**PREAMBLE**

Diavik Diamond Mines Inc (DDMI’s) Operational Phase Contingency Plan (OPCP) designates lines of authority, responsibility, establishes proper reporting, communication procedures, and organizes plans of action in the event of an incident/spill. This plan applies to the operational phase of the mine operations. The plan is applicable to all Diavik employees and any applicable contractors associated with the project located at latitude 64° 31’ N and longitude 110° 20’ W, approximately 300 km NNE of Yellowknife.

This plan will be reviewed and updated on an annual basis or as required, to reflect any changes in the scope/schedule related to operational activities, personnel, and/or technology. It should be noted that Diavik Diamond Mines Inc. is one of the members of the Tibbitt to Contwoyto Winter Road Joint Venture. Therefore information related to contingency planning for offsite transportation has been removed from this plan. A separate Spill Contingency Plan was submitted by the Joint Venture, and updates (i.e. position titles and phone numbers) are done annually.

This plan was prepared and approved by Diavik Diamond Mines Inc. Any correspondence related to this plan including requests for additional copies should be forwarded to:

Health, Safety & Environment Department
Superintendent, Environment
Diavik Diamond Mines Inc.
Yellowknife, N.T.
P.O. Box 2498
5007 – 50th Avenue
Yellowknife, N.T. X1A 2P9

Tel. (867) 766-5407
Fax (867) 766-5401
DISTRIBUTION LIST

The following table provides the positions of the key personnel to whom a copy of this OPCP has been distributed. The list will be updated if there are changes to organizational structure.

<table>
<thead>
<tr>
<th>COPY #</th>
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<td>VP Operations</td>
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<td>DDMI</td>
<td>Manager, HSET</td>
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<td>3</td>
<td>DDMI</td>
<td>Site Security Manager</td>
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</tr>
<tr>
<td>4</td>
<td>WLWB</td>
<td>Chairperson</td>
<td>Hard Copy &amp;</td>
</tr>
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</table>

Electronic

* On DDMI Intranet under Reference/Environment Management Plans

Hard copies are also located at the Disaster Management Response stations: Kimberlite Board Room, North Construction Offices (Mine Site stations), Yellowknife Corporate Office Main Board Room and G&G Expediting Boardroom (Yellowknife stations).
RECORD OF AMENDMENTS

The Health, Safety, Environment and Training (HSET) Manager is required to update position titles and numbers as well as other site-specific data, whenever these changes occur so that:

- The Plan remains useful
- It complies with Diavik standards for environmental practices
- It meets standards and guidelines set by federal, territorial and regional authorities

Amendment pages and/or revised plans will be periodically sent to all holders of the Plan by the HSET Manager. It will be the responsibility of each holder of the Plan to update their copy as shown below.

<table>
<thead>
<tr>
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<th>Nature of Amendment</th>
<th>Pertinent Sections</th>
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<td></td>
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<td>6</td>
<td>Updated</td>
<td></td>
<td>March 2003</td>
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<td>March 2006</td>
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<tr>
<td>10</td>
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<td></td>
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<td>CE</td>
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<tr>
<td>11</td>
<td>Revised to address requirements in the NWT Guidelines for Spill Contingency Planning (INAC 2007)</td>
<td>Sections 1-5, Table 6.1, Section 8, Appendices A,B,C &amp; D</td>
<td>March 2008</td>
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<td>March 2009</td>
<td>SGB</td>
</tr>
<tr>
<td>13</td>
<td>Update to include WLWB comments dated June 12, 2009 titled DDMI’s 2008 proposed updates to the OPCP, HMMP, and WRMP</td>
<td>Refer to WLWB letter dated June 12, 2009 for details.</td>
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<td>October 2010</td>
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<tr>
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<td>Annual Update</td>
<td>March 2011</td>
<td>SGB</td>
<td></td>
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</table>
The following list summarizes the changes made in v15, the March 2011 Annual Update;

1. Revised staff titles and department names based on DDMI organizational changes;
2. Updated internal and external contact numbers in Section 2I
3. Updated figures where necessary;
4. Updated Section 5 (Training and Exercises);
5. Updated Table 6.1;
6. Removed the discussion regarding the investigation and mitigation work conducted by Asset Management for hydraulic oil spills to the *Hydraulic Oil Hose and Fuelling Equipment* part of Section 6;
7. Minor administrative edits to wording throughout the document to better align with current operations.
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APPENDIX A: Equipment and Facility Inspection Schedules and Response Equipment Locations
APPENDIX B: GNWT 24-hr Spill Line Report Form
APPENDIX C: Environmental Sensitivity Mapping
APPENDIX D: Response Strategies
1. INTRODUCTION AND PROJECT DETAILS

The purpose of the Diavik Diamond Mine Inc. (DDMI’s) Operational Phase Contingency Plan (OPCP) is to provide response measures for any unintentional release of hazardous/toxic substances as well as procedures for water management. Figure 1 shows the project site layout for the operational phase. The OPCP defines the responsibilities of key personnel and outlines their duties and required procedures when responding to unintentional releases of products to the environment.

This plan has been designed to facilitate effective communication and the efficient clean up of spills from potentially hazardous materials. The hazardous materials include:

- Hydrocarbon liquids such as diesel fuel, gasoline, hydraulic oil;
- Soluble solids such as ammonium nitrate prill;
- Soluble liquids, such as glycols, acids, and paints;
- Poor quality water (i.e. sediments, sewage and water treatment plant effluent & sludge); and
- Corrosive liquids such as sulfuric acid.

The principle objectives of this plan are to:

1. Provide readily accessible emergency information to the clean-up crews, management, and government agencies in the event of any emergency situation;
2. Comply with federal and territorial regulations and guidelines pertaining to the preparation of contingency plans and notification requirements;
3. Comply with company environmental and safety policies;
4. Promote safe and effective recovery of spilled materials; and
5. Minimize environmental impacts of spills to water or land.

This plan outlines response measures and the organization of the emergency response team. Alert and notification procedures and cleanup strategies are outlined along with the duties and responsibilities of key response personnel. Contained within this document are the Emergency contacts listed for DDMI, any applicable contractors, government agencies, private organizations and neighboring sites/operations.

Separate documents, the DDMI Business Resilience and Recovery Plan (BRRP) Plan and the DDMI Emergency Management Plan (EMP), outline the sequence of notification that would transpire for various types of operational incidents and emergencies that may occur at the site (significant spills, etc.). The EMP document encompasses both surface and underground mining scenarios. Additionally, the document Emergency Duty Cards for Underground Mining is also provided on the intranet. This document specifically outlines detailed information about tasks required underground in the event of an emergency.
Further information is provided in the following appendices:

- Appendix A contains inspection schedules for storage facilities and equipment and locations of response equipment;
- Appendix B provides a copy of the NWT 24-hr Spill Line incident form;
- Appendix C contains environmental sensitivity maps to assist in planning and conducting spill clean up operations at the mine site; and
- Appendix D describes Specific Response Strategies for cleanup in different kinds of conditions.

The OPCP is prepared in accordance with Indian and Northern Affairs Guidelines for Spill Contingency Planning (April 2007). It combines requirements for Spill Contingency and General Contingency planning. The plan will be reviewed on an annual basis or as required to make modifications and improvements as the operation continues to evolve.

**Project and Site Description**

The mine site layout is shown in Figure 1 for reference. At full development, the mine site will be 12.67 km². Most infrastructure is located within two main areas: the south and north sides. The south side includes: process plant, sewage treatment plant, water intake, main and south camp accommodation buildings, powerhouses, south tank farm, warehouse and truck shop, lube storage building, A21 portal development and various laydown areas. The north side includes: north construction offices, A154/418 pits and underground portal, underground dry and offices, fuel tank storage, truck shop, water treatment plant, batch plant, crusher and paste plants. The emulsion plant and ammonium nitrate storage buildings are located on the perimeter of the property to the west and south.

**Potentially Impacted Areas**

The Diavik mine is a diamond mine that includes open pit and underground mining. It is located on an island in Lac de Gras, which would likely be the receiving water for spills of a large magnitude, were they not contained on land. Local water quality is typical of pristine arctic lakes and supports migrating waterfowl and a healthy fish population. The area frequently experiences high winds, which would be a catalyst for dispersal of any liquid product that could enter the lake and could potentially hamper response efforts. The waters of Lac de Gras are also the source for camp drinking water supply and general raw water use on the island. The land on East Island supports a variety of wildlife, but most animals simply pass through the area and do not reside on the island.
Figure 1: Site Layout

Quickbird Satellite Image
Clavik Diamond Mine
August 2010

Projection: UTM Zone 12, WGS84
Produced by
Clavik Diamond Mine
Environment Department
Ladakh Oasis, Northwest Territories
**Hazardous Materials**

Refer to Section 6 for a complete list of hazardous materials transported to and stored on site.

**Prevention**

Transport, transfer and storage of materials are performed by trained personnel using secondary containment where appropriate, with well-maintained equipment and containers. Good housekeeping practices are adopted especially in areas such as storage facilities, loading and unloading zones. Maintenance of related accessories such as transfer hoses with camlock mechanisms, drip pans and pumps are carried out at regular intervals to ensure that they are in good order. Site Supervisors will document the existing condition of the equipment/storage facilities, the problems, and the recommendations made on repairs. S/he will also record the amount of materials stored, compatibility of materials stored, levels of fluids (overfilling) and used/unused protective equipment. S/he will recommend and incorporate changes and improvements in procedures by evaluating previous releases and spills.

**Inspections**

Periodic inspections will be carried out to verify that resources and equipment for emergency response are available and in good working condition. During inspections, the records of maintenance and repairs for each piece of equipment will be checked to ensure it is current, that the service or repair date is completed and that appropriate recommendations were made. Inspections will also be carried out at each of the facilities where handling or storage of hazardous materials or waste streams occurs.

During the operational phase, an inspection schedule will be utilized to ensure the inspection of the following areas:

- Tank farm
- Airstrip
- Roadways
- Piping and valves
- Liners
- Electrical/cabling
- Storage areas
- Incinerators
- Waste disposal
- Fueling areas

Typical inspection schedules and duties are presented in **Appendix A**, along with a map showing fixed response locations such as spill kits and fire hydrants.
2. RESPONSE ORGANIZATION

This section addresses the response organization and the responsibilities of each individual during response to an incident.

Response Organization

Figure 2 displays the line of communication in the event of an incident or spill situation.

The first person to notice, or come in contact with, any hazardous situation either initiates a Code 1 (in the case of fire or severe injury) or reports to his/her immediate supervisor (in the case of a spill on land or water). The supervisor is responsible to report the incident to the designated On-Scene Supervisor (see Figure 2) at site. Further reporting procedures are the responsibility of the On-Scene Supervisor. Major responsibilities, such as initial coordination, spill clean-up and mobilizing the Emergency Response Team (ERT) are part of the Coordinator’s duties. Responsibilities such as informing communities, WSCC and media, is the responsibility of Diavik Senior Management.

The On-Scene Coordinator will contact the applicable area Manager or alternate, who in turn will inform the Vice President of Operations. Onsite Environment personnel will complete a GNWT spill report form as information is compiled. After all information has been collected, DDMI Environment will submit a report to the NWT 24-hour Spill Line. A copy of the GNWT Spill Report form is provided in Appendix B. In the event that the emergency is associated with a loss of power, satellite phones are available at: medic's office, IT, Geology and HSE departments.

Note: Should an emergency situation occur where a major release of hazardous material happens, refer to the Business Resilience and Recovery Plan (BRRP) and the Emergency Management Plan for guidance in responsibility and control. These plans are found on the DDMI Intranet under the “Health, Safety & Environment” link.
Figure 2: Incident/Spill Response Organization

SPILL OF PETROLEUM, TOXIC, CORROSIVE, OR OTHER SUBSTANCES ON LAND OR WATER

CONTACT SUPERVISOR

CONTACT ON-SCENE SUPERVISOR – MINE RESCUE COORDINATOR, SAFETY SUPERINTENDENT, OR ENVIRONMENT SUPERINTENDENT

CALL CODE 1 AND NOTIFY AREA SUPERVISOR

CONTACT ON-SCENE SUPERVISOR – MINE RESCUE COORDINATOR, SAFETY SUPERINTENDENT, OR ENVIRONMENT SUPERINTENDENT

CONTACT AREA MANAGER AND ASSET MANAGEMENT MANAGER OR ALTERNATE ABOUT EQUIPMENT REQUIRED. CONTACT ENVIRONMENT STAFF AND SENIOR MANAGEMENT

COLLECT REQUIRED INFORMATION ON SPILL/INCIDENT AND FILL OUT ENVIRONMENTAL INCIDENT INVESTIGATION REPORT (INTRANET).

HSE DEPARTMENT SUBMITS EXTERNAL REPORT VIA THE NWT SPILL LINE. THE SPILL LINE DISTRIBUTION LIST INCLUDES RELEVANT REGULATORS

DDMI SENIOR MANAGEMENT DIRECTS EXTERNAL COMMUNICATIONS TO COMMUNITIES, MEDIA, WSCC, ETC.

ENVIRONMENT SUPERINTENDENT SUBMITS FOLLOW-UP REPORT TO THE INAC INSPECTOR WITHIN 30 DAYS OF THE INCIDENT
Organizational Roles and Responsibilities

The following tables list the major responsibilities of site staff that will be participating in environmental emergency response management.

