To: Keedock Kim

From: Larry Connell

Date: February 10,1993

Subject: Giant Mill Effluent Treatment Circuit

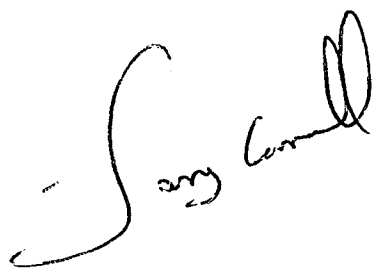
Thanks for the flotation tailings settling rate data. The test gave me a settling rate of 0.1627 ft/hr which is unusually slow. Based on this one result we would need a thickener cross sectional area of 7.03 sq. ft./ton of dry solid. This would mean that the 80 foot diameter TRP thickener would only handle 715 tons per day of flotation tail with no flocculant use.

The scope of the project has changed since last week. I have been asked to size and cost a system to treat the combined mill tailings and minewater streams. Consequently can you please run a new series of settling tests as follows:

1) A sample of combined mill tailings and minewater streams

This sample would have to be taken somewhere after the discharge of the final mill tailings pump, such as at the discharge into the Northwest Pond or somewhere in the line feeding the Northwest Pond. I calculate that the slurry density of this stream will be on average approximately 21% solids by weight. Can you please run five separate settling tests all at full strength slurry. The sample for each test should be collected at five separate times. The repetition is intended to compensate for the discontinuous nature of some of the streams that make up the final mill tailing. I plan to use an average of the five settling rates.

I have enclosed my calculation of the contributing strams that make up the final tailings along with a flowsheet of the proposed circuit. I have also enclosed a copy of a standard settling test procedure. Again thanks for your help.

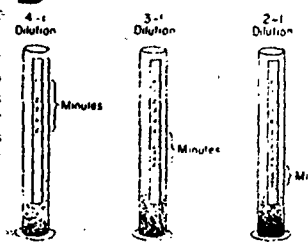


Determining Thickener Capacities

The thickener capacity required to handle a pre-determined tonnage of a certain pulp, by overflowing a clear solution and obtaining the desired pulp density of thickener discharge, depends upon the settling rate of that particular pulp. The settling rate of any pulp is easily determined by simple laboratory tests such as outlined below:

Laboratory Test Method

Place a measured quantity of pulp at a known density in a beaker or glass cylinder. Fix a narrow strip of paper on one side of the container. Mix pulp thoroughly. Draw a line on the paper at the top of the pulp and mark "0" minutes. For five minutes, at one minute intervals, mark the point to which the solids have settled. This determines the free settling rate of the solids at the initial density.



Usually readings should be taken at three different densities of the pulp corresponding approximately to densities which will exist in the various zones in the thickener.

Decant sufficient clear water or solution to establish a pulp with intermediate density. For instance, if initial pulp density was 4:1, water to solids, the removal of one-fourth of the water would establish a density of 3:1. Mix thoroughly. Repeat readings of settlement as above.

Then decant again to obtain a pulp at the third density. The pulp just tested was at 3:1 dilution, so decanting one-third of the water will give 2:1 dilution, water to solids. Mix thoroughly. Repeat settling measurements at one-minute intervals for five minutes.

The settling rate per minute should be uniform during the testing at each dilution, until compression is reached, at which time the amount of settling will decrease during each succeeding minute. Measure the settling marks in inches, thus determining the settling rate in inches per minute for each pulp density, and convert this to feet per hour.

Determining Final Density

Final density is then determined. Thoroughly mix the pulp remaining after the test at 2:1 dilution and allow to settle for 18 hours. Mark the position of settled pulp and let stand for a few hours to see if final density was reached. If pulp continues to settle, mark its position at hourly intervals until settling stops. Decant off all clear water or solution. Then determine moisture content of pulp by weighing and drying.

Calculating Thickener Area

Thickener area required is then calculated by applying above determined data in the following formula:

$$A = \frac{1.333\,(F-D)}{R}$$

A = Thickener area in square feet per ton of dry solids thickened in 24 hours.

F = Initial density (Parts Water to Solids by weight)

D = Final density to which pulp will settle or density at which you want to discharge pulp from thickener *

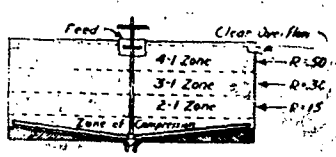
R = Settling rate in feet per hour

*Usually it is desired to discharge pulp from the thickener at its final density as shown in the above test. However, if you want to discharge pulp more diluted than the actual final density, the density desired should be used in above formula rather than the final density to which the pulp will settle

Calculations of indicated thickener area from each of the three settling rates obtained in tests will indicate any change in settling rate in the different zones of the thickener, and the largest area obtained from the three calculations should be used.

