

# **Faosimile** TRANSMISSION

ROYAL OAK MINES INC., ENVIRONMENTAL SERVICES  
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**to:** John Brodie, (604) 922-9520  
**from:** Stephen Schultz, Royal Oak Mines  
**date:** November 4, 1997  
**subject:** Information Requirements - Giant Mine closure Cost Estimate  
**pages:** 21

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I apologise for the delay in supplying information to you. Much of this information comes from various files on the property and took time to consolidate.

Included with this fax are:

- 1) Three pages on mine water quality (1996 and 1997). Bear in mind that there is some seepage from the Northwest Pond into the Supercrest area of the mine.
- 2) Canadian Climate Normals for Yellowknife, 1961-1990. There is no evaporation data here. I have a report from Bob Reid at DIAND on evaporation studies at nearby Pocket Lake, but can't find it as yet.
- 3) Thermistor readings from Dam 21D and Dam 11 in the TCA. Please note my reservations on the data in fax to Golder Associates.
- 4) Historical data on catchment basin water quality (dam seepage) for various dams (5 pages). Note that seepage has been reduced to non-detectable levels of flow at a number of dams in the last few years, with a program of systematic beaching of tailings on the upstream faces of the dams.

I'm preparing some information on the cost of water treatment and the water balance, which I can fax tomorrow. I have some large reports and drawings which I'll send by courier tomorrow.

In direct answer to some of your inquiries:

- There are two vent intakes to the mine: B-shaft vent plant, 2 x 100 HP fans; B3 shaft vent plant, 2 x 75 HP fans. There is one exhaust plant at Akaitcho shaft, 1 x 100 HP fan. In addition to these there are numerous distribution fans underground with more combined installed horsepower than the surface plant fans.

- Tailings were used for backfill in the 1950's and 1960's. Uncemented, cycloned coarse flotation tailings were pumped underground. I believe there are estimates of the volumes/tonnages somewhere. In addition, over the course of one summer in the early 1980's, tailings were disposed of in the C1 pit - again, this was flotation tails only.

- We really don't know much as yet about arsenic in the solid tailings. Typical levels are 200 to 400 ppm. The mill people reckon that very little of this would be Trioxide because there is ample opportunity for this to be dissolved before discharge. There would be some unroasted arsenopyrite and the roaster also produces a certain amount of ferric arsenate, the proportion depending on the roaster operation (they produce more ferric arsenate if they "over-roast", but this impedes cyanidation and is avoided). Data on Acid Rock Drainage potential is coming (average NP/AP ratio is 12.9).

- There may be some information from Geocon or MAJM corp. on tailings dam stability analyses. I'm working with MAJM on this, because I don't think we have the report here.

I hope that this is of some help.

Regards,

Stephen Schullz

# MINE WATER SAMPLES - 1996

Date	Sample	Arsenic (ppm)	Cyanide (ppm)	Ammonia (ppm)
13-Mar	Station 1	48	0.19	24.8
	Station 2	28.9	0.15	22
	Station 3	12.5	0.02	16
	Station 4	7.93	0.02	20.8
	Mine Water	19.2	0.19	16.8
20-Mar	Station 1	12.5	0.07	19.2
	Station 2	12.5	0.4	15.6
	Station 3	4.8	0.09	14.6
	Station 4	6.56	0.37	20
	Mine Water	14	0.31	18.8
17-Apr	Station 1	13	2.1	29.4
	Station 2	12.2	3.6	18.4
	Station 3	5	2.6	17.6
	Station 4	7	1.8	18
	Mine Water	12.2	2.67	19
24-Apr	Station 1	12.5	2.2	13.2
	Station 2	12.2	3.6	28
	Station 3	4.3	1.8	24
	Station 4	5.6	0.1	23
	Mine Water	8.5	0.9	21

Date	Sample	Arsenic (ppm)	Cyanide (ppm)	Ammonia (ppm)
03-May	Station 1	22	3	20
	Station 2	25	1.1	9.6
	Station 3	27	1.8	18.4
	Station 4	33	0.06	8
	Mine Water	22.5	1.5	16.6
16-May	Station 1	18	2.5	16.4
	Station 2	39.6	1.5	22
	Station 3	6.7	0.86	18.4
	Station 4	10.7	0.06	10.2
	Mine Water	63.5	0.55	15.6
24-May	Station 1	10.5	0.4	25
	Station 2	48	0.38	12
	Station 3	9.4	0.04	15.6
	Station 4	32.9	0.05	22.4
	Mine Water	40	0.25	9.6
31-May	Station 1	7	5	18.4
	Station 2	4	5.9	16
	Station 3	15.5	1.1	14.4
	Station 4	25	0.05	20.8
	Mine Water	20.8	3.6	152

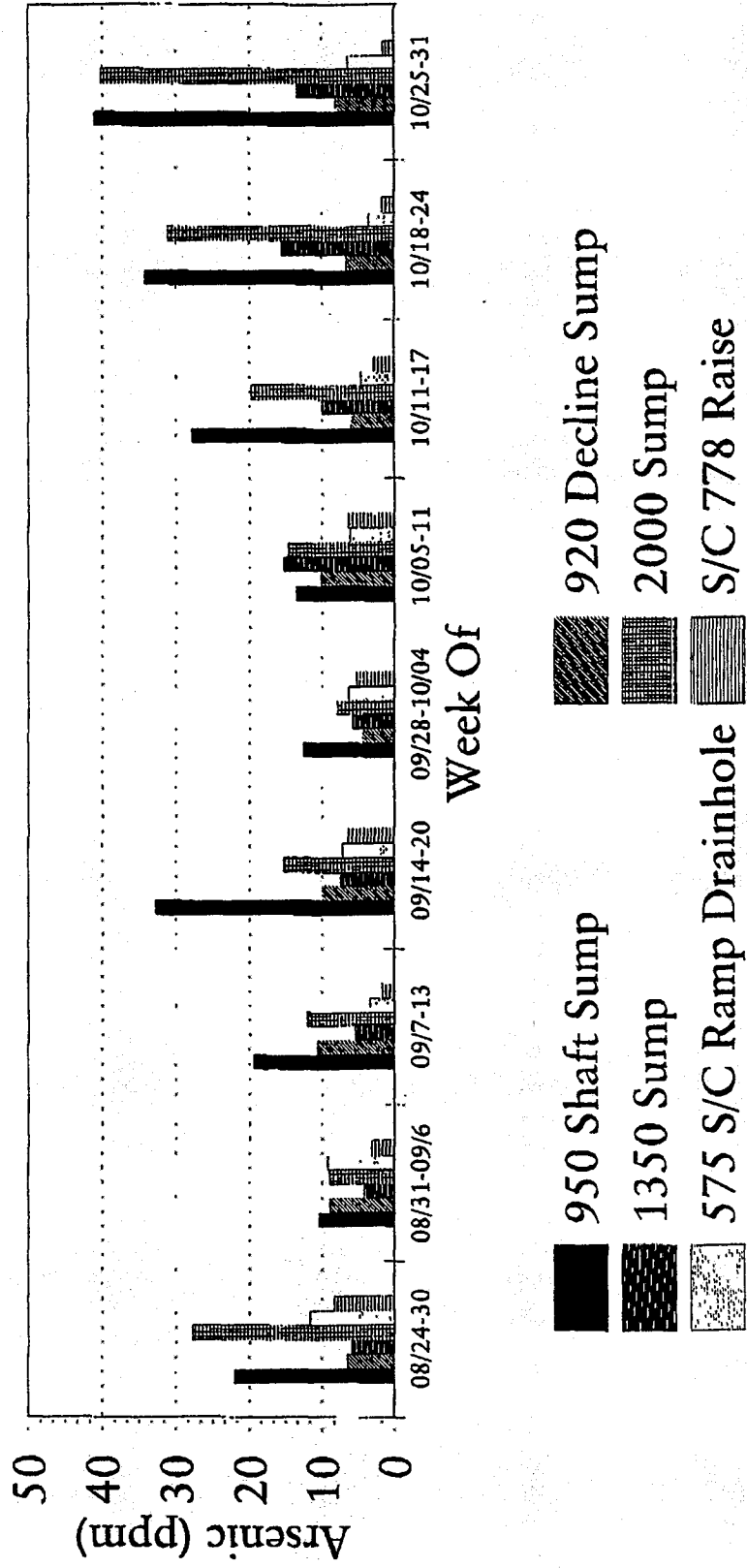
Date	Sample	Arsenic (ppm)	Cyanide (ppm)	Ammonia (ppm)
06-Jun	Station 1	8.2	2	17.8
	Station 2	5.6	3.1	19
	Station 3	11.5	0.8	16.2
	Station 4	21	0.08	18.6
	Mine Water	19.8	0.74	20.4
12-Jun	Station 1	6.1	0.93	17
	Station 2	11.1	0.68	15.8
	Station 3	12	0.4	16
	Station 4	20	0.05	21
	Mine Water	22.5	0.53	19.4
19-Jun	Station 1	4.3	0.04	17.6
	Station 2	14.9	0.38	9.6
	Station 3	6	0.12	9.8
	Station 4	19.2	1.01	11.6
	Mine Water	19	0.48	18
26-Jun	Station 1	9.8	0.68	16
	Station 2	3.8	0.67	8
	Station 3	8.2	0.34	7.6
	Station 4	14.9	0.21	15.6
	Mine Water	16	0.58	15.6

