APPENDIX 5

BEST MANAGEMENT PRACTICES PLAN

GREENS CREEK MINING COMPANY

Revised: November 2005

TABLE OF CONTENTS

ATTACHMENT A

FIGURES

ATTACHMENT B

TABLES

1 INTRODUCTION

1.1 GENERAL INFORMATION

NAME OF FACILITY:	**Greens Creek Mine**
TYPE OF FACILITY:	**Underground Mining and Milling Operation**
LOCATION:	**Admiralty Island, Alaska**
NAME AND ADDRESS OF OWNER OR OPERATOR:	**Greens Creek Mining Company** **P.O. Box 32199** **Juneau, Alaska 99803-2199**

DESIGNATED PERSONS ACCOUNTABLE FOR SPILL PREVENTION, REPORTING, AND EMERGENCY PROCEDURES AT FACILITY:

- Rich A. Heig, General Manager
  Office (907) 789-8110 ____

- Bill Oelklaus, Environmental Manager
  Office (907) 789-8170
  Home (907) 790-2873
  Cell (907) 723-4111

- Tom Zimmer , Surface Operations Manager
  Office (907) 790-8460

- Geraldine Lyons , Mill Manager
  Office (907) 789-8173

1.2 NAME AND LOCATION OF PROJECT

The project is the Greens Creek Mine, operated by Kennecott Greens Creek Mining Company (KGCMC). The address and telephone number of the Company is:

Kennecott Greens Creek Mining Company
P.O. Box 32199
Juneau, Alaska 99803-2199
(907) 789-8100

The location of the project is the northwestern portion of Admiralty Island, Alaska, some 18 air miles southwest of Juneau, Alaska.

1.3 PURPOSE OF BMP

Section 304(e) of the 1977 Clean Water Act (CWA) authorized the Administrator to publish regulations to control the discharge to toxic or hazardous pollutants under Section 307 and 311 of the CWA, from the following sources:

- Plant/project site runoff
- Spillage or leaks
- Sludge or waste disposal
- Drainage from raw material storage areas

Criteria and standards for Best Management Practices (BMP), published under 40 CFR Part 125, Subpart K, revised regulations governing the National Pollutant Discharge Elimination System (NPDES) in order to reflect new controls on toxic and hazardous pollutants under the Act.

In addition to the above, EPA in reissuing NPDES Permit AK-004320-6 to KGCMC, effective 1 July 2005, explicitly addressed inclusion of enhanced Stormwater considerations into the KGCMC BMP Plan (Section II.).

The purpose of this document is to meet BMP requirements for local, State of Alaska, and Federal agencies having interest in, and jurisdiction over, such matters in this project's operations. The fundamental concept of this BMP plan is to determine the potential for toxic and hazardous chemicals to reach receiving waters and outlining appropriate preventive measures.

1.4 SCOPE OF BMP

The BMP plan contains the project management's policies and responsibilities related to Best Management Practices. Responsibility and authority for immediate action in the event of a hazardous material spill or contamination is also documented in the plan.

Activities of KGCMC at the mining project on Admiralty Island, Alaska addressed by this BMP plan include: hazardous materials and chemical storage areas; loading, unloading and material transport area; in-plant transfer, process, and materials or chemical handling areas; plant by-product disposal areas; surface exploration drilling sites; and project site runoff.

Hazardous materials and chemicals to be stored consist of milling reagents and supplies such as sodium sulfite, sodium cyanide, sodium carbonate, zinc sulfide, lime, copper sulfate, flotation reagents, flocculants, and petroleum products. These substances are transported and stored in drums, bags, and FLO-BINS in sea vans and similar containers. Products and by-products to be stored include bulk, lead, and zinc concentrates, and tailings from the milling process, as well as waste rock from the mining activity.

Unloading, loading and material transport operations at the KGCMC site include the transfer of materials and chemicals to and from locations by forklifts, trucks, and conveyor systems. Containers are initially unloaded from ocean-going barges by forklifts and transported to the mill site by trucks. Concentrate products are transported by covered trucks and conveyor systems in the process of loading outgoing vessels. Tailings are transported from the mill by underground trucks into the mine, to be used as backfill, and by covered truck to the surface tailings basin.

Plant transfer areas, process areas, and material handling areas include the transfer operations from raw material to concentrate products and tailings by-product. In the mining process, these operations involve: forklift and hoist transfer of containers; the transfer of reagents and slurry by pipes and pumps; and the movement of concentrate by mechanical conveyor system.

Plant by-product disposal areas consist of a dry tailings deposit site and associated sediment pond as well as production rock storage areas around the KGCMC facilities. These sites are designed, constructed, and operated to alleviate the potential for leachate or overflow from reaching groundwater or natural bodies of water.

Surfaced exploration drilling remains active at the KGCMC operations. As such, remote drill sites are identified by KGCMC annually and approved by the U.S. Forest Service. These sites are serviced by helicopter. Drilling contractor’s environmental performance is addressed by their daily attention to a proscribed set of environmental protective measures.

Precipitation is the primary source of runoff at the project site. Runoff from the mine/mill site may become contaminated. All contaminated runoff is controlled using drainage ditches and culverts directed to Pond "A". The runoff is then pumped to the tailings impoundment area with the mill process water, and extended aeration treated sewage effluent for re-treatment prior to discharge through Outfall

002. This composite water effluent is required to meet the discharge parameters in the NPDES permit for Outfall 002.

1.5 BEST MANAGEMENT PRACTICES

This section outlines those KGCMC documents which influence or supplement this BMP Plan at the Greens Creek operation. Those programs, environmental impact studies, environmental assessments, permits and leases practices have been listed below:

Objective: To maintain an active environmental program to prevent pollution and minimize waste; to produce metals in an environmentally friendly way; comply with applicable laws and regulations; and to seek continuous improvement.

See Environmental Management System, ISO 14001 certified by NSF-ISR since December 2004

Objective: To maintain and protect water quality and fisheries habitat, and to minimize adverse effects on riparian areas from logging and other land disturbing management activities.

See Fish and Wildlife Monitoring Programs - Appendix 4
Marine Program - Appendix 2
Freshwater Sampling - Appendix 1

Objective: To minimize sediment production from streambanks and structural abutments in natural waterways.

See Reclamation - Appendix 14
Road Operations and Maintenance - Appendix 8

Objective: To prevent contamination of surface and subsurface soil and water resources from spills of petroleum products.

See U.S. Coast Guard Fuel Operations Manual - Appendix 9
SPCC Plan - Appendix 6
Facility Response Plan

Objective: To minimize contamination of waters from accidental spills of oil and hazardous substances by use of appropriate contingency plans.

See SPCC Plan - Appendix 6
Facility Response Plan

Objective: To locate, design, and manage administrative sites to prevent water pollution and other adverse environmental health impacts.

See Environmental Management System (the KGCMC EMS has been ISO-14001 certified since December 2004)
General Plan of Operations – All Appendices
Annual Work Plans
EIS/EA

Objective: To prevent water pollution and health risks from the disposal of sewage at Forest Service Facilities, facilities under special use permit, and temporary camps of all types.

Outfall 001 treated effluent from the Domestic Water Treatment at Hawk Inlet is piped to combine with Outfall 002 composite waters prior to treatment and discharge.

Objective: To protect surface and subsurface soil and water resources from nutrients, bacteria, and chemicals associated with solid waste disposal.

See ADEC Waste Management Program and Permit - Appendix 7

Objective: To protect water quality by minimizing soil erosion.

See Reclamation Plan - Appendix 14

Objective: To ensure that constructed erosion control structures are stabilized and working effectively.

See Reclamation/Erosion Plan - Appendix 14
Road Operations and Maintenance Plan - Appendix 8

Objective: Where effective minimize erosion by conducting operations during low-risk periods.

See Reclamation Plan - Appendix 14

Objectives: To minimize the chance and extent of road related mass failures, including landslides and embankment slumps.

Objectives: To minimize the erosion from cutslopes, fillslopes, and the road surface and consequently reduce the risk of sediment production.

Objectives: To minimize erosion of and sedimentation from disturbed ground on incomplete projects.

See Reclamation Plan - Appendix 14
Road Operations and Maintenance Plan - Appendix 8

Objective: To minimize stream channel disturbances and related sediment production.

See 1983 & 2004 EIS

1988 EA
Plan of Operations
Annual Work Plans

Objectives: To identify and implement diversion and de watering requirements at construction sites to protect water quality and downstream uses.

14.17 Bridge and Culvert Design and Installation

Objective: To minimize adverse impacts on water quality, streamcourses, and fisheries resources from the installation of bridges, culverts, or other stream crossings.

Objective: To minimize sediment production from borrow pits, gravel sources, and quarries, and limit channel disturbance in those gravel sources suitable for development in floodplains.

See USFS Leases
Freshwater Monitoring Program – Appendix 1

Objective: To maintain all roads in a manner which provides for soil and water resources protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities.

Objective: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production.

Objective: Reduce the potential for erosion and sedimentation from road surface disturbance during periods of high runoff and spring thaw conditions.

See Road Operations and Maintenance - Appendix 8

Objective: To minimize the impact of snow melt on road surfaces and embankments and to reduce the probability of sediment production resulting from snow removal operations.

See Road Operation and Maintenance - Appendix 8
Tailings Impoundment - Appendix 3

Objective: To minimize the amount of erosion and sedimentation at non-silvicultural facilities through implementation of a pollution prevention plan.

See Road Operation and Maintenance - Appendix 8
Tailings Impoundment - Appendix 3
Reclamation - Appendix 14

Objective: To incorporate soil and water resource considerations into the planning process for mining and mineral exploration operations.

See Annual Work Plans
General Plan of Operations – All Appendices
1992 Waste Rock EA

Objectives: To incorporate soil and water resource considerations into the planning process for mining plans of operation for lode mining operations.

See 1983 EIS
1988 EA
Annual Work Plan
General Plan of Operations
Freshwater Monitoring Program - Appendix 1
Tailings Impoundment - Appendix 3
Road Maintenance and Operation - Appendix 8
Production Rock Sites - Appendix 11
Reclamation - Appendix 14

Objective: To incorporate soil and water resource considerations into the planning process for mining plans of operation.

See General Plan of Operations
Reclamation - Appendix 14

1.6 RECORD OF CHANGES AND AMENDMENTS TO THE BMP

Whenever a change in facility design, construction, operation, or maintenance occurs which materially affects the facility's potential for discharge of significant amounts of hazardous or toxic pollutants into the waters of the United States, 40 CFR Part 125.104(e) requires the facility owners or operators shall amend the BMP plan. In addition, 40 CFR Part 125.104(f) requires that if the BMP plan proves to be ineffective in achieving the general objective of preventing the release of significant amounts of toxic or hazardous pollutants, the BMP plan shall be subject to modification.

Changes in the BMP plan shall be duly reported and recorded below:

DATE	SECTION(S) CHANGED OR AMENDED	INITIALS
______	_____________________________________	____
______	_____________________________________	____
______	_____________________________________	____
______	_____________________________________	____

1.7 STATEMENT OF GREENS CREEK MINING COMPANY POLICY

The Kennecott Greens Creek Mining Company policy on environmental concerns is to take any or such actions deemed necessary to prevent accidental release of hazardous or toxic materials or chemicals into the natural environment. In the event that an accidental release should occur, the policy of Kennecott Greens Creek Mining Company is to immediately mitigate the effects of such a release using equipment and techniques which are available, practical, and proven for such use. Cooperation with local, State, and Federal regulatory and advisory agencies will be maintained to the greatest extent possible.

1.8 BMP PLAN REVIEW

This document describes the Plan for Best Management Practices to control and contain potential pollutants at the KGCMC site and has been reviewed by the engineering staff and General Manager of Kennecott Greens Creek Mining Company. The document is believed to be complete, with data available at this time, and comprehensive in addressing the relevant environmental concerns of the project.

2 BMP COMMITTEE

2.1 BMP COMMITTEE MEMBERS

The BMP Committee is composed of KGCMC personnel involved in the development, implementation, maintenance, and updates of the BMP program. Members of the committee are knowledgeable in spill control and waste treatment, and include environmental specialists, mine and plant managers, safety and health specialists, and facility supervisors. The BMP Committee members and their telephone numbers are presented in Section 2.3.

2.2 COMMITTEE RESPONSIBILITIES

The Greens Creek BMP Committee is responsible for:

- Development of the BMP.
- Implementation, maintenance, and updates of the BMP.
- Identification of toxic and hazardous materials on-site.
- Identification of potential spill source.
- Establishment of incident reporting procedures.
- Development of BMP inspections and records procedures.
- Review of any environmental incidence.
- Determination and implementation of any necessary changes to the BMP.
- Coordination of plant incident response, cleanup, and notification of authorities.
- Establishment of BMP training for plant personnel.
- Assistance in interdepartmental coordination in carrying out the BMP.
- Review of new construction and changes in processes and procedures for spill prevention and control.
- Evaluation of the effectiveness of the BMP.
- Recommendations to KGCMC management on BMP-related matters.

2.3 THE BMP COMMITTEE MEMBERS AND TELEPHONE NUMBERS

Title	**Office Phone**
Environmental Manager	(907) 789-8170
Mill Manager	(907) 789-8173
Surface Operations Manager	(907) 790-8460
Surface Operations Superintendents (2)	(907) 790-8470

3 BACKGROUND

3.1 SITE HISTORY

The Kennecott Greens Creek Mining Company facilities are located on Admiralty Island, approximately 18 miles from Juneau, Alaska (see Figure 5.A.1). Mineralization was recognized near Greens Creek in 1975 by the Pan Sound Joint Venture consisting of Noranda Exploration, Marietta Resources International, Exalas Resources Corporation, and Texas Gas Exploration. Subsequent extensive underground drilling and inspection of the ore body was conducted in 1978.

Environmental baseline studies were initiated resulting in the preparation of a Draft Environmental Impact Statement (DEIS, 1982), and a Final Environmental Impact Statement (FEIS) which was approved by the U.S. Forest Service in January of 1983. A general plan of operations was completed and approved by the Forest Service early in 1984.

