Annex A-7

Report: 2011 Completion Report for Great Bear Lake Sites – Phase I Remediation

2011 Completion Report
For

Great Bear Lake Sites -
Phase I Remediation

Sawmill Bay, NWT

Submitted to:

Public Works and Government Services Canada

Prepared by:

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EXECUTIVE SUMMARY

Phase I of the Great Bear Lake Sites Remediation project began during the summer of 2010 and was completed in 2011. The 2010 remediation activities at Sawmill Bay, Contact Lake, Bonanza, and El Bonanza included: consolidating and stockpiling surface debris (including drums); barricading of select buildings and demolition of minor structures; burning of unpainted, untreated wood; and consolidation, containerization and shipping of hazardous materials off-site. The 2011 program focussed on the management of the drums with residual contents at Sawmill Bay.

Operations for the two year Phase I clean-up program were based at a temporary camp constructed at Sawmill Bay in 2010. The on-site work during 2011 took place from June 5th to June 10th and July 20th to August 30th. During the June stage of the 2011 program, the liquid contents of the old drums were inspected, sampled, analysed, and classified as per the SENES drum sampling plan and the standards outlined in the Indian and Northern Affairs Canada (INAC) document entitled Abandoned Military Site Remediation Protocol (AMSRP).

In July, a temporary drum treatment area was constructed which consisted of a drum washing station and an effluent treatment system. Water collected from Great Bear Lake was used as process water to clean the old drums. This process water was treated, temporarily stored in bladders, recycled through the system as process water or tested to confirm that the water met the effluent quality criteria, and subsequently discharged in accordance with the provisions outlined by the Water License (WL) at a location approved by the Land Use Inspector (LUI).

During July and August, the old drums were emptied of liquid contents, cleaned and crushed. In total, 2190 drums were cleaned and crushed during the 2011 campaign. Consolidation groupings were based on the disposal requirements set in the AMSRP, laboratory results, and visual observations. In total, 204 drums remain on-site from the consolidation activities. Along with the historic cache of 16 drums located north of the former old airstrip, there are 220 drums remaining on-site at Sawmill Bay.

An on-site community representative (OCR), from Déline, was on-site throughout the 2011 construction season. The OCR inspected all aspects of the working operations. The OCR inspections were conducted in conjunction with those performed by the on-site department representative.

At the end of the 2011 construction season, the temporary camp was dismantled and demobilized along with vehicles, equipment, and construction materials. Equipment and supplies were demobilized from Sawmill Bay to Déline by barge.

Additional remedial work at Sawmill Bay will be completed as part of other future remedial programs. The contract objectives of the Phase I Great Bear Lake Sites Remediation project are now deemed complete.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF DIAGRAMS

LIST OF FIGURES

APPENDIX A

LIST OF APPENDICES

AT REAR OF REPORT

1.0 INTRODUCTION

SENES was retained by Public Works and Government Services Canada (PWGSC), on behalf of Aboriginal Affairs and Northern Development Canada (AANDC) to provide resident engineering services for Phase I of the Great Bear Lake (GBL) Sites remediation program. The following document details the work activities undertaken during 2011. Reference is made to the 2010 work where applicable; however for further details on the 2010 work, consult the document entitled *2010 Completion Report for Great Bear Lake Sites – Phase I Remediation of Sawmill Bay, Contact Lake, El Bonanza, and Bonanza NWT* prepared by SENES for PWGSC on behalf of AANDC dated March 2011. Additional details on the program are also available by referencing the tender documents, entitled *Public Works and Government Services Canada Specifications for Environmental Site Remediation – Phase I Great Bear Lake Sites* (August 2010).

1.1 BACKGROUND

The Great Bear Lake Phase I Remediation project entailed remedial works at four sites namely the abandoned airstrip and lodge at Sawmill Bay and three abandoned mine sites at Contact Lake, Bonanza, and El Bonanza. The sites are situated within the Sahtu settlement lands at the eastern corner of Great Bear Lake, Northwest Territories. At the Great Bear Lake sites, mining, milling, military, and fishing activities were carried out at various intervals between the 1930s and 1980s.

The Sawmill Bay site is located at N 65°43’14”, W 118°55’14”, approximately 65 km southwest of Port Radium along the northern section of the Leith Peninsula at the eastern end of Great Bear Lake. The closest Dene community of Déline lies 230 km to the west of Sawmill Bay while Yellowknife lies 400 km southeast of Sawmill Bay. Situated on the edge of the Canadian Shield, it covers an area of approximately 20 km^2, extending from the former sawmill and beach landing on the south shore of the bay, to the lodge area and the old airstrip located approximately 1 km inland from the western tip of the bay.

The on-site remediation began during the summer of 2010 and included: gathering, consolidating, and stockpiling surface debris and drums; building closure and demolition; burning of unpainted, untreated wood; and shipping hazardous material off-site from the Sawmill Bay, Contact Lake, Bonanza, and El Bonanza sites. The remediation activities were staged from a temporary base camp built at Sawmill Bay.

The 2011 program focussed on the mitigation of the issues associated with the drums and their contents which were remaining at Sawmill Bay at the end of the 2010 field season. Apart from

demobilization activities by barge to Déline, the 2011 remediation program occurred solely at Sawmill Bay.

1.2 SITE ACCESS

The mobilization of contractor's equipment and supplies occurred in 2010 through a combination of aircraft and barge. Hercules aircraft transported equipment from Yellowknife to Déline. The equipment was then transported by barge to Sawmill Bay.

In 2011, Twin Otter and Cessna aircraft arriving from Yellowknife, Déline, and Norman Wells delivered supplies and personnel on a regular basis. Demobilization of contractor's equipment and supplies occurred by barge transportation to Déline.

1.3 SUMMARY OF REMEDIATION ACTIVITIES

During 2011, a temporary drum treatment area was constructed which consisted of a drum washing station and a treatment system consisting of an oil-water separator in series with granular activated carbon and clay polishing units. Drum contents were consolidated into waste streams and process water used for washing drums prior to crushing was treated. The treated water was stored in holding bladders prior to discharge. Maps and photographs showing the remediation activities are attached as Appendix A and B, respectively.

Further details with regards to the 2011 program are available within the following documents:

- Sawmill Bay Drum Sampling Program – Progress Report (SENES, June 2011);
- GBL Barrel Processing Plan (AEL, July 2011);
- GBL Barrel and Waste Water Treatment Safe Work Plan (AEL, July 2011);
- Barrel Crushing SOP (AEL, July 2011);
- GBL Phase I Sawmill Bay Drum Sampling Laboratory Summary and QA/QC (SENES, July 2011); and
- GBL Demobilization Plan (AEL, October 2011).

Copies of these documents are attached in Appendix C.

1.4 THE PROJECT TEAM

Along with members of the Déline community, Table 1 presents the project team for the Phase I remediation program.

Table 1 Project Team

Element	Company/Group	Responsible Person
Site Custodian	Aboriginal Affairs and Northern Development Canada - formerly Indian and Northern Affairs Canada (Yellowknife, NT)	Joel Gowman, Acting Sahtu Project Manager, Contaminants and Remediation Directorate (CARD)
Owner's Representative	Public Works and Government Services Canada (Edmonton, AB)	Michael Bernardin, Project Manager, Northern Contaminated Sites
Contractor	Aboriginal Engineering Ltd. (Yellowknife, NT)	Robert Johnson, P.Eng., Project Manager
Site Quality Assurance	SENES Consultants Limited (Richmond Hill, ON)	Charles Gravelle, P.Eng., Senior Project Manager; Jason Mauchan, M.Eng. and Ryan Janzen, B.Sc.E., Department Representative
On-site Community's Representative (OCR)	Déline First Nation	Dennis Kenny, Kurry Mackeinzo, and Bryan Gaudet Jr.

2.0 ABORIGINAL INVOLVEMENT

2.1 COMMUNITY REPRESENTATIVES

The Déline First Nation on-site community representatives (OCR) were Denis Kenny, Kurry Mackeinzo, and Bryan Gaudet. Mr. Kenny was on-site during the drum content sampling program from June 5th until June 10th, 2011. Mr. Mackeinzo was on-site from July 23rd until August 13th, 2011 and Mr. Gaudet was on-site from August 13th until August 25th, 2011 during the remediation work related to the drums and their contents.

At Sawmill Bay, the on-site community representatives (OCR) inspected all aspects of the working operations. These inspections included, but were not limited to,: the camp living quarters, the drum caches, the drum processing area, the temporary fuel cache locations, the garbage incinerating area, the non-hazardous debris stockpiles, the drum crushing area, the three restricted access zones, the drum contents consolidation area, and the barge loading area. The OCR inspections were conducted with the on-site department representative.

2.2 WORKFORCE

The prime contractor for the Great Bear Lake Phase I remediation work was Aboriginal Engineering Limited (AEL). The head office of AEL is located in Yellowknife, Northwest Territories. AEL is part of the Tli Cho group of northern companies.

Aboriginal Opportunity Considerations (AOC) were documented throughout the project. Specifically, on-site hours for both Sahtu and Tlicho beneficiaries were tracked. Table 2 provides the person-hours for AEL employees on-site during the Great Bear Lake Sites Phase I Remediation program. The AOC contractual percentage targets for on-site Sahtu and Tlicho employment were 75% and 6%, respectively.

Table 2 On-Site Employment Summary

Employment	Timeframe			
	2010 hours	**2011 hours**	**Total hours**	**Overall %**
Total	12,138	7,519	19,657	
Northern	10,902	6,630	17,531	89
Aboriginal	10,439	6.630	17,069	87
Sahtu	8,698	4,788	13,486	69
Tlicho	0	687	687	3
Women	1,940	1,486	3,426	17

2.3 TRAINING

Within the first 24 hours of being on-site, all persons completed a worker orientation seminar which included a WHMIS course, a brief history of Sawmill Bay, and site specific safety awareness. Part of the worker orientation seminar was an information session on low level gamma radiation. The plain language review covered good hygiene, behavioural practices and awareness of radiological impacted areas, Personal Protection Equipment (PPE), and Health & Safety as it relates to the existing low level gamma radiation in the soils within the boundaries of the restricted access zones.

As a source of information during the AEL orientation seminar, the following document was referenced:

- *Health & Safety Briefing Highlights and Notes from Sawmill Bay and Déline, NWT* dated 15 September 2010, prepared by Terriplan Consultants and AMEC on behalf of the Low Level Radioactive Waste Management Office (LLRWMO)

This reference document is attached as Appendix D.

3.0 WORK SITE HEALTH AND SAFETY

Health and Safety of the workers employed for the Great Bear Lake Sites Remediation Phase I Program was of paramount concern to the project management team. As such, a site specific health and safety plan (AEL 2011) was developed prior to the start of the job. The plan detailed expected job hazards, recommended safety measures, safe work practices, emergency procedures and personal protective equipment requirements. The AEL site specific health and safety plan is attached as Appendix E.

Prior to the start of the site work, AEL prepared a Worker Orientation Seminar (AEL 2011). The Seminar was conducted repeatedly at Sawmill Bay for all persons new to the site. The orientation seminar covered:

- the overview of the Great Bear Lake sites;
- project communication, organization and administration;
- remediation activities and scope of work;
- work specific task requirements;
- site specific health and safety;
- radio communication protocols; and
- environmental protection.