Date	Sample	Arsenic (ppm)	Cyanide (ppm)	Ammonia (ppm)
03-Jul	Station 1	9	0.43	14.8
	Station 2	10.9	0.36	12.3
	Station 3	17.7	0.3	11.8
	Station 4	30.1	0.29	9.6
	Mine Water	16.8	0.3	15.2
10-Jul	Station 1			
	Station 2			
	Station 3			
	Station 4			
	Mine Water			
17-Jul	Station 1			
	Station 2			
	Station 3			
	Station 4			
	Mine Water			
24-Jul	Station 1			
	Station 2			
	Station 3			
	Station 4			
	Mine Water			

## LOCATIONS

- STN. 1 950 LEVEL (BACK SUMP)
- 2 950 LEVEL (FRONT SUMP)
- 3 1300 LEVEL
- 4 2000 LEVEL

# ARSENIC CONCENTRATIONS 1997 MINE (water samples)



# 1997 MINE WATER QUALITY - ARSENIC ONLY

ARSENIC CONCENTRATIONS (PPM) FROM SELECTED LOCATIONS 10/31/97

	08/24-30	08/31-09/6	09/7-13	09/14-20	09/28-10/04	10/05-11	10/11-17	10/18-24	10/25-31
950 Shaft Sump	22	10.4	19.4	32.9	12.6	13.6	27.8	34.3	41.1
920 Decline Sump	6.5	8.9	10.6	10	4.4	10.1	5.9	6.6	8.2
1350 Sump	5.9	4.1	5.4	7.4	5.8	15.2	10	15.5	13.4
2000 Sump	27.8	9	12.1	15.3	8	14.7	19.7	31.1	40.2
575 S/C Ramp Drainhole	11.7	9.2	3.4	7.1	6.3	6.1	4.6	3.5	6.4
S/C 778 Raise	8.3	3.1	1.6	6.4	5.2	6.4	2.8	1.7	1.5



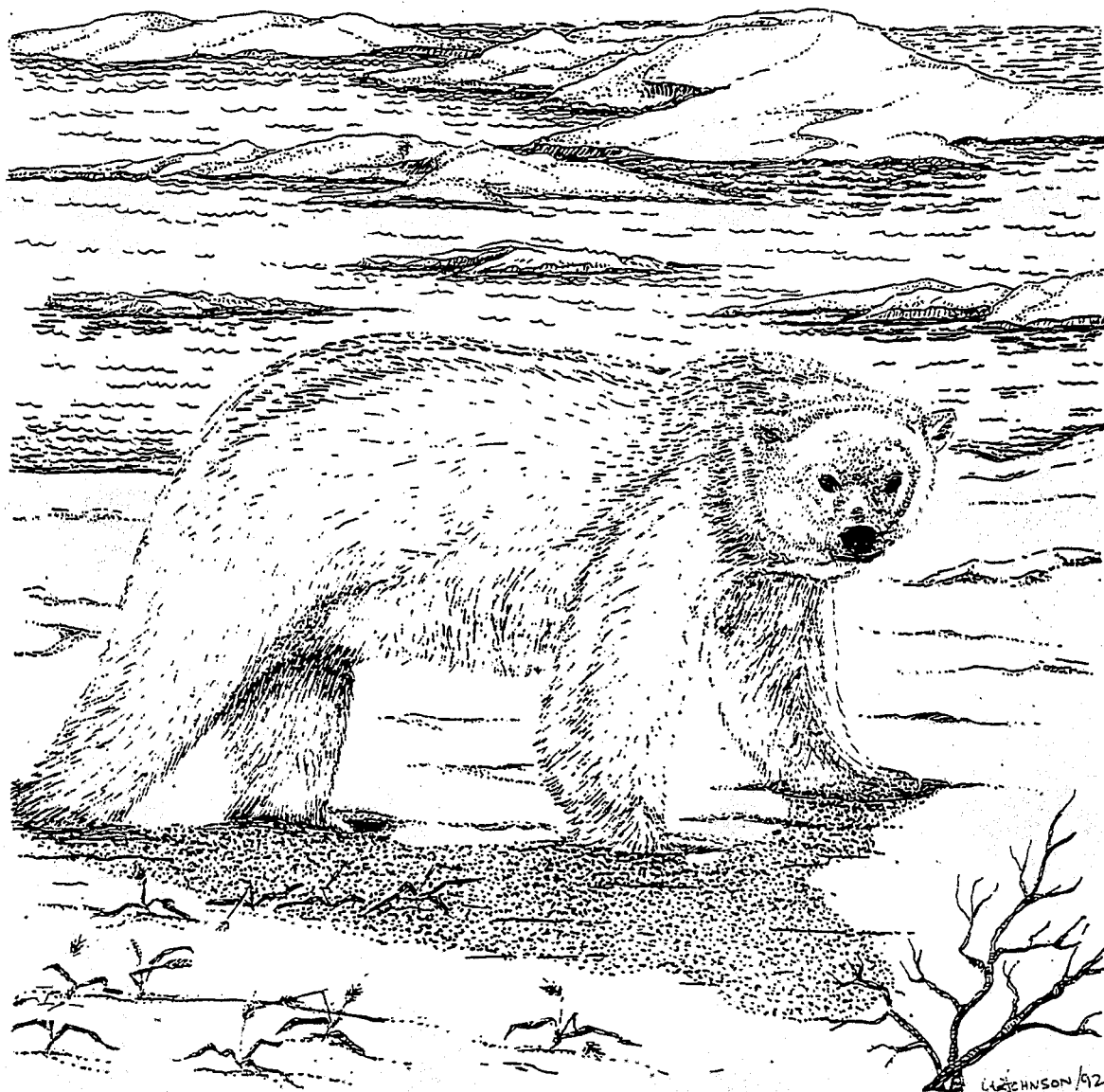
Environment  
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Atmospheric  
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de l'environnement  
atmosphérique

