Giant Mine

CONTINGENCY PLAN
and
Emergency Spill Response Manual

Royal Oak Mines Inc.

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Royal Oak Mines Inc.

Giant Mine

CONTINGENCY PLAN
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Emergency Spill Response Manual

Response plans for As_2O_3 lime

4 point

Submitted to: The NWT Water Board

Initial Submission: January 1992
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August 1994
August 1995
August 1998

Prepared by: Royal Oak Mines Inc. and
EBA Engineering Consultants Ltd.

The plan meets the requirement of the Spill Contingency Planning & Reporting Regulations

PREAMBLE

This Contingency Plan and Emergency Spill Response Manual will be in effect commencing August 1, 1998, and applies to all projects and operations of Royal Oak Mines Inc. at the Giant Mine (62^0 30' N, 114^0 21' W). These operations are conducted under the terms and conditions of surface land lease L-3668T, issued by the Government of the Northwest Territories (GNWT), and of water licence N1L2-0043, issued by the Northwest Territories Water Board.

Formal distribution of this plan is as follows:

i) **Royal Oak Mines Inc., Giant Mine** (internally)

General Manager
Superintendent, Environmental Services
Mine Superintendent
Chief Engineer
Chief Geologist
Mill Superintendent
Mill Metallurgist
Mill Shift Supervisors
Maintenance Superintendent
Maintenance General Foreman
Mill Mechanical Foreman
Surface Mechanical Foreman
Electrical Foreman
Senior Safety Supervisor
Safety/Security Officers
Warehouse Supervisor
Environmental Laboratory Technician

ii) **Royal Oak Mines Inc., Corporate Office**, Kirkland, Washington, USA

Manager, Environmental Services

iii) **Government Agencies**

Northwest Territories Water Board
GNWT - Resources, Wildlife and Economic Development (Environmental Protection Services)
GNWT - Municipal and Community Affairs (Lands Division)
GNWT - Municipal and Community Affairs (Office of the Fire Marshall)
Indian and Northern Affairs Canada (Water Resources Division)
Environment Canada (Environmental Protection Branch)
Fisheries and Oceans Canada
Workers' Compensation Board (Prevention Services Division)
City of Yellowknife

Additional copies of this plan can be obtained by contacting:

Royal Oak Mines Inc.
NWT Division - Giant Mine
P.O. Bag 3000
Yellowknife, NT
X1A 2M2

Attention: Mr. Stephen Schultz
Superintendent of Environmental Services
Tel (867) 669-3729
Fax (867)873-2914

Table of Contents

1.0 INTRODUCTION

The Giant Mine is a gold mining and ore processing facility owned and operated by Royal Oak Mines Inc. and is located on Highway # 4, approximately 5 kilometres north of the city of Yellowknife, Northwest Territories. The mine has been producing gold bullion since 1948.

The purpose of this contingency plan is to outline a formal, practical response system which can be implemented rapidly in the event of a spill of materials resulting from industrial activities at the Giant Mine site that may be hazardous to human health or the natural environment. The plan is intended to promote safe handling of hazardous materials and help to minimize the occurrence of spill incidents. When spills do occur, this plan is intended to guide mine site personnel in the correct response to these incidents and minimize health and safety hazards, environmental damage and clean up costs.

This plan is primarily intended to be used by employees of the Giant Mine. It is intended to be easily understood and to be reasonably comprehensive in providing access to the information required to deal with a spill.

Legislative authority for contingency plans is controlled by both the territorial and federal governments under various acts and regulations. Principal legislation includes the ***Environmental Protection Act, Spill Contingency Planning and Reporting Regulations*** (GNWT, July 1993), as well as contingency planning guidelines developed by the Northwest Territories Water Board (1987) and Environment Canada (1990). Additionally, the NWT Water Board, under the ***Guidelines for Tailings Impoundment in the Northwest Territories*** (1987), requires mining companies to prepare contingency plans for tailings spill incidents.

The ***Transportation of Dangerous Goods Act*** applies to those companies involved in shipping goods to and from the mine. Under this act, Royal Oak Mines is responsible for the safe loading and the proper placarding and documentation of shipments of dangerous goods leaving the mine site. Once a contracted carrier accepts those goods, they become the carrier's responsibility. This contingency plan is designed to cope with spills that occur at the mine site. The plan does **not** deal with the spill or release of any material that is in transit to or from the mine.

While technically Royal Oak Mines has no control of, or responsibility for hazardous goods being shipped to or from the Giant Mine site, the company is committed to using its available resources, when requested and where practical, to assist in the containment and clean up of any spilled materials that, in the opinion of it's management, are associated with the company's activities.

All Royal Oak Mines employees should be familiar with the company's Environmental Code of Practise (a copy of this Code is provided in Appendix A.). The principles expressed in the Code of Practise form the basis of this contingency plan.

2.0 SITE DESCRIPTION

2.1 Setting and Infrastructure

The Giant Mine site is located near Yellowknife adjacent to the shores of Great Slave Lake on the western shore of Yellowknife Bay. The mine is located in a zone of discontinuous permafrost. The local topography is characterized by a series of exposed bedrock highs and minor overburden deposits in low areas.

The mine infrastructure is comprised of several buildings required for gold production. These include the mill, the mine headframe, several office buildings and various support services buildings (i.e. engineering, carpentry, and mechanical shops). A Town site for a number of Giant Mine staff is located in the southwestern section of the property.

Figures included with this plan depict the layout of the existing infrastructure at the Giant Mine. Figure 1 is a general site plan while Figure 2 provides a more detailed view of the mill, maintenance and main storage areas.

2.2 General Operations

- **Mining**

Gold ore is extracted from the orebody by undergound mining methods, at an approximate rate of 1,100 tonnes per day. The rock is drilled and then blasted with an ammonium nitrate and fuel oil based explosive (ANFO). Blasted rock is excavated and transported underground by diesel powered machinery. Electrically (battery) powered locomotives are also used to move the ore from the active mining areas to the main shaft ('C-shaft'), where the ore is brought to the surface by an electric hoist. The ore is delivered to the mill by a system of belt conveyors.

- **Ore Processing**

The milling operation uses a number of unit processes to liberate and recover the gold, including crushing and grinding, froth flotation, roasting and cyanide leaching. Water is added to the ore in the grinding process and the ground ore is transported as a liquid slurry through the subsequent processes. Various chemicals are added to the slurry during the milling processes, such as slaked lime, xanthate and sodium cyanide. These are necessary as part of the gold extraction process in use at Giant. Some new chemicals are formed as by-products of the processes, such as arsenic trioxide, which is recovered as a dry dust from a baghouse filter and pneumatically conveyed into underground storage chambers.

- **Tailings Disposal and Waste Water Treatment**

The main waste stream from the milling operation is a liquid slurry, referred to as 'tailings'. Tailings contains the solid residue of processed ore and waste water which comprises residual dissolved chemicals from the mill processes. The tailings slurry is pumped, via a 25 cm (10 inch) plastic pipeline, to one of the active Tailings Containment Areas (TCA's). The currently active TCA's are

4000 E

6000 E

8000 E

10000 E

12000 E

A1 PIT

A2 PIT

BROCK PIT

B2 PIT (UBC)

C-1 PIT

HDC

A-BOILER

TOWNSITE

SHAFT

B1 PIT

BAKER CREEK

GAR LAKE

TRAPPER CREEK

VEE LAKE ROAD

TRAPPER LAKE

ICG

DAM 21C

DAM 21D

NORTHWEST POND

DAM 21B

DAM 22A

DAM 21A

DAM 22B

B-4 PIT

B3 PIT

B3 VENT PLANT

PIPELINES

TAILINGS PIPE LINE

DAM 12

DAM 8

CARBON COLUMNS

DAM 1

DAM 11

SOUTH POND

DAM 4

DAM 7

TRP

PILOT PLANT

POLISHING POND

DAM 5

CENTRAL POND

SETTLING POND

TAILINGS PIPELINE DECANT PIPELINE

AKAITCHO MINESITE (SUPERCREST)

DAM 6

DAM 9

DAM 10

DAM 2

EFFLUENT TREATMENT PLANT

EXPLOSIVES PLANT

NORTH POND

YELLOWKNIFE BAY

DAM 3C

DAM 3

DAM 3D

20000 N

NOTE:
BASE MAP: 1987 AERIAL

0 500' 1000' 2000 FEET

6000 N

8000 N

10000 N

12000 N

14000 N

16000 N

18000 N

Royal Oak Mines Inc.

GIANT MINE
SURFACE PLAN

EMERGENCY SPILL RESPONSE AND CONTINGENCY PLAN

GENERAL MINESITE LAYOUT

DATE: JUNE 24, 1998	SCALE: N.T.S.
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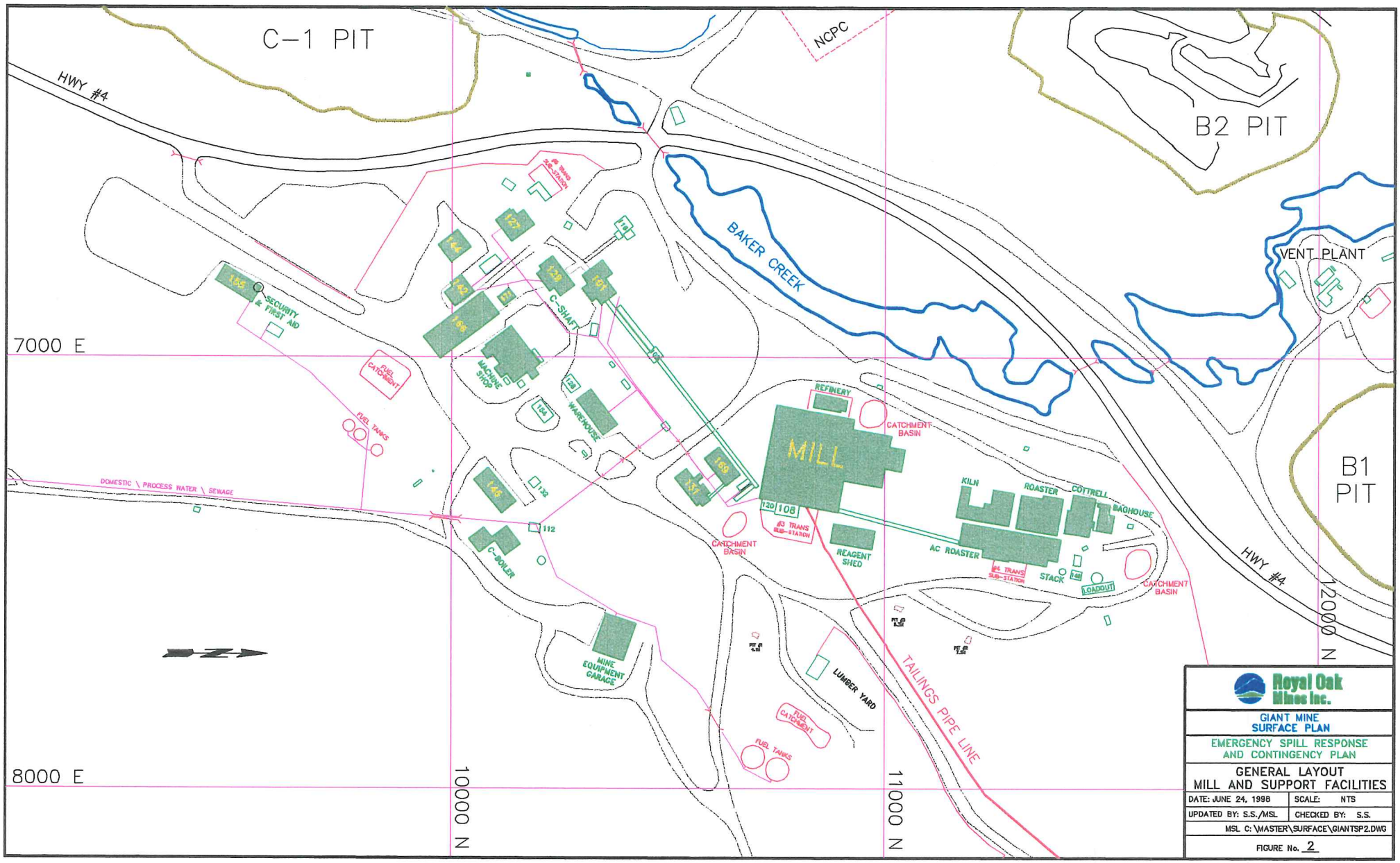
FIGURE No. 1



Royal Oak Mines Inc.

GIANT MINE
SURFACE PLAN

EMERGENCY SPILL RESPONSE
AND CONTINGENCY PLAN

GENERAL LAYOUT
MILL AND SUPPORT FACILITIES

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FIGURE No. 2

the South, North and Northwest Ponds. The Tailings Containment Areas have been constructed to contain tailings in local topographic lows. Containment is provided by the natural surrounding terrain and by engineered dams constructed of clay and broken rock.

The solid tailings discharged into the Tailings Containment Areas quickly settles to form a saturated solid deposit and waste water from the tailings slurry forms a clear pond on top of the solid deposit. During the summer months, this clear water is pumped to the Effluent Treatment Plant (ETP), where dissolved contaminants, such as cyanide and arsenic, are removed from the water in carefully controlled chemical reactions. Chemicals, such as hydrogen peroxide, slaked lime and ferric sulphate are added to the water to destroy the cyanide and convert other contaminants into solid compounds. Solid compounds are removed from the water in the Settling and Polishing Ponds, and the treated water is discharged into Baker Creek.

- **Use of Water**

There are three main sources of water for the Giant Mine and town site. Fresh water required for industrial uses is pumped from Great Slave Lake and is delivered by a surface pipeline to the underground mine (at C-shaft) and to the mill. Groundwater, which seeps into the mine from the surrounding rock, is pumped to the surface and is also delivered to the mill for industrial uses. In addition to these sources, a small amount of potable water is obtained from the City of Yellowknife and is used in the houses at the Giant town site.

All of the water from these sources ultimately reports to the tailings disposal and water treatment system.

- **Sewage Disposal**

Domestic grey water from the Giant town site, and the mine washroom facilities, is pumped through surface pipelines to the mill, where it is combined with tailings slurry and pumped to the Tailings Containment Areas.

- **Chemical Storage and Handling**

Numerous chemicals are used in the milling and water treatment operations. The majority of these are shipped and stored in solid form, but are used at the mine in solution form. Upon demand, daily batches of these chemicals are mixed with water to form solutions. Small stock tanks of chemical solutions are located within the mill and effluent treatment plant buildings. Dry chemicals are stored in the Mill Reagent Shed, the Fenced Yard and the Effluent Treatment Plant. Quick lime is delivered in bulk and stored in silos at the mill and ETP.

Hydrogen peroxide is delivered in bulk, in liquid form, and is stored in stainless steel tanks adjacent to the Effluent Treatment Plant.

- **Explosives**

The primary explosive used in the underground mine is a mixture of ammonium nitrate and fuel oil (diesel), known as ANFO. These two components are delivered separately, in bulk, to the

Explosives Plant. A contracted, specialist firm (Bulk Explosives Ltd.) blends the components in the Explosives Plant and delivers ready-to-use ANFO to the mine shaft in small bags. The contracted firm assumes responsibility for these products to the point of delivery at the mine shaft and maintains a contingency plan for these operations.

- **Heating Fuels**

Heat for the mine and townsite buildings is provided by two main boiler houses, known as A-boiler and C-boiler. A-boiler is located adjacent to the Town site and C-boiler is located next to the maintenance shed. Fuel is delivered in bulk by mobile tanker trucks and is stored in tanks near the boilers. These boilers have recently been burning a recycled oil product called Newalta™ Heavy Burner Fuel. Royal Oak Mines is planning to burn a different heating fuel in future years, called Enviro 4000, which is also manufactured by the Newalta Corporation.

Additional heat is provided in isolated buildings by small furnaces. These furnaces are fired by P-40 type diesel fuel stored in small local tanks.

Mine ventilation air is heated in winter by propane fired furnaces, located at the B - shaft and B3 ventilation plants. Propane storage is provided at these locations and regular bulk deliveries are received.

- **Automotive Fuels**

Mobile heavy equipment used at the mine is powered with diesel fuel. A number of diesel fuelling stations and storage tanks are located on the mine site. Bulk deliveries of diesel fuel are made to these tanks on a regular basis.

Light vehicles in use at the mine are gasoline fuelled. A underground storage tank for gasoline is located in front of the Main Warehouse and bulk deliveries are received on a regular basis.

- **Hydraulic and Lubricating Oils**

The heavy equipment used at the mine consumes large quantities of hydraulic and lubricating oils. These oils are shipped to the mine in drums and pails, and are stored in the Fenced Yard and the Warehouses.

The mine operates a used-oil furnace to heat the mine Dry and office building. Used oil is drained from machinery and stored in drums, adjacent to the Mine Equipment Garage. Batches of used oil are consolidated and delivered to the used-oil furnace day-tank. Royal Oak Mines is planning to install additional waste oil furnaces with the objective of disposing of all waste oils generated at the site.

3.0 SPILL RESPONSE TRAINING

The effectiveness of this Contingency Plan and Emergency Spill Response Manual will be dependent upon the following:

- Proper distribution of the plan to those personnel most likely to encounter a spill during normal mine site operations.
- Education of employees in the objectives and contents of the plan. Education in the correct actions to take upon discovery of a spill or potential release.
- Training of response team personnel in the techniques and materials that can be employed in spill containment and clean up activities.

Employee training in these areas will be achieved as follows:

- Personnel most likely to encounter a spill will receive training as to how they should react upon initial discovery of the incident. All of these employees will know how to report a spill incident and how to initiate the spill response system
- Personnel most likely to be involved in the implementation of this contingency plan will be trained as to the objectives, methods and responsibilities identified in this plan.

4.0 SPILL RESPONSE PROCEDURES

The sequence of events that should be initiated upon discovery of a spill or release of tailings, petroleum products, chemical or other deleterious substance, is graphically depicted in Figure 3. The names and contact numbers of response team members are given in Figure 4.

It is the responsibility of each named member of the spill response system, before a planned extended absence from his or her workplace and home, to designate a suitably trained replacement member who will assume his or her role in the system.

The required action by the members in the response team are detailed in the following sections:

4.1 First Person Response

a) Be alert and consider the safety of yourself and your co-workers as paramount

b) Assess the hazard to persons in the vicinity of the spill and if necessary, take action to control danger to human life. Stay upwind of the spilled material. If possible, identify the material or product released.

c) Contact the Mill Shift Supervisor (by mine site radio, or at 669-3735) and report the spill, identify the location and request assistance

d) Until help arrives, apply the following general procedures in dealing with the spill

- Make every effort to **IDENTIFY** the spilled product
- Consult the appropriate Material Safety Data Sheet at the nearest WHMIS station and determine the principal types of health and safety hazards associated with this product or material.
- Wear the appropriate protective clothing when working on or near the spill
- Keep all unnecessary people away
- If safe to do so, **STOP THE LEAK**
- Try to **CONTAIN THE SPILL** by constructing a dyke, digging a pit, using an absorbent material or by placing the spilled material in an impervious container. (The locations of spill response resources are shown in Figures 8 and 9.)
- **CLEAN UP SPILLED MATERIALS** using methods and materials approved by the On-Scene Coordinator.

- Dispose of the materials in containers and at a location approved by the On-Scene Coordinator or the Environmental Coordinator

- Remember to consider your personal safety and those of your co-workers before proceeding with any action

4.2 Mill Shift Supervisor's Response

- Proceed to the spill location

- Assess the situation and make arrangements for first aid, removal of injured personnel or fire fighting assistance, as required; take action to secure the site for the protection of human safety

- If safe to do so, take appropriate action to stop the release of material; take the necessary action to contain or prevent the spread of the spilled material (See guidelines for First Person Response)

- Gather information on the status of the situation, including details of the material released, the amount released, flow direction, proximity to water courses, and an estimate of the containment measures required

- Contact the Mill Superintendent (at 669-3730, or by radio), or his designate, and advise him/her of the nature and status of the spill. If requested by the Mill Superintendent, complete an Accident/Incident Report form providing all relevant details as to what has occurred (Report forms are provided in Appendix B)

- Complete a NWT Spill Report form and provide this and all other pertinent spill details to the Environmental Coordinator when he/she arrives at the incident scene (forms are provided in Appendix B)

4.3 Response Team Organization

4.3.1 On-Scene Co-ordinator

- The On-Scene Co-ordinator will be the Mill Superintendent (or Acting Mill Superintendent in the former's absence)

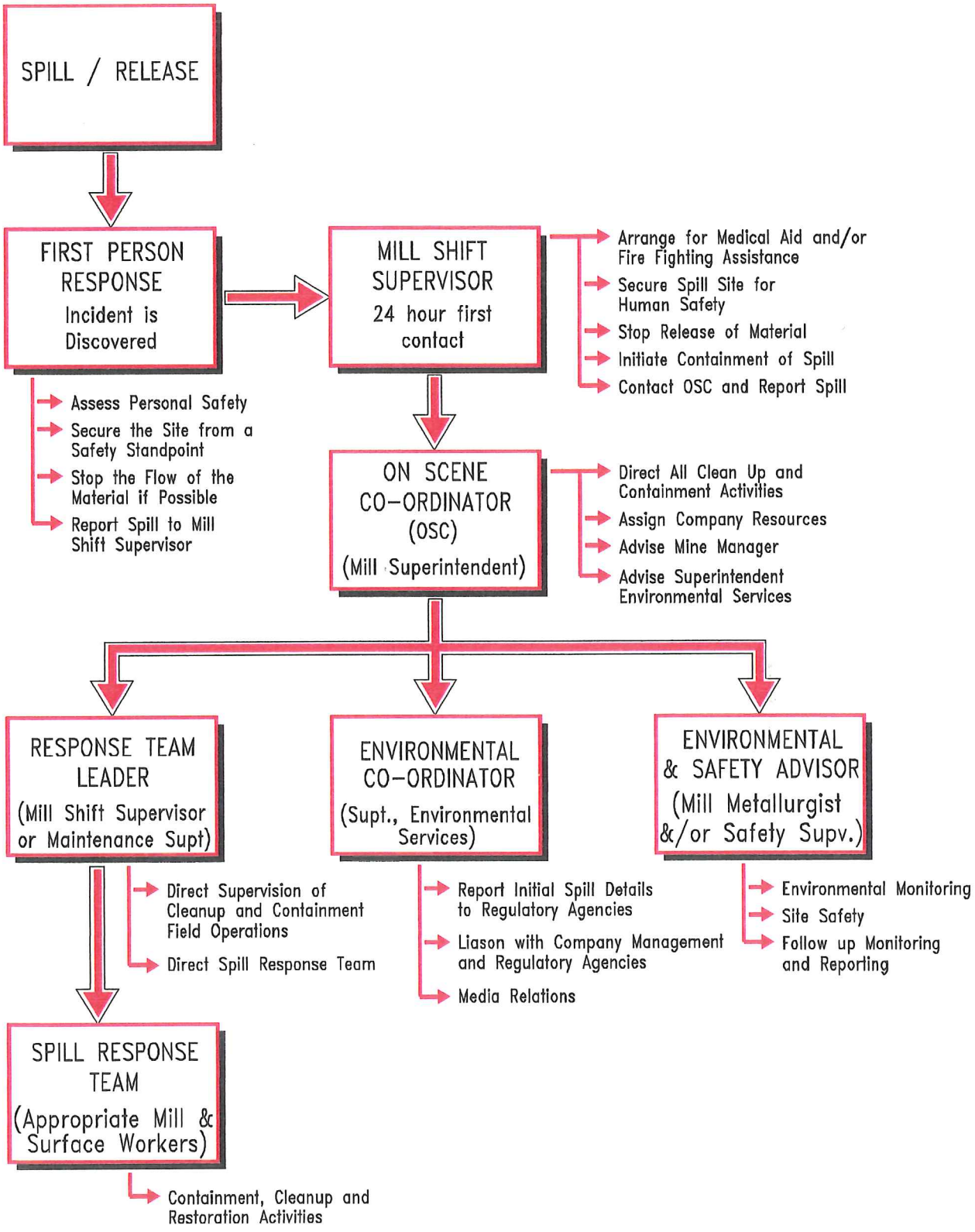
- Has complete authority over the spill scene and all mitigation efforts

- Evaluates the initial situation and assesses the scale of the incident

Royal Oak Mines Inc.