Each work day began with a safety meeting (tailgate meeting) led by the site supervisor. During the safety meeting the activities for the day were outlined, safety topics were discussed, and job hazard assessments (JHA) were completed. The JHA template is attached within Appendix F. AEL incorporated daily record keeping of the tailgate meeting in their Sawmill Bay health and safety binder. The daily sign-in template is attached within Appendix F. The safety topics varied according to the remediation activities scheduled. The tailgate meetings included safety topics such as wildlife sightings, potential safety hazards regarding the day's work, bear fence operation, personal protective equipment, the restricted access zones, general hygiene, and input from the site medic. Worker feedback was incorporated into the morning meetings. The development of procedures and protocols to mitigate hazards also included worker feedback.

During the course of the site work, a weekly construction meeting, incorporating health and safety, was conducted on each Wednesday. The site supervisor, foreman, field technician, department representative, and on-site community representative attended the weekly meeting. During these meetings, the work completed was documented, any incidents were reviewed, selected health and safety topics were discussed, and a projected schedule of work was presented by the site supervisor.

A medic was on-site at Sawmill Bay for the duration of the remediation project.

The following subsections summarize key aspects of health and safety that were enforced on-site.

3.1 PERSONAL PROTECTIVE EQUIPMENT (PPE)

All personnel were required to wear the appropriate personal protective equipment (PPE), which at a minimum consisted of a CSA approved hard hat, CSA certified footwear Grade 1 approved, safety glasses and reflective clothing. Workers were also required to wear other safety equipment including hearing protection, gloves, or dust masks depending on the nature of the work.

For work at the drum processing area, workers were required to wear additional safety equipment including:

- Tyvek coveralls;
- Half face-piece respirator with NIOSH approved P100 filter; and
- Nitrile gloves.

For work at the drum washing station within the drum processing area, workers were required to wear additional safety equipment including:

- Face shield; and
- Rubber gloves.

A decontamination area was established outside of the drum processing area. Eating, drinking, smoking and chewing tobacco were controlled by setting aside breaks for these activities. Tyvek coveralls were disposed of daily.

3.2 WILDLIFE SAFETY

A wildlife response plan was developed for the remediation work that addressed potential encounters, firearm protocols, basic safety principles, social responsibilities of a firearm user, preventing and responding to bear encounters and minimizing the impact on wildlife. During project work a wildlife monitor was retained full time. The monitor patrolled accessible work areas on a rotational basis.

Black bears were seen on a number of occasions during the 2011 construction season. Black bears were spotted at locations such as: near the garbage incineration area at the end of the old airstrip; the temporary fuel cache adjacent to the old lodge; on the access road to the airstrip; along both airstrips; and near camp.

An electric bear fence was installed around the camp perimeter which was activated every evening and deactivated every morning prior to the safety meeting. To reduce the risk of attracting wildlife, food scraps were burned each day in the incinerator by the airstrip, and workers were required to return all food waste from the work site to camp disposal facilities. Beginning in the first week of August, the bear fence was in operation during the days.

On August 25th, 2011 a nuisance black bear was destroyed. The incident report is attached within Appendix G.

3.3 RESTRICTED ACCESS ZONES

Three restricted access zones were previously identified as containing low level gamma radiation in the soils. The restricted access zones were demarcated using blue flagging tape. Included within the on-site orientation for all persons arriving at site were briefing notes on health and safety as it related to the three restricted access zones. The briefing notes were based on the aforementioned document prepared by Terriplan Consultants and AMEC on behalf of the Low Level Radioactive Waste Management Office (LLRWMO) entitled *Health & Safety Briefing Highlights and Notes, Sawmill Bay and Déline, Northwest Territories* dated October 12, 2010. The low level gamma radiation health and safety briefing document is attached as Appendix D.

At each orientation seminar the workers were informed of the reasons for the restricted access zones and were briefed on health and safety with regards to low level radiation in soils. An on-site information session was conducted on July 21st, 2011 by representatives of the LLRWMO. The session included an opportunity for workers to ask questions and to use the specialized monitoring equipment.

During the 2011 construction season, work inside the restricted access zones was not required.

3.4 DOCUMENTATION

During each morning a tailgate meeting occurred prior to the day`s activities. Agenda items for each meeting included Job Hazard Assessment (JHA) forms and a question period. The JHA forms were completed and signed by those workers performing the specific tasks. Specific tasks included but were not limited to:

- Drum deheading;
- Drum washing;
- Drum transporting;
- Daily garbage incineration;

- Drum crushing; and
- Barge loading.

An inspection report was submitted to AEL by a Workers' Safety and Compensation Commission of the Northwest Territories and Nunavut (WSCC) representative based on an on-site inspection occurring July 27, 2011. The inspection report is attached within Appendix G. The mitigative actions relating to the compliance orders were documented in the August 5th daily report. Daily reports are attached within Appendix H.

4.0 REMEDIATION ACTIVITIES

4.1 TIMELINE

The on-site activities during 2011 commenced in June. From June 5th to June 10th the liquid contents of the drums were sampled. The role of the contractor during this period was to provide camp support for the SENES field team. For details on the activities of the testing program refer to the document entitled *Sawmill Bay Drum Sampling Program – Progress Report by SENES* dated 17 June 2011 (updated 6 October 2011) and the document entitled *Sawmill Bay Drum Sampling Laboratory Summary and QA/QC* dated July 2011 (updated 6 October 2011). These documents are attached within Appendix C.

Site activities resumed with mobilization to site on July 20th. On-site work continued daily until final demobilization on August 30th, 2011.

Equipment and supplies were demobilized from Sawmill Bay through two barge trips to Déline. The barge demobilized equipment on two separate occasions from Sawmill Bay, namely August 4th and August 30th.

For further information on the remediation activities timeline, see the attached daily and weekly reports in Appendix H.

4.2 SITE AREAS

The three site areas at Sawmill Bay are the Main Camp, the airstrip, and the barge landing area. Summaries of the remediation activities completed during 2011 for the three areas of site are presented below in Table 3, 4, and 5, respectively.

Table 3 Summary of Remediation Activities Completed at Sawmill Bay Main Camp

Area	Description
Main Camp (see Figure 2)	Restricted access area demarcated with flagging tape Three latrines dug for black water Temporary fuel cache located adjacent to lodge 11 tents deconstructed of which included 5 sleeping quarters, kitchen/ dining hall, showers/laundry, storage shed, medic tent, office, dry room Temporary hazardous debris stockpile (HDS) decommissioned

Table 4 Summary of Remediation Activities Completed at Sawmill Bay Airstrip

Area	Description
Airstrip (see Figure 3)	Drum with liquid/sludge sampled Drums with liquid/sludge classified Restricted access area demarcated with flagging tape Drum processing area constructed Drums classified into waste streams by content Drum contents pumped into appropriate stream Empty drums cleaned at drum washing station Process water treated Treated process water held in bladders Treated process water tested in accordance with the Water License (WL) Empty drums crushed and stockpiled within non-hazardous debris stockpile-1 (SB-NHDS-1) Drum processing equipment dismantled and demobilized Soil samples collected from drum processing area Treated process water discharged in accordance to WL and LUI

Table 5 Summary of Remediation Activities Completed at Sawmill Bay Barge Area

Area	Description
Barge Landing (see Figure 4)	Restricted access zone demarcated with flagging tape Drums with liquid/sludge sampled Drums with liquid/sludge classified Drums with liquid/sludge transported to airstrip drum cache Soil sampling at Bay Area drum cache Demobilization of equipment by barge Demobilization by barge of drums containing PHC-impacted soils

4.3 REMEDIATION ACTIVITIES BY PROCESS

Summaries of the remediation activities by process completed at Sawmill Bay during 2011 are detailed below.

4.3.1 Drum Transportation Activities

At the end of the 2010 construction season, two caches of the remaining drums with liquid/sludge contents had been established. The Airstrip Drum cache and the Bay Area drum cache (see Figures 5 and 6, Appendix A) contained approximately 1000 drums each. Note that empty drums were crushed during the 2010 season and that the drums remaining contained liquid/sludge, water, petroleum products, glycol, or a combination thereof. Subsequent to sampling activities in June 2011, the entire Bay Area drum cache was transported to the airstrip. Transporting all the drums from the Bay Area cache to the Airstrip cache was the Contractor's choice to not re-establish the water treatment/processing area. The drums were transported through a combination of ATV with trailer, pick-up truck, and front-end loader. Photographs of drum transportation activities are presented within Appendix B.

At the end of the 2011 construction season, 18 drums containing PHC-impacted soils were transported by barge to Déline. The PHC-impacted soils were temporarily stored on polyethylene liners and subsequently placed into drums. The drums were transported by plane from Déline to Yellowknife by Buffalo Airways on October 25th, 2011. Once in Yellowknife, the drums were received by KBL Environmental. The manifest documenting the transport from Déline to KBL in Yellowknife is attached as Appendix L.

4.3.2 Consolidation of Drum Contents

The consolidation of drum contents occurred along the western edge of the former old airstrip (see Figure 3, Appendix A). Overall, drum contents were either pumped directly into new drums for consolidation or pumped into white holding tanks within the drum processing area. Generally, contents for consolidation contained petroleum products, and contents for the white holding tank contained a mixture of petroleum products and water.

The consolidation groupings were based on the disposal requirements set in the AMSRP, laboratory results, and visual observations. For example, according to the AMSRP drum contents with a flash point of <25°C are required to be transported off-site. Therefore, based on the June laboratory results, those drums which had contents with a flash point of <25°C were consolidated. Table 6 below summarizes the consolidation efforts. Note that the numbers presented in Table 6 represent the remaining drum cache at the airstrip.

Table 6 Drums with Consolidated Contents

Contents	Number of drums	Volume
Process waste[1,4] (oil from oil-water separator)	70	All 85%-95% full
Oil	51	All 85%-95% full
Fuel (gas, diesel)	18	Sixteen 85% full, two 25% full
[2]Group 1	11	All 90% full
Fuel (Jet A, B)	7	Six 85% full, one 20% full
[3]Group 2	3	Two 90% full, one 50% full
Transmission fluid	3	All 90% full
Antifreeze	1	75% full
Sand[5]	40	Range from 50% full to only 3" of sand in the bottom

[1]Process waste is the 'oil' generated from the oil-water separator within the drum contents treatment facility
[2]Flash point <25°C.
[3]Flash point between 25°C and 60.5°C.
[4]Laboratory analysis was not conducted on process waste.
[5]Drums containing sand from historical activities predating the current remediation program.

Of particular interest are the consolidated drums of process waste generated from the oil-water separator. Further analysis of this liquid was not conducted. Based on the findings presented within the *Sawmill Bay Laboratory Summary and QA/QC* report, drum contents sampled during the June program did not contain elevated levels of PCBs, chlorine, cadmium, chromium, or lead in comparison to the AMSRP action levels with regards to allowance of on-site incineration. Therefore, it is presumed that the process waste does not contain elevated levels of these parameters. It is suggested that the process of consolidating contents of drums previously tested and subsequently run through the oil-water separator will not significantly increase levels of inorganics or PCBs. However, the flash point of the liquid contained within the process waste drums may have changed due to mixing various consolidated streams and therefore this parameter may require further analysis. Flash point is of particular interest with regards to transporting contents off-site and classifying contents under Transportation of Dangerous Goods (TDG) regulations. Specifically, a liquid with a flash point of <60.5°C is considered a Class 3 material. Furthermore, drum contents with a flash point of <25°C of >225°C are not acceptable for on-site incineration according to the AMSRP.