# **CANADIAN CLIMATE NORMALS NORMALES CLIMATIQUES AU CANADA 1961-90**



## **YUKON AND NORTHWEST TERRITORIES TERRITOIRES DU YUKON ET DU NORD-OUEST**

## WRIGLEY A

63°13'N 123°26'W/O, 150m, 1943 to/à 1990

	Jan janv	Feb févr	Mar mars	Apr avr	May mai	Jun juin	Jul juill	Aug août	Sep sept	Oct oct	Nov nov	Dec déc	Year année	
Temperature														Température
Daily Maximum (°C)	-24.5	-19.0	-9.8	3.7	14.0	21.1	22.8	19.9	12.0	-0.3	-14.9	N	N	Maximum quotidien (°C)
Daily Minimum (°C)	-32.5	-28.7	-23.1	-9.4	0.9	7.9	9.7	N	1.2	-6.9	-22.9	N	N	Minimum quotidien (°C)
Daily Mean (°C)	-28.4	-23.9	-16.4	-2.8	7.5	14.5	16.3	N	6.6	-3.5	-19.1	N	N	Moyenne quotidien (°C)
Extreme Maximum (°C)	5.0	11.1	12.5	25.0	31.0	35.0	35.0	33.5	28.3	21.7	8.9	7.8		Maximum extrême (°C)
Date	987/11+	968/29	990/30+	989/29	990/29	950/17	989/14+	989/13	967/15	969/04+	974/03+	944/13		Date
Extreme Minimum (°C)	-51.7	-53.3	-46.7	-36.1	-16.7	-3.9	-1.1	-6.0	-18.0	-31.5	-48.0	-49.4		Minimum extrême (°C)
Date	972/13+	968/03	955/02	954/06	974/02	958/09+	966/28+	986/24	983/28	984/31	990/24	976/11		Date
Precipitation														Précipitations
Rainfall (mm)	0.0	0.0T	0.1	N	21.6	53.9	56.1	48.6	26.4	5.5	0.2	0.0T	N	Chutes de pluie (mm)
Snowfall (cm)	18.0	12.3	12.9	N	6.3	0.0T	0.0	0.0	3.8	30.8	21.8	N	N	Chutes de neige (cm)
Precipitation (mm)	17.2	11.9	13.0	N	26.8	53.9	56.1	48.6	30.1	36.5	21.5	N	N	Précipitations (mm)
Extreme Daily Rainfall (mm)	0.0	0.0	2.5	11.7	23.9	31.7	38.1	40.1	27.2	16.0	5.1	0.0		Extrême quot. de pluie (mm)
Date	990/31+	990/28+	965/09	952/26	976/28	988/30	968/05	949/14	959/03	953/06	967/21	990/31+		Date
Extreme Daily Snowfall (cm)	20.8	12.0	11.4	20.3	30.5	0.8	0.0	0.0	12.7	29.4	16.5	25.9		Extrême quot. de neige (cm)
Date	962/19	987/26	952/29	964/01	972/21	978/15	990/31+	990/31+	946/29	984/04	948/16	953/31		Date
Extreme Daily Pcpn. (mm)	20.8	12.0	11.4	20.3	28.4	31.7	38.1	40.1	27.2	29.4	16.5	25.9		Extrême quot. de préc. (mm)
Date	962/19	987/26	952/29	964/01	970/13	988/30	968/05	949/14	959/03	984/04	948/16	953/31		Date
Month-end Snow Cover (cm)	N	N	N	19	0	0	0	0	1	18	27	N		Couver. de neige, fin de mois (cm)
Days With														Journées avec
Maximum Temperature >0°C	N	N	N	N	31	N	N	N	N	N	N	N	N	Température maximale >0°C
Measurable Rainfall	0	0	0	N	6	10	11	10	8	2	0	N	N	Hauteur de pluie mesurable
Measurable Snowfall	11	8	8	N	2	0	0	0	2	9	10	N	N	Hauteur de neige mesurable
Measurable Precipitation	11	8	9	N	8	10	11	10	9	10	11	N	N	Hauteur de préc. mesurable

## YELLOWKNIFE A

62°28'N 114°27'W/O, 205m, 1942 to/à 1990

	Jan janv	Feb févr	Mar mars	Apr avr	May mai	Jun juin	Jul juill	Aug août	Sep sept	Oct oct	Nov nov	Dec déc	Year année	
Temperature														Température
Daily Maximum (°C)	-23.9	-19.7	-12.5	-0.5	10.1	18.0	20.8	18.1	10.0	1.3	-10.8	-20.1	-0.8	Maximum quotidien (°C)
Daily Minimum (°C)	-32.2	-29.4	-24.6	-12.0	-0.1	8.2	12.0	10.0	3.4	-4.2	-18.9	-28.2	-9.7	Minimum quotidien (°C)
Daily Mean (°C)	-27.9	-24.5	-18.5	-6.2	5.0	13.1	16.5	14.1	6.7	-1.4	-14.8	-24.1	-5.2	Moyenne quotidien (°C)
Extreme Maximum (°C)	3.4	6.2	8.9	20.3	26.1	30.3	32.5	30.9	26.1	19.0	7.8	2.8		Maximum extrême (°C)
Date	985/03	986/28	973/30	980/28	948/31	990/23	989/16	984/02	951/06	988/05	956/23	944/13		Date
Extreme Minimum (°C)	-51.2	-51.2	-43.3	-40.6	-22.8	-4.4	0.6	-0.6	-9.7	-28.9	-44.4	-48.3		Minimum extrême (°C)
Date	947/31	947/04+	955/02	967/02	959/01	967/08+	951/12	982/25	983/29	972/26	966/27	946/25		Date
Degree-Days														Degrés-jours
Above 18 °C	0.0	0.0	0.0	0.0	0.1	4.4	19.0	8.7	0.0	0.0	0.0	0.0	32	Au-dessus 18°C
Below 18 °C	1427.5	1201.8	1133.7	727.6	403.7	150.8	66.8	130.9	338.2	602.6	986.1	1307.5	8477	Au-dessous 18°C
Above 5 °C	0.0	0.0	0.0	3.5	71.2	244.6	355.2	280.9	79.2	4.5	0.0	0.0	1039	Au-dessus 5°C
Below 0 °C	869.5	693.6	575.8	211.0	22.7	0.0	0.0	0.0	2.7	85.8	446.7	749.5	3657	Au-dessous 0°C
Precipitation														Précipitations
Rainfall (mm)	0.0T	0.0T	0.0T	1.6	12.2	23.0	35.2	41.6	24.8	14.6	0.6	0.2	154.0	Chutes de pluie (mm)
Snowfall (cm)	18.8	17.1	13.7	10.5	4.3	0.2	0.0	0.0T	3.5	21.7	33.5	20.6	143.9	Chutes de neige (cm)
Precipitation (mm)	14.9	12.6	10.6	10.3	16.6	23.3	35.2	41.7	28.8	34.8	23.9	14.7	267.3	Précipitations (mm)
Extreme Daily Rainfall (mm)	0.3	0.2	0.5	8.6	34.0	33.6	66.0	82.8	29.7	35.6	7.1	2.2		Extrême quot. de pluie (mm)
Date	977/17	981/01	958/27	946/27	957/05	988/28	988/22	973/15	982/07	967/11	954/21	985/20		Date
Extreme Daily Snowfall (cm)	13.0	23.7	10.9	13.0	11.2	3.0	0.0	1.0	15.2	16.0	14.7	15.7		Extrême quot. de neige (cm)
Date	980/23	982/20	954/14	981/07	979/28	970/06	990/31+	982/23	961/28	975/29	973/16	975/30		Date
Extreme Daily Pcpn. (mm)	12.4	17.5	10.9	13.5	34.0	33.6	66.0	82.8	29.7	35.6	12.2	11.4		Extrême quot. de préc. (mm)
Date	946/03	982/20	954/14	966/05	957/05	988/28	988/22	973/15	982/07	967/11	942/22	958/31		Date
Month-end Snow Cover (cm)	31	36	35	8	0	0	0	0	1	7	21	26		Couver. de neige, fin de mois (cm)
Days With														Journées avec
Maximum Temperature >0°C	-	-	2	14	29	30	31	31	30	19	2	-	188	Température maximale >0°C
Measurable Rainfall	-	-	-	1	5	7	10	10	9	6	-	-	50	Hauteur de pluie mesurable
Measurable Snowfall	12	10	9	5	2	-	0	-	2	10	16	14	80	Hauteur de neige mesurable
Measurable Precipitation	11	9	8	6	6	8	10	10	10	14	15	12	118	Hauteur de préc. mesurable
Freezing Precipitation	-	1	-	-	-	0	0	0	-	3	4	1	11	Précipitation verglaçante
Fog	2	2	-	-	-	1	-	-	2	4	3	2	19	Brouillard
Thunderstorms	0	0	0	0	-	2	2	-	-	0	0	0	6	Orages
Sunshine (hrs)	N	N	191.9	267.5	338.9	380.6	372.0	284.0	155.4	62.0	46.0	N	N	Insolation (h)
Station Pressure (kPa)	99.27	99.28	99.25	99.04	98.96	98.63	98.70	98.65	98.76	98.53	98.82	99.06	98.91	Pression à la station (kPa)
Moisture														Humidité
Vapour Pressure (kPa)	N	N	N	0.29	0.52	0.83	1.08	1.07	0.73	0.48	0.20	N	N	Pression de vapeur (kPa)
Rel. Humidity - 0600L (%)	N	69	70	73	69	66	71	81	85	85	79	71		Humidité relative - 0600L (%)
Rel. Humidity - 1500L (%)	67	65	59	57	48	45	48	54	62	76	78	71		Humidité relative - 1500L (%)
Wind														Vent
Speed (km/h)	13	13	14	16	16	16	15	15	15	16	15	12	15	Vitesse (km/h)
Most Frequent Direction	NW	E	NE	E	NE	S	S	S	SE	E	E	E	E	Direction la plus fréquente
Maximum Hourly Speed (km/h)	72	61	51	64	64	68	64	64	72	64	64	56		Vit. horaire max. (km/h)
Direction	NW	NW	NW	NW	NE	NW	N	NE	W	NW	NW	NW		Direction
Maximum Gust Speed (km/h)	105	98	70	93	87	89	85	80	105	89	113	80		Vit. max. du coup de vent (km/h)
Direction	W	N	NW	W	NW	W	N	N	W	NW	W	S		Direction

