

# **ROAD OPERATION AND MAINTENANCE**

GREENS CREEK MINING COMPANY

Revised: December 2005

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# 1 INTRODUCTION

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This Plan is written to outline the operations and maintenance of A and B roads, including the B extension road. The A road is used to ferry employees to the mine site and is not to be used for production purposes or to haul barge freight. The A road is maintained as the B road, but doesn't require a lot of attention in this document, because the B road is the backbone of the project and is the area of most concern.

Greens Creek has evaluated and tried to identify potential problems, and implement action to address those possibilities. This Plan is written to address the operations and maintenance activities as individual components of the overall Plan.

KGCMC is the owner and operator of a mine and concentrate facility located on the north end of Admiralty Island near Juneau, Alaska. Various materials are transported approximately 8.6 miles by truck to and from the mine site and loading facility at Hawk Inlet. KGCMC provides support service generally consisting of bussing workers and other personnel between Young Bay and the mine site. The "B" road is used primarily for trucking ore concentrate and tailings from the mine to Hawk Inlet, transportation of waste rock, and freight transportation.

## 1.1 Public Access

The roads were developed for the following specific purposes; 1) transport employees, and 2) transport freight, tailings, and concentrates. Motorized use by the public is prohibited. While it is discouraged for Safety reasons however, there is no public restriction on walking on or across the road.

## **2 ROAD OPERATIONS**

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### **2.1 Bulk Concentrate and Tailings Transportation**

Greens Creek transports, over the "B" road to the Concentrate Storage Building, lead concentrates, bulk (a mix of lead/zinc concentrate) and zinc concentrates. Mill tailings are also transported over the "B" road from the mill site to the Tailings Impoundment Area near Hawk Inlet. The equipment used to haul concentrates and tailings are capable of hauling 50-ton payloads.

The same equipment will be used to transport lighter loads, if KGCMC so directs, in the interest of protecting the haul road from excessive wear, and streams from sediment build-up. The trailer units are equipped with retractable covers, sealed tailgate, and are within the design criteria specified as U-80 loading. The trailers are loaded at the Concentrator Building with a Caterpillar 966E loader.

The trailers are checked prior to transporting to assure covers are in place and secure, and that the tailgate is properly closed, latched, and secured against spillage.

Trucks are driven with their lights on and maintain established speed limits during transportation. Those limits are posted as 25 mph and through the sharp turns 15 mph. Trucks approaching road maintenance or men working on the road reduce speed and observe the 15-mph limit. All trucks have 2-way radios and announce their position about every mile.

Loaded trucks have the right-of-way. If trucks carrying freight meet a loaded truck coming down the hill, the truck traveling in the downhill direction has the right-of-way. The exception is when powder is being transported. The powder vehicle has the right-of-way. Vehicles yielding the right-of-way pull into a turn-out and turn their lights off. All production and maintenance vehicles have the right-of-way over standard pickups and suburbans.

### **2.2 Crew Transportation**

Bus service provides transportation between Young Bay and the mine site for authorized personnel. The bus service is provided for all shifts on all working days. Three buses with radios are available for the day and night shifts with one additional bus for the swing shifts. Buses each have a capacity of 48 persons. Opposing direction traffic is routinely stopped while the buses are transporting the work force.

Buses may be parked in three locations: Young Bay, Hawk Inlet, and near the KGCMC maintenance shop at the 920 level. Employees enter the buses at Young Bay and are driven to their work locations at Hawk Inlet or the 920 level. The bus driver rides the boat from Auke Bay to Young Bay with the normal crew. At the end of shift, the driver going off shift drives the bus back to Young Bay and takes the boat home. Day and night shifts “cross” at Young Bay. The cycle is repeated each morning and evening. To maintain full coverage between day/night shifts for critical operations Mill, Power House, Medical, etc), the fourth bus is used to transport the swing shift crew between Hawk Inlet and the 920 level.

### **2.3 Freight, Fuel, and Port Handling**

KGCMC provides transportation and port handling for freight and fuel moving to or from any destination on the project road system. For bulk fuel transportation the fuel is loaded and unloaded into a 8,000-gallon tanker and transported on an as-needed basis.

### **3 ROAD MAINTENANCE**

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Routine road maintenance is performed on the road system between Young Bay, Hawk Inlet, the mill site, and the portal site. The parking area at Young Bay, the landing and barge ramp at Hawk Inlet, and the driving area at the mill site will also receive routine maintenance.

Road maintenance includes all routine work of grading, sanding, snow removal, snow pole placement, watering for dust control, culvert thawing as well as culvert and ditch cleaning and maintenance. The manner in which these are managed is listed below. Road maintenance work including seeding, guardrail maintenance, work required by any failure of the subsurface or road structure, any major road resurfacing or repairing of damage due to slides, avalanches, washouts, or culvert collapse, is handled on a case-by-case basis and resolved at the time of their occurrence. To prevent degradation of the road driving surface, aggregate will be replaced at a rate commensurate with its degradation. In general KGCMC annual budgets cover material sufficient to resurface approximately one-third of the road surface each year.

