	SE	15	N	waves from SW to NE
DS2-600	25/08/2003	0.89	5.1	SW	5	NA	waves from West to east
DS2-600 QA/QC duplicate using nev	25/08/2003	0.89	3.9	SW	5	NA	waves from West to east
DS2-800	25/08/2003	1.28	3.5	SW	5	NA	waves from West to east
DS2-800 QA/QC Duplicate	25/08/2003	1.23	4.4	SW	5	NA	waves from West to east
DS2-1000	25/08/2003	1.02	4.4	SW	5	NA	waves from West to east
DS2-1200	25/08/2003	1.67	3.6	SW	5	NA	waves from West to east
DS2-1400 at south side of dock cell	25/08/2003	1.63	8.9	SW	5	NA	waves from West to east
DS3-1425 at north side of dock cell	25/08/2003	2.23	1.1	SW	5	NA	waves from West to east
DS2-1600	25/08/2003	1.67	2.4	SW	5	NA	waves from West to east
DS2-1800	25/08/2003	1.14	2.7	SW	5	NA	waves from West to east
DS2-600	26/08/2003	1.04	3.5	S	0	NA	no flow direction, no waves
DS2-600 (S&S filter)	26/08/2003	1.85	6.3	S	0	NA	no flow direction, no waves
DS2-800	26/08/2003	0.95	4.8	S	0	NA	no flow direction, no waves
DS2-800 QA/QC Duplicate	26/08/2003	1.65	3.7	S	0	NA	no flow direction, no waves
DS2-1000	26/08/2003	0.96	3.9	S	0	NA	no flow direction, no waves
DS2-1000 (S&S filter)	26/08/2003	0.91	4.7	S	0	NA	no flow direction, no waves
DS2-1200	26/08/2003	0.8	1.5	S	0	NA	no flow direction, no waves
DS2-1200 (S&S filter)	26/08/2003	2.1	6.3	S	0	NA	no flow direction, no waves
DS2-1400 at south side of dock cell	26/08/2003	1.33	5.7	S	0	NA	no flow direction, no waves
DS2-1400 Duplicate	26/08/2003	1.48	5	S	0	NA	no flow direction, no waves
DS3-1425 at north side of dock cell	26/08/2003	2.84	4.3	S	0	NA	no flow direction, no waves
DS2-1600	26/08/2003	1.25	6.3	S	0	NA	no flow direction, no waves
DS201800	26/08/2003	1.78	5.6	S	0	NA	no flow direction, no waves
DS2-600	27/08/2003	1.34	8.31	E	3	NA	no flow direction, no waves
DS2-600 QA/QC Duplicate	27/08/2003	1.67	3.8	E	3	NA	no flow direction, no waves
DS2-800	27/08/2003	1.2	7.4	E	3	NA	no flow direction, no waves
DS2-800 (S&S filter)	27/08/2003	1.06	6.7	E	3	NA	no flow direction, no waves
DS2-1000	27/08/2003	0.65	5.9	E	3	NA	no flow direction, no waves
DS2-1000 (S&S filter)	27/08/2003	1.68	4.3	E	3	NA	no flow direction, no waves
DS2-1200	27/08/2003	1.78	2.9	E	3	NA	no flow direction, no waves
DS2-1600	27/08/2003	0.92	5.6	E	3	NA	no flow direction, no waves
DS2-1800	27/08/2003	0.93	5.6	E	3	NA	no flow direction, no waves
DS2-600	31/08/2003	0.42	3.9	W	2	S	
DS2-800	31/08/2003	0.96	5	W	2	S	
DS2-1000	31/08/2003	0.6	5.7	W	2	S	
DS2-1200	31/08/2003	1.16	4.8	W	2	S	
DS2-1200 QA/QC duplicate	31/08/2003	0.81	4.9	W	2	S	
DS2-1400 at south side of dock cell	31/08/2003	0.76	4	W	2	S	
DS3-1425 at north side of dock cell	31/08/2003	1.6	2.5	W	2	S	
DS2-1600	31/08/2003	1.94	5	W	2	S	
DS2-1800	31/08/2003	1.09	3.6	W	2	S	
No work along shoreline from September 1 to September 15 except September 12th, no TSS sampling as a result.							