Companies involved in the project have changed several times in subsequent years. Interest was originally held by Pan Sound Joint Venture, comprised of Marietta Resources International, Exalas Resources Corporation, Texas Gas Exploration, and Noranda Exploration. In 1978, Pan Sound Joints Venture was dissolved, and the Greens Creek Joint Venture (GCJV) was formed. GCJV consisted of the four original companies plus Bristol Resources, Incorporated. Anaconda Minerals Company acquired the interest of Marietta Resources Inc. in 1982. Amselso Minerals Inc. acquired Anaconda's share of the project in 1985, Noranda's share in 1986, and ultimately assumed management of the project. Amselco began a review of existing information and developed a detailed mining plan and design modifications that led to the preparation of an Environmental Assessment to supplement the 1984 EIS.

In February 1988 Kennecott, as a result of the merger of two oil companies, Standard Oil and British Petroleum, assumed control of the project. In March 1988, the Environmental Assessment was approved by the Forest Service.

In July 1989, RTZ purchased British Petroleum's mineral holdings. Kennecott and Greens Creek Mining Company were part of this purchase.

The KGCMC project involves an underground mine to recover an estimated 11.5 million tons of ore containing significant quantities of zinc, silver, lead, and gold. The direct products of the project are concentrates of zinc and lead, with significant quantities of silver and metallic gold. Major facilities include the underground mine, surface mill and concentrator, surface tailings facility, port facilities, a gravel-surfaced road system, and associated storage facilities (see Figure 5.A.2), as well as remote exploration drilling sites.

3.2 FACILITY DESCRIPTION

3.2.1 Mine/Mill Site

The mine, located on the south side of Greens Creek, has a main access portal at an elevation of 920 feet. Personnel and supplies are brought into the mine at the 920 portal and distributed throughout the mine with rubber-tired vehicles. Ore and waste are removed from this 920 portal with rubber-tired vehicles, and all other levels are interconnected with ore and waste passes accessed with these same rubber-tired vehicles. Ventilation exhaust is directed out of the 1350 adit, which also serves as an emergency escape way from the underground workings.

Underground mining methods incorporate rubber-tired diesel-powered equipment. Drift and fill is the primary mining method used to extract the ore. Long-hole stoping is also utilized in ore zones conducive to this bulk mining method. These methods use cemented tailings as backfill in mined-out areas to support vehicles and equipment, and to provide ground support allowing subsequent mining of adjacent ore. Excess water from the mining operations is collected and piped to Pond "A" located on the north side of Greens Creek.

The mill site is located on the north side of Greens Creek directly across from the mine. Access to the mine site from the mill site is from a bridge that crosses Greens Creek. The mill site, as seen on Figure 5.A.3, consists of the mill buildings, fuel storage tanks, an office complex, a coarse ore stockpile and waste pile, water supply pumphouse, switch gear building, and a warehouse and storage area. A minimum of two months worth of supplies, including reagents, will be stored at the mine/mill site.

A selective flotation milling process is used to concentrate valuable minerals from the raw ore following grinding. The flotation process consists of size reduction, mineral concentration, and moisture reduction of the concentrate. Size reduction involves grinding the ore in semi-autogenous (SAG) and ball mills. Ore will enter the SAG mill at a size of 15 inches or smaller and leave in the one-half-inch (-16 mesh) size range. The ore will then enter the ball mill to be further reduced in size to produce a slurry, which is 80 percent minus 74 microns.

The ore slurry is transported in pipes to flotation cells where first carbonaceous wastes, and then valuable minerals, will be separated from gangue materials in a series of froth flotation processes. The ore minerals in this case will be sulfides of lead, zinc, copper, silver, and uncombined gold. Waste includes various silicate, carbonate, and sulfide minerals. The valuable minerals adhere to air bubbles that rise to the surface of the tank and are removed. To make the process work, air and various reagents are selectively added to the flotation tanks. This allows the bubbling or frothing action to float different minerals selectively, so that differing metal concentrates can be produced. The concentrator recovers various valuable minerals into one of three concentrates for sale; Zinc, Lead, and Bulk. No reduction of sulfides to base metals, or other changes in the chemical composition of ore minerals, takes place in the concentrator or at the project site.

Following separation of ore minerals from tailings, the concentrate slurries are piped to separate thickener tanks where the water content is reduced. The thickened slurries are then compression-filtered to remove most of the remaining water.

During production, an average of some 2,000 tons of ore is mined each day. A comparable milling rate is processed daily, producing approximately 700 tons per day (tpd) of concentrate and 1,300 tpd of tailings.

3.2.2 Tailings

Of the approximately 1,300 tpd of tailings on average approximately one-half 650 tpd are returned to the underground mine and used as backfill in mine voids. The remaining one-half (650 tpd) of the dewatered tailings will be placed in a stockpile at the mill site, loaded by front-end loaders onto covered haul trucks of approximately 50-ton capacity, and transported to the surface tailings facility.

The approximately 650 tpd of tailings are deposited daily over a 20-year period in the dry tailings facility. The facility is located at the upper end of Tributary Creek drainage. The total area of the site is approximately 123 acres which includes an 11 acre water retention pond (Pond 7) with a total water storage volume of some 40 acre-feet. The dry tailings are situated adjacent to, and upstream of, the sediment pond.

Pond 7 receives water via the drain system under the tailings pile, runoff from the tailings basin watershed, runoff from the Site 23 rock storage area, process water piped from the Mill, and from combined wastewater and treated sewage effluent piped from the Mill/Mine and Hawk Inlet facilities. Water from the pond is passed through the water treatment plant in the tailings area prior to discharge into Hawk Inlet in accordance with the NPDES permit requirements.

3.2.3 Ship Loading/Unloading Facility

Supplies such as fuels and reagents are transported by barge to the Hawk Inlet dock facility and unloaded at the marine terminal complex. The cargo dock is located at the same site as the old cannery-dock structure. The barge dock consists of breasting dolphins and a floating dock connected by ramp to land.

Concentrate ore ships are scheduled at approximately 2 per month. A yearly average 80 barges bringing goods, rock and fuel into Hawk Inlet. Chemicals and containers are unloaded from barges by forklifts and transported to the process site by truck. KGCMC wastes and return materials are placed back onto these barges by the forklifts.

Concentrates are transported from the Mill to the Hawk Inlet dock facility by covered haul truck. An enclosed telescoping boom conveyor is used to transport concentrates from within the shore storage area directly into the holds of bulk cargo ships. Some twenty to twenty-four concentrate ships are loaded annually in Hawk Inlet. Figure 5.A.4 shows the Hawk Inlet site.

3.2.4 Dockside Storage

A 280-foot by 100-foot storage building is located adjacent to the Hawk Inlet marine dock (see Figure 5.A.4). Concentrate is transported by covered haul truck from the Mill to this storage facility seven days per week. The Concentrate Storage Building will store up to about eight weeks of production, some 40,000 tons. The main fuel storage tank (200,000 gallons) is also located at the Hawk Inlet site. Fuel barges offload diesel fuel directly into this tank through a welded steel pipe.

3.2.5 Road System

Roads have been constructed for the Greens Creek project between Young Bay, Hawk Inlet dock facility, and the Mine/Mill site. A five-mile long, 14-foot wide road allows transport of personnel from the Young Bay dock to Hawk Inlet. An 8.5-mile long, 16-foot wide road provides transport of supplies and concentrates between Hawk Inlet and the Mine/Mill site. The road is also used to transport dry tailings by covered haul truck from the Mill to the surface tailing facility and waste rock from the mine to various waste areas.

The tailings facility is located approximately 7 miles from the Mine/Mill location. An average of 20 to 25 round trips per day are made to transport dry tailings between the Mill and the tailings basin. An additional 24 round trips per day are made to transport materials, supplies, concentrate and people between the Mine/Mill site and Hawk Inlet site.

3.3 DRAINAGE AND ENVIRONMENTAL CRITICAL AREAS

Drainage from the Greens Creek facility flows into four water bodies. These are Greens Creek, Zinc Creek, Cannery Creek, and Hawk Inlet (which all three of the creeks naturally drain into). These creeks in relation to project features can be seen on Figure 5.A.2.

3.3.1 Greens Creek

Greens Creek drainage basin is 23.5 square miles. Low flows in Greens Creek occur during mid-winter and late summer, with annual average monthly minimum flows of 40 cfs at the mouth and 6 cfs upstream near the mine/mill site. High rainfall in the fall results in a mean monthly flow of 250 cfs during October (USFS, 1983). The drainage basin includes the mine/mill site and over half of the roadway between the Hawk Inlet docking facility and the mine/mill site. A bridge crosses Zinc Creek between the mine/mill site, and the roadway crosses several tributaries to Greens Creek over two other, small bridges and over 100 culverts.

3.3.2 Zinc Creek

Adjacent to, and north of Greens Creek, is the Zinc Creek drainage basin, which has a drainage area of 4.7 square miles. A small channel sometimes connects Greens Creek and Zinc Creek near their mouths. A portion of the roadway and the entire tailings basin is within the Zinc Creek drainage basin.

The roadway crosses Zinc Creek over a bridge some three miles up from the Hawk Inlet facility. The tailings basin is located on the upper reaches of Tributary Creek which runs into Zinc Creek.

3.3.3 Cannery Creek

Cannery Creek is located at the southern end of the Hawk Inlet site. Its drainage area is less than two square miles. The roadway crosses Cannery Creek over a culvert, at 0.7 mile. The majority of the area at the Hawk Inlet docking facility drains directly into Hawk Inlet and not into Cannery Creek. Cannery Creek is the potable water source for the Cannery facility; this take-up point comes from a weir immediately upstream of the road crossing.

3.3.4 Hawk Inlet

Greens Creek, Zinc Creek, and Cannery Creek all flow into Hawk Inlet. The predicted annual flow of both Greens Creek and Zinc Creek into Hawk Inlet is 120,000 acre-feet per year. Their annual average flow creek flow from these streams into Hawk Inlet is 170 cubic feet per second (cfs).

4 RISK IDENTIFICATION AND ASSESSMENT

4.1 HAZARDOUS SUBSTANCE AND TOXIC MATERIALS INVENTORY

The following describes the toxic and hazardous substances employed in the Greens Creek Mining operations which are listed under Sections 307(a)(1) and 311 of the Clean Water Act and required to be addressed under the NPDES Permit No. AK-004320-6. These include the chemical reagents used in the milling process, products of the milling process, and petroleum products.

Dischargers who use, manufacture, store, handle or discharge any pollutant listed as toxic under Section 307 (a)(1) of the Clean Water Act (CWA) or any pollutant listed as hazardous under Section 311 of the CWA are subject to the requirements of 40 CFR 125 applicable to BMP programs for all activities which may result in significant amounts of those pollutants reaching waters of the United States. Table 5.B.1 lists the toxic (priority) pollutants under Section 307 (a)(1) and the hazardous substances under Section 311 of the CWA. The presence of each of the listed chemicals is indicated if used or produced at the Greens Creek Mine in significant quantity. Sodium cyanide is the reagent of greatest concern since it is considered a hazardous substance listed under Section 311 of the CWA and is also on the P-list for acutely hazardous wastes (P106). Both lead and zinc compounds are listed as Priority Pollutants under Section 307(a) of the CWA. These compounds will be found in both the concentrate and tailings. Trace amounts of several other compounds listed under Section 307 (a) and 311 of the CWA are in the ore and will be found in the concentrate and tailings. These compounds and their presence are also shown on Table 5.B.1.

Under Section 311 of the CWA, oil is also subject to BMP program requirements. Oil is defined under Section 311 of the CWA as: "oil of any kind or in any form, including but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil."

Under the NPDES Permit No. AK-004320-6 specific objectives for the control of toxic and hazardous pollutants include an examination of reagents and supplies including sodium carbonate, sodium cyanide, sodium sulfite, lime, copper sulfate, flotation reagents, flocculents, and petroleum products. Although these milling reagents, with the exception of sodium cyanide, are not considered toxic or hazardous under Section 307(a) or 311 of the CWA, they are addressed in the BMP as requested by the NPDES permit.

Specific information on the physical, chemical, toxicological, and health aspects of the milling reagents and petroleum products is found on its Material Safety Data Sheet (MSDS). MSDSs are available to KGCMC employees during their regular work shifts. Notebooks containing complete sets of MSDSs for the site (listed below) are located in the Safety Office, Medical, Warehouse, and Hawk Inlet Services. Notebooks containing MSDSs for individual work areas are located in the Mine Shifter, Mine Maintenance, Mill Maintenance, Mill Assay Lab, and Mill areas.

The mill reagents and their consumption rates are shown on Table 5.B.2. The point of addition of these substance in the milling process is shown on Figure 5.A.5. The following describes the mill reagents which are generally stored at the mine site and utilized within the process.

- Copper Sulfate - Is used as an activator for zinc. Vapors and mists are extremely corrosive to the skin, eyes, nose, throat, and mucous membranes. Breathing high concentrations may be fatal. High temperatures, alkalis, oxidizing or reducing materials, cyanides, sulfides, combustible materials, and hydroxylamines, should be avoided.

- Dow Froth 250 - Is used as an alcohol frother. It is not likely to cause skin or eye irritation and exposures to vapors are unlikely due to its physical properties.

- Ferric Chloride - Is used as a co-precipitant in water treatment plants to remove metals and particulates.

- Flocculent (Percol 351 and Goldenwest 774) - Are added to thickeners (Percol 351) and water treatment plants (Goldenwest 774) to increase settling rates. They are not considered hazardous, but can become slick when wetted. Dust generated in handling can be explosive if sufficient quantities are mixed with air, in which case ignition sources should be avoided. Contact with strong oxidants should be avoided.

- Hydrogen Peroxide - Is added to the mill waste water treatment plant (WWTP) to destroy cyanide complexes prior to discharge. Peroxide is a strong oxidizing chemical and can be harmful if contact is made with the eyes, skin, or mucous membranes.

- Methyl Isobutyl Carbinol (Aero 343) - Is an alcohol frother. Its vapors are moderately toxic and may cause irritation to eyes and skin with contact. Heat, flame, and contact with strong oxidizing agents should be avoided, and it should not be stored or handled in aluminum equipment at high temperatures.

- Diesel Fuel - Is a collector used to float carbon. It may cause eye and skin irritation with direct contact, and exposure to mist or fumes may cause irritation to nose and throat, and signs of nervous system depression. Diesel fuel is combustible and must be stored accordingly.