Figure 3

EMERGENCY SPILL CONTINGENCY PLAN
Response Team Flowsheet



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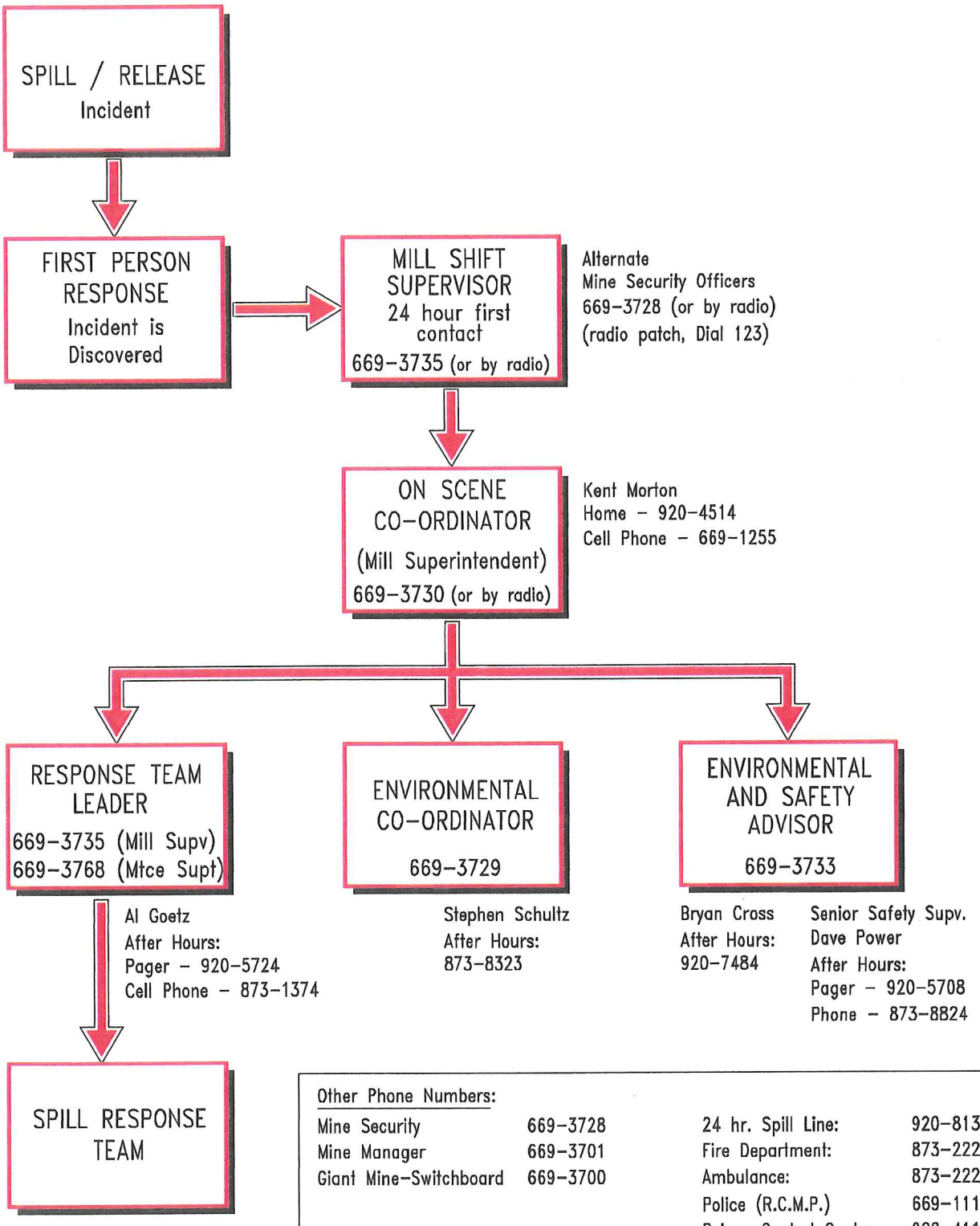
Royal Oak Mines Inc.

Figure 4

EMERGENCY SPILL CONTINGENCY PLAN
Response Team Flowsheet - Phone List



Other Phone Numbers:

Mine Security	669-3728	24 hr. Spill Line:	920-8130
Mine Manager	669-3701	Fire Department:	873-2222
Giant Mine-Switchboard	669-3700	Ambulance:	873-2222
		Police (R.C.M.P.)	669-1111
		Poison Control Centre (Hospital)	920-4111

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- Activates the response plan and calls out the key personnel in the response team to address the situation
- Assesses the requirements for manpower, equipment, materials and tools to contain the spilled material.
- Develops the overall plan of action for containment and clean up of the spill and delegates the responsibility of implementing the plan
- Ensures that assigned responsibilities are carried out and that proper co-ordination exists between supervisory team members
- Alerts the Mine Manager
- Provides regular spill status reports to the Environmental Coordinator

4.3.2 Response Team Leader

- Depending on the type of spill, the response team leader may be the Mill Shift Supervisor or the Maintenance Superintendent. The On - Scene Co-ordinator will choose the appropriate Team Leader based on his or her knowledge of the materials and equipment involved in the incident
- Responsible for all field operations in response to the spill
- Assembles the Spill Response Team members from available manpower, and ensures that team members have the appropriate skills to implement the response plan
- Directs the Spill Response Team in the implementation of mitigation measures such as containment, recovery, remediation, and disposal operations and directs operational support, including decontamination procedures
- Ensures Spill Response Team has proper personal protective equipment
- Provides clean up progress reports to the On-Scene Coordinator
- Works in conjunction and in cooperation with the On-Scene Coordinator

4.3.3 Environmental and Safety Advisor

- Normally the Mill Metallurgist. The On-Scene Coordinator may also call out the Senior Safety Supervisor to advise on significant safety hazards

- In conjunction with the Environmental Coordinator, provides technical advice on the anticipated environmental impacts of the spill
- Estimates the effectiveness of various containment, recovery, and disposal options, suggesting the most appropriate approach
- Responsible for the collection and analysis of water samples to identify and monitor possible contaminant levels
- Implements a program of sampling natural water courses, both directly impacted by the spill and downstream of the spill site. This program should be implemented even if it appears that the spilled material has not reached a water course. The program should be designed to assess the potential for damage to the natural environment as a result of the incident. Initial samples should be taken as soon as possible after the spill has occurred, followed by repeated sampling at regular intervals over the subsequent clean up and restoration activities. Sampling time intervals should be developed in consultation with the appropriate regulatory officials whenever possible
- Follows up at the spill site after the initial response to monitor the effectiveness of the clean up operation and recommends further remediation work, if necessary

4.3.4 Environmental Coordinator

- Normally the Superintendent of Environmental Services. Works in conjunction with the Environmental Advisor and the Response Team Leader
- Acts as the Company's spokesperson with the public, media, and government services
- Reports the spill by calling the 24 Hour Spill Line at (867) 920-8130 and provides initial incident details
- Gathers relevant information and submits a detailed spill report to the applicable regulatory agencies, no later than thirty (30) days after the initial reporting of the spill
- Ensures that annual updates to the Contingency Plan and Emergency Spill Response Manual are completed, distributed to mine site supervisors and submitted to regulatory agencies. Annual updates should reflect changes in mine site personnel, operations or technologies.
- Ensures that spill response personnel receive adequate training in order to fulfill their responsibilities on the Spill Response Team

5.0 SYSTEM COMPONENT FAILURES - PREVENTION

This section outlines potential failure modes of the mine site systems that handle or store hazardous materials and describes the control measures used to prevent failures, or detect and mitigate such incidents.

5.1 Tailings Pipe Line

The location of the Tailings Containment Areas, dams, seepage containment and pump back stations are shown in Figure 5.

The following is a list of possible causes for a failure of the tailings pipeline:

1) Line is worn or broken

2) Line is frozen due to cold weather and tailings settlement at low points in the line; tailings are left in the line after a power outage or tailings pump failure

3) Trestle collapse and subsequent line rupture

4) Line blockages

5) Accidental or intentional damage to the pipeline and its component parts (such as vehicle collision)

Visual inspections of the active tailings lines are carried out at least once per shift (twice a day) by the Mill Shift Supervisors. In addition, the Security Officers also make a check of the line twice a day. Records of these checks are maintained by the Mill Shift Supervisors and by the Security Officers. These records are available for inspection by regulatory officials.

5.2 Tailings Dam Structures

The following is a list of possible causes for a tailings dam structure failure:

1) Overfilling of the Tailings Containment Area

2) Slumping or settling of the dam due to pressure

3) Erosion of the dam by natural elements or seepage

4) Erosion of the dam by leakage from a broken tailings line

5) Heavy precipitation (rain or snowfall) event, resulting in elevated levels in the tailings containment ponds

Visual inspections of the active tailings dam structures are carried out twice daily by the Mill Shift Supervisors. Records of all visual inspections are maintained by the Mill Shift Supervisors. These records are available for inspection by regulatory officials.

An annual inspection of the tailings dam structures is carried out each summer by a qualified geotechnical engineering firm. The last tailings dam inspection was completed by Golder Associates Ltd. in June of 1998. An inspection report will be submitted to Royal Oak Mines and subsequently filed with the NWT Water Board in August, 1998.

5.3 Heating Fuel Storage

There are currently three main heating fuels stored at the Giant mine: diesel, and two recycled fuel products supplied by the Newalta Corp., called Heavy Burner Fuel and Enviro 4000. These are stored in tanks located close to the boiler houses, as indicated in Figures 6 and 7.

With the exception of propane, heating oil tanks are provided with secondary containment of sufficient volume to contain the contents of the tank, in the event of a tank or line rupture. Daily visual inspections of these tanks are made by the Security Officers and observations are recorded. These records are available for inspection by regulatory officials.

In addition, propane, used for mine air heating is stored in large tanks at two locations as shown in Figure 6. ICG Propane Ltd. operates a propane storage facility on the mine lease also shown in this figure. Royal Oak Mines has no responsibility for this facility.

5.4 Automotive Fuel Storage

A number of fuelling stations and storage tanks are used to dispense diesel fuel to mobile equipment. The locations of these tanks are indicated in Figures 6 and 7.

Daily visual inspections of these tanks are made by the Security Officers and observations are recorded. These records are available for inspection by regulatory officials.

A single underground storage tank is used to dispense gasoline to light vehicles. The inventory of this tank is monitored to detect any possible leakage.

5.5 Chemical and Petroleum Storage Yards

Various chemical and petroleum products are used at the site with drummed, bagged, and pail storage provided. These materials are stored in a number of locations, as shown in Figures 6 and 7, and as listed in Section 9.0.

The chemical and petroleum storage yards are inspected weekly by Warehouse personnel.

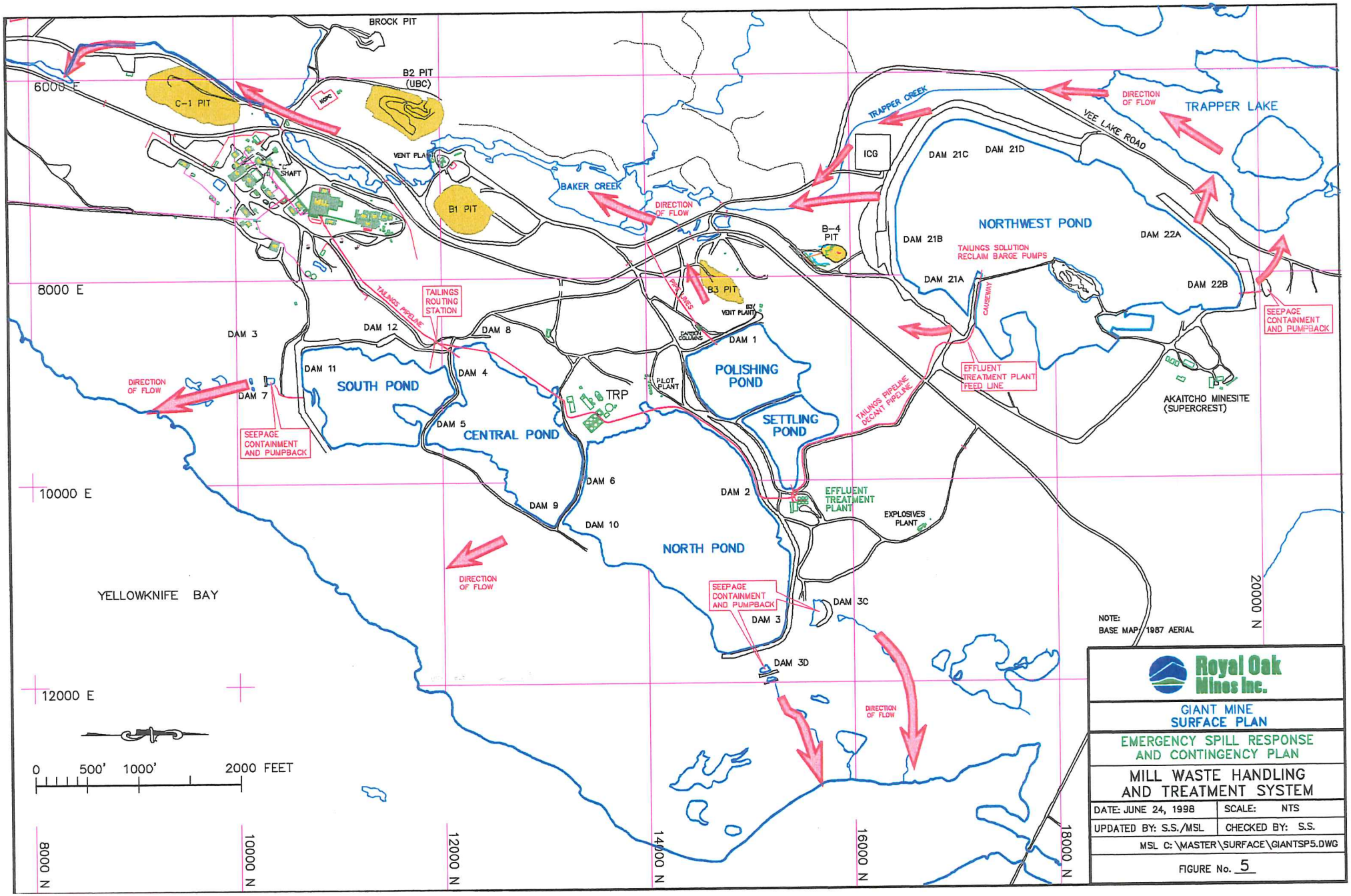
BROCK PIT
B2 PIT (UBC)
C-1 PIT
6000 E
C SHAFT
VENT PLANT
B1 PIT
BAKER CREEK
DIRECTION OF FLOW
TRAPPER CREEK
DIRECTION OF FLOW
TRAPPER LAKE
VEE LAKE ROAD
ICG
DAM 21C
DAM 21D
NORTHWEST POND
DAM 21B
DAM 22A
DAM 21A
DAM 22B
TAILINGS SOLUTION RECLAIM BARGE PUMPS
B-4 PIT
B3 PIT
VENT PLANT
PIPELINES
CAUSEWAY
SEEPAGE CONTAINMENT AND PUMPBACK
8000 E
TAILINGS ROUTING STATION
TAILINGS PIPELINE
DAM 3
DAM 12
DAM 8
DAM 1
DAM 11
SOUTH POND
DAM 4
POLISHING POND
EFFLUENT TREATMENT PLANT FEED LINE
AKAITCHO MINESITE (SUPERCREST)
DIRECTION OF FLOW
DAM 7
SEEPAGE CONTAINMENT AND PUMPBACK
TRP
PILOT PLANT
DAM 5
CENTRAL POND
SETTLING POND
TAILINGS PIPELINE DECANT PIPELINE
10000 E
DAM 6
DAM 9
DAM 2
EFFLUENT TREATMENT PLANT
EXPLOSIVES PLANT
DAM 10
NORTH POND
YELLOWKNIFE BAY
DIRECTION OF FLOW
SEEPAGE CONTAINMENT AND PUMPBACK
DAM 3C
DAM 3
DAM 3D
20000 N
NOTE:
BASE MAP 1987 AERIAL
12000 E
DIRECTION OF FLOW
0 500' 1000' 2000 FEET
8000 N
10000 N
12000 N
14000 N
16000 N
18000 N
Royal Oak Mines Inc.
GIANT MINE
SURFACE PLAN
EMERGENCY SPILL RESPONSE AND CONTINGENCY PLAN
MILL WASTE HANDLING AND TREATMENT SYSTEM
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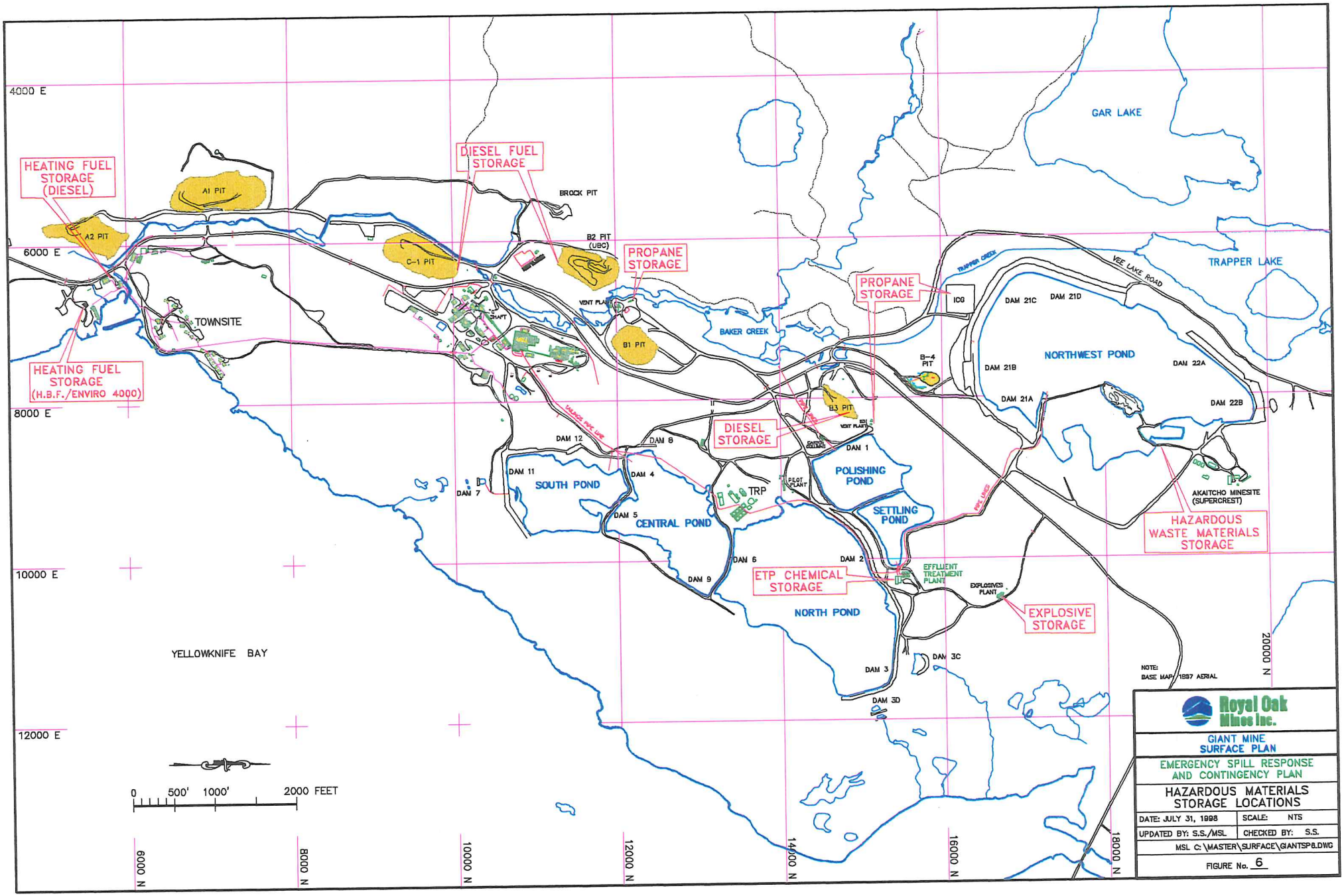
FIGURE No. 5



NOTE:
BASE MAP: 1997 AERIAL

Royal Oak Mines Inc.

GIANT MINE
SURFACE PLAN

EMERGENCY SPILL RESPONSE AND CONTINGENCY PLAN

HAZARDOUS MATERIALS STORAGE LOCATIONS

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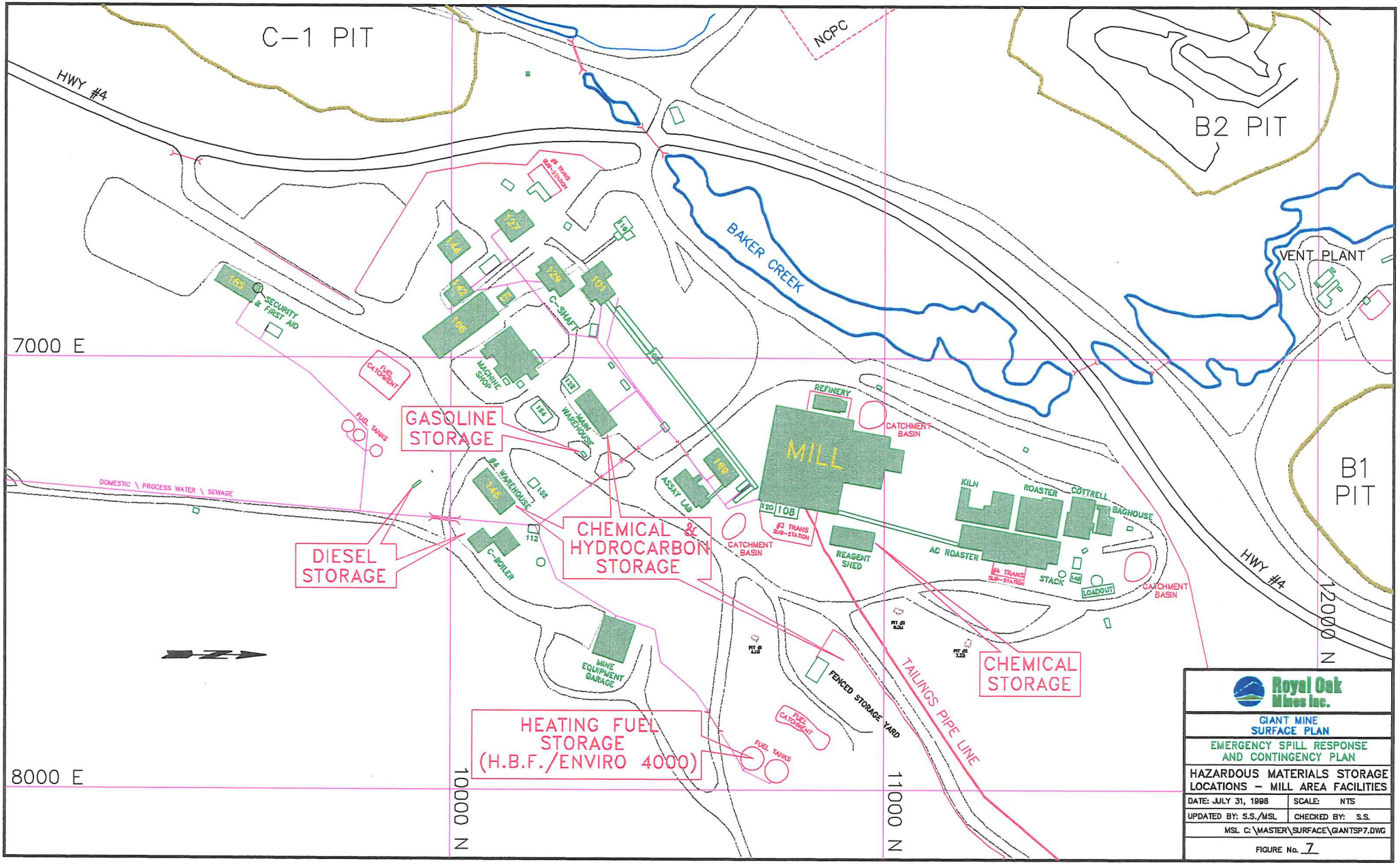
FIGURE No. 6


C-1 PIT
HWY #4
NCPC
B2 PIT
BAKER CREEK
VENT PLANT
B1 PIT
7000 E
8000 E
10000 N
11000 N
12000 N
SECURITY & FIRST AID
FUEL CATCHMENT
FUEL TANKS
MACHINE SHOP
C-SHAFT
MAIN WAREHOUSE
#4 WAREHOUSE
C-BOILER
ASSAY LAB
MILL
REFINERY
CATCHMENT BASIN
#3 TRANS SUB-STATION
REAGENT SHED
KILN
ROASTER
COTTRELL
BAGHOUSE
AC ROASTER
#4 TRANS SUB-STATION
STACK
LOADOUT
MINE EQUIPMENT GARAGE
FENCED STORAGE YARD
TAILINGS PIPE LINE
DOMESTIC \ PROCESS WATER \ SEWAGE
GASOLINE STORAGE
DIESEL STORAGE
CHEMICAL & HYDROCARBON STORAGE
CHEMICAL STORAGE
HEATING FUEL STORAGE (H.B.F./ENVIRO 4000)
Royal Oak Mines Inc.
GIANT MINE
SURFACE PLAN
EMERGENCY SPILL RESPONSE AND CONTINGENCY PLAN
HAZARDOUS MATERIALS STORAGE LOCATIONS - MILL AREA FACILITIES
DATE: JULY 31, 1998
SCALE: NTS
UPDATED BY: S.S./MSL
CHECKED BY: S.S.
MSL C:\MASTER\SURFACE\GIANTSP7.DWG
FIGURE No. 7

6.0 SYSTEM COMPONENT FAILURES - RESPONSE ACTION

6.1 Tailings Pipe Line Failure

A single pipeline carries tailings slurry from the mill approximately 600 metres to a system of valves and pipe joints, adjacent to the northwest corner of the South Tailings Pond. From this point, tailings may be routed through different pipelines to the South, North or Northwest Tailings Ponds (see Figure 5.).