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	12/09/2003	1.24	6	SW	18	NA	
DS2-800	12/09/2003	1.91	2.7	SW	18	NA	
DS2-1000	12/09/2003	1.11	5.3	SW	18	NA	
DS2-1200	12/09/2003	1.26	5.8	SW	18	NA	
DS2-1400 at south side of dock cell	12/09/2003	1.82	5.1	SW	18	NA	
DS3-1425 at north side of dock cell	12/09/2003	0.68	3.7	SW	18	NA	
DS2-1600	12/09/2003	1.05	6.2	SW	18	NA	
DS2-1800	12/09/2003	0.64	5.5	SW	18	NA	
Work along shoreline, TSS sampling resumed							
DS2-600	15/09/2003	0.45	4.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-800	15/09/2003	0.57	3.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1000	15/09/2003	0.75	3.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1200	15/09/2003	0.45	4.5	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1400 at 1325	15/09/2003	1.46	5	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS3-1425 at 1450	15/09/2003	0.99	4.9	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1600	15/09/2003	0.84	4.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1800	15/09/2003	0.55	3.5	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1800 QA/QC Duplicate	15/09/2003	0.7	4.1	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-600	17/09/2003	0.65	4.7	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-800	17/09/2003	0.66	3.4	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1000	17/09/2003	0.55	5	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1200	17/09/2003	0.41	4.7	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1400 at 1325	17/09/2003	2.11	6.2	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS3-1425 at 1450	17/09/2003	1.45	5.9	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1600	17/09/2003	0.54	4.3	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800	17/09/2003	0.73	3.5	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800 QA/QC Duplicate	17/09/2003	0.73	4.7	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-600	18/09/2003	0.46	4.2	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-800	18/09/2003	0.79	4.2	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1000	18/09/2003	0.62	4.4	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1200	18/09/2003	0.47	4.1	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1400 at 1325	18/09/2003	0.8	4.5	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS3-1425 at 1450	18/09/2003	0.97	2.8	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1600	18/09/2003	0.69	4	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1800	18/09/2003	0.48	3.2	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1800 QA/QC Duplicate	18/09/2003	0.48	3	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-600	19/09/2003	0.43	3.5	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-800	19/09/2003	0.39	3.9	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1000	19/09/2003	0.45	3.9	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1200	19/09/2003	0.54	4	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1400 at 1325	19/09/2003	0.58	3.8	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS3-1425 at 1450	19/09/2003	0.89	3.8	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1600	19/09/2003	0.56	4	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800	19/09/2003	1.4	4.1	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800 QA/QC Duplicate	19/09/2003	1.4	4.6	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-600	20/09/2003	1.03	4	S	5	NA	Low tide , slush on surface, ice packed in the Bay and shore, foggy, light snow.
DS2-800	20/09/2003	0.82	4.6	S	5	NA	Low tide , slush on surface, ice packed in the Bay and shore, foggy, light snow.
DS2-1000	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1200	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1400 at 1325	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS3-1425 at 1450	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1600	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1800	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1800 QA/QC Duplicate	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.

TSS Sampling completed September 19th, shore iced in.

Marine Shoreline Photographs
Week of July 18, 2003

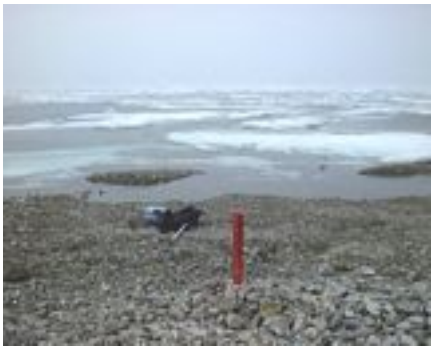

Station 800N


Station 1000N


Station 1200N

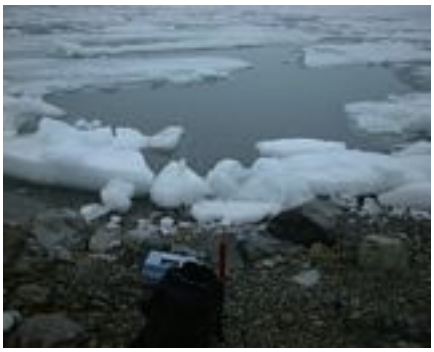

Station 1400N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of July 25, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of August 2, 2003

Station 600N

Station 800N

Station 1000N

Station 1200N

Station 1400N

Could not access station

Station 1425N

Station 1600N

Station 1800N

Marine Shoreline Photographs
Week of August 9, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of August 17, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of August 24, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of September 21, 2003

Station 600N

Station 800N

Station 1000N

Station 1200N

Station 1400N

Could not access station

Station 1425N

Station 1600N

Station 1800N

APPENDIX 20

SUMMARY OF

EFFLUENT MONITORING

AND

EFFLUENT CHARACTERIZATION

POLARIS MINE – MMER MONITORING REPORT

3rd QUARTER 2003

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13: 96 hr acute rainbow trout test

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14: 72 hr acute *Daphnia magna* test

APPENDIX C

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPAW 95-EPA West Coast: 7-day Topsmelt Survival and Growth Test.

APPENDIX D

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPS 1/Rm/27-EC: 92 hr Echinoderm (sand dollar) Fertilization Test (Annual)

APPENDIX E

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPA/600/4-91-003, Method 1009.0: Algae (*Champia parvula*) 7-day Sublethal Growth Test (Annual).

APPENDIX F (Mass Loadings)

i. Concentration & monthly mean concentrations of each deleterious substance of Schedule 4
ii. pH of the effluents samples as required by subsection 12(1)
iii. Description of sample collection method
iv. Total volume of effluent deposited during each month of the quarter as per section 19
v. Mass loading of the deleterious substances set out in Schedule 4 and as per section 20

APPENDIX G

i. Results of the effluent characterization as per paragraph 15(1)(a)

APPENDIX A

96-h Acute Rainbow Trout Toxicity Test

Reporting Requirements for Reference Method EPS 1/RM/13

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Wednesday July 30, 2003 - 1:00 PM
   - Test 2: Wednesday August 20, 2003 - 12:30 AM
   - Test 3: Tuesday September 16, 2003 - 5:00 PM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - 96-hour Rainbow Trout LC_{50}