<table>
<thead>
<tr>
<th>TITLE</th>
<th>SPECIFIC RESPONSIBILITIES</th>
</tr>
</thead>
</table>
| Incident Observer | • In the case of a fire or severe injury, initiate a Code 1. Remain on radio Channel 1 to provide guidance to the ERT.  
• In the case of a spill, contact the supervisor to report the incident. |
| Supervisor | • Initial assessment of the severity of the incident.  
• Contacts the On-Scene Coordinator.  
• Gathers facts about the spill.  
• Assists as required in response measures. |
| On-Scene Coordinator | • Assumes complete authority over the incident/spill scene and personnel involved.  
• Assesses the situation and the magnitude of the incident/spill.  
• Activates the Contingency Plan.  
• Reports the incident/spill to Environment staff.  
• Develops an overall plan of action.  
• Reports to the Asset Management Manager and provides recommendations on resource requirements (additional manpower, equipment, material, etc.) to complete the cleanup effort.  
• Implements training and simulation requirements for incident/spill response personnel.  
• Assists Asset Management Manager and/or the Fixed Plant/Surface Operations Manager in documenting the cause of the incident/spill, effectiveness of the response effort and recommends appropriate measures to prevent a reoccurrence of the incident. |
| Emergency Response Coordinator, Health & Safety Superintendents and/or Environmental Superintendent |  |
| Alternate: HSE Manager |  |
| Emergency Response Team (ERT) | • ERT reports to the On-Scene Coordinator  
• When required, trained members of the ERT are mobilized to assist in any incidents requiring additional efforts to handle, control or manage.  
• ERT members assist the On-Scene Coordinator in documenting the cause of the incident/spill, effectiveness of the response effort and recommend appropriate measures to prevent a reoccurrence of the incident.  
• Members of the ERT are regularly trained on incident/spill response.  
• Maintain team-specific plans/procedures. |
|-----------------------------|---------------------------------------------------------------------------------------------------|
| Asset Management and Fixed Plant Surface Operations Managers | • Provides the necessary facilities and/or equipment.  
• Provides adequate personnel and time resources to conduct activities safely.  
• Makes financial decisions on major expenses during any incidents/spills.  
• Provides liaison with Diavik Management to keep them informed of incident/spill response activities.  
• Documents the cause of the incident/spill, effectiveness of the response effort and implements appropriate measures to prevent a reoccurrence of the incident.  
• Ensures that the response activity is completed effectively and all communication followed up. |
| Alternate: Surface Operations Superintendent | |
| Vice President of Operations | • Makes any major significant decisions on-site related to the incident.  
• Assist in communications with media and any external organizations. |
<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>HSE Department Environment Staff</td>
<td>• Provides advice on incident/spill and environmental issues to the On-Scene Coordinator.</td>
</tr>
<tr>
<td></td>
<td>• Responsible for reporting the incident to NWT-24 hour spill line</td>
</tr>
<tr>
<td></td>
<td>• Recommends and implements any required sampling, testing, or monitoring program associated with the incident/spill.</td>
</tr>
<tr>
<td></td>
<td>• Files reports with appropriate regulatory organizations.</td>
</tr>
<tr>
<td></td>
<td>• Reports to HSET Manager</td>
</tr>
<tr>
<td></td>
<td>• Assists the Vice President of Operations with documentation, follow up and liaison with government agencies and media.</td>
</tr>
<tr>
<td></td>
<td>• Reviews incident occurrences and recommends preventative measures.</td>
</tr>
<tr>
<td></td>
<td>• Assists in implementing training and simulation requirements for spill response personnel.</td>
</tr>
<tr>
<td>On-scene Trained Medical Personnel</td>
<td>• Supports all medical emergencies.</td>
</tr>
<tr>
<td></td>
<td>• Provides first aid to all victims.</td>
</tr>
<tr>
<td>President</td>
<td>• Supports the efforts of the Vice President of Operations.</td>
</tr>
<tr>
<td></td>
<td>• Coordinates with Director of Communities &amp; External Relations and HSET Manager.</td>
</tr>
<tr>
<td>Director, Communities &amp; External Relations</td>
<td>• Acts as a spokesperson with government agencies as well as the public and the media, ensuring that any press releases are accurate.</td>
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**Internal Contacts**

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<tr>
<th>TITLE</th>
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<tr>
<td>Vice President of Operations</td>
<td>(867) 765-7155/</td>
<td>(867) 766-5910</td>
</tr>
<tr>
<td></td>
<td>(867) 445-4586</td>
<td></td>
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<tr>
<td>Asset Management Manager</td>
<td>(867) 765-7127/</td>
<td>(867) 766-5454</td>
</tr>
<tr>
<td></td>
<td>(867) 445-4597</td>
<td></td>
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<tr>
<td>Fixed Plant Surface Operations Manager</td>
<td>(867) 765-7134</td>
<td>(867) 766-5454</td>
</tr>
<tr>
<td></td>
<td>(867) 445-5476</td>
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<tr>
<td>Surface Operations Superintendent</td>
<td>(867) 766-5456</td>
<td>(867) 766-5454</td>
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<tr>
<td>HSET Manager</td>
<td>(867) 766-5443</td>
<td>(867) 766-5401</td>
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<tr>
<td>Emergency Response Coordinator</td>
<td>(867) 765-5462</td>
<td>(867) 766-5401</td>
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<tr>
<td>Safety Superintendent</td>
<td>(867) 766-5426</td>
<td>(867) 766-5401</td>
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<tr>
<td>Environment Superintendent</td>
<td>(867) 766-5407</td>
<td>(866) 766-5940</td>
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<tr>
<td>Site Security</td>
<td>(867) 766-5903</td>
<td>(867) 766-5459</td>
</tr>
<tr>
<td>Environment Coordinators</td>
<td>(867) 766-5403</td>
<td>(866) 766-5940</td>
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**Contractor Contacts**

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<tr>
<th>TITLE</th>
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<tbody>
<tr>
<td>Ekati Services – Camp Manager</td>
<td>(867) 766-5913</td>
<td>(867) 766-5916</td>
</tr>
<tr>
<td>Medical Services</td>
<td>(867) 766-5901</td>
<td>(867) 766-5417</td>
</tr>
<tr>
<td>Denesoline Western Explosives Ltd.</td>
<td>(867) 766-5489</td>
<td>(867) 766-5493</td>
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</table>
External Contacts

CONTACT NUMBERS:

1. Government 24-hour Spill Report Line:
   PHONE # (867) 920-8130
   FAX # (867) 873-6924
   Email spills@gov.nt.ca

2. Worker's Safety and Compensation Commission:
   PHONE # (867) 920-3888

<table>
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<tr>
<th>TITLE</th>
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<tr>
<td>Chief Mines Inspector, WSCC</td>
<td>(867) 669-4412</td>
</tr>
<tr>
<td>Operations Director (DIAND)</td>
<td>(867) 669-2760</td>
</tr>
<tr>
<td>INAC Inspector</td>
<td>(867) 669-2767</td>
</tr>
<tr>
<td>Manager, Water Resources Division (DIAND)</td>
<td>(867) 669-2749</td>
</tr>
<tr>
<td>Manager, Enforcement Environment Canada</td>
<td>(867) 669-4730</td>
</tr>
<tr>
<td>DFO (Office Administrator)</td>
<td>(867) 669-4900</td>
</tr>
<tr>
<td>Hazardous Substance Specialist,</td>
<td>(867) 873-7645</td>
</tr>
<tr>
<td>Environmental Protection Service (ENR)</td>
<td></td>
</tr>
<tr>
<td>Regional Superintendent (ENR)</td>
<td>(867) 920-6134</td>
</tr>
<tr>
<td>Office of the Fire Marshall, Municipal &amp;</td>
<td>(867) 873-7469</td>
</tr>
<tr>
<td>Community Affairs</td>
<td></td>
</tr>
<tr>
<td>RCMP (Yellowknife)</td>
<td>(867) 669-1111</td>
</tr>
<tr>
<td>BHP – Site Environment Superintendent</td>
<td>(867) 880-2232</td>
</tr>
<tr>
<td>De Beers – Environment Manager</td>
<td>(867) 766-7322</td>
</tr>
</tbody>
</table>
3. ACTION PLAN

Initial Actions for Spills

For all spill emergencies, it is essential that three initial response priority actions be undertaken. These are:

I. Respond Quickly
II. Respond Safely
III. Full Notification and Reporting

1. RESPOND QUICKLY

1. Identify the spilled material.
2. Ensure the safety of yourself and others.
3. Shut off ignition sources – NO SMOKING.
4. Attend to the injured.
5. Call for assistance.
6. Assess the severity of the spill.
7. On-Scene Coordinator mobilizes Emergency Response Team.

2. RESPOND SAFELY

1. Consult MSDS & Product Guides for further information on the substance.
2. Keep unnecessary people out of the area.
3. Wear impervious clothing, goggles, and gloves, as well as any other necessary PPE.
4. Approach spill from upwind, IF SAFE TO DO SO.
5. Stop product flow by shutting off valves or plugging leak, if safe to do so.
6. Do not contain gasoline/aviation fuel if vapors might ignite.
7. Allow gasoline or aviation fuel spills to evaporate.
8. Contain product using booms, berms, absorbent pads, absorb all or improvise with materials available at the scene, if possible and safe to do so.
9. Recover spill as soon as possible and dispose of material in an approved, contained area.

3. OBTAIN AND REPORT SPILL DETAILS

A GNWT Spill Report Form is included as Appendix B.

EXTERNAL REPORTABLE SPILLS MUST BE REPORTED TO THE NWT 24-HOUR SPILL REPORT LINE BY DIAVIK ENVIRONMENT STAFF: (867) 920-8130
**Spill Response Actions**

Response strategies for spills on land, muskeg, water, ice and snow are provided in **Appendix D** - Response Strategies for Clean Up. This appendix includes details on procedures for containing and cleaning up spills, transferring, storing and managing spill-related waste and procedures for working in adverse environmental conditions. Specific spill response action plans for materials transported and used on site are provided in separate MSDS and Product Guides, which are located in several locations at site. Also included in this appendix is a map showing hazardous material storage areas around site and likely drainage pathways that any released material may follow.

These response strategies mostly pertain to larger spills, to provide guidance in areas of uncertainty. Given the chemicals stored on site, the worst probable case scenario would be a large release (millions of litres) of fuel or process water directly into Lac de Gras.

In the event of a release emergency (an event requiring dedicated resources to stop the release, minimize dispersion, recovery of product, etc), the INAC Inspector will be notified immediately and status reports will be issued regularly. Clean up requirements will be determined in consultation with the INAC Inspector.
4. RESOURCE INVENTORY

This section exclusively addresses the emergency response machinery, equipment, tools and other resources that will be made available on-site for spill counter measures. The schedule for inspecting emergency response equipment at site is located in Appendix A.

Emergency Response Personnel

The organizational chart and table presented in Section 2 outline the roles and responsibilities and telephone numbers of key internal emergency response positions.

Mobile Equipment

Mobile equipment available to DDMI, that will be used for spill contingency include:

- Graders
- Cranes
- Snow Cats
- Vacuum Truck
- Loaders
- Backhoe
- Bulldozer
- Forklift
- Water trucks
- Trash Pumps, Hoselines and Fittings for Hydrocarbon Recovery

Excavators
- Winch Trucks
- Pickup Trucks
- Generator Sets
- Fire Trucks
- Aluminum Boats
- Fuel Trucks
- Spill Recovery Trucks
- Bobcat
- Dozers
- Haul trucks

Additional mobile equipment/machinery on site will be made available for use in an emergency situation.

Temporary Containment System

A supply of the temporary containment systems is also available. These temporary items include the following.

- Booms
- Drums
- Tanks
- Settling ponds
- Floating spill absorbent packages
- Spill absorbent material packages/pads
- Silt fencing
Emergency Transportation

Transportation systems that will be used under an emergency situation/evacuation are:

- Aircraft (fixed wing or rotary)
- 4-wheel drive vehicles
- Snowmobiles
- Boats

Communication Equipment

Radios, telephones, faxes and other wireless communication systems/equipment will be used during an emergency response situation.

Spill Response Kits

Spill response kits are strategically located around the mine site (see Figure A-1). Each department and work area is responsible for providing sufficient spill response kits in their respective work areas. These kits are kept in marked packages at visible and accessible locations. The locations include all fuel storage & transfer areas, chemical storage areas, and so on. Spill Response Kits (storage containers) shall contain the following:

- 45 gal, 16 gauge Open Top Drum, c/w Bolting Ring & Gasket
- 1-48”x1/16” Neoprene Pad (drain stop)
- Plug N/ Dike TM Granular, 1-gal U. S. (3.8 litres)
- Splash Protective Goggles
- 2-PVC Oil Resistant Gloves
- 1-pkg Polyethylene Disposable Bags (5mil) 10 per Pack
- 1 Shovel (Spark Proof)
- 1-case T-12 3”x 12’ Mini Booms / case
- 1-bail HP-256 17”x 19” x1/2” Pads, 100 Pads/bail
- 1-bail of Sphag Sorb TM

The majority of the mobile equipment onsite have the following spill kits:

- 1 Emergency Spill Kit Tote
- 1 Spill Response Jug (2.3Kg)
- 5 Land-only Absorbent pads
- 2 Large Disposable Bags
Mobile HazMat Trailer

The trailer is portable but is located adjacent to the Emergency Response center. The Mobile HazMat Trailer contains the following:

- 3 Peat moss bags
- 10 Chemical Suits
- 6 Bags of Sphagsorb
- 10 Marine Sorbent Booms
- 31 Spill Kits, various
- 4 bags and 2 rolls of oil absorbent pads
- Acid Neutralizer
- 2 Fire extinguishers – 20 lb ABC type
- 31 Universal Booms
- 2 bags absorbent pellets
- Various ropes, tarps, hose, blankets, etc.

External Resources

In the event of a major emergency that requires additional resources, equipment and manpower will be made available through members of the Winter Road Joint Venture and with external organizations and work forces.
5. TRAINING AND EXERCISES

Diavik has a fully equipped Emergency Response Team (ERT) trained and ready to respond to any emergency incident including environmental emergencies. The team has its own fire truck, airport response truck, ambulance (surface and underground), underground pumper truck, rescue truck and spill response trailer. The Diavik ERT also has access to additional equipment such as loaders and suction trucks when required.

The ERT has up to 60 active members, each of whom train 12 hours per 2-week rotation. Full day (12 hour) training sessions are held every Wednesday and special training sessions are scheduled periodically through the year.

Every employee at Diavik receives spill and waste management training during their initial site induction so they can respond to small spills and raise the alarm if a larger response is required. ERT members receive more extensive HAZMAT training and learn how to respond while wearing protective clothing and breathing apparatus.

Every Wednesday, from February 11, 2010 up to and including March 3, 2010 the ERT was involved in Hazardous Materials theory and scenario based training. The team completed theory based training on Hazardous Materials and Hazardous Materials Response including full decontamination procedures. Upon completing the theory, practical training was completed to familiarize the team members with the equipment at the DDMI site.