Any person finding a discharge from the tailings line, NO MATTER HOW SMALL, should immediately report the incident to the Mill Shift Supervisor (by radio, or at 669-3735).

If the pipeline failure is located downstream of the valve station, the Mill Shift Supervisor may choose to redirect the tailings flow through an alternate line, depending on the condition of the alternate Tailings Containment Area (TCA). If the line failure is located between the mill and the valve station, the Mill Supervisor will arrange to shut down the mill immediately.

Tailings will continue to flow to the alternate TCA, or the mill will cease operations until the line is repaired.

Containment measures must be immediately implemented to ensure that tailings material does not enter any natural body of water. If necessary, the Mill Shift Supervisor will initiate the spill response system previously described in Section 4.0.

6.2 Tailings Dam Structure Failure

Potential containment dam failures must be addressed as quickly as possible, in order to avoid or minimize environmental impacts.

Any person who observes liquid flowing or seeping from the tailings dam should report the following information to the Mill Shift Supervisor (by mine site radio, or at 669-3735).

1) Your name and the location of the discharge source point

2) A description of your observations.

3) Be prepared to accompany the Mill Shift Supervisor to the appropriate location, to point out and confirm your observations.

*(It should be noted that some **controlled** seepage from the tailings dams is normal and acceptable. Currently, Dam 11 and Dam 22B are known to produce some seepage. The water is contained by secondary dams and pumped back into the pond)*

The Mill Shift Supervisor should, upon notification, determine the full extent and size of the failure. It is the responsibility of the Mill Shift Supervisor to evaluate the failure and initiate the spill response system, if necessary.

A spill resulting from the failure of a tailings dam structure would require the construction of a coffer dam to contain the released material, while either temporary, or permanent repairs are completed on the failed structure. To minimize the seepage of contaminants into any water course these temporary containment dams should be constructed of materials with low permeability, whenever possible.

The spill would be contained by rebuilding the dam, or constructing a secondary dam with materials that are locally available. The use of a synthetic liner may be necessary. Liquid portions of the tailings should be contained within berms or impoundment basins and pumped back to the tailings pond. Repairs to the failed structure would take place to standards acceptable to the mine management and it's geotechnical advisors.

Sources of local, natural materials that may be used to construct secondary containment structures are identified in Figure 8.

6.3 General Spill Containment and Remediation

The measures outlined in this section are intended to minimize the extent of contamination following the release of a hazardous material. For all spills, the initial response will be to immediately minimize any direct threat to human life, or the natural environment. Personnel not directly associated with the containment and remedial operations will not be permitted near the incident scene. The locations of spill response resources are indicated in Figures 8 and 9.

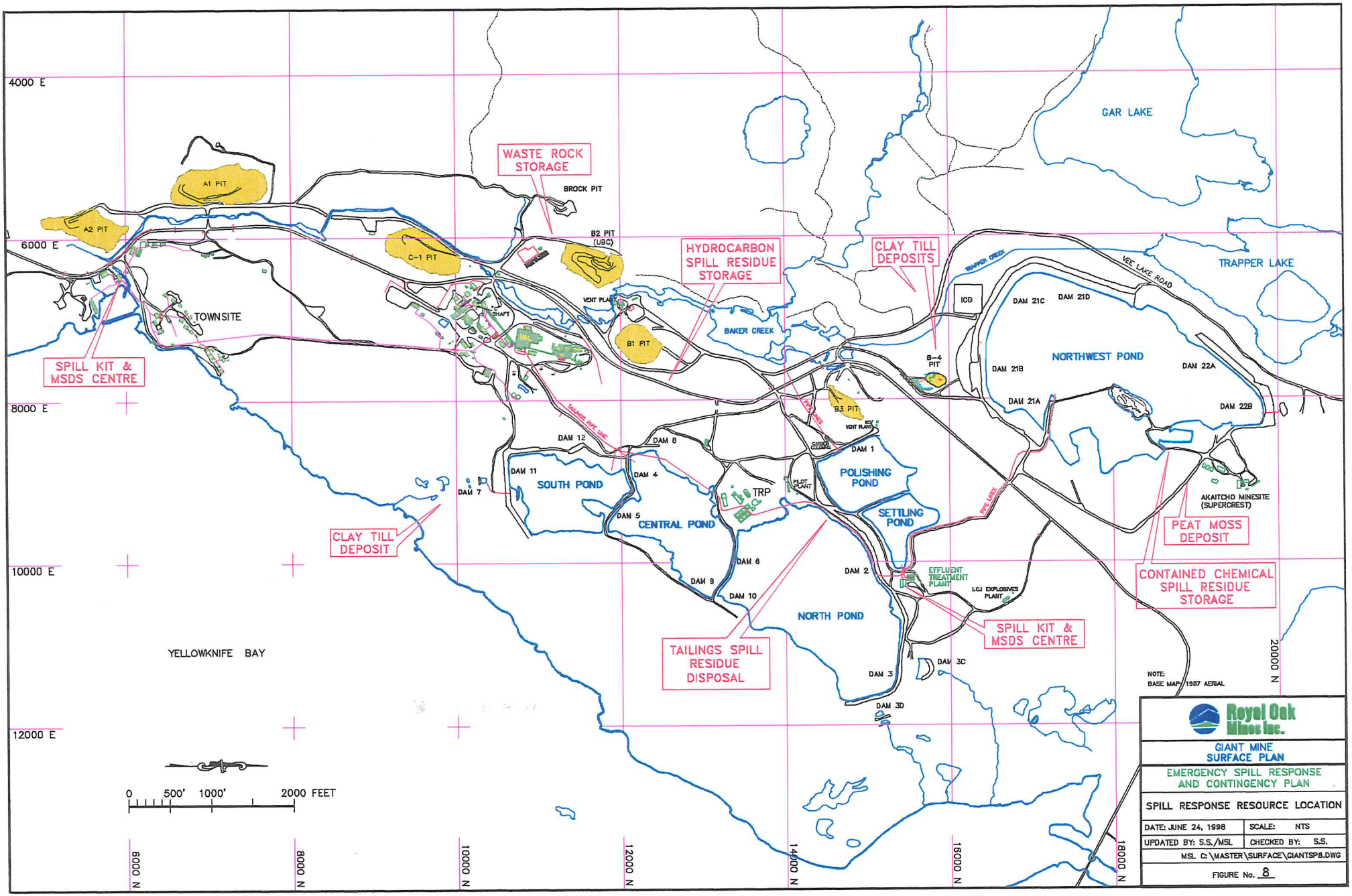
6.3.1 Containment on Open Water

For spills on open water, containment procedures will vary depending on whether the material floats or sinks, and whether the water is flowing or standing.

For floating materials (such as hydrocarbon products), a surface boom may be deployed. In flowing water, the boom should be stretched across the flow, downstream from the spill and in an area of low velocity. In standing water, deploy the boom to contain the spill close to shore. Absorbent pads or socks should be placed between the spill location and the boom. If a boom is not available, an earthen dyke may be constructed, subject to regulatory approval.

For materials heavier than water (such as tailings solids), a containment dyke should be constructed if possible. This will contain the dispersion of the material in standing water. In small amounts of flowing water, divert the flow around the material by dyking and ditching if possible.

If containers of hazardous materials have been released into water, the containers must be recovered while containment measures are taken. Removal of damaged containers must be the priority action.



NOTE:
BASE MAP: 1987 AERIAL

Royal Oak Mines Inc.

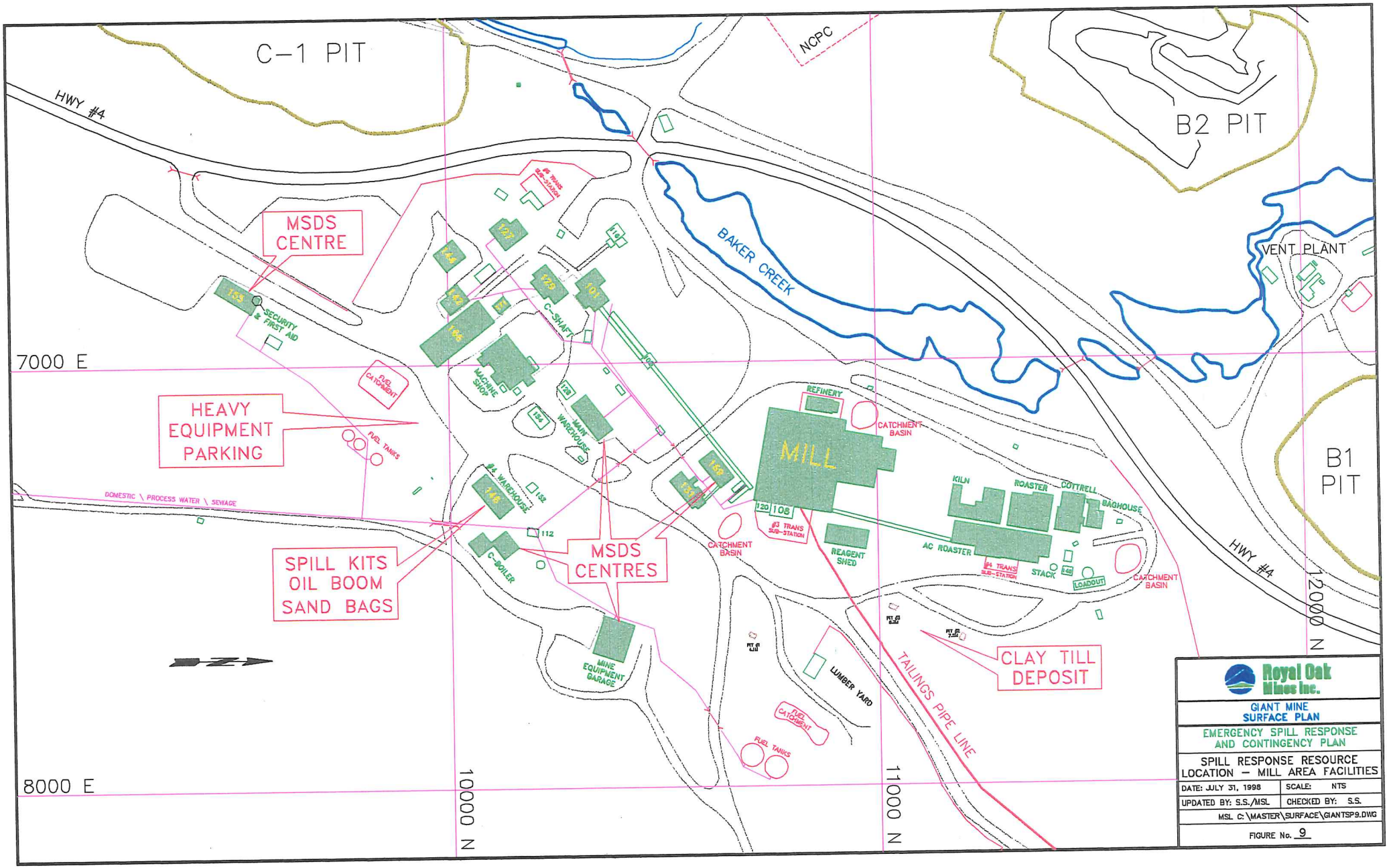
GIANT MINE
SURFACE PLAN

EMERGENCY SPILL RESPONSE AND CONTINGENCY PLAN

SPILL RESPONSE RESOURCE LOCATION

DATE: JUNE 24, 1998	SCALE: NTS
UPDATED BY: S.S./MSL	CHECKED BY: S.S.
MSL C:\MASTER\SURFACE\GIANTSP8.DWG	

FIGURE No. 8



Royal Oak Mines Inc.

GIANT MINE
SURFACE PLAN

EMERGENCY SPILL RESPONSE AND CONTINGENCY PLAN

SPILL RESPONSE RESOURCE LOCATION – MILL AREA FACILITIES

DATE: JULY 31, 1998	SCALE: NTS
UPDATED BY: S.S./MSL	CHECKED BY: S.S.
MSL C:\MASTER\SURFACE\GIANTSP9.DWG	

FIGURE No. 9

6.3.2 Containment on Ice

Spills on ice (such as a tailings discharge into Yellowknife Bay) will be affected by the strength of the ice and the floating or sinking characteristics of the material. The safe bearing capacity of ice has to be carefully assessed. The following table can be used to estimate the load bearing capacity of good ice:

Thickness (Centimetres)	*Load (tonnes)*
7.5	0.2
15	0.9
23	1.8
38	5.5
51	9.1
76	18.2
102	36.4

General rules about ice strength include:

1) "White" ice is only half as strong as "Blue" ice
2) Reduce load by a half, if ice cracks are parallel (in the same direction) to travel
3) Reduce load by three-quarters if ice cracks are both parallel and at right angles to travel 4) Use great care if weather is extremely cold after a warm period or warm after a cold period
5) Control speed in shallow water to avoid wave build up

If the spill does not penetrate the ice and the ice is safe to work on, containment will be similar to procedures used on land.

If the spill penetrates the ice, the situation will be similar to spills in open water. If the material floats then the ice may be broken to install a containment boom. The ice between the spill and the boom should be collected and disposed of with the spilled material. In standing water under ice, the primary effort must be to recover the material.

6.3.3 Containment on Snow

Snow is one of the best natural absorbents and should be used it as much as possible when available. Snow provides protection against the spread of fire if the spilled material is flammable. Contaminated, saturated snow facilitates removal of the contaminant to a recovery or disposal site.

Methods to prevent a spill on snow from spreading include:

- Compact the snow around the outside perimeter of the spill area
- Construct and compact snow dams (dams may be wetted with water in freezing conditions to reduce permeability)

- Locate the low point of the spill area, then clear channels in the snow to allow material not absorbed to flow into the low area

- Once collected, the spilled material contained in the low area can either be recovered with absorbent materials, pumped or shovelled into containers, or picked up using mobile heavy equipment and transported to an approved disposal site

6.3.4 Containment on Land

In all cases of liquid spills, the initial step is to prevent further dispersion. This may be done by dyking around the spill, using locally available natural materials placed by mobile heavy equipment. Absorbent materials such as fibre pads, Zorbal, Floor-Dry, Hazorb Pillows, peat moss and sawdust, or gelling agents, such as Chemgel should be utilized to prevent further spread or seepage.

The locations of spill response resources such as spill kits and absorbents is indicated in Figures 8 and 9.

6.3.5 Fire or Explosion Hazards

When fire is associated with a spill of hazardous material, extinguishing the fire is a necessary step. The fire may prevent efforts to stop or minimize the spillage. In all cases, the first step is to clear people from the surrounding area.

Containment dykes should be constructed down gradient from liquid spills, to minimize the spread of fire and contain any unburned fluid. Foam, CO_2, or water should be used to fight the fire, as is appropriate for the types of materials present. Particular care must be taken to prevent inhalation of combustion vapours.

When the fire is extinguished, proceed to stop further spillage, contain the spill, and initiate appropriate clean up measures.

Advise the Yellowknife Fire Department (at 873-2222), as soon as possible, in the event of any spill incident involving fire. They should be advised of all details relating to the incident and the types of materials involved.

6.3.6 Neutralization

When the spill is contained, wherever possible apply a neutralizing agent as instructed by the Material Safety Data Sheets (the locations of MSDS Sheets are shown in Figure 9). If the neutralized material is harmless, the containment can be removed and the site restored. If the material must be recovered, use suitable containers and disposal methods as advised by the Environmental Coordinator.

Materials include:
- Acids (neutralized with alkalis)
- Sodium Cyanide (neutralized with Sodium Hypochlorite)
- Alkalis or Strong Bases (neutralized with acids)

7.0 HAZARDOUS MATERIAL DISPOSAL & SITE RESTORATION

Small volumes of spilled materials, contaminated soils and absorbent materials should be manually shovelled into empty drums. The CONTENTS OF ALL CONTAINERS used for spill residues MUST BE CLEARLY IDENTIFIED on the outside of the container, with permanent markings. The Response Action Team will assist the Environmental Coordinator with this inventory. Larger volumes of spill residues, contaminated soils or snow must be removed from the spill site with heavy equipment.

Spill residues must be removed from the spill site to an approved location as part of the initial spill response plan.

All spill residues must be disposed of, stored or treated in a manner approved by the Superintendent of Environmental Services. As a general rule, there are three locations on the mine site for the disposal or storage of spill residues (these locations are indicated in Figure 8):

1)	**Tailings Containment Areas**	For tailings material, or mill process materials. Hydrocarbon wastes must NOT be disposed of in the TCA
2)	**Hydrocarbon Remediation Area**	For land farming treatment of hydrocarbon contaminated soils and storage of contained hydrocarbon wastes (pending approval of disposal methods)
3)	**Hazardous Waste Storage Area**	For storage of contained chemical wastes (pending approval of disposal methods). Hydrocarbon wastes must NOT be stored at this location

Final disposal of the recovered materials will be determined in consultation with the appropriate regulatory officials and the product manufacturer.

The clean up operations organised under the spill response system will be designed by the On-Scene Coordinator primarily to mitigate the most significant and immediate threats to the natural environment. The effectiveness of the initial response, and the potential longer term impacts on the local environment, must be evaluated by the Superintendent of Environmental Services, based on visual inspections of the spill site and, if necessary, soil and water sampling and analysis. Final remediation work, contouring and revegetation of affected areas will be conducted under the direction of the Superintendent of Environmental Services.

Remediation work on a spill site is not considered complete, until the responsible regulatory officials have approved of the work conducted and do not consider the spill site to be a long term threat to the natural environment.

8.0 SPILL RESPONSE RESOURCES

8.1 Spill Equipment Inventory

The following is a list of equipment available for spill containment and site remediation purposes:

- 1 - International Pumper Fire Truck
- 1 - D8 Bulldozer
- 1 - D6 Bulldozer
- 1 - D3 Bulldozer
- 2 - 988 Loaders
- 1 - 920 Loader
- 1 - 769B Dump Truck
- 1 - 10 Ton Dump Truck
- 1 - 245 Backhoe
- 1 - 562 Grader
- 1 - Low Boy Trailer
- Portable Gas Driven Pumps
- Portable Generators
- Portable Lighting Equipment

Royal Oak Mines is currently reviewing the stocks and locations of other spill response resources. While absorbent materials have normally been stocked in the Main Warehouse and Maintenance Shops, the locations and ease of access to these materials is under review. Provision of 'spill kits' at key locations, such as fuel storage and boiler locations is planned. The kits will contain a variety of absorbent materials and personal protective clothing. These spill kits will be in place by September 30, 1998, at the locations indicated in Figures 8 and 9.

Other sources of equipment and resources, as required, include: Miramar Con Mine, Robinson Trucking Ltd., and other rental/contracting companies in Yellowknife.

Imperial Oil, through its Agent, Northshore Petroleum Ltd. maintains an Oil Spill Containment and Response (OSCAR) Trailer in Yellowknife, which is available to Royal Oak Mines for spill response. Each OSCAR Trailer contains:

- Containment booms and skimmers with anchors, buoys, ropes
- Pumps with suction / discharge hoses and fittings
- Oman generating plant with lighting stand
- Oil spill absorbents, hand tools, protective clothing, portable tank, etc

8.2 Outside Resource Contacts

1) Miramar Con Mine (24 hrs.) 873-2783

2) RTL - Robinson Enterprises Ltd. (24 hrs.) 873-6271

3) OSCAR Trailer - Northshore Petroleum Ltd. (After hours)	873-6211 873-1677
4) GNWT - R.W.E.D., Environmental Protection	873-7654
5) Environment Canada, Environmental Protection Branch After hours (NWT Spill Line)	669-4700 920-8130
6) Fisheries and Oceans Canada Arctic Habitat Coordinator	920-6641

9.0 HAZARDOUS MATERIALS INVENTORY

9.1 Material Safety Data Sheets (MSDS)

The Giant Mine has a centralized MSDS information centre on the property located in the Main Warehouse. In addition, localized stations are maintained at various locations around the property as displayed in Figure 9. These stations contain site specific MSDS sheets for products used in that location. Access to any information on chemicals is available 24 hours per day through the warehouse MSDS centre. Copies of MSDS sheets for the following, significant chemicals used at the mine site have been appended to this contingency plan (Appendix D):

Sodium Cyanide	NaCN
Hydrogen Peroxide	H_2O_2
Ferric Sulphate	Fe_2SO_4
Arsenic Trioxide	As_2O_3
Diesel Fuel	
Enviro 4000	
Unleaded gasoline	

MSDS for lime > 20,000 kg stored

In addition, action plans for incidents involving specific, significant chemicals are kept in the mill. They are located in the mill lab and can be obtained through the mill lab staff or the Mill Shift Supervisor.

Chemical spill emergency response information is also available 24 hours a day from the Canadian Transport Emergency Centre (CANUTEC) at (613) 996-6666.

9.2 Mill and Effluent Treatment Plant Reagents

The location of storage facilities for mill reagents, fuel or other hydrocarbon products stored at the Giant Mine site are shown on Figures 6 and 7.

Table 1 provides a list of the various chemicals used on the property, the approximate amount of the product stored at the site, and their storage locations.