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements
   - Salinity controls were run
   - Sample water salinity was 2ppt (Test 1); 4ppt (Test 2), and 6ppt (Test 3)

iii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iv. Percent mortality of fish in stock tank(s)
   - Test 1: 0.1%
   - Test 2: 0.1%
   - Test 3: 1%

v. Species of test organism
   - Rainbow Trout (*Oncorhynchus mykiss*)

vi. Date and time for start of definitive test
   - Test 1: Saturday August 2, 2003 - 2:00 PM
   - Test 2: Friday August 22, 2003 - 12:30 PM
   - Test 3: Friday September 19, 2003 - 5:00 PM

vii. Person(s) performing the test and verifying the results
   - Andy Diewald, Devika Jayaweera, May Lee

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH - 7.8, T - 15.0°C, DO - 10.0mg/L, C - 4100µmhos/cm
   - Test 2: pH - 7.8, T - 15.0°C, DO - 10.1mg/L, C - 6000µmhos/cm
   - Test 3: pH - 8.1, T - 16.0°C, DO - 10.0mg/L, C - 8000µmhos/cm

Reporting Requirements for Reference Method EPS 1/RM/13

ix. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment
- Test 3: No pH adjustment

x. Indication of aeration of test solutions before introduction of fish
- Test 1: 6.5 ± 1 mL/min/L for 60mins
- Test 2: 6.5 ± 1 mL/min/L for 90mins
- Test 3: 6.5 ± 1 mL/min/L for 120mins

xi. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 12 L (test 1&2), 15 L (test 3)
- 6.25% - 12 L (test 1&2), 15 L (test 3)
- 12.5% - 12 L (test 1&2), 15 L (test 3)
- 25% - 12 L (test 1&2), 15 L (test 3)
- 50% - 12 L (test 1&2), 15 L (test 3)
- 100% - 12 L (test 1&2), 15 L (test 3)
- Salinity Control - 12 L (test 1&2), 15 L (test 3)

xii. Measurements of dissolved oxygen, pH and temperature
- Test 1: DO: 8.2 - 10.1 mg/L, pH: 7.0 - 7.8, T: 15.0 °C
- Test 2: DO: 8.2 - 10.1 mg/L, pH: 7.1 - 7.8, T: 15.0 °C
- Test 3: DO: 8.2 - 10.0 mg/L, pH: 6.6 - 8.1, T: 15.0 - 16.0 °C

xiii. Number of fish added to each test vessel
- 10 fish/ vessel

xiv. Mean and range of fork length of control fish at end of test
- Test 1: 42mm (40-44)
- Test 2: 38mm (35-42)
- Test 3: 36mm (32-40)

xv. Mean wet weight of individual control fish at end of the test
- Test 1: 0.57g (0.43-0.68)
- Test 2: 0.59g (0.43-0.72)
- Test 3: 0.50g (0.35-0.61)

xvi. Estimated loading density of fish in test solutions
- Test 1: 0.48g/L
- Test 2: 0.49g/L
- Test 3: 0.33g/L

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
- Results were the same for Test 1, Test 2, and Test 3, except where noted
- Control (0%) - 0
- 6.25% - 0
- 12.5% - 0
- 25% - 0
- 50% - 0 (test 1&2), 1 (test 3)
- 100% - 0
- Salinity Control - 0

Reporting Requirements for Reference Method EPS 1/RM/13

ii. Number of control fish showing atypical/stressed behaviour
- None in Test 1, Test 2, or Test 3

iii. Mean mortality rate in solutions of effluent and control water
- Results were the same for Test 1, Test 2, and Test 3, except where noted
- Control (0%) - 0%
- 6.25% - 0%
- 12.5% - 0%
- 25% - 0%
- 50% - 0% (test 1&2), 10% (test 3)
- 100% - 0%
- Salinity Control - 0%

iv. Estimate of 96-h LC50 in multi-concentration tests
- Results were the same for Test 1, Test 2, and Test 3
- 96hr LC_{50} concentration > 100% effluent

v. Most recent 96-h LC50 for reference toxicity test(s)
- Reference toxicity tests for Toxicant: SDS
- Test 1: (Jul-10-03) 96-h LC_{50} = 36mg/L SDS, 95% CL = 30-42mg/L
- Test 2: (Aug-5-03) 96-h LC_{50} = 24mg/L SDS, 95% CL = 18-32mg/L
- Test 3: (Sep-3-03) 96-h LC_{50} = 24mg/L SDS, 95% CL = 22-26mg/L

APPENDIX B

72-h Acute *Daphnia magna* Toxicity Test

Reporting Requirements for Reference Method EPS 1/RM/14

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Wednesday July 30, 2003 - 1:00 PM
   - Test 2: Wednesday August 20, 2003 - 12:30 AM
   - Test 3: Tuesday September 16, 2003 - 5:00 PM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - 48-hour *Daphnia magna* LC_{50}