A mock Code 1 Emergency was staged and the team responded as per DDMI ERT procedures. The mock Code 1 scenario included a Sulphuric Acid spill where an employee was knocked unconscious and there was hazardous material spilling in proximity to him. During each training session, the team responded to the Water Treatment Plant (to where the scenario was staged) along with their HazMat Trailer and began preparation for rescue and decontamination.

Team 1 prepared to enter the area dressed in HazMat equipment and using an SCBA. While they were dressing, another group set up the decontamination area ensuring all equipment was available for the teams entering the incident scene.

Team 1 entered the scene and protected the casualty from further contamination while removing all contaminated clothing and rinsing once all possible contaminant was cleared from the casualty. The casualty was then brought through the decontamination area for further cleaning and handed to the Medics in the Cold Zone.

Team 2 then went in to continue to contain the spill and begin decontaminating the area.
Upon completion of the containment / cleaning, both teams went through the proper decontamination channels until coming out in the Cold Zone and being sent to the Medics for further evaluation.

The training sessions were a great success enabling the team to familiarize themselves with the procedures and equipment. Some learning's gained from the scenario included knowledge of water sources in all buildings with potential Hazardous Materials, requirements for larger tarps to contain splash material in the decontamination area and issues with storing some Hazardous Material equipment outside in the winter.
6. RISK ASSESSMENT AND PREVENTION

Risk Assessment

Risk assessment identifies potential problems, provides a determination of impacts to the environment, ranks the probability of a problem occurring and provides preventative measures to minimize the possibility of the problem happening. Table 6-1 identifies the predominant hazardous materials transported, stored and generated at the site.

Table 6.1 Hazardous Materials Stored at Site during Operations

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>MAX. AMOUNT PRESENT ON-SITE</th>
<th>MAX. AMOUNT TRANSPORTED PER TRUCKLOAD</th>
<th>STORAGE LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>80,000,000 liters</td>
<td>42,000 liters</td>
<td>Tank Farms</td>
</tr>
<tr>
<td>Gasoline</td>
<td>5,000 liters</td>
<td>205 liter drums</td>
<td>Airport Fuel Storage</td>
</tr>
<tr>
<td>Lubricating Oil</td>
<td>19,569 liters</td>
<td>25,000 liters</td>
<td>Warehouse Sprung</td>
</tr>
<tr>
<td>Lubricating Oil (engine)</td>
<td>385,756 liters</td>
<td>25,000 liters</td>
<td>Lube Storage Building/Warehouse Sprung / D1 Laydown (temporary storage)</td>
</tr>
<tr>
<td>Gear Oil</td>
<td>28,814 liters</td>
<td>20,000 liters</td>
<td>Lube Storage Building</td>
</tr>
<tr>
<td>Arctic Hydraulic Fluid – All Season</td>
<td>77,987 liters</td>
<td>25,000 liters</td>
<td>Lube Storage Building/Warehouse Sprung / D1 Laydown (temporary storage)</td>
</tr>
<tr>
<td>Used/Waste Oil</td>
<td>350,000 liters</td>
<td>20,000 litres</td>
<td>Bermed area beside Lube Storage &amp; Power Plant, Waste transfer Area, D1 Laydown</td>
</tr>
<tr>
<td>Transmission Oil</td>
<td>145,921 liters</td>
<td>25,000 liters</td>
<td>Lube Storage Building/Warehouse Sprung</td>
</tr>
<tr>
<td>Rock Drill Oil</td>
<td>9,645 liters</td>
<td>25,000 liters</td>
<td>Lube Storage Building/Warehouse Sprung</td>
</tr>
<tr>
<td>Jet B</td>
<td>15,000 liters</td>
<td>205 liter drums</td>
<td>Airport Fuel Storage</td>
</tr>
<tr>
<td>Jet A</td>
<td>10,000 liters</td>
<td>205 liter drums</td>
<td>Airport Fuel Storage</td>
</tr>
<tr>
<td>Windshield Washer Fluid</td>
<td>1,626 liters</td>
<td>6,000 liters</td>
<td>Lube Storage Building</td>
</tr>
<tr>
<td>Fuel Conditioner</td>
<td>100 liters</td>
<td>1 liters</td>
<td>Lube Storage Building</td>
</tr>
<tr>
<td>Antifreeze – engine glycol</td>
<td>56,280 liters</td>
<td>25,000 liters</td>
<td>Lube Storage Building</td>
</tr>
<tr>
<td>Glycol – buildings, used for heat transfer</td>
<td>174,274 liters</td>
<td>25,000 liters</td>
<td>Power Plant</td>
</tr>
<tr>
<td>Used Ethylene Glycol</td>
<td>20,000 liters</td>
<td>20,000 liters</td>
<td>Bermed area beside Lube Storage &amp; Power Plant, Waste transfer Area, D1 Laydown</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------</td>
<td>---------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Nuclear Density Gauge (Cesium 137)</td>
<td>24 unit</td>
<td>1 unit</td>
<td></td>
</tr>
<tr>
<td>ANFO (Ammonium Nitrate, Fuel Oil Mix)</td>
<td>2,500 kg</td>
<td>Manufactured On-Site</td>
<td></td>
</tr>
<tr>
<td>Ammonium Nitrate (low-density totes)</td>
<td>533,700 kg</td>
<td>40,500 kg</td>
<td></td>
</tr>
<tr>
<td>Ammonium Nitrate (high-density, bulk)</td>
<td>7,535,541 kg</td>
<td>40,000 kg</td>
<td></td>
</tr>
<tr>
<td>Emulsifiers</td>
<td>122,843 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Sodium Nitrite</td>
<td>16,571 kg</td>
<td>5,000 kg</td>
<td></td>
</tr>
<tr>
<td>Sodium Thiocyanate</td>
<td>31,548 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Soda Ash</td>
<td>115 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>2,541 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Sodium Nitrate</td>
<td>180,000 kg</td>
<td>18,000 kg</td>
<td></td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>32,436 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Citric Acid</td>
<td>6,250 kg</td>
<td>10,000 kg</td>
<td></td>
</tr>
<tr>
<td>Slurry Oil</td>
<td>69,672 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Detonator Caps &amp; Delays (PETN &amp; Lead Azide)</td>
<td>215,786 units</td>
<td>30,000 units</td>
<td></td>
</tr>
<tr>
<td>TNT (Boosters)</td>
<td>16,765 kg</td>
<td>25,000 kg</td>
<td></td>
</tr>
<tr>
<td>Propane</td>
<td>8,838 kg</td>
<td>25,000 kg</td>
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</tr>
<tr>
<td>Acetylene (20 lbs per Cyl)</td>
<td>1,953 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Oxygen (20 lbs per Cyl)</td>
<td>4,446 kg</td>
<td>20,000 kg</td>
<td></td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>4,920 liters</td>
<td>2,200 liters</td>
<td></td>
</tr>
<tr>
<td>Paint</td>
<td>423 liters</td>
<td>200 liters</td>
<td></td>
</tr>
<tr>
<td>Solvents</td>
<td>5,330 liters</td>
<td>20 liters</td>
<td></td>
</tr>
<tr>
<td>Sulfuric Acid (Batteries)</td>
<td>140 liters</td>
<td>200 liters</td>
<td></td>
</tr>
<tr>
<td>Slaked Lime</td>
<td>5,000 kg</td>
<td>5,000 kg</td>
<td></td>
</tr>
<tr>
<td>Ferrosilicon</td>
<td>1,130,193 kg</td>
<td>25,000 kg</td>
<td></td>
</tr>
<tr>
<td>Flocculants</td>
<td>150,000 kg</td>
<td>25,000 kg</td>
<td></td>
</tr>
<tr>
<td>Coagulants</td>
<td>20,000 kg</td>
<td>7,000 kg</td>
<td></td>
</tr>
<tr>
<td>Sewage Sludge</td>
<td>400 m³ – 750 m³</td>
<td>Generated On-Site</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Quantity</td>
<td>Disposal Area</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>----------------</td>
<td>---------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Type 10 Cement</td>
<td>31,370,400 kg</td>
<td>Batch &amp; Paste Plants</td>
<td></td>
</tr>
<tr>
<td>Type 30 Cement</td>
<td>1,098,200 kg</td>
<td>Batch &amp; Paste Plants</td>
<td></td>
</tr>
<tr>
<td>Form Oil (Concrete Bloc)</td>
<td>5,000 litres</td>
<td>Warehouse CS3, Lube Storage Building</td>
<td></td>
</tr>
<tr>
<td>Meyco Minefill 701 (DELVO)</td>
<td>223,000 litres</td>
<td>Former Acid Storage Bldg. / D1 Lawdown</td>
<td></td>
</tr>
<tr>
<td>Glenium</td>
<td>35,000 litres</td>
<td>Former Acid Storage Bldg.</td>
<td></td>
</tr>
<tr>
<td>Shotcrete</td>
<td>11,020,800 kg</td>
<td>Batch Plant</td>
<td></td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>88,000 liters</td>
<td>NIWTP</td>
<td></td>
</tr>
<tr>
<td>Shotcrete Accelerator SA160</td>
<td>200,000 litres</td>
<td>Underground</td>
<td></td>
</tr>
<tr>
<td>ALUM</td>
<td>910,813 kg</td>
<td>NIWTP</td>
<td></td>
</tr>
<tr>
<td>Clearco</td>
<td>8,200 litres</td>
<td>Sewage Treatment Plant</td>
<td></td>
</tr>
<tr>
<td>EK35</td>
<td>17,000 litres</td>
<td>Airport Apron</td>
<td></td>
</tr>
<tr>
<td>Aqueous Monopropylene Glycol Mix (Aircraft Deicer)</td>
<td>3,500 litres</td>
<td>Airport Fuel Storage</td>
<td></td>
</tr>
<tr>
<td>Enduratex ENT220P20</td>
<td>100 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Enduratex EP220</td>
<td>60 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Hydrex AW100</td>
<td>100 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Hydrex AW68</td>
<td>20 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Hydrex AW46</td>
<td>410 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Synduro SHB150</td>
<td>40 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Turboflo TFR022P20</td>
<td>20 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Hydrex MV15 Arctic 15</td>
<td>615 litres</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Moly EP2</td>
<td>108 kg</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Roto Z Compressor Oil</td>
<td>40 liters</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Barrier #22, Royal Purple</td>
<td>208 liters</td>
<td>Paste Plant</td>
<td></td>
</tr>
<tr>
<td>Product Description</td>
<td>Quantity</td>
<td>Unit</td>
<td>Location</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------</td>
<td>---------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Spirax HD 75W/90</td>
<td>100 liters</td>
<td>20 L pail</td>
<td>Paste Plant</td>
</tr>
<tr>
<td>Unirex N3 grease</td>
<td>180 kg</td>
<td>180 kg drum</td>
<td>Paste Plant</td>
</tr>
<tr>
<td>Nitrogen (15 lb cylinders)</td>
<td>476 kg</td>
<td>20,000 kg</td>
<td>Mtce.Shop/Warehouse</td>
</tr>
<tr>
<td>Argon (20 lb cylinders)</td>
<td>576 kg</td>
<td>20,000 kg</td>
<td>Mtce.Shop/Warehouse</td>
</tr>
<tr>
<td>Carbon Dioxide (15 lb cylinders)</td>
<td>336 kg</td>
<td>20,000 kg</td>
<td>Mtce.Shop/Warehouse</td>
</tr>
<tr>
<td>Blue Shield (20 lb cylinders)</td>
<td>3,330 kg</td>
<td>20,000 kg</td>
<td>Mtce.Shop/Warehouse</td>
</tr>
<tr>
<td>Oil Coolant (20 L pails)</td>
<td>200 litres</td>
<td>200 litres</td>
<td>Warehouse CS3</td>
</tr>
<tr>
<td>Ucartherm Building Glycol 60/40</td>
<td>3,373 kg</td>
<td>3,373 kg in 1,100 litre totes</td>
<td>Mine Dry/Accommodations</td>
</tr>
<tr>
<td>Enduratex EP 460 Lube (210 litre drums)</td>
<td>3,150 litres</td>
<td>3,150 litres</td>
<td>Paste Plant</td>
</tr>
<tr>
<td>Dowtherm SR-1 (heat transfer fluid)</td>
<td>7,910 kg</td>
<td>7,910 kg in 1,100 litre totes</td>
<td>Mine Dry/Accommodations</td>
</tr>
<tr>
<td>Propylene Glycol (100% concentrate)</td>
<td>10,000 kg</td>
<td>10,000 kg in 1,100 litre totes</td>
<td>NIWTP</td>
</tr>
<tr>
<td>Pump Lubricant Hydrex AW32 (210 litre drums)</td>
<td>5,040 litres</td>
<td>5,040 litres</td>
<td>Paste Plant</td>
</tr>
</tbody>
</table>

* Max Capacity
Note: In addition to the material listed in Table 6.1, potential spills could occur from the following waste streams:

- operational debris (rock and construction debris not included in risk categories below),
- chemical based sediments (considered as either chemical or sediment and is incident-specific),
- sewage sludge (sewage),
- domestic/food wastes (not included in risk categories, animal attractant only),
- processed kimberlite, untreated effluent or seepage (mine-altered waters),
- oil filters (loss of oil classified as a petroleum hydrocarbon material), and;
- biological wastes (chemical risk).

An accidental release of any of the described materials could occur on site, on land, into a water body (stream or lake) or on ice/snow. Weather is one of the parameters to play an important role in spill response operations. If the ground is frozen the response operation may become easier, or if rainfall is heavy or prolonged the response may be more difficult. Regardless of all the preventive measures and contingencies put in place, at some point an emergency response will be necessary. Mitigative measures will be practiced to help prevent or to minimize the potential for spills or accidents to occur.

The most common causes of spills to date at the site have been leaks from hydraulic hose failures, storage tanks/piping, fuel transfer equipment, weather-related issues and human error. Potential spills could occur due to a large rupture from any of the petroleum products storage tanks. In the case of failure of a dam structure, the resulting environmental impact could be more serious in nature than a large fuel spill.