Table 1: Chemical Product Types, Volumes and Storage Locations

Chemical Name	Volume Stored	Unit Volume / Container Type	Storage Location
Alchem Balls	454 kg	22.7 kg bags	Mill Reagent Shed
Armac HT Flake	544 kg	27 kg boxes	Mill Reagent Shed
Borax, Anhydrous Granular	1589 kg	25 kg bags	Mill Reagent Shed
Calcium Chloride	1612 kg	25 kg bags	Mill Reagent Shed

Calcium Hypochlorite	240 kg	30 kg drums	Mill Reagent Shed
Caustic Soda	5925 kg	25 kg bags	Mill Reagent Shed
Carbon, Activated Granular	9080 kg	908 kg bags	Mill Reagent Shed
Copper Sulphate	6000 kg	1000 kg bags & 25 kg bags	Effluent Treatment Plant and Reagent Shed
Ferric Sulphate	40000 kg	Bulk	Effluent Treatment Plant
Filter Aid, Kenite 700	5000 kg	22.7 kg bags	Reagent Shed
Flocculant - Percol 351	275 kg	25 kg bags	Reagent Shed
Frother - Dowfroth 1012	4869 kg	204 kg drums	Lumber Yard
Hydrogen Peroxide	25000 kg	Bulk	Effluent Treatment Plant
Keytone	330 kg	165 kg drums	Lumber yard
Lead Nitrate	200 kg	25 kg bags	Reagent Shed
Lime, Quick Pulverized	43000 kg	Bulk	Silos at Mill & Effluent Treatment Plant
Manganese Dioxide	600 kg	25 kg bags	Reagent Shed
Millsperse B10 Dispersant	270 kg	270 kg drum	Roaster Building
Silica Flour	908 kg	25 kg bags	Reagent Shed
Soda Ash	5250 kg	25 kg bags	Reagent Shed
Sodium Cyanide	18240 kg	1000 kg Bag / Box	Lumber Yard
Sodium Metabisulfite	908 kg	22.7 kg bags	Reagent Shed
Sodium Nitrate	2542 kg	25 kg bags	Reagent Shed
Xanthane - Potassium Amyl	3600 kg	125 kg drums	Fenced Yard
Xanthane - Sodium Isopropyl	9600 kg	125 kg drums	Fenced Yard
Zinc Dust	2452 kg	22.7 kg pails	Reagent Shed

9.3 Fuels, Oils, and Petroleum Products

9.3.1 Heating Fuels

Heavy Burner fuel or Enviro 4000 is purchased in bulk from Newalta Corp. (Edmonton, AB) and delivered by tandem tanker truck at the rate of 50,000 litres per delivery. The oil is stored in four storage tanks, provided with secondary containment. Two tanks located close to A-Boiler have a

combined capacity of 95,000 litres. Two tanks located near C-Boiler have a combined capacity of 127,000 litres.

9.3.2 Diesel Fuel (P40 type)

Purchased in bulk from the Imperial Oil agent in Yellowknife, Northshore Petroleum Ltd. Deliveries to the site are by tanker truck. Diesel is stored at various above ground tanks around the property, ranging from 1,000 - 24,000 litres in size. In addition, diesel is stored in the underground mine in two tanks. Their capacities are 2,250 and 9,000 litres. Total diesel oil storage capacity in use is 104,000 litres.

9.3.3 Gasoline

Purchased in bulk from Imperial Oil agent, Northshore Petroleum Ltd. Delivered via tanker truck to a single underground storage tank, adjacent to the warehouse, with storage capacity of 4,500 litres.

9.3.4 Diesel Heating Oil

Purchased in bulk from Imperial Oil Agent, Northshore Petroleum Ltd. Delivered via tanker truck to local furnace tanks. Storage is in various above ground tanks around the property, ranging from 1,100 - 4,500 litres in size. Total heating oil storage capacity in use is 31,000 litres.

9.3.5 Propane

Primarily used to heat ventilation air to the mine in winter. Purchased in bulk from ICG Canadian Propane Ltd. Delivered via tanker truck to storage tanks at mine ventilation plants (B-shaft, B 3 vent raise). Storage is in above ground tanks, ranging from 380 to 114,000 litres in size.

9.3.6 Oils and Greases

Purchased in drums, pails, and cases from Imperial Oil Agent, Northshore Petroleum Ltd. Deliveries via truck to (heated) # 3 Warehouse, heated oil shed, or Fenced Yard. Storage locations for these materials are shown in Figure 7.

Table 2 provides a list of the oils and greases stocked on site and their normal unit volumes:

Table 2: Inventory of Oil and Grease and Storage Locations

Name	Container Type	Storage Location
Arox EP22 of EP Arctic	205 l drums	Fenced Yard
Arox EP100	4 l jugs or 20 l pails	Oil Shed # 4 Warehouse

Cable Floatcoat		Oil Shed # 4 Warehouse
Esso Extra 10W30	1 litre jugs	Main Warehouse
Hydraulic Essolube HD 10W	205 l drums	Fenced Yard
Essolube HD 20	205 l drums	Fenced Yard
Essolube HD 30	205 l drums	Fenced Yard
Essolube Plus HDX 20-20 W	1 l jugs	Warehouse
Essolube Hydraulic XD3-10 W	20 l pails	Warehouse
Essolube XD30	205 l drums	Fenced Yard
Esstic 32	205 l drums	Fenced Yard
Esstic 68	205 l drums	Fenced Yard
Esstic 100	205 l drums	Fenced Yard
Esso GX7580	20 l pails	Oil Shed # 4 Warehouse
Esso GX80W/90	20 l pails	Oil Shed
Esso GX85W/140	20 l pails	Warehouse
Hydraulic Univis J13	1 l jugs	Warehouse
Hydraulic Univis N20	205 l drums	Fenced Yard
Hydraulic Univis N22	205 l drums	Fenced Yard
Tresso 32	205 l drums	Fenced Yard
Thread Cutting Dark	4.5 l jugs	Main Warehouse
Thread Cutting Clear Ridgid	4.5 l jugs	Main Warehouse
Voltesso 35	205 l drums	Fenced Yard
ATF Type A	1 l jugs	Main Warehouse
ATF Type F	1 l jugs	Main Warehouse
Hydraulic ATF Type A	205 l drums	Fenced Yard
Diamond Drill DDR-3	17 kg pails	Oil Shed
Gear Cover 3000	55 kg kegs	Oil Shed

Kubloa 30	case lots	Oil Shed
Lo-Temp EP Cartridge	400 gr tubes	Main Warehouse
MPH Cartridge	400 gr tubes	Main Warehouse
Nebula EP	17 kg pails	Oil Shed
Spartan EP 200	205 l drums	Fenced Yard
Spartan EP 320	205 l drums	Fenced Yard
Spartan EP 460	205 l drums	Fenced Yard
Spartan EP 1000	205 l drums	Fenced Yard
Unirex EP 1	400 gr tubes	Main Warehouse
Unirex EP 2 Cartridge	400 gr tubes	Main Warehouse
Unirex EP 2	55 kg kegs	Oil Shed # 4 Warehouse
Unirex N2L Cartridge	400 gr tubes	Main Warehouse
EP102 Epic Synthetic	17 kg pails	Main Warehouse

* Contents expressed as kilograms

9.4 Miscellaneous Hydrocarbons

Table 3 provides a listing of miscellaneous hydrocarbon products that are stocked in small quantities on the mine site, their storage location and respective unit volumes:

Table 3: Miscellaneous Hydrocarbons, Volumes and Locations

Product	Container Type	Location
Acetone	4.5 l jugs	Assay Lab
Acetylene B Size	15 kg cylinder	Warehouse Compressed Gas Storage
Acetylene WS Small	4.5 kg cylinder	Warehouse Compressed Gas Storage
Acetylene WTL Large	80 kg cylinder	Warehouse Compressed Gas Storage
Additive Fuel Oil EG275F	205 l drums	Fenced Yard
Alcohol Methyl Hydrate	20 l pails	Warehouse # 4

Antifreeze Gasoline K425		Main Warehouse
Antifreeze Automotive	4 l jugs	Main Warehouse
Antifreeze Automotive	205 l drums	Fenced Yard
Antifreeze Frost X	205 l drums	Fenced Yard
Cleaner Electrosol	20 l pails	Main Warehouse
Cleaner Imperial		Main Warehouse
Cleaner Lectra Clean 2018	spray cans	Main Warehouse
Degreaser 5107TI Ripper II	205 l drums	Fenced Yard
Belt Spraygrip	spray cans	Main Warehouse
Layout Spray	spray cans	Main Warehouse
Glyptal Blue Grey G1237	spray cans	Main Warehouse
Gylptal Light Grey G1228	spray cans	Main Warehouse
Glyptal Red G1201	spray cans	Main Warehouse
Glyptal Red Spray G1201A	spray cans	Main Warehouse
Glyptal 1202	spray cans	Main Warehouse
Glyptal Thinner	spray cans	Main Warehouse
Glyptal Thinner 3190	spray cans	Main Warehouse
Rockwell 147B	boxes	Main Warehouse
Rockwell 147C	boxes	Main Warehouse
Rockwell # 775256	boxes	Main Warehouse
Lectra Clean	spray cans	Main Warehouse
Pyridine		Main Warehouse
Solvent C-666	20 l pails	Main Warehouse
Solvent Varasol	205 l drums	Fenced Yard
Turpentine	4.5 l cans	Main Warehouse

* Denotes number of sticks/tube

10.0 EMERGENCY TELEPHONE NUMBERS

Fire Emergencies:

Yellowknife Fire Dept.	873-2222
24 Hour Forest Fire Line	1-800-661-0800

Medical Emergencies:

Ambulance	873-2222
Hospital	669-4111
Poison Control Centre	669-4111

Police:

Police (RCMP)	669-1111

Environmental Emergencies:

24 Hour NWT Spill Line:	920-8130
Marine and Air Search and Rescue (N.W.T.):	1-800-267-5631

10.1 Royal Oak Mines Inc. - Giant Mine

MINE TELEPHONE NUMBER: (867) 669-3700
MILL TELEPHONE NUMBER: (403) 669-3732

Name and Position	Work Number	Cellular number	Pager Number	Home Number
John Stard, Mine Manager	669-3701	873-1317	-	669-7938
Stephen Schultz, Superintendent, Environmental Services	669-3729	-	-	873-8323
Rob Moore, Mine Superintendent	669-3763	873-1318	-	873-2499
Kent Morton, Mill Superintendent	669-3730	669-1255	-	920-4514
Harold Mercer, Manager Human Resources and Safety (NWT)	669-3713	873-1278	-	669-9571
Dave Power, Senior Safety Supervisor	669-3717	-	920-5708	873-8824
Al Goetz, Maintenance Superintendent	669-3768	873-1374	920-5724	669-6378
Denis Gratton, Chief Engineer	669-3747	-	920-5709	669-9568
Bryan Cross, Mill Metallurgist	669-3733	-	-	920-7484
Lyle Bexson, Warehouse Purchasing Co-ordinator	669-3726	873-1039	-	873-6491

10.2 Government Departments

Government of Canada

Indian and Northern Affairs Canada	
Renewable Resources and Environment	669-2648
Water Resources	669-2651
Land Administration	669-2671
Arctic Environmental Laboratory	669-2781
Environmental & Conservation	669-2589
N.W.T. Water Board Office	920-8191
Water Resources Officer	669-2764
24 Hour Spill NWT Line	**920-8130**
Environment Canada	
Environmental Protection Branch	
District Office - Yellowknife	669-4700
FAX Line	873-8185
Fisheries & Oceans Canada	
Area Manager NWT West	920-6642
Arctic Habitat Coordinator	920-6641
Director Conservation & Compliance	920-6635
General Inquiries	920-6640

Government of the Northwest Territories

Resources, Wildlife and Economic Development

Environmental Protection	873-7654
Fax Line	873-0221

Workers Compensation Board

Prevention Services	
Director	873-7078
Mines Inspection Services	920-3888 or 669-4408
Mine Accident Report Line (24 Hours)	873-0123

Municipal and Community Affairs

Office of the Fire Marshall	873-7469
Emergency Measures	873-7083

City of Yellowknife

Office of the Mayor	920-569
General Inquiries	920-560

10.3 Outside Agencies

TEAP (Transportation Emergency Assistance Plan of the Canadian Chemical Producers Association) 24 Hour Emergency Number *(Primarily designed for Highway Transport Emergencies)*	(403) 477-8339
CANUTEC (Canadian Transport Emergency Centre) 24 Hour Emergency Number *(Primarily designed for Highway Transport Emergencies)*	(613) 996-6666

11.0 RESPONSE ACTIONS PLANS

Royal Oak Mines uses a variety of petroleum and chemical products at the Giant mine site. Royal Oak Mines has developed a number of individual Response Action Plans for some of the major materials used at the site. These are listed as follows and are presented in Appendix C.

Hydrocarbons:

1. P 40 Diesel Oil
2. Regular Unleaded Gasoline
3. Enviro 4000
4. Hydraulic and Lubricating Oil
5. Waste Oil

Selected Chemicals

1. Sodium Cyanide
2. Hydrogen Peroxide
3. Ferric Sulphate

Additionally, Royal Oak Mines has prepared two Response Actions Plans for spills from either the tailings line or tailings containment areas. These are also presented Appendix C.

References:

- **Royal Oak Mines Inc.**
  Giant Mine Yellowknife
  Emergency Spill Response and Contingency Plan
  August 1995

- **Echo Bay Mines Ltd.**
  Contingency Plan
  Lupin Operations
  April 1996

- **Government of the Northwest Territories**
  Department of Resources, Wildlife and Economic Development
  Spill Contingency Planning and Reporting Regulations
  July 1993

- **Government of Canada**
  Environment Canada
  Guidelines for the Preparation of Hazardous Material Spill Contingency Plans
  March 1990

- **Northwest Territories Water Board**
  Guidelines for Contingency Planning
  January 1987

- **Northwest Territories Water Board**
  Guidelines for Tailings Impoundment
  February 1987

APPENDIX A

ROYAL OAK MINES
ENVIRONMENTAL CODE OF PRACTICE

Royal Oak
Mines Inc.

ENVIRONMENTAL CODE OF PRACTISE

The environmental performance of any corporation has a direct bearing on statutory liability, public image and ultimately, profitability. As a good corporate citizen, *Royal Oak Mines Inc.* recognizes that it has a responsibility to manage the environmental performance of the Company's operations to the benefit of the operations, the Company, its shareholders and the environment. Environmental protection management at the Company's operations makes good business sense: production schedules are facilitated, statutory and environmental risks are minimized, and profitability is promoted.

Royal Oak Mines Inc. will take every practical precaution towards ensuring that its operations and/or products do not present an unacceptable level of risk to its employees, customers, the public or the environment. The Company will operate under an environmental code of practise that can be summarized as follows:

- *Royal Oak Mines Inc. will comply with all applicable statutory legislation in the jurisdictions in which it undertakes business.*

- *Royal Oak Mines Inc. will carry out its activities in a manner which both advances protection of the environment and minimizes the risk to the environment.*

- *Royal Oak Mines Inc. will self-monitor its environmental protection management programs to ensure compliance with both regulatory requirements and the Company's own internal performance standards.*

- *Royal Oak Mines Inc. will work with government(s) and the public to enhance communications and an understanding of the Company's activities with relation to environmental protection.*

It is the responsibility of every employee of *Royal Oak Mines Inc.* to carry out their daily activities in accordance with this environmental code of practise. Environmental protection management is the direct responsibility of operational line management.

Management supports and recommends the environmental audit program. This audit program is a proactive "management tool", which provides a systematic process for evaluating and co-operatively managing the environmental performance of the Company's operations.

Margaret K. Witte
President and C.E.O.

October 6, 1994

APPENDIX B

SPILL/INCIDENT REPORT FORMS

Northwest Territories

N.W.T. SPILL REPORT (Oil, Gas, Hazardous Chemicals or other Materials)

ᓄᓇᕗᑦ ᑯᐃᓕᒥ ᐅᓂᒃᑳᖅᑎᑦᑎᓂᖅ ᐃᓕᓴᕐᓂᖅ, ᐊᒻᒪᓗ, ᐊᑦᑕᕐᓇᖅᑐᑦ ᐃᓕᓴᕐᓂᐊᕐᓂᖅ ᐅᖃᓕᒫᓂᖅ)

24-Hour Report Line
24-ᓄᑦ ᐃᑲᖏᓄᑦ ᐅᓂᒃᑲᖏᐊᕐᓇᖅᑐᖅ ᐅᖃᓕᒫᖏᑦ
Phone/ᐅᖃᓕᒫᑦ (403) 920-8130
Fax/ᓱᒃᑐᐅᑯᑦ (403) 873-6924

A Report date and time ᐅᑦᓗᖅ ᓯᕗᓕᕐᓂᓗ ᖃᓄᐃᓕᖅᑐᑎᓪᓗᒍ ᐅᓂᒃᑲᐅᑎᒋᔭᖅᑕ	**B** Date and time of spill (if known) ᐅᑦᓗᖅᖃᑦ ᐊᖏᑎᑦᓗᒍ ᖃᓄᐃᓕᖅᑐᑎᓪᓗᒍ (ᖃᐅᔨᓪᓚᕐᓂᐊᕐᓗ)	**C** ☐ Original report ᓯᓚᑦᓂᖅᓯᒪᓕᒥ ᐅᓂᒃᑲᐅᑎᒋᔭᖅ ☐ Update no. _____ ᐅᓂᒃᑲᐅᑎᒋᒃᓂᓕᕆᖅ ᐊᓱᐅᑦ __	Spill number ᐊᖏᓯᑦ ᓇᓱᐅᑦ

D Location and map coordinates (if known) and direction (if moving)
ᓇᓂ ᐊᖏᑭ ᐊᓘᒪᓗ ᓇᓇᕐᖁᔭᑦ ᓇᓱᐅᑎᖅᑎᑦ (ᖃᐅᔨᓪᓚᕐᓂᐊᕐᓂᑦ) ᐊᓘᒪᓗ ᓇᒧᓐᓄᐅᑭᓐᓂᐊᕐᓪᓚᓐᓄᑦ (ᐃᖅᑎᖃᕐᓂᑦ)

E Party responsible for spill
ᑭᓄᑦ ᐊᖏᑎᒋᑎᑦ

F Product(s) spilled and estimated quantities (provide metric volumes/weights if possible)
ᑭᓯᑦ ᑭᓯᓕᔪᓂᑦ ᐊᖏᑭᑦ ᖃᓄᑎᒍ ᐊᖅᑭᓂᖃᖅᑕ (ᐊᖅᑭᓂᓐᓄᑦ ᐅᑭᖅᑎᓂᖅᑎᓕᔪᓂᑦ ᐊᐸᖃᓐᓇᖅᑕ)

G Cause of spill
ᑭᓯ ᐊᖏᓴᐸᑕᐅᑭ

H Is spill terminated? ᐊᖏᐸᖅ ᓄᖅᑲᖅᑎᑕᐅᑭ? ☐ yes/ Δ ☐ no/ ᑭᓐᓇ	**I** If spill is continuing, give estimated rate ᓯᓚ ᐊᖏᓴᑦ ᖃᓄᑎᒋ ᓯᓐᓂᑎᑎᖅᓱᖅᐸᑦ	**J** Is further spillage possible? ᐊᖏᓇᖅᓂᑐᐃᓐᓇᓚᖅᑲᖅᐸᑦ? ☐ yes/ Δ ☐ no/ ᑭᓐᓇ	**K** Extent of contaminated area (in square metres if possible) ᖃᓄᖅ ᑐᓴᐅᑎᑭᒃ ᐊᖏᖅᐊᐅᐸᖅ (ᐅᓄᕐᓯᓚᓗᒍ ᐊᐸᖃᓐᓇᖅᑕ)

L Factors affecting spill or recovery (weather conditions, terrain, snow cover, etc.)
ᑭᓯᑦ ᐱᓴᐸᑕᐅᑦ ᐊᖏᐸᒧᑦ ᐅᑭᓐᓄᑦ ᐊᖅᑭᑦᑕᐅᓇᓯᑎᑦᓗᒍ (ᓯᓚ ᖃᓄᐃᓕᓴᕐᓂᕐᓂᓄᑦ, ᓄᓇ ᖃᓄᐃᓕᓴᕐᓂᕐᓂᓄᑦ ᐊᓂᔨᓄᐅᓚᓯᓕᕐᓂᓄᓐᓄ, ᐊᓯᖏᓐᓄᑦᓂᓗ)

M Containment (natural depression, dykes, etc.)
ᐅᖅᓯᐊᓕᖅᖃᖅᐅᐸᑦ ᑭᓕᔪᒍᑦ ᐃᓯᖅᓴᓕᖅᓯᒪᐸᖅ (ᓄᓇᒥ ᐃᓯᖅᓴᐃᑦ, ᐊᓯᑭᓕᔪᓂᓕᓂᑦ)

N Action, if any, taken or proposed to contain, recover, clean up or dispose of product(s) and contaminated materials
ᖃᓄᐃᓕᓴᐅᑎᑭᒃ, ᖃᓄᐃᓕᓴᐅᑎᑭᖅᑐᑦ ᑭᑭᓯ ᖃᓄᐃᓕᓴᐅᑎᑭᖅᑐᑦᑎᓂᖅᑐᑦ ᐊᑕᐅᓯᖏᑎᑕᐅᓇᓯᓕᒃ, ᓄᖅᑲᖅᑎᑕᐅᓇᓯᓕᒃ ᑭᓴᓕᒪᓕᖅᑲᖅᑕᐅᑭᒃ ᑭᑭᓯ ᐃᓕᑕᐅᓇᖅᑐᑦ ᐊᖏᐸᖅ (ᐊᖏᐸᓕᔪᓂᑦ) ᑭᓘᒪᓗ ᐊᖏᓇᐃᑭᐅᓕᖅ.

O Do you require assistance? ᐃᑲᓇᖅᑕᐅᑦᓴᓇᖅᑐᖅᓱᐊᑦ? ☐ no ᑭᓐᓇ ☐ yes, describe: Δ - ᓇᓗᓇᐃᔨᓪᓗᒍ	**P** Possible hazards to persons, property, or environment; eg: fire, drinking water, fish or wildlife ᐊᑦᑕᑦᓇᐃᓐᓇᓚᖅᑲᖅᑕ ᐃᓄᓐᓄᑦ, ᐱᖓᑎᑎᔨᐅᓇᓄᑦ ᐅᑭᓐᓄᑦ ᐊᒋᑎᒧᑦ ᓯᓚᑦ - ᐃᑭᑦᓗᓂ, ᐃᒥᑦᒧᑦ ᓂᐅᖅᑲᖅᑕᐅᓯᒧᑦᓗᓂ, ᐃᖅᑲᓗᓇᓄᑦ ᐅᑭᓐᓄᑦ ᓂᕐᔪᑎᓄᑦ

Q Comments and/or recommendations ᐅᖅᑲᐅᓯᓴᐃᑦ ᑭᓘᒪᓗ ᐅᑭᓐᓄᑦᓂᖅᑐᑦ ᖃᓄᐃᓕᓴᐅᑎᖅᑐᑦᑕ

FOR SPILL LINE USE ONLY
ᐊᑐᖅᑕᐅᔪᓴᖅ ᐊᖏᓇᓄᑦ ᐅᖃᓕᑭᐃᐅᐸᐅᑐᓄᑐᖅ

Lead Agency
ᐃᖅᑲᓇᐃᔨᖅᑐᓕᓇᑭᐃᑦ ᐊᖏᓇᒥᖅ ᑲᒪᒋᔭᖅᑐᑦ-

Spill significance
ᐊᖏᓇᑦ ᖃᓄᐃᓕᖅᑐᖅ-

Lead Agency contact and time
ᐃᖅᑲᓇᐃᔨᖅᑐᓕᓇᑭᐃᑦ ᐊᖏᓇᒥᖅ ᑲᒪᒋᔭᖅᑐᑦ
ᖃᐅᔨᓴᖅᑕᐅᓂᖅ ᑭᓘᒪᓗ ᖃᓄᐃᓕᖅᑐᑎᓪᓗᒍ

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Is this file now closed? ☐ yes/Δ
ᑕᕐᓇ ᐅᓂᒃᑲᓚᐅᐸᖅ ᒪᑐᐅᑦ? ☐ no/ᑭᓐᓇ

Reported by ᐅᓂᒃᑲᖅᑐᖅ	Position, Employer, Location ᖃᓄᐃᑦᑐᒥᒃ ᐃᖅᑲᓇᐃᔨᓕᒃ, ᐃᖅᑲᓇᐃᔨᖅᑎᑦᓂᖅ, ᓇᒥ	Telephone ᐅᖃᓕᑭᐅᑦ
Reported to ᑭᓱᓕᒥ ᐅᓂᒃᑲᐅᑎᒋᔭᖅᑐᖅ	Position, Employer, Location ᖃᓄᐃᑦᑐᒥᒃ ᐃᖅᑲᓇᐃᔨᓕᒃ, ᐃᖅᑲᓇᐃᔨᖅᑎᑦᓂᖅ, ᓇᒥ	Telephone ᐅᖃᓕᑭᐅᑦ

Royal Oak Mines Inc.
NWT Division –

ACCIDENT/INCIDENT REPORT

Department

EXACT LOCATION	Date of Occurence	Time AM PM	Date Reported

PERSONAL INJURY

Injured's Name

Occupation | Injured Part of Body

Nature of Injury

Object/Equipment/Substance/Inflicting Injury

Person with Most Control of Object/Equipment/Substance

PROPERTY DAMAGE

Property Damaged

Estimated Costs

Nature of Damage

Object/Equipment/Substance/Inflicting Damage

Person with Most Control of Object/Equipment/Substance

ANALYSIS

Describe clearly how the accident occurred: Attach accident diagram for all mobile equipment accidents.