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements
   - Salinity controls were run
   - Sample water salinity was 2ppt (Test 1); 4ppt (Test 2), and 6ppt (Test 3)

iii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iv. Species of test organism
   - *Daphnia magna*

v. Date and time for start of definitive test
   - Test 1: Saturday August 2, 2003 - 2:00 PM
   - Test 2: Friday August 22, 2003 - 3:30 PM
   - Test 3: Friday September 19, 2003 - 3:15 PM

vi. Person(s) performing the test and verifying the results
   - Andy Diewald and May Lee

vii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH - 7.5, T - 21.0°C, DO - 8.7mg/L, C - 4100µmhos/cm
   - Test 2: pH - 7.8, T - 20.0°C, DO - 8.9mg/L, C - 9280µmhos/cm
   - Test 3: pH - 8.0, T - 19.5°C, DO - 8.7mg/L, C - 11330µmhos/cm

viii. Confirmation that no adjustment of sample or solution pH occurred
   - Test 1: No pH adjustment
   - Test 2: No pH adjustment
   - Test 3: No pH adjustment

Reporting Requirements for Reference Method EPS 1/RM/14

ix. Indication of any adjustment of hardness of effluent sample
- Test 1: No hardness adjustment
- Test 2: No hardness adjustment
- Test 3: No hardness adjustment

x. Indication of any aeration of sample
- Test 1: No pre-aeration adjustment
- Test 2: No pre-aeration adjustment
- Test 3: 25-50 mL/min/L for 10mins

xi. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 200 mL
- 6.25% - 200 mL
- 12.5% - 200 mL
- 25% - 200 mL
- 50% - 200 mL
- 100% - 200 mL
- Salinity Control - 200 mL

xii. Measurements of dissolved oxygen, pH and temperature
- Test 1: DO: 8.3 - 8.7 mg/L, pH: 7.5 - 7.9, T: 20.0 - 21.0 °C
- Test 2: DO: 8.4 - 9.0 mg/L, pH: 7.6 - 8.1, T: 20.0 - 20.5 °C
- Test 3: DO: 8.3 - 9.1 mg/L, pH: 7.6 - 8.1, T: 19.5 - 21.0 °C

xiii. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
- Test 1: 9 days to brood, >15 neonates/brood, 4.6% mortality in 7d prior to test
- Test 2: 9 days to brood, >19.9 neonates/brood, 10.0% mortality in 7d prior to test
- Test 3: 8 days to brood, >26.3 neonates/brood, 5.5% mortality in 7d prior to test

xiv. Number of neonates per test vessel and milliliters of solution per daphnid
- Methods for all tests and dilution series were the same:
- 10 neonates per vessel
- 200 mL of solution per daphnid

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
- Results were the same for Test 1, Test 2, and Test 3, except where noted
- Control (0%) - 0 dead / immobile (test 1&2), 1 dead (test 3)
- 6.25% - 0 dead / immobile
- 12.5% - 0 dead / immobile
- 25% - 0 dead / immobile
- 50% - 0 dead / immobile
- 100% - 0 dead / immobile (test 1&2), 1 dead (test 3)
- Salinity Control - 0 dead / immobile

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
- Single concentration test was not conducted, dilution series tests were conducted

Reporting Requirements for Reference Method EPS 1/RM/14

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
- Test 1: 48-h LC_{50} = > 100% effluent
- Test 2: 48-h LC_{50} = > 100% effluent
- Test 3: 48-h LC_{50} = > 100% effluent

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
- Reference toxicity tests for Toxicant: Zinc
- Test 1: (Aug-7-03) 96-h LC_{50} = 453µg/L Zinc, 95% CL = 377-544µg/L
- Test 2: (Aug-7-03) 96-h LC_{50} = 453µg/L Zinc, 95% CL = 377-544µg/L
- Test 3: (Sep-23-03) 96-h LC_{50} = 429µg/L Zinc, 95% CL = 355-518µg/L

APPENDIX C

7-d Topsmelt Growth and Survival Toxicity Test

Reporting Requirements for Reference Method EPA/600/R-95/136

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

Test Organisms Imported from External Supplier

i. Species of test organism
   - Topsmelt (*Atherinops affinis*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Aquatic Bio Systems (ABS), Fort Collins, Colorado

iv. Date test species acquired on
   - August 21, 2003

v. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

vi. Percent mortality of fish in 24-hour period preceding the test
   - <10% mortality

vii. Age at start of test
   - 10 days post-hatch

viii. Unusual appearance, behaviour, or treatment of larvae before their use in the test
   - Nothing unusual, no excessive crowding of larvae, larvae appear healthy, disease-free, stress free,

ix. Confirmation that larvae are actively feeding and swimbladders are not inflated
   - Larvae actively feeding and swimbladders not inflated

x. Confirmation that temperature change was <3°C and dissolved oxygen was maintained at >6mg/L during transport
   - Temperature change was <2°C and dissolved oxygen supersaturated mg/L during transport

xi. Test organism acclimation rate at the testing laboratory
   - Holding water conditions upon arrival were DO=supersaturated, pH=7.3, T=22°C
   - Organisms were acclimated slowly overnight
   - Addition of EVS lab seawater at intervals of 30 – 60min to reach acceptable conditions
   - Organisms were acclimated to DO=8mg/L, salinity=28ppt,T=20°C

