ACUTE LETHALITY STUDY OF G.C.O.S. DIKE FILTER DRAINAGE USING RAINBOW TROUT AND BROOK STICKLEBACKS

W. H. LAKE, Biologist
Water Quality Control Branch
Pollution Control Division

August 11, 1976

FOREWORD

When evaluating this data, lethality (i.e. death of the organism) is the symptom being observed. Acutely lethal refers to a sample killing 50% of a population after 96 hours exposure.

1. The dike filter drainage was found to be acutely toxic to both rainbow trout and brook sticklebacks. The results of the bioassays on rainbow trout confirmed those results of S. Hrudey of the Environmental Protection Service, Environment Canada.

2. At the point of entry of the effluent, the sample was acutely lethal to rainbow trout and showed a slight degree of lethality to brook sticklebacks.

3. The downstream samples were not lethal to brook sticklebacks and demonstrated a slight degree of lethality to rainbow trout 10 - 15 feet downstream.

4. The downstream sample taken from the boat dock was not lethal to sticklebacks or rainbow trout.

5. When considering the bioassay data and excluding the point of entry of the effluent into the river, the G.C.O.S. dike filter drainage does not present a significant lethality problem to fish.

6. Acute lethality in the dike filter drainage is probably due to a combination of chemicals and not due to the action of one individual component. Ammonia and surfactants would be two chemicals making major contributions.

7. The lethal action of the interface, i.e., point of entry, is also due to the combination of the chemicals and the effect is reduced due to dilution with river water.

SUMMARY OF GREAT CANADIAN OIL SANDS DIKE FILTER DRAINAGE BIOASSAYS

The initial study of acute lethality of the dike filter drainage started on July 12th. Four samples were collected at this time and for each of the next two following weeks.

There were four samples taken and the samples were taken as follows:

(1) Dike filter drainage from two pipes located at the southeast corner of the tailings pond. One hundred gallons of this sample were taken.

Selection of the dike filter drainage site was due to the lack of sufficient flows in the majority of pipes. The area selected was chosen for accessibility and sufficient flows.

One hundred gallons of this sample were collected for multiple concentration static bioassays. Site A on photograph 1.

(2) An upstream sample taken about 10 - 15 feet from the drainage pipe draining the northeast third of the tailings pond. Twenty-five gallons were collected.

(3) River effluent interface was the point where a collecting pipe draining the northeast third of the tailings pond emptied into the river. The sample was taken in the river as the effluent empties into the river. Twenty-five gallons were taken of this sample.

During the three sample periods, these three positions were sampled each time.

(4) Initially this sample was taken from the boat dock which was approximately 40 yards downstream from the point of discharge. On the next two occasions, this sample was taken about 10 feet from the point of discharge. This sample size was 25 gallons.

1105 THRINES POND SHEET 1.

On photograph 2, Site B represents the three sample sites 2, 3 and the last two downstream samples. Site C represents the boat dock.

Ninety-six hour acute lethality bioassays were conducted on the four samples using rainbow trout and brook sticklebacks. The rainbow trout bioassays were conducted by the Environmental Protection Services, Aquatic Toxicology Laboratory, and the stickleback bioassay was conducted by the Pollution Control Division, Bioassay Laboratory.

The 96-hour static bioassays using rainbow trout followed normal bioassay procedures, i.e. 15°C.

The 96-hour static bioassays using sticklebacks were at ambient temperature, i.e., 21.5°.

The stickleback bioassays were conducted in 5-gallon pails sitting on the floor of the laboratory. Twenty liters were used when enough sample was available but 10 fish were used in all of the containers. Dike filter drainage test was undiluted effluent.

In the rainbow trout bioassays, all of the tests were replicated.

The results for the bioassays were as follows:

(1) Dike Filter Drainage - July 12th. This sample was acutely lethal in both the rainbow trout and stickleback bioassays.

The 96-hour LC_{50} for rainbow trout was determined to be less than 20% and calculated to be 8.4% and 9.0 on the replicates.

The following concentrations were run and 100% mortality occurred in all concentrations:

100% - 2 hours
80% - 4 hours
60% - 6 hours
40% - 12 hours
20% - 36 hours

In the stickleback bioassay, 100% of the fish died in 2 hours and 40 minutes. The MST (mean survival time) was calculated to be 1.95 hours.

On photograph 2, Site B represents the three sample sites 2, 3 and the last two downstream samples. Site C represents the boat dock.

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100% - 2 hours
80% - 4 hours
60% - 6 hours
40% - 12 hours
20% - 36 hours

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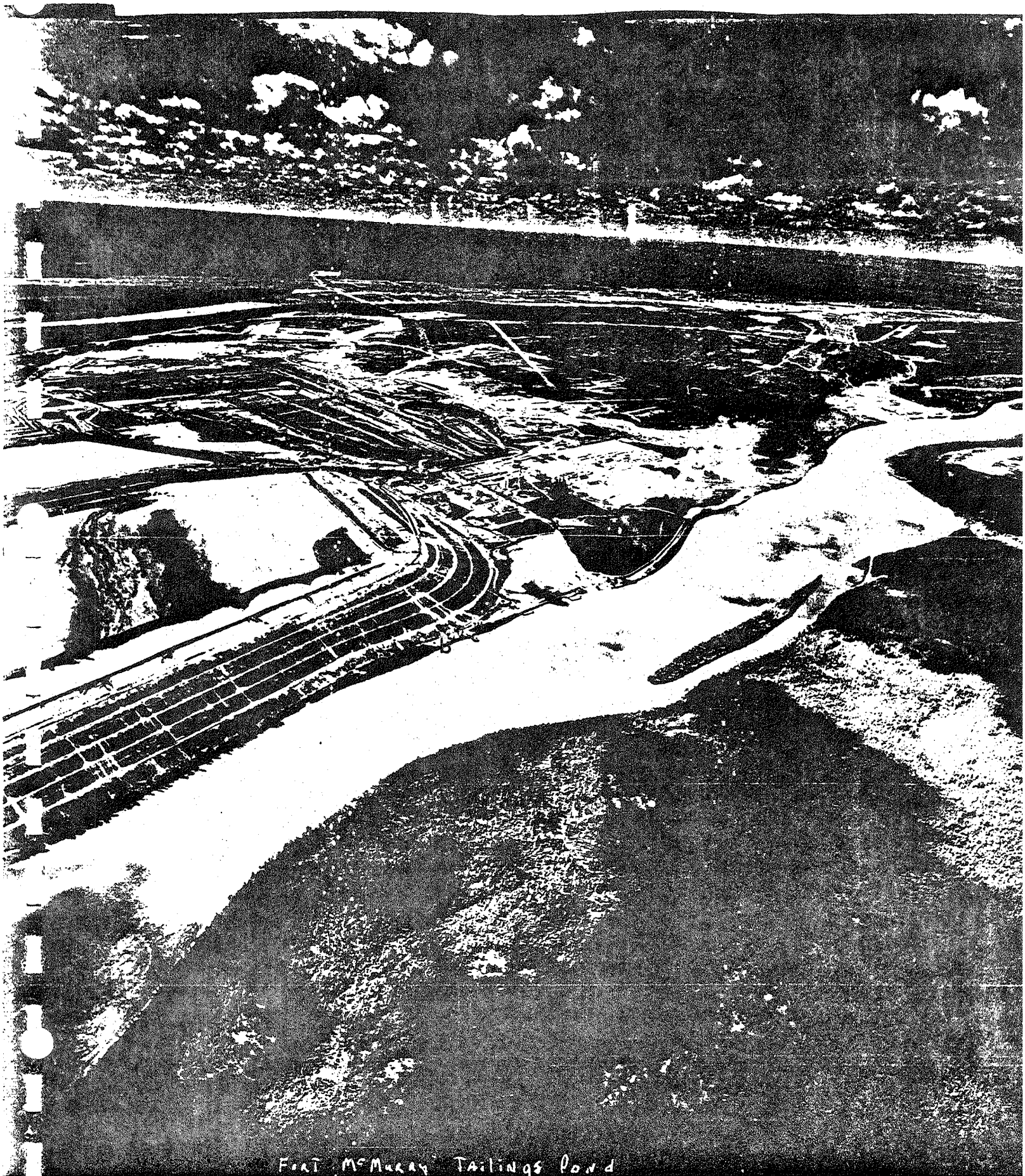
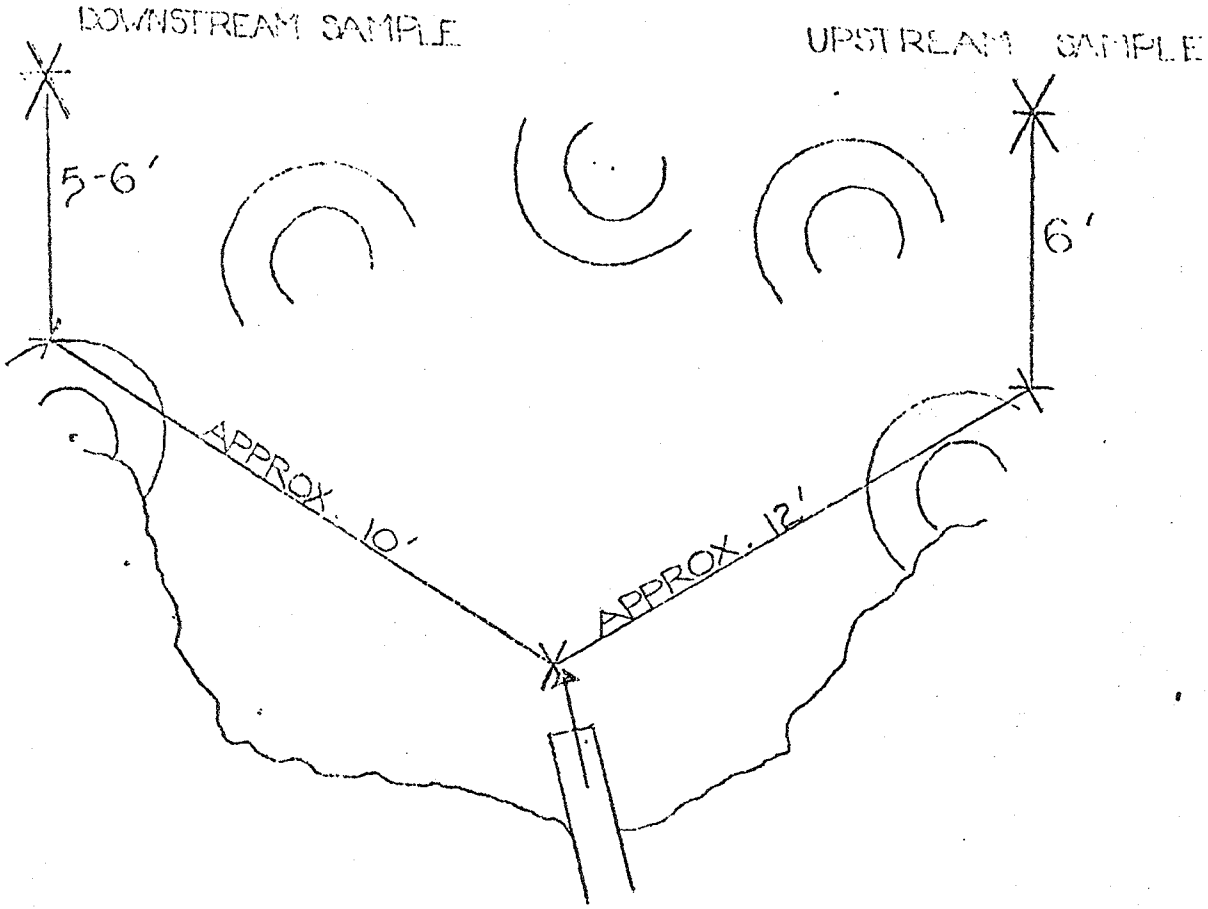
CLS TAILINGS POND Part 2



Fort McMurray Tailings Pond



ENLARGED DRAWING OF

SAMPLE AREA B

In the July 20th bioassay, the 96-hour LC_{50} was determined to be 20% and was calculated to be 9.4% and 3.5%.

There was 100% mortality in all concentrations and the times were as follows:

100% - 1.5 hours
80% - 3.0 hours
60% - 8 hours
40% - 24 hours
20% - 24 hours

In the stickleback bioassay, 100% of the fish died in 3 hours and 4 minutes with an M.S.T. of 2.45 hours.

In the July 27th bioassays the 96-hour LC_{50} was less than 20% and calculated to be 5.2% and 3.45%

There was again 100% mortality in all concentrations and the results were as follows:

100% - 2 hours
80% - 2.3 hours
60% - 5 hours
40% - 12.0 hours
20% - 24 hours

In the stickleback bioassay, there was 100% mortality in 3 hours and 45 minutes with an M.S.T. of 2.9 hours.

(2) In the upstream sample, there was no mortality in the sticklebacks after 96 hours of exposure. Only tests were conducted on July 12th and July 27th as there was not enough sample in the July 20th sample.

In the rainbow trout bioassays there were no mortalities in the July 12th and July 20th tests but 1 fish died after 96 hours in the July 27th sample.

(3) Mortality occurred in all of the interface, i.e., point of entry of effluent into the river samples. The results were as follows:

July 12th - 100% mortality in 72 hours
July 20th - 50% mortality in 96 hours
July 27th - 100% mortality in 84 hours

On the July 12th bioassay, three sticklebacks died after 96 hours repre-

senting 30% of the population. There was not sufficient sample size to conduct a test on the July 20th sample. On the July 27th bioassay there was 10% mortality after 96 hours.

(4) In the downstream bioassays conducted on sticklebacks there were no mortalities after 96 hours.

In the rainbow trout bioassay on July 12th, there was no mortality after 96 hours of exposure. This sample was taken by the boat dock.

On the bioassay conducted on July 27th, there was no mortality after 96 hours of exposure but two fish died after another 96 hours of exposure.

77.138 [illegible]

CHEMICAL ANALYSIS REQUEST [illegible]

NO. [illegible] RESULTS TO: M. Lake

STATION: Athabasca upstream

SAMPLED BY: P. Milner, T.E. Bowie DATE SAMPLED: 29/7/76 TIME: ______

PRESSURE: ______ FLOW: ______ GAL (97161F) GRAB: ______ COMPOSITE: ______ HOUR

GROUNDWATER: ______ SURFACE WATER: ______ SEWAGE: ______ INDUSTRIAL: ______ SEDIMENT: ______

ROUTINE 16

- ✓ 2 pH
- ✓ 3 CONDUCT.
- ✓ 4 CALCIUM
- ✓ 5 MAGNESIUM
- ✓ 6 SODIUM
- ✓ 7 POTASSIUM
- ✓ 8 IRON
- * 9 SILICA
- ✓ 10 (NO_2+NO_3)-N
- ✓ 11 NITRITE-N
- ✓ 12 CHLORIDE
- ✓ 13 SULFATE
- ✓ 14 FLUORIDE
- ✓ 15 CARBONATE
- ✓ 16 BICARBONATE

GENERAL 1

- ✓ 18 BOD
- ✓ 21 ODOR
- ✓ 23 TR
- ✓ 24 TRF
- ✓ 25 NFR
- ✓ 26 NFRF
- 27 TURBIDITY
- ✓ 30 SURFACTANTS
- 33 T & L
- 38 Cr^{+6}
- 71/72/73 COLOR

GENERAL 2

- ✓ 17 COD
- ✓ 28 NH_3-N
- ✓ 31 PHOSPHATE T
- ✓ 32 TKN
- * 84 o-PO_4

CARBON

- ✓ 39 T.O.C.
- ✓ 76 T.C.
- ✓ 77 T.I.O.C.