Potential problems related to spills can be categorized as potentially threatening to:

- a) Life
- b) Property
- c) Environment

The safety of personnel could be threatened where potentially flammable materials such as gasoline are involved, or where spilled material such as ammonium nitrate could ignite and possibly explode. In addition to explosions and fires causing considerable damage to property, toxic effects are possible.

For the purpose of risk assessment, spills are separated into four categories:
• petroleum hydrocarbon materials
• chemicals
• sewage
• sediments
• mine-altered waters

The impact to life and the environment, due to the release of these materials, as well as the mitigative and preventive measures are described herein.

Preventive Measures

The primary objective is to avoid any incidental release of hazardous substances into the environment. Practicing preventive measures leads to the protection of the environment, prevention of injury to personnel, less damage to the property and reduction of expensive clean-up costs. Good house-keeping and good record keeping, regular maintenance and routine inspections of equipment, storage facilities, solid waste incinerators, sewage and waste water treatment plants, will maximize the prevention measures. Regular training of operational personnel improves the performance towards preventive measures, which in turn minimizes potential negative impacts. Training of the emergency response personnel by simulating mock drill exercises will prepare the emergency response personnel to handle spills in the most efficient way.

Knowledge of environmentally sensitive areas (Appendix C) and response strategies (Appendix D) as well as the knowledge acquired through training and simulation exercises will be very effective in preventive and response measures. The design and location of storage facilities, solid waste incinerators, sewage and wastewater treatment plants, loading zones and transportation re-routing to avoid sensitive areas will prevent adverse environmental impacts. This strategy includes locating storage facilities, loading zones and transportation routes away from watercourses. Proper protective measures will be taken to lessen the effects of adverse weather conditions and difficult terrain. Protocols such as spill evaluation during occurrence, as well as routine assessment and use of the results in training will be a proactive approach taken by DDMI to lessen environmental impacts.

Through risk assessment and prevention, any potential incidents will be identified, their probability of occurrence will be established and the impacts to life and environment will be assessed. Any negative impacts will be minimized by training, inspection, record keeping and a proactive preventive approach.

The location of water bodies and drainage paths were an important consideration in the design and location of storage sites, transfer sites, pipelines, incinerators and the sewage and wastewater treatment facility. The majority of this infrastructure is lined and bermed and situated away from water bodies. The following subsections address the
potential impacts, the probability of a spill event and preventive measures that can be taken for each hazardous substance category or potential incident.

**Petroleum Products Storage Tanks**

The largest storage tanks at Diavik are 18,000,000 liter diesel above ground tanks. The probability of a major leak is low but the impact would be high if the fuel was released to the environment. Smaller tanks at site also have a low probability of rupturing or leaking. Spills can be prevented by comprehensive training of personnel during the loading and unloading of fuel, regular maintenance, and frequent inspections for leaks. All fuel tank farm areas are designed with an impervious geomembrane lining and berm in order to contain all spills. Tanks outside of lined/bermed areas are double walled to provide secondary containment.

**Open Valves or Broken Pipes**

Although the impact from such spills will be high, the probability of occurrence is moderate and will be mitigated and prevented by:

- Locking all valves that are not in use
- Providing double locking for fuel transfer hoses
- Installing markers around all above ground transfer pipelines
- Locating fuel lines within the tank system containment
- Training personnel (Transportation of Dangerous Goods)
- Providing spill kits in transfer locations

**Hydraulic Hose and Fuelling Equipment**

The probability for hydraulic hose leaks and fueling equipment spills are high, however the impact will be low because volumes are usually small. Preventative measures to be applied include:

- Regular checks for wear and leaks of hoses
- Rigorous maintenance schedules for all equipment
- Inspections for leaks and measurement of the fuel content in the tanks
- Secondary containment at fuel transfer stations
- Training of personnel to spot leaks and refuel efficiently
- Providing spill kits at transfer locations and in applicable vehicles
Spills from Vehicles/Equipment Involved in Accidents

The probability of vehicle/equipment involvement in an accident will be medium with a low to medium impact depending on the volume spilled and the location of the spill. The following preventative measures will be exercised:

- Strict enforcement of speed limits and other rules related to light vehicle and heavy equipment operation
- Training personnel (Transportation of Dangerous Goods)
- Providing spill kits in vehicles

Chemicals

The probability of chemical spills is low and the impact will be low to high depending on the type of chemical and the location of the spill. The preventative measures are as follows:

- Hazardous Materials are stored in appropriately labeled containers which are fire protected
- Storage facilities are weather protected, lined, and bermed where required
- Training, inspection, and inventory control have been implemented.

Sewage

The probability of pump failure, pipe rupture and power outage are low and the potential environmental impact is low. The preventive measures exercised for the pumps and pipes will involve weekly inspections. Additional prevention for pumps includes monthly servicing and retaining backup pumps on site.

Fire

Gasoline and jet fuels are flammable and other hydrocarbons are combustible and could burn if ignited. Sodium nitrite and ammonium nitrate can ignite and will be kept away from oxidizers. Compressed gases (propane and acetylene) can ignite with explosive power and the cylinders will be stored in such a way as to minimize the possibility of such occurrences.

Sediment

During operations, sediments in the water system can result from work on land (i.e. rock placement and culvert installations). Releases could occur from unexpected breaches in the settling ponds or drainage system or could occur at the work area. Containment roads and sedimentation ponds have been constructed to manage the quality of site runoff. Also, other mechanisms such as silt fences are utilized to reduce sediment loadings. The Diavik Emergency Response Team, Technical Services and Environment
staff as well as various contractors are familiar in the proper methods to deploy silt fence and are available to respond to events that require sediment control measures. Construction projects outside of the site drainage collection system are required to have an environmental review as part of the project risk assessment.

**Material Safety Data Sheets (MSDS)**

The probability of uncontrolled human or wildlife contact with any hazardous, toxic and flammable substances is low. Material Safety Data Sheets (MSDS) of all materials transported, stored and used on-site are available in readily identifiable binders at strategic locations on-site and near to the hazardous and toxic substances storage areas. Copies of pertinent MSDS for products utilized at site are available in the Warehouse and at each of the specific work areas where the hazardous materials are utilized. Diavik is currently working on implementing an electronic database for all MSDS sheets.

MSDS sheets and product guides provide information on: a) typical physical and chemical properties; b) safety measures; c) response to spills on land, snow, ice and water; d) storage, transfer and disposal measures.

**Mine-Altered Waters**

Mine-altered waters are contained in various impoundment structures and in the piping infrastructure that moves water to various locations around the mine site:

- The Processed Kimberlite Facility;
- The North Inlet; and
- Collection Ponds

Mine-altered water could be released from a major leak, a dam breach, a treatment plant malfunction or from a minor source like a dam seep or pipeline leak. The probability of a major release is low. A major dam breach would be a significant safety concern, and although mine-altered water at Diavik does not contain high levels of contaminants, a release of this type could cause erosion and would carry suspended solids into the receiving environment (Lad de Gras). Similarly, a malfunction at the water treatment plant could release water to Lac de Gras with elevated suspended materials. To mitigate and prevent a release like this, numerous controls have been put in place:

- Dams and dikes are constructed/maintained in accordance with the Canadian Dam Safety Guidelines and the terms of the DDMI Water License;
• Dams, dikes, pipelines and other water movement infrastructure are inspected regularly by DDMI. Dams and dikes are also subject to annual inspection by the Engineer of Record and third party inspections;

• Most collection ponds are pumped dry during/after freshet and prior to freeze-up to maintain impoundment capacity;

• The North Inlet Water Treatment Plant has automated systems installed that will shut the plant down if water quality parameters exceed control limits.

The probability of a minor release from a dam seep or pipeline leak is high, however, the environmental impact would be very low. As noted above, mine-altered water at Diavik does not contain high levels of contaminants and a small release would have no measureable impact on the receiving environment. To mitigate and minimize these types of releases, numerous controls have been put in place:

• Dams, dikes, pipelines and other water movement infrastructure are inspected regularly by DDMI;

• DDMI maintains pumps, hoses, mobile generators, and other equipment at the mine site that can be deployed when a seep/leak is identified;

• Where practical, pipelines are constructed within containment so that leaks report to an impoundment structure, rather than the environment;

• Major facilities have secondary containment structures constructed down stream (e.g. PKC)

• In the event of a seep, water quality is monitored until the source has been stopped.
7. AREA-SPECIFIC CONTINGENCY PLANS

7.1 Water Management During Operations

7.1.1 Management of Surface Runoff from Operational Areas

In operations, the management of surface runoff from specific operational areas is a part of the Water Management Plan. The occurrence of surface run-off is limited to a 5-month period, from May to September. Engineered collection ponds have been strategically constructed around the site to collect runoff and pump it to the PKC Facility or North Inlet should the parameters not meet license limits. The goal of these collection ponds is to essentially limit the transfer of suspended solids to Lac de Gras by intercepting seepage and runoff.

DDMI uses these engineered ponds to reduce the amount of suspended solids in surface water, to acceptable levels prior to discharge into natural wetland depressions or to Lac de Gras.

Instances of seepage bypassing engineered containment have occurred periodically at Diavik. Diavik addresses these situations with both proactive and reactive responses:

- Pumps are deployed and sumps are excavated to intercept seepages that exist outside of engineered containment;
- Access roads are constructed in areas that are difficult to access where potential seepage could occur; and
- Culvert road crossings are installed in permanent roadways where necessary to allow seepage to be pumped back into engineered containment.

7.1.2 Potential Risks Associated with Surface Runoff

Without appropriate management control of surface runoff, it could lead to elevated levels of turbid water (suspended solids) entering water bodies such as Lac de Gras. This could then lead to siltation occurring near the waters edge, which could eventually effect aquatic and fish habitat.

7.1.3 Control Remedies and Mitigation

In the case of surface runoff, collection ponds have been constructed to collect and manage the water quality. Should any future construction be required DDMI will manage any potential turbid water by implementing one or all of the following procedures, depending on the work activity:
• Conducting pre-work risk assessment and activity meetings;

• Installing siltation fences down stream of the activity prior to or during the work activity taking place - A silt fence consists of a barrier of permeable geotextile stapled to hardwood stakes, installed in a trench approximately 0.2 m deep. Their height and width is governed by the contours of the natural drainage channel. Fences capture silt and prevent migration of sediments in low-flow natural watercourses and downstream of culverts. Some maintenance and regular removal of sediment is necessary.

• Collecting and pumping water from depressions/ditches near work activity and discharging pumped water to wetland treatment or containment upstream of the activity. This methodology is an acceptable means of controlling turbid drill waters during exploration drilling programs and the construction phase.

DDMI will continue to initiate the control procedures during future construction activities. By using these procedures, DDMI will be exercising due diligence in minimizing and protecting water bodies and the aquatic environment. In the event that runoff and/or seepage are observed outside of the drainage collection system, water chemistry will be compared to the Water License discharge criteria.

7.2 Hazardous Materials Storage Areas

7.2.1 Management of Hazardous Materials Storage Areas

DDMI has a Hazardous Materials Management Plan for the mine site. This plan has been submitted to the Water Board as a requirement of the Type A Water License and is updated annually. This plan should be referred to for specific details for the management plans of hazardous materials. This section summarizes aspects of this plan related to Contingency planning.

Hazardous materials present during the operational phase have been identified, classified and stored in an environmentally safe and responsible manner. This ensures that any incidents involving potentially hazardous materials, which could affect the well being of either the personnel on-site or the environment of the mine site, are dealt with promptly using an organized methodology to ensure that no lasting environmental effects are observed.

7.2.2 Potential Risks

Hazardous materials to be transported, handled, stored, distributed, used, and finally disposed of during operations are mainly the following:

• Petroleum or petroleum based products
• Explosives
• Flammable or oxidizing gases
• Hazardous chemicals which will be used in the process and water/wastewater treatment plants

Hazardous materials spills could potentially affect the land, the water and aquatic environment, and the wildlife in the area. By having contingency measures in place and acting immediately, these effects are minimized.

7.2.3 Control Remedies and Mitigation

Hazardous materials are classified in accordance with the Transportation of Dangerous Goods Act and Regulations. All of the substances, which fall under these regulations, are labeled accordingly in order to inform personnel as to their toxicity and to comply with governmental regulations.

Material Safety Data Sheets (MSDS) are available for all hazardous materials located on-site. These sheets are available in areas where hazardous materials are present and stored and will be available at any computer at the mine site with an intranet connection when DDMI has rolled out the database system for MSDSs. Awareness of potential hazards is a priority and personnel are trained in proper handling and use of these materials.

Petroleum products, explosives and miscellaneous hazardous materials (including used oil) are stored in facilities that contain no open drains and have a concrete berm, a geomembrane liner or are double-walled. These storage facilities are in compliance with the GNWT legislation, the National Fire Code of Canada and the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations. All storage tanks are regularly maintained. All containers used to store hazardous materials are closed and sealed when they are not in use. The locations of the storage tanks are detailed in the Hazardous Materials Management Plan.

The storage facilities are clearly identified as storage facilities for hazardous materials with proper labeling and MSDS information readily available. The facilities are well ventilated in order to prevent the build-up of toxic fumes or dust, which could harm both the personnel present and the environment. The facilities are secured and only authorized personnel have access to the potentially hazardous materials.

There are designated operators for handling hazardous materials/wastes. All operation personnel involved in the handling of hazardous wastes are fully trained for 'Personal Safety and Protection'. They are also trained in emergency response. Responsibilities for hazardous materials management are assigned to the Fixed Plant/Surface Operations Department. In addition, all DDMI employees are given basic instructions for complying with the hazardous waste management system during environmental awareness training/orientation.
7.3 Effluent Treatment Operations

7.3.1 Management of Domestic Sewage

The Sewage Treatment Plant (STP) is located next to Power House #1 and Boiler Plant. The plant is designed to treat up to 320 m$^3$ of raw domestic sewage per day. The wastewater requiring treatment comes from the following sources: Toilets, Kitchen, Showers, and Laundry. Many inputs are piped directly to the STP, however, sewage from remote sanitary systems around the mine site (including underground toilets) is transported by vacuum truck to a lift station next to the STP where it is pumped as influent into the plant for treatment.