Reporting Requirements for Reference Method EPA/600/R-95/136

Test Facilities and Conditions

i. Test type & method
   - 7-day Topsmelt (*Atherinops affinis*) Survival and Growth Toxicity Test
   - Static renewal
   - Sample water was renewed daily
   - Reference Method - EPA/600/R-95/136 (EPAW 95-EPA West Coast)

ii. Indications of deviations from requirements in Sections 11 of Method EPA/600/R-95/136 (EPAW 95-EPA West Coast)
   - No deviations from requirements
   - Salinity controls were run
   - Sample water salinity was 5.3ppt

iii. Date and time for start of definitive test
   - Friday August 22, 2003 - 5:00 PM

iv. Test vessel description
   - 600mL beaker

v. Person(s) performing the test and verifying the results
   - Kevin Goodearle, Julianna Kalocai, Sioe Lie Kwee, Rachel DeWynter, Edmund Canaria, and Armando Tang

vi. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - pH - 7.9, T - 20.0°C, DO - 11.0mg/L, C - 9570µmhos/cm, (salinity - 5.3 ppt)

vii. Confirmation that no adjustment of sample or solution pH occurred
   - No pH adjustment

viii. Indication of aeration of test solutions before introduction of fish
   - Pre-aeration at 6.5mL/min/L for 30mins due to supersaturation of sample with O_2 when sample was heated to 20°C
   - DO was reduced from 11.0mg/L to 7.8 mg/L

ix. Indication that EC guidance document for salinity adjustment was followed
   - No deviations from EC guidance document on preparation of hypersaline brine
   - HSB prepared from natural seawater concentrated to 90ppt (by freezing/refreezing to remove frozen layer and concentrate salts)
   - No deviations from EC guidance document for salinity adjustment of sample
   - HSB was added to samples to salinity adjust them from 5.3ppt to 30ppt

x. Type and source of control/dilution water
   - UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xi. Concentrations and volumes tested
   - Concentrations (% effluent volume / total volume) tested and total volumes used were:
   - Control (0%) - 200 mL
   - Salinity Control (0%) - 200 mL
   - 4.5% - 200mL
   - 9.0% - 200mL
   - 18.1% - 200mL
   - 36.2% - 200mL
   - 72.3% - 200mL

xii. Number of replicated per concentration
   - 5 replicates per concentration

xiii. Number of organisms added to each test vessel
   - 5 fish per vessel

xiv. Manner and rate of exchange of test solutions
   - Daily renewal

Reporting Requirements for Reference Method EPA/600/R-95/136

xv. Measurements of dissolved oxygen, pH and temperature
- DO: 6.6 - 7.8 mg/L, pH: 7.7 - 8.2, T: 19.0 - 20.0 °C, salinity: 29 - 31 ppt

Results

i. Number and % of mortalities of fish in each test solution
- Totals from all 5 replicates are presented:
- Control (0%) - 1/25 = 4%
- Salinity Control - 0/25 = 0%
- 4.5% - 0/25 = 0%
- 9.0% - 0/25 = 0%
- 18.1% - 0/25 = 0%
- 36.2% - 0/25 = 0%
- 72.3% - 1/25 = 4%

ii. Average dry weight per original fish in test vessel
- Means from all 5 replicates are presented:
- Control (0%) - 1.18 mg
- Salinity Control - 1.14 mg
- 4.5% - 1.13 mg
- 9.0% - 1.32 mg
- 18.1% - 1.09 mg
- 36.2% - 1.11 mg
- 72.3% - 1.14 mg

iii. Estimate of 7-d LC_{50} (95% CL)
- 7-d LC_{50} concentration > 72.3% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

iv. Estimate of 7-d IC_{25} (95% CL) for growth
- 7-d IC_{25} concentration > 72.3% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

v. Current reference toxicity tests (95% CL) for 7-d LC_{50} for survival and 7-d IC_{50} for growth
- Reference toxicity tests for Toxicant: Copper
- Test conducted on August 22, 2003, same day as effluent test
- Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
- 7-d LC_{50} survival = 122mg/L Cu, 95% CL = 111-135mg/L
- 7-d IC_{50} growth = 122mg/L Cu, 95% CL = 106-132mg/L

vi. Reference toxicity warning limits (+/- SD) for 7-d LC_{50} for survival and 7-d IC_{50} for growth
- Reference toxicity tests for Toxicant: Copper
- 7-d LC_{50} survival = 139 ± 63mg/L Cu,
- 7-d IC_{50} growth = 136 ± 52mg/L Cu

APPENDIX D

92-h Echinoderm Fertilization Test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

Test Organisms

i. Species of test organism
   - Sandollar Echinoid (*Dendraster excentricus*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - M-REP, Escondido, California
   - All adults providing gametes are from the same population and source
   - Gametes are spawned in-house at EVS

iv. Date test species acquired on
   - August 22, 2003

v. Holding time and conditions for adults
   - Adults received at the testing laboratory the day of the test, shipped overnight

vi. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

vii. Weekly percent mortality of adults being held over 7d preceding test
   - <2% per day over the 7 days preceding the test

viii. Age of test organisms
   - < 4 hours after spawning

ix. Unusual appearance, behaviour, or treatment of adults or gametes before test start
   - Organisms appear healthy