#### **3.1 Routine Grading**

Roads are routinely graded to ensure a proper crown for drainage. A motor grader will grade the road surface toward the middle of the road. In general a 2 percent grade crown will be maintained on both the A and B Roads. Table 8.1 shows specific grading specifications for these roadways.

Rut development will be monitored throughout the A and B Road system. In general, routine grader maintenance will remove developing ruts, as well as undesirable accumulations of fines (sediment) from the road surface. Should rutting greater than 2 inches in depth develop, it will be removed as soon as practicable. Berms will be eliminated along the A and B Road system to allow free drainage of the road surface except as required for Safety and/or special circumstances.

#### **3.2 Sanding/Snow Removal**

Experience has shown winter months and the amount of snow will dictate procedures. Past experience has shown that snow plowing is sufficient and snow blowing is not necessary to maintain proper road conditions, and assure that the movement of deer is not impacted, during the winter. KGCMC will breach snow berms along the cleared roadway at strategic locations to minimize surface pooling by allowing snowmelt and/or rain to drain from the road. Past experience has also shown that use of the road grader and/or a front-end loader is the most efficient way to keep turn-outs cleared for vehicle passage. During Winter the road crown may be removed to facilitate snow removal. If removed, KGCMC will reestablish the crown each Spring to direct precipitation off of the road surface.

The B extension road is not treated as the A & B roads during winter months. Depending on conditions and operational needs for the B extension road, KGCMC may not maintain this extension during the winter months. The steep grade on the lower sections of this road may require extra maintenance for mobile equipment use during winter. Therefore, access to this area in the winter is generally made through the mine via 29 Incline and out through the 1350 portal.

Pea gravel is used for snowy and icy conditions and is applied at a rate of approximately 180 lbs./mile. Pea gravel size is approximately 5/8" which makes an outstanding coarse surface as well as an excellent traction material.

### **3.3 Dust Control**

Fugitive dust emissions are generated by haul trucks, supply trucks, service vehicles, or personnel buses. KGCMC maintains a water truck, fitted with a spray bar, and sprays the road if notable dust is observed from the various vehicles traveling the road.

Drivers noting dusting conditions are expected to notify their supervisor so, watering of the roads can be initiated. All vehicles have radio communications and it is therefore quite efficient for an employee to contact a supervisor.

### **3.4 Culverts and Ditches**

Culverts and ditches are maintained to assure good runoff from the road and nearby watersheds. It is critical for good road maintenance that functional culverts and ditches are maintained. Culverts and ditches will be examined at least twice each year for accumulated sediment: Spring and Fall. Culverts with more than 4 inches of accumulated sediments, and ditch areas with greater than 6 inches of accumulated sediments will be scheduled for prompt cleaning. Areas behind sediment control features such as straw bales or silt fences may achieve greater depositions without requiring clean-out. Such sediment control structures will be placed along the road system in response to historic, as well as newly discovered generation, preventing excess sediments release to adjacent areas. Some use will also continue at the outlets of select culverts as needed. Such in-ditch features also reduce runoff velocities thereby reducing the erosive potential of flowing water. Sediment control features also serve to protect adjacent buried water pipelines. Additional inspection following significant runoff events will be conducted to identify sediment accumulation problem areas. Sediment removal from road surfaces, ditches, and culverts will be placed within the Tailings Basin or active Production Rock disposal areas or the Coarse Ore Pad.

Culverts are cleaned by hand and/or with the use of a backhoe, depending on the nature of the debris, and which method will give the best protection to the waste water lines. Road maintenance personnel conduct semi-annual inspections. Extra inspections are conducted during heavy or prolonged rain storms. The extra inspection includes a formal reporting procedure, and form (daily shift production report) so that problems are documented and addressed as soon as possible. If, during the inspection debris is noted, which is restricting the run-off flow, it is marked as plugged. Plugged ditches and culverts are cleaned as soon as possible after their discovery. Debris cleaned from ditches will generally be placed within the Tailings Basin or active Production Rock disposal areas as outlined in the Erosion Control Plan.

### **3.5 Other Maintenance**

Occasionally slides, damage to guardrail, washouts, etc. happen. These events are generally those outside of KGCMC's control. These conditions are corrected as soon as possible by the most practical means. The Company does scale the "highwall" to protect the waste water line as well as drivers. Trees are also checked for driving hazards. KGCMC maintains proper banks through seeding and other revegetation methods, as part of normal operations, in an effort to reduce unexpected events.

The primary environmental concern of the road is the loss of significant sediment from the roadway corridor.

If sediment production is unacceptable, additional mitigation measures than those outlined above will be undertaken. These extra measures may include 1) carrying lighter

loads, 2) reduced air pressure in tires or 3) enhanced sediment removal and sediment control device use, and 4) other measures which will reduce sediment production.