NUTRIENTS (low level)

- 85 o-PO_4
- 86 NO_3-N, NO_2-N

NON-ROUTINE

- 19 DO
- ✓ 20 O & G
- ✓ 29 PHENOLS
- 34 CHLOR A
- ✓ 35 CYANIDE
- ✓ 36 SULFIDE
- 37 SULFUR T
- ✓ 60 HYDROCARBONS
- ✓ 61 PESTICIDES
- ✓ 62 PCB's

NON-ROUTINE

- * 63 ALDEHYDES
- * 64 UREA
- * 65 MERCAPTANS
- * 66 AMINES
- 80 FLUORESCEIN
- 83 CHLORINE
- 42 MERCURY

METALS

- * 22 ANTIMONY
- ✓ 40 ARSENIC
- * 41 SELENIUM
- * 43 BORON
- ✓ 44 COBALT
- ✓ 45 COPPER
- 46 MANGANESE
- ✓ 47 NICKEL

METALS

- * 48 TIN
- ✓ 49 CADMIUM
- ✓ 50 CHROMIUM
- ✓ 51 LEAD
- ✓ 52 ZINC
- * 53 BERYLLIUM
- 54 SILVER
- * 55 VANADIUM
- * 56 BARIUM
- * 57 TELLURIUM
- 58 MOLYBDENUM
- * 59 ALUMINUM
- * 87 LITHIUM
- * 88 STRONTIUM
- * 89 THALLIUM
- * 90 TUNGSTEN

* - TESTS NOT RUN AT PRESENT

OTHERS: ______

COLIFORM M.P.N./100ML (36001L) ______ STANDARD PLATE COUNT/ML (36900L) ______

M.P.N.E. COLI/100ML (36011L) ______ TEMPERATURE °C (02061F) ______

✓ CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA UPSTREAM

LAB NO. 6926 DATE REC'D 29/ 7 / 76 DATE COMPLETED 11 / 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.9	CONDUCTIVITY	02041L	225.
CALCIUM	20105L	30.	MAGNESIUM	12102L	12.6
SODIUM	11102L	6.	POTASSIUM	19102L	1.0
IRON	26302L	3.4	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	1.
SULFATE	16306L	28.	FLUORIDE	09107L	0.05*
BICARBONATE	06201L	116.	HARDNESS T	10604L	126.
ALKALINITY T	10101L	95.	TDS	00205L	194.
BOD	08201L	1.6	COD	08301L	29.8
ODOR	02001L	1.	TR	10471L	208.
TRF	10571L	142.	NFR	10401L	70.
NFRF	10503L	42.	SURFACTANTS	10701L	0.07
AMMONIA	07555L	0.14	PHOSPHATE T	15407L	0.33
NITROGEN TK	07003L	0.62	T.O.C.	06001L	18.
CARBON T	06000L	31.	T.I.O.C.	06051L	13.
OIL & GREASE	06521L	1.4	PHENOLS	06532L	0.003
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.002
COPPER	29305L	0.004	NICKEL	28302L	0.002
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.003
LEAD	82302L	0.004	ZINC	30305L	0.022

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ....[signature]........... FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

LIST OF ...
ION CO. 7245-6639
FILE NO.

CHEMICAL ANALYSIS REQUEST

POLLUTION CONTROL LABORATORY
BOX 489 EDMONTON T5J 2K1

RESULTS TO: Bill Baker

LOCATION: Athabasca upstream

SAMPLED BY: C Mildner DATE SAMPLED: July 20 TIME: 14:15

PRESSURE: ______ FLOW: ______ GAL (971619) GRAB: ✓ COMPOSITE: ______ HOUR

GROUNDWATER: ______ SURFACE WATER: ✓ SEWAGE: ______ INDUSTRIAL: ______ SEDIMENT: ______

ROUTINE 16	GENERAL 1	CARBON	NON-ROUTINE	METALS
✓ 2 pH	✓ 18 BOD	✓ 39 T.O.C.	* 63 ALDEHYDES	* 48 TIN
✓ 3 CONDUCT.	✓ 21 ODOR	✓ 76 T.C.	* 64 UREA	✓ 49 CADMIUM
✓ 4 CALCIUM	✓ 23 TR	✓ 77 T.I.O.C.	* 65 MERCAPTANS	✓ 50 CHROMIUM
✓ 5 MAGNESIUM	✓ 24 TRF	NUTRIENTS (low level)	* 66 AMINES	✓ 51 LEAD
✓ 6 SODIUM	✓ 25 NFR	85 o-PO_4	80 FLUORESCEIN	✓ 52 ZINC
✓ 7 POTASSIUM	✓ 26 NFRF	86 NO_3-N, NO_2-N	83 CHLORINE	* 53 BERYLLIUM
✓ 8 IRON	27 TURBIDITY	NON-ROUTINE	✓ 42 MERCURY	54 SILVER
* 9 SILICA	✓ 30 SURFACTANTS	19 DO	METALS	* 55 VANADIUM
✓ 10 (NO_2+NO_3)-N	33 T & L	✓ 20 O & G	* 22 ANTIMONY	* 56 BARIUM
✓ 11 NITRITE-N	38 Cr^{+6}	✓ 29 PHENOLS	✓ 40 ARSENIC	* 57 TELLURIUM
✓ 12 CHLORIDE	71/72/73 COLOR	34 CHLOR A	* 41 SELENIUM	58 MOLYBDENUM
✓ 13 SULFATE	GENERAL 2	✓ 35 CYANIDE	* 43 BORON	* 59 ALUMINUM
✓ 14 FLUORIDE	✓ 17 COD	✓ 36 SULFIDE	✓ 44 COBALT	* 87 LITHIUM
✓ 15 CARBONATE	✓ 28 NH_3-N	✓ 37 SULFUR T	✓ 45 COPPER	* 88 STRONTIUM
✓ 16 BICARBONATE	✓ 31 PHOSPHATE T	✓ 60 HYDROCARBONS	46 MANGANESE	* 89 THALLIUM
	✓ 32 T_kN	61 PESTICIDES	✓ 47 NICKEL	* 90 TUNGSTEN
	* 84 o-PO_4	✓ 62 PCB's		

* - TESTS NOT RUN AT PRESENT

OTHERS: ______

COLIFORM M.P.N./100ML (36001L) ______ STANDARD PLATE COUNT/ML (36900L) ______

CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA RIVER UPSTREAM

LAB NO. 7245-6639 DATE REC'D 22/ 7 / 76 DATE COMPLETED 11 / 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.8	CONDUCTIVITY	02041L	230.
CALCIUM	20105L	25.	MAGNESIUM	12102L	12.1
SODIUM	11102L	5.	POTASSIUM	19102L	0.9
IRON	26302L	2.0	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	1.*
SULFATE	16306L	22.	FLUORIDE	09107L	0.05*
BICARBONATE	06201L	117.	HARDNESS T	10604L	112.
ALKALINITY T	10101L	96.	TDS	00205L	183.
BOD	08201L	2.3	COD	08301L	52.4
ODOR	02001L	1.	TR	10471L	347.
TRF	10571L	274.	NFR	10401L	207.
NFRF	10503L	188.	SURFACTANTS	10701L	0.06
AMMONIA	07555L	0.06	PHOSPHATE T	15407L	0.64
NITROGEN TK	07003L	0.78	T.O.C.	06001L	22.
CARBON T	06000L	34.	T.I.O.C.	06051L	12.
OIL & GREASE	06521L	2.8	PHENOLS	06532L	0.006
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.002
COPPER	29305L	0.004	NICKEL	28302L	0.004
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.001*
LEAD	82302L	0.005	ZINC	30305L	0.010

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ....FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

SAMPLE NO. 6413 RESULTS TO: W. Lobe

LOCATION: Athabasca River Water - Upstream from Effluent.

SAMPLED BY: P. Mehrer DATE SAMPLED: July 14/76 TIME: _____

PRESSURE: _____ FLOW: _____ GAL (CF/16M) GRAB: ____ COMPOSITE: _____ HOURS

GROUNDWATER: _____ SURFACE WATER: _____ SEWAGE: _____ INDUSTRIAL: ____ SEDIMENT: ____

ROUTINE 16	GENERAL 1	CARBON	NON-ROUTINE	METALS
✓ 2 pH	✓ 18 BOD	✓ 39 T.O.C.	* 63 ALDEHYDES	* 48 TIN
✓ 3 CONDUCT.	✓ 21 ODOR	✓ 76 T.C.	* 64 UREA	✓ 49 CADMIUM
✓ 4 CALCIUM	✓ 23 TR	✓ 77 T.I.O.C.	* 65 MERCAPTANS	✓ 50 CHROMIUM
✓ 5 MAGNESIUM	✓ 24 TRF	NUTRIENTS (low level)	* 66 AMINES	✓ 51 LEAD
✓ 6 SODIUM	✓ 25 NFR	___ 85 o-PO_4	___ 80 FLUORESCEIN	✓ 52 ZINC
✓ 7 POTASSIUM	✓ 26 NFRF	___ 86 NO_3-N, NO_2-N	___ 83 CHLORINE	* 53 BERYLLIUM
✓ 8 IRON	___ 27 TURBIDITY	NON-ROUTINE	✓ 42 MERCURY	___ 54 SILVER
* 9 SILICA	✓ 30 SURFACTANTS	___ 19 DO	METALS	* 55 VANADIUM
✓ 10 (NO_2+NO_3)-N	___ 33 T & L	___ 20 O & G	* 22 ANTIMONY	* 56 BARIUM
✓ 11 NITRITE-N	___ 38 Cr^{+6}	✓ 29 PHENOLS	✓ 40 ARSENIC	* 57 TELLURIUM
✓ 12 CHLORIDE	___ 71/72/73 COLOR	___ 34 CHLOR A	* 41 SELENIUM	___ 58 MOLYBDENUM
✓ 13 SULFATE	GENERAL 2	✓ 35 CYANIDE	* 43 BORON	* 59 ALUMINUM
✓ 14 FLUORIDE	✓ 17 COD	✓ 36 SULFIDE	✓ 44 COBALT	* 87 LITHIUM
✓ 15 CARBONATE	✓ 28 NH_3-N	. 37 SULFUR T	✓ 45 COPPER	* 88 STRONTIUM
✓ 16 BICARBONATE	✓ 31 PHOSPHATE T	✓ 60 HYDROCARBONS	✓ 46 MANGANESE	* 89 THALLIUM
	✓ 32 T_kN	___ 61 PESTICIDES	✓ 47 NICKEL	* 90 TUNGSTEN
	* 84 o-PO_4	✓ 62 PCB's		

* - TESTS NOT RUN AT PRESENT

OTHERS: _____

COLIFORM M.P.N./100ML (36001L) _____ STANDARD PLATE COUNT/ML (36900L) _____

F.P.N.E. COLI/100ML (36011L) _____ TEMPERATURE °C (02061P) _____

CHEM. ANALYSIS REPORT

LOCATION :ATHABASCA RIVER UPSTREAM FROM EFFLUENT

LAB NO. 6413 DATE REC'D 14/ 7 / 76 DATE COMPLETED 11 / 8 / 76.

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.8	CONDUCTIVITY	02041L	250.
CALCIUM	20105L	22.	MAGNESIUM	12102L	10.6
SODIUM	11102L	7.	POTASSIUM	19102L	1.1
IRON	26302L	0.6	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	1.*
SULFATE	16306L	27.	FLUORIDE	09107L	0.05*
BICARBONATE	06201L	118.	HARDNESS T	10604L	98.
ALKALINITY T	10101L	97.	TDS	00205L	186.
BOD	08201L	1.1	COD	08301L	27.8
ODOR	02001L	1.	TR	10471L	199.
TRF	10571L	150.	NFR	10401L	36.
NFRF	10503L	26.	SURFACTANTS	10701L	0.06
AMMONIA	07555L	0.07	PHOSPHATE T	15407L	0.29
NITROGEN TK	07003L	1.00	T.O.C.	06001L	19.
CARBON T	06000L	32.	T.I.O.C.	06051L	13.
OIL & GREASE	06521L	1.6	PHENOLS	06532L	0.002
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.001
COPPER	29305L	0.006	NICKEL	28302L	0.004
CADMIUM	48302L	0.002	CHROMIUM	24304L	0.001
LEAD	82302L	0.004	ZINC	30305L	0.062

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS = TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED .....FOR
M.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

. 6928

RESULTS TO: Mr. Lee

[illegible]ION: Dike filter drainage

[illegible]ED BY: P. Mildner & S. Bodie   DATE SAMPLED: 29/7/76   TIME: ______

[illegible]SSURE: ______ FLOW: ______ GAL (97161F) GRAB: ______ COMPOSITE: ______ HOUR

[illegible]NDWATER: ______ SURFACE WATER: ______ SEWAGE: ______ INDUSTRIAL: ______ SEDIMENT: ______

ROUTINE 16

- ✓ 2 pH
- ✓ 3 CONDUCT.
- ✓ 4 CALCIUM
- ✓ 5 MAGNESIUM
- ✓ 6 SODIUM
- ✓ 7 POTASSIUM
- ✓ 8 IRON
- * 9 SILICA
- ✓ 10 (NO_2+NO_3)-N
- ✓ 11 NITRITE-N
- ✓ 12 CHLORIDE
- ✓ 13 SULFATE
- ✓ 14 FLUORIDE
- ✓ 15 CARBONATE
- ✓ 16 BICARBONATE

GENERAL 1

- ✓ 18 BOD
- ✓ 21 ODOR
- ✓ 23 TR
- ✓ 24 TRF
- ✓ 25 NFR
- ✓ 26 NFRF
- 27 TURBIDITY
- ✓ 30 SURFACTANTS
- 33 T & L
- 38 Cr^{+6}
- 71/72/73 COLOR

GENERAL 2

- ✓ 17 COD
- ✓ 28 NH_3-N
- ✓ 31 PHOSPHATE T
- ✓ 32 T_kN
- * 84 o-PO_4

CARBON

- ✓ 39 T.O.C.
- ✓ 76 T.C.
- ✓ 77 T.I.O.C.

NUTRIENTS (low level)

- 85 o-PO_4
- 86 NO_3-N, NO_2-N

NON-ROUTINE

- 19 DO
- ✓ 20 O & G
- ✓ 29 PHENOLS
- 34 CHLOR A
- ✓ 35 CYANIDE
- ✓ 36 SULFIDE
- 37 SULFUR T
- ✓ 60 HYDROCARBONS
- 61 PESTICIDES
- ✓ 62 PCB's

NON-ROUTINE

- * 63 ALDEHYDES
- * 64 UREA
- * 65 MERCAPTANS
- * 66 AMINES
- 80 FLUORESCEIN
- 83 CHLORINE
- ✓ 42 MERCURY

METALS

- * 22 ANTIMONY
- ✓ 40 ARSENIC
- * 41 SELENIUM
- * 43 BORON
- ✓ 44 COBALT
- ✓ 45 COPPER
- ✓ 46 MANGANESE
- ✓ 47 NICKEL

METALS

- * 48 TIN
- ✓ 49 CADMIUM
- ✓ 50 CHROMIUM
- ✓ 51 LEAD
- ✓ 52 ZINC
- * 53 BERYLLIUM
- 54 SILVER
- * 55 VANADIUM
- * 56 BARIUM
- * 57 TELLURIUM
- 58 MOLYBDENUM
- * 59 ALUMINUM
- * 87 LITHIUM
- * 88 STRONTIUM
- * 89 THALLIUM
- * 90 TUNGSTEN

* - TESTS NOT RUN AT PRESENT

OTHERS: ______

COLIFORM M.P.N./100ML (36001L) ______ STANDARD PLATE COUNT/ML (36900L) ______

M.P.N.E. COLI/100ML (36011L) ______ TEMPERATURE °C (02061F) ______

CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA RIVER DIKE FILTER DRAINAGE

LAB NO. 6928 DATE REC'D 29 / 7 / 76 DATE COMPLETED 11 / 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	8.2	CONDUCTIVITY	02041L	1500.
CALCIUM	20105L	1.	MAGNESIUM	12102L	6.1
SODIUM	11102L	294.	POTASSIUM	19102L	8.1
IRON	26302L	0.2	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	16.
SULFATE	16306L	10.*	FLUORIDE	09107L	6.15
BICARBONATE	06201L	864.	HARDNESS T	10604L	27.
ALKALINITY T	10101L	709.	TDS	00205L	1194.
BOD	08201L	15.0	COD	08301L	302.0
ODOR	02001L	10.	TR	10471L	964.
TRF	10571L	718.	NFR	10401L	10.*
NFRF	10503L	10.*	SURFACTANTS	10701L	2.21
AMMONIA	07555L	7.67	PHOSPHATE T	15407L	1.02
NITROGEN TK	07003L	9.07	T.O.C.	06001L	190.
CARBON T	06000L	328.	T.I.O.C.	06051L	138.
OIL & GREASE	06521L	51.0	PHENOLS	06532L	0.030
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.001*
COPPER	29305L	0.001*	NICKEL	28302L	0.002
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.001*
LEAD	82302L	0.003*	ZINC	30305L	0.044

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ...[signature]............FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

CON 7247-6641 CHEMICAL ANALYSIS REQUEST

BOX 489 EDMONTON T5J 2K1

NO.