Test Facilities and Conditions

i. Test type & method
   - Echinoderm (*Dendraster excentricus*) Fertilization Toxicity Test
   - Static
   - Reference Method – EPS/1/RM/27 with 1997 amendments

ii. Test duration
   - 10:10 min (10min sperm + 10min sperm & egg)

iii. Date and time for start of definitive test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- Friday August 22, 2003 - 5:00 PM

iv. Test vessel description
- 16 x 125mm test tubes

v. Person(s) performing the test and verifying the results
- Kevin Goodearle, Julianna Kalocai, Sioe Lie Kwee, Rachel DeWynter, Edmund Canaria, and Armando Tang

vi. Indication of rate and duration of pre-aeration of test solutions before initiation of test
- No pre-aeration

vii. Confirmation that no adjustment of sample or solution pH occurred
- No pH adjustment

viii. Procedure for sample filtration
- No sample filtration

ix. Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment

x. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment
- Salinity adjusted from 5ppt to 29ppt

xi. Type and source of control/dilution water
- UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xii. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 10mL
- Salinity Control (0%) - 10mL
- 4.6% - 10mL
- 9.1% - 10mL
- 18.2% - 10mL
- 36.5% - 10mL
- 73.0% - 10mL

xiii. Number of replicated per concentration
- 4 replicates per treatment concentration

xiv. Number of organisms per container
- 2000 eggs per 10mL vessel

xv. Measurements of pH and dissolved oxygen in sample water before use
- pH - 8.3, DO - 8.4mg/L

xvi. Measurements of pH, temperature, dissolved oxygen, and salinity during test
- pH - 7.9-8.4, T - 15.0-15.5°C, DO - 8.1-8.4mg/L, salinity - 29ppt

Results

i. Number and % of fertilized eggs in each test concentration
- (Number is equal to percent since totals were 100)
- Control (0%): #F = 51, 50, 52, 54 #UF = 49, 50, 49, 46
- Salinity Control: #F = 51, 52, 50, 51 #UF = 49, 48, 50, 49
- 4.6%: #F = 35, 40, 29, 45 #UF = 65, 60, 71, 55
- 9.1%: #F = 36, 28, 33, 25 #UF = 64, 72, 67, 75
- 18.2%: #F = 22, 24, 18, 20 #UF = 78, 78, 82, 80
- 36.5%: #F = 12, 8, 7, 10 #UF = 88, 92, 93, 90
- 73.0%: #F = 1, 0, 2, 0 #UF = 99, 100, 98, 100

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

ii. Estimate of IC_{25} (95% CL) for fertilization success
- IC_{25} concentration = 3.8 (1.1 - 7.2)% v/v effluent
- Quantal statistic method = log linear interpolation

iii. Current reference toxicity tests (95% CL) for IC_{50} for fertilization
- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test conducted on August 22, 2003, same day as effluent test
- Reference test conducted under same conditions
- IC_{50} for fertilization = 1.3mg/L SDS, 95% CL = 1.1-1.5mg/L

APPENDIX E

7-d Sublethal *Champia* (Algae) Toxicity Test

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 1 x 4L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

vii. Temperature of water upon receipt at lab
   - 13°C

Test Organisms

i. Species of test organism
   - Algae (*Champia parvula*)

ii. Name and city of testing laboratory
   - Saskatchewan Research Council [SRC], Saskatoon, SK

iii. Source of test species
   - Sexually mature male and female branches
   - Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995
   - Appear in good health
   - Females have trichogynes, males have sori with spermatia

Test Facilities and Conditions

i. Test type & method
   - *Champia parvula* sexual reproduction test
   - Static, non-renewal
   - 2-day exposure, followed by 5-7 day recovery period for cystocarp development
   - Reference Method - EPA/600/4-91/003, Method 1009.0

ii. Date and time for start of definitive test
   - Friday August 22, 2003 – 10:00 AM

iii. Test vessel description
   - 270mL transparent polystyrene cups with polystyrene lids

iv. Person(s) performing the test and verifying the results
   - Mary Moody

v. Indication of pre-aeration of test solutions
   - No pre-aeration

vi. Confirmation that no pH adjustment of sample or solution occurred
   - No pH adjustment

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

vii. Indication that EC guidance document for salinity adjustment was followed
- No deviations from EC guidance document on preparation of hypersaline brine
- HSB prepared from natural seawater at 90ppt
- No deviations from EC guidance document for salinity adjustment of sample
- Salinity adjustment: 642mL effluent + 258mL HSB + 9mL test nutrient solution
- Salinity of samples adjusted from 5ppt to 30ppt

viii. Type and source of control/dilution water
- Natural seawater collected at the Pacific Environmental Center, Environment Canada, North Vancouver, BC
- Filtered to 0.2µm and autoclaved prior to use
- Salinity adjusted as per EC guidance document to 30ppt with HSB from the same source

ix. Concentrations and volumes of test solutions
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
- Salinity Control Brine (0%) - 100mL, 4.5cm depth
- 4.5% - 100mL, 4.5cm depth
- 8.9% - 100mL, 4.5cm depth
- 17.8% - 100mL, 4.5cm depth
- 35.6% - 100mL, 4.5cm depth
- 71.3% - 100mL, 4.5cm depth

x. Number of replicated per concentration
- 3 replicates per concentration

xi. Number of organisms per test chamber
- 5 female branches + 2 male branches per chamber

xii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample before use
- pH - 7.93, T - 23.5°C, DO - 9.4mg/L, salinity - 5ppt

xiii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample during test
- DO: 7.8 - 8.0 mg/L, pH: 7.74 - 8.98, T: 23°C, salinity: 30ppt