- Nalco 8130 - Is a flocculent used to settle particulates in the waste water stream. It has a low pH and is considered a hazardous material because of its corrosive properties.

- Potassium Amyl Xanthate (Aero 350) - Is a collector used for lead and zinc recovery. Skin and eye contact with solutions of the product may cause irritation, and dust may cause respiratory irritation. Heat or moisture will liberate carbon disulfide, which is toxic and explosive.

- Quick Lime - Is used as a pH regulator. It will burn the skin, and the dust can irritate eyes, throat, and lungs. It should be stored in a cool, dry, well-ventilated place away from all other chemicals and potential sources of contamination.

- Soda Ash (Sodium Carbonate) - Is used as a pH regulator. Soda ash may cause irritation to the nose and throat, and chest discomfort from dust inhalation. Dust will irritate eyes. Contact with dust may also cause skin irritation. Conditions with high temperatures and acids should be avoided.

- Sodium Cyanide - Acts as a depressant in the flotation of lead sulfide to separate it from mixed ores containing zinc sulfide and iron sulfide. Sodium Cyanide is hazardous because of possible hydrogen cyanide gas formation and the toxic effects of cyanide by absorption or ingestion by the human body. Sodium cyanide may be fatal if swallowed or inhaled. Hydrogen cyanide gas will evolve from contact with acids and water. Weak alkaline solutions also can produce dangerous amounts of hydrogen cyanide.

- Sodium Isopropyl Dithiophosphate (Aero Promoter 3418) - Is a collector used to enhance gold and silver recovery. It may cause irritation to skin and eyes with contact, and to nose and throat with dust inhalation. Aero Promoter 3418 should not be mixed with acids because the evolution of toxic and explosive hydrogen sulfide gas could result.

- Sulfuric Acid - May be added during the milling process or the final wastewater treatment plant process to adjust the effluent pH. Sulfuric acid is corrosive and it can burn skin and eyes from direct contact. Its vapors are irritating to eyes, nose and skin. It can react with organic materials, chlorates, water, and powdered metals, and can ignite finely-divided combustible materials.

- Zinc Sulfate - Is used as a depressant for zinc. Zinc sulfate dust may cause irritation to eyes, nose, throat, and may cause chest discomfort if inhaled. Heat, acids, and oxidizing materials should be avoided.

- Other reagents may be used as a result of future test studies that reveal that various reagent substitutions would improve plant performance.

All hazardous materials including incoming shipments, portable containers (sea vans, FLO-BINS, drums, and bags) and stationary bulk containers (tanks, process vessels, etc.) are labeled with the name of the chemical and associated hazards. Warehouse personnel are responsible for reinsuring that received containers are properly labeled. The safety coordinator is responsible for insuring that in-plant containers are properly labeled.

Combustible and flammable fuels are used at both the mine/mill site and the Hawk Inlet site for power production, equipment and heating. These are addressed further in the Spill Prevention Control and Countermeasure Plan (SPCC) in Appendix 6.

Products of the milling process include lead, bulk, and zinc concentrate and tailings. Approximately 550 tpd of concentrate, and 1,700 tons per day of tailing are produced. Table 5.B.3 presents the results of actual production which analyzed chemical quantities in the lead, bulk, and zinc concentrate and the tailings.

4.2 MATERIALS COMPATIBILITY

Materials and process chemicals are stored in separate containers at the mill site until their use. The containers have been approved for the transport and storage of each chemical, and have the appropriate materials, construction, and coatings to prevent corrosion, degradation, or other destruction of the containers by the chemicals involved.

Chemicals are only mixed in their appropriate bins inside the mill building. The mixing of chemicals is by tested and proven methods of the mining and recovery industry; no experimental mixing or testing is involved. All chemicals are compatible with each other except acids and cyanides which should not come in contact. Hydrogen Peroxide and Sulfuric Acid are not compatible with other reagents. Extra precautions will be taken to prevent any association of these chemicals.

4.3 PROJECT AREAS SUBJECT TO BMP REQUIREMENTS

Areas of the project which are subject to BMP requirements include materials storage areas, loading, unloading, and material transport areas; plant transfer, processing, and handling of materials, and areas of material disposal.

A schematic of the flow of materials is presented in Figure 5.A.6. This figure indicates the direction and quantity of materials moving form one area to another. To summarize the flow of materials, raw ore is removed from the mine and stored in an uncovered stockpile. The ore is then transported from the stockpile to the mill for processing via conveyor belt, loaded through a grizzly bay by a front end loader. All mill size reduction, flotation, and dewatering are wet processes accomplished by pumping of liquid and slurries. Process chemicals are delivered to the island by barge, unloaded by forklift, and transported to the mill by truck. Within the mill, the process chemicals are mixed with ground milled ore and the desired products separated and concentrated. The concentrates are then loaded by front end loader into Max-Haul trucks inside the mill and transported by these covered trucks to the Hawk Inlet dock storage area. From there the product is transported to outbound ships by conveyor system. Tailings left over from the process are transported back into the mine by underground trucks for redeposition, or to the tailings impoundment by the covered Max-Haul trucks for permanent disposal.

Each of the areas subject to BMP requirements are described below. On-site runoff for each of these areas is also discussed. The direction of flow of potential spills and surface runoff is assessed, in the following paragraphs in addition to the potential for toxic and hazardous pollutants to reach water bodies.

4.3.1 Materials Storage Areas

Material Storage areas include areas adjacent to, and inside of, the mill building for the storage of mill reagents; fuel storage at the mine site and at the Hawk Inlet site; and storage of ore concentrate and tailings in the mill building, and storage of ore concentrate at the Hawk Inlet site. Figures 5.A.7 and 5.A.8 show the location of material storage at the mine/mill site and Hawk Inlet site, respectively.

Mill Reagent Storage

With the exception of lime, chemicals used for processing are stored inside the mill reagent area. Reagents are transported by sea van to the mill. Sea vans are designed for extreme environmental conditions such as those found in Southeastern Alaska. They are thick ribbed steel containers which are air and water tight and can be stacked on top of each other and transported easily from one area to another by forklift. Sea vans are placed on packed gravel pads, adjacent to the mill reagent area. Individual containers within sea vans are transported by forklift into the mill building dry reagent storage area for unloading. Approximately two weeks worth of reagents are stored within the mill building.

Sodium cyanide will be stored in FLO-BIN containers within sea vans. Eight FLO-BIN containers are contained in one sea van. FLO-BIN containers will hold 3,000 pounds of sodium cyanide in the form of briquettes. The FLO-BIN containers are returned so disposal of containers is unnecessary. These containers are handled with a forklift and can be stacked two high when loaded, and three high when empty. The bins have a 9-inch by 22-inch slide gate with an end-lock closure and a gasket seal at the bottom; this is to remain secure until use. The top and top-opening cover are domed to encourage water runoff. FLO-BIN containers are transferred by forklift from sea vans to the dry reagent storage area where they are immediately used. Figure 5.A.9 shows a typical FLO-BIN container.

Lime is stored in a silo located on the northwest corner of the mill building reagent storage area. The silo is a steel bin and holds 50 tons of powdered lime. The lime silo has a floor sump to contain and recycle any spills.

Other mill reagents are transported in drums and shrink-wrapped bags within sea vans. Frother reagents may be combined in sea vans; whereas, other reagents are transported in separate sea vans.

All reagents when received at Hawk Inlet are unloaded from the sea barge and transported to the mill in the sea van they arrive on-site in. The sea vans are unloaded when they arrive at the mill as the chemicals are needed. Only N_2CN and H_2SO_4 bins remain locked in the sea vans.

Individual containers for each reagent include:

Sodium Cyanide	-	Contained in 2,000-lb. Super Sacks
MIBC	-	Contained in 55-gal. drums
Aero 3418A	-	Contained in 55-gal. drums
SD-100	-	Contained in 55-gal. drums
8130	-	Contained in 330-gal. tote bins
Zinc Sulfate	-	Contained in 100-lb. bags as dry solid
Soda Ash	-	Contained in bags as a dry solid
Mineral Oil (Diesel)	-	Stored in 55-gal. drums as liquid
Aero 350	-	Contained in 55-gal. drums as a dry solid
Aero 3418	-	Contained in 55-gal. drums as a liquid
Copper Sulfate	-	Contained in 100-lb. bags as a dry solid
Dowfroth 250	-	Contained in 55-gal. drums as a liquid
Flocculent (Percol 351)	-	Contained in sacks as a dry solid
Flocculent (Goldenwest 774)	-	Contained in sacks as a dry solid
Hydrogen Peroxide	-	Contained in bulk tank as a liquid
Sulfuric Acid	-	Contained in bulk tank as a liquid

Individual reagent containers including FLO-BINS, drums, and bags are stored inside the mill building on concrete chemical containment pads. Spills of any chemical outside are recovered to the extent possible for recycling or routed to the tailings facility. Any spills inside of the mill building are routed to sump pumps for recycling.

Surface runoff at the mine/mill site is shown on Figure 5.A.7. As can be seen on Figure 5.A.7, all process areas including areas where chemicals are stored drain across concrete surfaces to the lined containment ditch which flows to Pond A. Water in Pond A is pumped either into the Mill, or through an eight-inch HDPE pipeline to Pond 23 or the Tailings facilities. In an emergency, if Pond A's pump is turned off; the mill will go to recirculation or shut down. Some remaining water will flow to Pond A from the pump wet well and surface runoff. The ponds are designed for a 10-year, 24-hour storm event. All runoff from the disturbed process area flows into lined KGCMC containment and none of these flows run directly into Greens Creek or any other water body.

Under catastrophic conditions, Pond A water can be treated in of the two mill water treatment plants to neutralize or remove the specific contaminants. Any contaminated soils would be neutralized and washed. Under conditions above a 10-year storm event, excess water would flow to Pond B from Pond A, and then into Greens Creek. However, runoff would be very diluted under these circumstances and impacts would be minimal. As part of the fresh water monitoring program, monthly samples are taken from both Pond A and Pond B. During a spill incident, samples would be taken from both Pond A and B to have an accurate record of what entered Greens Creek.

leaks or spills from reagent containers stored within the mill building are washed to the reagent sump pump. The Lime Silo has its own sump to collect any spills. Spills from sodium cyanide FLO-BIN containers within the mill building storage area are unlikely, because of the durability of the containers which will be transferred directly to the mixing tank feed hopper. All containers are visually inspected by mill personnel on a regularly-scheduled basis for leak detection.

Fuel Storage

Bulk fuel tanks are located at the mill site and at Hawk Inlet site. Storage of fuel is discussed in detail in the SPCC (Appendix 6)

Ore Concentrate and Tailings

Segregated storage for a maximum of 200 tons of lead concentrate, 300 tons of combined lead and zinc concentrate, and 300 tons of zinc concentrate exists in a room on the southwestern side of the mill building. Concentrates are held in this room prior to transport to the Hawk Inlet site (see Figure 5.A.7) in covered Max-Haul trucks. The concentrates are completely enclosed with concrete floors and side walls. Transfer of concentrates to trucks is also conducted within this mill building room (see Section 4.3.2). Spills to receiving water bodies, at the mill site from loading concentrate, are impossible.

Generally, about 12,000 tons of concentrate will be in storage at the Hawk Inlet site Concentrate Storage Building. This building can hold some 40,000 tons of concentrate if necessary while awaiting a ship for loading. Bulk, zinc, and lead concentrate are stored in this 120-foot by 280-foot covered storage building (see Figure 5.A.8). The concentrate storage building is designed for chemical containment with a concrete slab floor and lower side walls. In addition, the entire area around the building is surrounded by a berm and all runoff is routed to the DB-04 settling pond prior to being pumped up to the Tailings area water handling and treatment facilities prior to discharge through Outfall 002 into Hawk Inlet. In the event of a spill of concentrates, the solids are immediately scraped up with the surrounding rock and either returned to the concentrates within the storage building, returned to the mill for reprocessing, or disposed of in the tailings area.

A maximum of 7,500 tons of tailings from the milling process is stored at the southeastern corner of the mill building. This area is covered, contained on a concrete floor, and partially enclosed by concrete walls. Surface water runoff, as shown on Figure 5.A.7, is routed through sediment traps into the lined ditch which flows to Pond A prior to being pumped to the tailings facility. No tailings are directly discharged into Greens Creek.

4.3.2 Loading, Unloading, and Transport Areas

Materials and chemicals are transported by truck over an 8 ½–mile, single-lane, gravel-surfaced road between Hawk Inlet and the mine/mill site. Figure 5.A.2 shows the roadway between Hawk Inlet and the mine/mill site. Chemicals are transported to the mill site in containers. Concentrate is carried in covered Max-Haul trucks from the mill to the Hawk Inlet storage building. These trucks dump into the Concentrate Storage Building from outside of the building through an opening for this purpose. Any wheeled vehicle which enters this building must have the wheels cleaned in a Truck Wash Building prior to leaving the concrete covered travel area surrounding these facilities. Concentrates are loaded by an enclosed, telescoping conveyor and chute system from within this storage building directly into ocean-going vessel holds. Covered Max-Haul trucks also transport tailings from the mill site some 7 ½ miles to the tailings basin.

Mill Reagent Loading, Unloading, and Transport

Milling reagents, contained in sea vans, are delivered weekly by ocean barges to the Hawk Inlet facility. Sea vans are off-loaded with large fork lifts from barges at Hawk Inlet (see Figure 5.A.10) which then transport them to the nearby Hawk Inlet warehouse. Mill reagents are transported by a freight truck to the mill site in these sea vans for storage. Sea vans are unloaded by forklift at the mill site for storage in and adjacent to the mill building. Lime is also delivered weekly by barge and transported in special lime ISO-containers which are similar to sea vans. Lime is blown from the container into the silo for storage.

If an accident were to occur en route to the mill site, spillage is unlikely due to the construction of the containers. These containers are built for transport and rough handling. In addition, reagents inside the sea van containers are separately packaged, as described in the previous section, and incompatible materials are not packed together in the same sea vans.

Lime ISO-containers are also durable and built for transport. During the transfer of lime powder from its transport container to the silo, lime powder will occasionally spill. Drainage around this area is directed to Pond A. Lime addition to Pond A will improve the settling performance as lime is a primary coagulant used to enhance settling.

Sea vans and lime containers will be inspected by AML personnel in Seattle prior to transport to ensure no faults in construction are present.