DESCRIPTION

Immediate Causes (Substandard Practices or Conditions)

What acts, Failures to Act and/or Conditions Contributed Most Directly to this Accident/Incident.

Basic Causes (Personal and Job Factors)

What are the Basic or Fundamental Reasons for the Existence of these Acts and/or Conditions?

LOSS SEVERITY POTENTIAL			PROBABLE RECURRENCE RATE		
Major	Serious	Minor	Frequent	Occasional	Rare

PREVENTION

What Action has or will be Taken to Prevent Recurrence? Place X by Items Completed.

Investigated By:	Date:	Reviewed By:
		Date:

THIS FORM MUST BE ROUTED ACCORDING TO THE NUMBERS.

1. Investigator's comments:

Investigator's Signature: Date:

2. Mine Foreman's/General Foreman's comments:

Mine Foreman's/General Foreman's Signature: Date:

3. Department Superintendent's comments:

Department Superintendent's Signature: Date:

4. Safety/Training Department comments:

Safety/Training Department Signature: Date:

5. General Manager's comments:

General Manager's Signature: Date:

6. Front Line Supervisor's comments:

Front Line Supervisor's Signature: Date:

7. Comments of Employee Involved:

I have read and understand the information provided and the recommendations made in this report.

Employee Signature: Date:

APPENDIX C

RESPONSE ACTIONS PLANS

RESPONSE ACTION PLAN — DIESEL FUEL SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number.
- ELIMINATE ignition sources and any open flame.
- STOP the flow of product.
- CONTAIN the flow of oil by dyking with earth or other barrier, blocking any entry to waterways, construction of an oil interceptor trench or underflow dam, etc. If spill has reached natural waters, deploy a containment boom and apply oil sorbent materials.

RECOVERY

- Recover as much free product as possible by pumping into drums or portable tanks. Excavate any contaminated soils/snow and dispose of at an approved site. Diesel fuel spilled on water can be recovered by using skimmers or sorbent booms.

FIRE RESPONSE

- Use CO_2, dry chemical, foam or water spray (fog).
- Use water to cool tanks.
- Divert the fuel to a secure area and allow to burn under control.
- If diesel fuel is escaping, get it contained as soon as possible.

PROPERTIES

- Chemical composition hydrocarbon C_9 to C_{16} range.
- Clear to yellow with hydrocarbon odour.
- Floats on water.
- Flash Point 40° C.

ENVIRONMENTAL CONCERNS

- Toxic to fish and other aquatic organisms, harmful to waterfowl.

CONTAINERS

- Transported to the site by tanker truck and transferred to various storage tanks at the mine.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. For confined spaces SCBA may be required.
- Aviod contact with strong oxidizers such as nitric acid, sulphuric acid, chlorine and peroxides.

RESPONSE ACTION PLAN GASOLINE SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number.
- ELIMINATE ignition sources and any open flame.
- REMOVE all personnel not involved with the incident from the area.
- STOP the flow of product.
- CONTAIN the flow of gasoline by dyking with earth or other barrier, blocking any entry to waterways, construction of an oil interceptor trench or underflow dam, etc. If spill has reached natural waters, deploy a containment boom and apply oil sorbent materials or leave to evaporate.
- Gasoline contains benzene a suspected carcinogen. Avoid breathing vapours, and if necessary, obtain an organic vapour cartridge full face respirator or wear SCBA.

RECOVERY

- Conduct regular explosive atmosphere monitoring with an intrinsically safe instrument.
- Recover as much free product as possible by pumping into drums or portable tanks. Free Product recovery operations should utilize an **explosion proof** pump and all equipment involved in the transfer **must be** properly grounded. Excavate any contaminated soils/snow and dispose of at an approved site. Gasoline spilled on water can be recovered by using skimmers or sorbent booms or left to evaporate.
- When excavating gasoline contaminated soils, consider using a layer of fire suppression foam to reduce the potential of explosion arising from sparks caused during excavating.

FIRE RESPONSE

- Use CO_2, dry chemical, foam or water spray (fog).
- Use water to cool tanks.
- Divert the gasoline to a secure area and allow to burn under control.
- If gasoline is escaping, get it contained as soon as possible.

PROPERTIES

- Chemical composition hydrocarbon C_4 to C_{12} range.
- Light green, clear, amber colour liquid with hydrocarbon odour.
- Floats on water.
- Flash Point -50° C.
- Vapours and product are highly flammable and explosive.
- Vapours are heavier than air.

ENVIRONMENTAL CONCERNS

- Toxic to fish tp fish and other aquatic organisms, harmful to waterfowl.

CONTAINERS

- Transported to the site by tanker truck and transferred to a single underground storage tank situated near the warehouse at the mine.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. For confined spaces SCBA may be required.
- Eliminate all sources of ignition.
- Restrict access and work upwind from the spilled product.
- Avoid contact with strong oxidizers such as nitric acid, sulphuric acid, chlorine and peroxides.

RESPONSE ACTION PLAN ENVIRO 4000 FUEL SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number.
- ELIMINATE ignition sources and any open flame. Vapours may ignite if exposed to static discharge.
- STOP the flow of product.
- CONTAIN the flow of oil by dyking with earth or other barrier, blocking any entry to waterways, construction of an oil interceptor trench or underflow dam, etc. If spill has reached natural waters, deploy a containment boom and apply oil sorbent materials.

RECOVERY

- Recover as much free product as possible by pumping into drums or portable tanks. Excavate any contaminated soils/snow and dispose of at an approved site. Use proper grounding procedures. Enviro 4000 fuel spilled on water can be recovered by using skimmers or sorbent booms.

FIRE RESPONSE

- Use dry chemical, foam or water spray (fog).
- Use water to cool tanks.
- Divert the fuel to a secure area and allow to burn under control.
- If Enviro 4000 fuel is escaping, get it contained as soon as possible.

PROPERTIES

- Chemical composition hydrocarbon C_x to C_{xx} range.
- A light brown colour with a hydrocarbon odour.
- Floats on water.
- Flash Point 28° C (closed cup).

ENVIRONMENTAL CONCERNS

- Toxic to fish and other aquatic organisms, harmful to waterfowl.

CONTAINERS

- Transported to the site by tanker truck and transferred to various storage tanks at the mine.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. For confined spaces SCBA may be required. The use of organic cartridge respirators is also suggested for protection from vapours.
- Avoid contact with strong oxidizers such as nitric acid, sulphuric acid, chlorine and peroxides.

RESPONSE ACTION PLAN LUBRICATING & HYDRAULIC SPILLS

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number.
- ELIMINATE ignition sources and any open flame.
- STOP the flow of product.
- CONTAIN the flow of oil by dyking with earth or other barrier, blocking any entry to waterways, construction of an oil interceptor trench or underflow dam, etc. If spill has reached natural waters, deploy a containment boom and apply oil sorbent materials.

RECOVERY

- Recover as much free product as possible by pumping into drums or portable tanks. Excavate any contaminated soils/snow and dispose of at an approved site. Lubricating and hydraulic oils spilled on water can be recovered by using skimmers or sorbent booms. Use sorbent pads or granular sorbents for minor spills.

FIRE RESPONSE

- Use CO_2, dry chemical, foam or water spray (fog). Water may spread fire.
- Use water to cool other containers.
- Divert the oil to a secure area and allow to burn under control.
- If oils are escaping, get it contained as soon as possible.
- Wear SCBA and eye protection.

PROPERTIES

- Chemical composition mixture of hydrocarbons and conventional industrial oil additives C_{22} to C_{66} range.
- Light and dark amber colours with hydrocarbon odour.
- Floats on water.
- Flash Point 190 to 215° C.

ENVIRONMENTAL CONCERNS

- Toxic to fish and other aquatic organisms, harmful to waterfowl.
- Will foul river banks, shorelines, etc.

CONTAINERS

- Transported to the site by oil company truck and transferred to various storage locations at the mine. Products stored in various size containers up to 205 l drum.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. The use of an organic cartridge respirator will not likely be required.
- Avoid contact with strong oxidizers such as nitric acid, sulphuric acid, chlorine and peroxides..

RESPONSE ACTION PLAN — WASTE OIL SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number.
- ELIMINATE ignition sources and any open flame.
- STOP the flow of product.
- CONTAIN the flow of oil by dyking with earth or other barrier, blocking any entry to waterways, construction of an oil interceptor trench or underflow dam, etc. If spill has reached natural waters, deploy a containment boom and apply oil sorbent materials.

RECOVERY

- Recover as much free product as possible by pumping into drums or portable tanks. Excavate any contaminated soils/snow and dispose of at an approved site. Waste oil spilled on water can be recovered by using skimmers or sorbent booms. Use sorbent pads or granular sorbents for minor spills.

FIRE RESPONSE

- Use CO_2, dry chemical, foam or water spray (fog). Water may spread fire.
- Use water to cool other containers.
- Divert the oil to a secure area and allow to burn under control.
- If oils are escaping, get it contained as soon as possible.
- Wear SCBA and eye protection.

PROPERTIES

- Chemical composition mixture of hydrocarbons and conventional industrial oil additives C_{22} to C_{66} range.
- Black and brown colours with hydrocarbon odours.
- Floats on water.
- Flash Point 100 to 200° C.

ENVIRONMENTAL CONCERNS

- Toxic to fish and other aquatic organisms, harmful to waterfowl.
- Will foul river banks, shorelines, etc.

CONTAINERS

- Transported to the site by oil company truck and transferred to various storage locations at the mine. Products stored in various size containers up to 205 l drum.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. The use of an organic cartridge respirator will not likely be required.
- Avoid contact with strong oxidizers such as nitric acid, sulphuric acid, chlorine and peroxides..

RESPONSE ACTION PLAN — SODIUM CYANIDE SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number. Technical assistance for spills is also available from Dupont Emergency Response Centre 24 hours a day at **(613) 348-3616**.
- Alert First Aid staff as to the nature of the emergency.
- Monitor air quality for the presence of hydrocyanic acid (HCN) gas. Do **not** enter area containing sodium cyanide (NaCN) dust or HCN gas without SCBA.
- Secure the site and prevent non authorized entry.
- STOP the flow of sodium cyanide at source and PREVENT sodium cyanide from contacting any acid, acid salts or water as this will release HCN gas. If sodium cyanide contacts water, contain spill to as small an area as possible.
- CONTAIN the sodium cyanide by dyking with earth, sand bags or other barrier, blocking any entry to waterways, construction of an interceptor trench or depression, etc. Neutralize with lime. If spill has reached water, build a dyke or berm to contain.
- Wear protective clothing and SCBA, ventilate area and add hydrated lime to slow reaction.

RECOVERY

- Recover as much dry product as possible by shovelling into drums or containers. Provide workers with dust masks. Excavate any contaminated soils/snow and dispose of at an approved site ensuring no contact with water or drainage towards watercourses. Sodium cyanide spilled on wet or rain soaked surfaces can be recovered by shovelling into waterproof containers. Spray affected area with calcium hypochlorite to avoid the formation of toxic HCN gas. Solutions that are not recovered can be neutralized by adding lime and a solution of calcium hypochlorite. Use sorbents for minor spills. Collected liquids should be pumped to leakproof containers pending disposal.

FIRE RESPONSE

- Material is not flammable and will not support combustion.
- Do **not** use CO_2 to extinguish the fire as this may produce HCN gas. Use extinguishers compatible with storage site construction materials. If water must be used, limit quantities and treat any runoff as a spill of sodium cyanide solution.
- Wear SCBA and protective clothing.

PROPERTIES

- Chemical formula is **NaCN**. Product is very soluble in water.
- Material is white solid, briquets or granules.
- Aqueous solutions is alkaline and subject to rapid decomposition.
- Absorbs moisture from the air.

ENVIRONMENTAL CONCERNS

- Toxic to fish and other aquatic organisms, concentrations less than 1mg/l are of concern. Prevent entry into waterways.
- Dispose of recovered solid sodium cyanide in the mill if quality is acceptable.
- Soil containing sodium cyanide can be added to the mill circuits under the direction of the Mill Superintendent or at the Tailings pond.

CONTAINERS

- Transported to the site in 93 kg drums and stored in the fenced lumber yard.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. Leather work boots are not recommended. The use of SBA is required.
- Avoid contact with skin, clothing and **do not get into eyes**. Wash throughly after handling.
- Avoid inhalation of dust and prevent it from contacting eyes.
- Shower after incident response shift. Refrain from eating and smoking until after completing wash up. Properly decontaminate work clothing or dispose. Dispose leather boots if worn during clean up.

RESPONSE ACTION PLAN HYDROGEN PEROXIDE SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number. Technical assistance for spills is also available from Dupont Emergency Response Centre 24 hours a day at **(613) 348-3616**.
- Alert First Aid staff as to the nature of the emergency.
- Monitor air quality for the presence of vapours. Do **not** enter spill area without proper protective clothing. Ventilate the spill area. Prevent contact with eyes, skin, etc.
- Secure the site and prevent non authorized entry.
- STOP the flow of material as near to the leak source as possible.
- CONTAIN the flow by dyking with earth, sand bags or other barrier, blocking any entry to waterways, construction of an interceptor trench or depression, etc. May be destroyed by applying sodium metabisulfite or sodium sulfite. If spill has reached water, build a dyke or berm to contain.
- Wear protective clothing and SCBA, do not use leather boots or gloves as these can ignite following contact with peroxide. Cotton clothing can also ignite.

RECOVERY

- Recover as much dry product as possible by shovelling into drums or containers. Provide workers with face, skin and breathing protection. Excavate any contaminated soils/snow and dispose of at an approved site ensuring no contact with water or drainage towards watercourses. Use sorbents for minor spills. Collected liquids should be pumped to leakproof containers pending disposal.

FIRE RESPONSE

- Material will not burn, but decomposition, which may be caused by heat will release oxygen which increases the explosive limit range and burning rate of flammable vapours .
- Use only water, cool tanks/ containers with water spray.
- Wear SCBA and suitable protective clothing not leather.

PROPERTIES

- Chemical formula is H_2O_2. Product is very soluble in water.
- Material is a clear liquid with a pungent odour.

ENVIRONMENTAL CONCERNS

- Toxic to fish and other aquatic organisms, concentrations less than 1mg/l are of concern. Prevent entry into waterways.
- Dispose of recovered diluted product at the water treatment plant.

CONTAINERS

- Transported to the site in bulk by truck and stored at the effluent treatment plant.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. Leather work boots and gloves are not recommended. The use of SBA is required.
- Avoid contact with skin, clothing and **do not get into eyes**. Wash throughly after handling.
- Shower after incident response shift. Refrain from eating and smoking until after completing wash up. Properly decontaminate work clothing or dispose. Dispose leather boots and gloves if worn during clean up.

RESPONSE ACTION PLAN FERRIC SULPHATE SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be advised of the incident and a response initiated. Report spill to 24 hour number.
- STOP the flow of ferric sulphate at source and PREVENT solid ferric sulphate from contacting any water.
- CONTAIN the flow of ferric sulphate solution by dyking with earth, sand bags or other barrier, blocking any entry to waterways, construction of an oil interceptor trench or depression, etc. Neutralize with lime. If spill has reached water, deploy a containment boom and apply oil sorbent materials.

RECOVERY

- Recover as much dry product as possible by shovelling into drums or containers. Excavate any contaminated soils/snow and dispose of at an approved site. Waste ferric sulphate spilled on water can be recovered by using skimmers or sorbent booms. Use sorbents for minor spills. Collected liquids should be pumped to containers pending disposal.

FIRE RESPONSE

- Material is non-combustible.
- Use extinguishers compatible with storage site construction materials.
- Wear SCBA and protective clothing.

PROPERTIES

- Chemical formula is $Fe_2(SO_4)_3$. Product is soluble in water and is 55% weight on average.
- Dry powder is reddish brown and liquid is clear red.
- Odourless.

ENVIRONMENTAL CONCERNS

- Toxic to fish and other aquatic organisms, through accumulation in the ecosystem.
- Dispose of all containers at an approved disposal site. Landfilling is not recommended.

CONTAINERS

- Transported to the mine site in bulk and stored at the Effluent Treatment Plant.

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles. The use of SCBA is required for confined space.
- Avoid contact with skin clothing and **do not get into eyes**. Wash throughly after handling.
- Avoid inhalation of dust and prevent it from contacting eyes.

RESPONSE ACTION PLAN — TAILINGS LINE SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be IMMEDIATELY advised of the incident by radio, phone or in person. Initiate mill shut down procedures to STOP product flow. Notify the Mine Manager and activate response team. Report spill to 24 hour number.
- CONTAIN the flow of tailings by dyking with earth, sand bags, snow or other barrier, blocking any entry to waterways, construct an interceptor trench or direct flow towards a low area away from water. If spill has reached natural waters, contain or divert tailings away from the water. Construct a berm if required. Use earth moving equipment.

RECOVERY

- Excavate any tailings contaminated soils/snow and dispose of at the tailings pond. Replace all excavated soils with clean backfill to previous levels. Contact local authorities for approval to temporarily berm water courses for containment and clean up.

FIRE RESPONSE

- Use dry chemical, foam or water spray (fog).
- Use water to cool tanks.
- Do not use CO_2 to fight fires as HCN gas could be released.

PROPERTIES

- Tailings contain a mixture of mill reagents including sodium cyanide, lime, zinc, finely ground rock in water having a dark gray colour. Tailing solution is generally odourless ,however at times, there is a faint cyanide odour (bitter almond).

ENVIRONMENTAL CONCERNS

- Extremely toxic to fish and other aquatic organisms, harmful to wildlife and waterfowl.
- Solids known to generate acid though oxidation if left exposed to weather or open environment.

CONTAINERS

- N/A

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles.
- Avoid contact with products such as nitric acid, sulphuric acid, and peroxides as these could liberate HCN gas.

RESPONSE ACTION PLAN — TAILINGS POND SPILL

24 HOUR SPILL REPORT LINE 920-8130

INITIAL RESPONSE

- The Mill Superintendent or designate shall be IMMEDIATELY advised of the incident by radio, phone or in person. Initiate mill shut down procedures to STOP product flow. If needed, divert tailings flow to an unaffected area. Notify the Mine Manager and activate response team. Report spill to 24 hour number.
- CONTAIN the flow of tailings by dyking with earth, sand bags, snow or other barrier, blocking any entry to waterways, construct an interceptor trench or direct flow towards a low area away from water. If spill has reached natural waters, try to eliminate additional tailings from entering the water. Construct a berm if required. Use earth moving equipment to complete repairs to containment dam.

RECOVERY

- Pump tailings to alternate containment pond. Excavate any tailings contaminated soils/snow and dispose of at the tailings pond. Replace all excavated soils with clean backfill to previous levels. Contact local authorities for approval to temporarily berm water courses for containment and clean up.

FIRE RESPONSE

- Use dry chemical, foam or water spray (fog).
- Use water to cool tanks.
- Do not use CO_2 to fight fires as HCN gas could be released.

PROPERTIES

- Tailings contain a mixture of mill reagents including sodium cyanide, lime, zinc, finely ground rock in water having a dark gray colour. Tailings solution is generally odourless ,however at times, there is a faint cyanide odour (bitter almond).

ENVIRONMENTAL CONCERNS

- Extremely toxic to fish and other aquatic organisms, harmful to wildlife and waterfowl.
- Solids known to generate acid though oxidation if left exposed to weather or open environment.

CONTAINERS

- N/A

PERSONAL PROTECTION

- Wear impervious chemical resistant clothing, gloves, footwear and goggles.
- Avoid contact with products such as nitric acid, sulphuric acid, and peroxides as these could liberate HCN gas.

APPENDIX D

MATERIAL SAFETY DATA SHEETS

DUPONT CANADA INC.

MATERIAL SAFETY DATA SHEET

Sodium Cyanide

CEC00007 Revised 12-JUN-1998 Printed 15-JUL-1998

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"Cyanobrick", "Cyanogran" are registered trademarks of DuPont.

Corporate MSDS Number	: DU000290
CAS Number	: 143-33-9
Formula	: NaCN
CAS Name	: SODIUM CYANIDE
Grade	: "CYANOBRIK"; "CYANOGRAN"

Product Use

Ore leaching and flotation

Tradenames and Synonyms

Cyanide of Sodium
Prussiate of Soda

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont Canada, Inc.
P.O. Box 2200
Streetsville
Mississauga, Ontario L5M 2H3

PHONE NUMBERS

Product Information	: 1-800-387-2122
Transport Emergency	: 1-613-348-3616 (24 HOURS)
Medical Emergency	: 1-613-348-3616 (24 HOURS)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
*SODIUM CYANIDE	143-33-9	>96 WT%
OTHER SODIUM SALTS		<4 WT%

* Disclosure as a toxic chemical is required under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

HAZARDS IDENTIFICATION

Potential Health Effects

May be fatal if inhaled, swallowed, or absorbed through skin. Contact with acids, water or weak alkalies liberates poisonous hydrogen cyanide gas. Causes eye burns. May irritate skin and cause alkali burns.

HUMAN HEALTH EFFECTS:

Overexposure by skin contact may include alkali burns, skin irritation with discomfort, and rash. Eye contact may include irritation or burns with discomfort, tearing or blurring of vision. Excessive and prolonged contact may result in permanent eye damage.

Effects of skin contact, inhalation or ingestion overexposures to cyanide are characterized by central nervous system excitation followed by depression. Symptoms may include:

- Reddening of the eyes
- Irritation of the throat
- Palpitation
- Difficulty in breathing
- Salivation
- Numbness
- Nausea
- Headache
- Weakness of arms and legs
- Giddiness
- Collapse
- Convulsions

Convulsions, coma and death due to respiratory arrest may occur without first aid or medical treatment.

Cyanosis (bluish discoloration of the skin) is a sign that follows cardiovascular collapse and apnea (absence of breathing). Reported chronic effects of acute, severe overexposures may not be due to cyanide per se but to the hypoxic (oxygen deficient) state. There appears to be no cumulative effects from repeated exposures. Reports of chronic thyroid effects from occupational exposure to cyanide fail to establish a well defined cause-effect relationship, but may be related to vitamin deficiency.

(HAZARDS IDENTIPICATION - Continued)

Individuals with preexisting diseases of the central nervous system may have increased susceptibility to the toxicity of excessive exposures.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

Compound-Specific First Aid & Notes to Physicians

A step-wise procedure of "First Aid" and "Medical Treatment" is recommended for any cyanide poisoning. Treatment requires immediate action to prevent harm or death. First Aid is given initially, and experience shows that when given promptly it is usually the only treatment needed for typical accidental poisonings. Medical treatment may be needed for more severe poisoning.

First aid treatment uses oxygen and amyl nitrite and can be given by a first responder before medical help arrives.

Medical treatment is given if the patient does not respond to First Aid. Medical Treatment is a more aggressive treatment requiring intravenous injections of sodium nitrite and sodium thiosulfate, and must be administered by qualified medical personnel. It provides a larger quantity of antidote which also helps eliminate cyanide from the body. Even if a doctor or nurse is present, the need for fast treatment dictates using the First Aid procedure with oxygen and amyl nitrite while Medical Treatment materials for intravenous injection are being prepared. When antidotal treatment is necessary, it should be started immediately.