RESULTS TO: Bell Labs

LOCATION: Dike Filter Drainage

SAMPLED BY: R. Mcldrum DATE SAMPLED: July 20 TIME: 13:45

PRESSURE: ______ FLOW: ______ GAL (97161F) GRAB: ✓ COMPOSITE: ______ HOUR

GROUNDWATER: ______ SURFACE WATER: ______ SEWAGE: ______ INDUSTRIAL: ✓ SEDIMENT: ______

ROUTINE 16	GENERAL 1	CARBON	NON-ROUTINE	METALS
✓ 2 pH	✓ 18 BOD	✓ 39 T.O.C.	* 63 ALDEHYDES	* 48 TIN
✓ 3 CONDUCT.	✓ 21 ODOR	✓ 76 T.C.	* 64 UREA	✓ 49 CADMIUM
✓ 4 CALCIUM	✓ 23 TR	✓ 77 T.I.O.C.	* 65 MERCAPTANS	✓ 50 CHROMIUM
✓ 5 MAGNESIUM	✓ 24 TRF	NUTRIENTS (low level)	* 66 AMINES	✓ 51 LEAD
✓ 6 SODIUM	✓ 25 NFR		80 FLUORESCEIN	✓ 52 ZINC
✓ 7 POTASSIUM	✓ 26 NFRF	85 o-PO_4	83 CHLORINE	* 53 BERYLLIUM
✓ 8 IRON	✓ 27 TURBIDITY	86 NO_3-N, NO_2-N	✓ 42 MERCURY	54 SILVER
* 9 SILICA	✓ 30 SURFACTANTS	NON-ROUTINE	METALS	* 55 VANADIUM
✓ 10 (NO_2+NO_3)-N	✓ 33 T & L			* 56 BARIUM
✓ 11 NITRITE-N	✓ 38 Cr^{+6}	19 DO	* 22 ANTIMONY	* 57 TELLURIUM
✓ 12 CHLORIDE	✓ 71/72/73 COLOR	✓ 20 O & G	✓ 40 ARSENIC	58 MOLYBDENUM
✓ 13 SULFATE	GENERAL 2	✓ 29 PHENOLS	* 41 SELENIUM	* 59 ALUMINUM
✓ 14 FLUORIDE		34 CHLOR A	* 43 BORON	* 87 LITHIUM
✓ 15 CARBONATE	✓ 17 COD	✓ 35 CYANIDE	✓ 44 COBALT	* 88 STRONTIUM
✓ 16 BICARBONATE	✓ 28 NH_3-N	✓ 36 SULFIDE	✓ 45 COPPER	* 89 THALLIUM
	✓ 31 PHOSPHATE T	37 SULFUR T	46 MANGANESE	* 90 TUNGSTEN
	✓ 32 T_kN	✓ 60 HYDROCARBONS	✓ 47 NICKEL	
	* 84 o-PO_4	61 PESTICIDES		
		✓ 62 PCB's	* - TESTS NOT RUN AT PRESENT	

OTHERS: ______

COLIFORM M.P.N./100ML (36001L) ______ STANDARD PLATE COUNT/ML (36900L) ______

LOCATION : ATHABASCA RIVER DIKE FILTER DRAINAGE

LAB NO. 7247 6641 DATE REC'D 22 / 7 / 76 DATE COMPLETED 11/ 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	8.1	CONDUCTIVITY	02041L	1510.
CALCIUM	20105L	1.	MAGNESIUM	12102L	5.7
SODIUM	11102L	291.	POTASSIUM	19102L	8.5
IRON	26302L	0.1*	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	16.
SULFATE	16306L	10.*	FLUORIDE	09107L	6.16
BICARBONATE	06201L	865.	HARDNESS T	10604L	25.
ALKALINITY T	10101L	709.	TDS	00205L	1192.
BOD	08201L	11.7	COD	08301L	393.1
ODOR	02001L	10.	TR	10471L	1003.
TRF	10571L	804.	NFR	10401L	10.*
NFRF	10503L	10.*	SURFACTANTS	10701L	2.32
AMMONIA	07555L	7.83	PHOSPHATE T	15407L	1.00
NITROGEN TK	07003L	8.72	T.O.C.	06001L	88.
CARBON T	06000L	226.	T.I.O.C.	06051L	138.
OIL & GREASE	06521L	55.8	PHENOLS	06532L	0.026
CYANIDE	06601L	0.02	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.001
COPPER	29305L	0.001	NICKEL	28302L	0.002
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.001
LEAD	82302L	0.003*	ZINC	30305L	0.002

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ....FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

POLLUTION CONTROL — CHEMICAL ANALYSIS REQUEST

SAMPLE NO. 6415 — RESULTS TO: W. Lake

LOCATION: Dike Filter Drainage

SAMPLED BY: R. Meldau — DATE SAMPLED: July 14th — TIME: _____

PRESSURE: _____ FLOW: _____ GAL (97101F) GRAB: ____ COMPOSITE: ____ HOURS

GROUNDWATER: ____ SURFACE WATER: ____ SEWAGE: ____ INDUSTRIAL: ____ SEDIMENT: ____

ROUTINE 16

- ✓ 2 pH
- ✓ 3 CONDUCT.
- ✓ 4 CALCIUM
- ✓ 5 MAGNESIUM
- ✓ 6 SODIUM
- ✓ 7 POTASSIUM
- ✓ 8 IRON
- * 9 SILICA
- ✓ 10 (NO_2+NO_3)-P
- ✓ 11 NITRITE-N
- ✓ 12 CHLORIDE
- ✓ 13 SULFATE
- ✓ 14 FLUORIDE
- ✓ 15 CARBONATE
- ✓ 16 BICARBONATE

GENERAL 1

- ✓ 18 BOD
- ✓ 21 ODOR
- ✓ 23 TR
- ✓ 24 TRF
- ✓ 25 NFR
- ✓ 26 NFRF
- ___ 27 TURBIDITY
- ✓ 30 SURFACTANTS
- ___ 33 T & L
- ___ 38 Cr^{+6}
- ___ 71/72/73 COLOR

GENERAL 2

- ✓ 17 COD
- ✓ 28 NH_3-N
- ✓ 31 PHOSPHATE T
- ✓ 32 T_KN
- * 84 o-PO_4

CARBON

- ___ 39 T.O.C.
- ___ 76 T.C.
- ___ 77 T.I.O.C.

NUTRIENTS (low level)

- ___ 85 o-PO_4
- ___ 86 NO_3-N, NO_2-N

NON-ROUTINE

- ___ 19 DO
- ✓ 20 O & G
- ✓ 29 PHENOLS
- ___ 34 CHLOR A
- ✓ 35 CYANIDE
- ✓ 36 SULFIDE
- ___ 37 SULFUR T
- ✓ 60 HYDROCARBONS
- ___ 61 PESTICIDES
- ✓ 62 PCB's

NON-ROUTINE

- * 63 ALDEHYDES
- * 64 UREA
- * 65 MERCAPTANS
- * 66 AMINES
- ___ 80 FLUORESCEIN
- ___ 83 CHLORINE

METALS

- ✓ 42 MERCURY
- * 22 ANTIMONY
- ✓ 40 ARSENIC
- * 41 SELENIUM
- * 43 BORON
- ✓ 44 COBALT
- ✓ 45 COPPER
- ✓ 46 MANGANESE
- ✓ 47 NICKEL

METALS

- * 48 TIN
- ✓ 49 CADMIUM
- ✓ 50 CHROMIUM
- ✓ 51 LEAD
- ✓ 52 ZINC
- * 53 BERYLLIUM
- ___ 54 SILVER
- * 55 VANADIUM
- * 56 BARIUM
- * 57 TELLURIUM
- ___ 58 MOLYBDENUM
- * 59 ALUMINUM
- * 87 LITHIUM
- * 88 STRONTIUM
- * 89 THALLIUM
- * 90 TUNGSTEN

* - TESTS NOT RUN AT PRESENT

OTHERS: _____

COLIFORM M.P.N./100ML (36001L) _____ STANDARD PLATE COUNT/ML (36900L) _____

M.P.N.E. COLI/100ML (36011L) _____ TEMPERATURE °C (02061F) _____

CHEM. ANALYSIS REPORT

LOCATION : DIKE FILTER DRAINAGE

LAB NO. 6415 DATE REC'D 14/ 7/ 76 DATE COMPLETED 11/ 7/ 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	8.	CONDUCTIVITY	02041L	1500.
CALCIUM	20105L	3.	MAGNESIUM	12102L	6.5
SODIUM	11102L	312.	POTASSIUM	19102L	7.4
IRON	26302L	0.4	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	15.
SULFATE	16306L	31.	FLUORIDE	09107L	6.11
BICARBONATE	06201L	880.	HARDNESS T	10604L	34.
ALKALINITY T	10101L	721.	TDS	00205L	1254.
BOD	08201L	5.6	COD	08301L	432.0
ODOR	02001L	10.	TR	10471L	980.
TRF	10571L	795.	NFR	10401L	10.*
NFRF	10503L	10.*	SURFACTANTS	10701L	1.86
AMMONIA	07555L	6.80	PHOSPHATE T	15407L	1.16
NITROGEN TK	07003L	8.03	T.O.C.	06001L	169.
CARBON T	06000L	310.	T.I.O.C.	06051L	141.
OIL & GREASE	06521L	63.3	PHENOLS	06532L	0.018
CYANIDE	06601L	0.01	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.001
COPPER	29305L	0.003	NICKEL	28302L	0.004
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.001
LEAD	82302L	0.003	ZINC	30305L	0.010

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS = TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED .....FOR
M.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

LAB NO. 6929   CHEMICAL ANALYSIS REQUEST   BOX 469 EDMONTON T5J 2K1

RESULTS TO: R.W. Cade

LOCATION: River effluent Interface

SAMPLED BY: R. Milloy & G. Bodie   DATE SAMPLED: 29/7/76   TIME: ______

PURPOSE: ______ FLOW: ______ GAL (97161F) GRAB: ______ COMPOSITE: ______ HOU

GROUNDWATER: ______ SURFACE WATER: ______ SEWAGE: ______ INDUSTRIAL: ✓ SEDIMENT: ______

ROUTINE 16
- ✓ 2 pH
- ✓ 3 CONDUCT.
- ✓ 4 CALCIUM
- ✓ 5 MAGNESIUM
- ✓ 6 SODIUM
- ✓ 7 POTASSIUM
- ✓ 8 IRON
- * 9 SILICA
- ✓ 10 (NO_2+NO_3)-N
- ✓ 11 NITRITE-N
- ✓ 12 CHLORIDE
- ✓ 13 SULFATE
- ✓ 14 FLUORIDE
- ✓ 15 CARBONATE
- ✓ 16 BICARBONATE

GENERAL 1
- ✓ 18 BOD
- ✓ 21 ODOR
- ✓ 23 TR
- ✓ 24 TRF
- ✓ 25 NFR
- ✓ 26 NFRF
- ___ 27 TURBIDITY
- ✓ 30 SURFACTANTS
- ___ 33 T & L
- ___ 38 Cr^{+6}
- ___ 71/72/73 COLOR

GENERAL 2
- ✓ 17 COD
- ✓ 28 NH_3-N
- ✓ 31 PHOSPHATE T
- ✓ 32 T_kN
- * 84 o-PO_4

CARBON
- ✓ 39 T.O.C.
- ✓ 76 T.C.
- ✓ 77 T.I.O.C.

NUTRIENTS (low level)
- ___ 85 o-PO_4
- ___ 86 NO_3-N, NO_2-N

NON-ROUTINE
- ___ 19 DO
- ✓ 20 O & G
- ✓ 29 PHENOLS
- ___ 34 CHLOR A
- ✓ 35 CYANIDE
- ✓ 36 SULFIDE
- ___ 37 SULFUR T
- ✓ 60 HYDROCARBONS
- ___ 61 PESTICIDES
- ✓ 62 PCB's

NON-ROUTINE
- * 63 ALDEHYDES
- * 64 UREA
- * 65 MERCAPTANS
- * 66 AMINES
- ___ 80 FLUORESCEIN
- ___ 83 CHLORINE
- ✓ 42 MERCURY

METALS
- * 22 ANTIMONY
- ✓ 40 ARSENIC
- * 41 SELENIUM
- * 43 BORON
- ✓ 44 COBALT
- ✓ 45 COPPER
- ___ 46 MANGANESE
- ✓ 47 NICKEL

METALS
- * 48 TIN
- ✓ 49 CADMIUM
- ✓ 50 CHROMIUM
- ✓ 51 LEAD
- ✓ 52 ZINC
- * 53 BERYLLIUM
- ___ 54 SILVER
- * 55 VANADIUM
- * 56 BARIUM
- * 57 TELLURIUM
- ___ 58 MOLYBDENUM
- * 59 ALUMINUM
- * 87 LITHIUM
- * 88 STRONTIUM
- * 89 THALLIUM
- * 90 TUNGSTEN

* - TESTS NOT RUN AT PRESENT

OTHERS: ______

COLIFORM M.P.N./100ML (36001L) ______ STANDARD PLATE COUNT/ML (36900L) ______

M.P.N.E. COLI/100ML (36011L) ______ TEMPERATURE °C (02061F) ______

CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA RIVER EFFLUENT INTERFACE

LAB NO. 6929   DATE REC'D 29 / 7/ 76   DATE COMPLETED 11/ 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.8	CONDUCTIVITY	02041L	750.
CALCIUM	20105L	25.	MAGNESIUM	12102L	13.2
SODIUM	11102L	110.	POTASSIUM	19102L	4.1
IRON	26302L	2.8	NO2 + NO3	07105L	1.4
NITRITE	07205L	0.2	CHLORIDE	17203L	6.
SULFATE	16306L	61.	FLUORIDE	09107L	1.80
BICARBONATE	06201L	367.	HARDNESS T	10604L	116.
ALKALINITY T	10101L	301.	TDS	00205L	586.
BOD	08201L	14.8	COD	08301L	140.0
ODOR	02001L	1.	TR	10471L	584.
TRF	10571L	418.	NFR	10401L	98.
NFRF	10503L	78.	SURFACTANTS	10701L	0.85
AMMONIA	07555L	2.09	PHOSPHATE T	15407L	0.65
NITROGEN TK	07003L	2.87	T.O.C.	06001L	53.
CARBON T	06000L	114.	T.I.O.C.	06051L	61.
OIL & GREASE	06521L	11.2	PHENOLS	06532L	0.011
CYANIDE	06601L	0.04	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.002
COPPER	29305L	0.008	NICKEL	28302L	0.005
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.002
LEAD	82302L	0.004	ZINC	30305L	0.020

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ....MJD.................FOR
V.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

S NO. 72-7 D-6642 RESULTS TO: D.W. Lake

LOCATION: Athabasca River - effluent interface

SAMPLED BY: P. Mildner DATE SAMPLED: July 20/76 TIME: 13:55

PRESSURE: ______ FLOW: ______ GAL (971611) GRAB: ✓ COMPOSITE: ______ HOU

GROUNDWATER: ______ SURFACE WATER: ✓ SEWAGE: ______ INDUSTRIAL: ✓ SEDIMENT: ______

ROUTINE 16	GENERAL 1	CARBON	NON-ROUTINE	METALS
✓ 2 PH	✓ 18 BOD	✓ 39 T.O.C.	* 63 ALDEHYDES	* 48 TIN
✓ 3 CONDUCT.	✓ 21 ODOR	✓ 76 T.C.	* 64 UREA	✓ 49 CADMIUM
✓ 4 CALCIUM	✓ 23 TR	✓ 77 T.I.O.C.	* 65 MERCAPTANS	✓ 50 CHROMIUM
✓ 5 MAGNESIUM	✓ 24 TRF	NUTRIENTS (low level)	* 66 AMINES	✓ 51 LEAD
✓ 6 SODIUM	✓ 25 NFR		80 FLUORESCEIN	✓ 52 ZINC
✓ 7 POTASSIUM	✓ 26 NFRF	85 o-PO_4	83 CHLORINE	* 53 BERYLLIUM
✓ 8 IRON	✓ 27 TURBIDITY	86 NO_3-N, NO_2-N	✓ 42 MERCURY	54 SILVER
* 9 SILICA	✓ 30 SURFACTANTS	NON-ROUTINE	METALS	* 55 VANADIUM
✓ 10 (NO_2+NO_3)-N	✓ 33 T & L			* 56 BARIUM
✓ 11 NITRITE-N	✓ 38 Cr^{+6}	19 DO	* 22 ANTIMONY	* 57 TELLURIUM
✓ 12 CHLORIDE	✓ 71/72/73 COLOR	✓ 20 O & G	40 ARSENIC	58 MOLYBDENUM
✓ 13 SULFATE	GENERAL 2	✓ 29 PHENOLS	* 41 SELENIUM	* 59 ALUMINUM
✓ 14 FLUORIDE		34 CHLOR A	* 43 BORON	* 87 LITHIUM
✓ 15 CARBONATE	✓ 17 COD	✓ 35 CYANIDE	✓ 44 COBALT	* 88 STRONTIUM
✓ 16 BICARBONATE	✓ 28 NH_3-N	✓ 36 SULFIDE	✓ 45 COPPER	* 89 THALLIUM
	✓ 31 PHOSPHATE T	37 SULFUR T	46 MANGANESE	* 90 TUNGSTEN
	✓ 32 T_kN	✓ 60 HYDROCARBONS	✓ 47 NICKEL	
	* 84 o-PO_4	61 PESTICIDES		
		✓ 62 PCB's		