Mill Site Loading of Concentrates and Tailings

Bulk, zinc, and lead concentrates are loaded, in the mill building concentrate room, by front-end loader onto 50-ton covered Max-Haul trucks. Trucks are muss pass through a spray truck wash prior to driving outside of this mill building room. Figure 5.A.11 shows the concentrate loading room area in the mill building, and Figure 5.A.12 shows this area in detail. Runoff water from the truck wash collects in the sump and is pumped to the bulk thickener. No runoff water from the concentrate loading area leaves the building. The likelyhood of spills into Greens Creek from concentrate loading operations, therefore, are remote.

On average, approximately 850 tons per day of dry tailings are loaded by front-end loaders from the tailings stockpile area of the mill to 50-ton covered Max-Haul trucks for transport to the surface tailings facility. Similarly on average, approximately 850 tons per day of tailings are loaded, by front-end loaders, to the backfill feeder conveyor loading hopper where they are mixed with cement for transport in 16-20 ton teletram trucks to the mine and used as backfill. Figure 5.A.11 shows the mill tailings loading area.

Tailings may spread from the tailings storage area to the loading area during loading. This entire area is roofed to keep precipitation from contacting the tailings. When loading the tailings, care will be exercised to keep tailings within the covered area.

Concentrate and tailings are transported by covered trucks to the Hawk Inlet site and the surface tailings facility, respectively. Approximately 11 - 12 truck loads per day of concentrate travels between the mill site and Hawk Inlet storage site. Approximately 15 to 20 truckloads per day of tailings also travel between the mill site and the tailings facility. In addition, materials, supplies, fuels, and waste rock are transported by truck daily between Hawk Inlet and the mine/mill site.

As shown on Figure 5.A.2, the Greens Creek stream runs close to the upper portion of the roadway. The road route also crosses Zinc Creek, several creeks that are tributaries to Greens Creek, and Cannery Creek. The significant amount of traffic on this road and its location to the mentioned creeks increases the risk of spills into water bodies.

The worst-case scenario for a spill of truck-hauled concentrate or tailings would be the introduction of up to 50 tons of bulk, zinc or lead concentrate, or tailings directly into a creek. The most likely scenario for an accident would involve spillage of the bulk, zinc or lead concentrate, or tailings on the slopes of the road corridor. Immediate mobilization of workers to place sediment impediments around the spill covers over the spilled material, and timely recovery of the spill by manual and mechanized equipment has minimized the impact of such spills. Similar techniques would also be employed in the unlikely event of a direct spill into the creek. However, a direct spill would result in a greater volume of concentrate or tailings washing downstream before response measures could be taken.

In the event of a direct spill of truck-hauled concentrate or dry tailings into a creek, it is possible that acute effects would occur to aquatic organisms in the immediate area of the spill. Most effects would be due to smothering by the sediment, although lead and zinc concentrates could introduce long-term effects to the aquatic habitat. The concentrate and dry tailings would not readily move under conditions of normal discharge, however, and would be largely recoverable.

In the event of road spills of concentrate or tailings, the following events take place. Surface Operations and road traffic is notified of the spill by in-vehicle radio transmission. Mechanical equipment (225 backhoe, front-end loader, receiving truck) is mobilized to the site.

The material remaining in the tipped truck may be removed, placed in a second, receiving truck, and taken to its proper area; concentrate or tailings. The tipped truck is righted and returned back onto the road, if undamaged this receives the spilled material and surrounding soils and road material. This material is taken and returned to the mill for re-processing, or disposed of in the tailings area.

To reduce the potential for truck accidents, the number of trucks are minimized to the extent possible. Extensive radio communication is employed to communicate for traffic movement, hazards, or any spill occurrences. Surface Operations has developed a road traffic Standard Operating Procedure which details travel on the road as well as proper meeting protocols which include vehicle type priorities. Loaded work vehicles have priority over smaller vehicles.

Concentrate and Tailings Unloading

The Max-haul trucks unload concentrate through a designated dump opening into the storage building at the Hawk Inlet site. Max-Haul trucks deposit concentrate from outside the contained areas to prevent the tires of the truck from spreading concentrates. A front-end loader trans-locates bulk, zinc, and lead concentrates to contained designated areas, within the concentrate storage building. The potential for concentrate to reach Hawk Inlet is unlikely. Any concentrate spills from the storage building or from truck tires run off to the DB-04 settling pond over the concrete pad around these facilities, and not directly into Hawk Inlet.

A covered, telescoping conveyor and chute system is employed for loading concentrate product from within the storage building directly into the ship's holds. This conveyor system is covered to prevent concentrate from blowing or falling off the system into the environment. Figure 5.A.13 shows the conveyor system. At the end of the conveyor system is an elephant trunk feeder which also telescopes to reach down into the ship's hold to distribute the concentrates. During the first shiploading, minor amounts of concentrate reached Hawk Inlet. This spillage was caused by improper design of the transfer chutes. This entire initial concentrate loading system has been replaced with the current covered, telescoping conveyor and chute system, and further spillage or loss to the environment is improbable. Ships of 10,000- to 40,000-ton capacity transport concentrates from the Hawk Inlet site, monthly.

Dry tailings are unloaded in the tailings facility. Max-Haul trucks will unload tailings from crossroads which extend into the tailings pile. Surface runoff and potential for spills are controlled at the tailing facility as described in Section 4.3.4.

Transport of Mill Site Wastewater

Wastewater from the mill and mine site area is composed of mill wastewater, site runoff water, mine drainage, and domestic wastewater. During dry periods, site runoff would be minimal and would result in minimal dilution of the wastewater. All site runoff from process areas at the mine/mill site drains to Pond A. Water in Pond A is piped to the tailings basin sediment pond. The wastewater is transported to the tailings basin through a single eight-inch diameter high density polyethylene pipe. This line is installed along the roadway from the mill site to the basin and covered with soil and rock to prevent damage from falling rocks or equipment. The transit time through the roughly 7 miles of this water transfer line has been measured at some 4 hours.

Since operations began, the wastewater line has been broken by KGCMC or contractor operations (ditch or road maintenance, facility installations) and accident (falling trees and rocks). In the event of an incident, the following procedure is followed:

1. Pumping into the damaged line is stopped at either the Pond A sump or Pond 23 pump house.
2. The mill is placed on recirculation, or possibly shutdown.
3. Mill maintenance crews and/or water operations staff are dispatched to assess the damage and make repairs.
4. Environmental Department takes spill specific samples of the wastewater and affected creeks to determine water quality effects.

A maximum probable volume of a spill would be approximately two pipe volumes or 250,000 gallons.

When a spill occurs, it takes time for the mill to go to recirculation or shutdown. During this time the water flowing from the mill waste water treatment plant will enter Pond A directly. If these conditions happen to take place during one of the 24-hour design storm events, there is a possibility that this water could enter Greens Creek and or hawk Inlet. Methods employed to repair the pipe, in the event that the pipe is broken, depend on the type and extent of the damage. Repair material is kept at the 920 mill site and Hawk Inlet.

There is an in/out flow comparison system installed in the waste water pipe line to assist in pipe leak detection. This system never worked in the manner it was designed. To correct this problem, a magnetic flowmeter was installed at the Pond A sump, and a flowmeter replacement is scheduled at the tailings pond in 1992. The mill control system will alert the mill operator when pipe inflow/outflow valves are not in substantial agreement. A major disagreement in flows will indicate the possibility of a leak.

4.3.3 Plant Transfer, Process, and Materials; or Chemical Handling Areas

Areas of transfer, process, and materials handling involve processes within the mill building where raw ore is ultimately separated into concentrates for sale, and tailings waste. Chemicals are transported from their respective sea vans into the mill building by forklift. Inside the mill building, the chemicals are mixed in dedicated tanks in the reagent area, and applied as part of the ore flotation separation process. Mixing, handling, and process locations inside the building all have floors which slope to sump pumps.

Two weeks usage of reagents are stored in FLO-BINs, bags, and drums in the mill building reagent storage area. All mixing is carried out in this isolated area of the mill. Holding tanks maintain three days storage of mixed reagent. Lime is pumped in a continuous loop from the holding tank, through the points of addition area and returned to the holding tanks. Reagent is removed from the loop at its point of addition and controlled by timer-activated solenoid valves. All other reagents are pumped from their holding tanks to direct point of addition. Passage rates are controlled by timer-actuated solenoid valves and monitoring pumps.

FLO-BINs containing sodium cyanide are stored near the hoist as seen on Figure 5.A.14. FLO-BIN containers are hoisted to the feed hopper (see Figure 5.A.15). While on the feed hopper, the slide gate underneath the FLO-BIN container is opened and the sodium cyanide briquettes fall into the mixing tank. From the mixing tank the reagent mixture is piped to the sodium cyanide storage tank where it is distributed to areas in the milling process as shown on Figures 5.A.17 and 5.A.18. A sump pump located in the area where sodium cyanide is handled and mixed collects any spills or leaks for recycling. This area is well ventilated with a fan. Detectors, in the area, and throughout the mill building activate if hydrogen cyanide gas is present at elevated levels.

Lime is routed from the storage bin to a slaking unit and then to the mixing tank, all located in the lime silo. The lime silo is equipped with an exhaust fan and blower, and a sump is located under the silo to collect any spills and route them back into the adjacent mill building. From the mixing tank the lime mixture is transferred to the storage tank located inside of the mill building (see Figures 5.A.14 and 5.A.15). From the storage tank the mixture is routed to various areas for addition in the milling process (see Figures 5.A.16 and 5.A.18). The lime area is also equipped with a sump pump to collect and recycle any spills.

Other reagents used in the milling process are transferred in bags or drums by forklift from the reagent storage area, inside the mill building, to their respective mixing tanks (see Figure 5.A.14). Bags or drums are manually dumped into mixing tanks by personnel wearing protective equipment including protective clothing, respirators, and face shields. Reagents are then withdrawn from the respective mixing tanks and directed through dedicated piping for use in various areas in the mill process. An exhaust fan is located above the sodium sulfite storage tank. The mixing and transfer of reagents is shown on Figures 5.A.16, 5.A.17, and 5.A.18. A reagent sump pump collects and recycles any spills or leaks in the reagent area. As mentioned earlier, sodium cyanide and lime handling areas each have their own sump pumps, and spills or leaks of these reagents are not routed to the main reagent area sump pump.

Reagent mixing and storage tanks are made of steel, except for copper sulfate which is mixed and stored in fiberglass tanks. Copper sulfate and sodium cyanide mixing and storage areas are located on opposite ends of the reagent area to avoid any potential incompatibility problems.

All reagents are routed by PVC, high-density polyethylene pipes, stainless steel pipes, or braided hoses to various areas in the milling and flotation separation processes. The entire milling process is underlain by a concrete chemical containment pad and is entirely enclosed within the mill building. Exceptions are the zinc, lead, bulk, and tailings thickeners, and the tailings stock tank which are located outside, adjacent to the mill building.

All gangue, concentrate, or tailings slurry transfer in the milling process is either through high-density polyethylene or steel pipes. All pipes are above ground and above concrete floors in the mill building. Any leaks or spills are routed to appropriate sump pumps for recycling.

In addition to the reagent area sump pumps described above, the mill building is equipped with a sump pump located under the SAG mill, plane tables and shaking tables; two lead and bulk area sump pumps, one under the lead and bulk flotation circuits and the other under the lead and bulk thickeners and stock tanks; two zinc area sump pumps, one under the zinc floatation circuit and the other under the zinc thickener and stock tanks; a concentrate storage and loading area sump pump; and a tailings thickener area sump pump. Figures 5.A.19, 5.A.20, 5.A.21, and 5.A.22 show the sump pumps and the processes associated with each sump pump.

The working surface surrounding the mill building and other associated surface facilities is generally surfaced with a concrete liner. This impervious surface drains through a series of sediment traps into a HDPE-lined containment ditch running down gradient the length of these surface facilities to the lined containment pond Pond–A. Pumps in this pond withdraw accumulated waters which can then be directed either into the mill for treatment in one of its two water treatment plants, or sent directly to the tailings area for treatment and discharge under the NPDES permit provisions. Collected sediments are removed and carried to the ore pad to be fed through the mill process, placed underground as backfill, or incorporated into the controlled surface waste piles.

The potential for any spills or leaks in the mill building to reach the outside environment and any receiving water bodies is unlikely. All pipes, pumps, filter, tanks, and electrical equipment will be inspected on a routine basis, as described in Section 7.0 and 8.0, to avoid major leaks or spills. In the event of a major spill or leak, the plant will be shut down until the potential for environmental danger is controlled, and repairs are made.

4.3.4 Material Disposal Area

The approximate 1,700 tpd of tailings from the milling process is wet filtered to reduce the water content to approximately 10 to 12 percent by weight. The water from the tailings dewatering process is recycled within the mill process. The tailings are loaded with front-end loaders to a cement mixing plant and then to slinger trucks for redeposition as backfill into the mine, or they are placed directly into covered Max Haul trucks for transport to the surface tailings facility. Annually, approximately one-half of the tailings are placed back into the mine workings, with the remainder placed in the surface tailings facility.

The surface tailings facility consists of a dry tailings pile and sediment ponds situated adjacent to one another. An associated main embankment and saddle embankment, slurry walls to all four sides of the tailings placement area, drainage ditches on the west, north and east sides of the tailings pile which collect runoff, tailings area underdrains and associated wet wells, a high-density sludge water treatment plant, and an outfall pipeline and spillway which discharge to Hawk Inlet (see Figure 5.A.23).

The dry tailings pile is raised in 1.5-foot (compacted) increments to a maximum height of 160 feet above the natural ground. Crossroads will be raised concurrently to provide access for trucks hauling tailing material onto the tailings pile. A centerline drain - finger drain system under the tailings pile drains into the sediment pond. Collected sediment removed from the pond, the water treatment plant, and the road ditches will be allowed to dry, then incorporated into the dry tailings pile.

Both the main and saddle embankment have relatively impervious clay cores to reduce seepage losses from the sediment pond. In addition, seepage cut-off walls surrounding the pile area extend through the highly-permeable peat and sand lenses immediately beneath, and are keyed into an underlying, impermeable clay layer or bedrock. The amount of vertical seepage loss is minimized due to the low permeability and artesian pressure of the aquitard soils at depth which underlie the tailings basin.