## YELLOWKNIFE HYDRO

62°40'N 114°15'W/O, 159m, 1943 to/à 1990

	Jan janv.	Feb févr.	Mar mars	Apr avr.	May mai	Jun juin	Jul juill.	Aug août	Sep sept.	Oct oct.	Nov nov.	Dec déc.	Year année	
Temperature														Température
Daily Maximum (°C)	-23.8	-20.2	-11.9	-0.7	10.0	18.1	21.5	18.5	10.6	1.4	-11.1	-20.7	-0.7	Maximum quotidien (°C)
Daily Minimum (°C)	-33.0	-31.6	-26.4	-14.1	-2.7	5.3	9.0	7.1	1.4	-4.5	-18.9	-29.6	-11.5	Minimum quotidien (°C)
Daily Mean (°C)	-28.3	-25.8	-19.1	-7.3	3.7	11.7	15.3	12.8	6.0	-1.5	-14.9	-25.1	-6.0	Moyenne quotidien (°C)
Extreme Maximum (°C)	2.8	6.7	12.8	21.0	25.6	30.6	32.2	31.0	26.7	17.2	7.2	1.7		Maximum extrême (°C)
Date	958/07	954/06	945/28	980/28	948/31	955/23	975/11	984/02	967/15	947/01+	970/03	944/13		Date
Extreme Minimum (°C)	-53.9	-53.9	-46.7	-43.3	-26.1	-6.1	-1.1	-3.9	-13.3	-27.2	-45.6	-47.2		Minimum extrême (°C)
Date	947/31	947/04	955/03	954/06	959/02	959/02+	951/15	950/18	965/25	956/27	966/27	948/10+		Date
Degree-Days														Degrés-jours
Above 18 °C	0.0	0.0	0.0	0.0	0.0	1.7	9.2	2.9	0.0	0.0	0.0	0.0	14	Au-dessus 18°C
Below 18 °C	1439.2	1239.8	1153.3	756.8	443.9	190.1	94.2	163.2	359.7	606.7	978.3	1338.1	8763	Au-dessous 18°C
Above 5 °C	0.0	0.0	0.0	1.5	48.7	203.7	318.1	242.8	61.5	2.7	0.0	0.0	879	Au-dessus 5°C
Below 0 °C	881.2	731.0	595.4	231.8	30.3	0.0	0.0	0.0	3.1	84.1	438.9	780.1	3776	Au-dessous 0°C
Precipitation														Précipitations
Rainfall (mm)	0.0	0.0	0.0	2.2	12.6	27.8	37.8	45.3	24.8	15.8	0.3	0.0	166.7	Chutes de pluie (mm)
Snowfall (cm)	18.2	18.0	12.7	9.9	4.1	0.0	0.0	0.0	1.9	17.6	27.8	22.5	132.8	Chutes de neige (cm)
Precipitation (mm)	18.2	18.0	12.7	12.5	16.7	27.9	37.8	45.3	26.7	33.4	28.2	22.5	299.9	Précipitations (mm)
Extreme Daily Rainfall (mm)	0.0	0.0	6.4	7.6	21.3	31.5	40.0	32.8	32.2	36.3	7.1	0.0		Extrême quot. de pluie (mm)
Date	990/31+	990/28+	952/29	966/04	956/27	976/01	990/13	975/29	982/07	967/11	953/15	990/31+		Date
Extreme Daily Snowfall (cm)	12.5	10.4	20.3	15.2	14.7	5.1	0.0	0.0	17.0	28.2	21.5	21.6		Extrême quot. de neige (cm)
Date	985/05	976/08	972/16	964/18	979/27	957/14	990/31+	990/31+	983/27	970/18	987/20	958/31		Date
Extreme Daily Pcpn. (mm)	12.5	10.4	20.3	15.2	21.3	31.5	40.0	32.8	32.2	42.7	21.5	21.6		Extrême quot. de préc. (mm)
Date	985/05	976/08	972/16	964/18	956/27	976/01	990/13	975/29	982/07	967/11	987/20	958/31		Date
Month-end Snow Cover (cm)	M	M	M	N	N	0	0	0	0	N	N	M		Couver. de neige, fin de mois (cm)
Days With														Journées avec
Maximum Temperature >0°C	0	0	2	14	29	30	31	31	30	19	2	0	188	Température maximale >0°C
Measurable Rainfall	0	0	0	0	5	8	9	11	8	6	0	0	46	Hauteur de pluie mesurable
Measurable Snowfall	10	10	7	4	2	0	0	0	0	7	13	11	64	Hauteur de neige mesurable
Measurable Precipitation	10	10	7	5	6	8	9	11	8	12	13	11	110	Hauteur de préc. mesurable



# **Facsimile** TRANSMISSION

ROYAL OAK MINES INC., ENVIRONMENTAL SERVICES  
FAX (403) 873 2914 PHONE (403) 669 3729

---

**to:** Jim Cassie, Golder Associates, (403) 299-5606  
**from:** Stephen Schultz  
**date:** September 11, 1997  
**subject:** Giant Mine Thermistor Readings  
**pages:** eight