Sewage is essentially characterized by the following constituents:

- Soluble organic material expressed as Biological Oxygen Demand (BOD)
- Organic particulates, expressed as total suspended solids (TSS)
- Nutrients (phosphorus and nitrogen)
- Bacteria expressed as Fecal Coliforms
- Oils and Grease

Treated effluent is pumped to the Processed Kimberlite Containment (PKC) area where the water is recycled back to the plant for use.

7.3.2 Potential Risks

As with most wastewater treatment plants, there will from time to time be upsets in the plant, especially when facilities such as this are required to operate 24 hours/day all year long.

The potential risks associated with an upset to this plant are that one of the above noted parameters may not be treated and will be pumped out to the PKC. There it will be mixed in with large volumes of water. This PKC water is not discharged to Lac de Gras as it is included in the reclaim circuit for the Process Plant.

7.3.3 Control Remedies and Mitigation

Domestic and sanitary sewage will be treated for the removal of BOD, suspended solids, fecal coliforms and nutrients as per the following criteria, if it is directly discharged to Lac de Gras:
<table>
<thead>
<tr>
<th>Maximum Average Concentration</th>
<th>Grab Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD₅ 15 mg/L</td>
<td>25 mg/L</td>
</tr>
<tr>
<td>Total Suspended solids 15 mg/L</td>
<td>25 mg/L</td>
</tr>
<tr>
<td>Oil and greases 3 mg/L</td>
<td>5 mg/L</td>
</tr>
<tr>
<td>Fecal coliforms per 100 ml Colony Forming Units (CFU) 10 CFU</td>
<td>20 CFU</td>
</tr>
</tbody>
</table>

Total Phosphorus loading limit of 300 kg per month for all treatment facilities combined that are discharging to Lac de Gras.

The treatment sludge generated by the treatment system is dewatered and disposed of in an approved containment area within the Waste Transfer Area (WTA). The intended use of this material is soil amendment for reclamation. In the event that too much sludge is generated for capacity at the WTA it can be disposed of in the PKC, as per the Waste Management Plan.

The sewage treatment system consists of the following process units:

- Equalization
- Biological oxidation
- pH control
- Sand Filtration
- Chlorination
- Sludge dewatering

The Fixed Plant/Surface Operations Department is responsible for operating the sewage and domestic water treatment plants, and operators conduct daily inspections of these plants. The sewage plant is automated, containing alarm systems in the circuit that will identify problems if they occur. The operators run indicator tests at the plant to monitor the operation of the plant. As per water license requirements, annual samples of the sewage effluent are collected by environment staff.

### 7.4 Management of Water Associated with the North Inlet Water Treatment Plant (NIWTP)

#### 7.4.1 North Inlet Water Treatment Plant

As part of its Type ‘A’ Water License requirements (Part E, Item 2), DDMI was required to submit an Operations plan for the North Inlet Water Treatment Plant. This plan was
updated and submitted in September 2010. This approved plan provides specific details as to equipment, methodologies and contingencies that are implemented for the operation of the North Inlet Water Treatment Plant. It details how water volumes will be pumped, managed and treated.

7.4.2 Potential Risks

As with most mechanical wastewater treatment plants that require some chemical addition, there will from time to time be upsets in the plant, especially when facilities such as this are required to operate 24 hours/day.

The associated risks with this activity are that after treatment the specified water license limits may not be met. This could result in one or more specified parameters from the license being exceeded within discharge water to Lac de Gras for a short period of time.

7.4.3 Control Remedies and Mitigation

The North Inlet Operations Plan and the facility Standard Operating Procedures (SOPs) provide the details of the various control remedies and mitigations that are in place within this facility. These include on-line pH, turbidity, conductivity and flow meters that will be constantly monitored and on alarm systems. The NIWTP is designed as a twinned system and was expanded in 2009 to include a second, almost identical plant. Water being treated can be directed through either (or both) of two identical treatment banks in each plant, which allows the facility to remain in operation during maintenance activities. Treatment banks can be taken off-line for maintenance or repairs without affecting the operation of other banks.

The Type ‘A’ Water License provides the list of the parameter limits that must be met within this plant. Samples of NIWTP effluent are collected as per license requirements. NIWTP operators also collect and analyze samples from various stages of the treatment process to assess and optimize treatment.

Should the treated effluent parameters not be met, the treated effluent will be re-directed back to the North Inlet or the NIWTP will be shut down until the problem with the plant is rectified. The NIWTP has internal control limits for certain measured parameters such as turbidity. The control limits are set below effluent discharge criteria in the Water License and are part of an automated shut-down system for the plant. If the internal limits are reached the plant will automatically re-direct effluent back to the North Inlet until operators resolve the issue and put the plant back into normal operation (i.e. discharging treated water to Lac de Gras). Internal control limits are detailed in NIWTP SOPs.
7.5 Solid Waste

7.5.1 Solid Waste Management

As part of DDMI’s Environmental Management System, a Waste Management Plan has been prepared. This plan provides specific details on how solid waste will be managed and disposed, and should be referred to for thorough details. Listed below is a summary of this plan.

DDMI is committed to taking all necessary steps to ensure that the collection, storage, transportation and disposal of all wastes generated by the project will be conducted in a safe, efficient and environmentally safe manner. An essential step towards achieving these goals is the preparation of a Waste Management Plan, which identifies potential wastes that will be generated on site and sets out efficient ways of processing them with minimum adverse environmental effects.

The main objectives of the plan are the creation of a framework for the proper disposal of wastes and the minimization of potentially adverse impacts on the physical and biological environment, in compliance with the Federal and Northwest Territories (NWT) legislation. The fundamental basis of the plan is the practical and positive management of wastes incorporating the implementation of a sound waste minimization program. The ideals of the four R’s; namely, reduction, recovery, reuse and recycling of wastes, are embodied in the Waste Management Plan. Along with this, appropriate mitigation measures to counteract adverse environmental effects are identified and discussed.

7.5.2 Potential Risks

Various solid wastes will be generated during the operational phase of the project. They include but are not limited to the following: waste batteries, belts, tires, domestic garbage, sewage sludge, paint, aerosol cans, waste lumber and other operational materials.

If not managed correctly, solid waste materials could cause adverse effects to the land, water and aquatic environment, as well as the wildlife in the area. In addition to the various management plans and operating procedures that have been developed to proactively manage risk, established contingency measures further reduce the potential for adverse environmental effects.

7.5.3 Control Remedies and Mitigation

As part of its solid waste management plan, DDMI has designated a Waste Transfer Area. The Waste Transfer Area is located adjacent to the ‘Test Piles’ area on the south part of the island. It includes the following:

- The entire facility is lined to contain spills or runoff from the area;
• a designated section to handle contaminated material (i.e. soil from any spills);
• a burn pit area to burn any non hazardous (inert) materials; ashes from the burn area are placed in the landfill;
• incinerators to burn domestic waste; and
• designated areas to stockpile solid and liquid wastes generated at site such as drums, paint cans, batteries, pallets, oil filters, aerosol cans, waste oil, waste glycol, construction debris (i.e. lumber, piping, scrap metal), etc.

All other wastes are collected in the Waste Transfer Area and segregated based on type. During the construction phase, approval was granted to use the quarry as an inert landfill. This continues into operations, and the inert landfill is located in the North Country Rock Pile, on the north side of the North PKC Dam. Only specific inert materials are permitted to be deposited in the landfill area, they include (but are not limited to): styrofoam, plastics, liners, scrap wood (pressure treated), and scrap metal/pipe. Regular inspections of this area are undertaken to confirm compliance.

Wastes are sorted in the Waste Transfer Area and either stored in designated sea cans/areas for back shipping to an approved landfill or licensed recycling company in the south, or brought to the inert landfill if acceptable for disposal. Potential reuse or recycling possibilities are continuously being evaluated and implemented where feasible. All the wastes are handled and transported by trained personnel employed by the Fixed Plant/Surface Operations Department. Any improperly disposed materials identified by the waste management crew will be removed and transferred for proper disposal.

The Fixed Plant/Surface Operations Department performs weekly inspections of the various waste collection transfer and disposal points, the inventory of bulk wastes, the waste management data sheets, the status of the protective equipment, and the spill kits. Records are kept of these inspections. These inspections assist in evaluating the capacity of the waste management facilities and in planning the logistics for back shipping and the need for any modifications to the system.

There are designated trained operators for handling and managing solid wastes generated. All operation personnel involved in the handling of solid waste are fully trained for personal safety and protection. They are also to be trained in emergency response. In addition, all employees are given basic instructions for complying with the waste management system during environmental awareness training/orientation.

7.6 Management of Cement and Grouting Operations

In underground operations, paste backfill, cemented rock fill (CRF), shotcrete, cement and grouting are all utilized frequently. CRF and paste will be used to backfill many of the voids created by mining the kimberlite underground. DDMI monitors water quality at various locations underground to determine how underground water chemistry is being effected by paste/cement and other activities such as blasting.
7.6.1 Potential Risks

The risk related to using these materials underground is that they may impact underground water quality. Due to the nature of underground mining, it is not feasible to prevent water from coming into contact with these materials.

7.6.2 Control Remedies and Mitigation

The effects on water quality from paste, cement, etc., are monitored through regular sampling of underground water. No water from underground is released directly to the environment - it is all intercepted in the underground dewatering system, sent to the North Inlet and eventually, through the North Inlet Water Treatment Plant before being released back to Lac de Gras. Based on preconstruction predictions and results to date, DDMI does not anticipate that underground paste, CRF, cement, or grouting will cause significant concerns related to water quality.

7.7 Management of Additional Flows/Seepages from the A-154/A-418 Pits (via seepage wells or mine water)

7.7.1 A154/A418 Seepage Flows and Mine Water Flows

The Diavik Diamond Mines Water Retention Dikes Operation Manual for the A-154 and A-418 Dikes provides specific details as to equipment, methodologies and contingencies that are implemented during the mine operations of the A-154 and A-418 open pits. It details the frequencies of inspections and digital data acquisition from the automated system. This data is collected from all the various instrumentation that has been installed during construction of the dike (e.g. thermistor strings, inclinometers, piezometers, extensometers, survey markers/pins, seismographs). It also provides details on how flows will be measured from the mine water and seepage wells inside the dike. This data is obtained on a continuous basis to detect any significant flow changes. The plan then outlines the actions/contingencies that will be implemented should higher then expected increase in flows occur.

7.7.2 Potential Risks

Through all the baseline studies and pre-feasibility/feasibility studies a prediction of the flow requirements entering the pits from either mine water or seepage was determined. Engineering designs for pit operations and subsequent North Inlet Water Treatment Plant have been designed to manage and treat these predicted flows. However, there is a risk that an increase in flows from either the mine water and/or seepage may occur. The result will be more water requiring management and treatment prior to being discharged back to Lac de Gras.
7.7.3 Control Remedies and Mitigation

The *Diavik Diamond Mines Water Retention Dikes Operation Manual* provides specific details of the various control remedies and mitigations that would be implemented should higher than expected water volumes be encountered in the pits. It is expected that any flow increases will be gradual in nature and will allow mitigation plans to be implemented. These mitigation plans as noted are detailed in the Operations plan but may include one, or a combination of the following: determine problem area, grout the area, add relief wells, and add inverted filters.

The North Inlet provides a large basin for storage of mine water. Fluctuations in dike seepage and pit water inflows are managed by storing water in the North Inlet prior to treatment and discharge to Lac de Gras.

The North Inlet Water Treatment Plant is capable of treating up to 90,000 m$^3$/day of mine water, seepage water or a combination of both. The rationale for the flow meters from the seepage wells and mine water are to continuously track any increase in flow so that the water treatment operators can adjust operation of the NIWTP accordingly.

7.8 Management of Additional Flows/Seepages from Underground Operations

7.8.1 Underground Water

The Operations Plan for the A-154 and A-418 underground operations provides specific details as to equipment, methodologies and contingencies that are implemented during mining of either kimberlite pipe. It details the frequencies of inspections and digital data acquisition from the automated system. This data is collected from all the various instrumentation that has been installed during construction of the dike (e.g. thermistor strings, inclinometers, piezometers, extensometers, survey markers/pins, seismographs). It also provides details on how flows will be measured from the mine water and seepage wells inside the underground operations. These data are obtained on a continuous basis to detect any significant flow changes. The plan then outlines the actions/contingencies that will be implemented should higher than expected increase in flows occur.

7.8.2 Potential Risks

Through all the baseline studies and pre-feasibility/feasibility studies a prediction of the flow requirements entering the underground mine operations from either mine water or seepage was determined. Engineering designs for the underground mine operations and subsequent North Inlet Water Treatment Plan have been designed to manage and treat these predicted flows. However, there is a risk that an increase in flows from either
the underground mine water and/or seepage may occur. The result will be more water requiring management and treatment prior to being discharged back to Lac de Gras.

7.8.3 Control Remedies and Mitigation

The A154/A418 Decline and A21 Decline Water Hazard Management Plan provides specific details of the various control remedies and mitigations that would be implemented should higher than expected water volumes be encountered. It is expected that any flow increases will be gradual in nature and will allow mitigation plans to be implemented. These mitigation plans as noted are detailed in the Water Hazard Management Plan, but the main water control measure that will be used for the underground declines is cover grouting performed as part of the mining cycle.

Another control to manage flows in the underground is the continued dewatering of the A154 and A418 pits (even after open pit mining is completed). To date, however, flows into the open pits have reduced significantly since underground operations began.

The North Inlet provides a large basin for storage of mine water. Fluctuations in dike seepage, pit water and underground water inflows are managed by storing water in the North Inlet prior to treatment and discharge to Lac de Gras.

The North Inlet Water Treatment Plant is capable of treating up to 90,000 m$^3$/day of mine water, seepage water or a combination of both. The rationale for the flow meters from the underground mine water are to continuously track any increase in flow so that the water treatment operators can adjust operation of the NIWTP accordingly.
8. CONTINGENCY MEASURES RELATING TO AMMONIA TOXICITY AT THE NORTH INLET WATER TREATMENT PLANT

8.1 Approved Contingency Plan – Effluent Toxicity (March 2008)

Context: This Plan has been prepared in response to the WLWB Directive of November 1, 2007 in support of the Ammonia Management Plan. It is to be considered in the event that elevated concentrations of ammonia are measured in the North Inlet Water Treatment Plant final effluent.