The sand contained within the drums was not tested, however, is assumed to contain elevated levels of PHCs.

4.3.3 Drum Washing

Drums were washed within the drum processing area (see Figure 5, Appendix A). The drum washing occurred after the removal of liquid contents and prior to crushing. The washing process took place on a custom built drum stand which held 8 empty drums on an angle to allow for wash water to drain. The drums were cleaned with a hot water pressure washer. The initial source of the water for washing was Great Bear Lake. The department representative along with the on-site community representative visually inspected each washed drum to ensure removal of residual contents.

The water used for the cleaning process was captured within a lined box which held the drum stand. This process water was pumped into the white holding tanks for treatment. The treatment system contained an oil-water separator, activated carbon, and clay which resulted in two liquid streams: treated water and process waste. The process waste was consolidated as mentioned above. The treated water was either held in temporary holding bladders and sampled for discharge or recycled back into the hot water pressure washer system for cleaning subsequent drums.

Photographs of the drum washing process are presented within Appendix B.

4.3.4 Discharging Treated Water

Treated water was discharged in accordance with the requirements set in the Water License. Further detail with regards to the Regulatory information is presented in Section 5 below. Table 15 summarizes the fate of treated water in terms of volume and timeline.

Diagram 1 schematically represents the fate of water in the treatment system.

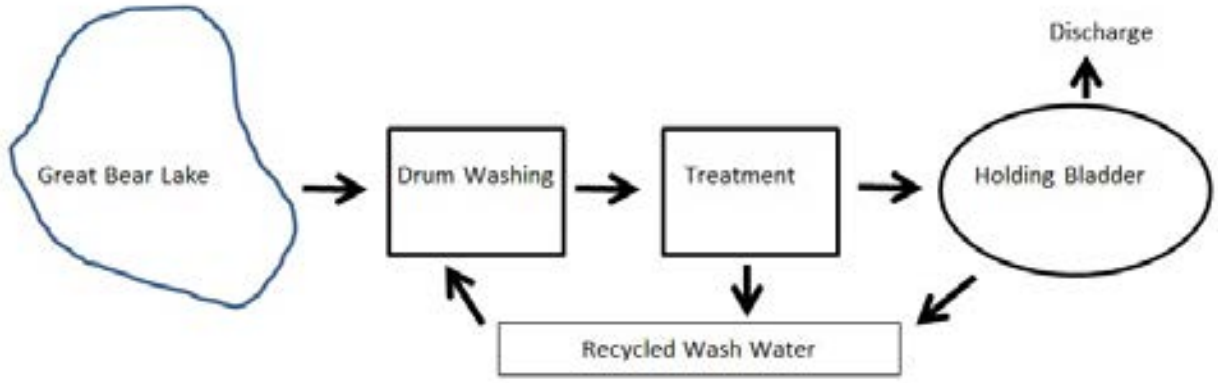


Diagram 1: Fate of water used for washing drums

4.3.5 Crushing

Drum crushing continued in 2011 with an additional 2190 drums being crushed. Drums were crushed using an excavator in a similar fashion to 2010. The safety of the drum crushing operation was enhanced in 2011 with the addition of a barrier device. The barrier device was in place to separate the crushing pad from surrounding workers. Drum crushing occurred adjacent to the Airstrip drum cache. A photograph of the barrier device is shown in Appendix B.

Once drums were crushed, they were placed on a polyethylene liner within non-hazardous debris stockpile-1 (NHDS-1) (see Figure 3, Appendix A).

4.4 BASELINE SAMPLING

Baseline samples were collected in June 2011 at both potential drum processing areas.

Sample locations were selected based on the contractor's indication of where the drum processing would occur. At the former old airstrip, prior to establishing the drum processing area, samples were collected from five locations (see Figure 5, Appendix A). The parameters tested for included hydrocarbons, BTEX, PCBs and metals. Field observations by the on-site geotechnical engineer indicated that the upper stratum of soil was generally a damp, brown, medium-grained sand. The more stringent coarse-grained CCME Tier 1 Levels are therefore referenced below for comparison purposes.

Analytical results for PHCs were compared to CCME soil quality guidelines for a residential/parkland land use. Analytical results for PCBs and inorganics were compared to DEW Line Cleanup Criteria (DCC). Table 7 summarizes the analytical results for samples collected at the drum processing area located at the former old airstrip.

Table 7 June 9th Soil Samples – Drum Processing Area

Sample #	BTEX	F2	F3	F4	PCBs and metals
CCME Values[1]		150 ppm	300 ppm	2800 ppm	DEW Line Cleanup Criteria (DCC)
A[2]-SS1	Below detection[3]	<10 ppm	<10 ppm	<10 ppm	< DCC values
A-SS2	Below detection	<10 ppm	<10 ppm	<10 ppm	< DCC values
A-SS3	Below detection	<10 ppm	<10 ppm	<10 ppm	< DCC values
A-SS4	Below detection	<10 ppm	<10 ppm	<10 ppm	< DCC values
A-SS5	Below detection	<10 ppm	<10 ppm	<10 ppm	< DCC values

1. Tier 1 CCME levels for Residential/Parkland coarse-grained surface soil.
2. A = Airstrip, SS = Surface Sample.
3. Detection limits for benzene, toluene, ethylbenzene, and xylenes (total) were 0.005 ppm, 0.02 ppm, 0.01 ppm and 0.04 ppm.

The baseline samples were collected on June 9th, 2011. All five samples reported PCBs in soils of <0.010 ppm. The samples contained metals in soils at values below Tier I DCC criteria for lead and below Tier II DCC criteria for other regulated metals including arsenic, cadmium, chromium, cobalt, copper, mercury, nickel, and zinc.

Baseline soil samples were also collected on June 9th at the then potential drum washing station location at the dock area. The analytical results of these surface samples (B-SS-1 through B-SS-5) included below detection levels for BTEX, F2, F3, and F4; and below Tier I and Tier II DCC levels for inorganics.

The analytical results are attached within Appendix I. The locations of the samples are presented on Figure 5 and Figure 6, respectively.

4.5 END OF SEASON SAMPLING

End of season soil sampling occurred at the wash station (WS), airstrip cache (AC) and dock cache (DC). Samples were collected at the wash station based on this area being the drum processing area. Samples locations at the two historical caches were based on these areas being high traffic areas with regards to the movement of drums. All drums were ultimately transported from the caches to the drum processing area. End of season sampling occurred on August 29th, 2011, after deconstruction of the drum processing area.

Table 8 summarizes the results for WS samples. Figure 5 shows the locations of the samples.

Table 8 August 29th Soil Samples – Drum Processing Area

Sample #	BTEX	F2	F3	F4	PCBs and metals
CCME Values[1]		150 ppm	300 ppm	2800 ppm	
SBWS[2] -1	Below detection[3]	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBWS-2	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBWS-3	Below detection	130 ppm	140 ppm	<10 ppm	Not analyzed
SBWS-4	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBWS-5	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed

1. Tier 1 CCME levels for Residential/Parkland coarse-grained surface soil.
2. SBWS = Sawmill Bay Wash Station.
3. Detection limits for benzene, toluene, ethylbenzene, and xylenes (total) were 0.005 ppm, 0.02 ppm, 0.01 ppm and 0.04 ppm.

The end of season samples collected from the wash area footprint (SBWS-1 through -5) were below CCME Tier 1 Levels. The CCME Tier 1 levels for coarse-grained surface soil under a residential/parkland use for F2, F3, and F4 are 150 ppm, 300 ppm and 2800 ppm, respectively.

Samples were also collected from the Airstrip cache (SBAC-1 through -5) on August 29th. Drums were transported to the airstrip cache over the course of the 2010 and 2011 construction season. Sample locations are shown on Figure 3. Table 9 summarizes the results for Airstrip cache (AC) samples.

Table 9 August 29th Soil Samples – Airstrip Drum Cache Area

Sample #	BTEX	F2	F3	F4	PCBs and metals
CCME Values[1]		150 ppm	300 ppm	2800 ppm	
SBAC[2] -1	Below detection[3]	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBAC-2	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBAC-3	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBAC-4	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBAC-5	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed

1. Tier 1 CCME levels for Residential/Parkland coarse-grained surface soil.
2. SBAC = Sawmill Bay Airstrip Cache.
3. Detection limits for benzene, toluene, ethylbenzene, and xylenes (total) were 0.005 ppm, 0.02 ppm, 0.01 ppm and 0.04 ppm.

The five samples collected from the airstrip drum cache area were below detection for BTEX and PHC fractions.

End of season samples were also collected from the dock cache (SBDC-1 through -5). Sample locations are shown on Figure 6. Table 10 summarizes the results for dock cache (DC) samples.

Table 10 August 29th Soil Samples – Dock Drum Cache Area

Sample #	BTEX	F2	F3	F4	PCBs and metals
CCME Values[1]		150 ppm	300 ppm	2800 ppm	
SBDC[2] -1	Below detection[3]	18 ppm	20 ppm	<10 ppm	Not analyzed
SBDC-2	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBDC-3	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed
SBDC-4	Below detection	**190 ppm**	**500 ppm**	<10 ppm	Not analyzed
SBDC-5	Below detection	<10 ppm	<10 ppm	<10 ppm	Not analyzed

1. Tier 1 CCME levels for Residential/Parkland coarse-grained surface soil.

2. SBDC = Sawmill Bay Dock Cache.
3. Detection limits for benzene, toluene, ethylbenzene, and xylenes (total) were 0.005 ppm, 0.02 ppm, 0.01 ppm and 0.04 ppm.

Samples collected from the dock drum cache (SBDC-1 through -5) were below Tier 1 levels except for SBDC-4 which had a F2 fraction in soils value of 190 ppm and a F3 fraction in soils value of 500 ppm. In comparison, the CCME values are 150 ppm and 300 ppm, for F2 and F3, respectively for surface coarse-grained soil in a residential/parkland land use.

The SBDC samples were selected from within the dock area cache located within surface debris stockpile #22 (SA-DA-22). Debris and drums were historically present within this stockpile area. The drums were initially transported within the stockpile area for inspection and subsequently either crushed if empty or transported to the airstrip cache if containing liquid. During the drum movement events, visual inspections of the soils were conducted on a daily basis by the DR and OCR together. On the occasions when staining was observed, the impacted soil was removed and placed on polyethylene liner. Typically, this involved a shovel and removing the upper 0.15 m of sandy soil within small impacted areas. At the end of the 2011 construction season, the PHC-impacted soils were placed in drums for off-site transportation. The drums were transported from Sawmill Bay to Déline by barge along with the contractor's equipment and supplies. On October 25th, the drums were transported by Buffalo Airways to Yellowknife. Once in Yellowknife, KBL Environmental received the drums containing PHC-impacted soils. The manifest documenting the transport from Déline to KBL in Yellowknife is attached as Appendix L.