Bedrock groundwater discharge from the tailings facility is estimated to be small. Groundwater monitoring wells are installed downstream of the tailings facility to the south, west and north to monitor water levels and water quality. If significant degradation of the groundwater quality were to result from seepage, cut-off trenches or pump-back wells would be constructed to intercept the seepage and pump it back to the tailings sediment pond. (See Appendix 1.)

The tailings sediment ponds are sized to provide retention of the 25-year, 24-hour storm event from facilities covered by the ADEC Waste management Permit 0211-BA001, and the 10-year, 24-hour storm from the rest of the KGCMC surface facilities. These contact waters are combined with treated Mill process water and treated domestic sewage from the KGCMC facilities in the tailings ponds. From here they are sent to the tailings area water treatment plant. Treated effluent from the tailings water treatment plant is routed out the outfall line, monitored as required by the NPDES permit, and discharge through a diffuser into the ADEC/EPA approved mixing zone on the ocean floor. End-of-pipe pollutant concentrations cannot exceed the following limits, as specified by NPDES Permit No. AK-004320-6, to assure meeting Alaska Water Quality Standards in Hawk Inlet at the edge of the approved mixing zone (107:1 dilution) as set by the 31 March 2005 ADEC 401 Certification letter.

NPDES Water Quality Permit Limits (AK 004320-6)

Parameter	Monthly Average (ug/l)	Daily Maximum (ug/l)
Cadmium (Cd)	50	100
Copper (Cu)	150	300
Lead (Pb)	300	600
Mercury (Hg)	1	2
Zinc (Zn)	500	1,000
Total Suspended Solids	20	30
Outfall flow	2.39 mgd	3.6 mgd
pH	Minimum 6.0 S.U – Maximum 9.0 S.U.	
WAD Cyanide (CN)	Monitor weekly	
BOD_5	Monitor monthly	
Fecal Coliform	Monitor monthly	
Total Residual Chlorine	Monitor quarterly	

The tailing sediment pond is sized to provide sediment storage, working storage (equalizing), storage for the above described storm events with freeboard. However, during excess storm events, discharges through the designed Emergency Spillway could occur for several hours, but would be diluted by runoff in the adjacent upland muskeg, and the waters of Hawk Inlet. These events would be infrequent and of short duration, and are guarded against by keeping the pond elevation at the minimal levels during storm periods. Localized water quality degradation in Hawk Inlet could occur during the overflow. Although these discharges would not occur through the effluent diffuser, because of dilution and short contact time, they are not believed to present a threat of acute or chronic toxicity to marine life. Proposed ADEC standards, thus, may be exceeded during the overflow and NPDES standards are not applicable during storm overflows beyond the composite 25-year and 10-year, 24-hour event.

5 CONTINGENCY PLAN

5.1 INTRODUCTION

5.1.1 Purpose and Scope

This Contingency Plan outlines the general procedures which are followed by KGCMC personnel to respond to unplanned release of fuels, oils, or chemical reagents which occur for any reason. The procedures presented in this plan follow those outlined in the KGCMC Emergency Procedures Manual where applicable.

This Contingency Plan prepared by Greens Creek Mining Company (KGCMC), Admiralty Island, Alaska is part of the Best Management Practices program (BMP) required under the federal National Pollutant Discharge Elimination System (NPDES) permit. The BMP describes measures to be implemented to prevent or minimize the potential for the release of toxic or hazardous pollutants to the water of the United States (40 CFR 125.100 - 125.104). Substances at KGCMC which are included in these categories and could be released include chemical reagents, oil and fuels, and mining products and wastes including ore, waste rock, and tailings. A Spill Prevention Control and Countermeasure (SPCC) Plan addressing oil and fuel has also been developed for KGCMC and is present in this document as Appendix 6. This Contingency Plan is designed to meet the requirements of 40 CFR 109 for oil releases and should be used in conjunction with the SPCC Plan.

Each process or area of the facility for which the contingency plan applies to was discussed in Section 4. Chemical reagents to be used in the milling process include the following; sodium cyanide, copper sulfate, sodium sulfite, potassium amyl xanthate, sodium isopropyl dithiophosphate; methyl isobutyl carbonol, quick lime, 3418A, SD100, sulfuric acid, hydrogen peroxide, and 8130. Sodium cyanide is the reagent of greatest concern because of its acute toxicity. Any spill residue (gravels, soil, clean-up materials) of hazardous chemicals are handled as a hazardous waste under RCRA.

In addition, bulk fuels including Number 1 and 2 diesel and gasoline are also stored and transferred at the facility. Refer to the SPPC for specific quantities, locations, and operating procedures concerning fuel transfer and storage.

5.1.2 Related Documents and Plan Storage Location

Other emergency planning documents which are relevant to this Contingency Plan are listed below:

KGCMC Spill Prevention Control and Countermeasure Plan
KGCMC Facility Response Plan
KGCMC U.S. Coast Guard Manual for Hawk Inlet

KGCMC Emergency Procedures Manual
KGCMC "Right to Know"
KGCMC Contractors Safety Manual
KGCMC Training Program

Copies of this plan or any revised versions of it are kept at the following locations:

- Environmental Manager's Office
- Surface Operations Office
- Mine, Mill, Maintenance Office
- KGCMC computer network at N:everyone/GPO/Apn05

5.2 SPILL RESPONSE AND REPORTING PROCEDURES

5.2.1 Summary of Response Procedures for a Spill of a Hazardous Substance

This section briefly outlines the procedures followed in the event of a spill of fuel or a chemical reagent at the Greens Creek facility. Figure 5.A.24 shows the Environmental Contact Procedure for Greens Creek. Response actions are detailed for specific chemical reagents, notably sodium cyanide.

At the KGCMC facilities on Admiralty Island, the primary responsibility for response and notification regarding releases of hazardous or toxic materials to the environment lies with the KGCMC Surface Operations Manager, Environmental Manager, and the Mill Manager. Several additional people could be involved with a given release; to ensure that responses to the release will be efficient, organized and thorough, the responsibilities of each of those people is specified. The efforts of a response will vary depending on the identified severity of the release. KGCMC is capable of providing a full range of response activities.

Person Discovering Spill

An individual witnessing or discovering a release of any size of any substance is responsible for immediately notifying his supervisor and the On-site Environmental representative of the observation. If any people have been injured, medical and safety personnel are contacted immediately according to standard protocols for handling injuries. If possible, the person witnessing the release should note the material, the location of the release, the time and date the release was noted, the apparent cause, the approximate volume, apparent fire or other hazards, or any other pertinent information. If the release can be stopped at the source (i.e., turn off a valve) without risking injury, the person should make an effort to do so.

The following procedures outline steps to be taken upon discovery of a release:

A. Assess the situation (what spilled? Why? Injuries? location? How long has it been occurring? Imminent hazards?).
B. Stop or contain the spill if possible without risking injury.

C. Notify Supervisor immediately.
D. Notify Medical immediately of injury has occurred, or Safety if fire, explosion, poisoning, or another threat is imminent.
E. Secure the area to protect others.
F. Administer first aid if necessary.

<u>Supervisor</u>

The supervisor of the person who witnessed the release will notify the Mill Manager, the Surface Operations Manager and the Environmental Manager immediately that a release has been detected. If there is danger of fire, explosion, personnel poisoning, or injury, the supervisor will evacuate the area, notify Medical, and the department manager.

A. Evacuate the area if danger of fire, explosion, personnel poisoning, or other hazards exist.
B. Verify that Medical has been notified in the event of injury.
C. Notify Mill Manager, Surface Operations Manager, and Environmental Manager immediately.

Emergency Coordinators

1. Mill Manager: work (907) 789-8100

2. Surface Operations Manager: work (907) 789-8100

3. Environmental Manager: work (907) 789-8170
   home (907) 790-2873

4. General Manager: work (907) 789-8100

D. Safety will advise other managers of the initial problem.
E. Begin containment and neutralization of spill as directed by Line Manager, and/or Mill Manager, Surface Operations Manager, and Environmental Manager using MSDS sheets and practical knowledge to determine actions.

<u>For Fuel Spill:</u>

- Use booms to halt migration of liquid fuel on waterways;
- Use absorbent pads to halt migration of liquid fuel on land or on waterways;
- Shovel saturated or contaminated soils or materials into a drum or suitable container;
- Use heavy equipment to construct dams, berms, or trenches to contain and restrict the flow of fuels;
- Assure pumping of down gradient containment is off to prevent spread of the contaminent.

For Sodium Cyanide Spill:

- Safety first! Follow all safety precautions, including appropriate personal protective clothing.
- Shovel or sweep material into a drum or suitable container;
- Keep spilled material dry; this is a high priority and will take quick action at KGCMC due to the high precipitation in the area.
- If it is raining, cover the spill to reduce dissolution of sodium cyanide;
- Implement detoxification procedures.

Medical

Medical is responsible for logging information, notifying emergency personnel, other key management people contacting environmental personnel, contacting safety personnel, limiting radio and telephone communications, and relaying communications on response actions (the Environmental office is the designated operations center for spill response activities). Information to be logged includes data on the type, location, and volume of the spill and on any injuries resulting from it.

A. Log information
B. Notify emergency personnel
C. Notify Mill Manager, Surface Operations Manager, and Environmental Manager.
D. Limit telephone and radio communications.
E. Relay communications for the spill response effort.

Mill Manager/Health and Safety Manager, and Environmental Manager

The Mill Manager or Surface Operations Manager initiates the response and need for mobilization. The Environmental Manager is responsible for coordinating the spill response and for making the required federal, state, and local notifications. They determine whether the release constitutes a reportable quantity and the level of response which is required. They mobilize and coordinate immediate and long-term responses performed by trained personnel. The Mill Manager, Surface Operations Manager, and Environmental Manager are responsible for all follow-up reporting and documentation regarding the spill.

A. Determine whether external assistance and/or notifications are necessary.
B. Notify KGCMC General Manager of spill.
C. Mobilize spill response team.
D. Notify external organizations of the spill.

Coast Guard National Response Center
24 hour 1-800-424-8802
17th U.S. Coast Guard District
Rescue Coordination Center (907) 586-7340

U.S.C.G. Captain of the Port, Southeast Alaska
Working Hours, Monday - Friday (907) 463-2450-65
After hours and weekend (907) 463-2330

Alaska Department of Environmental Conservation,
Southeast Regional Office (907) 465-5340

Other required notifications.

E. Continue coordination of spill response effort.
F. Perform follow-up documentation and reporting.

5.3 NOTIFICATIONS

Any KGCMC employee or subcontractor who witnesses a release of any size of any material is responsible for notifying his KGCMC supervisor and, if injury has occurred, the Medical officer on duty. The Supervisor will notify the Mill Manager, the Surface Operations Manager, the Environmental Manager and will verify that Medical has been notified if an injury has occurred. The Surface Operations Manager, and Environmental Manager will notify the KGCMC General Manager of the spill as soon as possible.

External organizations which may need to be notified include emergency response personnel such as SEAPRO the petroleum response organization, hospitals, the Coast Guard, and oil spill response teams and government agencies. Emergency safety personnel are notified by the Medical Officer. Agency notifications and reporting will be coordinated through the Environmental Manager. In the event of a reportable spill, the U.S. Forest Service will be notified immediately. The following additional agencies may be contacted depending on the nature, location, and volume of the spill:

- Alaska Department of Environmental Conservation (ADEC);
- U.S. Department of Agriculture (USDA), U.S. Forest Service (USFS);
- U.S. Coast Guard
- People within 1-mile radius of a spill;

- Carrier owner and agent if not KGCMC;
- EPA Chemical Spill Coordinator;
- Local medical facilities;
- Nearby water users (fishermen).

5.4 EMERGENCY EQUIPMENT LOCATIONS

Emergency equipment used for spill containment, detoxification, and removal, and for site security and safety is available at several locations at the KGCMC facility. These locations are: 1) Warehouse, 2) Cannery Storage Area. Vehicles available for spill response include loaders and trucks to haul chemicals, contaminated soil, or workers. Other emergency response equipment includes:

Communication: All vehicles and buildings contain either two-way radios or telephones for communication.

Personal Protective Equipment: PVC clothing, respirators, protective goggles, full-face shields, rubber gloves, steel-toed boots, and hard hats.

Containment/Contingency Van - Hawk Inlet:
400-feet Sorb-Boon sorbent (20-ft. long sections)
4 Sweeps (22" x 100') 3M Brand, Type 126
5 bales of pads, 3M, Type 156.

Fire Extinguishers: Portable fire extinguishers are located in all buildings and at all fuel loading and off-loading facilities. In addition, fire hydrants are located throughout the mine service area.

Hand Tools: Miscellaneous shovels, buckets, portable pumps, and empty drums of containerizing spilled materials.

Specific emergency response plans for each area of the facility contain maps showing equipment locations and contain lists and descriptions of capabilities of the equipment which is available for emergency response.

5.5 CLEANUP AND DETOXIFICATION

Spill cleanup procedures depend on the type, nature, volume, and location of the spill. The Mill Manager, Surface Operations Manager, and Environmental Manager have overall responsibility for directing the cleanup activities.

Cleanup response is performed by trained personnel in two episodes, immediate response, and long-term cleanup. Certain actions, as outlined below, are taken immediately to address any spill.

5.5.1 Immediate Cleanup Procedures

Immediate cleanup procedures are intended to stop the release and substantial spreading of the spilled substance in order to control and minimize the threat to human health and the environment. The following steps should be taken for immediate cleanup:

1. Personnel will make full use of protective equipment and clothing prior to initiation of any work.
2. Stop the release at its source by closing a valve, blocking a hole, or other action as required to stop a spill.
3. For sodium cyanide, keep the spilled material dry to minimize the dissolution of sodium cyanide and the generation of hydrogen cyanide gas. Detoxify with sodium hypochlorite, lime or hydrogen peroxide.
4. Contain the spreading of the spill using booms, sorbent pads, or other appropriate equipment.
5. Neutralize or detoxify the spilled substance if applicable after referring to MSDS sheets for guidance.
6. Clean up any free product or chemical which is readily removable using a shovel, sorbent pads, a pump, or other available equipment.