IN CASE OF CYANIDE POISONING, START FIRST AID TREATMENT IMMEDIATELY, THEN CALL A PHYSICIAN.

In most cases, cyanide poisoning causes a deceptively healthy pink to red skin color. However, if a physical injury or lack of oxygen is involved, the skin color may be bluish. Reddening of the eyes and pupil dilation are also symptoms of cyanide poisoning. Cyanosis (blue discoloration of the skin) tends to be associated with severe cyanide poisonings whereas red coloration of the skin is more common in industrial accidents that involve less cyanide.

(FIRST AID MEASURES - Continued)

All persons with the potential for cyanide poisoning should be trained to provide immediate First Aid using oxygen and amyl nitrite. Always have on hand the materials listed below in the FIRST AID and MEDICAL TREATMENT Sections. Actions to be taken in case of cyanide poisoning should be planned and practiced before beginning work with cyanides. Identification of community hospital resources and emergency medical squads in order to equip and train them on handling of cyanide emergencies is essential.

FIRST AID

FIRST AID SUPPLIES

Adequate First Aid supplies for cyanide poisoning should be conveniently placed throughout the cyanide areas and should be immediately accessible at all times, but secured against tampering or theft. Supplies should be routinely inspected (typically daily) by people who would use them in an emergency. The total number of each item listed below should be adequate to handle the largest number of exposure cases reasonably anticipated, taking into account that some supplies may be wasted, destroyed, or inaccessible in the emergency.

1. Oxygen Resuscitators - Any positive pressure resuscitator capable of giving oxygen in conjunction with amyl nitrite can be used.

2. Amyl Nitrite Ampoules (antidote) - One box of one dozen ampoules per station is usually satisfactory. Locate stations throughout the cyanide area.

CAUTION: Amyl nitrite is not stable and must be replaced every 1-2 years, or earlier depending on storage conditions. Store in the original dated box away from heat and freezing temperatures. Do not store amyl nitrite or Medical Treatment Kits (see below) in enclosed areas where temperatures can exceed 60-66 deg C (140-150 deg F) or where freezing may occur. Storage in high temperature climates may require replacement before the expiration date, unless cool storage is provided. Avoid excessive cold storage which will reduce the vapor pressure of amyl nitrite and, hence, its effectiveness. A common DuPont practice is to use the resuscitator as the storage point for the amyl nitrite ampoules.

3. A set of cyanide first aid instructions should be located at each amyl nitrite storage location. Workers should be fully trained since in a real emergency there will be insufficient time to "read the book".

Amyl Nitrite Notes:

1. Amyl nitrite is highly volatile and flammable; do not smoke or use around a source of ignition.

(FIRST AID MEASURES - Continued)

2. If treating a patient in a windy or drafty area, provide something--a rag, shirt, wall, drum, cupped hand, etc.--to prevent the amyl nitrite vapors from being blown away. Keep the ampoule upwind from the nose. The objective is to get amyl nitrite into the patient's lungs.

3. Rescuers should avoid amyl nitrite inhalation to avoid becoming dizzy and losing competence.

4. Lay the patient down. Since amyl nitrite dilates blood vessels and lowers blood pressure, laying the patient down will help prevent unconsciousness.

5. Do not overuse. Monitor the patient for shock which would indicate excessive use. This has not occurred in practice at DuPont plants, and we are nor aware of any serious after effects from treatment with amyl nitrite.

6. Review and adhere to proper storage, inspection and replacement requirements given above.

FIRST AID PROCEDURE

The exposed person should be removed from the contaminated area, contaminated clothing removed and the individual washed off. The rescuer and/or person providing first aid is subject to exposure if the affected person's clothing is wetted with cyanide. For HYDROGEN CYANIDE, rescue of a wetted person should be done wearing self-contained breathing air (SCBA), rubber gloves, and other personal protective equipment as necessary. For SODIUM CYANIDE or POTASSIUM CYANIDE dusts or solutions, SCBA is normally not needed. Contact with HYDROGEN CYANIDE must be avoided by rescuers, but short contact from solid cyanide or solutions is normally not a problem if skin washing is prompt. As soon as possible, even while clothing is being removed or washing is taking place, First Aid should be started.

1. If no symptoms are evident, no treatment is necessary; decontaminate patient.

2. If conscious but symptoms (nausea, difficult breathing, dizziness, etc.) are evident, give oxygen.

3. If consciousness is impaired (non-responsiveness, slurred speech, confusion, drowsiness) or the patient is unconscious but breathing, give oxygen and amyl nitrite by means of a resuscitator.

To give amyl nitrite, break an ampoule in a gauze pad and insert into lip of the resuscitator mask for 15 seconds, then take away for fifteen seconds. Repeat 5-6 times. If necessary, use a fresh ampoule every 3 minutes until the patient regains consciousness (usually 1-4 ampoules). Administer oxygen continuously. Guard against the ampoule entering the patient's mouth.

(FIRST AID MEASURES - Continued)

4. If not breathing, give oxygen and amyl nitrite immediately by means of a positive pressure resuscitator (artificial respiration).

See 3. above, and continue to give oxygen simultaneously to aid recovery. If massive exposure occurred, consider keeping the first one or two ampoules in the lip of the resuscitator mask continuously. Guard against the ampoule entering the patient's mouth.

INHALATION

If consciousness is impaired, oxygen and amyl nitrite should be administered as indicated above. Carry the patient to an uncontaminated atmosphere. Keep the patient warm and calm. Call a physician.

SKIN CONTACT

If consciousness is impaired, oxygen and amyl nitrite should be administered as indicated above. Immediately flush with large quantities of water for up to 5 minutes after contact or suspected contact, and completely remove all contaminated clothing (including shoes or boots). Flushing with water for up to 5 minutes is generally sufficient to effectively remove cyanide from the patient's skin. Call a physician.

EYE CONTACT

Immediately flush the eyes with large quantities of water for up to 5 minutes while holding the eyelids apart. Do not try to neutralize with "acids" or "alkalis". Eye contact will require further evaluation and possibly treatment. Continue rinsing the eye during transport to the hospital. See a physician. Oxygen and amyl nitrite should be used as indicated above.

INGESTION

If consciousness is impaired, oxygen and amyl nitrite should be administered as indicated above. If the patient is conscious, immediately give the patient activated charcoal slurry. Never give anything by mouth to an unconscious person. Call a physician. Continue to give oxygen. DO NOT give Syrup of Ipecac or other emetics since they will induce vomiting which could interfere with resuscitator use.

NOTE: To prepare activated charcoal slurry, mix 50 grams of activated charcoal in 400 mL (about 2 cups) water and mix thoroughly. Give 5 mL/kg, or 350 mL for an average adult.

MEDICAL TREATMENT

(FIRST AID MEASURES - Continued)

EXPERIENCE SHOWS THAT FIRST AID GIVEN PROMPTLY IS USUALLY THE ONLY TREATMENT NEEDED FOR TYPICAL INDUSTRIAL CYANIDE POISONING. LARGER CYANIDE POISONINGS INCREASE THE NEED FOR MEDICAL TREATMENT.

Do not over-react. Although prompt action is essential when poisoning has occurred, a lucid, conscious person who can communicate may not have significant cyanide poisoning and Medical Treatment will rarely be necessary. "Treat what you see" is a good rule of thumb. Mildly symptomatic patients who remain alert may be managed by supportive care only.

The half-life of cyanide in the body is about 20-90 minutes. In diagnosis and monitoring of patients, the critical period for treatment is short. Normally the effects from cyanide poisoning occur in the first few minutes and will indicate the degree of poisoning.

"Preventive" use of cyanide antidote in the absence of impaired consciousness is not normally warranted. Keep the patient calm by assurance over the next 30 minutes, and closely monitor the patient's condition. If skin contact with cyanide has been prolonged and/or extensive cyanide has been ingested, watch the individual closely for at least 30 minutes to assure there are no effects from delayed absorption of cyanide into the blood stream.

Consider assuring intravenous access in cases where significant toxicity is possible. Establishment of IV access with normal saline, Ringer's lactate, or other available IV fluid will facilitate administration of the antidote if necessary.

MEDICAL TREATMENT KITS

Medical Treatment Kits for cyanide poisoning should be conveniently located for easy access. Materials for intravenous injection are intended for use only by a physician or fully qualified medical personnel. The location of kits should be carefully planned as part of the emergency program. Kits should always be taken with patient during transport to medical facilities to ensure availability. Suggested locations for kits include:

- in or near the cyanide area
- plant medical station
- guard house entrance
- local hospital
- doctor's office and residence

(FIRST AID MEASURES - Continued)

CAUTION: Avoid storing amyl nitrite or Medical Treatment Kits in areas subject to extreme heat or freezing conditions. Kits and amyl nitrite should be accessible but secured against tampering. They should be inspected regularly and the amyl nitrite ampoules replaced every 1-2 years (See First Aid Supplies Section). Medical Treatment Kits should contain the following:

1. One box containing one dozen (12) amyl nitrite ampoules.

2. Two sterile ampoules of sodium nitrite solution (10 mL of a 3% solution in each).

3. Two sterile ampoules of sodium thiosulfate solution (50 mL of a 25% solution in each).

4. One 10 mL sterile syringe. One 50 mL sterile syringe. Two sterile intravenous needles. One tourniquet.

5. One dozen gauze pads.

6. Latex gloves.

7. A "Biohazard" bag for disposal of bloody/contaminated equipment.

8. A set of cyanide instructions on first aid and medical treatment.

NOTE: Amyl nitrite ampoules and Medical Treatment Kits can be purchased through local pharmacies with a physician's prescription. The pharmacy can order kits by calling Taylor Pharmaceuticals at:

o 800-223-9851 or 714-492-4030

MEDICAL TREATMENT PROCEDURE

1. Sodium nitrite: Adult - 10 mL of 3% solution (300 mg) Draw solution from the ampoule and inject slowly over 4-5 minutes (2 to 2.5 mL/minute). As soon as practical, monitor blood pressure and continue checking pulse. Slow the rate of injection if hypotension (low blood pressure) occurs.

2. Sodium thiosulfate: Adult - 50 mL of 25% solution (12.5 grams) Follow sodium nitrite with sodium thiosulfate injected at a rate of 2.5 mL/minute (10-20 minutes).

The total time for injection of these initial doses of both components at the recommended rates is lengthy, approximately 20-25 minutes.

(FIRST AID MEASURES - Continued)

Consider the body weight and condition of the patient when treating a cyanide exposed patient with sodium nitrite. Both amyl nitrite and sodium produce methemoglobin, which reduces the oxygen carrying capacity of the blood. Methemoglobinemia is potentially harmful when methemoglobin levels exceed 20-30% (See Antidotal Effects below).

If symptoms persist or recur after the initial treatment, repeat the antidote at one half the original doses one hour after the original administration. Monitor methemoglobin levels when practical in every patient treated with the intravenous antidote.

AVOID OVER-TREATMENT.

The above sodium nitrite injection is about one-third the lethal dose, so care should be taken to avoid excessive use. Excessive use has not occurred in DuPont's experience. It is not essential that full quantities of antidote be given just because treatment was started. Should injection be stopped for any reason, keep track of the amount administered in case treatment needs to be restarted.

ANTIDOTAL EFFECTS

Nitrites can produce hypotension through peripheral vasodilatation (widening of the blood vessels). Methemoglobin formation, although considered a therapeutic effect, may cause symptoms if levels exceed 20-30%. Recommended intravenous doses of sodium nitrite usually produce methemoglobin levels under 20%. Headache, nausea, vomiting, and syncope (fainting) may follow nitrite administration, and syncope may occur if the patient is not lying down. While it is important to be aware of the effects from nitrite therapy, there have been no long-lasting effects associated with this treatment regimen for cyanide exposure in DuPont's experience and knowledge.

RECOVERY AND DISPOSITION

For most accidental poisonings, patients can be revived in a few minutes using oxygen and amyl nitrite with complete recovery within a few hours.

If necessary, the patient should be monitored for 24-48 hours. Any patient whose symptoms require the use of IV antidote should be considered for admittance to an intensive care unit.

Observe for return of symptoms. Monitor methemoglobin levels, blood pH and oxygenation through arterial blood gas analysis. Calculate anion gap from serum electrolytes. Cyanide poisoning causes lactate accumulation and an anion gap metabolic acidosis.

(FIRST AID MEASURES - Continued)

Delayed neurotoxic effects are not expected consequences of cyanide exposure although these neurotoxic effects may occur if hypoxia (oxygen deficiency) was prolonged or occurred following massive cyanide exposure.

In the presence of smoke inhalation that can occur during fires, withholding amyl nitrite or sodium nitrite administration should be considered because of the potential for high carboxyhemoglobin levels. However, administration of oxygen and possibly thiosulfate should be continued.

FIRE FIGHTING MEASURES

Flammable Properties

Will not burn.

Follow appropriate National Fire Protection Association (NFPA) codes.

Cyanide may not be completely destroyed in an ordinary fire involving combustible materials such as paper or wood. While sodium cyanide does not support combustion, it can oxidize in a fire.

Extinguishing Media

Use water on fires near cyanide but minimize the amount of water if containers are opened or burned to avoid cyanide runoff (see "Incompatibility with Other Materials" and "Fire Fighting Instructions"). DO NOT use carbon dioxide (CO_2) on wet cyanide where carbonic acid ($H_2O + CO_2$) could release cyanide.

Fire Fighting Instructions

Cyanide dissolves readily in water; therefore, cyanide solution runoff may occur if containers are opened or burned. Runoff should be contained to avoid environmental or safety problems. Contained cyanide solution can be detoxified with hypochlorite. In some cases it may be desirable to let a fire burn out by itself since sodium cyanide will not normally be affected by the fire.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

(ACCIDENTAL RELEASE MEASURES - Continued)

Spill Clean Up

Shovel and sweep up spilled material into a covered container or plastic bag pending transfer. Cover and keep spillage dry. Flush spill area with a dilute solution of sodium hypochlorite or calcium hypochlorite to destroy the cyanide. Call DuPont for guidance. Comply with Federal, State, and local regulations reporting releases. The EPA Reportable Quantity (RQ) is 10 pounds.

HANDLING AND STORAGE

Handling (Personnel)

Emergency planning and training are needed before beginning work with cyanide since prompt treatment is essential in cases of cyanide poisoning. Always have Cyanide Antidote Kits on hand. Do not breathe dust, mist, or cyanide gas. Do not get in eyes. Avoid contact with skin and clothing. Do not carry foodstuffs, beverages, or tobacco where contamination with cyanide is possible. Wash thoroughly after handling. Wash contaminated clothing before reuse.

Storage

Store in properly labeled containers in dry, ventilated, secured areas. Keep containers closed and contents dry. Do not store with acids or acid salts, containers with water or weak alkalis, or oxidizing agents. Do not handle or store food, beverages, or tobacco in cyanide areas. Do not store near combustibles or flammables because subsequent fire fighting with water could lead to cyanide solution runoff. If legal, do not store under sprinkler systems.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use sufficient ventilation to keep employee exposure below recommended limits.

Personal Protective Equipment

Recommended minimum protection: Chemical splash goggles and rubber gloves (butyl or neoprene preferred).

Have available and use as appropriate: face shield; rubber suits, aprons, and boots; NIOSH approved disposable air purifying respirator with appropriate particulate filter; self-contained breathing air supply (in case of emergency); hydrogen cyanide detector; First Aid and Medical Treatment supplies, including oxygen resuscitators.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

Exposure Guidelines

Exposure Limits
Sodium Cyanide

PEL	(OSHA)	: 5 mg/m3, as CN, 8 Hr. TWA, Skin
TLV	(ACGIH)	: Ceiling 5 mg/m3, as CN, Skin
AEL *	(DuPont)	: 5 mg/m3, 15 minute TWA, as CN, Skin

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: 1496 C (2725 F) @ 760 mm Hg
Vapor Pressure	: Negligible
Vapor Density	: Nil
Melting Point	: 564 C (1047 F)
Solubility in Water	: 37 WT% @ 20 C (68 F)
pH	: 11.3-11.7
Form	: Solid, Granular, Briquettes.
Color	: White.
Specific Gravity	: 1.6
Bulk Density (Packed)	: 50-55 lb/cu ft

The pH listed above is typical for 5-25 % solutions with no pH adjustment.

Solid cyanide has no odor, but it can have a slight ammonia and/or hydrogen cyanide odor if damp.

STABILITY AND REACTIVITY

Chemical Stability

Very stable when dry.

Incompatibility with Other Materials

Large amounts of poisonous, flammable hydrogen cyanide (HCN) gas will be evolved from contact with acids. Reacts violently with strong oxidizing agents when heated. Water or weak alkaline solutions can produce dangerous amounts of hydrogen cyanide in confined areas.

Decomposition

Moisture will cause slow decomposition, releasing poisonous hydrogen cyanide and ammonia gases.

(STABILITY AND REACTIVITY - Continued)

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

Oral LD50: 15 mg/kg in rats

The compound is a skin and eye irritant in tests with laboratory animals. Toxic effects described in animals from exposure by inhalation, ingestion, or skin contact include asphyxia (lack of oxygen), dyspnea (shortness of breath), ataxia (incoordination), tremors, coma, and lethality by disrupting oxidative metabolism. Tests in bacterial and mammalian cell cultures demonstrate no mutagenic activity. Tests for embryotoxicity in animals have shown an embryotoxic or teratogenic effect only at exposure levels very nearly lethal to the maternal animals. Observance of the established exposure limits and prevention of skin contact with sodium cyanide solutions should be adequate to prevent adverse health effects on anyone in the workplace, including the conceptus (fetus).

ECOLOGICAL INFORMATION

Ecotoxicological Information

AQUATIC TOXICITY:

96 hour LC50 - Pathead minnows: 0.43-0.66 mg/L.
Extremely toxic.

DISPOSAL CONSIDERATIONS

Waste Disposal

This material may be a RCRA Hazardous waste. Do not flush cyanide into sewers which may contain an acid. Detoxify with dilute sodium hypochlorite, hydrogen peroxide, or calcium hypochlorite. Comply with Federal, State, and local regulations on disposal methods used to achieve the constituent based treatment standard, if permitted; or transfer to a licensed disposal contractor.

TRANSPORTATION INFORMATION

Shipping Information

DOT

Proper Shipping Name	: SODIUM CYANIDE
Hazard Class	: 6.1
I.D. No. (UN/NA)	: UN1689
DOT Label(s)	: TOXIC
Special Information	: MARINE POLLUTANT
Packing Group	: I

DOT/IMO

Proper Shipping Name	: SODIUM CYANIDE, SOLID
Hazard Class	: 6.1
UN No.	: 1689
DOT/IMO Label	: TOXIC
Special Information	: MARINE POLLUTANT
Packing Group	: I

Reportable Quantity : 10 lb (4.54 kg)

Shipping Containers

Steel Drums : 50 kg, 100 kg

"CYANO-DOL" Railcars and Trucks
Excel I and Excel II Trucks
Hopper Railcars
"FLO-BINS" (3,000 lb. net; 3,600 lb. gross)
Bag in a Box (1,000 kg./2,200 lb.)

Tuff Paks: 48, 20 kg bags in a box (960 kg or 2112 lbs).

Shipping Information -- Canada

TDG

Proper Shipping Name	: SODIUM CYANIDE SOLID
PIN No.	: UN 1689
TDG Class	: 6.1 (9.2)
TDG Packing Group	: I

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute	: Yes
Chronic	: No
Fire	: No
Reactivity	: Yes

(REGULATORY INFORMATION - Continued)

Pressure : No

HAZARDOUS CHEMICAL LISTS

SARA Extremely Hazardous Substance: Yes
CERCLA Hazardous Substance : Yes
SARA Toxic Chemical : Yes

Canadian Regulations

WHMIS Classification:

CLASS D Division 1 Subdivision A - Very Toxic Material/Acute Lethality.

CLASS D Division 2 Subdivision B - Toxic Material. Skin or Eye Irritant.

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

DSL Reported/Included

OTHER INFORMATION

NFPA, NPCA-HMIS

NPPA Rating
Health : 3
Flammability : 0
Reactivity : 1

NPCA-HMIS Rating
Health : 3
Flammability : 0
Reactivity : 1

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

The "Skin" notation in the Exposure Limits Section indicates that liquid or vapor may penetrate the skin (especially if the skin is broken). Control of vapor, dust, and mist inhalation alone may not be sufficient to prevent an excessive dose.

For further information, see DuPont Cyanide Storage and Handling Bulletin.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS

CHEMICALS
DuPont Canada Inc.
7070 Mississauga Rd.
Mississauga, Ontario, L5M 2H3
(905) 821-5369.

# Indicates updated section.

End of MSDS

DUPONT CANADA INC.

MATERIAL SAFETY DATA SHEET

HYDROGEN PEROXIDE (20 TO 60%)

CEP10004 Revised 12-OCT-1996 Printed 8-JUL-1998

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

Corporate MSDS Number	: DU000114
Formula	: H2O2
Molecular Weight	: 34.02

Product Use

Bleaching Agent

Oxidizing Agent

Tradenames and Synonyms

"ALBONE"
"PERONE"
"TYSUL"
"ALBONE", "PERONE" AND "TYSUL" ARE REGISTERED TRADEMARKS OF DUPONT.
CC0007
HYDROGEN PEROXIDE SOLUTIONS

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont Canada, Inc.
P.O. Box 2200
Streetsville
Mississauga, Ontario L5M 2H3

PHONE NUMBERS

Product Information	: 1-800-387-2122
Transport Emergency	: 1-613-348-3616 (24 HOURS)
Medical Emergency	: 1-613-348-3616 (24 HOURS)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
HYDROGEN PEROXIDE	7722-84-1	20-60 %
WATER	7732-18-5	40-80 %
"ALBONE" 50M ALSO CONTAINS		
ADIPIC ACID	124-04-9	
SUCCINIC ACID	110-15-6	

HAZARDS IDENTIFICATION

Potential Health Effects

Hydrogen peroxide may cause severe irritation or burns of the skin, eyes and mucous membranes. Splashes in the eye can cause severe eye damage with ulceration of the cornea, and may cause irreversible eye damage, including blindness. Skin exposure can result in bleaching of the skin and hair.

Inhalation of concentrated vapors can cause irritation of the nose and throat with chest discomfort, cough, difficulty in breathing and shortness of breath.

Ingestion can cause irritation of the upper gastrointestinal tract with pain and distention of the stomach and esophagus due to liberation of oxygen.

Gross overexposure by ingestion may be fatal.

HUMAN HEALTH EFFECTS:

Skin contact with aqueous solutions of less than 50% may cause irritation with discomfort or rash. Higher or prolonged exposure may result in skin burns or ulceration. Evidence suggests that skin permeation can occur in amounts capable of producing systemic toxicity. Effects of eye contact with aqueous solutions of less than 5% may include eye irritation with discomfort, tearing, or blurring of vision. Higher or prolonged exposure may result in eye corrosion with corneal or conjunctival ulceration. Contact with aqueous concentrations of greater than 10% may result in eye corrosion with corneal or conjunctival ulceration with possible irreversible eye damage, including blindness.

Overexposure by inhalation may cause irritation of the upper respiratory passages or nonspecific discomfort such as nausea, headache, or weakness. Higher inhalation exposures may lead to temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath; or fatality from gross overexposure. Ingestion may cause irritation of the gastrointestinal tract with upper

(HAZARDS IDENTIFICATION - Continued)

abdominal pain, "heartburn", nausea, vomiting, and diarrhea. "Coffee grounds" vomitus and black tarry stools may occur as a result of gastrointestinal tract bleeding. Additional effects from overexposure include red blood cell destruction, or gas embolism. When used as colonic lavage, hydrogen peroxide has caused gas embolism and gangrene of the intestine at concentrations down to 0.75%. Gross overexposure by ingestion may be fatal.

Individuals with preexisting diseases of the skin, eyes, or lungs may have increased susceptibility to the toxicity of excessive exposures.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION

If inhaled, immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash contaminated clothing and shoes promptly and thoroughly.

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

If swallowed, do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

If swallowed, large amounts of oxygen may be released quickly. The distention of the stomach or esophagus may be injurious. Insertion of a gastric tube may be advisable.