Any further issues related to hydrocarbon-impacted soils will be managed during the next phase of remedial work.

4.6 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

4.6.1 Soils

Duplicate soil samples were collected as part of the 2011 QA/QC program. The duplicate soil samples and respective locations were: DUP-1 is a duplicate of SBDC-1; and DUP-2 is a duplicate of SBAC-5. The first duplicate grouping contained non-detects for each of BTEX, F1 and F4. The values for F3 and F4 were 18 ppm and 20 ppm for SBDC-1. In comparison, the values for F3 and F4 for DUP-1 were 22 ppm and 22 ppm. The second duplicate grouping contained non-detects for BTEX, F1, F2, F3, and F4 for both SBDC-1 and DUP-2. Table 11 displays the results of QA/QC samples with parameters reported at values greater than detection limits.

Table 11 Assessment of QA/QC Samples for Soil

Sample # / Parameter	SBDC-1	DUP 1	RPD[1]
PHC F3	18 ppm	22 ppm	20%
PHC F4	20 ppm	22 ppm	10%

1. RPD = Relative Percent Difference. RPD = $2 \left| X_1 - X_2 \right| / (X_1 + X_2)$

The QC limit used for RPD was 30 percent for field duplicate pairs with concentrations reported at or above the laboratory detection limits. The duplicate analysis results showed excellent precision. RPD values for field duplicate soil samples were 20% and 30% for PHC F3 and PHC F4, respectively. As part of the QA/QC program for soils, the internal laboratory quality assurance reports completed by Maxxam Analytics were reviewed. The complete quality assurance reports are provided within the laboratory certificates, attached as Appendix I. The scope of work completed by a laboratory was conducted by Maxxam Analytics. Maxxam is Canadian Association for Laboratory Accreditation (CALA) certified.

4.6.2 Liquid Contents of Drums

Duplicate groupings for liquid contents of the drums were discussed within the *Sawmill Bay Drum Sampling Laboratory Summary and QA/QC* report.

4.6.3 Water within Holding Bladders

The QA/QC program for water within the holding bladders included a field duplicate, a requested laboratory duplicate, a trip blank, and a review of the quality assurance reports contained within laboratory certificates.

The field duplicates SB-W-4 and SB-W-4A were collected on August 13th. The duplicate analyses included dissolved metals, pH, and phenols. Note that the water within the holding bladder representative of SB-W-4 and SB-W-4A was recycled back into the system as wash water for drums (see Table 15: Fate of Water Summary below). The laboratory duplicate of PW4-2308A was analyzed for total extractable hydrocarbons (TEH). Table 12 displays the analytical results for both field and laboratory duplicates.

Table 12 Assessment of QA/QC Samples for water in holding bladders

Sample Number / Parameter	SB-W-4	SB-W-4A	RPD[1]	PW4-2308A	PW4-2308A Lab-Dup	RPD
Volatile Hydrocarbons (BTEX C5-C10)	<0.2 mg/L	n.a.[2]	NC[3]	<0.2 mg/ L	n.a.	NC
pH	9.05	9.14	1%	7.80	n.a.	NC
Extractable Hydrocarbons (TEH30)	0.53 mg/L	n.a.	NC	0.65 mg/L	0.57 mg/L	13%
NAPL/free product	Not present	Not present	NC	Not present	Not present	NC
Phenols	23 ug/L	22 ug/L	4%	3 ug/L	n.a.	NC
Arsenic (total)	7.3	n.a	NC	1.3 ug/L	n.a.	NC
Copper (dissolved)	<0.3 ug/L	<0.3 ug/L	NC	0.4 ug/L	n.a.	NC
Cadmium (dissolved)	0.041 ug/L	0.042 ug/L	2%	0.11 ug/L	n.a.	NC
Mercury (total)	<0.002 ug/L	n.a.	NC	0.005 ug/L	n.a.	NC
Nickel (dissolved)	1.0 ug/L	0.9 ug/L	11%	0.6 ug/L	n.a	NC
Lead (dissolved)	7.0 ug/L	7.0 ug/L	0%	0.4 ug/L	n.a	NC
Zinc (total)	48	n.a.	NC	39 ug/L	n.a	NC
Chromium (total)	<1	n.a	NC	<1 ug/L	n.a	NC
Cobalt (dissolved)	<0.3 ug/L	<0.3 ug/L	NC	<0.3 ug/L	n.a	NC
LC50(96) Trout or EC50(15) Microtox	Pass	n.a	NC	Pass	n.a	NC

1. RPD = Relative Percent Difference. RPD = $2 \left| X_1 - X_2 \right| / (X_1 + X_2)$
2. n.a. = not analyzed.
3. NC = not calculated.

RPD values were not calculated (NC) if both results were reported as less than the method detection limit. RPD results for water were all below the QC limit of 30 percent.

A trip blank was prepared by Maxxam Analytics. The trip blank originated in Yellowknife and was shipped to Sawmill Bay in a cooler on a scheduled charter. Once on site, the trip blank was stored with other laboratory provided bottles and subsequently other water samples for analysis.

The trip blank was shipped back to Yellowknife for furtherance to Calgary with PW2-2308A and PW4-2308A. Trip blanks are used to evaluate the potential for samples to be cross-contaminated during sample transportation to/from the laboratory. The trip blank analytical results are identified in Table 13. Trip blank analytical results were reported as less than the detection limits.

Table 13 Trip Blank Analytical Results

Sample Name/ Parameter	Trip Blank
Volatile Hydrocarbons (BTEX C5-C10)	<RDL[1]
pH	6.33
Extractable Hydrocarbons (TEH30)	<0.03 mg/L
NAPL/free product	Not present
Phenols	<0.002 ug/L
Arsenic (total)	<0.2 ug/L
Copper (dissolved)	0.3 ug/L
Cadmium (dissolved)	<0.005 ug/L
Mercury (total)	0.004 ug/L
Nickel (dissolved)	<0.5 ug/L
Lead (dissolved)	<0.2 ug/L
Zinc (total)	<3.0 ug/L
Chromium (total)	<1.0 ug/L
Cobalt (dissolved)	<0.3 ug/L
LC50(96) Trout or EC50(15) Microtox	n.a.[2]

1. RDL = Reported Detection Limit
2. n.a. = not analyzed

As part of the QA/QC program for water within the holding bladders, the internal laboratory quality assurance reports completed by Maxxam Analytics were reviewed. Method blanks were reported to be below detection limits. Spiked blanks and matrix spikes were both reported within acceptable quality control limits. The complete quality assurance reports are provided within the laboratory certificates, attached as Appendix I

5.0 REGULATORY INFORMATION

5.1 WATER LICENCE

Water licence S09L8-001 was granted on July 26, 2010. The licence is effective from July 26, 2010 until July 25, 2015. The water license is attached in Appendix J. During 2011, a total of 48 m^3 of fresh water was obtained from Great Bear Lake for camp activities and drum washing. Water use was metered using 1 m^3 containers.

Raw sewage was disposed in latrines. Three latrines were constructed at the Main Camp area. The locations of the latrines are shown in Figure 2, Appendix A. Drinking water was shipped to site via Yellowknife.

In total, 15,700 litres of water were discharged at the approved location adjacent to the former old airstrip. The discharge location is presented in Figure 3, Appendix A. The laboratory certificates of samples taken from the holding bladders prior to discharge are attached within the Water License annual report, attached as Appendix J. A summary of the laboratory results corresponding to the four discharge events is presented in Table 14. The maximum allowable concentrations for discharge water as detailed in the Water License are presented in Table 14 for reference.

Table 14 Summary of Analytical Results for Discharge Water

Sample Number / Parameter	SB-W-1B	SB-W-2B	PW2-2308A	PW4-2308A	MAC
Volatile Hydrocarbons (BTEX C5-C10)	<0.2 mg/L	<0.2 mg/ L	<0.2 mg/ L	<0.2 mg/ L	15 mg/ L
pH	7.58	7.78	7.37	7.80	6-9
Extractable Hydrocarbons (TEH30)	1.1 mg/ L	<0.03 mg/L	1.5 mg/L	0.65 mg/L	5 mg/L
NAPL/free product	Not present	Not present	Not present	Not present	Not present
Phenols	30 ug/L	8 ug/L	6 ug/L	3 ug/L	Not listed
Arsenic (total)	26 ug/L	49 ug/L	0.6 ug/L	1.3 ug/L	100 ug/L
Copper (dissolved)	0.3 ug/L	<0.2 ug/L	0.9 ug/L	0.4 ug/L	200 ug/L

Sample Number / Parameter	SB-W-1B	SB-W-2B	PW2-2308A	PW4-2308A	MAC
Cadmium (dissolved)	0.018 ug/L	0.016 ug/L	0.55 ug/L	0.11 ug/L	10 ug/L
Mercury (total)	0.003 ug/L	0.003 ug/L	0.011 ug/L	0.005 ug/L	0.6 ug/L
Nickel (dissolved)	0.7 ug/L	<0.05 ug/L	2.3 ug/L	0.6 ug/L	200 ug/L
Lead (dissolved)	3.2 ug/L	1.7 ug/L	4 ug/ L	0.4 ug/L	50 ug/L
Zinc (total)	36 ug/L	38 ug/L	84 ug/L	39 ug/L	1000 ug/L
Chromium (total)	<1 ug/L	<1 ug/L	<1 ug/L	<1 ug/L	100 ug/L
Cobalt (dissolved)	<0.3 ug/L	<0.3 ug/L	0.9 ug/L	<0.3 ug/L	50 ug/L
LC50(96) Trout or EC50(15) Microtox	0 % Dead trout	0 % Dead trout	EC50(15) = >100%	EC50(15) = >100%	Pass = <50% dead trout or EC50(15) = >75%
Discharge Date	August 13th	August 17th	August 30th	August 30th	

1. Maximum Allowable Concentrations (MAC) for discharge of process water as per Part D (15) of the Water License.

The fate of treated process water is presented in chronological order within Table 15. Treated water was either recycled back into the washing process or discharged to the environment. Note that treated water was discharged on August 13th, August 17th, and August 30th.