5.5.2 Long-Term Cleanup Procedures

Long-term cleanup procedures are those which are performed after the initial response to remove or decontaminate contaminated soil or other environmental media. They may include but not be limited to the following activities:

1. Excavation, removal, treatment and/or disposal of additional contaminated soil.
2. Collection and treatment or disposal of contaminated water.
3. Decontamination and-or disposal of contaminated equipment.
4. Provide monitoring of contaminants if necessary.

5.6 ULTIMATE DISPOSITION

The ultimate disposal of any contaminated material including sorbent pads, personal protective equipment, soils, or anything else will be in compliance with all applicable state, Federal, and local laws. Disposal options for contaminated materials include reuse in the milling process, treament and discharge under the NPDES permit, drumming and shipping off the island, incineration, and disposal on the tailings basin. Proper approval will be sought prior to disposal of any contaminated materials. Hazardous waste under RCRA will be properly stored and transported off-site to permitted facilities for final disposal.

5.7 ARRANGEMENTS WITH LOCAL AGENCIES AND OTHER FACILITIES

KGCMC maintains membership in the SouthEast Alaska Petroleum Response Organization (SEAPRO) for support to spill response operations. The Mill Manager, the Surface Operations Manager, and the Environmental Manager coordinate responses with other organizations if necessary in the event of a spill. The Coast Guard is familiar with the facility and has approved the current U.S. Coast Guard Manual Plan to operate the port facility transferring oil to KGCMC, as well as the Facility Response Plan for the entire KGCMC facility.

5.8 DOCUMENTATION AND REPORTING OF INCIDENTS

Documentation of a spill incident includes the following items:

- Notification reports;
- Statements from KGCMC employees regarding how the spill occurred;
- The amount and type of material spilled, the extent of the spill and any other visual observations;
- A chemical analysis of the spilled material, if an unknown substance;
- A description of the response action taken;
- A time record from discovery of the spill incident through completion of cleanup;
- A listing of all persons on the scene;
- A listing of any persons injured by the spill, and descriptions of the injuries.

5.9 CONTINGENCY PLAN AMENDMENT

This Contingency Plan is reviewed, and amended, if necessary whenever: a) applicable regulations are revised; b) the plan fails in an emergency; c) the facility changes--in its design, construction, operation, maintenance, or other circumstances--in a way that materially increases the potential for fires, explosions, or releases of fuel, wastes, or chemical reagents, or changes the response necessary in an emergency; d) the list of emergency coordinators changes; or e) the list of emergency equipment changes.

6 HOUSEKEEPING PRACTICES

Good housekeeping practices are encouraged and emphasized throughout the Kennecott Greens Creek Mining Company project site for reasons of health, safety, morale, and environmental awareness.

Sufficient solid waste containers are made available throughout the site to accommodate cleanup of debris. Cleanup of hazardous or toxic substances is addressed in other sections of this BMP plan.

Regular maintenance activities are not considered complete until cleanup has been accomplished. Building floor washdowns are routinely conducted to provide clean, safe, walking surfaces. Floor sweeping and washdown within the mill building routes any reagents and process materials to appropriate sump pumps as discussed in Section 4.3.3. Regular inspections are performed by supervisors and managers. Good housekeeping practices are promoted by posters, suggestions boxes, bulletin boards, slogans, employee publications, safety meetings and other techniques.

Cleaning chemicals and spill absorption materials are stocked in appropriate locations throughout the site to facilitate efficient cleanup of the site. All areas of the project have sufficient access to brooms, mops, buckets, shovels, cleaning agents, and absorption materials to implement good housekeeping standards and to immediately mitigate any spills and/or spill debris.

7 PREVENTIVE MAINTENANCE

A comprehensive and complete preventive maintenance program is in place at the Kennecott Greens Creek Mining Company site. Facilities are shutdown and inspected periodically. The water treatment plants are shutdown frequently so that facilities can be regularly inspected. Pipes, pumps, tanks, and circuit lines are visually inspected daily.

Personnel are employed full-time with coverage on every shift, 365 days per year primarily for preventive maintenance purposes in the concentrator. Plant operators continuously check pipes, pumps, etc. daily during their regular work schedule.

The preventive maintenance program applies to the chemical storage areas, transportation vehicles, embankments, ditches, settling and holding ponds, pipelines, conveyor systems, and other transfer, containment, and control systems such as pipes, valves, containers, pumps, meters, and other facilities. These facilities are inspected and maintained daily during operations. The appropriate adjustment, repair, or replacement of parts or systems is completed in a timely fashion.

A preventive maintenance computer software program, “Ellipse”, is used to record inspections, tests, lifetime of parts, and history of past activities. Printouts are distributed weekly to plant foremen, which detail preventive maintenance activities that need to be conducted for the week. The program is updated continuously to document all activities that have been completed and reschedule preventive maintenance activities for the following week. The “Ellipse” program has in its database all parts used at the Greens Creek facility, inspection schedule for these parts, and their replacement or repair dates. The program orders parts automatically, ahead of time, before they are needed to ensure that parts are on site and available when needed.

The Maintenance Facilities of the KGCMC project is fully equipped with the necessary tools, machinery, and test equipment to manage maintenance practices on any scale. Located on an isolated island, the project is stocked with sufficient spare parts to replace most any weak or failing part or system before a major incident occurs. The maintenance personnel are fully trained and experienced to repair and/or replace any system which might need attention and thus prevent accidents or incidents.

8 INSPECTION AND RECORDS

Visual inspections of all operating areas and equipment are conducted daily through the course of work. The frequency of the inspections is based on the types of chemicals, materials, age and utilization of equipment, and systems design of the project.

Supervisory maintenance personnel monitor project operation and physical condition of vessels, containers, systems, vehicles, and mechanical equipment, such as, pumps, valve lines, and flanges.

Water Operations and Plant Services personnel monitor wastewater pipeline air release valves, remote generators, icing conditions at outfall, oil separators, bridges, fresh water lines, potable water plumbing, building maintenance, maintenance to docks, fuel receiving, and fuel transfer stations.

Environmental engineering staff monitors fresh water quality, air quality, soil quality, dam structures, sediment ponds, waste areas, containment areas, pipeline condition, haul truck condition, Greens Creek flow and withdrawal, and drinking water quality. Items of particular concern will be those systems and areas identified in the "Risk Identification and Assessment" chapter of this BMP plan.

Material storage areas are inspected for evidence of, or the potential for, significant discharges. Storage areas are inspected for leaks, durability, damage, and corrosion of containers; for deterioration of foundation or supports; and for closure of drain valves in containment facilities.

Areas of loading and unloading are inspected during transfer of materials. The condition of equipment, such as, forklifts, trucks, and conveyor systems is inspected. In the case of fuel transfer, inspections ensure that the transfer is complete prior to disconnecting any lines (see U.S. Coast Guard manual, Appendix 9). Security of containers on forklifts and/or trucks is inspected prior to loading, unloading or transfer of material storage containers.

In-plant transfer and material handling areas in the mill building include the visual inspection of reagent storage containers, tanks, pipelines, pumps, valves, seals, and fittings. Daily inspections are conducted by specified maintenance personnel and by operations personnel.

Visual inspections, water quality sampling, and groundwater monitoring are conducted at the tailings facility. This will ensure that overflows are minimized, water quality standards are met, and that seepage into groundwater is not excessive.

Runoff and collection systems throughout the entire Greens Creek facility are inspected. Ditches, pipes, settling and holding ponds are inspected regularly to ensure that no process material is transported beyond KGCMC containment facilities, nor discharging directly into any creeks or water bodies. Diked areas, and overflow structures are also inspected to ensure the integrity of the runoff collection system.

BMP areas and facilities are documented in the program. Inspection procedures, time intervals between inspections for each facility or element, results of inspections, follow-up procedures, and foremen assigned to certain inspections are included in the program. As inspections are completed, records of dates completed, results, and activities are entered into KGCMC records.

9 SECURITY

During production, the Kennecott Greens Creek Mining Company operates 24 hours per day, 7 days per week. The smallest number of personnel on plant grounds at any given time is late at night when 30 to 40 operators are present. Surface Operations maintains security alertness within the project area during all shifts. A Security Plan approved by the U.S. Coast Guard details KGCMC Hawk Inlet Port Security measures.

All buildings and tanks at both the mill site and Hawk Inlet site are well lit at night. Sea van storage containers and sodium cyanide FLO-BINs are locked until used. No unauthorized personnel are permitted access to the facility at any time. Visitors must check in and out of the KGCMC facilities. For safety, as well as security considerations, visitors to the site are escorted by KGCMC personnel at all times while on facility grounds.

Alaska State Emergency Medical Technician coverage is provided at KGCMC 24 hours a day 365 days per year. Additionally a large number of the workforce maintains EMT or ETT medical Certification and CPR Certification. It is the duty and responsibility of each Medical Technician to provide under the program sponsoring physician: appropriate treatment in accordance with Alaska State Trauma Guidelines and the Sponsoring Physician's Standing Orders for all trauma-related and medical emergencies; to provide necessary coordination for emergency transport of sick and/or injured personnel; and ensure that the receiving hospital is contacted and informed as to the number of injured, nature and extent of injuries, transportation route, and estimated time of arrival. Physician sponsor contact must be attempted for all significant medical encounters. Management must be contacted as soon as possible and informed of each emergency situation in progress.

The following manuals are kept readily accessible at the Security Office and updated periodically as information becomes available:

Emergency Response Plan Manual outlining and detailing departmental and personnel roles and responsibilities when emergency situations occur, i.e., personal injury, medivac procedures, fire or explosion, bomb threats, environmental, power failures, press communications, mine rescue, etc.

Material Safety Data Sheets - manuals arranged in alphabetical order by product or chemical name for all the products used at the mine site.

Standing Orders and Procedures Manual detailing basic and intermediate emergency medical skill to be used in the event that direct on-line medical control with the sponsoring physician is not possible.

Access Control Log - Daily activities record of key control, firearms issue, visitors, equipment issue, treatments performed and/or medications dispensed.

Mine site access is controlled by the boat crew at the Auke Bay dock prior to the 5:00 a.m., and 5:00 p.m. departure of the M/V Admiralty Wind. Access is also checked by employee identification cards scanned by the boat crew, or sign-in sheets for those wishing to board the boat without cards.

For safety, security and personnel accountability purposes, mill and mine supervision must be notified of all visitors requesting access to those specific areas due to specialized training required unique to each area, i.e., cyanide training for the mill and self-rescuer training for underground. At no time are unauthorized personnel to be on the property unescorted. All visitors are required to process through the Basic Hazard Training and be advised of, and furnished as necessary, required safety equipment.

Communications equipment available at the KGCMC site provides direct telephone communication worldwide via the satellite telephone system and the VHF radio telephone patch. Direct radio communications between all KGCMC vehicles occurs via mobile radio. Cell phone contact is available to the Admiralty Wind bridge/captain. There are 7 marine VHF channels available including Channel 16, the Coast Guard emergency frequency, and Channel 22, to contact the marine operator. The primary working channels that are utilized at the mine site and monitored at the Medical Office are: Ch.1 (surface repeater), Ch. 2 (mill working channel), Ch. 3 (underground working channel), and Ch. 6 (Surface Operations working channel for the road system). A Mine Pager Phone (with several surface and underground locations) is also monitored when the Medical Office is occupied. Channel 6 is the primary emergency contact for EMT Officers, as it is constantly monitored. All of the communications are provided with battery backup and all are checked on a daily basis.

Additional duties as assigned include, but are not limited to the following:

- Hazard Training, safety equipment issue, record keeping on all visitors to the mine site, and self-rescuer training for underground visitors.
- Key control and access logs of surface buildings and vehicles.
- Warehouse access for urgent situations during graveyard and swing shifts and week-ends.
- Pump house recordings and drinking water tests on weekends and holidays.
- First-Aid/CPR training for plant employees and contractors.
- Monthly emergency and safety equipment inspection of surface areas and structures.
- Maintaining medical supplies inventory and equipment preparedness in the response vehicle, at the mine site, at Hawk Inlet, and on board the M/V Admiralty Wind.

- Meteorological data collecting and recording each day.
- Monthly and Annual fire extinguisher inspections.
- Quarterly self-rescuer weight checks and record keeping.

10.0 STORMWATER OUTFALL BMPs

NPDES permit AK004320-6 effective July 2005 Section II.D.6. requires establishment of BMPs for each of the 10 Stormwater Outfalls authorized in the permit "…sufficient to ensure that the storm water discharges will not cause or contribute to a State water quality standards violation." This section incorporates the required NPDES permit BMP information.

The stormwater outfalls were first incorporated into the KGCMC individual NPDES permit with the re-issuance of the permit in 1998. The outfall sites were selected by ADEC staff to monitor typical stormwater discharges from those areas generally lying beyond the "contact water" capture and treatment facilities of KGCMC. In general these included much of the 13½ miles of access/haulage road ways, and the previously developed quarry sites for construction rock. Parameters felt to be most likely to reveal KGCMC facility contaminants include Lead and Zinc, Total Suspended Solids and pH. In addition, for those sites receiving runoff from vehicle traffic areas, Oil & Grease monitoring was also included. The current permit added Hardness in reflection of hardness dependent AWQS. Grab samples are collected from each site twice each year during storm events, generally in the spring and again in the fall. Additionally, the current permit also included an expansion of the stormwater sampling to include concurrent sampling of "…receiving waters potentially affected by the storm water discharges." (Section I.E.).