FIRE FIGHTING MEASURES

Flammable Properties

Will not burn, but decomposition, which may be caused by heat or contamination will release oxygen which will increase the explosive limit range and burning rate of flammable vapors.

Fire and Explosion Hazards:

Strong oxidizer. Contact with clothing or combustibles may cause fire. Effect may be delayed. Contact with organic liquids or vapors may cause immediate fire or explosion, especially if heated. Under certain circumstances, detonation may be delayed. Oxygen release from hydrogen peroxide may force organic or hydrogen vapors into an explosive range. Follow appropriate National Fire Protection Association (NFPA) codes.

Extinguishing Media

Use only water.

Fire Fighting Instructions

Flood with water. Cool tank/container with water spray.

Wear full protective clothing (rubber suit and boots) including chemical splash goggles or hood and self-contained breathing apparatus.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Comply with Federal, State, and local regulations on reporting releases of wastes. Flood area with water and drain to an approved chemical sewer or wastewater treatment system, including municipal sewers if approved. May be destroyed with sodium metabisulfite or sodium sulfite (1.9 lbs. SO2 equivalent per lb. of peroxide) after diluting to 5-10% peroxide.

The Extremely Hazardous Substance List Reportable Quantity for >52% Hydrogen Peroxide is 1 lb.

If Hydrogen Peroxide (20 to 60%) is spilled and not

(ACCIDENTAL RELEASE MEASURES - Continued)

recovered, or is recovered as a waste for treatment or disposal, the CERCLA Reportable Quantity is 100 lbs. (release of an unlisted Hazardous Waste characteristic of ignitibility).

HANDLING AND STORAGE

Handling (Personnel)

Use extreme care when attempting any reactions because of fire and explosion potential (immediate or delayed). Conduct all initial experiments on a small scale and protect personnel with adequate shielding as the reactions are unpredictable and may be delayed, and may be affected by impurities, contaminants, temperature, etc. Do not get in eyes. Do not taste or swallow. Avoid contact with skin and clothing. Wash thoroughly after handling. Avoid contact with flammable or combustible materials. Avoid contamination from any source including metals, dust, and organic materials. Never use pressure to empty drums; container is not a pressure vessel. In the event of an accident where large volumes of hydrogen peroxide might come into contact with external fires or with incompatible chemicals, a one-half mile area from the incident should be evacuated.

Storage

Store in a properly vented container or in approved bulk storage facilities. Do not block vent. Do not store on wooden pallets. Do not store where contact with incompatible materials could occur, even with a spill. (See "Hazardous Reactivity".) Have water source available for diluting. Do not add any other product to container. Never return used or unused peroxide to container, instead dilute with plenty of water and discard. Rinse empty containers thoroughly with clean water before discarding. (See "Waste Disposal".)

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use sufficient ventilation to keep employee exposure below recommended exposure limits.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

Personal Protective Equipment

EYE/FACE PROTECTION

Wear coverall chemical splash goggles. In addition, where the possibility exists for eye or face contact due to splashing or spraying of material, wear chemical splash goggles/full-length face shield combination.

RESPIRATORS

Where there is potential for airborne exposure in excess of applicable limits, wear NIOSH/MSHA approved respiratory protection.

PROTECTIVE CLOTHING

Where there is potential for skin contact, have available and wear as appropriate: impervious gloves, apron, pants, jacket, hood, and boots; or totally encapsulating chemical suit with breathing air supply. Permeation data supplied by vendors indicate that impervious materials such as natural rubber, natural rubber plus neoprene, nitrile, or polyvinylchloride afford adequate protection.

Do not wear leather gloves or leather shoes (uppers or soles) because they can ignite following contact with peroxide. Cotton clothing can also ignite. This effect may be within minutes, or delayed. Clothing fires and skin damage occur less quickly with 50% or lower hydrogen peroxide than with 70% material, but adequate personal protection is essential for all industrial concentrations. Protective skin creams offer no protection from hydrogen peroxide and should not be used.

Exposure Guidelines -

Applicable Exposure Limits

HYDROGEN PEROXIDE		
PEL	(OSHA)	: 1 ppm, 1.4 mg/m3 (90%) - 8 Hr TWA
TLV	(ACGIH)	: 1 ppm, 1.4 mg/m3, 8 Hr. TWA, A3
AEL *	(DuPont)	: None Established
ADIPIC ACID		
PEL	(OSHA)	: None Established
TLV	(ACGIH)	: 5 mg/m3, 8 Hr. TWA
AEL *	(DuPont)	: 5 mg/m3, 8 & 12 Hr. TWA
WEEL	(AIHA)	: 5 mg/m3, 15 minute TWA

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Evaporation Rate	: >1
Solubility in Water	: 100 WT%
Form	: Clear liquid
Color	: Colorless
Odor	: Slightly pungent, irritating

	HYDROGEN PEROXIDE CONCENTRATION			
WT %	20%	35%	50%	60%
Boiling Point C	103	108	114	119
F	217	226	237	246
Melting Point C	-14.6	-33.0	-52.2	-55.5
F	5.7	-27.4	-62.0	-67.9
Specific Gravity 25 C (77 F)	1.07	1.13	1.19	1.24
Vapor Pressure-mmHg 25 C (77 F)	20.6	17.4	13.5	10.7

STABILITY AND REACTIVITY

Chemical Stability

Unstable with heat or contamination; liberation of oxygen gas may result in dangerous pressures. (See "Decomposition", below.)

Incompatibility with Other Materials

Incompatible with most flammables/combustibles (See "Fire and Explosion Hazards") as well as cyanides, nitric acid, potassium permanganate, and many other oxidizing and reducing agents. Mixtures with both organics and some acids may be especially reactive.

Decomposition

Contamination or heat may cause self-accelerating exothermic decomposition with oxygen gas and steam release that can cause dangerous pressures. May react dangerously with rust, dust, dirt, iron, copper, heavy metals or their salts (such as mercuric oxide or chloride), alkalis, and with organic materials (especially vinyl monomers).

(STABILITY AND REACTIVITY - Continued)

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

Inhalation 8-hour LC50:		>2,000 ppm in rats (90% H2O2)
Skin absorption LD50	:	>2,000 mg/kg in rabbits (35% H2O2)
Oral LD50	:	1232 mg/kg in rats (35% H2O2)

At aqueous concentrations of less than 50% hydrogen peroxide skin irritation occurs, but at greater concentrations hydrogen peroxide is corrosive to the skin. Concentrations less than 5% in aqueous solutions are eye irritants; solutions between 5% and 10% range from severe eye irritants to being corrosive; concentrations greater than 10% are corrosive to the eye. The compound is not a skin sensitizer in animals.

Repeated inhalation exposures produced nasal discharge, bleached hair, and respiratory tract congestion with some deaths occurring in rats and mice exposed to concentrations greater than 67 ppm. Dogs exposed by inhalation to 7 ppm for 6 months had lung and skin irritation.

The effects from single high oral doses include convulsions. Repeated administration of the compound in the diet of animals resulted in growth inhibition, reduced weight gain, abnormal liver function, ulcers, and discoloration of the stomach lining with swelling. Long-term administration to mice in the drinking water resulted in gastric erosion and duodenal hyperplasia.

One study by skin application suggested no carcinogenic activity. Results of an ingestion study with mice suggested that hydrogen peroxide might be carcinogenic. However, the FDA and other organizations have reviewed this study and concluded there is insufficient evidence that hydrogen peroxide is carcinogenic. An unpublished, long-term study with rats revealed no evidence of carcinogenicity. Female rats treated with 10% hydrogen peroxide produced offspring of lower body weight and some structural abnormalities, but these changes were attributed to maternal toxicity. Hydrogen peroxide produced genetic damage to bacterial and mammalian cells in culture, but one study in animals indicated it did not produce genetic damage. Limited tests in animals demonstrate no reproductive toxicity.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

96-hour LC50, catfish: 37.4 mg/L

DISPOSAL CONSIDERATIONS

Waste Disposal

Comply with Federal, State, and local regulations. If approved, may be diluted and drained to a municipal sewer or waste treatment plant. May be diluted and drained through a scrap metal pit (iron, copper, etc.) to reduce peroxide concentration. Hydrogen peroxide may be an RCRA regulated hazardous waste upon disposal due to the oxidizing characteristic under the ignitibility category.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO

Proper Shipping Name	: HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS
Hazard Class	: 5.1
UN No.	: 2014
DOT/IMO Label	: OXIDIZER, CORROSIVE
Subsidiary Hazard Class	: 8
Packing Group	: II

Shipping Containers

Tank Cars.
Tank Trucks.

ISO (Sea) Tanks
Drums
Bottles

Shipping Information -- Canada

TDG

Proper Shipping Name	: Hydrogen Peroxide Aqueous Solutions
TDG Class	: 5.1 (8)
TDG Packing Group	: II
UN #	: 2014

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute	: Yes
Chronic	: No
Fire	: No
Reactivity	: Yes
Pressure	: Yes

LISTS:

SARA Extremely Hazardous Substance	-(Yes)*
CERCLA Hazardous Material	-(**)
SARA Toxic Chemical	-No

*For greater than 52% material.
**See Disposal Information.

HYDROGEN PEROXIDE >52% is listed by OHSA as a Highly Hazardous Chemical in Appendix A to 29 CFR 1910.119. Use of this product may require compliance with 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals.

Canadian Regulations

WHMIS Classification:

CLASS C Oxidizing Material

CLASS E Corrosive Material

CLASS F Dangerously Reactive Material

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

DSL Reported/Included

OTHER INFORMATION

NFPA, NPCA-HMIS

NFPA Rating

Health	: 2
Flammability	: 0
Reactivity	: 1

Oxidizer.

(Continued)

NPCA-HMIS Rating
Health : 3
Flammability : 0
Reactivity : 1

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

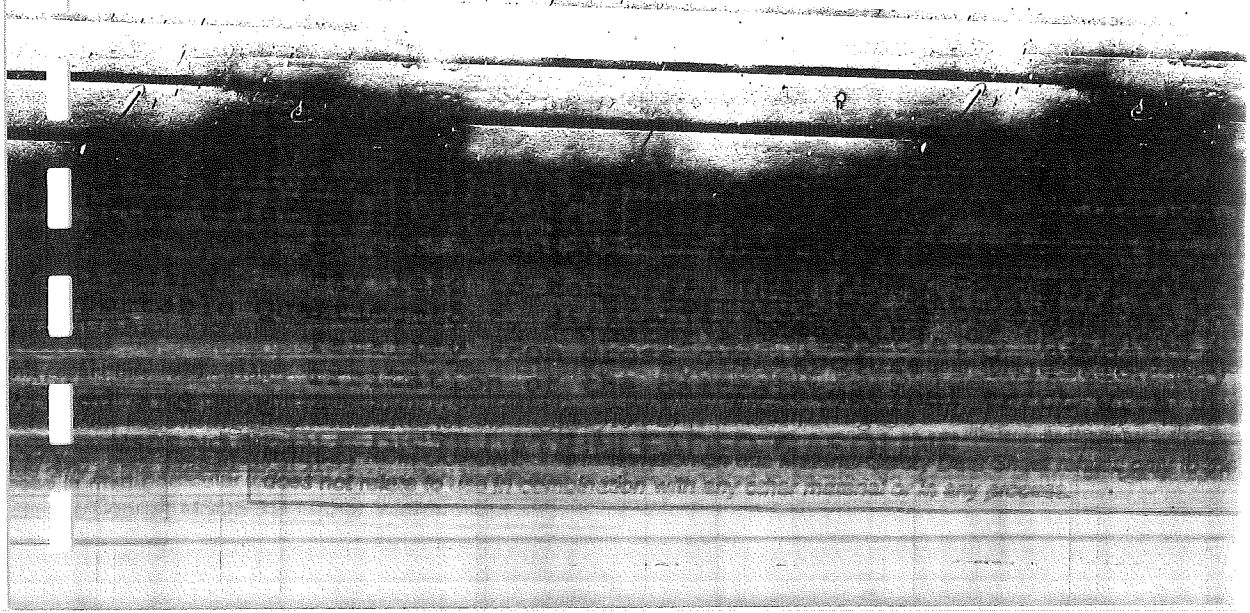
For further information, see DuPont HYDROGEN PEROXIDE Storage and Handling Bulletin.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS
---------- HYDROGEN PEROXIDE.

# Indicates updated section.

End of MSDS



EAGLEBROOK

DATA SHEET

FerriClear™

APPLICATION

FerriClear is a hydroxylated ferric sulfate. FerriClear is used in water, wastewater and industrial water treatment. FerriClear produces a fast-reacting dense floc which coagulates suspended solids, clarifies and reduces the turbidity of finished water. It is useful in decolorization of surface water. FerriClear removes trace metal impurities by co-precipitation, absorption and interstitial entrapment.

FerriClear has shown outstanding effectiveness in sludge conditioning. When used with an organic polymer it reduces the demand for the polymer.

FerriClear can also be applied to control odors, particularly those associated with the sulfide ion. Iron sludges settle rapidly, aiding in solids reduction and sludge handling.

SAFETY AND FIRST AID

FerriClear is corrosive and an irritant. It can cause eye burns and irritate the skin. Avoid direct body contact with solution by wearing protective clothes and rubber gloves. Wear safety splash goggles to protect the eyes. In case of accidental contact with skin or eyes, flush with copious amounts of water. In case of contact with eyes, flush with water for at least 15 minutes and call a physician. For skin contact, after flushing with water, remove contaminated clothing and shoes. Clothing should be washed before reuse.

Do not ingest. FerriClear can irritate and seriously damage the mouth and digestive tract. For further safety information see material safety data sheet.

SOME OF THE USES ARE:

Water Clarification	Lime Softening
Hydrogen Sulfide Removal	Phosphorus Removal
Sludge Conditioning	Oil & Grease Separation
Air Flotation	Filter Aid & Conditioning
Organics Removal	Heavy Metals Removal

TYPICAL PROPERTIES:

Color	Dark Reddish
Odor	Nil
Water Soluble Fe+++	12% (±0.5%)
Water Soluble Fe++	0.3%
Specific Gravity	1.48 to 1.56
Free Acid	0%
pH	less than 1

ON-SITE STORAGE

FerriClear can be stored in either stainless steel, fiberglass reinforced polyester or rubber-lined steel tanks. All fittings, piping and valves must be of same materials. Insulation is not required because of the freezing point of the standard FerriClear solution (—40°C/—40°F). The tanks should be diked to contain any spillage. Small spills can be neutralized with soda ash or lime. After neutralization, the area can be flushed with water. FerriClear is corrosive and attacks many metals rapidly. Any wetted parts should be of stainless steel or more resistant plastic.

EAGLEBROOK
Material Safety Data Sheet

Product Information/Emergency Phone (416) 822-5835
(800) 268-5317

Transportation Emergency Phone (613) 996-6666 (Canutec)

MATERIAL SAFETY DATA SHEET

FERRICLEAR™

I. Product Identification

Chemical Name/Product Identifier FerriClear™ Solution
Synonyms Iron Salt
Chemical Family Inorganic Acidic Salt Solution
Chemical Formula $Fe_3(SO_4)_7OH$
Shipping Name Hydroxylated Ferric Sulphate Solution UN1760
Product Use Water and Wastewater Treatment; Purifying Factory Effluents and Deodorizing Sewage; Mordant in Dyeing and Printing Textiles; Pigments and Inks; Photoengraving.

NOTE: Meets AWWA Standards for Ferric Sulphate in Potable Standard AWWA B406-87.

II. Hazardous Ingredients

Ingredients	CAS Number	Product I.D. Number	Percent Composition	LC_{50}ppm Inhalation	LD_{50}mg/kg Oral
Hydroxylated Ferric Sulphate	#127667-53-6	UN1760	43-46% w/w	N/Av	5000 mg/kg (rat)

III. Physical Data

Physical State Liquid
Odour and Appearance Brown to Beige Colour; No Odour
Vapour Pressure (mmHg) N/Av
Evaporation Rate (BuAc = 1) N/Av
Boiling Point (F°) N/Ap
Coefficient of Water/Oil Distribution N/Av
Specific Gravity 1.52-1.58
Odour Threshold N/Ap
Vapour Density (Air = 1) Similar to Water
pH Less than 1
Freezing Point (C°) Approximately -35° C
Solubility in Water Complete

IV. Fire and Explosion Hazard Data

Conditions of Flammability Not Flammable.
Means of Extinction As appropriate for other combustibles in area.
Sensitivity to Mechanical Impact/Static Discharge N/Ap
Hazardous Combustion Products See Hazardous Decomposition Products.
Special Procedures Emits toxic fumes during thermal decomposition. Firefighters should wear protective equipment and respirator when working in a confined area. Closed containers may heat above boiling point and rupture violently.
Unusual Fire and Explosion Hazards May react violently with metals to generate hydrogen inside tanks or drums - avoid pressure build up and/or ignition source.
Flash Point (method) Will not burn.
Upper/Lower Flammable Limits (% by volume) N/Ap
Auto-Ignition Temperature N/Ap

V. Reactivity Data

Stability Stable
Incompatable Materials Alkalis, Soluble Carbonates, and Gold and Silver Salts
Conditions of Reactivity Fairly corrosive to mild steel. Storage and equipment materials include FRP, PVC and rubber-lined steel.
Hazardous Decomposition Products May emit toxic fumes of SO_2 and SO_3.

VI. Toxicological Properties (Routes of Exposure and Acute Effects)

LD_{50} of Material 5000 mg/kg (oral, rat) for Ferric Sulphate.
LC_{50} of Material N/Av.
Exposure Limit ACGIH-TLV: 1 mg/m³ as Fe (OSHA Limits)
Inhalation Irritation of upper respiratory passages and mucous membranes.
Skin May cause skin irritation.
Eyes Irritation, blurred vision, may cause eye burns.
Ingestion May irritate mucous membranes. Nausea or irritation of the digestive tract.
Irritancy An irritant to skin, eyes and mucous membranes.
Sensitization Infrequently associated with skin sensitization.
Synergistic Products None Known.
Chronic Effects Not listed as a carcinogen by IARC or ACGIH.
Other Effects Including Reproductive Toxicity, Teratogenicity, Mutagenicity No Data.

VII. First Aid Measures

Inhalation Remove to fresh air, give artificial respiration if necessary and call a physician.
Eyes Wash eyes with running water for at least 15 minutes and call a physician.
Skin Flush affected area with soap and water for 15 minutes and call a physician.
Ingestion Do not induce vomiting. Give large quantities of water and call a physician. Never give anything by mouth to an unconscious person.

VIII. Preventative Measures

Spill, Leak or Release Contain spill, then neutralize with lime or soda ash. CAUTION: Heat and gases may be generated during neutralization. Add lime or soda ash slowly. Avoid breathing gases if in a confined space.
Waste Disposal Dispose of material in accordance with Federal, Provincial and Local Regulations.
Respiratory Protection Use NIOSH/MSHA approved breathing apparatus if necessary to keep concentration of product below ACGIH-TLV.
Ventilation Local Exhaust
Protective Gloves Rubber Gloves
Eye Protection Chemical Splash Goggles
Other Protective Equipment Wear rubber apron, pants, jacket, and footwear when handling product.
Storage and Handling Conditions Can be in either stainless steel, FRP polyester or rubber-lined steel tanks. All fittings, piping and valves must be of same material.
Storage Store product in a well ventilated area in FRP or rubber-lined steel tanks or polyethylene drums. Storage area should be diked to contain spills. Capacity should be either double the tank truck or tank car volume or two weeks supply, whichever is greater. Do not store in metal containers. Provide venting for rubber-lined steel to avoid potential pressure build-up if lining fails.
Special Shipping Information Ferric sulphate solution, class 8.2 UN1760 Packing Group III.

IX. Additional Notes or References

Abbreviations
N/Av: Not Available
N/Ap: Not Applicable
M: Minute
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Government Industrial Hygienists
TLV: Threshold Limit Values
FRP: Glass-Fibre Reinforced Plastic
PVC: Polyvinyl Chloride
NIOSH: National Institute for Occupational Safety and Health
MSHA: Mine Safety and Health Administration
TDG: Transportation of Dangerous Goods Act and Regulations

X. References

1. Merck & Co., Inc. *The Merck Index, 1983, Tenth Edition.*
2. Van Nostrand Reinhold, *Hawley's Condensed Chemical Dictionary, Eleventh Edition*, N. Irving Sax and Richard Lewis, Jr.
3. Van Nostrand Reinhold, *Dangerous Properties of Industrial Materials, Sixth Edition*, N. Irving Sax.
4. Canadian Centre of Occupational Health and Safety. RTECS (Registry of Toxic Effects) database.
5. ACGIH, *Threshold Limit Values and Biological Exposure Indices to 1990-91.*
6. International Agency for Research on Cancer Monographs, Supplement 7, 1988.
7. Transportation of Dangerous Goods Act and Regulations.

XI. Preparation Information

Date of Preparation 9/91 by Eaglebrook, Inc. of Canada
For Further Production Information call: (416) 822-5836.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ARSENIC TRIOXIDE

MSDS Number: A7512 --- *Effective Date: 09/08/97*

1. Product Identification

Synonyms: Arsenic (III) oxide; arsenic sesquioxide; arsenous trioxide, white arsenic
CAS No.: 1327-53-3
Molecular Weight: 197.84
Chemical Formula: As2O3
Product Codes: 0061

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Arsenic Trioxide	1327-53-3	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CANCER HAZARD. CONTAINS INORGANIC ARSENIC WHICH CAN CAUSE CANCER. Risk of cancer

depends on duration and level of exposure. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE LIVER AND KIDNEY DAMAGE. USE ONLY WITH ADEQUATE VENTILATION AND RESPIRATORY EQUIPMENT.

J.T. Baker SAF-T-DATA (tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Arsenic may cause inflammation of the mucous membranes with cough and foamy sputum, restlessness, dyspnea, cyanosis, and rales. Symptoms like those from ingestion exposure may follow. May cause pulmonary edema.
Ingestion:
Arsenic is highly toxic! May cause burning in esophagus, vomiting, and bloody diarrhea. Symptoms of cold and clammy skin, low blood pressure, weakness, headache, cramps, convulsions, and coma may follow. May cause damage to liver and kidneys. A suspected fetal toxin. Death may occur from circulatory failure. Estimated lethal dose 120 milligrams.
Skin Contact:
May cause irritation, symptoms including redness, itching, and pain.
Eye Contact:
May cause irritation with itching, burning, watering of eyes; may cause conjunctiva damage.
Chronic Exposure:
Arsenic on repeated or prolonged skin contact may cause bronzing of the skin, edema, dermatitis, and lesions. Repeated or prolonged inhalation of dust may cause damage to the nasal septum. Chronic exposure from inhalation or ingestion may cause hair and weight loss, a garlic odor to the breath and perspiration, excessive salivation and perspiration, central nervous system damage, hepatitis, gastrointestinal disturbances, cardiovascular damage, and kidney and liver damage. Arsenic compounds are known human carcinogens and may be teratogenic based on effects in laboratory animals.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth

to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse. Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to this substance.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
If emesis if unsuccessful after two doses of Ipecac, consider gastric lavage. Monitor urine arsenic level. Alkalization of urine may help prevent disposition of red cell breakdown products in renal tubular cells. If acute exposure is significant, maintain high urine output and monitor volume status, preferably with central venous pressure line. Abdominal X-rays should be done routinely for all ingestions. Chelation therapy with BAL, followed by n-penicillamine is recommended, but specific dosing guidelines are not clearly established.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Toxic fumes of arsenic trioxide and arsine may be formed in fire situations.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
10 ug(As)/m3 ppm (TWA)
-ACGIH Threshold Limit Value (TLV):
0.01 mg(As)/m3 (TWA),
listed as A1, confirmed human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING:
Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
Any area where inorganic arsenic is stored, handled, used, etc., must be established as a 'Regulated Area' with controlled access, limited to authorized persons. Containers of inorganic arsenic and Regulated Areas must be labeled to show a CANCER SUSPECT AGEN is present. Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing arsenic or lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting

requirements. (arsenic: 29 CFR 1910 .1018; lead: 29 CFR 1910.1025).