Effective Date: This Plan became effective upon written approval of the Ammonia Management Plan by the WLWB on April 24, 2008.

Procedure

1. If the monthly average ammonia concentration from DDMI’s internal monitoring are greater than 3 mg/L, then:
   a. provide Inspector with updates on the results of DDMI’s internal ammonia monitoring results for the North Inlet within the first week of each month. These results will be provided as monthly updates to the attached Figure (see also Ammonia Management Plan Section 10.3);
   b. Review mine source water concentrations with mine operations and verify conformance with the Ammonia Management Plan or take any corrective actions;

2. If any daily result from DDMI’s internal monitoring exceeds 6 mg/L, then:
   a. inform the Inspector;
   b. provide Inspector weekly updates on the maximum average ammonia concentration at SNP 1645-18 and 1645-18B (SNP Part B Item 9);

3. If the maximum average ammonia concentration at SNP 1645-18 (SNP Part B Item 9) reaches the EQC level of 6 mg/L (Part H Item 6a), then:
   a. discontinue the NIWTP discharge to Lac de Gras;
   b. re-circulate NI water through the NIWTP, returning the water to the west end of the NI to attempt to reduce ammonia concentrations;
   c. collect a water sample from 1645-18 and submit for acute and chronic toxicity (SNP Part B Item 10 and 11a);
   d. notify the Inspector;
   e. continue DDMI internal daily and SNP 1645-18 monitoring;
   f. resume NIWTP discharge, with notification to the Inspector, if concentrations in two consecutive SNP samples at 1645-18 (SNP Part B Item 9) are less than 6 mg/L.
4. If there is greater than 20% mortality in the acute toxicity test then DDMI will follow the Approved Contingency Plan – Effluent Toxicity – Revised May 2005. (Appendix C of the 2011 Ammonia Management Plan, v4).
9. REFERENCES


6. BHP, Ekati Diamond Mine – Spill and General Contingency Plan, March 2001


Appendix A

Equipment and Facility Inspection Schedules
And Response Equipment and Locations
Figure A-1: Site Layout and Spill Kit Locations
Table B-1 - Bulk Fuel Storage Facility Inspection Schedule

<table>
<thead>
<tr>
<th>TRADE</th>
<th>FREQUENCY</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Visual Inspections of Tanks, Piping, Roads, Pathways, Dikes, Yard Lights</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Remove Combustible Materials</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Check Control Switches</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Monthly</td>
<td>Check Fire Extinguishers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check Locks and Chain Locks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check Above Ground Pipes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check Valves, Welds, Vents, Straps and Cables, and Nozzles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check Connectors, Lined Floors and Dikes</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Annual</td>
<td>Valves Full Open, Valves Full Closed, Check Liners and Repair</td>
</tr>
<tr>
<td>Electrical</td>
<td>Weekly</td>
<td>Electronic Level Sensors</td>
</tr>
<tr>
<td>Electrical</td>
<td>Monthly</td>
<td>Electronic Level Switches</td>
</tr>
<tr>
<td>Electrical</td>
<td>Annual</td>
<td>Cables to Piping, Tanks, and Ground Rod</td>
</tr>
<tr>
<td>HSE Department</td>
<td>Weekly</td>
<td>Visually Check All Components of the System, Including Roads and Pipes for Leakage or Release</td>
</tr>
</tbody>
</table>
### Table B-2 - Fuel Transfer Station Inspection Schedule

<table>
<thead>
<tr>
<th>TRADE</th>
<th>FREQUENCY</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Every Shift</td>
<td>Visual Inspections of Containers, Liners, Piping, Roads, Pathways, Yard Lights</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Remove Combustible Materials</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Check Control Switches</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Monthly</td>
<td>Check Fire Extinguishers, Check Locks and Chain Locks, Check Above Ground Pipes, Valves, Welds, Vents, Straps and Cables, Connectors, Nozzles Check Lined Floors and Dikes</td>
</tr>
<tr>
<td>HSE Department</td>
<td>Weekly</td>
<td>Visually Check All Components of the System, Including Liners, Roads and Pipes for Leakage or Release, Protective Equipment, Spill Kits</td>
</tr>
</tbody>
</table>

### Table B-3 – Waste Transfer & Inert Landfill Area Inspection Schedule

<table>
<thead>
<tr>
<th>TRADE</th>
<th>FREQUENCY</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Remove Unwanted Materials</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Monthly</td>
<td>Check Fire Extinguishers, Equipment</td>
</tr>
<tr>
<td>HSE Department</td>
<td>Every other day</td>
<td>Visually Check All Components of the Waste Transfer and Inert Landfill Area. Checking for non-compliance for materials deposited in areas (i.e. scrap food).</td>
</tr>
</tbody>
</table>
### Table B-4 - Incinerators Inspection Schedule

<table>
<thead>
<tr>
<th>TRADE</th>
<th>FREQUENCY</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Remove Unwanted Materials</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Monthly</td>
<td>Check and Maintain Incinerator Components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check fire extinguishers</td>
</tr>
<tr>
<td>HSE Department</td>
<td>Weekly</td>
<td>Visually Check All Components of the Incinerators</td>
</tr>
</tbody>
</table>

### Table B-5 – Sewage and North Inlet Treatment Plant Inspection Schedule

<table>
<thead>
<tr>
<th>TRADE</th>
<th>FREQUENCY</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Daily</td>
<td>Remove Unwanted Materials</td>
</tr>
<tr>
<td>Fixed Plant/Surface Operations Department</td>
<td>Monthly</td>
<td>Check and Maintain Sewage Plant Components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check Fire Extinguishers</td>
</tr>
<tr>
<td>HSE Department</td>
<td>Weekly</td>
<td>Visually Check All Sewage and North Inlet Treatment Plant Components, Including Roads and Pipes for Leakage or Release</td>
</tr>
<tr>
<td>TRADE</td>
<td>FREQUENCY</td>
<td>TASK</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>HSE Department Safety Personnel / ERT</td>
<td>Weekly</td>
<td>Visual inspections, fluid checks of response vehicles (e.g. pumper truck, ambulance)</td>
</tr>
<tr>
<td>HSE Department Safety Personnel / ERT</td>
<td>Annually, or after a response</td>
<td>Inventory of spill response trailer equipment and condition.</td>
</tr>
<tr>
<td>HSE Department Safety Personnel / ERT</td>
<td>Monthly</td>
<td>Check Fire Extinguishers</td>
</tr>
</tbody>
</table>
Appendix B
GNWT 24-hr Spill Line Report Form
<table>
<thead>
<tr>
<th>A</th>
<th>REPORT DATE: MONTH - DAY - YEAR</th>
<th>REPORT TIME</th>
<th>ORIGIAL SPILL REPORT, OR</th>
<th>REPORT NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>OCCURRENCE DATE: MONTH - DAY - YEAR</td>
<td>OCCURRENCE TIME</td>
<td>UPDATE # TO THE ORIGINAL SPILL REPORT</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>LAND USE PERMIT NUMBER (IF APPLICABLE)</td>
<td>WATER LICENCE NUMBER (IF APPLICABLE)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION</td>
<td>REGION</td>
<td>MWT</td>
<td>NUNAVUT</td>
</tr>
<tr>
<td>E</td>
<td>LATITUDE</td>
<td>LONGITUDE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>DEGREES</td>
<td>MINUTES</td>
<td>SECONDS</td>
<td>DEGREES</td>
</tr>
<tr>
<td>G</td>
<td>RESPONSIBLE PARTY OR VESSEL NAME</td>
<td>RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>ANY CONTRACTOR INVOLVED</td>
<td>CONTRACTOR ADDRESS OR OFFICE LOCATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>PRODUCT SPILLED</td>
<td>QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES</td>
<td>U.N. NUMBER</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>SECOND PRODUCT SPILLED (IF APPLICABLE)</td>
<td>QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES</td>
<td>U.N. NUMBER</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>SPILL SOURCE</td>
<td>SPILL CAUSE</td>
<td>AREA OF CONTAMINATION IN SQUARE METRES</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>FACTORS AFFECTING SPILL OR RECOVERY</td>
<td>DESCRIBE ANY ASSISTANCE REQUIRED</td>
<td>HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>REPORTED TO SPILL LINE BY</td>
<td>POSITION</td>
<td>EMPLOYER</td>
<td>LOCATION CALLING FROM</td>
</tr>
<tr>
<td>O</td>
<td>ANY ALTERNATE CONTACT</td>
<td>POSITION</td>
<td>EMPLOYER</td>
<td>ALTERNATE CONTACT LOCATION</td>
</tr>
<tr>
<td>P</td>
<td>RECEIVED AT SPILL LINE BY</td>
<td>POSITION</td>
<td>STATION OPERATOR</td>
<td>EMPLOYER</td>
</tr>
<tr>
<td>Q</td>
<td>LEAD AGENCY</td>
<td>EC</td>
<td>CC</td>
<td>GMWT</td>
</tr>
<tr>
<td>R</td>
<td>LEAD AGENCY</td>
<td>CONTACT NAME</td>
<td>CONTACT TIME</td>
<td>REMARKS</td>
</tr>
<tr>
<td>S</td>
<td>FIRST SUPPORT AGENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>SECOND SUPPORT AGENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>THIRD SUPPORT AGENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C
Environmental Sensitivity Mapping
Environmental Sensitivity Mapping

Since the route to Lac De Gras is viable only in the winter, the seasonal concerns pertaining specifically to the winter period are shown. Sensitive wildlife areas and key species concerns in the project area are depicted in Figures C-1 and C-2. Sensitive fish habitat areas in the proximity of the project are shown in the event of a spill or other environmental incident, and will provide some guidance to the appropriate mitigative measures required.

Certain areas on East Island may require additional environmental controls than normal to provide adequate environmental protection. These sensitive areas (e.g. – areas outside of the DDMI drainage collection and control system or area near water) are shown on Figure C-3. Work taking place in these areas requires that DDMI Environment personnel are consulted during the risk assessment (planning) stage of the project.

The project site is located in a transition zone between taiga forest and arctic tundra, typified by largely cryosolic soils, continuous permafrost with shallow active layers supporting dwarf shrubs, herbs and lichens. A variety of mammals and birds live in the area. Lakes are numerous in the area, but are of low productivity (Reference: Integrated Environmental and Socio-economic Baseline Report, Diavik, 1998).
Figure C-1 - Sensitive Wildlife and Fish Habitat Areas
Figure C-2 – Waste Disposal and Storage Facilities, including hazardous wastes (Potential for Wildlife Attraction)
Figure C-3 – Sensitive Areas Requiring DDMI Environment Consultation during Risk Assessment
Incidents Involving Caribou

A number of concerns regarding caribou presence on-site during thin-ice conditions will be addressed.

In some years, caribou could be present near the mine site in autumn, during thin-ice conditions that impede their safe passage. In any given year the period of actual freeze-up and hazardous conditions varies greatly but is likely to be less than 10 days. This process is monitored as part of the caribou-monitoring plan. DDMI and the local communities acknowledge that caribou distribution patterns can vary widely from year to year, and that mitigation plans and contingency measures must be in place to adapt to unusually large numbers of animals near the mine site. Approaches to such adaptive planning are presented in the Mitigation Measures and Contingency Planning section below.

Increased air and road traffic on-site during emergency responses may also affect caribou migration patterns on and around the East Island. These actions are particularly of concern during thin-ice conditions. For serious events, emergency actions would take priority over general environmental protocols (e.g., caribou herding procedures) that would be undertaken during normal operational conditions. This very low probability could lead to significant conflicts between caribou and response activities if large numbers of caribou were on the island at the time of the event. However, the probability of such events is factored into the design of the mining activities, and it must be extremely low for the mine to proceed from a safety and economic perspective. In addition, the probable location of such an event coupled with normal operational protocols to keep animals out of the site under normal conditions, greatly reduces the potential for serious conflicts with caribou. DDMI believes that adaptive mitigation measures and contingency planning for reducing potential conflicts under normal operational conditions are the best approaches for dealing with unforeseen events of the nature discussed.

Mitigation Measures and Contingency Planning

The Environmental site staff will coordinate the on-site monitoring of caribou distributions and numbers in the vicinity of the East Island when required. Environmental staff also undertake offsite monitoring activities. In addition, DDMI involves community representatives in monitoring activities at agreed upon periods, and depending on the programs being conducted.

From July 1 to October 15, the Environmental Site staff regularly communicate with counterparts at the Ekati Mine to obtain advance warning of animals moving south into
the DDMI area. Particular importance will be placed on animal distributions in and around the Misery mine site and access road.

Diavik Environment staff record the official day of freeze-up around East Island, marked by the last day that open water is observed.

During the period of thin ice (i.e., from initial freeze-up to an ice depth of 10 cm [or October 30, whichever comes first]), monitoring for caribou in the vicinity of the East Island will include four road-based surveys on the island twice per week. Helicopter surveys of West Island and the north mainland will also be initiated at the discretion of the Environment Superintendent, when a helicopter is available on site.

The following Caribou Traffic Advisory system is structured to reflect the number of caribou on the East Island. The presence of 100 animals during the thin ice period or 1000 animals on the island at any given point in time is considered to be a threshold for elevated levels of management actions, as the ability to effectively manage the movements of more animals even under controlled conditions is questionable. Searches will be conducted by site Environmental staff twice per week to determine the numbers of caribou present on the East Island.

The frequency of the surveys/searches discussed above may be increased when the presence of caribou on the island has been confirmed.