Table 15 Fate of Treated Water Summary

Bladder No.	Fill Start Date	Fill End Date	Volume Treated (L)	Sampling Date	Discharge Date	Volume Discharged (L)	Volume Recycled (L)	Fate
1	28-Jul-11	01-Aug-11	5600	28-Jul-11	n/a	n/a	5600	Recycled: failed to pass discharge criteria.
2 (i)	01-Aug-11	09-Aug-11	5600	10-Aug-11	17-Aug-11	5600	n/a	Dicharged to environment.
3	09-Aug-11	10-Aug-11	5600	10-Aug-11	13-Aug-11	5600	n/a	Discharged to environment.
4 (i)	10-Aug-11	13-Aug-11	5600	13-Aug-11	n/a	n/a	5600	Recycled: wash water.
5 (i)	16-Aug-11	16-Aug-11	5600	n/a	n/a	n/a	5600	Recycled: wash water.
Direct to wash	17-Aug-11	17-Aug-11	1750	n/a	n/a	n/a	1750	Treated water pumped into overpacks for washing.
4 (ii)	18-Aug-11	19-Aug-11	2500	n/a	n/a	n/a	2500	Recycled: wash water.
Direct to wash	18-Aug-11	18-Aug-11	1400	n/a	n/a	n/a	1400	Treated water pumped into overpacks for washing.
2(ii)	19-Aug-11	23-Aug-11	3000	n/a	n/a	n/a	3000	Recycled: wash water.
Direct to wash	20-Aug-11	20-Aug-11	3500	n/a	n/a	n/a	3500	Treated water pumped into overpacks for washing.
Direct to wash	21-Aug-11	21-Aug-11	1400	n/a	n/a	n/a	1400	Treated water pumped into overpacks for washing.
Direct to wash	22-Aug-11	22-Aug-11	1050	n/a	n/a	n/a	1050	Recycled: wash water.
4 (iii)	23-Aug-11	23-Aug-11	3500	23-Aug-11	30-Aug-11	3500	n/a	Discharged to environment.
Direct to wash	23-Aug-11	23-Aug-11	700	n/a	n/a	n/a	700	Recycled: wash water.
2(iii) *	19-Aug-11	23-Aug-11	3500	23-Aug-11	30-Aug-11	1000	2500	2500 l recyled, 1000 l discharged to environment.
Totals:			**50300**			**15700**	**34600**	

An annual report was prepared to fulfill the reporting requirements stated within Part B, Section 1 of the Water Licence. The annual report was submitted to PWGSC for furtherance to the Sahtu Land and Water Board as a document entitled *Great Bear Lake Sites Remediation Phase I-Water Licence S09L8-001 Annual Report 2011*. This report is attached within Appendix J.

5.2 LAND USE PERMIT (LUP)

The Sahtu Land & Water Board issued Land Use Permit S09D-001 Type 'A' permit to Aboriginal Affairs and Northern Development Canada (formerly Indian and Northern Affairs), Contaminants and Remediation Directorate. The permit commenced on July 26, 2010 and is valid until July 25, 2015. A copy of the LUP is included within Appendix K.

During 2011, the camp at Sawmill Bay was in operation for a total of 47 days. The camp size generally ranged from 14 to 19 people. Household waste was burned daily. Black water was disposed of in latrines.

The work completed was in accordance with the terms and conditions of the LUP.

6.0 FUTURE WORK

Any additional remedial work at the respective sites will be completed as part of other remedial programs associated with the Silver Bear remediation program.

The information presented below is for the benefit of future remedial programs and represent the current site conditions at time of writing.

6.1 REMAINING DRUMS

There are 220 drums remaining at Sawmill Bay. The drums remaining include the consolidated drum cache as detailed in Table 6 and the small cache beyond the northern end of the former old airstrip. The consolidated cache includes 164 drums containing liquid and 40 drums containing sand. During April 2012, KBL Environmental of Yellowknife was contacted regarding the remaining 164 drums containing liquid and the 40 drums containing sand. KBL spoke with both the contractor and on-site department representative regarding the drums. Further information regarding the drums was provided to PWGSC in a memo entitled *KBL Quote for receiving Sawmill Bay consolidated drums* dated May 8th, 2012. KBL corporate information is attached as Appendix M.

The cache beyond the north end of the airstrip (see Figure 1, Appendix A) includes 16 drums of which 13 are empty, 2 are full, and 1 is half full of petroleum product.

There are 108 drums remaining at El Bonanza and 25 drums at Contact Lake. The drums remaining and Contact Lake were not transported to Sawmill Bay due to reasons including but not limited to being located on a steep slope and being in welded groups of 3 or 4. The drums remaining at El Bonanza were not transported to Sawmill Bay due to reasons including but not limited to the integrity of the drums and the risks involved with transport. The drums at El Bonanza area located in EB-DA-1.

Included within future remedial work at Contact Lake and El Bonanza will be the processing of the remaining drums.

6.2 SURFACE DEBRIS

Surface debris was collected by hand during the 2010 season to a maximum depth of 0.5 m below grade. Table 16 outlines the volume of surface debris that was collected and transported to various non-hazardous debris stockpiles. Note that surface debris collection only included those objects which were readily moveable by hand and therefore does not include heavy machinery which is notably present at each of the GBL Phase I sites. It is also important to note

that surface debris extended beyond 0.5 m below grade in the main gully behind the former lodge and SA-DA-23 at Sawmill Bay, and; within CL-DA-1 and CL-DA-2,3 areas of Contact Lake. In these locations the surface debris also extends beyond the demarcations of the August 2010 maps.

Table 16 Volume of Surface Debris collected by hand during Phase I

Location	Surface Debris Collected (m^3)
Sawmill Bay	**510**
Contact Lake	**248**
Bonanza/El Bon.	**58**

These surface debris volumes do not include crushed drums or wood collected for incineration. Drum crushing was a major focus of the Phase I project with the goal being to reduce waste volumes. Table 17 summarizes the numbers of drums crushed thus far. To date, the drum crushing has occurred only at Sawmill Bay. The crushed drums are located within the non-hazardous debris stockpiles at the airstrip and bay area, corresponding to the two drum crushing locations.

Table 17 Number of Drums Crushed by Year

Year	Drums crushed
2010	**8235**
2011	**2190**
Total	**10,425**

6.3 PLANE FUSELAGE AND ASBESTOS CONTAINING MATERIAL (ACM)

A plane fuselage is located in the vicinity of the old dock area of Sawmill Bay in what was formerly referred to as SA-DA-20. The large metal debris object was inspected by department representatives for the presence of possible asbestos containing materials. The fuel line of the plane fuselage was confirmed to contain chrysotile asbestos. Table 18 outlines the findings.

Table 18 Summary of Plane Fuselage Fuel Line Pipe Wrap

Sawmill Bay Plane Fuselage	Chrysotile	Others[1]
Units	% (vol/vol)	% (vol/vol)
Pipe Wrap 1	90-99	<1
Pipe Wrap 2	90-99	<1
Pipe Wrap 3	90-99	<1

[1] Others includes Actinolite, Amosite, Anthrophylite, Crocidolite, Tremolite, Cellulose, Glass Fibres, Hair, and Other Fibres

The buildings at Sawmill Bay were not demolished during the Phase I program. Note there is suspected asbestos containing materials within various structures at Sawmill Bay such as the Boiler House. At the other GBL Phase I sites, the ACM was removed, double bagged, and placed in adjacent non-hazardous debris stockpiles, prior to building demolition.

6.4 ASH

Included in the future remedial work will be the consolidation and removal of ash from site. Generally, the ash piles contain small metal debris. At Sawmill Bay, there are two ash piles namely at the former old airstrip (SB-Burn-1) and behind the old lodge (SB-Burn-2). The location of the ash piles are shown on Figure 2 and Figure 3, attached within Appendix A. The ash piles contain elevated levels of metals and an absence of PAHs within the samples collected in 2010. For further information regarding the analytical results of the ash, refer to the *2010 Completion Report for Great Bear Lake Sites Remediation – Phase I* by SENES dated March 2011. It is suggested that ash piles remaining at the Great Bear Lake Sites be considered a potential environmental concern due to the abundance of small metal debris contained within. In 2010, ash piles were covered with tarp. In 2011, the ash piles were left as is.

Note that ash piles at Contact Lake, Bonanza, and the El Bonanza sites generally exist in the footprint of the former buildings.

6.5 DEBRIS STOCKPILE ADJACENT TO POWER HOUSE

A bermed and lined debris hazardous debris stockpile (HDS) area was constructed adjacent to the Power House at Sawmill Bay (see Figure 2, Appendix A) to temporarily house hazardous debris en route to Yellowknife. The HDS area was bermed and lined as per the specification requirements. The Sawmill Bay HDS was used to temporarily store old batteries, DDT impacted wood, old transformers, and old paint cans. During 2010, three transformers in steel overpacks, 5 m^3 of DDT impacted wood, PCB impacted soil from underneath the El Bonanza transformer, and 70 old batteries were shipped from Sawmill Bay to Yellowknife by twin otter aircraft. Note that these materials originated from all four of the sites and were consolidated at Sawmill Bay for shipment to Yellowknife. Once in Yellowknife, the material was handled by KBL.

Transportation documents for these materials were included within the document entitled *2010 Completion Report for Great Bear Lake Sites Remediation – Phase I* by SENES dated March 2011.

Subsequent to shipping the items off-site in 2010, additional items were placed within the stockpile. At the end of the program, the debris within the stockpile considered hazardous included 20 old car batteries contained within plastic bags and 15 old paint cans. Within the stockpile were also old transformers from three locations around the main camp area. The transformers were transported to this stockpile in 2010 at the request of AANDC (formerly INAC). Note that these transformers are not considered hazardous waste based on previous analytical data, however, were transported to the bermed and lined stockpile for due diligence. At the end of the construction season, the HDS was decommissioned. Materials contained within the HDS were transported to the adjacent Power House building. During planning of future remedial work at Sawmill Bay note that these items are contained within the Power House building.

7.0 SUMMARY

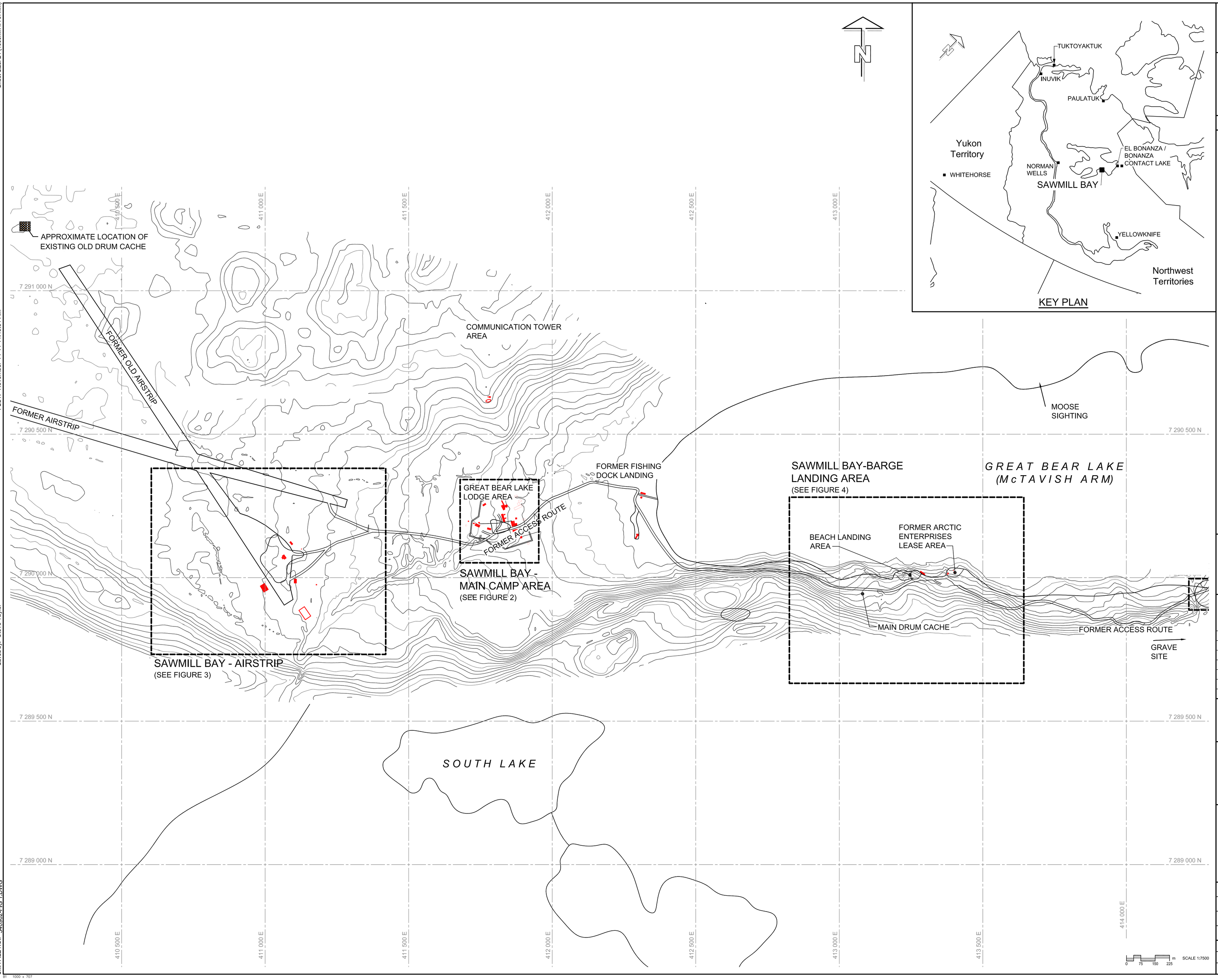
In general, the remediation program at Sawmill Bay continued in 2011 over the period of one week in June and six weeks in July and August. In summary, old drum contents were tested, amalgamated, and consolidated within newer drums; and old drums were washed, crushed, and placed in non-hazardous debris stockpiles. Final demobilization of the contractor`s equipment and supplies to Déline occurred at the end of August, 2011.