Results

i. Number and % mortality of female plants after recovery in each test solution
- Totals from all 3 replicates are presented:
- Control (0%): 0 (0%) mortality
- Salinity Control (0%): 0 (0%) mortality
- 4.5%: 0 (0%) mortality
- 8.9%: 0 (0%) mortality
- 17.8%: 0 (0%) mortality
- 35.6%: 0 (0%) mortality
- 71.3%: 0 (0%) mortality

ii. Mean number of cystocarps per plant in each test concentration
- Control (0%): 57.4; 49.6; 44.2
- Salinity Control (0%): 66.4; 44.0; 45.2
- 4.5%: 52.2; 51.4; 57.4
- 8.9%: 61.2; 63.6; 41.2
- 17.8%: 30.4; 34.4; 18.6
- 35.6%: 6.6; 6.0; 7.6
- 71.3%: 0.0; 2.4; 1.4

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

iii. Estimate of IC_{25} (95% CL) for cystocarp development
- IC_{25} concentration = 13.6 (9.0-16.0)% effluent v/v
- Quantal statistic method was linear interpolation

iv. Current reference toxicity tests (95% CL) for IC_{50} for cystocarp development
- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test conducted on July 29, 2003, within 30 days of effluent test
- Reference toxicant test was conducted under the same experimental conditions as the effluent test
- IC_{50} cystocarp development = 1.19mg/L SDS, 95% CL = 1.14-1.23mg/L

v. Reference toxicity warning limits (+/- 2SD) for IC_{50} for cystocarp development
- Reference toxicity tests for Toxicant: SDS
- 7-d IC_{50} growth = 1.47 (1.17-1.84) mg/L SDS

APPENDIX F

Effluent Metals Concentrations and Loadings

2003 3rd QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1]								pH[1]	Collection Method
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]		
07-Jul-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]
14-Jul-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]
21-Jul-03	25-Jul-03	*0.0001*	0.00122	*0.005*	0.00793	0.00126	0.0479	*3*	*0.005*	7.77	Water Pump
28-Jul-03	30-Jul-03	*0.0004*	0.00057	*0.005*	0.00319	0.00115	0.0625	*3*	*0.005*	7.84	Water Pump
04-Aug-03	05-Aug-03	*0.0005*	0.00068	*0.005*	0.00083	0.00144	0.0892	*3*	*0.005*	7.85	Water Pump
11-Aug-03	12-Aug-03	*0.001*	0.00091	*0.005*	0.00124	0.00256	0.151	*3*	*0.005*	7.94	Water Pump
18-Aug-03	19-Aug-03	*0.001*	0.00097	*0.005*	0.00046	0.00265	0.146	8	*0.005*	8.1	Water Pump
25-Aug-03	26-Aug-03	*0.001*	0.0009	*0.005*	0.00114	0.00261	0.16	*3*	*0.005*	7.96	Water Pump
01-Sep-03	02-Sep-03	*0.0002*	0.00089	*0.005*	0.00333	0.00274	0.15	10	*0.005*	8.06	Water Pump
08-Sep-03	09-Sep-03	*0.002*	0.00107	*0.005*	0.00117	0.00292	0.158	11	0.01	7.94	Water Pump
15-Sep-03	16-Sep-03	*0.001*	0.00099	-	0.00046	0.00365	0.186	5	*0.005*	7.96	Water Pump
22-Sep-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]
29-Sep-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "na" refers to no effluent discharge to sample

Concentrations in red italics were set to the detection limit

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[2]							
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
July/03	0.0003	0.00090	0.005	0.00556	0.00121	0.055	3	0.005
August/03	0.0009	0.00087	0.005	0.00092	0.00232	0.137	4	0.005
September/03	0.0011	0.00098	0.005	0.00165	0.00310	0.165	9	0.007

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note[2] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
07-Jul-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]
14-Jul-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]
21-Jul-03	25-Jul-03	0.005	0.061	0.25	0.3965	0.063	2.395	150	250,000	50,000
28-Jul-03	30-Jul-03	0.027268	0.038857	0.34085	0.217462	0.078396	4.260625	204.51	340,850	68,170
04-Aug-03	05-Aug-03	0.0382705	0.052048	0.382705	0.063529	0.110219	6.827457	229.623	382,705	76,541
11-Aug-03	12-Aug-03	0.069936	0.063642	0.34968	0.086721	0.179036	10.56034	209.808	349,680	69,936
18-Aug-03	19-Aug-03	0.0636	0.061692	0.318	0.029256	0.16854	9.2856	508.8	318,000	63,600
25-Aug-03	26-Aug-03	0.079663	0.071697	0.398315	0.090816	0.20792	12.74608	238.989	398,315	79,663
01-Sep-03	02-Sep-03	0.0189928	0.084518	0.47482	0.31623	0.260201	14.2446	949.64	474,820	94,964
08-Sep-03	09-Sep-03	0.277646	0.148541	0.694115	0.162423	0.405363	21.93403	1527.053	1,388,230	138,823
15-Sep-03	16-Sep-03	0.081164	0.080352	-	0.037335	0.296249	15.0965	405.82	405,820	81,164
22-Sep-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]
29-Sep-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note[2] - Average Flow rate is the weekly flow as recorded by flow meter totalizers divided by 7