---

Jim,

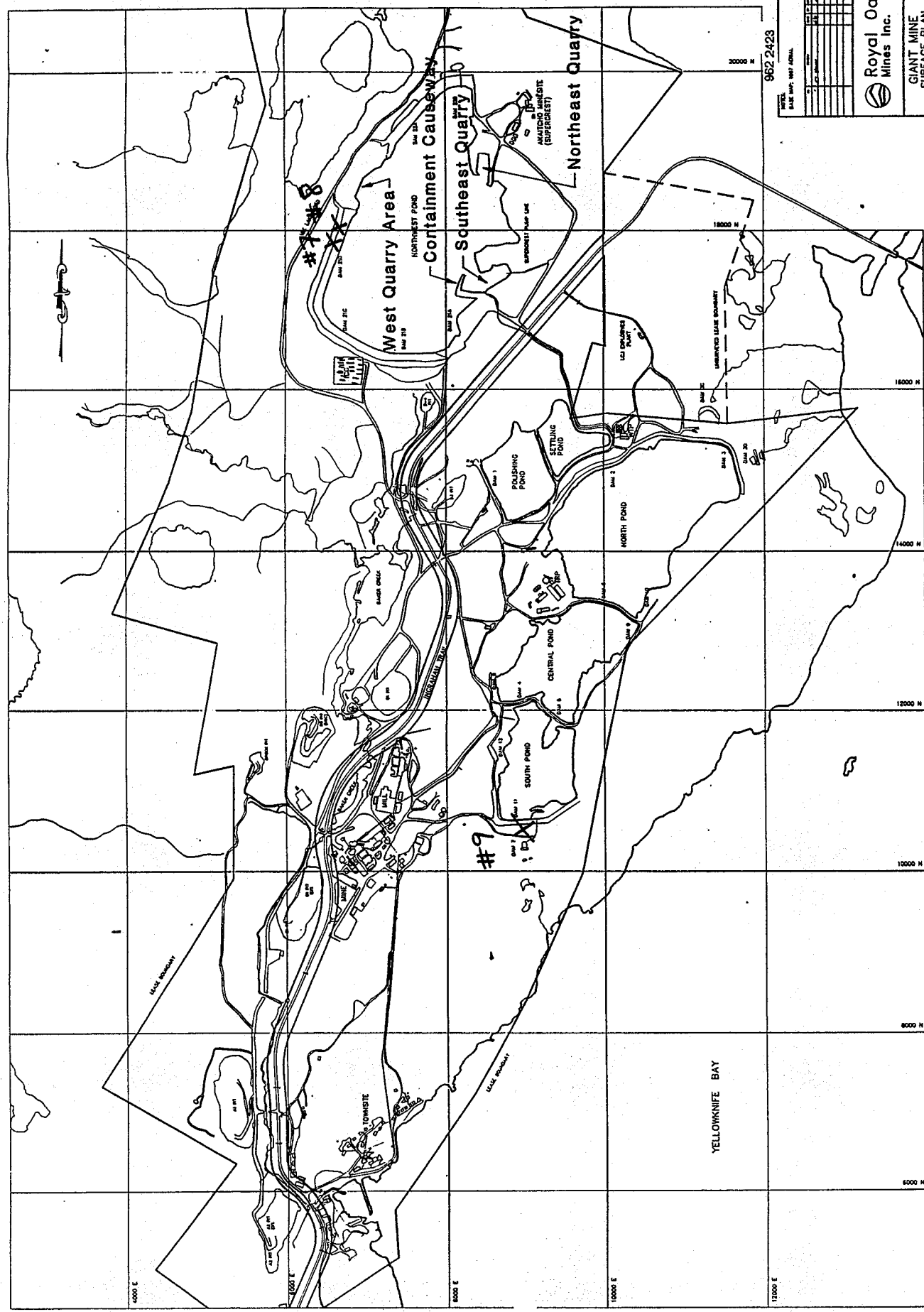
For what they are worth, here are some thermistor readings from the dams at Giant. There is a separate graph for each year (I'm including 1996 and 1997 readings).

Thermistor strings #7 and #8 are installed in Dam 21D. String #9 is installed in Dam 11 on the South Pond. I'm afraid that the readings for Dam 21D do not make much sense - either they are reading them incorrectly or have confused the depths. The pattern of readings at Dam 11 make much more sense.

I also have readings of pump operating time at Dam 22B and Dam 7. These have not been tabulated properly and I don't have time to work on them now, so I'm not providing them for you here.

As for conclusions from these data, I'm not sure what you can say. Perhaps you could comment that the thermistors and seepage rates are measured bi-weekly and leave it at that.

I'm sorry that this data is limited and confusing. It seems that at Giant they are more willing to read the instrumentation (than at Colomac), but don't care what the data means.



LOCATION OF THERISTOR STRONGS 7, 8 AND 9.

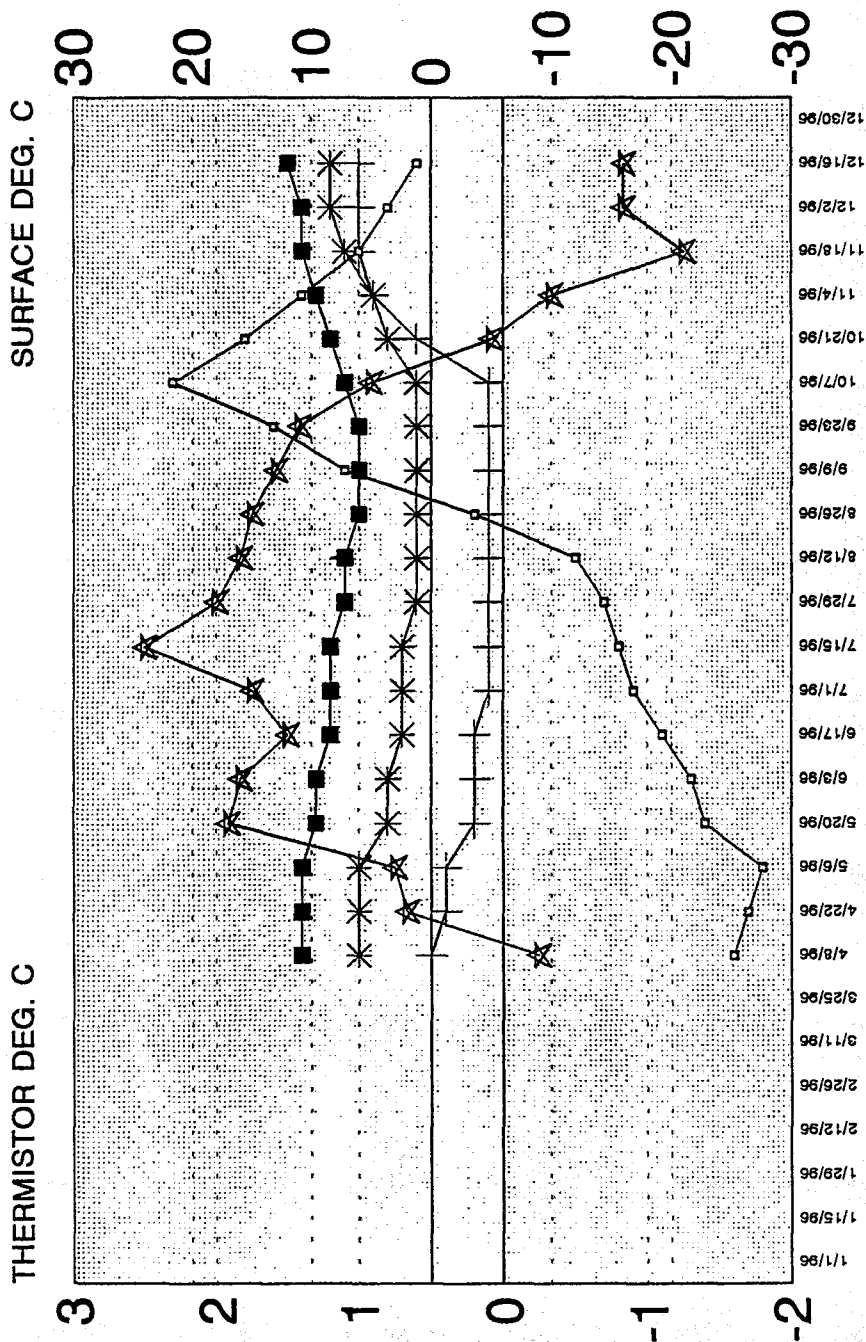
Figure 1.  
SITE PLAN

SCALE: 1" = 1200'

NOTE: Plan supplied by Royal Oak Mines Inc.

# ROYAL OAK MINES - GIANT MINE

DAM 21 D ARSENIC STOPE THERMISTOR HOLE #7 1996



## LEGEND

- 40'DEPTH
- + 50'DEPTH
- \* 60'DEPTH
- 70'DEPTH
- ★ SUR.TEMP.