Phase I of the Great Bear Lake Sites remediation program encompassed Sawmill Bay, the former Contact Lake mine site, the former El Bonanza mine site, and the former Bonanza mine site.

Additional remedial work at the Great Bear Lake Sites will be completed as part of other future remedial programs. The contract objectives of the Phase I Great Bear Lake Sites Remediation project are now deemed complete.

APPENDIX A

SITE MAPS



Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Western Region

Client: Indian and Northern Affairs Canada / Affaires indiennes et du Nord Canada

Canada

CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL COORDINATES AND ELEVATIONS ARE BASED ON UTM NAD83 DATUM.
3. .MAP BASED ON UMA/AECOM DRAWING R.015211.027-C10 AUGUST 2010
4 EXTENTS OF NHDS ARE APPROXIMATE
5. FORMER ACCESS ROUTE AND AIRSTRIP LOCATIONS SHOWN ARE APPROXIMATE.
6. RESTRICT ACCESS TO IDENTIFIED AREAS.

LEGEND

- 165.0 — EXISTING CONTOURS AT 2.0m INTERVAL
- SITE GRID (100m INTERVAL)
- EXISTING TREELINE
- DRUM STOCKPILE AREA
- WASHING AND DECONTAMINATION AREA
- SITE STRUCTURES OR FORMER INFRASTRUCTURE
- DRUM WITH LIQUID

SENES Consultants

REVISIONS	DESCRIPTION	DATE
0	POST REMEDIATION	

A detail number / number du detail
B source drawing no. / de dessin no.
C detail on drawing no. / detail sur dessin no.

project title / titre du projet
GREAT BEAR LAKE SITES REMEDIATION PROJECT NORTHWEST TERRITORIES
PHASE 1

drawing title / titre du dessin
SAWMILL BAY
LOCATION PLAN

designed by / concu par	J.MAUCHAN
drawn by / dessine par	S.TAYLOR
approved by / approuve par	C.GRAVELLE
PWGSC Project Manager / Administrateur de Projets TPSGC	G.WIATZKA
scale / echelle	1:1000
project no. / projet no.	R.015211
date	OCTOBER 2011
sheet / feuille	Figure 1
	OF 6

R.015211

Sheet Size: B1 (1000mm x 707mm)

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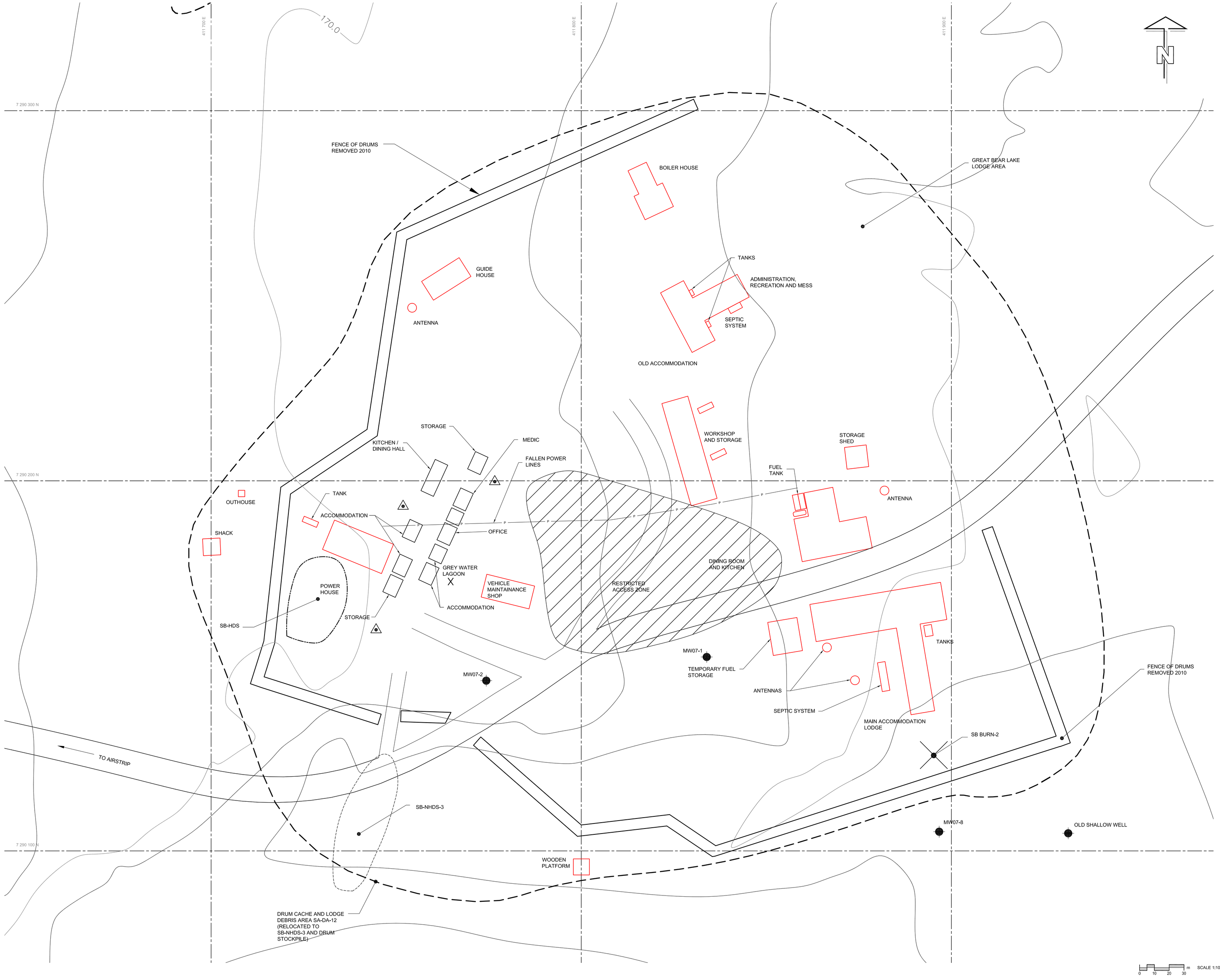

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Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Western Region

Client: Indian and Northern Affairs Canada / Affaires indiennes et du Nord Canada

Canada

CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL COORDINATES AND ELEVATIONS ARE BASED ON UTM NAD83 DATUM..
3. DRAWING BASED ON UMA/AECOM DRAWING R.0152211.027-C11 AUGUST 2010
4. FORMER ACCESS ROUTE LOCATIONS SHOWN ARE APPROXIMATE.
5. RESTRICT ACCESS TO IDENTIFIED AREAS.
6. ALLBUILDINGS IN SA-DA-12 CLOSED UP AUGUST 14/15 2010
7. EXTENTS OF HDS AN NHDS ARE APPROXIMATE
8. TEMPORARY CAMP BUILDING LOCATIONS ARE APPROXIMATE
9. RELOCATION OF DEBRIS OCCURRED IN 2010
10. TEMPORARY CAMP STRUCTURES WERE DEMOBILIZED END OF AUGUST 2011

LEGEND

- 165.0 — EXISTING CONTOURS AT 2.0m INTERVAL
- SITE GRID (100m INTERVAL)
- P — POWER LINE
- APPROXIMATE DEBRIS AREA
- HAZARDOUS STOCKPILE AREA
- NON HAZARDOUS STOCKPILE AREA
- BURN
- MW07-09 — EXISTING MONITORING WELL
- RESTRICTED ACCESS AREA
- LATRINE

SENES Consultants

REVISIONS	DESCRIPTION	DATE
0	POST REMEDIATION	

A detail number / number du detail
B source drawing no. / de dessin no.
C detail on drawing no. / detail sur dessin no.

project title / titre du projet
GREAT BEAR LAKE SITES REMEDIATION PROJECT NORTHWEST TERRITORIES
PHASE 1

drawing title / titre du dessin
SAWMILL BAY
MAIN CAMP AREA

designed by / conçu par	J.MAUCHAN
drawn by / dessiné par	S.TAYLOR
approved by / approuvé par	C.GRAVELLE
PWGSC Project Manager / Administrateur de Projets TPSGC	G.WIATZKA
scale / échelle	1:1000
project no. / projet no.	R.015211
date	OCTOBER 2011
sheet / feuille	Figure 2 OF 6

R.015211

FORMER AIRSTRIP

FORMER OLD AIRSTRIP

DRUM CACHE AND DEBRIS AREA SA-DA-1 (RELOCATED TO NHDS-1 AND DRUM STOCKPILE)

DRUM CACHE AND DEBRIS AREA SA-DA-2 (RELOCATED TO NHDS-1 AND DRUM STOCKPILE)

DAILY INCINERATION AREA

FORMER DRUM CACHE AND DEBRIS AREA SA-DA-4 (RELOCATED TO NHDS-1 AND DRUM STOCKPILE)

DEBRIS AREA SA-DA-3 (RELOCATED TO NHDS-1)

OLD GAS CYLINDERS

SBAC-1

MW07-9

DRUMS WITH SAND

NHDS-1

SBWS-1

SBWS-5

SB-BURN-1

SBWS-2

SBAC-2

FORMER DRUM STOCKPILE

WASH

SBWS-4

SBWS-3

TERMINAL BUILDING

DEBRIS AREA SA-DA-5 (RELOCATED TO NHDS-1)