KGCMC Stormwater Outfall Site Information:

Outfall	Location	Receiving Water	Site Specific BMPs
003	Southern part of Hawk Inlet facilities area near the cannery buildings	Hawk Inlet	-control spills, -maintain spill response kits in area, -maintain run-on diversion ditches, -maintain gravel pad surfaces, -removal of accumulated sediments as needed, -secondary containment for petroleum storage tanks,
004	Pit 7 (active rock quarry) off of A-Road at mile 1.8	Wetlands	-hydroseed stored soils, -maintain sediment traps, -removal of accumulated sediments as needed, -monitor/maintain constructed wetlands
005.2	Zinc Creek bridge (west side) off of B-Road at mile 3.0	Zinc Creek	-maintain bridge splash guards, -extend splash guards as needed, -clean bridge surface as needed, -re-deck bridge surface as needed, -maintain associated sediment traps in road ditches feeding to the site, -removal of accumulated sediments as needed,

			-replace road surfacing as needed
005.3	Site E (inactive waste rock storage area) off of B- Road at mile 4.5	Greens Creek	-hydroseed stored soil & rock -rock material scheduled for transfer to Tailings (2006-7), -maintain associated sediment traps in road ditches, -removal of accumulated sediments as needed, -replace road surfacing as needed
005.4	Pit 6 (inactive rock quarry and top soil storage) off of B-Road at mile 4.6	Greens Creek	-hydroseed stored soils, -maintain site sediment trap, -maintain associated sediment traps in road ditches, -removal of accumulated sediments as needed, -replace road surfacing as needed
005.5	Culvert at B-Road mile 7.8	Greens Creek	-maintain associated sediment traps in road ditches, -removal of accumulated sediments as needed, -replace road surfacing as needed
006	Pond D (sediment pond from inactive waste rock storage area D) off of B-Road at mile 8.0	Greens Creek	-hydroseed stored soil & rock, -maintain pump-back system of pond water into KGCMC containment
007	Pond C (sediment pond from inactive waste rock storage area C) off of B-Road at mile 8.2	Greens Creek	-minimize clean run-on water, -enhance sediment capture structure ahead of Pond C, -minimize water from 920 facilities, -develop pump-back system of pond water into KGCMC containment -removal of accumulated sediments as needed, -replace road surfacing as needed
008	960 laydown site (initial portal development rock)	Greens Creek	-transfer material into underground as backfill, -monitor adjacent roadway fill stability, buttress as necessary
009	Site 1350 adit and inactive waste rock storage	Greens Creek	-hydroseed stored soil & rock, -transfer material into underground as backfill

KGCMC NPDES Outfalls 001 and 002 are treated water point source discharge sites. Storm water outfall site 005.1 was incorporated into the KGCMC contact water collection system at the Tailings area with the issuance of the current permit.

11.0 EXPLORATION DRILLING

KGCMC annually conducts an active exploration drilling program in conjunction with the ongoing active mining and associated activities. KGCMC conducts exploration activities both from within the underground workings, and from the surrounding surface. All underground activities occur within the extant KGCMC mine. As such all disturbance is contained within those underground mine working areas, controlled, and handled as a composite whole.

The surface exploration program consists of three general activity types; Reconnaissance, Prospect Work, and Drilling. Due to the very limited road access in the vicinity of the KGCMC facilities, virtually all surface exploration occurs in "remote" sites, and is either accessed by walking from established facilities, or through helicopter support.

Reconnaissance and Prospect Work activities involve ground examination and detailed geological mapping, ground surveying, geochemical sampling (rocks, soils, and stream silts), and ground geophysical surveying. These are road and helicopter-based activities, entailing no significant surface disturbances or degradation. Reconnaissance work involves geologists traversing the ground observing the surface, and conducting geologic mapping. This activity may entail periodic collection of small rock, soil, and stream sediment samples. Most surface exploration work is conducted for KGCMC by contractor, or temporary seasonal employees, all under the direction of KGCMC staff.

Prospect Work Similarly non-invasive, Prospect Work activities consist of grid surveying, detailed grid mapping and sampling (rock, soil, and silt), and grid geophysical surveying (magnetics and electromagnetics). Grid work generally entails a minimal amount of brush clearing to facilitate surveying and the ingress and egress of field equipment for geophysical crews. When utilized, helicopter landing sites are often located on open ridges, creek bottoms, and meadows or muskegs to minimize vegetative cover or underlying soils disturbance. No new landing sites will be cleared for either Reconnaissance and Prospect Work activities, except near drill sites (as described below).

Drilling at surface exploration sites is seldom situated to allow direct access from the limited available road system. Therefore, these sites are generally exclusively serviced via helicopter. Detailed grid work, similar to the Prospect Work described above, will generally precede drilling at each site.

Drill sites will not be cleared until KGCMC is committed to drill from that site. Typical drill site clearance dimensions are 60 feet by 80 feet, but vary greatly with terrain and prevailing wind conditions. Drill site clearance only involves tall plant life, trees and other plant life high enough to endanger helicopter landings or slinging of material into the site. These drill sites include area to accommodate a 20' by 20' drill deck, storage area for all supplies associated with drilling, and allow for the safe helicopter long-line slinging of equipment and supplies. Drill deck frames will be constructed using trees cleared for the drill site and decked with 2"x12" rough-cut boards. Rough-cut lumber may be flown-in (and out upon completion of drilling) for drill decks located above treeline or within natural clearings. Only portable hand tools, including gas-powered chainsaws, will be used in drill site clearing and construction. Separate helicopter landing pads may be constructed in areas where no suitable landing zones are located within 800 feet of the drill pad. In all drill site construction, surface disturbance is minimized to control erosion potential.

KGCMC will transport materials via helicopter daily to and from the drill sites. All diesel fuel will be stored in 55-gallon drums placed within a secondary containment or within specially constructed double walled aluminum tanks, both capable of holding 110% of the primary volume. Domestic waste will be removed daily. All drilling materials that may attract bears (salad oil, drilling muds, etc.) will be stored in steel lock boxes when not in use. KGCMC personnel will frequently (at least every other day) visit the drill rigs to insure environmental compliance.

Water for the drilling operations will be sourced from nearby streams under Temporary Water Right and Fish Habitat permits obtained from the Alaska Department of Natural Resources. The water will be gravity feed to the drill sites wherever feasible using a 2-inch supply hose lain across the forest floor. A diesel powered supply pump will be used where gravity feeding is not possible. The supply pump and its fuel tank will be permanently mounted within a secondary containment system.

The drilling fluids to be used include a partially hydrolyzed polyacrylamide, a copolymer of acrylamide and sodium acrylate, and bentonite. These are the same drilling support fluids KGCMC has required when needed in past drilling activities. The driller captures and re-circulates the drilling fluids, minimizing the total quantity utilized at any site. Drill cuttings will be contained within the cleared drill site using settling tanks and sumps. The sumps will either be dug into the ground or where that is too difficult, they will be constructed using the cut timber and lined with burlap or geo fabric. Drill water will not be allowed to enter any live streams. Whenever drilling water effluent is found to approach within 200 feet of running water, drilling activities are to cease until this problem is rectified.

Each shift, prior to initiating activities at a surface drilling site, drill crews are required to complete a Surface Drilling Pre-Shift Environmental Checklist. This checklist covers examination of the water feed to the site, the drill site facilities, and the control of drill discharge water and cuttings.

Upon termination of drilling at a drillpad, all non-native materials, contaminated native materials, and equipment will be removed. Drill cuttings will remain within the constructed sumps, excess geo-fabric or burlap will be removed. Areas cleared to the mineral soil will be re-seeded with the seed mixture formulated for Greens Creek. Camera-dated digital photographs of each site will be taken within two weeks of cessation of operations.

12.0 EMPLOYEE TRAINING

Employee training approved by the Mine Safety and Health Administration (MSHA) is conducted annually (40 hours initially for underground employees, 24 hours initially for surface employees, and 8 hours annual refresher courses for all employees). Training includes inexperienced and experienced personnel in all levels of responsibility. The training program is designed to provide a complete understanding of the BMP Plan, the processes and materials with which they are working, the safety hazards, the practices for preventing discharges, and the procedures for responding properly and rapidly to toxic and hazardous materials.

Topics included in the training programs are:

- Identity of any hazardous materials in their work place
- The physical and health hazards of such chemicals
- Protective measures, procedures, and equipment to be used to protect employees from hazardous chemicals
- Methods to be used to detect the presence or release of a hazardous chemical in the work place (these may include observations such as color, odor, or form and/or sampling or continuous monitoring techniques
- How labeling is accomplished
- How the employee can obtain and use hazard information, particularly MSDSs
- Response to hazardous materials spills
- Details of hazards communication and transportation systems
- Treatment and clean-up techniques for spills
- First aid for hazardous emergencies
- Federal and state laws

Spill drills are conducted on an annual basis by the KGCMC Response Teams. Specific job training is also provided prior to starting a particular job or new position to ensure that employees not only understand the particular job and process operation, but also to help them to understand potential discharge problems. In addition, employees working in an area where hazardous chemicals are present are provided with appropriate MSDSs (Kennecott Greens Creek Mining Company "Right to Know").

Records of the initial and annual refresher training courses for all employees are maintained at the Health and Safety Manager's office. These records include the dates, instructors, subject matter, and lesson plans of the training sessions.

13 REFERENCES

America North Inc. 1988. Environmental Analysis Report, Greens Creek Mine, Admiralty Island, Alaska.

U.S.F.S. 1983. Final Environmental Impact Statement, Greens Creek Mine, Admiralty Island, Alaska.

Kennecott Greens Creek Mining Company General Plan of Operations with the U.S.F.S. – 15 Appendices

Kennecott Greens Creek Mining Company Environmental Management System – ISO 14001 Certified 2004 by NSF-ISR

Kennecott Greens Creek Mining Company "Right to Know Responsibilities and Basic Requirements, Employee and Contractor Information.

Kennecott Greens Creek Mining Company, MSHA Training Program.

Kennecott Greens Creek Mining Company, Emergency Response Plan Manual.

Kennecott Greens Creek Mining Company, Contractors Safety Manual.

USFS. 1982. Draft Environmental Impact Statement, Greens Creek Mine, Admiralty Island, Alaska.

USFS. 1988. Environmental Assessment for Proposed Changes to the General Plan of Operations for the Development and Operation of the Greens Creek Mine, Admiralty Island, Alaska.

USFS. 1992. Environmental Assessment for Additional Waste Rock Disposal Capacity at Greens Creek Mine Admiralty Island National Monument, Alaska

ATTACHMENT A (Figures)

ENVIRONMENTAL CONTACT PROCEDURES

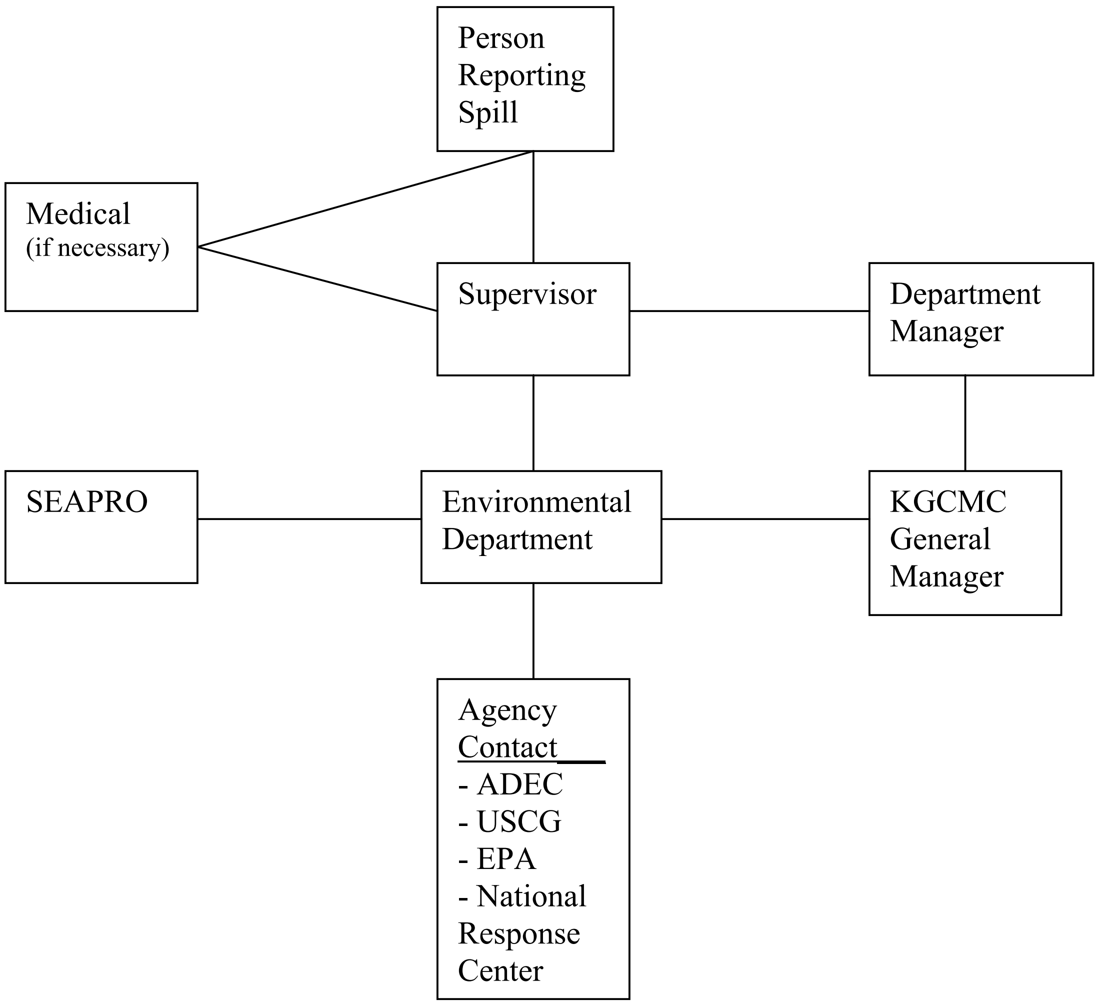

Figure 5.A.24

ATTACHMENT B (Tables)

