# MEMORANDUM State of Alaska

TO: File

DATE: November 5, 2003

SUBJECT: Kennecott Greens Creek Site Visit August 21, 2003

FROM: **Ed Emswiler**
ADEC, Solid Waste Section
**Kenwyn George**
ADEC, Water Quality Section

Attendees:
Kenwyn George, ADEC-AWQ
Ed Emswiler, ADEC-SW
Stan Foo, ADNR
Steve McGroarty, ADNR
Deborah Rudis, USF&WS
Ruth Hamilton-Heese, RM&E

On August 20, 2003, KGCMC presented the annual report as required under DEC's Waste Disposal permit. The following day the above listed personnel visited the site. Some of these people had not been to the Greens Creek mine before, so the visit comprised a full tour of the facilities. Greens Creek representatives included Bill Oelklaus, Pete Condon, Tom Zimmer, Kerry Lear, Brian Erickson, and Steve Kirsch.

The tour covered the following areas:

1. Underground Facility.

   A. KGCMC demonstrated how their geologists visually classify waste rock for acid generation potential. The annual report showed visual classification has a 96% success rate when compared to laboratory acid base accounting methods.

***Classification of waste rock underground***

B. A large stope was visited where long-hole mining was in progress. Here approximately 200 feet of stope was open with paste backfill to either side of a pillar that was being mined. The pillar had been opened at the top and bottom (the total height of the pillar being approximately 60 feet). The pillar is drilled from the top to near the bottom. The bottom section is then shot and a remotely operated "load-haul-dump loader" (LHD) is used to remove the shot rock. The operator is able to observe the LHD operation, but he is located outside of the open stope for safety purposes. Once cleared of rock the procedure is repeated: drill from the top, blast, remove ore by remote LHD. After all the ore has been removed, the cavity is filled with paste comprised of tailings and approximately 7% cement. The strength of the final product is about 150 psi. This cementatious material is able to withstand the nearby blasting and keep its integrity to the full height of the stope.

C. The paste backfill pump area was also visited. Tailings are hauled from the mill to an underground hopper, where they are mixed with water and cement to form a paste. Hydraulic rams pump the paste through 6" steel pipes to various locations within the mine. Approximately 50% of all tailings are retuned underground.

***Paste backfill pump underground***

2. Mill Facility.

The tour included the mill operation center. Here, computer programs enable the operator to control the process to maximize metals recovery, and in so doing optimize the economics of the plant based upon current ore feed grades and international metal's prices. Also observed were the SAG and ball mills, cyclone recovery units, gold recovery table, metals flotation cells, concentrates and tailings presses and wastewater treatment plant.


***Mill Flotation tanks***

***Gold recovery table***

2. Production or waste rock sites: Sites 1350, 960, C, 23, D and E were visited.

A. Site 1350. This site is located approximately 3/4 road miles above the main (920) mine portal entrance, and 100 yards northeast of the 1350 adit, approximately ¼ mile above sea level. This adit currently serves as the ventilation exhaust conduit for the underground mine workings. There were approximately 78,000 cubic yards of waste rock placed over an area of 5 acres. This waste was placed intermittently between 1978 and 1985 with development of the 1350 adit for exploration drilling prior to the mine development. The site has been inactive

since 1985. Buildings and materials associated with the previous exploration campsite have been fully removed.

The site was observed to be densely revegetated with grass. Spruce, and a few western hemlock trees were noted to have naturally seeded from the surrounding forest into the planted grass cover. The surface was uneven and side slopes were very steep (approximately 1(H):1(V)).

This site is to be backhauled into the 1350 adit at the end of mine life.

***Site 1350***

B. Site 960. It was noted that approximately 50% of Site 960 rock had been excavated from the site and hauled underground. Greens Creek intends to remove the remainder of the material in 2003. There were two small seeps at the site, one with reddish brown precipitates and a pH near neutral, the second clear with a pH near 3.0. It was reported that some upgradient groundwater may enter site 960. This water appears to pick up pyritic byproducts and metal sulfides as it passes through the site, adding to the contaminant load in the discharge. These low-flow groundwater seep's characteristics will be better determined once all the 960 material has been removed.

***Site 960, iron-rich seep to the left, clear, low pH seep to the right.***


***Excavation of Site 960 material***

C. Site 23/D.

Site 23 was visited. Greens Creek officials pointed out the zones where various classification of waste rock have been placed in accordance with the plan of operations. Additional items noted were water collection appurtenances, finger drains, and the 1-acre engineered cover system that is being monitored to document how it performs relative to the design assumptions.

Site D was briefly visited. There were several areas noted where springs surfaced. Greens Creek officials noted the final cover system would likely not be

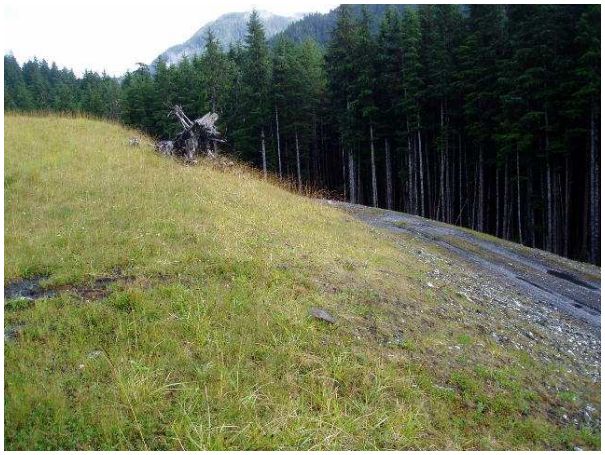
acceptable for Site D because of this. An updated hydro-geo-chemical assessment is currently underway for this site. The company is considering excavation of Site D in the long-range reclamation plan. In its place would be more acceptable material for this area. There may be stability issues for the up-gradient Site 23 related to the removal of the existing Site D material in order to replace it with new material.

***Site 23 1-year old waste rock at site 23***
***Note iron staining (approximately ¼" deep)***

***Class I argillite (left), Class II phyllite (right)***

***Differentiation of Class II and Class III waste rock placement zones at Site 23***

D. Site E. There were no remarkable changes at Site E since DEC's visit in November 2002. One reclamation alternative being considered for this site is to backhaul the production rock to the tailings disposal site after the stage II tailings expansion is permitted. This would alleviate the need to supply a cover system at Site E. It was reported the cost to do this would be competitive with supplying a reclamation cover system and regarding the existing pile to a 3:1 slope. There are also stability concerns related to native sands under the pile. A geo-technical assessment is currently in progress for Site E to address some of the above issues preparatory to site closure.



***Site E, Southeastern Aspect***

***Site E, Northeastern Aspect***

3. Tailings Disposal Site. The tailings site was visited. Portions of the tailings pile are at its presently permitted maximum height and tailings were being placed on the eastern side in the lined quarry area.

***Buttress on the west side of the tailings pile***

***Tailings placement in the lined quarry area***