* - TESTS NOT RUN AT PRESENT

OTHERS: ______

COLIFORM M.P.N./100ML (36001L) ______ STANDARD PLATE COUNT/ML (36900L) ______

CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA RIVER EFFLUENT INTERFACE

LAB NO. 7248 6642 DATE REC'D 22/ 7 / 76 DATE COMPLETED 11 / 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.6	CONDUCTIVITY	02041L	700.
CALCIUM	20101L	28.	MAGNESIUM	12102L	12.6
SODIUM	11102L	105.	POTASSIUM	19102L	5.9
IRON	26302L	1.9	NO2 + NO3	07105L	1.2
NITRITE	07205L	0.1*	CHLORIDE	17203L	7.
SULFATE	16306L	48.	FLUORIDE	09107L	1.41
BICARBONATE	06201L	346.	HARDNESS T	10604L	121.
ALKALINITY T	10101L	284.	TDS	00205L	552.
BOD	08201L	10.9	COD	08301L	135.7
ODOR	02001L	1.	TR	10471L	561.
TRF	10571L	423.	NFR	10401L	125.
NFRF	10503L	96.	SURFACTANTS	10701L	0.95
AMMONIA	07555L	1.84	PHOSPHATE T	15407L	0.60
NITROGEN TK	07003L	2.83	T.O.C.	06001L	50.
CARBON T	06000L	105.	T.I.O.C.	06051L	55.
OIL & GREASE	06521L	17.5	PHENOLS	06532L	0.012
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.002
COPPER	29305L	0.004	NICKEL	28302L	0.005
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.001*
LEAD	82302L	0.005	ZINC	30305L	0.028

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ....FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

DEPARTMENT OF ENVIRONMENT
POLLUTION CONTROL

CHEMICAL ANALYSIS REQUEST

BOX 489 EDMONTON T5J 2K1

SAMPLE NO. 6415

RESULTS TO: W. Locke

LOCATION: Athabasca River - Effluent interface

SAMPLED BY: R. Muldoon DATE SAMPLED: July 14th TIME:

PRESSURE: ____ FLOW: ____ GAL (97061F) GRAB: ____ COMPOSITE: ____ HOUR

GROUNDWATER: ____ SURFACE WATER: ____ SEWAGE: ____ INDUSTRIAL: ____ SEDIMENT: ____

ROUTINE 16	GENERAL 1	CARBON	NON-ROUTINE	METALS
✓ 2 pH	✓ 18 BOD	✓ 39 T.O.C.	* 63 ALDEHYDES	* 48 TIN
✓ 3 CONDUCT.	✓ 21 ODOR	✓ 76 T.C.	* 64 UREA	✓ 49 CADMIUM
✓ 4 CALCIUM	✓ 23 TR	✓ 77 T.I.O.C.	* 65 MERCAPTANS	✓ 50 CHROMIUM
✓ 5 MAGNESIUM	✓ 24 TRF	NUTRIENTS (low level)	* 66 AMINES	✓ 51 LEAD
✓ 6 SODIUM	✓ 25 NFR	85 o-PO_4	80 FLUORESCEIN	✓ 52 ZINC
✓ 7 POTASSIUM	✓ 26 NFRF	86 NO_3-N, NO_2-N	83 CHLORINE	* 53 BERYLLIUM
✓ 8 IRON	27 TURBIDITY	NON-ROUTINE	✓ 42 MERCURY	54 SILVER
* 9 SILICA	✓ 30 SURFACTANTS	19 DO	METALS	* 55 VANADIUM
✓ 10 (NO_2+NO_3)-N	33 T & L	✓ 20 O & G	* 22 ANTIMONY	* 56 BARIUM
✓ 11 NITRITE-N	38 Cr^{+6}	✓ 29 PHENOLS	✓ 40 ARSENIC	* 57 TELLURIUM
✓ 12 CHLORIDE	71/72/73 COLOR	34 CHLOR A	* 41 SELENIUM	58 MOLYBDENUM
✓ 13 SULFATE	GENERAL 2	✓ 35 CYANIDE	* 43 BORON	* 59 ALUMINUM
✓ 14 FLUORIDE	✓ 17 COD	✓ 36 SULFIDE	✓ 44 COBALT	* 87 LITHIUM
✓ 15 CARBONATE	✓ 28 NH_3-N	37 SULFUR T	✓ 45 COPPER	* 88 STRONTIUM
✓ 16 BICARBONATE	✓ 31 PHOSPHATE T	✓ 60 HYDROCARBONS	46 MANGANESE	* 89 THALLIUM
	✓ 32 T_KN	61 PESTICIDES	✓ 47 NICKEL	* 90 TUNGSTEN
	* 84 o-PO_4	✓ 62 PCB's		

* - TESTS NOT RUN AT PRESENT

OTHERS: ____

COLIFORM M.P.N./100ML (36001L) ____ STANDARD PLATE COUNT/ML (36900L) ____

M.P.N.E. COLI/100ML (36011L) ____ TEMPERATURE °C (02061F) ____

LOCATION : ATHABASCA RIVER EFFLUENT INTERFACE

LAB NO. 6416 DATE REC'D 14/ 7 / 76 DATE COMPLETED 11 / 8/ 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	8.0	CONDUCTIVITY	02041L	910.
CALCIUM	20105L	53.	MAGNESIUM	12102L	14.7
SODIUM	11102L	144.	POTASSIUM	19102L	4.9
IRON	26302L	2.1	NO2 + NO3	07105L	1.4
NITRITE	07205L	0.4	CHLORIDE	17203L	7.
SULFATE	16306L	57.	FLUORIDE	09107L	1.48
BICARBONATE	06201L	430.	HARDNESS T	10604L	192.
ALKALINITY T	10101L	353.	TDS	00205L	710.
BOD	08201L	13.6	COD	08301L	275.0
ODOR	02001L	1.	TR	10471L	670.
TRF	10571L	535.	NFR	10401L	66.
NFRF	10503L	56.	SURFACTANTS	10701L	0.87
AMMONIA	07555L	2.47	PHOSPHATE T	15407L	0.50
NITROGEN TK	07003L	3.30	T.O.C.	06001L	60.
CARBON T	06000L	129.	T.I.O.C.	06051L	69.
OIL & GREASE	06521L	13.7	PHENOLS	06532L	0.010
CYANIDE	06601L	0.[illegible]	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.002
COPPER	29305L	0.006	NICKEL	28302L	0.006
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.001*
LEAD	82302L	0.003*	ZINC	30305L	0.015

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 - NITRITE
NO3 - NITRATE

CERTIFIED ....[signature].......... FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

. NO. "9 // ~~ //"   RESULTS TO: W. Kirk

[ST]ATION: Athabasca downstream

SAMPLED BY: P. McGibney G. Bodie   DATE SAMPLED: 29/7/76   TIME:

PRESSURE: FLOW: GAL (97161F)   GRAB: COMPOSITE: HOUR

GROUNDWATER: SURFACE WATER: SEWAGE: INDUSTRIAL: SEDIMENT:

ROUTINE 16	GENERAL 1	CARBON	NON-ROUTINE	METALS
✓ 2 pH	✓ 18 BOD	✓ 39 T.O.C.	* 63 ALDEHYDES	* 48 TIN
✓ 3 CONDUCT.	✓ 21 ODOR	✓ 76 T.C.	* 64 UREA	✓ 49 CADMIUM
✓ 4 CALCIUM	✓ 23 TR	✓ 77 T.I.O.C.	* 65 MERCAPTANS	✓ 50 CHROMIUM
✓ 5 MAGNESIUM	✓ 24 TRF	NUTRIENTS (low level)	* 66 AMINES	✓ 51 LEAD
✓ 6 SODIUM	✓ 25 NFR	85 o-PO_4	80 FLUORESCEIN	✓ 52 ZINC
✓ 7 POTASSIUM	✓ 26 NFRF	86 NO_3-N, NO_2-N	83 CHLORINE	* 53 BERYLLIUM
✓ 8 IRON	27 TURBIDITY		✓ 42 MERCURY	54 SILVER
* 9 SILICA	✓ 30 SURFACTANTS	NON-ROUTINE	METALS	* 55 VANADIUM
✓ 10 (NO_2+NO_3)-N	33 T & L	19 DO	* 22 ANTIMONY	* 56 BARIUM
✓ 11 NITRITE-N	38 Cr^{+6}	✓ 20 O & G	40 ARSENIC	* 57 TELLURIUM
✓ 12 CHLORIDE	71/72/73 COLOR	✓ 29 PHENOLS	* 41 SELENIUM	58 MOLYBDENUM
✓ 13 SULFATE	GENERAL 2	34 CHLOR A	* 43 BORON	* 59 ALUMINUM
✓ 14 FLUORIDE	✓ 17 COD	✓ 35 CYANIDE	✓ 44 COBALT	* 87 LITHIUM
✓ 15 CARBONATE	✓ 28 NH_3-N	✓ 36 SULFIDE	✓ 45 COPPER	* 88 STRONTIUM
✓ 16 BICARBONATE	✓ 31 PHOSPHATE T	37 SULFUR T	46 MANGANESE	* 89 THALLIUM
	✓ 32 T_KN	✓ 60 HYDROCARBONS	✓ 47 NICKEL	* 90 TUNGSTEN
	* 84 o-PO_4	61 PESTICIDES		
		✓ 62 PCB's		

* - TESTS NOT RUN AT PRESENT

OTHERS:

COLIFORM M.P.N./100ML (36001L)   STANDARD PLATE COUNT/ML (36900L)

M.P.N.E. COLI/100ML (36011L)   TEMPERATURE °C (02061F)

CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA RIVER DOWNSTREAM

LAB NO. 6927   DATE REC'D 29 / 7 / 76   DATE COMPLETED 11 / 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.8	CONDUCTIVITY	02041L	345.
CALCIUM	20105L	13.	MAGNESIUM	12102L	13.2
SODIUM	11102L	31.	POTASSIUM	19102L	1.6
IRON	26302L	2.8	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	1.
SULFATE	16306L	27.	FLUORIDE	09107L	0.05*
BICARBONATE	06201L	177.	HARDNESS T	10604L	86.
ALKALINITY T	10101L	145.	TDS	00205L	263.
BOD	08201L	2.8	COD	08301L	62.7
ODOR	02001L	1.	TR	10471L	236.
TRF	10571L	152.	NFR	10401L	46.
NFRF	10503L	32.	SURFACTANTS	10701L	0.28
AMMONIA	07555L	0.55	PHOSPHATE T	15407L	0.42
NITROGEN TK	07003L	0.62	T.O.C.	06001L	27.
CARBON T	06000L	47.	T.I.O.C.	06051L	20.
OIL & GREASE	06521L	2.2	PHENOLS	06532L	0.005
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.002
COPPER	29305L	0.006	NICKEL	28302L	0.004
CADMIUM	48302L	0.001	CHROMIUM	24304L	0.002
LEAD	82302L	0.006	ZINC	30305L	0.026

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ..M.P................FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

NO. 7246640 RESULTS TO: Bill Scott

STATION: Athabasca River - downstream

SAMPLED BY: P. Mildren DATE SAMPLED: July 20/76 TIME: 14:45

MEASURE: _____ FLOW: _____ GAL (97161F) GRAB: ✓ COMPOSITE: _____ HOUR

EFFLUENT: _____ SURFACE WATER: _____ SEWAGE: _____ INDUSTRIAL: ✓ SEDIMENT: _____

POLLUTE 16	GENERAL 1	CARBON	NON-ROUTINE	METALS
✓ 2 pH	✓ 18 BOD	✓ 39 T.O.C.	* 63 ALDEHYDES	* 48 TIN
✓ 3 CONDUCT.	✓ 21 ODOR	✓ 76 T.C.	* 64 UREA	✓ 49 CADMIUM
✓ 4 CALCIUM	✓ 23 TR	✓ 77 T.I.O.C.	* 65 MERCAPTANS	✓ 50 CHROMIUM
✓ 5 MAGNESIUM	✓ 24 TRF	NUTRIENTS (low level)	* 66 AMINES	✓ 51 LEAD
✓ 6 SODIUM	✓ 25 NFR	___ 85 o-PO_4	___ 80 FLUORESCEIN	✓ 52 ZINC
✓ 7 POTASSIUM	✓ 26 NFRF	___ 86 NO_3-N, NO_2-N	___ 83 CHLORINE	* 53 BERYLLIUM
✓ 8 IRON	___ 27 TURBIDITY	NON-ROUTINE	✓ 42 MERCURY	___ 54 SILVER
* 9 SILICA	✓ 30 SURFACTANTS	___ 19 DO	METALS	* 55 VANADIUM
✓ 10 (NO_2+NO_3)-N	___ 33 T & L	✓ 20 O & G	* 22 ANTIMONY	* 56 BARIUM
✓ 11 NITRITE-N	___ 38 Cr^{+6}	✓ 29 PHENOLS	✓ 40 ARSENIC	* 57 TELLURIUM
✓ 12 CHLORIDE	___ 71/72/73 COLOR	___ 34 CHLOR A	* 41 SELENIUM	___ 58 MOLYBDENUM
✓ 13 SULFATE	GENERAL 2	✓ 35 CYANIDE	* 43 BORON	* 59 ALUMINUM
✓ 14 FLUORIDE	✓ 17 COD	✓ 36 SULFIDE	✓ 44 COBALT	* 87 LITHIUM
✓ 15 CARBONATE	✓ 28 NH_3-N	___ 37 SULFUR T	✓ 45 COPPER	* 88 STRONTIUM
✓ 16 BICARBONATE	✓ 31 PHOSPHATE T	✓ 60 HYDROCARBONS	___ 46 MANGANESE	* 89 THALLIUM
	✓ 32 T_kN	✓ 61 PESTICIDES	✓ 47 NICKEL	* 90 TUNGSTEN
	* 84 o-PO_4	✓ 62 PCB's		

* - TESTS NOT RUN AT PRESENT

OTHERS: _____

COLIFORM M.P.N./100ML (36001L) _____ STANDARD PLATE COUNT/ML (36900L) _____

M.P.N.E. COLI/100ML (36011L) _____ TEMPERATURE °C (02061F) _____

CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA RIVER DOWNSTREAM

LAB NO. 7246 6640 DATE REC'D 22 / 7 / 76 DATE COMPLETED 11 / 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.8	CONDUCTIVITY	02041L	295.
CALCIUM	20105L	13.	MAGNESIUM	12102L	14.7
SODIUM	11102L	18.	POTASSIUM	19102L	1.3
IRON	26302L	5.7	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	1.*
SULFATE	16306L	28.	FLUORIDE	09107L	0.27
BICARBONATE	06201L	156.	HARDNESS T	10604L	92.
ALKALINITY T	10101L	128.	TDS	00205L	232.
BOD	08201L	3.0	COD	08301L	66.0
ODOR	02001L	1.	TR	10471L	422.
TRF	10571L	323.	NFR	10401L	276.
NFRF	10503L	226.	SURFACTANTS	10701L	0.16
AMMONIA	07555L	0.33	PHOSPHATE T	15407L	0.78
NITROGEN TK	07003L	0.95	T.O.C.	06001L	23.
CARBON T	06000L	38.	T.I.O.C.	06051L	15.
OIL & GREASE	06521L	1.6	PHENOLS	06532L	0.007
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.004
COPPER	29305L	0.007	NICKEL	28302L	0.008
CADMIUM	48302L	0.001	CHROMIUM	24304L	0.006
LEAD	82302L	0.010	ZINC	30305L	0.030

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS = TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED .....FOR
W.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

POLLUTION CONTROL [illegible]

SAMPLE NO. 6414

RESULTS TO: [illegible]

LOCATION: Athabasca River - Downstream from Effluent

SAMPLED BY: [illegible] DATE SAMPLED: ______ TIME: ______

PRESSURE: ______ FLOW: ______ GAL (97161F) GRAB: ______ COMPOSITE: ______ HOUR

GROUNDWATER: ______ SURFACE WATER: ______ SEWAGE: ______ INDUSTRIAL: ______ SEDIMENT: ______

ROUTINE 16

- ✓ 2 pH
- ✓ 3 CONDUCT.
- ✓ 4 CALCIUM
- ✓ 5 MAGNESIUM
- ✓ 6 SODIUM
- ✓ 7 POTASSIUM
- ✓ 8 IRON
- * 9 SILICA
- ✓ 10 (NO_2+NO_3)-N
- ✓ 11 NITRITE-N
- ✓ 12 CHLORIDE
- ✓ 13 SULFATE
- ✓ 14 FLUORIDE
- ✓ 15 CARBONATE
- ✓ 16 BICARBONATE

GENERAL 1

- ✓ 18 BOD
- ✓ 21 ODOR
- ✓ 23 TR
- ✓ 24 TRF
- ✓ 25 NFR
- ✓ 26 NFRF
- ✓ 27 TURBIDITY
- ✓ 30 SURFACTANTS
- 33 T & L
- 38 Cr^{+6}
- 71/72/73 COLOR

GENERAL 2

- ✓ 17 COD
- ✓ 28 NH_3-N
- ✓ 31 PHOSPHATE T
- ✓ 32 T_kN
- * 84 o-PO_4

CARBON

- ✓ 39 T.O.C.
- ✓ 76 T.C.
- ✓ 77 T.I.O.C.