9. Physical and Chemical Properties

Appearance:
Transparent crystals, or white powder.
Odor:
Odorless.
Solubility:
3.7 g/100 ml water @ 20C (68F)
Specific Gravity:
3.74
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
465C (869F)
Melting Point:
315C (599F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Emits toxic fumes of arsenic when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Oxidizers, tannic acid, infusion cinchona and other vegetable astringent infusions and decoctions, iron solutions, rubidium carbide, chlorine trifluoride, fluorine, hydrogen fluoride, oxygen difluoride, acids, bases, sodium chlorate, zinc filings, other reactive metals and mercury. Corrosive to metals in the presence of moisture.
Conditions to Avoid:
Incompatibles.

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 14.6 mg/kg; investigated as a mutagen, tumorigen, reproductive effector.
Reproductive Toxicity:
Has shown teratogenic effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Arsenic Trioxide (1327-53-3)	Yes	No	1

12. Ecological Information

Environmental Fate:
When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may biodegrade to a moderate extent. This material is not expected to significantly bioaccumulate.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, ARSENIC TRIOXIDE
Hazard Class: 6.1
UN/NA: UN1561
Packing Group: II
Information reported for product/size: 500G

International (Water, I.M.O.)

Proper Shipping Name: ARSENIC TRIOXIDE
Hazard Class: 6.1
UN/NA: UN1561
Packing Group: II
Information reported for product/size: 500G

International (Air, I.C.A.O.)

Proper Shipping Name: ARSENIC TRIOXIDE
Hazard Class: 6.1
UN/NA: UN1561
Packing Group: II
Information reported for product/size: 500G

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Arsenic Trioxide (1327-53-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Arsenic Trioxide (1327-53-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313----- List	Chemical Catg
Arsenic Trioxide (1327-53-3)	1	100*	No	Arsenic comp

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Arsenic Trioxide (1327-53-3)	1	P012	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

WARNING:

THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 2Z
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: Reactivity:
Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CANCER HAZARD. CONTAINS INORGANIC ARSENIC WHICH CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE LIVER AND KIDNEY DAMAGE. USE ONLY WITH ADEQUATE VENTILATION AND RESPIRATORY EQUIPMENT.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:

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RELIANCE UPON THIS INFORMATION.

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Imperial Oil MATERIAL SAFETY DATA SHEET

Date Prepared: April 08, 1997
Supersedes: April 13, 1994
MSDS Number: 00826

Cette fiche signalétique est aussi disponible en français

1. PRODUCT INFORMATION

Product Identifier: MIDDLE DISTILLATE
ESSO MARINE GAS OIL (DYED OR CLEAR)
ESSO RAILROAD DIESEL (DYED OR CLEAR)
HEATING OIL (DYED OR CLEAR)
DIESEL (DYED OR CLEAR)
DIESEL QUALITY FURNACE FUEL (DYED OR CLEAR)
DIESEL QUALITY HEATING OIL (DYED OR CLEAR)
ESSO DIESEL (DYED OR CLEAR)
ESSO DIESEL QUALITY COMMERCIAL FUEL (DYED OR CLEAR
ESSO DIESEL QUALITY FURNACE FUEL
ESSO DIESEL QUALITY HEATING OIL
ESSO FURNACE FUEL (DYED OR CLEAR)
ESSO HEATING OIL (DYED OR CLEAR)
ESSO MARINE DIESEL FUEL (DYED OR CLEAR)
ESSO RAILROAD DIESEL FUEL #3 (DYED OR CLEAR)
ESSO TOBACCO CURING OIL
FUEL OIL 75
FUEL OIL 76
DIESEL MARINE (DYED OR CLEAR)
DIESEL MARINE GAS OIL (DYED OR CLEAR)
FURNACE (DYED OR CLEAR)
DIESEL MARINE - POUR DEPRESSED (DYED OR CLEAR)
NO.2 FUEL OIL
NAVAL FUEL OIL 3-GP-11M (DYED)
ESSO DIESEL FUEL LS
LOW SULFUR DIESEL (EXPORT (DYED)
DIESEL LOW SULFUR (DYED OR CLEAR)
NO.2 FUEL OIL FOR EXPORT
DIESEL FUEL FOR EXPORT
FURNACE TOBACCO CURING OIL
DIESEL NAVAL 3GP-11 (DYED OR CLEAR)
DIESEL NAVAL 3GP-15 (DYED OR CLEAR)
DIESEL LOW SULFUR RAIL (DYED OR CLEAR)
DIESEL LOW SULFUR DYED EP
DIESEL RAIL (DYED OR CLEAR)
DIESEL RAIL #3 (DYED OR CLEAR)
DIESEL RAIL #3 <HD> (DYED OR CLEAR)
DIESEL LOW SULFUR <032> (DYED OR CLEAR)
FURNACE URBAN (DYED OR CLEAR)

Application and Use:
Multi-purpose fuel

Product Description:

A complex mixture of aliphatic, olefinic, naphthenic and aromatic hydrocarbons.

REGULATORY CLASSIFICATION

WHMIS:

Class D, Division 2, Subdivision B: Toxic Material
Class B, Division 3: Combustible Liquids.

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT

All components of this product are either on the Domestic Substances List (DSL) or are exempt.

TDG INFORMATION (RAIL/ROAD):

Shipping Name: FUEL OIL
Class: 3
Packing Group: III
PIN Number: UN1202

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4111

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Fuel Oil No.2	>99.9 v/v	68476-30-2

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid
Specific gravity: not available
Viscosity: 1.30 cSt at 40 deg C
to 11.00 cSt at 40 deg C
Vapour Density: 4
Boiling Point: 150 to 370 deg C
Evaporation rate: < 1 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: not available
Odour Threshold: not available
Vapour Pressure: 4 kPa at 38 deg C
Density: 0.85 g/cc at 15 deg C
Appearance/odour: White or pale yellow liquid, petroleum odour

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
High vapour concentrations are irritating to the eyes, nose, throat and lungs; may cause headaches and dizziness; may be anesthetic and may cause other central nervous system effects.
Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Irritating.

INGESTION:

Low toxicity.
Small amounts of this liquid drawn into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC:

Lifetime skin painting tests indicate that materials of similar composition have produced skin cancer in experimental animals. The relationship of these results to humans has not been fully established.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:
Oral : LD50 > 5000 mg/kg (Rat)
Dermal : LD50 > 2000 mg/kg (Rabbit)
Inhalation : LC50 > 2500 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

Manufacturer recommends:
100 ppm based on composition.

Local regulated limits may vary.

5. FIRST AID MEASURES

INHALATION:

In emergency situations use proper respiratory protection to immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

Please turn over

Esso Imperial Oil

MATERIAL SAFETY DATA SHEET

SKIN CONTACT:

Immediately flush with large amounts of water. Use soap if available. Remove contaminated clothing, including shoes, after flushing has begun. If irritation persists, seek medical attention.

INGESTION:

DO NOT induce vomiting since it is important that no amount of the material should enter the lungs (aspiration). Keep at rest. Get prompt medical attention.

6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety goggles, long sleeves, and chemical-resistant gloves.
Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials.
In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Do not handle or store near an open flame, sources of heat, or sources of ignition.
Material will accumulate static charges which may cause a spark. Static charge build-up could become an ignition source. Use proper relaxation and grounding procedures.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth. Do not use combustible materials such as sawdust.
Recover by pumping (use an explosion proof motor or hand pump), or by using a suitable absorbent.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: > 40 deg C PMCT ASTM D93

Autoignition: NA Flammable Limits: LEL: 0.7% UEL: 6.5%

GENERAL HAZARDS:

Combustible Liquid; may form combustible mixtures at or above the flash point.
Toxic gases will form upon combustion.
Static Discharge; material may accumulate static charges which may cause a fire.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel.

Avoid spraying water directly into storage containers due to danger of boilover.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide and traces of oxides of sulphur

8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

10. PREPARATION

Date Prepared : April 08, 1997
Prepared by: Lubricants & Specialties
IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(800) 268-3183

NEWALTA

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

PRODUCT IDENTIFIER	**ENVIRO 4000**	**PRODUCT IDENTIFICATION NUMBER (PIN) UN1202**
PRODUCT USE	DISTILLATE FUEL ADDITIVE	

MANUFACTURER'S NAME: NEWALTA CORPORATION, INDUSTRIAL DIVISION	**SUPPLIER'S NAME:** NEWALTA CORPORATION, INDUSTRIAL DIVISION
STREET ADDRESS: 42 EASTLAKE CIRCLE, BOX 3814	**STREET ADDRESS:** #221, 9405 - 50 STREET
CITY: AIRDRIE **PROVINCE:** ALBERTA	**CITY:** EDMONTON **PROVINCE:** ALBERTA
POSTAL CODE: T4B 2B9	**EMERGENCY TELEPHONE NO:** 403-565-4645 **POSTAL CODE:** T6B 2T4

SECTION 2 - HAZARDOUS INGREDIENTS

PRODUCT IS A MIXTURE OF ALIPHATIC, OLEFINIC AND NAPHTHENIC HYDROCARBONS.

HAZARDOUS INGREDIENTS	WEIGHT/ WEIGHT %	CAS NUMBER	LD50 (WITH SPECIES AND ROUTE)	LC50 (WITH SPECIES AND ROUTE)	ACGIH TLV (8hr ppm)
FUEL OIL	100 (vol)	68476-30-2	n.av.	n.av.	n.av
PENTANE	0-1.0 (vol)	109-66-0	n.av.	128,200 (ppm in air,mice)	600 ppm
HEXANES	0.-2.0 (vol)	110-54-3	in rats 49 ml/kg	40,000 (ppm in air, mice)	50 ppm
HEPTANES	0.5-1.0 (vol)	142-82-5	n.av.	15,900 (ppm in air,mice)	400 ppm
OCTANES	1.0-1.5 (vol)	111-65-9	n.av.	n.av.	300 ppm
NONANES	1.5-3.0 (vol)	111-84-2	1218 mg/kg;inc. (mouse)	3200ppm;inhalc (rat)	200 ppm
CYCLOPENTANE	0-0.1 (vol)	287-92-3	n.av.	n.av.	600 ppm

SECTION 3 - PHYSICAL DATA

PHYSICAL STATE	ODOUR AND APPEARANCE	ODOUR THRESHOLD (ppm)
LIQUID	OLEFINIC ODOUR LIGHT BROWN COLOUR	n.av.

VAPOUR PRESSURE	VAPOUR DENSITY	EVAPORATION RATE	BOILING POINT (°C)	POUR POINT (°C)
(kPa) 7 @ 38°C	(AIR=1) 3-5 @ 20°C	LOW	179 TO >400	-15

pH	DENSITY (g/mℓ)	COEFF. WATER/OIL DIST.
n.ap.	0.850 @ 15°C	<1

SECTION 4 - FIRE AND EXPLOSION DATA

FLAMMABILITY	IF YES, UNDER WHICH CONDITIONS?	
YES X NO		INDUCED BY IGNITION SOURCE

MEANS OF EXTINCTION	
	DRY CHEMICAL, WATER FOG, SHUT FUEL SUPPLY OFF, ALSO FOAM

FLASHPOINT (°C) AND METHOD	LOWER FLAMMABLE LIMIT (% BY VOLUME)	UPPER FLAMMABLE UNIT (% BY VOLUME)
28 (CLOSED CUP)	0.6 (ESTIMATED)	15.0 (ESTIMATED)

AUTOIGNITION TEMPERATURE (°C)	HAZARDOUS COMBUSTION PRODUCTS
> 400 (ESTIMATED)	OXIDES OF CARBON, SULPHUR AND NITROGEN

EXPLOSION DATA	SENSITIVITY TO IMPACT	SENSITIVITY TO STATIC DISCHARGE
	MIXTURE NOT SENSITIVE	VAPOURS MAY IGNITE IF EXPOSED TO STATIC DISCHARGE

SECTION 5 - REACTIVITY DATA

CHEMICAL STABILITY	IF NO, UNDER WHICH CONDITIONS?	
YES X NO		STABLE COMPOUND, NO HAZARDOUS POLYMERIZATION WILL OCCUR

INCOMPATIBILITY WITH OTHER SUBSTANCES		
YES X NO	IF SO WHICH ONES:	HEAT: IGNITION SOURCES AND OXIDIZERS

REACTIVITY, AND UNDER WHAT CONDITIONS	n.av.

HAZARDOUS DECOMPOSITION PRODUCTS	OXIDES OF CARBON, NITROGEN, AND SULPHUR.

SECTION 6 - TOXICOLOGICAL PROPERTIES

ROUTE OF ENTRY				
SKIN CONTACT X	SKIN ABSORPTION	EYE CONTACT X	INHALATION X	INGESTION

EFFECTS OF ACUTE EXPOSURE TO PRODUCT
IRRITATING TO EYES BUT WILL NOT DAMAGE TISSUE. AVOID BREATHING VAPOURS OR MISTS.

EFFECTS OF CHRONIC EXPOSURE TO PRODUCT
PROLONGED CONTACT MAY CAUSE SKIN IRRITATION

EXPOSURE LIMITS	IRRITANCY OF PRODUCT	SENSITIZATION TO PRODUCT	CARCINOGENICITY
OIL MIST 5 MG/M³	MAY CAUSE RESPIRATORY TRACT IRRITATION	n.ap.	n.av.

TERATOGENICITY	REPRODUCTIVE TOXICITY	MUTAGENICITY	SYNERGISTIC
n.av.	n.av.	n.av.	n.av.

SECTION 7 - PREVENTIVE MEASURES

PERSONAL PROTECTIVE EQUIPMENT:

GLOVES (SPECIFY)	RESPIRATOR (SPECIFY)	EYE (SPECIFY)
CHEMICAL RESISTANT (NITRILE)	NIOSH APPROVED AIR PURIFYING RESPIRATOR WITH ORGANIC CARTRIDGE	SAFETY GLASSES WITH SIDE SHIELDS

FOOTWEAR (SPECIFY)	CLOTHING (SPECIFY)	OTHER (SPECIFY)
CHEMICAL RESISTANT	LONG SLEEVES	n.ap.

ENGINEERING CONTROLS (SPECIFY. EG. VENTILATION, ENCLOSED PROCESS)
USE EXPLOSIVE-PROOF VENTILATION TO CONTROL VAPOUR CONCENTRATION. FOR PERSONNEL ENTRY INTO CONFINED SPACE, ENTRY PROCEDURE MUST INCLUDE VENTILATION AND TESTING OF ATMOSPHERE. MAKE UP AIR MUST BE SUPPLIED TO BALANCE AIR EXHAUSTED.

LEAK AND SPILL PROCEDURE
ELIMINATE SOURCE OF IGNITION. PREVENT ADDITIONAL DISCHARGE OF MATERIAL. EVACUATE PERSONNEL NOT EQUIPPED WITH PROTECTIVE CLOTHING AND NIOSH APPROVED RESPIRATORY EQUIPMENT. CONTAIN SPILL WITH NONCOMBUSTIBLE ABSORBENTS.

WASTE DISPOSAL
CONSULT AN EXPERT AND ENSURE DISPOSAL IS IN COMPLIANCE WITH GOVERNMENT REQUIREMENTS.

HANDLING PROCEDURES AND EQUIPMENT
KEEP CONTAINERS CLOSED. STORE IN COOL, WELL VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. DO NOT PRESSURIZE, CUT, HEAT OR WELD EMPTY CONTAINERS. KEEP AWAY FROM OPEN FLAME AND USE PROPER GROUNDING PROCEDURES

STORAGE REQUIREMENTS
STORE AT NORMAL (UP TO 38°C) ATMOSPHERIC PRESSURE. KEEP AWAY FROM OPEN FLAMES AND USE PROPER GROUNDING PROCEDURES.

SPECIAL SHIPPING INFORMATION

PRIMARY TDGR CLASS 3 PIN: UN1202 PACKING GROUP III

SECTION 8 - FIRST AID MEASURES

SPECIFIC MEASURE

EYES: FLUSH EYES WITH LARGE AMOUNTS OF WATER UNTIL IRRITATION SUBSIDES. CALL FOR MEDICAL ATTENTION IF IRRITATION PERSISTS.

INHALATION: IN EMERGENCY SITUATIONS USE PROPER RESPIRATORY PROTECTION AND IMMEDIATELY REMOVE THE VICTIM FROM EXPOSURE. ADMINISTER ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. KEEP AT REST AND CALL FOR MEDICAL ATTENTION.

INGESTION: DO NOT INDUCE VOMITING, NO MATERIAL SHOULD ENTER THE LUNGS. (ASPIRATION). KEEP AT REST, GET PROMPT MEDICAL ATTENTION.

SKIN: FLUSH AREA WITH LARGE AMOUNTS OF WATER AND USE SOAP IF AVAILABLE. REMOVE SEVERELY CONTAMINATED CLOTHING AND LAUNDER BEFORE REUSE.

ENVIRO 4000

SECTION 9 - PREPARATION DATE OF MSDS

PREPARED BY	PHONE NUMBER	DATE
NEWALTA CORP. LAB COORDINATOR: JONG JAY	403-440-6790	MAY 19, 1998

THE INFORMATION ON THIS FORM IS BASED ON DATA THAT IS CONSIDERED RELIABLE, HOWEVER NEWALTA CORPORATION DOES NOT GUARANTEE THE ACCURACY THEREOF. NEWALTA CORPORATION EXPRESSLY DISCLAIMS ALL LIABILITY FOR LOSS OR DAMAGE, INCLUDING CONSEQUENTIAL LOSS, OR FOR INJURY TO PERSONS (INCLUDING DEATH) ARISING DIRECTLY OR INDIRECTLY FROM RELIANCE UPON THE INFORMATION FOR USE OF THE MATERIAL ON THIS DATA SHEET.

Imperial Oil MATERIAL SAFETY DATA SHEET

Date Prepared: June 20, 1997
Supersedes: June 14, 1997
MSDS Number: 08522

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1. PRODUCT INFORMATION

Product Identifier: UNLEADED GASOLINE
REGULAR UNLEADED
MIDGRADE UNLEADED
ESSO SUPER PREMIUM UNLEADED
PREMIUM UNLEADED
ESSO REGULAR UNLEADED
ESSO MIDGRADE UNLEADED
ESSO EXTRA MIDGRADE UNLEADED
ESSO PREMIUM UNLEADED
EXXON MIDGRADE UNLEADED
EXXON PREMIUM UNLEADED
INDOLENE GASOLINE
EXXON REGULAR UNLEADED
PREMIUM GASOLINE
ESSO EXTRA MIDGRADE GASOLINE
MIDGRADE GASOLINE
GASOLINE REGULAR UNLEADED
GASOLINE MIDGRADE UNLEADED MUL89 (DYED OR CLEAR)
GASOLINE REGULAR UNLEADED RUL87 (DYED OR CLEAR)
GASOLINE PREMIUM UNLEADED PUL91 (DYED OR CLEAR)
GASOLINE PREMIUM UNLEADED PUL92 (DYED OR CLEAR)
GASOLINE PREMIUM UNLEADED SUL94
SUPERSUPREME 94 PREMIUM UNLEADED GASOLINE-MTBE

Application and Use:
Motor gasoline fuel, for use in internal combustion engines only

Product Description:

A mixture of aliphatic and aromatic hydrocarbons and additives.

REGULATORY CLASSIFICATION

WHMIS:

Class D, Division 2, Subdivision A: Very Toxic Material.
Class B, Division 2: Flammable Liquids.

TDG INFORMATION (RAIL/ROAD):

Shipping Name: Gasoline
Class: 3
Packing Group: II
PIN Number: UN1203

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4111

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a)(i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #	
Gasoline	> 99 v/v	8006-61-9	LD50 > 18ml/kg,orl,rat LD50 > 5ml/kg,skn,rbt
Methyl T-Butyl Ether	0-11 v/v	1634-04-4	LD50:3.9g/Kg,ing,rat LD50: > 10g/Kg,skn,rbt LC50: 142Mg/L,inh,rat

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid
Specific gravity: not available
Viscosity: 0.80 cSt at 20 deg C
Vapour Density: 3.2
Boiling Point: 25 to 210 deg C
Evaporation rate: > 10 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: -60 deg C less than
Odour Threshold: not available
Vapour Pressure: 76 kPa to 103 kPa at 38 deg C
Density: 0.73 g/cc at 15 deg C
Appearance/odour: Naturally occurring water white or pale yellow; may be dyed a variety of colours for tax or other purposes; petroleum odour.

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

High vapour concentrations are irritating to the eyes, nose, throat and lungs; may cause headaches and dizziness; may be anesthetic and may cause other central nervous system effects.
Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin and cause a skin rash (dermatitis).

INGESTION:

Low toxicity.
Small amounts of this liquid drawn into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC:

The International Agency for Research on Cancer (IARC) has evaluated gasoline and found it to be a possible human carcinogen.
Contains benzene. Human health studies (epidemiology) indicate that prolonged and/or repeated overexposures to benzene may cause damage to the blood producing system and serious blood disorders, including leukemia.
Animal tests suggest that prolonged and/or repeated overexposures to benzene may damage the embryo/fetus. The relationship of these animal studies to humans has not been fully established.
Contains n-hexane. Prolonged and/or repeated exposures may cause damage to the peripheral nervous system (e.g. fingers, feet, arms etc.).

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:
Oral : LD50 > 18 ml/kg (Rat)
Dermal : LD50 > 5 ml/kg (Rabbit)

OCCUPATIONAL EXPOSURE LIMIT:

Manufacturer recommends:
For Benzene (skin) 1 ppm TWA for 8 hour workday.
For gasoline, 300 mg/m3.
For Methyl-tert-Butyl Ether, a 15 minute short-term exposure limit (STEL) of 50 ppm.

ACGIH recommends:
For Gasoline, ACGIH recommends a TWA of 300 ppm (890 mg/m3) and categorizes it as an animal carcinogen.
For n-Hexane, 50 ppm (180 mg/m3).
For Benzene, ACGIH recommends a TWA of 0.5 ppm (1.6 mg/m3), (skin), and categorizes it as a confirmed human carcinogen.
For Methyl-tert-Butyl Ether, ACGIH recommends a TLV of 40 ppm (144 mg/m3) an categorizes it as an animal carcinogen.

Local regulated limits may vary.

5. FIRST AID MEASURES

INHALATION:

In emergency situations use proper respiratory protection to immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

Please turn over

Esso Imperial Oil

MATERIAL SAFETY DATA SHEET

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.

INGESTION:

DO NOT induce vomiting since it is important that no amount of the material should enter the lungs (aspiration). Keep at rest. Get prompt medical attention.

6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye contact is avoided.
Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.
Use explosion-proof ventilation equipment.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Store and load at normal (up to 38 deg C) temperature and at atmospheric pressure.
Material will accumulate static charges which may cause a spark. Static charge build-up could become an ignition source. Use proper relaxation and grounding procedures.
For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.
Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Vapours or dust may be harmful or fatal. Warn occupants of downwind areas.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth. Do not use combustible materials such as sawdust.
Recover by pumping (use an explosion proof motor or hand pump), or by using a suitable absorbent.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Eliminate all sources of ignition. Vapours or dust may be harmful or fatal. Warn occupants and shipping in downwind areas.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: -40 deg C COC D92 less than/moins de

Autoignition: NA Flammable Limits: LEL: 1.4% UEL: 7.6%

GENERAL HAZARDS:

Extremely flammable; material will readily ignite at normal temperatures.
Flammable Liquid; may release vapours that form flammable mixtures at or above the flash point.
Toxic gases will form upon combustion.
Static Discharge; material may accumulate static charges which may cause a fire.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire if possible to do so without hazard. If a leak or spill has not ignited use water spray to disperse the vapours.
Either allow fire to burn out under controlled conditions or extinguish with foam or dry chemical. Try to cover liquid spills with foam.
Respiratory and eye protection required for fire fighting personnel.
Avoid spraying water directly into storage containers due to danger of boilover.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide under thermal decomposition.

8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

9. NOTES

10. PREPARATION

Date Prepared : June 20, 1997
Prepared by: Lubricants & Specialties
IMPERIAL OIL
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