SBAC-4

SBAC-3

MW07-11

OUTHOUSE

TO GREAT BEAR LAKE LODGE AREA

FORMER ACCESS ROUTE

SBAC-5

CONSOLIDATED DRUMS

CONCRETE SLAB

DEBRIS AREA SA-DA-6 (RELOCATED TO NHDS-1)

DISCHARGE LOCATION

ROUGH LOCATION OF BEAR BURIAL SITE

RESTRICTED ACCESS ZONE

DRUM CACHE AND DEBRIS AREA SA-DA-7 (RELOCATED TO NHDS-1 AND DRUM STOCKPILE)

DEBRIS AREA SA-DA-8 (RELOCATED TO NHDS-1)

SHED

MW07-10

DEBRIS AREA SA-DA-11 (RELOCATED TO NHDS-1)

DEBRIS AREA SA-DA-9 (RELOCATED TO NHDS-1)

DEBRIS AREA SA-DA-10 (RELOCATED TO NHDS-1)

410 700 E · 410 800 E · 410 900 E · 411 000 E · 411 100 E · 411 200 E · 411 300 E · 411 400 E

7 290 300 N · 7 290 200 N · 7 290 100 N · 7 290 000 N · 7 289 900 N · 7 289 800 N

190.0 · 180.0 · 200.0

SURVEY CONTROL POINTS			
POINT ID	NORTHING	EASTING	ELEVATION
559147	7 290 609.187	415 944.876	158.500
559M060	7 288 174.987	416 281.911	267.300

AIRSTRIP NORTH DRUM CACHE AREA
(SEE SHEET C04 FOR LOCATION REFERENCE)

DRUM CACHE AND DEBRIS AREA SA-DA-27 (RELOCATED TO NHDS-3 AND DRUM STOCKPILE)

0 10 20 30 m SCALE 1:1000

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Western Region

Client: Indian and Northern Affairs Canada / Affaires indiennes et du Nord Canada

Canada

CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL COORDINATES AND ELEVATIONS ARE BASED ON UTM NAD83 DATUM.
3. .MAP BASED ON UMA/AECOM DRAWING R.015211.027-C10 AUGUST 2010
4 EXTENTS OF NHDS-1 ARE APPROXIMATE
5. FORMER ACCESS ROUTE AND AIRSTRIP LOCATIONS SHOWN ARE APPROXIMATE.
6. RESTRICT ACCESS TO IDENTIFIED AREAS.
7. DEBRIS RELOCATED DURING 2010
8. CONSOLIDATION ACTIVITIES OCCURED IN AUGUST 2011

LEGEND

- 165.0 — EXISTING CONTOURS AT 2.0m INTERVAL
- SITE GRID (100m INTERVAL)
- APPROXIMATE DEBRIS AREA
- HAZARDOUS STOCKPILE AREA
- NON HAZARDOUS STOCKPILE AREA
- BURN
- MW07-09 — EXISTING MONITORING WELL
- SBWS-1 — SAMPLES (2011)
- RESTRICTED ACCESS AREA

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REVISIONS	DESCRIPTION	DATE
0	POST REMEDIATION	

A detail number / number du detail
B source drawing no. / de dessin no.
C detail on drawing no. / detail sur dessin no.

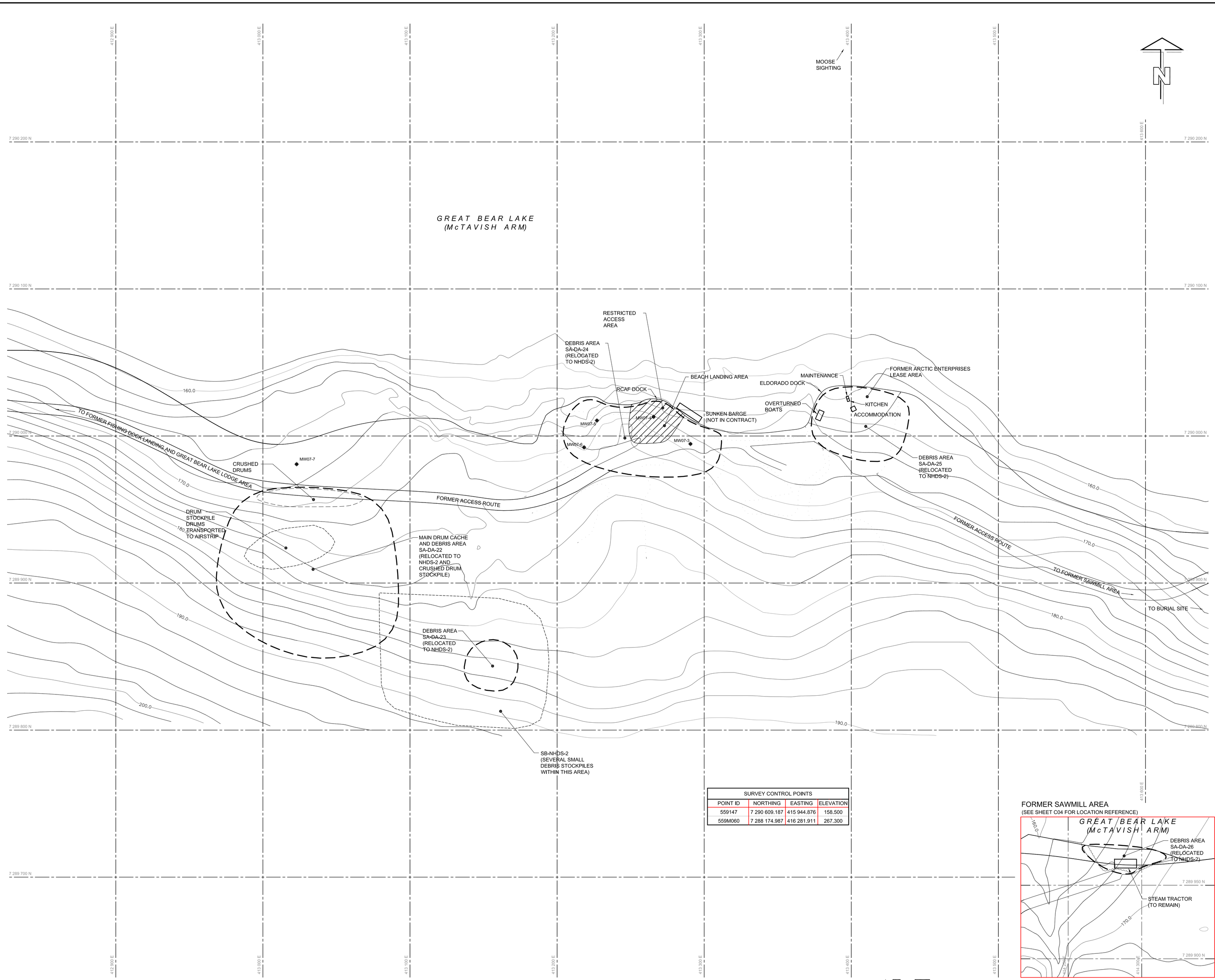
project title / titre du projet
GREAT BEAR LAKE SITES REMEDIATION PROJECT NORTHWEST TERRITORIES

PHASE 1

drawing title / titre du dessin
SAWMILL BAY AIRSTRIP AREA

designed by / conçu par	J.MAUCHAN
drawn by / dessiné par	S.TAYLOR
approved by / approuvé par	C.GRAVELLE
PWGSC Project Manager / Administrateur de Projets TPSGC	G.WATZKA
scale / echelle	1:1000
sheet / feuille	Figure 3
project no. / projet no.	R.015211
date	OCTOBER 2011
	OF 6

R.015211



SURVEY CONTROL POINTS			
POINT ID	NORTHING	EASTING	ELEVATION
559147	7 290 609.187	415 944.876	158.500
559M060	7 288 174.987	416 281.911	267.300

FORMER SAWMILL AREA
(SEE SHEET C04 FOR LOCATION REFERENCE)

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

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Western Region

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Canada

CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.

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3. CONTROL POINTS "559147" AND "559M060" PROVIDED BY CANADIAN SPATIAL REFERENCE SYSTEM.
4. DRAWING BASED ON UMA/AECOM DRAWING R.015211.027-C12 AUGUST 2010
5. SITE PLANS AND TOPOGRAPHIC INFORMATION BASED ON AIR PHOTOS AND SURVEY PROVIDED BY OTHERS. CURRENT CONDITIONS MAY NOT BE EXACTLY AS SHOWN.
6. FORMER ACCESS ROUTE LOCATIONS SHOWN ARE APPROXIMATE
7. EXTENTS OF NHDS ARE APPROXIMATE
8. RESTRICT ACCESS TO IDENTIFIED AREAS
9. DEBRIS RELOCATED DURING 2010
10. DRUMS TRANSPORTED TO AIRSTRIP DURING 2011

LEGEND

- 165.0 — EXISTING CONTOURS AT 2.0m INTERVAL
- SITE GRID (100m INTERVAL)
- EXISTING TREELINE
- APPROXIMATE DEBRIS AREA
- HAZARDOUS STOCKPILE AREA
- NON HAZARDOUS STOCKPILE AREA
- CRUSHED DRUMS
- BURN
- MW07-09 — EXISTING MONITORING WELL
- RESTRICTED ACCESS AREA

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project title / titre du projet

GREAT BEAR LAKE SITES REMEDIATION PROJECT NORTHWEST TERRITORIES

PHASE 1

drawing title / titre du dessin

SAWMILL BAY

BARGE LANDING AREA

designed by / conçu par	J. MAUCHAN
drawn by / dessiné par	S. TAYLOR
approved by / approuvé par	C. GRAVELLE
PWGSC Project Manager / Administrateur de Projets TPSGC	G. WIATZKA
scale / echelle	1:1000
project no. / projet no.	R.015211
date	OCTOBER 2011
sheet / feuille	Figure 4
	OF 6