TABLE 5.B.1
KENNECOTT GREENS CREEK MINING COMPANY

TOXIC AND HAZARDOUS SUBSTANCES LISTED UNDER SECTION 307 (A) AND 311 OF THE CLEAN WATER ACT

<u>Common Name - Listed y/n</u>

Acenaphthene*	n	Arsenic Pnetoxide	n
Acenaphthylene*	n	Arsenic Trichloride	n
Acetaldehyde	n	Arsenic Trioxide	n
Acetic Acid	n	Arsenic Trisulfide	n
Acetic Anhydride	n	Asbestos*	n
Acetone	n		
Acetone Cyanohydrin	n	Barium Cyanide	n
Acetyl Bromide	n	Benzene**	n
Acetyl Chloride	n	Benzidine*	n
Acrolein**	n	Benzo(a)*Anthracene*	n
Acrylonitrile**	n	Benzo(a)Pyrene*	n
Adipic Acid	n	Benzofluoranthen*	n
Aldrin**	n	Benzo(ghi)Perylene*	n
Allyl Alcohol	n	Benzoic Acid	n
Allyl Chloride	n	Benzo(k)Fluoranthene*	n
Ammonia	n	Benzonitrile	n
Ammonium Acetate	n	Benzoyl Chloride	n
Ammonium Benzoate	n	Benzyl Chloride	n
Ammonium Bicarbonate	n	Beryllium and compounds*	n
Ammonium Bichromate	n	Beryllium Chloride	n
Ammonium Biflouride	n	Beryllium Fluoride	n
Ammonium Bisulfite	n	Beryllium Nitrate	n
Ammonium Carbamate	n	BHC(alpha-, beta-,delta- & gamma-)*	n
Ammonium Carbonate	n	Bis(2-chloroethoxy) Methane*	n
Ammonium Chloride	n	Bis(2-chloroethly) Ether*	n
Ammonium Chromate	n	Bis(2-chloroisopropyl) Ether*	n
Ammonium Citrate Dibasic	n	Bis(chloromethyl) Ether	n
Ammonium Fluoborate	n	Bis(2-ethylhexyl) Phthalate*	n
Ammonium Fluoride	n	Bromoform*	n
Ammonium Hydroxide	n	4-Bromoform*	n
Ammonium Oxalate	n	n-Butyl Phthalaten	n
Ammonium Silicofluoride	n	Buthl Acetaten	n
Ammonium Sulfamate	n	Buthlamine	n

Ammonium Sulfide	n
Ammonium Sulfite	n
Ammonium Tartrate	
Ammonium Thiocyanate	n
Ammonium Thiosulfate	n
Amyl Acetate	n
Aniline	n
Anthracene*	n
Antimony and compounds*	y
Antimony Pentachloride	n
Antimony Potassium Tartrate	n
Antimony Tribromide	n
Antimony Trichloride	n
Antimony Trifluoride	n
Antimony Trioxide	n
Arsenic and compounds*	y
Arsenic Disulfide	n
Carbon Disulfide	n
Carbon Tetrachloride**	n
Chlordane**	y
Chlorine	n
Chlorbenzene**	n
Chlorodibromomethane*	n
Chloroethane*	n
2-Chloroethylvinyl Ether*	n
Chloroform**	n
p-Chloro-m-cresol*	n
2-Chloronaphthalene*	n
2-Chlorophenol*	n
4-Chlorophenyl Phenyl Ether*	n
Chlorpyrifos	n
Chlorosulfonic Acid	n
Chromic Acetate	n
Chromic Acid	n
Chromic Sulfate	n
Chromium and compounds*	n
Chromous Chloride	n
Chrysene*	n
Cobaltous Bromide	n
Cobaltous Formate	n
Cobaltous Sulfamaten	n
Copper and compounds	y
Coumaphos	n
Cresol	n
Crotonaldehyde	n
Cupric Acetate	n
Cupric Acetoarsenite	n
Cupric Chloride	n
Cupric Nitrate	n
Cupric Oxalate	n
Cupric Sulfate	n
Cupric Sulfate, Ammoniated	n
Cupric Tartrate	n
Cyanide*	y
Cyanogen Chloride	n
Cyclohexane	n
Butylbenzyl Phthalate*	n
Butyric Acid	n
Cadmium and compounds	n
Cadmium Acetate	n
Cadmium Bromide	n
Cadmium Chloride	n
Calcium Arsenate	n
Calcium Arsenite	n
Calcium Carbide	n
Calcium Chromate	n
Calcium Cyanide	n
Calcium Dodecylbenzenesulfonate	n
Calcium Hyprochlorite	n
Captan	n
Carbaryl	n
Carbofuran	n
3,3'-Dichlorobenzidine	n
Dichlorobromomethane*	n
Dichlorodifluoromethane*	n
1,1-Dichloroethane*	n
1,2-Dichloroethane*	n
1,1-Dichloroethylene*	n
2,4-Dichlorophenol*	n
Dichloropropane (1,2-)**	n
Dichloropropene	n
Dichloropropene Dichloropropane (mixture)	n
2,2-Dichloropropionic Acid	n
1,2-Dichloropropylene*	n
Dichlorvos	n
Dieldrin**	n
Diethylamine	n
Diethyl Phthalate*	n
Dimehtylamine	n
2,4-Dimethylphenol*	n
Dimethyl Phthalate*	n
Di-n-butyl Phthalate*	n
Dinitrobenzene (mixed)	n
4,6-Dinitro-o-cresol*	n
Dinitrophenol (2,4)=-)**	n
Dinitrotoluene (2,4- or 2,6-)**	n
Di-n-octyl Phthalate*	n
1,2-Diphenylhydrazine (as Azobenzene)*	n
Diquat	n
Disulfoton	n
Diuron	n
Dodecylbenzenesulfonic Acid	n
Edosulfan (alpha- or beta-)**	n
Edosulfan Sulfate*	n
Endrin**	n
Endrin Aldehyde*	n
Epichlorohydrin	n
Ethion	n
Ethylbenzene**	n
Ethylenediamine	n

2,4-D Acid	n
4,4'-DDD*	n
4,4'-DDE*	n
2,4 - D Eser	n
DDT(4,4'-) **	n
Diazinon	n
Dibenzo(a,h) Anthraccene*	n
Dicamba	n
Dichiobenil	n
Dichlone	n
Dichlorobenzene (1,2-,1,3-,or 1,4-)*	n
Ferrous Sulfate	n
Fluoranthene*	n
Fluorene*	n
Formaldehyde	n
Formic Acid	n
Fumaric Acid	n
Furfural	n
Guthion	n
Heptachlor**	n
Heptachlor Epoxide*	n
Hexachlorobenzene*	n
Hexachlorobutadiene*	n
Hexachlorocycclopentadiene*	n
Hexachloroethane*	n
Hydrochloric Acid	n
Hydrofluoric Acid	n
Hydrogen Cyanide	n
Hydrogen Sulfide	n
Indeno(1,2,3,-cd) Pyrene*	n
Isophorone*	n
Isoprene	n
Isopropanolamine Dodecylbenzenesulfonate	y
Acid	n
Kelthane	n
Kepone	n
Lead and compounds*	y
Lead Acetate	n
Lead Arsenate	n
Lead Chloride	n
Lead Fluoborate	n
Lead Fluoride	n
Lead Iodide	n
Lead Nitrate	n
Lead Stearate	n
Lead Sulfate	n
Lead Sulfide	n

Ethylenediamine Tetraacetic Acid (EDTA)	n
Ethylene Dibromide	n
Ethylene Dichloride	n
Ferric Ammonium Citrate	n
Ferric Ammonium Oxalate	n
Ferric Chloride	n
Ferric Fluoride	n
Ferric Nitrate	n
Ferric Sulfate	n
Ferrous Ammounium Sulfate	n
Ferrous Chloride	n
Mercuric Nitrate	n
Mercuric Sulfate	n
Mercuric Thiocyanate	n
Mercurous Nitrate	n
Mercury and compounds*	y
Methoxychlor	n
Methyl Bromide*	n
Methyl Chloride*	n
Methylene Chloride*	n
Methyl Mercaptan	n
Methyl Methacrylate	n
Methyl Parathion	n
Mevinphos	n
Mexacarbate	n
Monoethanolamine	n
Monomethylamine	n
Naphthalene**	n
Naphthenic Acid	n
Nickel and compounds	y
Nickel Ammonium Sulfate	n
Nickel Chloride	n
Nickel Hydroxide	n
Nickel Nitrate	n
Nickel Sulfate	n
Nitric	
Nitrobenzene**	n
Nitrogen Dioxide	n
Nitrophenol (mixed, 2-, or 4-)**	n
Nitrotoluene	n
N-nitrosodimethylamine*	n
N-nitrosodi-n-propylamine*	n
N-nitrosodiphenylamine*	n
Paraformaldehyde	n
Parathion	n
Pentachlorophenol**	n
Phenanthrene*	n
Phenol**	n
Phosgene	n
Phosphoric Acid	n
Phosphorus Oxychloride	n

Lead Thiocyanate	n
Lindane	n
Lithium Chromate	n
Malathion	
Maleic Acid	n
Maleic Anhydriden	
Mercaptodimethr	n
Mercuric Cyanid	n
Potassium Hydroxide	n
Potassium Permanganate	n
Propargite	n
Propionic Acid	n
Propionic Anhydride	n
Propylene Oxide	n
Pyrene*	n
Pyrethrins	n
Quinoline	n
Resorcinol	n
Selenium and compounds	y
Selenium Oxide	n
Silver and compounds*	y
Silver Nitrate	n
Sodium	n
Sodium Arsenate	n
Sodium Arsenite	n
Sodium Bichromate	n
Sodium Bifluoride	n
Sodium Bisulfite	n
Sodium Chromate	n
Sodium Cyanide	y
Sodium Dodecylbenzene Sulfonate	n
Sodium Fluoride	n
Sodium Hydrosulfide	n
Sodium Hydroxide	n
Sodium Hypochlorite	n
Sodium Methylate	n
Sodium Nitrite	n
Sodium Phosphate, Dibasic	n
Sodium Phosphate, Tribasic	n
Sodium Selenite	n
Strontium Chromate	n
Strychnine	n
Styrene	n
Sulfuric Acid	y
Sulfur Monochloriden	
2,4,5-T Acid	n
2,4,5-T Amines	n
2,4,5-T Esters	n
2,4,5-T Salts	n
2,4,5-TP Acid	n
2,4,5-TP Esters	n
TDE	n
2,3,7,8-Tetrachlorobenzo-p-Dioxin (TCDD)*	n
1,1,2,2-Tetrachloroethane*	n

Phosphorus Pentasulfide	n
Phosphorus Trichloride	n
Polychlorinated Biphenyls (PCB-1242, -1254, -1221, -1232, -1248, -1260, -1016)**	n
Potassium Arsenate	n
Potassium Arsenite	n
Potassium Bichromate	n
Potassium Chromate	n
Potassium Cyanide	
Tetrachloroethylene*	n
Tetraethyl Lead	n
Tetraethyl Pyrophosphate	n
Thallim and compounds*	y
Thallium Sulfate	n
Toluene*	n
Toxaphene**	n
1,2-Trans-Dichloroethylene*	n
1,2,4-Trichlorobenzene*	n
1,1,1-Trichloroethane*	n
1,1,2-Trichloroethane*	n
Trichloroethylene**	n
Trichlorofluoromethane*	n
Trichlorofon	n
Trichlorophenol (2,4,6-)**	n
Triethanolamine Dodecylbenzenesulfonate	n
Triethylamine	n
Trimethylamine	n
Uranyl Acetate	n
Uranyl Nitrate	n
Vanadium Pentoxide	n
Vanadyl Sulfate	n
Vinyl Acetate	n
Vinyl Chloride*	n
Vinylidene Chloride	n
Xylene (mixed)	n
Xylenol	n
Zinc and compounds*	y
Zinc Acetate	n
Zinc Ammonium Chloride	n
Zinc Borate	n
Zinc Bromide	n
Zinc Carbonate	n
Zinc Chloride	n
Zinc Cyanide	n
Zinc Fluoride	n
Zinc Hydrosulfite	n
Zinc Nitrate	n
Zinc Phenolsulfonate	n
Zinc Phosphide	n
Zinc Silicofluoride	n
Zinc Sulfate	n
Zirconium Nitrate	n
Zirconium Potassium Fluoride	n
Zirconium Sulfate	n
Zirconium Tetrachloride	n

* Priority pollutant under Section 307(a) of the CWA.

** Priority pollutant under Section 307(a) and hazardous substance under Section 311 of the CWA.
*** Hazardous substance listed under Section 311 of the CWA.

TABLE 5.B.2
KENNECOTT GREENS CREEK MINING COMPANY

Reagent Addition Points and Addition Rate (lbs per short ton of dry feed ore)

Copper Sulfate	
Zinc Conditioner #1	1.7029
Zinc Regrind	0.7036
Lead Bulk Rougher	0.3661
Bulk Conditioner Tank	0.2746
Bulk Rougher #1	0.0270
Goldenwest 774	
Water Treatment Plant	0.46
Hydrogen Peroxide	
Spray Water Tank	0.252
Methyl Isobutyl Carbinol	
Carbon Column	0.0243
Cyclone Underflow	0.0504
Lead Conditioner Tank	0.0080
Lead Cleaner 1-A	0.0022
Lead Cleaner 2	0.0097
Zinc Regrind	0.0056
Percol 351	
Lead Conditioner Thickener	0.008
Zinc Conditioner Thickener	0.01
Bulk Conditioner Thickener	0.01
Final Tails Thickener	0.04
Quicklime	
Zinc Conditioner	0.33
Zinc Rougher #1	0.25
Zinc Regrind Conditioner	0.30
Water Treatment Plants	0.30
Sodium Cyanide	
Lead Regrind Conditioner	0.08
Sodium Isopropyl Dithiophosphate (Aero 3418)	
Lead Conditioner Tank	0.0016
Lead Cleaner #2	0.0012
Sulfuric Acid	
Ball Mill Discharge Pump Box	0.183
Lead Regrind Conditioners	0.2
Water Treatment Plants	0.1
Xanthate	
Lead Conditioner Tank	0.726
Lead Rougher #1	0.0810
Lead Rougher #2	0.0203
Lead Regrind	0.0087
Lead Cleaner 1-B	0.0179
Lead Cleaner 2	0.0036
Zinc Conditioner Tank #2	0.1492
Zinc Rougher #1	0.1529
Zinc Rougher #2	0.0284
Zinc Regrind	0.0103
Zinc Column #2	0.0104
Lead-Bulk Rougher #1	0.0204
Lead-Bulk Rougher #2	0.0137
Bulk Conditioner Tank	0.0310
Bulk Rougher #1	0.0425
Bulk Rougher #2	0.0382
Bulk Rougher #3	0.0319
Bulk Cleaner	0.0198
Zinc Sulfate	
Zinc Conditioner Tank #2	1.7029
Zinc Regrind	0.7036
Lead Bulk Rougher #1	0.3661
Bulk Conditioner Tank	0.2746
Bulk Rougher #1	0.0270

TABLE 5.B.3
KENNECOTT GREENS CREEK MINING COMPANY
Material Safety Data Sheets of Concentrates and Tailings