The Environment Supervisor or designated Environmental Staff will provide the following warning levels on a daily basis:

**CARIBOU TRAFFIC ADVISORY**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO CONCERN:</strong></td>
<td>No caribou or fewer than 100 caribou present on East Island</td>
</tr>
<tr>
<td><strong>CARIBOU ADVISORY:</strong></td>
<td>Between 100 to 1000 caribou reported on East Island</td>
</tr>
<tr>
<td><strong>CARIBOU ALERT:</strong></td>
<td>Over 1000 caribou reported on East Island</td>
</tr>
<tr>
<td><strong>THIN ICE PERIOD (LATE FALL):</strong></td>
<td>Over 100 caribou reported on East Island</td>
</tr>
</tbody>
</table>

TEMPORARY ROAD CLOSURE OR MANAGEMENT ACTION MAY BE REQUIRED
Air Traffic Controls

If caribou are known to be on the island, monitoring for animal activity in the vicinity of the airstrip will be initiated by the Fixed Plant/Surface Operations Department at least 30 minutes prior to scheduled landings and immediately prior to aircraft take-off. Any number of caribou present on the airstrip or located within 100m of the airstrip will trigger caribou herding action.

If caribou are in the vicinity of the airstrip, all incoming aircraft will be notified immediately via radio contact and advised of possible landing delays or landing diversions to the Ekati airstrip. Concurrently, the air traffic controller at the Ekati Mine will be contacted for permission to divert landings if necessary.

All incoming aircraft will be required to contact the DDMI site at least 30 km from the site for an update on airstrip status before starting final approach.

Ground Traffic Controls

Four levels of Traffic Control have been established for the site. The Caribou Traffic Advisory ensures that all employees are aware of the number of caribou on the East Island.

In spite of best efforts to protect caribou on the East Island, DDMI acknowledges that situations may arise where animals are seriously injured or unlikely to survive (e.g., trapped after breaking through the ice) during interactions with the mine site, and humane measures may be required to prevent the animal from suffering. While such situations seldom occur and involve very few animals, pre-planning for such events is required.

DDMI has established protocols for such situations in consultation with the community members and GNWT, outlying the criteria for deciding on when and how animals will be humanely killed, and the end use of the animals.
Appendix D
Response Strategies
Appendix D outlines planning and training for spill response procedures for the following aspects:

**Planning & Logistics**  
Factors that influence the time to mobilize operations and the setting of associated response priorities.

**Monitoring the Spill**  
Safety and environmental threats requiring monitoring actions following a spill.

**Spills on Land**  
Containment of spills onto land, including operations during winter conditions.

**Spills on Muskeg**  
Containment of spills into bogs, fens and marshes.

**Spills on Water**  
Countermeasures for controlling spills into water.

**Spills in Ice and Snow**  
Response strategies for controlling and cleaning up spills during winter conditions.

**Removal**  
Techniques for skimming and absorbing spills released onto land or into water.

**Transfer**  
Equipment needed to move collected liquids and solids to interim storage and disposal facilities.

**Shoreline & Muskeg Cleanup**  
Response actions required in dealing with sensitive river banks and shorelines in the region.

**Burning**  
Issues related to the *in-situ* burning of spilled oils.

**Truck (Transportation) Incidents**  
Specific spill response procedures for truck roll-over incidents.
Figure D-1: Hazardous Material Storage Areas and Potential Drainage Paths
Planning & Logistics

The feasibility of containing and recovering a spill will be largely determined by its location and the rate of the release, spreading, transport and evaporation. Each situation should be assessed to determine the most appropriate/effective resources (personnel, equipment, sorbent materials, skimming operations, etc.) that should be deployed. For any spill where containment is a concern, best efforts should be made to minimize the volume of the spill (eliminate the source), contain as much of the spill as possible and minimize dispersion of the spilled material provided that it is safe to do so.

The pre-assembly of spill cleanup kits will expedite response and reduce the total deployment time needed, including:

- Equipment and support material procurement time.
- Personnel mobilization, transit and assembly at spill site time.
- Actual equipment set-up and deployment time.

1. Determine whether or not a spill has entered a waterway and whether or not access by land or water to control points is possible so that booms, sorbents and skimmers and vacuum trucks can be deployed. Check maps and consult with personnel familiar with the spill area.

2. Establish priorities to optimize utilization of personnel and gear needed for ALL cleanup phases (containment, removal, storage, transfer and disposal) at selected sites.

3. Allow additional time for adverse weather conditions.

Monitoring Spills

Monitor spills throughout the response to ensure safety and to direct cleanup efforts:

- Explosive gas concentrations in the atmosphere using an explosion meter.
- Spill movement and behavior, in order to properly direct response efforts.
- Any and all threats to the safety of people, property and the environment.

1. Spills On Land

Spills on land should be contained as close to the source as possible, if safety allows. Every effort should be made to ensure that a spill does not reach water, where its containment and recovery are much more difficult and the potential environmental impacts are much greater. Containment can be achieved using:

- A berm or dike around the spill source
- A trench or ditch downslope of the spill source

Berms can be constructed from earth, sandbags or snow.

**Earth Berm/Trench**

If possible, locate the berm/trench sufficiently downslope of the release point to complete its construction before the spill arrives. Dig the trench along a natural drainage contour. It should be approximately 0.5 m deep with a relatively flat bottom. The excavated material can then be combined with other available material to build a berm.

**Sand Bag Berm/Trench**

Sand bags can be used where available and if the earth is too hard or frozen and cannot be excavated or compacted. A plastic liner can be used to seal the trench and bags and should be anchored with gravel or rocks and be woven between layers of bags.
**Snow Berm**

In winter conditions, snow may provide a quick and efficient berm construction material. The snow should be well packed and water can be sprayed to form an ice layer on the top and sides of the berm to make it impermeable to the spill.

![Snow BERM Diagram](image)

The type and size of the containment method chosen will depend on the following factors:

**Size of Spill**

Berms surrounding large spills that cover extensive areas are difficult and time-consuming to build. For this reason, earth or snow berms may be more easily put into place than sandbags. It is also important to build the berm as close to the source as possible to minimize spreading.

**Terrain**

Steep terrain can make work difficult, particularly with heavy equipment, while large flat areas will require longer barriers to contain a spill. Spills will also travel much faster on steep inclines but move more slowly and tend to pool on flat ground, allowing more time for the construction of barriers.

**Soil Type**
Some oils and chemicals will soak into loose, coarse, or dry soils while packed or frozen soil can create a natural barrier. The void space in tundra quickly takes up spills. Frozen soil will also require relatively heavy machinery in order to build a trench or berm. Soft, wet soil can also impede vehicle and machinery access.

**Proximity to Water**

It is important that every precaution be taken to ensure that spills do not enter a waterway. If there is any possibility of contamination, a stream or river should be protected with a berm or flume as shown below.

![Diagram of water barrier](image)

**Weather**

Weather can play an important role in spill response operations, particularly if the ground is frozen or if rainfall is heavy or prolonged. Since oil floats on water, any pooled water that collects in a trench or against a berm will effectively increase the volume of liquid needed to be contained. Water can also significantly increase the tendency of oil to spread thus posing a substantial hindrance to effective cleanup. Soluble chemicals are difficult to remove and should be assessed for their impacts on an individual basis.

**Location**

The location of a spill determines the most feasible type of containment. Accessibility of both equipment and manpower could be hindered by difficult terrain or dense vegetation.
Areas might be required where a helicopter may land, as well as one or more designated locations where equipment could be staged for later deployment at strategic locations.

**Darkness**

Spills during winter in remote locations can be difficult to clean up if they spread or migrate beyond the release point and there is insufficient light to mount a cleanup operation. During summer months, extended days can facilitate response in the North.

**Temperature**

Air temperatures of the Arctic demand attention by response personnel during both high and low extremes. Heat stress must be avoided by the proper intake of fluids during the summer while temperatures below -20 °C necessitate the protection of skin from freezing.
2. SPILLS ON MUSKEG

Muskeg is generally poorly drained, wet and spongy. Internal drainage is usually slow and the depth of peat over mineral soil varies greatly. Muskeg is also highly acidic and low in nutrients, making natural biodegradation very slow, even during the summer months.

It is recommended that small oil spills in muskeg be mixed with peat moss and allowed to degrade during summer months since more damage can be done by attempting cleanup using mechanical removal methods.

It is possible that, due either to safety or the condition of ground (too soft), that cleanup should be delayed until conditions improve. In either case, all parties involved should be consulted in order to determine when and how cleanup should be undertaken. Site monitoring will also be required during the interim phase in order to ensure that the spill does not spread to any sensitive areas around the contaminated site.

Small Spills

In the event of a small spill, it is important to weigh the advantages of cleanup versus the potential negative impacts on the terrain. Considerable damage can be caused by both personnel and equipment to wet or sensitive areas. In many cases, the best solution may be to add nutrients to the contaminated area and monitor the site to ensure that the spill does not migrate to an adjacent sensitive area. In all cases, DDMI’s Environmental Staff and regulatory authorities should be consulted.

Large Spills

Spills involving large quantities of oil or chemicals into muskeg pose a serious threat and should be approached with caution. Possible containment and recovery methods for winter and summer spills, including the different possible scenarios, are discussed for:

- large spills on bogs
- large spills on fens
- large spills on marshes
## LARGE SPILLS IN BOGS

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Key Issues</th>
<th>Containment</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>· shrubs &amp; grasses</td>
<td>· oil pooled and likely to migrate</td>
<td>· dike with dirt · trenches</td>
<td>· pumps/vacuum trucks · trenches and bell holes · flush (warm water)</td>
</tr>
<tr>
<td>· semi-solid waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>· no open water</td>
<td>· oil pooled and stationary</td>
<td>· trenches and bell holes</td>
<td>· pumps/vacuum trucks · flush (warm water)</td>
</tr>
<tr>
<td>· water table below surface</td>
<td>· oil saturated into peat</td>
<td></td>
<td>· pumps/vacuum trucks · flush (warm water) · windrow saturated peat</td>
</tr>
<tr>
<td><strong>Winter</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>· shrubs &amp; grasses</td>
<td>· oil pooled and likely to migrate</td>
<td>· dike with snow or dirt · shallow trenches &amp; bell holes</td>
<td>· vacuum trucks · scrape &amp; remove · flush (warm water) · burning possible after initial recovery is completed</td>
</tr>
<tr>
<td>· frozen with firm base to support equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>· water table below surface</td>
<td>· oil saturated into peat</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>· oil trapped in frost layer in voids</td>
<td>· shallow trenches &amp; bell holes</td>
<td></td>
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</tbody>
</table>
## LARGE SPILLS IN FENS

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Key Issues</th>
<th>Containment</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>- shrubs, grasses, no trees</td>
<td>- oil likely to migrate in the direction of water flow</td>
<td>- booms</td>
<td>- pumps &amp; skimmers</td>
</tr>
<tr>
<td>- some open water</td>
<td></td>
<td>- dikes/inverted weirs</td>
<td>- flush (warm water)</td>
</tr>
<tr>
<td>- water table at or near surface</td>
<td></td>
<td>- filter fences</td>
<td>- sorbents</td>
</tr>
<tr>
<td></td>
<td>- oil pooled and stationary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>- shallow trenches and bell holes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- dikes (straw/sorbent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- aquatic habitat and wildlife protection</td>
<td>- use booms to protect sensitive areas</td>
<td>- avoid burning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- shrubs, grasses, no trees</td>
<td>- oil pooled on surface &amp; migrating</td>
<td>- dikes (snow or dirt)</td>
<td>- vacuum trucks</td>
</tr>
<tr>
<td>- some open water</td>
<td></td>
<td>- shallow trenches &amp; bell holes</td>
<td>- scrape &amp; remove</td>
</tr>
<tr>
<td>(frozen)</td>
<td></td>
<td></td>
<td>- flush (warm water)</td>
</tr>
<tr>
<td>- fairly solid base</td>
<td></td>
<td></td>
<td>- may burn after initial recovery is completed</td>
</tr>
<tr>
<td>- water table at or near surface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- oil on surface &amp; stationary</td>
<td>- shallow trenches</td>
<td>- vacuum trucks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- skimmers/pumps</td>
</tr>
<tr>
<td></td>
<td>- slot or trench through ice</td>
<td></td>
<td>- scraping</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- oil under ice &amp; Stationary</td>
<td></td>
<td>- vacuum trucks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- skimmers/pumps</td>
</tr>
</tbody>
</table>

![Diagram of Mineral Soil and Water Table in Fens](image)
## LARGE SPILLS IN MARSHES

<table>
<thead>
<tr>
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<th>Key Issues</th>
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<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wetland, grass or no vegetation</td>
<td>aquatic habitat &amp; wildlife protection</td>
<td>contain away from habitat if possible</td>
<td>no burning on recovery</td>
</tr>
<tr>
<td>mostly open water with vegetation at sides</td>
<td>direction of water flow &amp; oil likely to migrate</td>
<td>booms, filter fences, dikes/inverted weirs</td>
<td>skimmers/pumps, sorbent pads/rolls, burning possible after initial recovery</td>
</tr>
<tr>
<td>no firm base</td>
<td>oil pooled on surface and is stationary</td>
<td>booms, filter fences, dikes/straw &amp; sorbent</td>
<td>skimmers/pumps, sorbent pads/rolls, burning possible after initial recovery</td>
</tr>
<tr>
<td><strong>Winter</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mostly water (frozen)</td>
<td>aquatic habitat &amp; wildlife protection</td>
<td>isolate from known wildlife habitats</td>
<td>no burning on recovery</td>
</tr>
<tr>
<td>vegetation at edges</td>
<td>oil below ice &amp; migrating</td>
<td>slot ice for recovery</td>
<td>skimmers/pumps, sorbent pads/rolls</td>
</tr>
<tr>
<td>oil on surface &amp; migrating or stationary</td>
<td>slot ice for recovery</td>
<td>skimmers/pumps, sorbent pads/rolls, burning possible after initial recovery</td>
<td></td>
</tr>
<tr>
<td>dikes (snow, and dirt)</td>
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</table>
3. SPILLS ON WATER

Containing spills on water is often difficult because oil spreads quickly. In turbulent water, oil and chemicals are likely to mix into the water column, making recovery impractical. For these reasons, it is important that if a spill reaches water, containment is attempted as close to the source as possible and that the spill is prevented from reaching a flowing stream. Spills in lakes should be contained, if possible, before reaching outlets where containment and recovery can be both difficult and dangerous. Efforts to contain spills in large streams should be limited to land-based operations where the oil may pool in accessible back eddies. The recovery of water-soluble chemicals is not usually possible.