NUTRIENTS (low level)

- 85 o-PO_4
- 86 NO_3-N, NO_2-N

NON-ROUTINE

- 19 DO
- ✓ 20 O & G
- ✓ 29 PHENOLS
- 34 CHLOR A
- ✓ 35 CYANIDE
- ✓ 36 SULFIDE
- 37 SULFUR T
- ✓ 60 HYDROCARBONS
- 61 PESTICIDES
- ✓ 62 PCB's

NON-ROUTINE

- * 63 ALDEHYDES
- * 64 UREA
- * 65 MERCAPTANS
- * 66 AMINES
- 80 FLUORESCEIN
- 83 CHLORINE
- ✓ 42 MERCURY

METALS

- * 22 ANTIMONY
- ✓ 40 ARSENIC
- * 41 SELENIUM
- * 43 BORON
- ✓ 44 COBALT
- ✓ 45 COPPER
- 46 MANGANESE
- ✓ 47 NICKEL

METALS

- * 48 TIN
- ✓ 49 CADMIUM
- ✓ 50 CHROMIUM
- ✓ 51 LEAD
- ✓ 52 ZINC
- * 53 BERYLLIUM
- 54 SILVER
- * 55 VANADIUM
- * 56 BARIUM
- * 57 TELLURIUM
- 58 MOLYBDENUM
- * 59 ALUMINUM
- * 87 LITHIUM
- * 88 STRONTIUM
- * 89 THALLIUM
- * 90 TUNGSTEN

* - TESTS NOT RUN AT PRESENT

OTHERS: ______

COLIFORM M.P.N./100ML (36001L) ______ STANDARD PLATE COUNT/ML (36900L) ______

M.P.N.E. COLI/100ML (36011L) ______ TEMPERATURE °C (02061F) ______

CHEM. ANALYSIS REPORT

LOCATION : ATHABASCA RIVER DOWNSTREAM FROM EFFLUENT

LAB NO. 6414 DATE REC'D 14/ 7 / 76 DATE COMPLETED 11 / 8 / 76

PARAMETER	CODE	MG/L	PARAMETER	CODE	MG/L
pH	10301L	7.9	CONDUCTIVITY	02041L	250.
CALCIUM	20105L	20.	MAGNESIUM	12102L	10.6
SODIUM	11102L	5.	POTASSIUM	19102L	0.8
IRON	26302L	0.6	NO2 + NO3	07105L	0.1*
NITRITE	07205L	0.1*	CHLORIDE	17203L	1.*
SULFATE	16306L	32.	FLUORIDE	09107L	0.41
BICARBONATE	06201L	116.	HARDNESS T	10604L	93.
ALKALINITY T	10101L	95.	TDS	00205L	185.
BOD	08201L	1.0	COD	08301L	27.8
ODOR	02001L	1.	TR	10471L	176.
TRF	10571L	46.	NFR	10401L	33.
NFRF	10503L	29.	SURFACTANTS	10701L	0.06
AMMONIA	07555L	0.01	PHOSPHATE T	15407L	0.17
NITROGEN TK	07003L	0.54	T.O.C.	06001L	21.
CARBON T	06000L	32.	T.I.O.C.	06051L	11.
OIL & GREASE	06521L	3.3	PHENOLS	06532L	0.004
CYANIDE	06601L	0.01*	SULFIDE	16101L	0.02*
MERCURY	80003L	0.0001*	COBALT	27302L	0.001*
COPPER	29305L	0.004	NICKEL	28302L	0.004
CADMIUM	48302L	0.001*	CHROMIUM	24304L	0.001*
LEAD	82302L	0.004	ZINC	30305L	0.005

* INDICATES CONCENTRATION LESS THAN. CONDUCTIVITY REPORTED IN UMHOS. TURBIDITY IN JTU, PH IN PH UNITS. ALL METAL PARAMETERS EXPRESSED AS TOTALS. ALKALINITY AND HARDNESS EXPRESSED AS CALCIUM CARBONATE.

NITRATE, NITRITE + NITRATE, AND AMMONIA EXPRESSED AS N.
TDS - TOTAL DISSOLVED SOLIDS
NO2 = NITRITE
NO3 = NITRATE

CERTIFIED ....[illegible].......... FOR
V.E. KORTSCH, HEAD
POLLUTION CONTROL LABORATORY

STICKLEBACK BIOASSAY DATA

Dike Filter Drainge

	Initial pH	Temperature	100% Mortality after 96 hours
July 12th	8.20	21.5 ± .08	2.67 hours Length: 4.04 ± 0.24 Weight: .55 ± 0.23
July 20th	6.80	20.8 ± 0.07	3.07 hours Length: 4.09 ± .35 Weight: .59 ± .06
July 26th	7.15	20.8 ± 0.07	3.75 hours Length: 4.09 ± .35 Weight: .59 ± .06

Upstream Sample

July 12th	7.9	21.5 ± .08	0 Length: 4.04 ± 0.24 Weight: .55 ± 0.23
July 30th	6.90	20.8 ± 0.07	0 Length: 4.09 ± .35 Weight: .59 ± .06

Downstream Sample

July 12th	8.0	21.5 ± .08	0 Length: 4.04 ± 0.24 Weight: .55 ± 0.23
July 26th	6.80	20.8 ± 0.07	0 Length: 4.09 ± .35 Weight: .59 ± .06

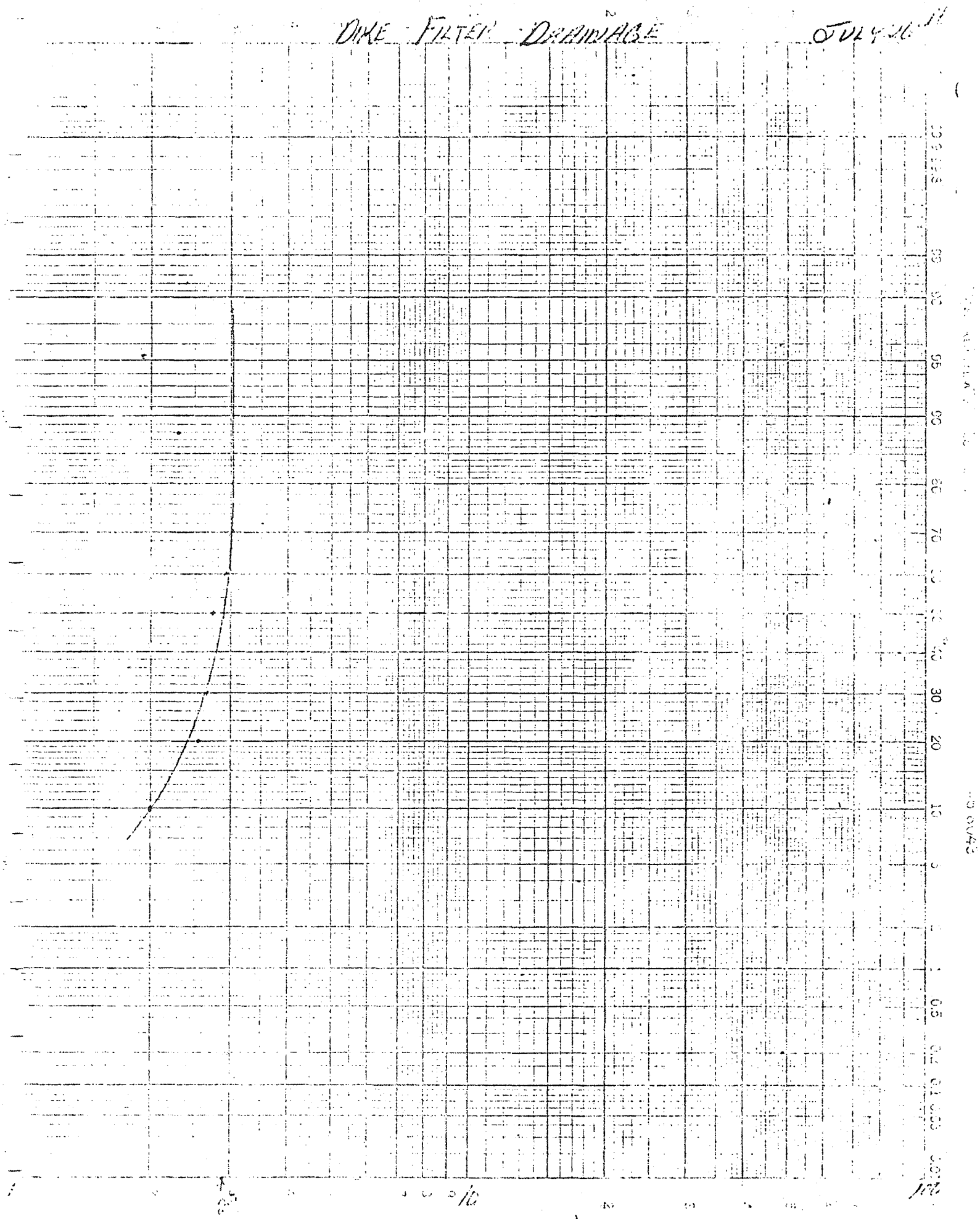
Interface

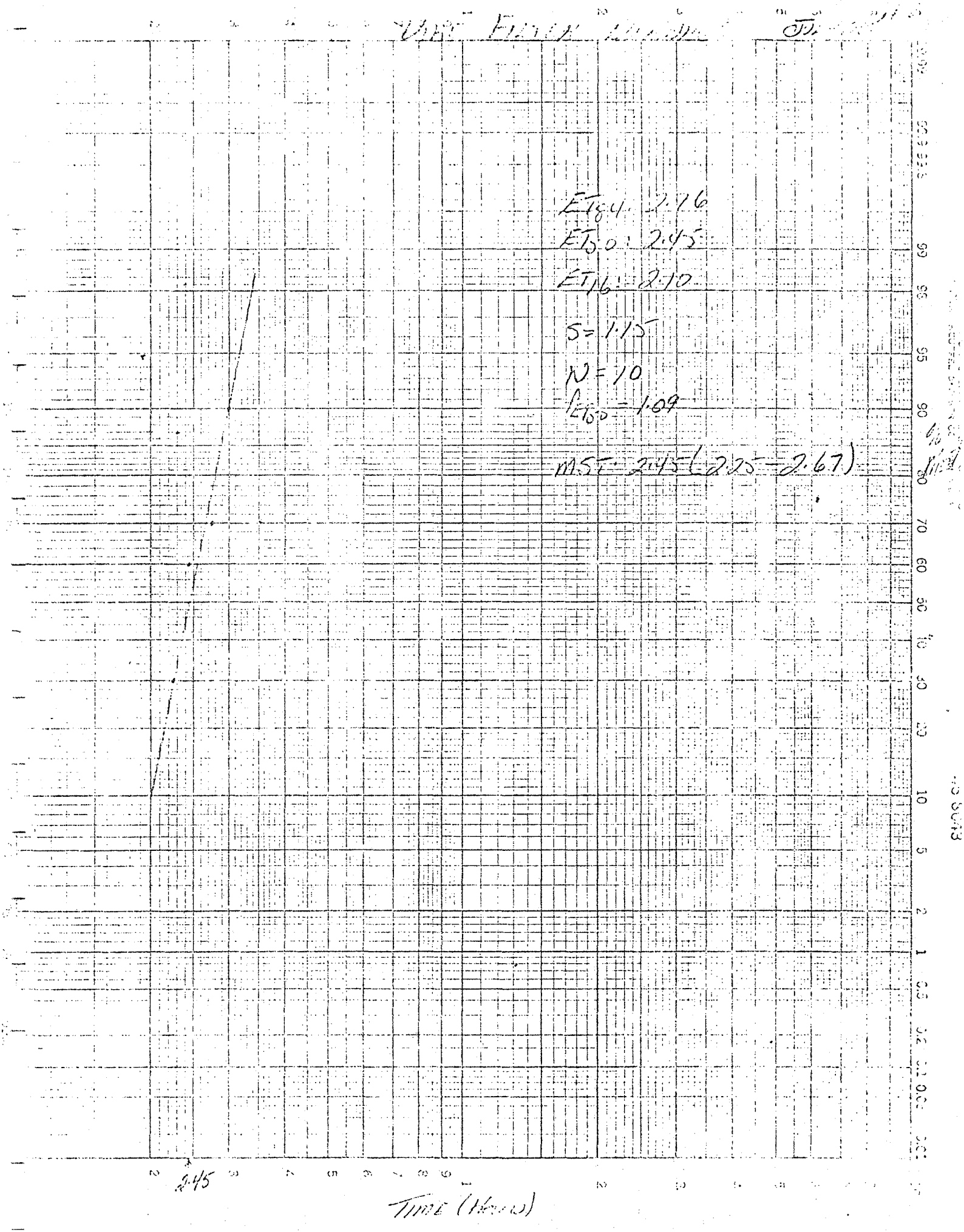
July 12th	7.8	21.5 ± 0.08	30% Length: 4.04 ± 0.24 Weight: .55 ± 0.23
July 26th	6.80	20.8 ± 0.07	10% Length: 4.09 ± .35 Weight: .59 ± 0.06

