

Faosimile TRANSMISSION

ROYAL OAK MINES INC., ENVIRONMENTAL SERVICES

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from: Stephen Schultz

date: November 5, 1997

subject: Further information on Giant Mine operations

pages: 4

John

*I've just realised today
(Nov. 6) that this did
not get through
yesterday. I apologise.*

The following pages are:

- 1) **Cost data on the Effluent Treatment Plant.** I don't have the weights of reagent used, just cost including freight to Yellowknife. Please advise me if you need reagent weights consumed. Also note that apart from stoichiometric estimates of the precipitate sludge produced, we have no measure of this. The capacity of the settling pond would be easily increased by raising the separator dyke between settling and polishing ponds and the retaining dam on the polishing pond. I would expect a two foot raise to provide many years of sludge containment (7 to 10 years?).
- 2) **Flowsheet of water sources and use on the property,** with annual volumes of major flows shown as daily rates. Note that we have no estimates for precip inflow to the ponds, evaporation or seepage to groundwater.
- 3) **Water Balance,** presented to show effect of water recycling within the mill process. Currently all mine water is directed to the ponds without being used in the mill because of technical difficulties posed by suspended solids and cyanide contamination.

Regards

Stephen Schultz

Giant Mine - Reagent costs of effluent treatment, 1996

1996 Month	Volume Treated (Imp Gal)	Hydrogen Peroxide (cost \$)	Lime (cost \$)	Copper Sulphate (cost \$)	Ferrie Sulphate (cost \$)	Flocculant (cost \$)	Comined Reagents (cost \$)	Volume Treated (m ³)	Volume Treated (m ³ /day)	Reagent Cost (cost/m ³)
June	44,988,300	\$27,792	\$2,051	\$6,501	\$38,908	\$154	\$75,406	204,492	6,816	\$0.369
July	86,281,332	\$50,760	\$3,933	\$13,059	\$72,713	\$275	\$140,739	392,188	12,651	\$0.359
August	124,440,246	\$42,613	\$5,672	\$12,440	\$82,914	\$282	\$143,920	565,637	18,246	\$0.254
September	99,107,820	\$33,646	\$4,517	\$10,104	\$56,733	\$237	\$105,238	450,490	15,016	\$0.234
October	57,493,758	\$32,031	\$2,621	\$5,790	\$32,477	\$139	\$73,052	261,335	8,430	\$0.280
November	16,660,000	\$23,281	\$759	\$2,071	\$10,952	\$39	\$37,102	75,727	5,048	\$0.490
Total	428,971,456	\$210,123	\$19,553	\$49,965	\$294,697	\$1,120	\$575,457	1,949,870		\$0.295

Notes: (1) Additional costs of water treatment: (a) Power for pumping effluent from tailings pond to treatment plant and operating plant: approx. \$85,000 p.a.

(b) Manpower for mixing reagent and control of plant: approx. \$25,000 p.a.

(2) Note greatly increased consumption of hydrogen peroxide when treating water in colder months.

Royal Oak Mines Inc.
GIANT MINE - TAILINGS CONTAINMENT CAPACITY
Table 1. Effect of Proposed Mine Water Treatment Plant

WITHOUT MINE WATER TREATMENT & RECYCLE
Current Water Balance and Predicted Life of Tailings Containment Facility

ore milled per day (tons)	ore milled per day (tonnes)	volume of solids per day (cubic metres)	water consumption per day (GPM)	water consumption per day (cubic metres)	water consumption per day (tonnes)	tailings % solids by weight	tailings % solids by volume	tailings solids volume per year (cubic metres)	tailings water volume per year (cubic metres)	total tailings volume per year (cubic metres)	poor water in tailings deposit per year (cubic metres)	Permanent pond capacity consumption per year (cubic metres)	Over-winter water storage requirement (182 days) (cubic metres)	total containment capacity at Nov 30/96 (cubic metres)	total containment capacity at Nov 30/96 (acre-feet)	Life of tailings containment remaining (years)
1,150	1,043	374	905	5,924	5,924	15.0%	5.9%	136,484	2,162,127	2,298,611	180,841	317,325	987,929	1,408,234	1141.7	1.5 22-May-98

WITH MINE WATER TREATMENT & RECYCLE
Anticipated Water Balance and Predicted Life of Tailings Containment Facility

ore milled per day (tons)	ore milled per day (tonnes)	volume of solids per day (cubic metres)	water consumption per day (GPM)	water consumption per day (cubic metres)	water consumption per day (tonnes)	tailings % solids by weight	tailings % solids by volume	tailings solids volume per year (cubic metres)	tailings water volume per year (cubic metres)	total tailings volume per year (cubic metres)	poor water in tailings deposit per year (cubic metres)	Permanent pond capacity consumption per year (cubic metres)	Over-winter water storage requirement (182 days) (cubic metres)	total containment capacity at Nov 30/96 (cubic metres)	total containment capacity at Nov 30/96 (acre-feet)	Life of tailings containment remaining (years)
1,150	1,043	374	685	3,829	3,829	21.4%	8.9%	136,484	1,397,618	1,534,102	180,841	317,325	606,722	1,408,234	1141.7	3.3 17-Mar-2000

*** NOTES:**

- (1) "Water Consumption" refers to NEW water to the system: i.e. total fresh water, groundwater inflow to mine and domestic waste water. Assume Precipitation Inflow to Ponds = Evaporation + Seepage Loss
- (2) Un-recoverable pore water in tailings deposit calculated using in-situ density of 1.20 tonnes dry solids per cubic metre of tailings deposit (from "Tailings & Waste Water Management Guidelines", Golder Associates, 1995)
- (3) Tailings Capacity at November 30, 1996, calculated from bathymetric surveys of North-West Pond, August 1996, and North Pond, 1992.
- (4) Useful life of Tailings Facility calculated assuming 182 days of over-winter water storage required (Dec 1 to June 1)