Assume the following data was obtained from the above tests:

At 4:1 dilution R = 0.50 feet per hour
At 3:1 dilution R = 0.30 feet per hour
At 2:1 dilution R = 0.15 feet per hour
Final density D = 1:1

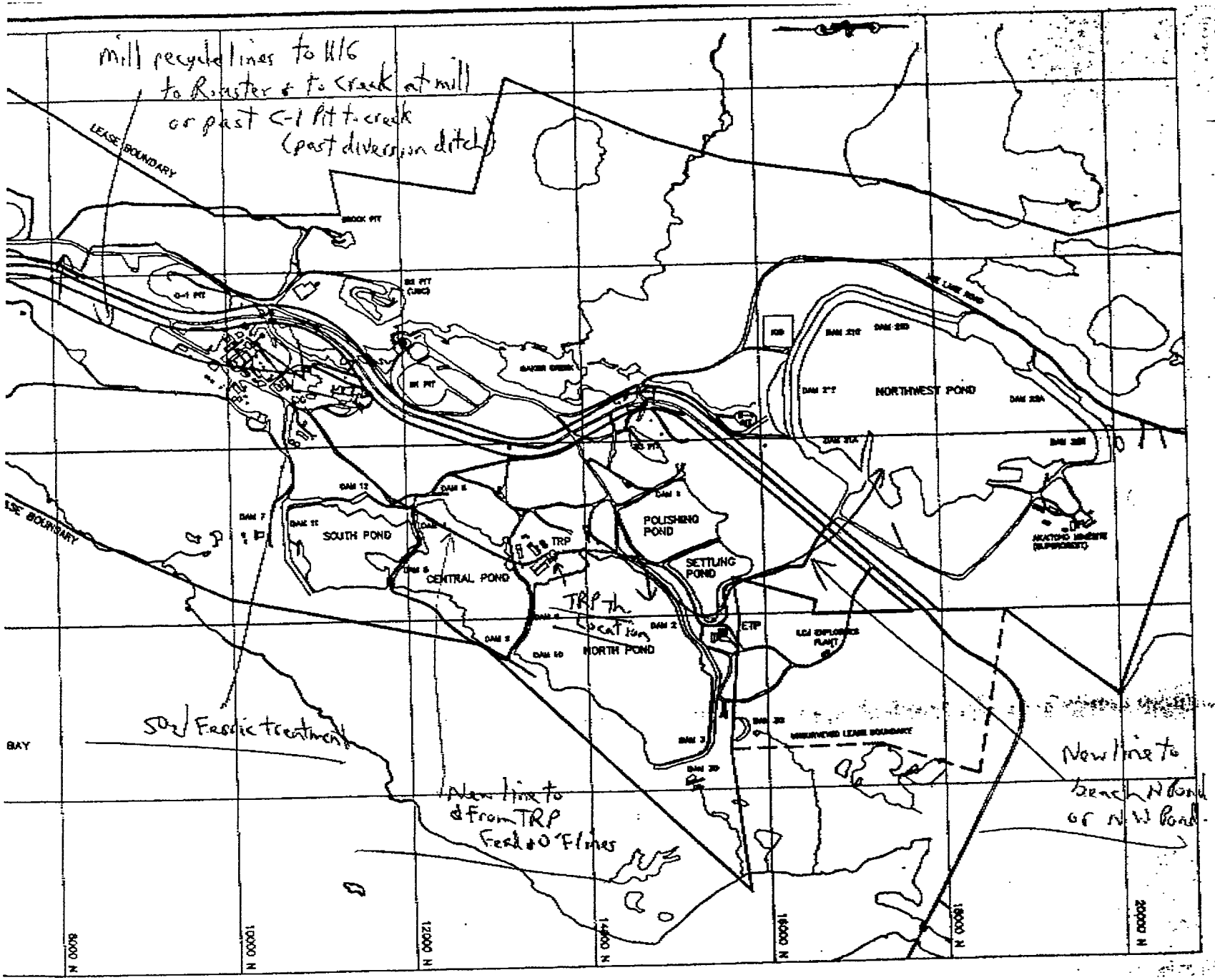


Applying this data to above formula you obtain:

$$A = \frac{1.33\,(4-1)}{.50} = 7.98$$

$$A = \frac{1.33\,(3-1)}{.30} = 8.86$$

$$A = \frac{1.33\,(2-1)}{.15} = 8.87$$



NOTES:
BASE MAP: 1987 AERIAL

Royal Oak Mines Inc.

GIANT MINE
SURFACE PLAN

GENERAL MINESITE LAYOUT

BY
CHKD
SCALE
DATE
S-92-14