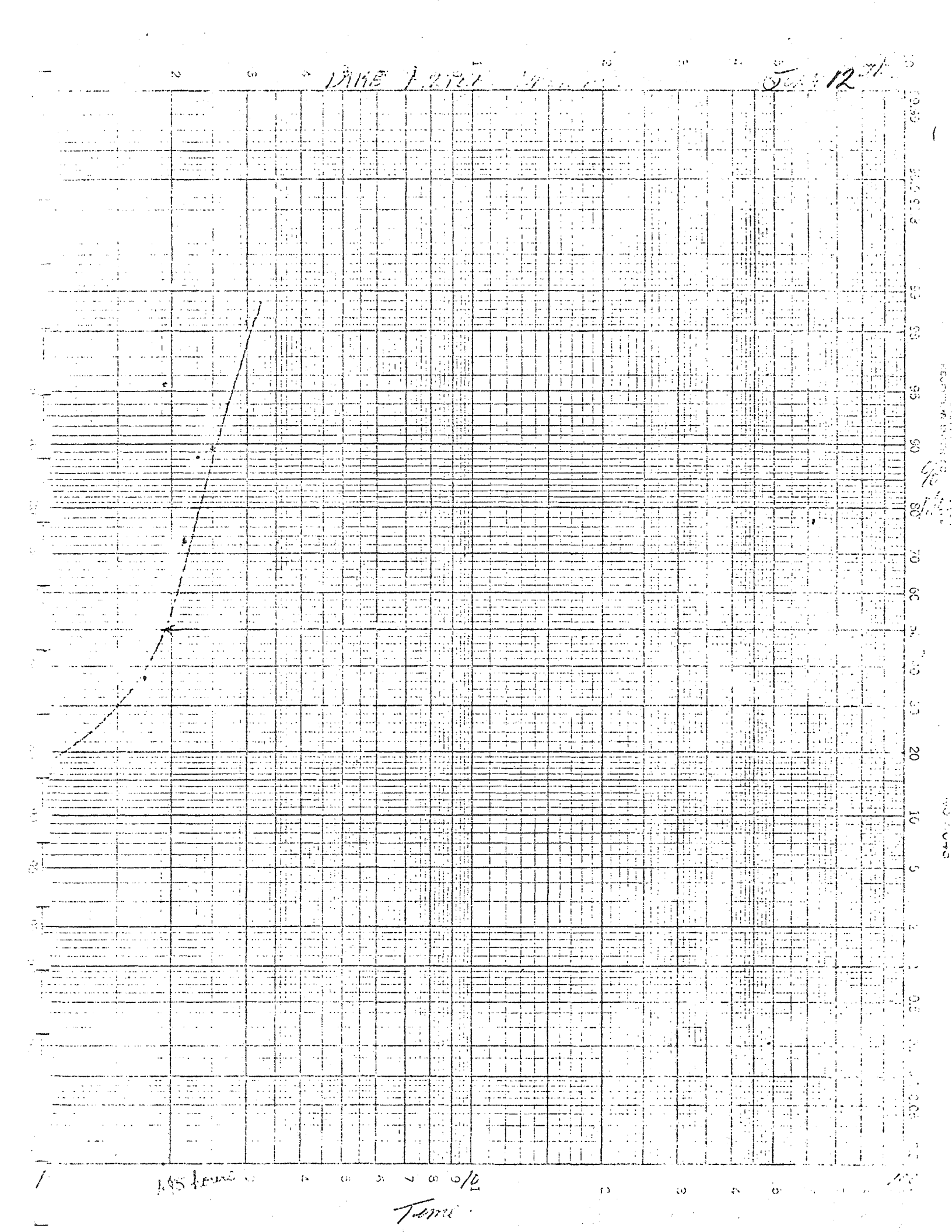
Control

July 12th	6.90	21.5 ± 0.08	0 Length: 4.04 ± 0.24 Weight: .55 ± 0.23
July 26th	8.20	20.8 ± 0.07	0 Length: 4.04 ± 0.24

DIKE FILTER DRAINAGE




$ET_{84} = 2.16$
$ET_{50} = 2.45$
$ET_{16} = 2.70$
$S = 1.15$
$N = 10$
$f_{ET_{50}} = 1.09$
MSE = 2.45 (2.25 - 2.67)
2.45
Time (Hours)



Environment Canada | Environnement Canada
Environmental Protection | Protection de l'Environnement

Aquatic Toxicology Laboratory
14317 - 128th Avenue
Edmonton, Alberta
T5L 3H3

August 6th, 1976

CONFIDENTIAL

Mr. W.H. Lake, Biologist
Water Quality Control
Department of the Environment
Province of Alberta
11237 - 120th Street
Edmonton, Alberta

Your file / Votre référence

Our file / Notre référence
4833-1

re: Great Canadian Oil Sands Bioassays:

Dear Mr. Lake:

Enclosed please find the results of the three sets of bioassay samples that we conducted for you. Each of the sets were treated as "prosecution bioassays" and were kept under lock and key at all times.

The results show that the "Dike Filter Drainage" was acutely lethal to rainbow trout. In all six of the samples run (A and B of N-02-001, 002, and 003) the LC_{50} for 96 hours was less than 20% effluent concentration by volume and graphically was determined to be less than 10% effluent concentration by volume. These results were comparable to the sample that we bioassayed two years ago from the same site. Until a detailed chemical analysis is given to us, a more specific analysis of the toxicity is impossible. This chemical analysis would be appreciated.

For the Athabasca River samples, the upstream water was not acutely lethal to rainbow trout at 100% concentration, the interface water was acutely lethal to rainbow trout at 100% concentration, and the downstream water was not acutely lethal to rainbow trout at 100% concentration. The upstream water sample (number N-02-003 'E') had one mortality at 84 hours but no mortality for the next 108 hours (the river samples for number 003 was run for 192 hours). The downstream water sample (number N-02-003 'D') had one mortality at 96 hours. The downstream sample (N-02-003 'D') had no mortality for the first 96 hours but in the next 96 hours, two fish died. Sample N-02-001 'C' (the interface water) had 100% mortality in the 100% concentration in 72 hours. Sample number N-02-002 'C' had 50% mortality in

..../2

in 96 hours at 100% concentration and the third interface sample (N-02-003 'C') had 100% mortality in 84 hours at 100% concentration. The chemical analysis for these samples would also be appreciated for a more thorough toxicity evaluation.

For your information tolerance tests were conducted with Sodium Lauryl Sulphate simultaneously with the three sets of bioassay samples submitted. These results are also enclosed.

Other information that would be appreciated is the field analysis (if taken) and also a description of the interface sampling location eg. whether it was well mixed or not.

In conclusion, the samples from the "Dike Filter Drainage" were acutely lethal to rainbow trout with LC_{50} values for 96 hours ranging from 3.45% to 9.4% effluent concentration by volume. The interface samples submitted were also acutely lethal to rainbow trout. The upstream and downstream river samples were not acutely lethal to rainbow trout.

If any further information or assistance is required, please advise.

Yours sincerely,

B.T. Thackeray, Biologist

C.c. J. Marsh
G. Webster
R. Nixon

Enclosures

ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY	TYPE OF TEST	TEST NUMBER
Fisher Scientific	24 hr. Static	P-02-025
SOURCE	**MATERIAL TESTED**	**DATE SAMPLED**
Fisher Scientific	Sodium Lauryl Sulfate	----
PLANT TREATMENT	**AMOUNT OF EFFLUENT RECEIVED**	**DATE RECEIVED**
----	----	----
STATUS OF PLANT	**DILUTIONS** ppm	**DATE TEST** **TIME**
----	Control, 2, 3, 4, 5, 6	14 / 7 / 1976 0900
SAMPLED BY	**TEST ORGANISM** **LOCATION**	**SEND RESULTS TO:**
----	S. gairdneri RF-376	Laboratory

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS		TEST RACK
Temp (^{o}C)	----	Temp (^{o}C)	14.0	2 - 2
D.O. (mg/l)	----	D.O. (mg/l)	10.2	
pH	----	pH	7.61	OBSERVER
Cond (umhos)	----	Cond (umhos)	155	W Mansfield
NH_3 (mg/l)	----	NH_3 (mg/l)	----	

REMARKS:-

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[illegible] Y DATA SHEET [illegible] Te[illegible] u[illegible] r: [illegible] 021 25 Tes[illegible] at[illegible] 14/ [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	2	3	4	5	6	TOTAL
TEMPERATURE (°C)	13.8 ± 0.4	13.8 ± 0.4	13.8 ± 0.4	13.5 ± 0.4	14.0	14.0	
DISSOLVED OXYGEN (mg/1)	9.2 ± 1.6	9.0 ± 1.8	8.9 ± 1.8	9.4 ± 1.1	10.2	10.2	
pH	7.43 ± 0.20	7.47 ± 0.22	7.47 ± 0.21	7.47 ± 0.19	7.64	7.61	
CONDUCTIVITY (umhos)	160 ± 1	160 ± 1	162 ± 4	162 ± 4	155	155	
AMMONIA (mg/1)							
FISH LENGTH (cm)	7.6 ± 0.7	8.2 ± 1.0	8.2 ± 0.6	7.4 ± 0.3	8.0 ± 0.3	7.8 ± 0.8	7.9 ± [illegible]
FISH WEIGHT (gm)	4.5 ± 1.4	6.0 ± 2.6	6.1 ± 1.2	5.0 ± 0.5	6.1 ± 0.7	5.4 ± 2.0	5.5 ±
LOADING DENSITY (1/gm)	1.8	1.3	1.3	1.6	1.3	1.5	1.5 ± [illegible]
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (1)	40	40	40	40	40	40	
LT_{50} (Hr)				≈ 17.0 12.0 – 24.0	≈ 9.9 8.0 – 12.0	≈ 7.5 7.0 – 8.0	
LC_{50} (Conc by Vol)	BY GRAPH ≈ 3.3			$3.0 < LC_{50} < 4.0$			

REMARKS:

CONFIDENTIAL

Test Number: P-02-025

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
6	8.0	4	80
	12.0	1	100
5	12.0	5	100
4	12.0	1	20
	24.0	2	60
3	24.0	0	0
2	24.0	0	0
CONTROL	24.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET 1.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-001 'B'
SOURCE Dike Filter Drainage	MATERIAL TESTED Dike Filter Drainage (Replicate)	DATE SAMPLED 12/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 100 Gallons	DATE RECEIVED 13/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100,80,60,40,20,control	DATE TEST TIME 15/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake
ORIGINAL FIELD ANALYSIS	ORIGINAL LAB ANALYSIS (100%)	TEST RACK
Temp (^{o}C) --	Temp (^{o}C) 17.0	
D.O. (mg/l) --	D.O. (mg/l) 3.3	3 - 3
pH --	pH 8.08	OBSERVER W. Neufeld A. Beckett
Cond (umhos) 00	Cond (umhos) 1150	
NH_3 (mg/l) --	NH_3 (mg/l) --	

REMARKS:-

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[illegible] BIOASSAY DATA SHEET [illegible] Test Number: [illegible] Test Date: [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	20	40	60	80	100	TOTAL
TEMPERATURE (°C)	15.1 ± 0.8	15.5 ± 0	15.5	15.5	15.5	15.5	
DISSOLVED OXYGEN (mg/l)	9.9 ± 0.3	10.0 ± 0.2	9.1	[illegible]	9.3	9.3	
pH	7.66 ± 0.19	8.40 ± 0.02	8.27	8.29	8.40	8.49	
CONDUCTIVITY (umhos)	157 ± 3	313 ± 4	485	760	950	1100	
AMMONIA (mg/l)	—	—	—	—	—	—	
FISH LENGTH (cm)	7.4 ± 0.8	6.6 ± 1.2	6.7 ± 1.0	7.9 ± 0.8	7.2 ± 1.1	7.3 ± 0.8	7.2 ± (
FISH WEIGHT (gm)	4.3 ± 1.2	3.3 ± 1.3	3.3 ± 1.2	4.7 ± 1.6	5.1 ± 1.2	4.0 ± 1.7	4.1 ± 0.
LOADING DENSITY (l/gm)	1.8	2.4	2.4	1.7	1.6	2.0	2.0 ± C
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (l)	40	40	40	40	40	40	
LT_{50} (Hr)	—	18.0 (12.5-25.9)	5.00 (2.57-9.64)	3.0 < LT_{50} < 4.0	1.95 (1.76-2.16)	1.38 (1.04-1.84)	
LC_{50} (Conc by Vol)	96 hr LC50 < [illegible] ; By graph 16 hr LC50 = 20%						

REMARKS:

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Test Number: 11-02-CC1B

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100 %	1.0	1	20
	1.25	1	40
	1.75	2	80
	2.0	1	100
80 %	2.0	3	60
	2.25	1	80
	3.0	1	100
60 %	4.0	4	80
	5.0	1	100
40 %	4.0	2	40
	6.0	1	60
	12.0	2	100
20 %	12.0	1	20
	24.0	3	90
	96.0	1	100
Control	96.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET 1.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-001 'A'
SOURCE Dike Drainage	MATERIAL TESTED Dike Filter Drainage (Original)	DATE SAMPLED 12/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 100 Gallons	DATE RECEIVED 13/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100,80,60,40,20,control	DATE TEST TIME 15/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	17.0	
D.O. (mg/l)	--	D.O. (mg/l)	3.3	3 - 4
pH	--	pH	8.08	OBSERVER
Cond (umhos)	--	Cond (umhos)	1150	W. Neufeld A. Beckett
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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BIOASSAY DATA SHEET II Test Number: N-02-001A Test Date: 5/7/74

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	20 %	40 %	60 %	80 %	100 %	
TEMPERATURE (°C)	15.0 ± 0.7	15.5 ± 0	15.5	16.0	16.0	16.0	
DISSOLVED OXYGEN (mg/l)	9.8 ± 0.5	10.0 ± 0.1	9.7	9.8	8.7	9.3	
PH	7.50 ± 0.14	8.43 ± 0.09	8.28	8.[illegible]5	8.29	8.40	
CONDUCTIVITY (umhos)	159 ± 5	350 ± 7	475	750	950	1100	
AMMONIA (mg/l)	—	—	—	—	—	—	TOTAL
FISH LENGTH (cm)	7.6 ± 0.3	7.6 ± 1.0	8.0 ± 0.4	8.2 ± 1.5	7.8 ± 1.0	8.0 ± 1.1	7.9 ± 0.2
FISH WEIGHT (gm)	4.5 ± 0.5	4.1 ± 1.5	5.1 ± 0.8	6.2 ± 3.3	5.5 ± 2.4	5.2 ± 1.7	5.1 ± 0.7
LOADING DENSITY (1/gm)	1.8	1.9	1.6	1.3	1.4	1.5	1.6 ± 0.2
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (1)	40	40	40	40	40	40	
LT_{50} (Hr)	—	10. - 24	7.4 (6.6-8.3)	3.45 (3.06-3.89)	2.70 (2.04-3.58)	1.55 (1.16-2.07)	
LC_{50} (Conc by Vol)	96 HR LC50 < 20% (by graph) 96 hr LC50: 8.4%						

REMARKS:

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Test Number: N-02-001A

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100 %	1.0	1	20
	1.5	2	40
	1.75	1	80
	2.0	1	100
80 %	2.0	1	20
	2.25	1	40
	3.0	1	60
	4.0	2	100
60 %	3.0	1	20
	4.0	3	80
	6.0	1	100
40 %	7.0	2	40
	9.0	1	60
	12.0	2	100
20 %	12.0	2	40
	24.0	3	100
Control	96.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-001 'D'
SOURCE Athabasca River Downstream	MATERIAL TESTED River Water	DATE SAMPLED 12/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 13/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100, 100, control	DATE TEST TIME 15/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	17.5	
D.O. (mg/l)	--	D.O. (mg/l)	8.9	3 - 2 (#3&4)
pH	--	pH	8.09	OBSERVER W. Neufeld A. Beckett
Cond (umhos)	--	Cond (umhos)	150	
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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Test Number: N-02-0[illegible] Test Date: [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	100 ①	100 ②				
TEMPERATURE (°C)	15.[illegible] ± 0.8	14.3 ± 0.7	14.3 ± 0.7				
DISSOLVED OXYGEN (mg/1)	9.9 ± 0.3	[illegible]	9.4 ± 0.3				
pH	7.66 ± 0.17	[illegible]	[illegible]				
CONDUCTIVITY (umhos)	157 ± 2	145 ± 0	145 ± 0				
AMMONIA (mg/1)							TOTAL
FISH LENGTH (cm)	7.4 ± 0.5	8.54 ± 1.1	7.4 ± 0.7				7.8
FISH WEIGHT (gm)	4.3 ± 1.2	6.5 ± 2.4	4.3 ± 1.2				5.0
LOADING DENSITY (1/gm)	1.8	1.2	1.9				1.6
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (1)	40	40	40				
LT_{50} (Hr)	N/A	N/A	N/A				
LC_{50} (Conc by Vol)	NOT ACUTELY LETHAL						

REMARKS:

Test Number: N-02-001 D

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100% ①	96.0	0	0
100% ②	96.0	0	0
Control	96.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-001 'E'
SOURCE Athabasca River Upstream	MATERIAL TESTED River Water	DATE SAMPLED 12/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 13/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100, 100, control	DATE TEST TIME 15/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	18.5	
D.O. (mg/l)	--	D.O. (mg/l)	8.8	3 - 2 (#5&6)
pH	--	pH	8.07	OBSERVER
Cond (umhos)	--	Cond (umhos)	155	W. Neufeld A. Beckett
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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PARAMETERS	CONCENTRATIONS (MEAN & VARIANCE)						
	CONTROL	100	100				TOTAL
TEMPERATURE (°C)	15.1 ± 0.8	14.8 ± 0.7	14.8 ± 0.7				
DISSOLVED OXYGEN (mg/1)	9.9 ± 0.3	9.8 ± 1.2	9.9 ± 0.2				
pH	7.86 ± 0.17	8.00 ± 0.05	8.07 ± 0.08				
CONDUCTIVITY (umhos)	157 ± 3	148 ± 3	148 ± 3				
AMMONIA (mg/1)							
FISH LENGTH (cm)	7.4 ± 0.8	7.7 ± 1.5	7.8 ± 0.8				7.6
FISH WEIGHT (gm)	4.2 ± 1.2	5.1 ± 2.7	5.0 ± 1.4				4.8
LOADING DENSITY (1/gm)	1.5	1.6	1.6				1.7
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (1)	40	40	40				
LT_{50} (Hr)	N/A	N/A	N/A				
LC_{50} (Conc by Vol)	NOT ACUTELY LETHAL						