This program is evaluated on a year-to-year basis and updated as experience is gained from actual road operation and maintenance.

### **3.6 Road Sediment Monitoring**

#### **3.6.1 Greens Creek Road Erosion Study**

The Greens Creek Road Erosion Study was initiated in 1992 to determine the sediment production of the "B" road, due to the increase in heavy vehicle traffic as discussed in the "Environmental Assessment for Proposed Changes to the General Plan of Operations" (Dated March, 1988). This monitoring program was established jointly by the USFS and KGCMC. The change in the operating plan entails hauling dewatered tailings by truck to the tailings impoundment, instead of transport of tails in a slurry form through a pipeline to the tailings impoundment area. The accepted change increases the road use by 19 percent for heavy vehicles, during operations.

The USFS intent was to quantify the sediment production during normal operations, due to the increased road traffic. The intent of the program was to isolate the effects of road traffic on sediment production (on the "B" road) by establishing three test sites for monitoring. The monitoring entailed taking samples during storm events (moderate to heavy rain), which quantify flows and sediment amounts associated with a weather event. The final analysis establishes representative sediment production for a particular weather event and permits extrapolations of total sediment production per year by utilizing weather records.

Five possible sites were initially identified, three sites were chosen to be monitored for 1 and 1/2 years. Instrumentation was not completed on one of the sites (site 1) because a new water line was being installed adjacent to the ditch and the soil was severally disturbed. The monitoring program began September 24, 1992 and continued to November 15, 1992. In 1993 these sites were instrumented again to sample through the summer and fall season.

Traffic counters showed traffic levels to average approximately 130 vehicle passes a day (heavy vehicles and equipment) plus an estimated 30 to 50 light vehicles (single cab trucks). During the spring of 1993, after the mine stopped production, the traffic was recorded using a pneumatic counter which showed a traffic level of an average of 30 passes a day.

The study concluded that the production of sediment from the road study sections at the Greens Creek Mine haul road was very high. Annual estimates for one kilometer resurfaced and non-resurfaced road sections with six percent gradients were 48 and 302

tons, respectively. The Greens Creek Mine road was subjected to an extremely high amount of traffic during the study period. This is substantially higher traffic than any other forest road would experience in southeast Alaska. The study had initially intended to try to determine the amount of sediment that passed to the stream; but, the study sites were not suitable for this type of sampling design. A majority of the drainage structures discharged onto forested slopes which terminated in broad vegetated benches. No well defined channels were developed on these features and it was documented that infiltration of sediment laden ditch waters into the duff layer prevented the sediments from reaching an active channel. The other road sections in which the road drainage discharged into a small stream did not fit the criteria necessary to conduct an adequate study (U.S.D.A Forest Service, 1994).

### **3.7 Timber Salvage**

During the year occasional trees along the Greens Creek road system may blow down, blocking the roadway, or creating a condition in which blow down appears imminent, and presents a safety hazard. In these situations, Greens Creek will request Forest Service approval to remove the trees greater than 10 inches DBH. Trees will be decked for Forest Service scaling at an approved location. Debris from these operations and removal of smaller plants will either be accumulated and used as organic material for reclamation efforts, burned under an ADEC burn permit, or the slash will be lopped and scattered. Ashes from burned materials will then be incorporated into reclaimed area surface material.

**TABLE 8.1 – ROAD GRADING**

This Table describes how KGCMC grades the “B” Road according to specific needs along different portions of the travel-way. Rather than using the term “insloping” and “outsloping”, these areas are referenced as “sloping toward hillside”, and “sloping away from hillside”. During Winter the road crown may be flattened to facilitate snow removal. If removed, KGCMC will reestablish the crown each Spring to direct precipitation off of the road surface.

FROM	TO	CONDITION
860	23 Pumphouse	Slope toward hillside
23 Pumphouse	7.7 mile	Slope toward hillside
7.6 mile	7.4 mile	Slope toward hillside
7.4 mile	6 mile	Crown
6 mile corner	5.9 mile	Slope away from hillside
5.9 mile	5.5 mile	Crown
5.5 mile	5.3 mile	Slope toward hillside
5.3 mile	4.8 mile	Crown
4.7 corner		Slope away from hillside
4.7 mile	3.2 mile	Crown
3.2 corner		Slope away from hillside
3.1 corner		Slope toward hillside
3 mile	1.5 mile	Crown
1.5 corner		Slope away from hillside
1.5 mile	1.2 mile	Crown
1.2 mile	1 mile	Slope toward hillside
1 mile	Junction	Crown

## REFERENCES

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U.S.D.A. Forest Service, March 1988. Environmental Assessment For Proposed Changes  
To The General Plan Of Operation For The Development And Operation For The Greens Creek Mine.

U.S.D.A. Forest Service, Forest Science Laboratory, June 1994. Greens Creek Road Erosion Study.