40'DEPTH	1/1/96	1/15/96	1/29/96	2/12/96	2/26/96	3/11/96	3/25/96	4/8/96	4/22/96	5/6/96	5/20/96	6/3/96	6/17/96	7/1/96	7/15/96	7/29/96	8/12/96	8/26/96	9/9/96	9/23/96	10/7/96	10/21/96	11/4/96	11/18/96	12/2/96	12/16/96	12/30/96
50'DEPTH								0.5	0.4	0.4	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.6	0.9	1	1		
60'DEPTH								1	1	1	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.9	1.1	1.2	1.2		
70'DEPTH								1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1	1	1	1.2	1.3	1.4	1.4	1.5	
SUR. TEMP.								-9	2	3	17	16	12	15	24	18	16	15	13	11	5	-5	-10	-21	-16	-16	
MONTH/DAY	1.01	1.15	1.29	2.12	2.26	3.11	3.25	4.08	4.22	5.06	5.20	6.03	6.17	7.01	7.15	7.29	8.12	8.26	9.09	9.23	10.07	10.21	11.04	11.18	12.02	12.16	12.30

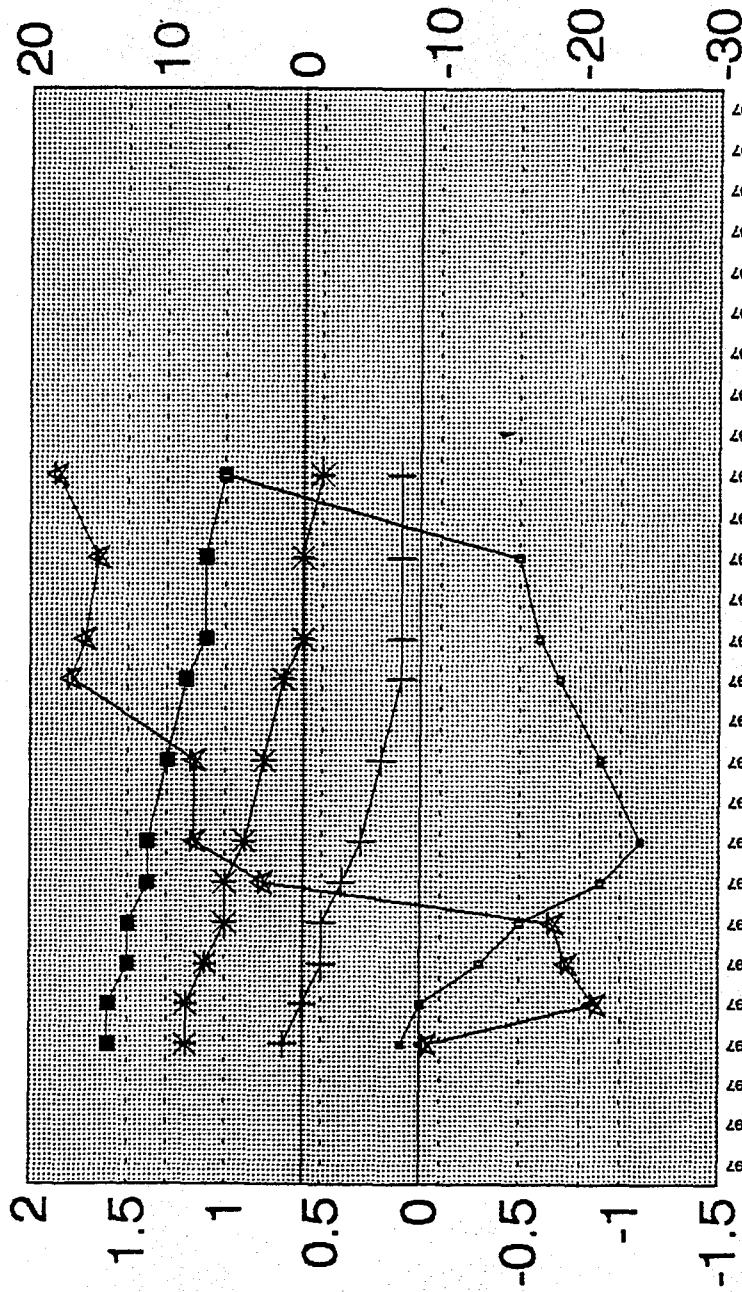
DATE

# ROYAL OAK MINES - GIANT MINE

Dam 21 1) ARSENIC STORE THERMISTOR HOLE #7 1997

THERMISTOR DEG. C

SURFACE DEG. C



LEGEND  
 - 40'DEPTH  
 + 50'DEPTH  
 \* 60'DEPTH  
 ■ 70'DEPTH  
 ★ SUR. TEMP.

SEP 02 1997

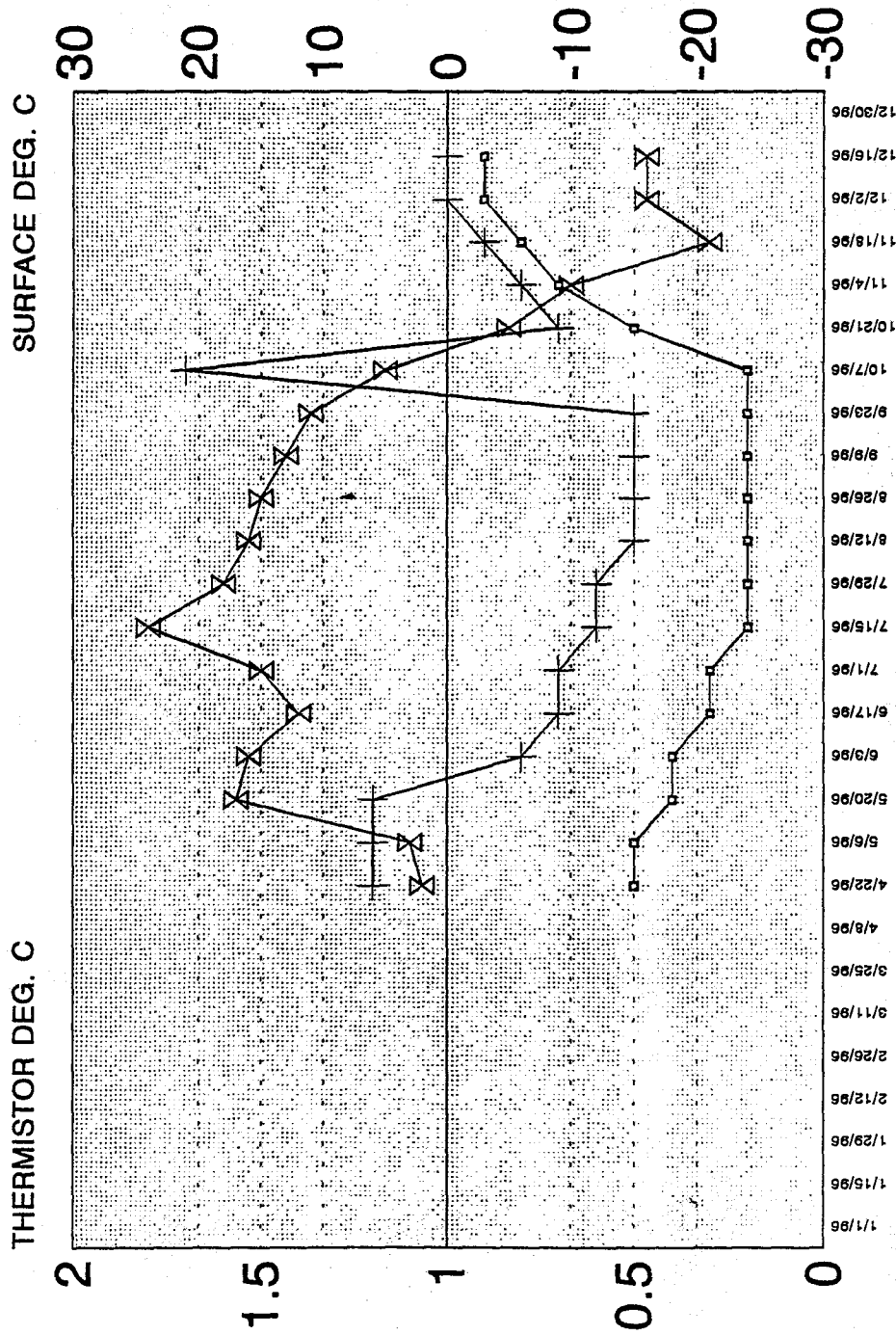
40'DEPTH	50'DEPTH	60'DEPTH	70'DEPTH	SUR. TEMP.	MONTH/DAY
0.1	0.7	1.2	1.6	-9	1/1/97
0.1	0.7	1.2	1.6	-9	1/15/97
0.1	0.7	1.2	1.6	-9	1/29/97
0.1	0.7	1.2	1.6	-9	2/7/97
0.1	0.7	1.2	1.6	-9	2/26/97
0.1	0.7	1.2	1.6	-9	3/2/97
0.1	0.7	1.2	1.6	-9	3/26/97
0.1	0.7	1.2	1.6	-9	4/9/97
0.1	0.7	1.2	1.6	-9	4/23/97
0.1	0.7	1.2	1.6	-9	5/7/97
0.1	0.7	1.2	1.6	-9	5/21/97
0.1	0.7	1.2	1.6	-9	6/4/97
0.1	0.7	1.2	1.6	-9	6/18/97
0.1	0.7	1.2	1.6	-9	7/2/97
0.1	0.7	1.2	1.6	-9	7/16/97
0.1	0.7	1.2	1.6	-9	7/30/97
0.1	0.7	1.2	1.6	-9	8/13/97
0.1	0.7	1.2	1.6	-9	8/27/97
0.1	0.7	1.2	1.6	-9	9/10/97
0.1	0.7	1.2	1.6	-9	9/24/97
0.1	0.7	1.2	1.6	-9	10/8/97
0.1	0.7	1.2	1.6	-9	10/22/97
0.1	0.7	1.2	1.6	-9	11/5/97
0.1	0.7	1.2	1.6	-9	11/19/97
0.1	0.7	1.2	1.6	-9	12/3/97
0.1	0.7	1.2	1.6	-9	12/17/97
0.1	0.7	1.2	1.6	-9	12/31/97