In flowing streams, oil travels at the same speed as the surface current. On larger rivers or in open lake areas, slicks are also transported at 3.5% of the wind speed. Although a comparatively small effect, it can be an important factor if the wind is at right angles to the water flow and if the water surface involved is extensive. The wind can force the spill to the sides of the river where flows are slower or to the shore of a lake. Long reaches of the river may become contaminated although containment and recovery may also be possible.

In smaller streams, the wind will have less impact and the slick speed can be easily estimated by placing a small stick in the middle of the stream and determining the length of time required for it to travel a given distance, typically 10 m. This information can be quickly converted to speed \( \frac{36}{\text{time (sec)}} = x \text{ km/h} \) to determine the estimated travel time to a confluence or other sensitive area.

**Containment Strategies**

Determining the best possible strategy for containment will depend on a number of factors:

- speed of slick travel
- location of possible containment sites
- availability of personnel and equipment
- location of sensitive areas
- safety of operations

Spills on water can be contained by using floating booms (sorbent or non-sorbent) or by constructing a temporary berm and inverted weir. The objective is to build a barrier against which the (normally floating) oil will pool while allowing the underflow of water.
**IMPORTANT**

Whenever the construction of a berm or flume is considered as part of a spill response operation, the impacts of the disturbance must be weighed against the potential impacts of the uncontained spill. Care must be taken to minimize any adverse effects. The Federal Department of Fisheries should be consulted if fish spawning streams are involved. (Phone (867) 669-4900)

<table>
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Barriers can be constructed from earth or rocks although if large rocks are used, plastic sheets or packed mud should be used to ensure that a complete seal is made. Choosing and positioning the pipe is critical for effective operation of the weir. The pipe should be low enough at the inlet end to ensure that an increase of the slick thickness or substantial lowering of the water will not result in a loss of oil through the pipe. Larger pipes, which allow greater volume (and slower) flows will minimize the tendency of the oil to become entrained in the water at the inlet side. The outlet end of the pipe should be positioned to create a continuous, smooth flow. Underflow of oil (under the pipe) should also be prevented by ensuring that the pipe inlet is not located on loose gravel.

![INVERTED WEIR Diagram](image-url)
**Booms**

Booming with either sorbent or non-sorbent booms can also be an effective means of containing spills on slow-moving waters and in lakes. Effective containment using conventional booming techniques will be very difficult in streams or rivers where currents exceed 0.7 knots (0.4 m/s). At these speeds, oil will become entrained in the water flowing under the boom resulting in significant losses. Some improvement can be achieved in waters flowing at 1-2 knots (0.5 - 1 m/s) if the boom is deployed at an angle of less than 90° to the direction of flow as shown below:

Sorbent booms or socks can also be used to provide a barrier to floating oil. These types of booms should be checked regularly to ensure that they do not become saturated with either water or oil since they will tend to float very low in the water or even sink and release oil downstream.
4. SPILLS IN ICE AND SNOW

Oil can remain relatively fresh, i.e., in an unweathered state, under snow and ice for several months or more after a spill. Evaporation rates will still be high when the oil is ultimately exposed to atmosphere except in very low temperatures. Oil can also move up and down small hills (several meters high) due to the capillary action of the snow.

Use snow to make berms and line with plastic. Remove contaminated snow or ice when it is safe to do so and place into marked containers to dispose at a licensed waste disposal facility. Assistance may be obtained from the emergency camps along the winter road as per the Winter Road Joint Venture agreement.

It should be noted that with respect to the collection of oil trapped under ice, there are a number of methods generally accepted as plausible for spill recovery. Oil slicks, which make their way under a sheet of ice, typically cover a much smaller area (one-tenth) than they do on ice-free water. Slick thickness will also range between 0.5-1 cm compared to several microns on free water. These characteristics allow for a number of processes to be used for recovery:

- **Burning in-situ:** Collection trenches can be dug into the ice and the spill burned in-situ. Furthermore, there exists an approximate 2 week period during ice breakup which allows ice to rise to the surface at which point approximately 70% of the material can either be cleaned up via sorbents, or burned in-situ.

- **Pumping:** The possibility of drilling through the ice and pumping out the spill is an alternative. Various skimmer models have been tested and reviewed in literature (State of the Art Review: Oil-in-ice Recovery, prepared for the Canadian Petroleum Association by Counterspill Research Inc., 1992), with rope mop skimmers and disk/drum skimmers eliciting the best responses.

The response used will be determined by such factors as:

- Spill size
- Ice conditions
- Ambient temperature (for optimal functioning of machinery)
- Location of the spill

**Containment**

Snow and ice can be used to create berms to keep spills from spreading. In frozen rivers, angled slots about 1 m wide or holes can be cut in the ice, where safety permits, to allow possible spill recovery. The oil will rise up into the openings where it will concentrate, and be available for recovery using skimmers or pumps.
**Disposal**

Oil spills in snow and ice can sometimes be burned if the spill can be isolated from the source. Although there is generally a reduced fire hazard, due attention to safety of operations is still required. If burning is not effective, recovered contaminated material will need to be collected and transported to a designated disposal/treatment facility.

**Recovery**

When large volumes of oil have been contained either through natural or mechanical containment, it will be necessary to remove or recover the accumulated oil. This will generally occur in excavated trenches or adjacent to berms or natural barriers and occasionally in slow running streams or quiet ponds.

Vacuum trucks are ideal at cleanup sites accessible by road and where a large volume of oil has pooled that is generally free of water. The truck must be positioned at a safe distance so that there is no possibility of fire or explosion.

Oleophilic devices, such as disc or drum skimmers, can selectively recover oil in water, and are better suited to applications where the oil has formed a distinct layer on top of quiet water. Accumulations adjacent to an inverted weir are an example. A vacuum truck would be largely ineffective in this instance since it would recover large amounts of water, particularly in a thin layer of oil with water flowing through the pipe or culvert.

An example of a disc skimmer application in an excavated pit is shown below:

![Typical Spill Recovery Operation Diagram](image-url)
When using disc or drum skimmers, ensure that small items of debris are periodically removed from scrapers to ensure their efficient operation.

**Transfer**

Pumps can be used to transfer oil recovered by a skimmer to temporary and/or final storage facilities. Pumps can also be used for low-pressure flushing of contaminated areas, although this spill response technique should only be carried out under the guidance of an environmental advisor. Diavik personnel should be familiar with the operation and maintenance of available transfer equipment:

- Centrifugal ("trash") pumps are capable of moving oil but will emulsify oil and water, resulting in the generation of larger volumes of liquid waste.
- Peristaltic, diaphragm and other positive displacement type pumps tend to reduce oil/water emulsification.
- Ensure that pumps and drives selected for transferring Jet-B, gasoline or other flammable products are explosion proof.

Solid wastes, such as contaminated sediment, used sorbent, spent boom and other debris, will require the use of rakes and shovels for initial pickup and then lined containers, pickup trucks, etc. for their transfer to disposal sites. Care should be taken during such operations to prevent the contamination of soil and water at transfer points.

**CLEANING STREAM BANKS, SHORELINE & MUSKEG**

Site restoration, stream banks and general "shoreline" cleanup of lakes are the final spill response steps. Due to seasonal variations and various types of stream banks and muskeg, a standard restoration program cannot be prescribed. Consultation with environmental advisors is critical to ensuring that cleanup efforts do not create adverse impacts. General cleanup rules include:

1. **Minimize** the impact to shoreline or muskeg, particularly vegetated areas, during all phases of spill response. Cleanup can cause more damage to such habitat than an untreated spill, especially where permafrost and vegetation are involved.

2. **Assess** the area requiring cleanup in terms of three factors:
   - environmental sensitivity
   - property, archeological or other damage
   - natural cleansing action at the site
Oil typically does not adhere to the banks of fast moving rivers. Little or no cleanup action can usually be taken. On the other hand, muskeg can undergo long-term contamination and reduced environmental productivity that cleanup may or may not help to alleviate because of other damage inflicted. Whatever method is chosen to deal with an area affected by a spill, minimizing damage to root systems is vital.

1. **Obtain** approval and instruction prior to conducting cleanup operations.

2. **Be particularly careful if oil has entered marshy areas and wetlands.**

Personnel and equipment should NOT be deployed into such areas without explicit approval from environmental authorities. Damage to both upland and water areas may result.

3. **Approach** vegetated areas and other sensitive zones from the waterside, if possible and if cleanup is to be attempted. Be aware that various plant species, birds, fish and animals can all be adversely affected by cleanup operations. In the Arctic, breeding and blooming periods during the summer months are particularly critical.

**BURNING**

The *in-situ* burning of spilled oil may be useful option, particularly in the North, where terrain and/or safety concerns may make conventional cleanup methods impractical. It is important that the decision to burn be made as soon as possible after the spill due to the fact that as the more volatile light ends evaporate, burning becomes more difficult.

**Application**

The best results will be achieved when burning fresh (less than 24 hours old) spills in winter or in muskeg with a high water table. Burning can also be effective in containment trenches or ponds where significant oil thickness can collect. Special care should be taken in winter conditions, as the heat from the burn will melt adjacent snow, increasing the potential for penetration of the oil, and potentially transporting the oil to the surrounding area.

Care must also be exercised during the summer. Naturally occurring bog and other plants on the Arctic tundra can burn, creating more damage than the original spill. Material for burning should be isolated from the surrounding terrain (in windrows or containers) prior to burning if there is ANY chance of adjacent areas being inadvertently set on fire.

**Limitations**
The burning of heavy or weathered oil is very difficult or impossible. Severe weather conditions such as high winds, snow and rain may also make burning impossible. Areas with vegetation cover which have not been severely damaged by the oil should not be burned as more damage will result than if the oil is left to degrade naturally. Care should also be taken in muskeg with a relatively low water table as burning may destroy sensitive root systems.

**Safety**

As with conventional cleanup methods, safety of operations is paramount in burning operations. Burning should only be done in contained areas or where firebreaks are employed. Muskeg and tundra can smolder for a considerable time after a burn and care should be taken to ensure that it does not ignite later, either from underground (root) systems or surface materials. Consultation with the Territorial Forest Fire Center in Fort Smith is advised ((867) 872-2103). Personnel involved in the burn should be fully trained in safe burning procedures including methods for avoiding the inhalation of potentially dangerous smoke and/or vapors.

**TRUCK (TRANSPORTATION) INCIDENTS**

Truck incidents typically result in spills similar to those from other sources, such as storage tanks, and share the same safety and response concerns. However, due to the nature of the equipment involved and the remoteness, typical of transportation incidents, there are a number of issues that should be considered.

**Safety**

When truck incidents occur, personnel are potentially at risk due to the cargo (fire and explosion) and to the incident itself (injuries). There is also a possibility that the incident might involve other people, either directly (i.e. multiple vehicle incidents), or indirectly (i.e. where the proximity of the incident to a residence, camp or depot might require evacuation). In all cases, the health and safety of Diavik (or contractor) personnel and the public is of highest priority.

In all truck incidents, the following procedure should be followed:

**Step 1  Confirm that a spill has occurred**

It may not be obvious if a spill has occurred - look for:

- pooled liquid
- damage to equipment/tanks
- smell of fuel or chemicals
- leaks from hatches, valves or other fixtures
Step 2  Assess the situation

Before initiating response actions, take the time to determine the nature of a spill to collect some or all of following facts:

- potential risk of fire, explosion and environmental damage
- extent of injuries to co-workers or the public
- source and approximate size of the spill
- possible methods to stop the flow of product
- proximity to water

Step 3  Take Actions

- Eliminate ignition source(s) if safe to do so.
- Shut off spill source if safe to do so.
- Attend to any injured persons.
- Restrict personnel to the spill site using road barriers or marker tape.
- Warn others in the area of the spill.
- Use an explosion meter to monitor atmospheric gas concentrations.
- Report spill to Diavik supervisor.
- Transport spill response kit to the spill site.
- Control spreading and minimize impacts.

Spill Containment and Recovery

Containment of the spill should be attempted using the methods discussed earlier in this appendix. Special care should be taken to ensure that spilled material does not reach water bodies where recovery is more difficult. Ice augers can be effective in terms of locating and exposing oil for burning or pumping off.

Transfer
Where safety allows, the remaining cargo should be transferred to another trailer or temporary tank either through the dispensing manifold or through a hatch cover. If both of these are inaccessible, a hole can be drilled using a spark-proof drill or similar non-sparking tool.

If the hatch cover is exposed and below the level of cargo remaining (i.e. the truck is on its side), a hatch cone cover can be used as described as follows:

<table>
<thead>
<tr>
<th>HATCH CONE COVER OPERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Ground the vehicle</strong></td>
</tr>
<tr>
<td>• Place spike in ground.</td>
</tr>
<tr>
<td>• Attach one end of ground cable to ground on tank.</td>
</tr>
<tr>
<td>• Attach other end of cable to ground on receiving tank.</td>
</tr>
<tr>
<td>• <strong>Attach recovery cone</strong></td>
</tr>
<tr>
<td>(making sure that air pocket is on top).</td>
</tr>
<tr>
<td>• Wrap excess bare cable around manhole neck over recovery cone.</td>
</tr>
<tr>
<td>• Hook one end of the load binder to eyelet end of cable and the other end of the load binder to the load chain that allows for a snug fit.</td>
</tr>
<tr>
<td>• Lock the load binder lever into locked position.</td>
</tr>
<tr>
<td>• Attach the drainage hose to coupler end of recovery cone.</td>
</tr>
<tr>
<td>• Open the air pocket.</td>
</tr>
<tr>
<td>• With the recovery cone securely over the manhole cover and grounding cables in place, <strong>open the manhole cover</strong></td>
</tr>
<tr>
<td>• Unzip the side zippers.</td>
</tr>
<tr>
<td>• Insert hands into the protective gloves.</td>
</tr>
<tr>
<td>• Feel for the manhole cover release latch and pull open cover.</td>
</tr>
</tbody>
</table>

Once the remaining cargo has been transferred, the vehicle can be righted using the equipment available in the area (i.e. cats, winch tractors, etc).