REMARKS:

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Test Number: NV-02-001E

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100% (1)	96.0	0	0
100% (2)	96.0	0	0
Control	96.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-001 'C'
SOURCE Athabasca River and Dike Filter Drainage Interface	MATERIAL TESTED River Water and Effluent Mixture	DATE SAMPLED 12/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 13/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100, 100, control	DATE TEST TIME 15/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	18.0	
D.O. (mg/l)	--	D.O. (mg/l)	7.8	3 - 2 (#1&2)
pH	--	pH	8.38	
Cond (umhos)	--	Cond (umhos)	650	OBSERVER W. Neufeld A. Beckett
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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.UASSAY DATA SHEET II Test Number: [illegible] Test Date: 15/[illegible]/74

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	100(1)	100(2)				TOTAL
TEMPERATURE (°C)	15.1 ± 0.5	14.9 ± 1.0	14.9 ± 1.0				
DISSOLVED OXYGEN (mg/1)	9.9 ± 0.3	9.5 ± 0.3	9.5 ± 0.5				
pH	7.66 ± 0.17	8.44 ± 0.0[illegible]	8.47 ± 0.03				
CONDUCTIVITY (umhos)	157 ± 2	613 ± 25	625 ± 29				
AMMONIA (mg/1)	—	—	—				
FISH LENGTH (cm)	7.4 ± 0.8	7.1 ± 0.6	7.6 ± 0.5				7.4±0.[illegible]
FISH WEIGHT (gm)	4.3 ± 1.2	4.3 ± 1.4	5.7 ± 1.2				4.8±0.[illegible]
LOADING DENSITY (1/gm)	1.8	1.9	1.4				1.7±0.[illegible]
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (1)	40	40	40				
LT_{50} (Hr)	[illegible]	505(305-83.6)	24([illegible]) 236				
LC_{50} (Conc by Vol)	96 hr LC50 < 100%: (No graph could be drawn)						

REMARKS:

Test Number: N-02-001C

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100% ①	24.0	1	20
	60.0	2	60
	72.0	2	100
100% ②	36.0	3	60
	72.0	2	100
Control	96.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Fisher Scientific	TYPE OF TEST 24 hr. Static	TEST NUMBER P-02-026
SOURCE Fisher Scientific	MATERIAL TESTED Sodium Lauryl Sulfate	DATE SAMPLED ----
PLANT TREATMENT ----	AMOUNT OF EFFLUENT RECEIVED ----	DATE RECEIVED ----
STATUS OF PLANT ----	DILUTIONS ppm Control, 2, 3, 4, 5, 6,	DATE TEST TIME 21 / 7 / 1976 0900
SAMPLED BY ----	TEST ORGANISM LOCATION S. gairdneri RF-376	SEND RESULTS TO: Laboratory

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS		TEST RACK
Temp (^{o}C)	----	Temp (^{o}C)	14.0	2 - 2
D.O. (mg/l)	----	D.O. (mg/l)	10.1	
pH	----	pH	7.89	OBSERVER
Cond (umhos)	----	Cond (umhos)	150	
NH_3 (mg/l)	----	NH_3 (mg/l)	----	

REMARKS:-

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ASSAY DATA SHEET II Test Number: 4-02-026 Test Date: 2/17/82

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	2	3	4	5	6	
TEMPERATURE (°C)	14.0 ± 0	14.0 ± 0	14.0 ± 0	14.0 ± 0	14.0 ± 0	14.0 ± 0	
DISSOLVED OXYGEN (mg/1)	9.6 ± 1.5	9.2 ± 1.8	9.0 ± 2.1	9.1 ± 1.8	9.0 ± 1.7	9.3 ± 1.2	
pH	7.71 ± 0.28	7.65 ± 0.34	7.67 ± 0.35	7.64 ± 0.30	7.62 ± 0.24	7.73 ± 0.23	
CONDUCTIVITY (umhos)	153 ± 4	153 ± 4	153 ± 4.0	153 ± 4	153 ± 4	153 ± 4.0	
AMMONIA (mg/1)							TOTAI
FISH LENGTH (cm)	7.6 ± 0.4	8.2 ± 0.6	7.7 ± 0.4	8.1 ± 0.6	8.4 ± 0.5	7.8 ± 0.8	8.0 ±
FISH WEIGHT (gm)	4.8 ± 0.7	6.0 ± 1.2	4.8 ± 0.8	6.0 ± 1.6	7.7 ± 1.3	6.7 ± 2.1	6.0 ±
LOADING DENSITY (1/gm)	1.7	1.3	1.7	1.3	1.0	1.2	1.4 ±
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (1)	40	40	40	40	40	40	
LT_{50} (Hr)	/	/	/	/	12.0 - 24.0	12.0 - 24.0	
LC_{50} (Conc by Vol)	4.0 < LC_{50} < 5.0						

REMARKS:

Test Number: P-02-026

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
6	24.0	5	100
5	24.0	5	100
4	24.0	0	0
3	24.0	0	0
2	24.0	0	0
CONTROL	24.0	0	0

ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-002 'B'
SOURCE Dike Filter Drainage 'Rep'	MATERIAL TESTED Dike Filter Drainage 'Rep'	DATE SAMPLED 20/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 50 Gallons	DATE RECEIVED 21/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100,80,60,40,20,control	DATE TEST TIME 22/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	24.5	
D.O. (mg/l)	--	D.O. (mg/l)	5.0	3 - 3
pH	--	pH	8.25	OBSERVER W. Neufeld A. Beckett
Cond (umhos)	--	Cond (umhos)	1350	
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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BIOASSAY DATA SHEET II Test Number: N-02-002 B Test Date: 3/17/76

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	20	40	60	80	100	
TEMPERATURE (°C)	14.4 ± 0.2	14.5 ± 0	14.5 ± 0	15.0	16.0	16.5	
DISSOLVED OXYGEN (mg/l)	9.9 ± 0.1	10.0 ± 0.1	9.9 ± 0.1	9.3	7.9	7.5	
pH	7.38 ± 0.06	8.17 ± 0.02	8.48 ± 0.01	8.50	8.47	8.46	
CONDUCTIVITY (umhos)	131 ± 2	298 ± 4	468 ± 4	750	950	1150	
AMMONIA (mg/l)	—	—	—	—	—	—	TOTAL
FISH LENGTH (cm)	8.0 ± 0.9	7.8 ± 0.4	8.0 ± 0.7	8.3 ± 1.4	7.6 ± 1.3	8.1 ± 0.8	8.0 ± 0.2
FISH WEIGHT (gm)	5.6 ± 1.9	5.2 ± 0.7	6.7 ± 1.7	6.1 ± 2.9	5.6 ± 2.5	6.4 ± 1.8	5.8 ± 0.5
LOADING DENSITY (1/gm)	1.4	1.5	1.2	1.3	1.4	1.5	1.4 ± 0.1
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (1)	40	40	40	40	40	40	
LT_{50} (Hr)	—	8.3(6.4-10.8)	12<LT50<24	5.3(2.9-9.8)	1.80(1.59-2.04)	1.25<LT50<1.50	
LC_{50} (Conc by Vol)	96 hr LC50<20% By graph 96 hr LC50: 35 %						

REMARKS:

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Test Number: N-02-00[illegible]

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100%	1.25	2	40
	1.50	3	100
90%	1.75	2	40
	2.0	2	80
	3.0	1	100
60%	4.0	2	40
	6.0	1	60
	8.0	2	100
40%	24.0	5	100
20%	8.0	2	40
	12.0	2	80
	24.0	1	100
Control	96.0	0	0

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NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I. .

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-002 'A'
SOURCE Dike Filter Drainage	MATERIAL TESTED Dike Filter Drainage (Original)	DATE SAMPLED 20/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 50 Gallons	DATE RECEIVED 21/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100,80,60,40,20,control	DATE TEST TIME 22/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	20.0	
D.O. (mg/l)	--	D.O. (mg/l)	5.7	3 - 4
pH	--	pH	8.23	OBSERVER
Cond (umhos)	--	Cond (umhos)	1350	W.Neufeld A.Beckett
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

BIOASSAY DATA SHEET [illegible] Test Number: [illegible] Test Date [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	20	40	60	80	100	TOTAL
TEMPERATURE (°C)	14.5 ± 0	14.3 ± 0.4	14.2 ± 0.4	14.5	15.5	17.0	
DISSOLVED OXYGEN (mg/l)	9.6 ± 0.5	[illegible] ± 0.1	9.9 ± 0.1	9.3	9.0	9.1	
pH	7.32 ± 0.06	[illegible] ± 0.13	8.42 ± 0.06	8.42	8.47	[illegible]	
CONDUCTIVITY (umhos)	131 ± 2	295 ± 0	470 ± 7	700	900	1150	
AMMONIA (mg/l)	—	—	—	—	—		
FISH LENGTH (cm)	8.2 ± 1.3	7.9 ± 0.6	8.6 ± 1.1	7.3 ± 0.7	7.8 ± 0.6	8.5 ± 1.2	8.0 ± [illegible]
FISH WEIGHT (gm)	6.3 ± 2.7	6.1 ± 1.5	7.0 ± 2.4	4.3 ± 1.3	5.6 ± 1.0	6.4 ± 2.4	6.0 ± [illegible]
LOADING DENSITY (l/gm)	1.3	1.3	1.1	1.9	1.4	1.2	1.4 ± [illegible]
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (l)	40	40	40	40	40	40	
LT_{50} (Hr)	—	12.0 < LT50 < 24.0	6.5 (2.9 – 14.5)	4.0 < LT50 < 5.0	1.45 (0.67 – 3.14)	1.25 < LT50 < 1.50	
LC_{50} (Conc by Vol)	96 HR LC50 < 20% [illegible] graph 96 HR LC50 = 9.4%						

REMARKS:

Test Number: 11-02-002 A

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100 %	1.25	1	20
	1.50	4	100
20 %	1.75	3	60
	2.25	1	80
	2.50	1	100
10 %	5.0	4	80
	6.0	1	100
40 %	8.0	3	60
	12.0	1	80
	24.0	1	100
20 %	12.0	2	40
	24.0	3	100
Control	96.0	0	0

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NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-002 'D'
SOURCE Athabasca River Downstream	MATERIAL TESTED River Water	DATE SAMPLED 20/7/76
PLANT TREATMENT --	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 21/7/76
STATUS OF PLANT --	DILUTIONS (%) 100, 100, control	DATE TEST TIME 22/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake
ORIGINAL FIELD ANALYSIS	ORIGINAL LAB ANALYSIS (100%)	TEST RACK
Temp (^{o}C) --	Temp (^{o}C) 24.0	
D.O. (mg/l) --	D.O. (mg/l) 8.3	3 - 2 (#3&4)
pH --	pH 8.24	OBSERVER W. Neufeld A. Beckett
Cond (umhos) --	Cond (umhos) 220	
NH_3 (mg/l) --	NH_3 (mg/l) --	

REMARKS:-

TA[illegible]ETH Test Number: NW-02-0[illegible]D Test Date: 12/7/76

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	100	100				
TEMPERATURE (°C)	14.4 ± 0.2	14.8 ± 0.7	14.7 ± 0.4				
DISSOLVED OXYGEN (mg/1)	9.9 ± 0.1	9.8 ± 0.2	9.7 ± 0.3				
pH	7.38 ± 0.06	8.2[illegible] ± 0.0[illegible]	8.24 ± 0.07				
CONDUCTIVITY (umhos)	131 ± 2	188 ± [illegible]	184 ± 5				
AMMONIA (mg/1)							TOTAL
FISH LENGTH (cm)	8.0 ± 0.9	7.6 ± 1.2	8.4 ± 0.6				5.[illegible]
FISH WEIGHT (gm)	5.6 ± 1.9	5.0 ± 1.7	6.3 ± 1.3				5.[illegible]
LOADING DENSITY (1/gm)	1.4	1.6	1.3				1.4
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (1)	40	40	40				
LT_{50} (Hr)	/	/	/				
LC_{50} (Conc by Vol)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

REMARKS:

Test Number: N-02-0022

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
① 100 %	96.0	1	20
② 100 %	96.0	0	0
Control	96.0	0	0

ENVIRONMENTAL PROTECTION SERVICE
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EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-002 'E'
SOURCE Athabasca River Upstream	MATERIAL TESTED River Water	DATE SAMPLED 20/7/76
PLANT TREATMENT --	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 21/7/76
STATUS OF PLANT --	DILUTIONS (%) 100, 100, control	DATE TEST TIME 22/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	24.0	
D.O. (mg/l)	--	D.O. (mg/l)	8.5	3 - 2 (#5&6)
pH	--	pH	8.09	
Cond (umhos)	--	Cond (umhos)	170	OBSERVER W. Neufeld A. Beckett
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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BIOASSAY DATA SHEET II Test # [illegible] N-82-[illegible] E Test Date: 22/[illegible]/[illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	100	100				
TEMPERATURE (°C)	14.4 ± 0.2	14.6 ± 0.2	14.6 ± 0.2				
DISSOLVED OXYGEN (mg/l)	9.9 ± 0.1	9.6 ± 0.4	9.8 ± 0.2				
pH	7.38 ± 0.06	8.08 ± 0.07	8.08 ± 0.09				
CONDUCTIVITY (umhos)	131 ± 2	141 ± 5	143 ± 4				
AMMONIA (mg/l)							TOTAL
FISH LENGTH (cm)	8.0 ± 0.9	8.3 ± 0.8	8.6 ± 0.5				8.3
FISH WEIGHT (gm)	5.6 ± 1.9	5.9 ± 1.6	6.7 ± 0.9				6.1
LOADING DENSITY (l/gm)	1.4	1.3	1.2				1.3
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (l)	40	40	40				
LT_{50} (Hr)	/	/	/				
LC_{50} (Conc by Vol)	NOT ACUTELY LETHAL						

REMARKS:

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Test Number: N-0[illegible]

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
① 100 %	96.0	0	0
② 100 %	96.0	0	0
CONTROL	96.0	0	0

ENVIRONMENTAL PROTECTION SERVICE
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EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-002 'C'
SOURCE Athabasca River and Dike Filter Drainage	MATERIAL TESTED River Water and Effluent Mixture	DATE SAMPLED 20/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 21/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100, 100, control	DATE TEST TIME 22/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	24.5	
D.O. (mg/l)	--	D.O. (mg/l)	8.1	3 - 2 (#1&2)
pH	--	pH	8.46	OBSERVER W. Neufeld A. Beckett
Cond (umhos)	--	Cond (umhos)	650	
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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BIOASSAY DATA SHEET — Test Number: OL 008 — Test Date: 2L [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	100%	100%				
TEMPERATURE (°C)	14.4 ± 0.2	15.0 ± 0.7	14.5 ± 0.7				
DISSOLVED OXYGEN (mg/l)	9.9 ± 0.1	9.7 ± 0.2	9.8 ± 0.3				
PH	7.38 ± 0.05	8.46 ± 0.10	8.49 ± 0.15				
CONDUCTIVITY (umhos)	131 ± 2	440 ± 10	446 ± 18				
AMMONIA (mg/l)							TOTAL
FISH LENGTH (cm)	8.0 ± 0.7	8.0 ± 0.7	7.4 ± 0.8				[illegible]
FISH WEIGHT (gm)	5.6 ± 1.9	7.1 ± 2.0	5.2 ± 1.3				[illegible]
LOADING DENSITY (1/gm)	1.4	1.1	1.6				[illegible]
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (l)	40	40	40				
LT_{50} (Hr)		[illegible]					
LC_{50} (Conc by Vol)	[illegible]						

REMARKS: The sample [illegible]

Test Number: N-02-002 C

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
① 100 %	96.0	3	60
② 100 %	72.0	2	40
	96.0	0	40

ENVIRONMENTAL PROTECTION SERVICE
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EDMONTON, ALBERTA.

BIOASSAY DATA SHEET 1.