DATE

# ROYAL OAK MINES - GIANT MINE

Dan 21 D

ARSENIC STOPE THERMISTOR HOLE #8 1984



## LEGEND

□ 45'DEPTH

+ 55'DEPTH

× SUR. TEMP

45'DEPTH	1/1/86	1/15/86	1/29/86	2/12/86	2/26/86	3/11/86	3/25/86	4/8/86	4/22/86	5/6/86	5/20/86	6/3/86	6/17/86	7/1/86	7/15/86	7/29/86	8/12/86	8/26/86	9/9/86	9/23/86	10/7/86	10/21/86	11/4/86	11/18/86	12/2/86	12/16/86	12/30/86
55'DEPTH																											
SUR. TEMP																											
MONTH/DAY	1.01	1.15	1.29	2.12	2.26	3.11	3.25	4.08	4.22	5.06	5.20	6.03	6.17	7.01	7.15	7.29	8.12	8.26	9.09	9.23	10.07	10.21	11.04	11.18	12.02	12.16	12.30

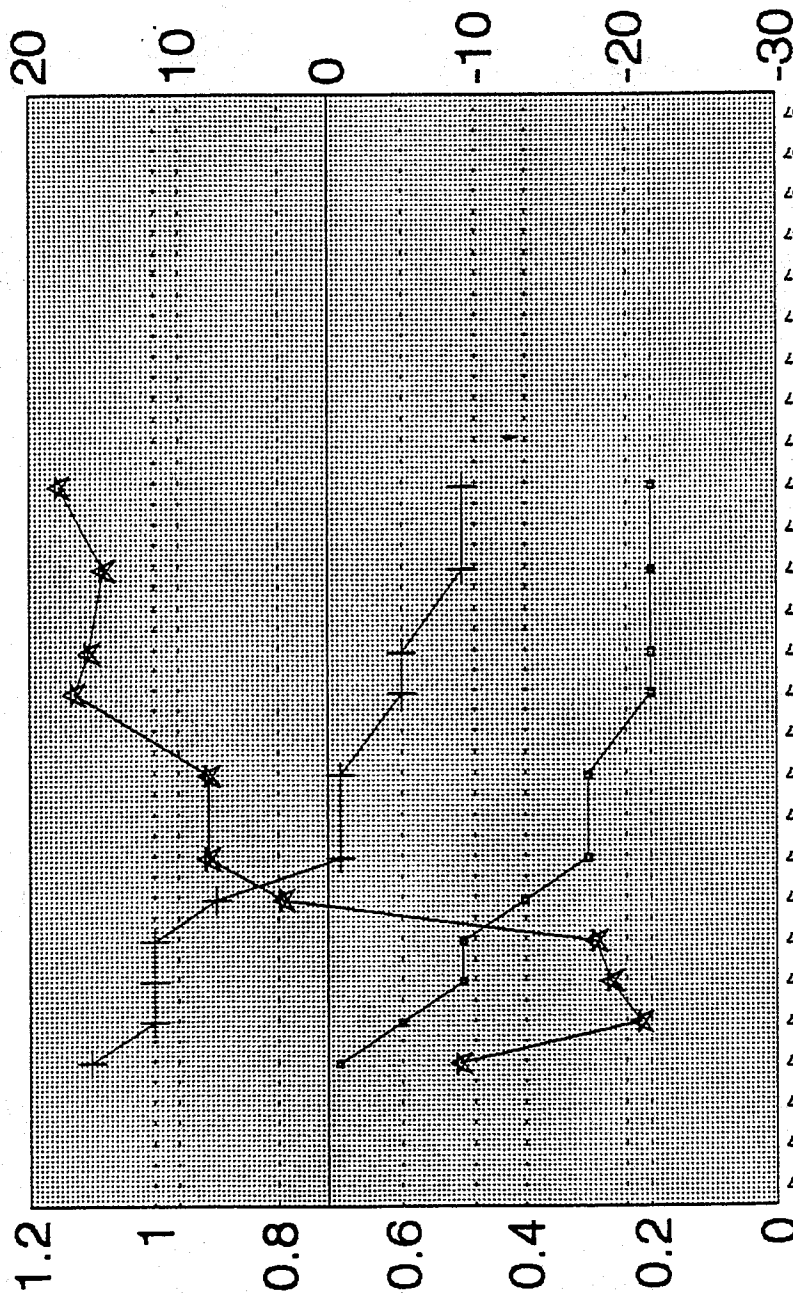
DATE

# ROYAL OAK MINES - GIANT MINE

DATE 21 JUL 1997 ARSENIC STORE THERMISTOR HOLE #8 1997

THERMISTOR DEG. C

SURFACE DEG. C



## LEGEND

+ 45'DEPTH

+ 55'DEPTH

\* SUR. TEMP.