Note [3] - "na" refers to no effluent discharge to sample

MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
July/03	0.50	1.55	9.16	9.52	2.19	103	5,495	9,158,175	340,023	594,222
August/03	1.95	1.93	11.23	2.09	5.16	306	9,201	11,227,425	510,583	2,261,153
September/03	3.78	3.13	17.53	5.16	9.62	513	28,825	22,688,700	762,676	1,961,166

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume is the actual total volume as recorded by flow meter totalizers for each month.

APPENDIX G

Results of Effluent Characterization

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

Nine effluent samples were collected on a weekly basis during the 3rd Quarter of 2003 beginning on July 25, 2003 and ceasing on September 16, 2003. Three of the nine samples were "monthly" samples and analysed for a wider suite of elements, as per the guidance document. Monthly loadings of metals to Garrow Bay were calculated based on average weekly discharge volumes from Garrow Lake to Garrow Bay via the creek outflow.

No holding times were missed for any of the water chemistry of toxicity testing samples.

Water samples for acute and sublethal toxicity testing were collected using a pump system from about 20 m downstream of the dam on Garrow Lake, within the main flow of the creek. Acute Lethality Testing was conducted during three months (July, August, and September) during the quarter. There were no adverse effects observed for either the 96-hr Rainbow Trout toxicity test, or the 48-hr *Daphnia magna* toxicity test. LC_{50} values were >100% effluent for both species in all testing events.

Sublethal Toxicity Testing was conducted once during August 2003. As this is considered a marine discharge, marine species were used for sublethal testing following brine adjustment of the brackish effluent (as per test protocols). Testing for fish (7-d Topsmelt growth and survival) and invertebrates (Sand dollar) was conducted at EVS Environment Consultants, Vancouver, while algae (48-h *Champia*) testing was undertaken by the Saskatchewan Research Council, Saskatoon.

There were no effects observed in the Topsmelt Survival and Growth Test at 100% effluent v/v.

Sublethal effects were observed for the echinoid and algal tests and concentrations less than 100% effluent v/v. In the echinoid *(Dendraster excentricus)* fertilization test (EVS Consultants), the LOAEL was 4.6% v/v effluent, the IC_{25} was 3.8% v/v, and the IC_{50} was 13.0% v/v. In the *Champia parvula* sexual reproduction test (Saskatchewan Research Council) the LOAEL was 17.8% v/v effluent, the IC_{25} 13.6% v/v, and the IC_{50} was 18.8% v/v.

Zinc was the primary contaminant of potential concern (COPC) identified in mine effluent and is the only metal to consistently exceed BC Ambient Water Quality Guidelines (BC AWQG) in effluent. During the 9 week discharge period, effluent zinc concentration averaged 128 ± 49µg/L (range 48 – 186µg/L), which is well below the MMER effluent limit of 500µg/L. The BC AWQG is 10µg/L. On August 19, 2003, when the sublethal samples were collected, the concentration of Zn in the effluent was 146µg/L. Converting the echinoid test endpoints into Zn concentrations results in a Lowest Observed Adverse Effect Level (LOAEL) of 6.7µg/L Zinc, an IC_{25} of 5.5µg/L, and an IC_{50} of 19.0µg/L. Reference toxicity tests of zinc on *Dendraster* fertilization give mean EC_{50} concentrations of 8.5-60µg/L (Dinnel et al. 1983). The concentration of zinc in the effluent that corresponds to the IC_{50} (i.e., 19.0µg/L) is within the effects range reported in reference *Dendraster* fertilization tests. Thus the echinoid test is quite sensitive to zinc, with the LOAEL being less than the BC AWQG concentration.

Endpoints for the *Champia* test in terms of zinc concentrations were 26.0µg/L Zn (LOAEL), 19.9µg/L (IC_{25}), and 27.4µg/L (IC_{50}). The reference IC_{25} endpoint for zinc in the *Champia* test performed in-house at SRC was 27µg/L (95% confidence limits 16-42µg/L). This reference concentration is very similar to zinc concentrations in the mine effluent at the toxicity endpoints observed in the *Champia* test. *Champia* also appears to be sensitive to zinc concentrations at or below the BC AWQG.

Given the similarity between zinc concentrations in the effluent samples and the effects concentrations of zinc in reference tests, it is likely that zinc is responsible for the sublethal effects observed in both the *Dendraster* and *Champia* tests.

Reference: Dinnel, P.A., Q.J. Stober, J.M. Link, M.W. Letourneau, W.E. Roberts, S.P. Felton, and R.E. Nakatan. 1983. Methodology and Validation of a Sperm Cell Toxicity Test for Testing Toxic Substances in Marine Waters. Final Report, FRI-UW-8306, Fisheries Research Inst., School of Fisheries, University of Washington, Seattle, WA :208. Source: EPA EcoTox database.