COMPANY Fischer Scientific	TYPE OF TEST 96 Hr. Static	TEST NUMBER P - 02 - 028
SOURCE Fischer Scientific	MATERIAL TESTED Sodium Lauryl Sulfate	DATE SAMPLED ----
PLANT TREATMENT ----	AMOUNT OF EFFLUENT RECEIVED ----	DATE RECEIVED ----
STATUS OF PLANT ----	DILUTIONS 40 l. 6, 5, 4, 3, 2, Control	DATE TEST TIME 28 / 7 / 76 0900
SAMPLED BY ----	TEST ORGANISM LOCATION S. gairdneri RF - 376	SEND RESULTS TO: Laboratory

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS		TEST RACK
Temp (^{o}C)	----	Temp (^{o}C)	14.0	2 - 2
D.O. (mg/l)	----	D.O. (mg/l)	9.9	
pH	----	pH	7.80	OBSERVER
Cond (umhos)	----	Cond (umhos)	135	W Mumford
NH_3 (mg/l)	----	NH_3 (mg/l)	----	

REMARKS:-

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BIOASSAY DATA SHEET II

Test Number: [illegible] Test Date: [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	2	3	4	5	6	
TEMPERATURE (°C)	13.5 ± 0	14.0 ± 0	14.0 ± 0	14.0 ± 0	14.0 ± 0	14.0 ± 0	
DISSOLVED OXYGEN (mg/1)	[illegible]	7.5 ± 1.1	9.0 ± 1.6	9.3 ± 1.1	9.3 ± 0.5	7.4 ± 0.8	
pH	7.44 ± [illegible]	7.56 ± 0.06	7.58 ± 0.18	7.64 ± 0.02	7.65 ± 0.15	7.7 ± 0.14	
CONDUCTIVITY (umhos)	138 ± 4	138 ± 4	138 ± 4	138 ± 4	138 ± 4	138 ± 4	
AMMONIA (mg/1)							TOTAL
FISH LENGTH (cm)	8.5 ± 0.6	7.2 ± 1.2	7.9 ± 0.4	7.3 ± 0.8	8.1 ± 0.6	7.6 ± 1.3	7.8 ±
FISH WEIGHT (gm)	5.8 ± 1.0	[illegible]	6.1 ± 0.8	4.6 ± 1.0	6.9 ± 1.3	6.1 ± [illegible]	5.4 ±
LOADING DENSITY (1/gm)	1.7	2.1	1.6	1.7	1.2	1.3	1.6 ±
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (1)	40	40	40	40	40	40	
LT_{50} (Hr)				≈ 23.0 12.0 - 24.0	≈ 17.0 14.0 - 1.0	[illegible]	
LC_{50} (Conc by Vol)	[illegible]			3 < LC_{50} < 4			

REMARKS:

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Test Number: P-02-028

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
6	12.0	2	40
	24.0	3	100
5	24.0	5	100
4	24.0	3	60
3	24.0	0	0
2	24.0	0	0
CONTROL	24.0	0	0

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NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY	TYPE OF TEST	TEST NUMBER
Great Canadian Oil Sands	96 hour Static	N-02-003 'B'
SOURCE	MATERIAL TESTED	DATE SAMPLED
Dike Filter Drainage	Dike Filter Drainage (Replicate)	26/7/76
PLANT TREATMENT	AMOUNT OF EFFLUENT RECEIVED	DATE RECEIVED
Tailings Pond	50 Gallons	27/7/76
STATUS OF PLANT	DILUTIONS(%)	DATE TEST TIME
Operational	100,80,60,40,20,control	28/7/76 0900
SAMPLED BY	TEST ORGANISM LOCATION	SEND RESULTS TO:
DOE Alberta	*Salmo gairdneri* RF-376	W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	21.5	
D.O. (mg/l)	--	D.O. (mg/l)	5.5	3 - 3
pH	--	pH	8.26	OBSERVER
Cond (umhos)	--	Cond (umhos)	1250	W. Neufeld, A. Beckett
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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[illegible]RIC [illegible]SAY DATA SHEET II   Test Number: N-02-202 Test Date: [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	20	40	60	[illegible]	100	
TEMPERATURE (°C)	14.5 ± 0.4	14.5	14.5	15.0	15.5	16.0	
DISSOLVED OXYGEN (mg/l)	9.6 ± 0.3	9.4	9.0	[illegible]	7.7	7.4	
pH	7.59 ± 0.13	8.27	8.36	8.25	8.4[illegible]	8.47	
CONDUCTIVITY (umhos)	132 ± 3	200	465	720	950	1100	
AMMONIA (mg/l)	—	—	—	—	—	—	TOTAL
FISH LENGTH (cm)	8.2 ± 1.2	7.9 ± 0.5	7.7 ± 0.8	7.2 ± 1.3	[illegible].1 ± 0.7	7.7 ± [illegible]	7.8 ± 0.
FISH WEIGHT (gm)	5.9 ± 2.6	5.9 ± 1.9	5.5 ± 1.4	4.4 ± 1.9	5.7 ± 1.6	4.9 ± 1.3	5.4 ± [illegible]
LOADING DENSITY (l/gm)	1.4	1.4	1.4	1.8	1.4	1.6	1.3 ± [illegible]
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (l)	40	40	40	40	40	40.	
LT_{50} (Hr)	—	7.0 < LT50 < 12.0	5.55 (4.10-7.42)	1.90 (1.51-2.39)	1.25 ([illegible])	1.0 < LT50 < 1.3	
LC_{50} (Conc by Vol)	96 hr LC50 < 20% (by graph) [illegible] LC50 ≈ 5.2%						

REMARKS:

Test Number: N-02-002 B

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100	1.0	2	40
	1.3	?	100
80	1.0	1	20
	1.3	1	40
	1.5	1	60
	2.0	1	80
	2.3	1	100
60	1.0	1	20
	1.8	1	40
	2.0	1	60
	4.0	2	100
40	4.0	1	20
	5.0	1	40
	6.0	1	60
	12.0	2	100
20	7.0	1	20
	12.0	4	100
CONTROL	96.0	0	0

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NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-003 'A'
SOURCE Dike Filter Drainage	MATERIAL TESTED Dike Filter Drainage (Original)	DATE SAMPLED 26/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 50 Gallons	DATE RECEIVED 27/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100,80,60,40,20,control	DATE TEST TIME 28/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake
ORIGINAL FIELD ANALYSIS	ORIGINAL LAB ANALYSIS (100%)	TEST RACK
Temp (^{o}C) --	Temp (^{o}C) 21.5	3 - 4
D.O. (mg/l) --	D.O. (mg/l) 5.5	
pH --	pH 8.26	OBSERVER W. Neufeld A. Deckett
Cond (umhos) --	Cond (umhos) 1250	
NH_3 (mg/l) --	NH_3 (mg/l) --	

REMARKS:-

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BI[illegible] AY [illegible]TA[illegible] [illegible]ET[illegible] [illegible] Nl[illegible]erd [illegible]CL OOL. Tel. Dat. [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	20	40	60	80	100	
TEMPERATURE (°C)	14.4 ± 0.2	14.0 ± 0	14.5	15.0	15.0	16.0	
DISSOLVED OXYGEN (mg/l)	10.0 ± 0.4	9.7 ± 0.4	9.4	8.8	8.1	8.7	
pH	7.60 ± 0.14	8.18 ± 0.16	8.36	8.40	8.42	8.53	
CONDUCTIVITY (umhos)	131 ± 2	285 ± 0	460	750	950	1100	
AMMONIA (mg/l)	—	—	—	—	—	—	TOTAL
FISH LENGTH (cm)	7.8 ± 0.5	7.4 ± 0.9	7.6 ± 1.2	7.9 ± 0.5	7.4 ± 1.0	8.6 ± 0.7	7.8 ± [illegible]
FISH WEIGHT (gm)	4.7 ± 0.8	5.5 ± 1.9	5.9 ± 3.0	5.6 ± 1.2	4.5 ± 2.2	6.7 ± 2.1	5.5 ± [illegible]
LOADING DENSITY (l/gm)	1.7	1.5	1.3	1.4	1.8	1.2	1.5 ± [illegible]
NUMBER FISH/DILUTION	5	5	5	5	5	5	
NUMBER DILUTIONS/CONC	1	1	1	1	1	1	
VOLUME OF DILUTIONS (l)	40	40	40	40	40	40	
LT_{50} (Hr)	—	8 < LT50 < 12	4 < LT50 < 12	3.55 (2.90 - 4.35)	1.92 (1.45 - 2.49)	1.15 (0.80 - 1.66)	
LC_{50} (Conc by Vol)	96 hr LC50 < 20%, by graph 96 hr LC50: 3.45%						

REMARKS:

Test Number: N-02-003H

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100 %	0.75	1	20
	1.50	3	80
	2.0	1	100
80 %	1.25	1	20
	2.0	2	60
	2.25	2	100
60 %	2.75	1	20
	4.0	3	80
	5.0	1	100
40 %	4.0	1	20
	12.0	4	100
20 %	12.0	4	80
	24.0	1	100
Control	96.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-003 'E'
SOURCE Athabasca River Upstream	MATERIAL TESTED River Water	DATE SAMPLED 26/7/76
PLANT TREATMENT --	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 27/7/76
STATUS OF PLANT --	DILUTIONS (%) 100, 100, control	DATE TEST TIME 28/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	20.5	
D.O. (mg/l)	--	D.O. (mg/l)	8.8	3 - 2 (#5&6)
pH	--	pH	8.19	OBSERVER W. Neufeld A. Beckett
Cond (umhos)	--	Cond (umhos)	165	
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

BIOASSAY DATA SHEET II Test Number: [illegible] Test Date: [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	100	100				
TEMPERATURE (°C)	14.5 ± 0.4	14.7 ± 0.3	14.7 ± 0.8				
DISSOLVED OXYGEN (mg/l)	9.6 ± 0.[illegible]	9.5 ± 0.4	[illegible] ± 0.3				
pH	7.59 ± 0.15	8.08 ± 0.09	8.04 ± 0.12				
CONDUCTIVITY (umhos)	1[illegible] ± [illegible]	141 ± 8	141 ± 8				
AMMONIA (mg/l)	—	—	—				TOTAL
FISH LENGTH (cm)	8.3 ± 1.2	7.6 ± 0.6	7.2 ± 0.5				7.7 ± 0.
FISH WEIGHT (gm)	5.9 ± 2.6	4.6 ± 1.3	3.5 ± 0.7				4.8 ± 1.
LOADING DENSITY (1/gm)	1.4	1.7	2.1				1.7 ± 0
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (1)	40	40	40				
LT_{50} (Hr)	/	/	/				
LC_{50} (Conc by Vol)	NOT ACUTELY LETHAL						

REMARKS:

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Test Number: N-02-003 E

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100	96.0	0	0
100	84.0	1	20
	96.0	0	20
CONTROL	96.0	0	0

ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY Great Canadian Oil Sands	TYPE OF TEST 96 hour Static	TEST NUMBER N-02-003 'C'
SOURCE Athabasca River and Dike Filter Drainage Interface	MATERIAL TESTED River Water and Effluent Mixture	DATE SAMPLED 26/7/76
PLANT TREATMENT Tailings Pond	AMOUNT OF EFFLUENT RECEIVED 25 Gallons	DATE RECEIVED 27/7/76
STATUS OF PLANT Operational	DILUTIONS (%) 100, 100, control	DATE TEST TIME 28/7/76 0900
SAMPLED BY DOE Alberta	TEST ORGANISM LOCATION *Salmo gairdneri* RF-376	SEND RESULTS TO: W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100%)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	20.5	
D.O. (mg/l)	--	D.O. (mg/l)	8.7	3 - 2 (#1&2)
pH	--	pH	8.43	OBSERVER W. Neufeld A. Beckett
Cond (umhos)	--	Cond (umhos)	600	
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

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BIOASSAY DATA SHEET [illegible]   Test [illegible] - 82 - [illegible]   Test Date: [illegible]

PARAMETERS	CONCENTRATIONS (MEAN & STANDARD DEVIATION)						
	CONTROL	① 100	② 00				TOTAL
TEMPERATURE (°C)	14.5 ± 0.4	14.5 ± 0.4	14.5 ± 0.4				
DISSOLVED OXYGEN (mg/l)	9.6 ± 0.3	9.1 ± 0.3	9.0 ± 0.2				
pH	7.59 ± 0.13	8.44 ± 0.04	8.43 ± 0.05				
CONDUCTIVITY (umhos)	122 ± 3	488 ± 3	491 ± 3				
AMMONIA (mg/l)	—	—	—				
FISH LENGTH (cm)	8.2 ± 1.2	7.7 ± 1.3	8.1 ± 0.9				8.0 ± 0.
FISH WEIGHT (gm)	5.9 ± 2.6	5.8 ± 2.9	6.8 ± 2.0				6.2 ± 0.
LOADING DENSITY (l/gm)	1.4	1.4	1.2				1.3 ± 0
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (l)	40	40	40				
LT_{50} (Hr)	—	600 ([illegible])	453 (372-556)				
LC_{50} (Conc by Vol)	96 hr LC50 [illegible]						

REMARKS:

Test Number: N-02-002 C

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
(1) 100	48.0	1	20
	60.0	2	60
	72.0	1	80
	84.0	1	100
(2) 100	36.0	1	20
	48.0	2	60
	60.0	2	100
CONTROL	96.0	0	0

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ENVIRONMENTAL PROTECTION SERVICE
NORTHWEST REGION BIOASSAY LABORATORY
EDMONTON, ALBERTA.

BIOASSAY DATA SHEET I.

COMPANY	TYPE OF TEST	TEST NUMBER
Great Canadian Oil Sands	96 hour Static	N-02-003 'D'
SOURCE	**MATERIAL TESTED**	**DATE SAMPLED**
Athabasca River Downstream	River Water	26/7/76
PLANT TREATMENT	**AMOUNT OF EFFLUENT RECEIVED**	**DATE RECEIVED**
--	25 Gallons	27/7/76
STATUS OF PLANT	**DILUTIONS (%)**	**DATE TEST TIME**
--	100, 100, control	28/7/76 0900
SAMPLED BY	**TEST ORGANISM LOCATION**	**SEND RESULTS TO:**
DOE Alberta	*Salmo gairdneri* RF-376	W.H. Lake

ORIGINAL FIELD ANALYSIS		ORIGINAL LAB ANALYSIS (100)		TEST RACK
Temp (^{o}C)	--	Temp (^{o}C)	20.5	
D.O. (mg/l)	--	D.O. (mg/l)	8.4	3 - 2 (#3&4)
pH	--	pH	8.33	
Cond (umhos)	--	Cond (umhos)	250	OBSERVER W. Neufeld, A. Beckett
NH_3 (mg/l)	--	NH_3 (mg/l)	--	

REMARKS:-

[illegible] DATA SHEET [illegible]   Test [illegible] [illegible]-02-[illegible]   Test Date: [illegible]

PARAMETERS	CONCENTRATIONS: (MEAN & STANDARD DEVIATION)						
	CONTROL	50	100				TOTAL
TEMPERATURE (°C)	14.5 ± 0.4	14.6 ± 0.[illegible]	14.6 ± 0.5				
DISSOLVED OXYGEN (mg/1)	9.6 ± 0.2	9.7 ± 0.5	9.2 ± 0.3				
pH	7.59 ± 0.13	8.[illegible] ± 0.05	8.15 ± 0.07				
CONDUCTIVITY (umhos)	134 ± 3	[illegible] ± 17	237 ± 12				
AMMONIA (mg/1)	—	—	—				
FISH LENGTH (cm)	8.3 ± 1.2	8.1 ± 0.6	7.5 ± 1.1				8.0 ± [illegible]
FISH WEIGHT (gm)	5.9 ± 2.6	5.4 ± 1.3	4.8 ± 1.8				5.4 ± [illegible]
LOADING DENSITY (1/gm)	1.4	1.5	1.7				1.5 ± [illegible]
NUMBER FISH/DILUTION	5	5	5				
NUMBER DILUTIONS/CONC	1	1	1				
VOLUME OF DILUTIONS (1)	40	40	40				
LT_{50} (Hr)	/	/	/				
LC_{50} (Conc by Vol)	NOT ACUTELY LETHAL						

REMARKS:

Test Number: N-02-002 D

BIOASSAY DATA SHEET III

EFFLUENT CONCENTRATION	REPLICATE HOURS	NUMBER OF MORTALITIES	% DEATH
100	96.0	0	0
100	96.0	0	0
CONTROL	96.0	0	0

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