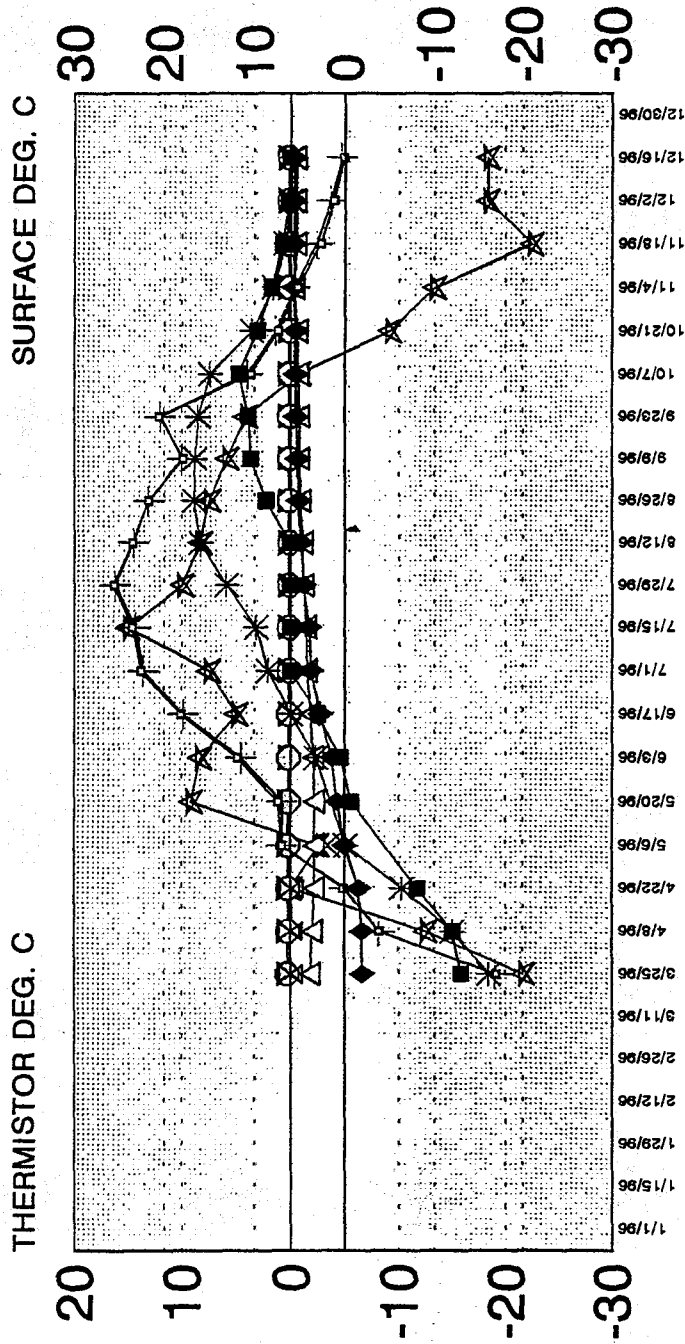
SEP 02 1997

45'DEPTH	1/1/97	1/15/97	1/29/97	2/12/97	3/7/97	3/21/97	4/4/97	4/18/97	4/30/97	5/12/97	5/26/97	6/8/97	6/21/97	7/4/97	7/18/97	7/31/97	8/14/97	8/27/97	9/9/97	9/23/97	10/6/97	10/20/97	11/3/97	11/17/97	12/1/97	12/15/97	12/29/97
55'DEPTH																											
SUR. TEMP.	1.01	1.16	1.29	2.07	2.26	3.11	3.25	4.08	4.22	5.06	5.20	6.09	6.17	7.01	7.15	7.28	8.12	8.26	9.09	9.23	10.07	10.21	11.04	11.18	12.02	12.16	12.30
MONTH/DAY																											

DATE

# ROYAL OAK MINES - GIANT MINE

Dam II ARSENIC STORE THERMISTOR HOLE #9 1996

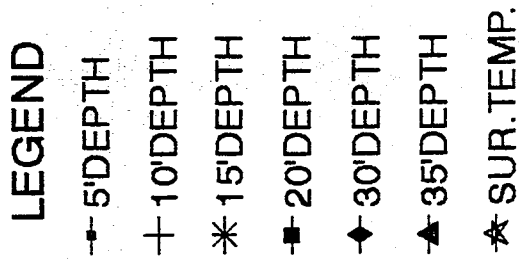


LEGEND	
—	5'DEPTH
+	10'DEPTH
*	15'DEPTH
■	20'DEPTH
×	25'DEPTH
◆	30'DEPTH
△	35'DEPTH
⊗	40'DEPTH
⊙	45'DEPTH
▼	50'DEPTH
★	SUR.TEMP.

5'DEPTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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DATE

DA 11 ~~ARSENIC STORPE~~ THERMISTOR HOLE #9 1997



SLP 02 1997

[illegible]

DATE \_\_\_\_\_



**OYAL OAK MINES INC.**  
 MT Division - Giant Mine

TO: STEVE SCHULTZ  
 FROM: V. L. Au-A

**ENVIRONMENTAL LAB  
 DAILY REPORT**

August '97

ACCOUNTING

DATE	SAMPLE	AS	CN	Cu	Pb	NI	Zn	PH	S.S.	Amn. N.	Temp.
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l		mg/l	mg/l	°C
15th	Gravel 3-C	8.3	2.1	.41		.23					
15th	Gravel 22-C	8.8	1.25	.07		.09					
17th	EFF.	.55	.31	.12		.42		8.2			
	SETTLING	.49	.29	.14		.33		8.2			
18th	43-1A	.43	.12	.09		.27		7.9			
	43-1C	.40	.11	.06		.25		7.9	.70	12.0	20
19th	EFFLUENT	.62	.18	.65		.30		9.0			
	SETTLING	.53	.30	.11		.35		8.3			
	43-1 CARBON	.46	.14	.07		.28		7.9	.78	12.6	20
	NORTHWEST FLD	25.8	15.0	5.76		.88					
23rd	EFFLUENT	.31	.20	.09		.24					
	SETTLING FLD	.54	.22	.12		.31					
	43-1 CARBON	.41	.14	.04		.21		7.9	.80	11.8	20
	43-1 CARBON										
09-13 FAX											
WED											
10/15/97											
limits:	Averages:	0.5 mg/l	0.8 mg/l	0.3 mg/l	0.2 mg/l	0.5 mg/l	0.2 mg/l		15 mg/l	19.5 mg/l	
	Grab:	1.0 mg/l	1.6 mg/l	0.6 mg/l	0.4 mg/l	1.0 mg/l	0.4 mg/l	6.9	30 mg/l		

## **ROYAL OAK MINES INC.**

### **NWT Division - Giant Mine**

**TO:** Gord Bilton/Engineering  
**CC:** Phil MacIntyre, Dave Anthony, Allen Jones  
**FROM:** Vi Lau-a  
**DATE:** June 13, 1995  
**SUBJECT:** Tailings Dams Water Samples (June 09, 1995)

---

*The following are the results of analyses of water samples taken from points around the tailings dams.*

<b>Area</b>	<b>As<sub>(m ppm)</sub></b>	<b>CN<sub>(m ppm)</sub></b>
1. Base of Dam 21D	0.02	0.01
2. Base of Dam 21B	0.11	<0.01
3. Base of Dam 21C	0.12	<0.01
4. Ponded Inside Dam 3D	0.70	<0.01
5. Sump at Dam 22B	4.80	7.00
6. Base of Dam 22A	0.96	1.20
7. Base of Dam 21A	2.60	0.22
8. Base of Dam 7	0.39	<0.01
9. Ponded Inside Dam 3C	2.40	0.12

Vi Lau-a  
Lab Technician

**ROYAL OAK MINES INC.**  
**NWT Division, Giant Mine**

**To: Rick Allan, Manager Technical Services**

**CC: Kevin Weston**

**From: Bill Van Breugel**

**Date: June 16, 1994**

**Re: Results of Pond Water Samples Taken on June 13, 1994**

---

Following are the results of water samples taken from seepage points around the tailings dams.

Sample	Location	As(ppm)	Cn(ppm)
1.	Ponded water beyond Dam 7	0.03	0.01
2.	Water reporting to Dam 7	0.98	0.22
3.	Water in Dam 3C	0.02	0.00
4.	Ponded at base of Dam 21A	0.02	0.01
5.	Ponded at base of Dam 21B	0.03	0.00
6.	Ponded at base of Dam 21C	0.02	0.00
7.	Trapper Creek Ditch	0.02	0.01
8.	Ponded at base of Dam 21D	0.02	0.01
9.	Ponded at base of Dam 22A	0.02	0.00
10.	Sump at base of Dam 22B	14.80	9.20

Notes: The water reporting to Dam 7 and the sump at the base 22B is pumped directly back to the tailings areas.

**ROYAL OAK MINES INC.**  
**NWT Division, Giant Mine**

**To: Rick Allan, Manager Technical Services**

**CC: Dave Anthony, Paul O'Hara**

**From: Bill Van Breugel**

**Date: 6 July 1994**

**Re: Tailings Dams Water Samples; June 29, 1994**

---

Following are the analyses of water samples taken from points around the tailings dams on June 29, 1994:

	Arsenic (ppm)	Cyanide (ppm)
1. Base of Dam 21D	0.01	0
2. Base of Dam 21B	0	0
3. Base of Dam 21C	0	0
4. Ponded inside Dam 3D	0.02	0.01
5. Sump at Dam 22B	0.08	0.20
6. Base of Dam 22A	0	0.02
7. Base of Dam 21A	0.10	0.15
8. Base of Dam 7	0	0
9. Ponded inside Dam 3C	0	0

MEMO TO: RICK ALLAN

CC: GARY HALVERSON

FROM: BILL VAN BREUGEL

DATE: AUGUST 6, 1993

SUBJECT: WATER SAMPLES TAKEN DURING DAM INSPECTIONS

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Following are the results of water samples taken during tailings dam inspections on July 21-23, 1993:

Sample	Location	As (ppm)	Cn (ppm)
1	Dam 7	5.9	1.2
2	Dam 8 Base	4.8	0.9
3	#3 Earth Dam	4.6	2.0
4	#3 Concrete Dam	2.0	0.8
5	Base of 21A	.34	0.9
6	Base of 21C	.19	.05
7	Base of 21B	.25	.04
8	Base of 22B	9.8	0.8
9	Base of 22A	.54	.06