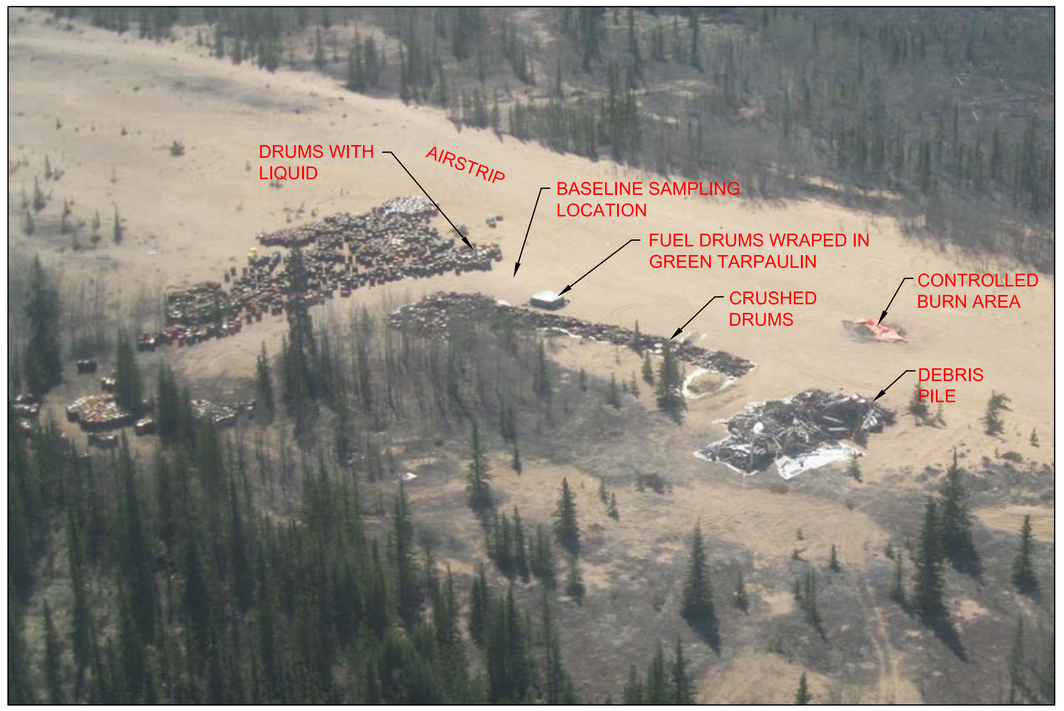
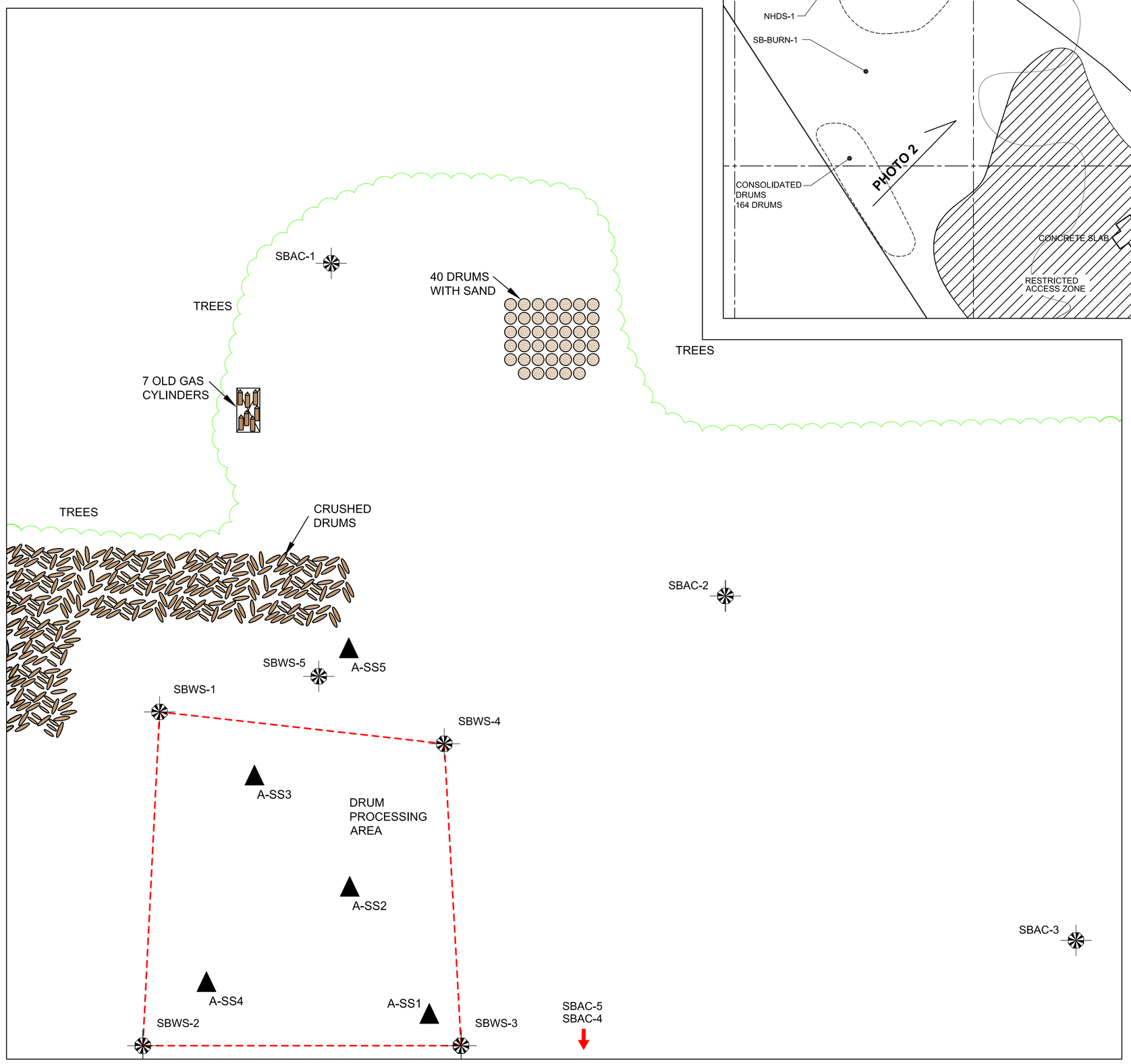
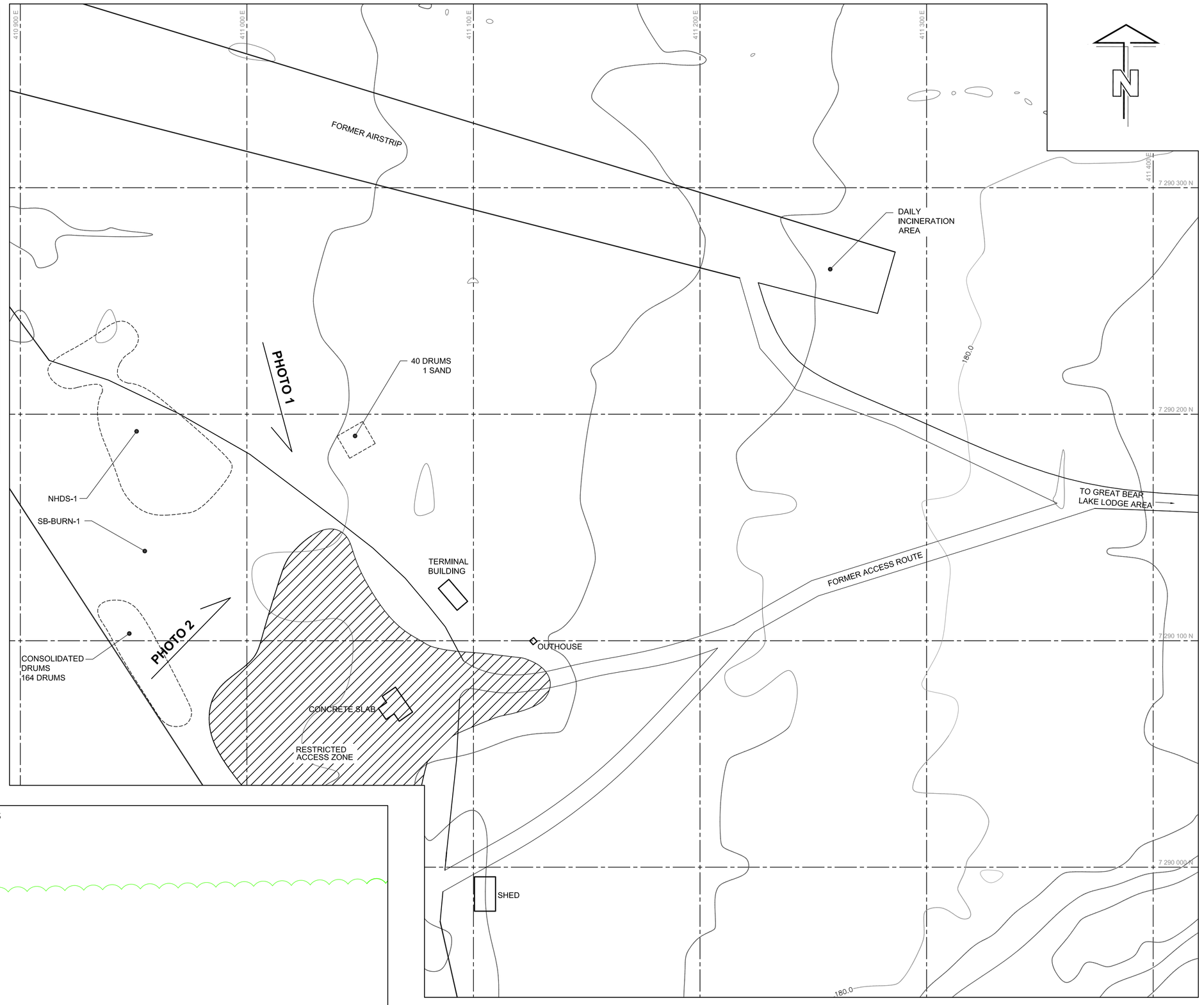


PHOTO 1 - JUNE 2011





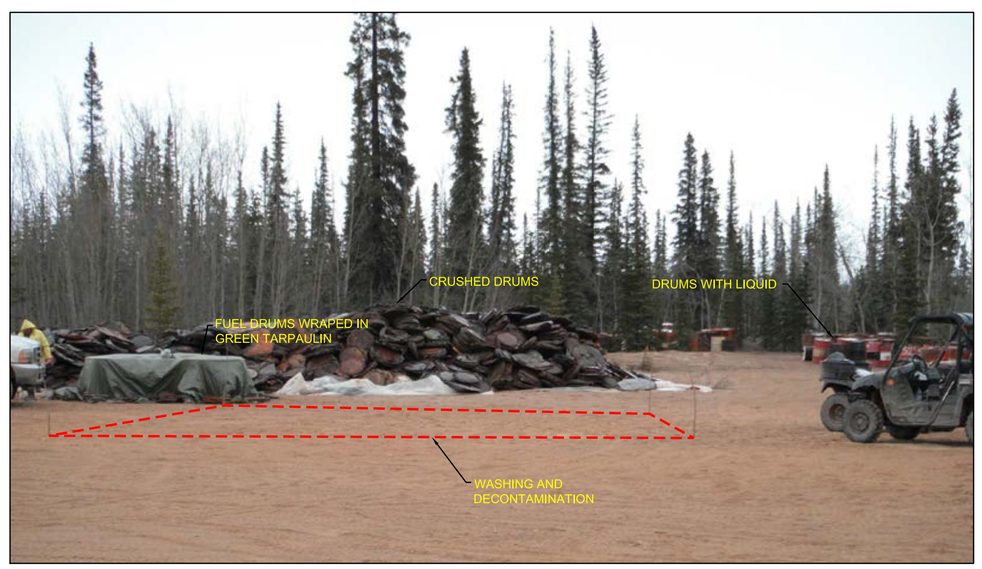


PHOTO 2 - JUNE 2011

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Western Region

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CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.

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4 EXTENTS OF NHDS-1 ARE APPROXIMATE
5. FORMER ACCESS ROUTE AND AIRSTRIP LOCATIONS SHOWN ARE APPROXIMATE.
6. RESTRICT ACCESS TO IDENTIFIED AREAS.
7. BUILDINGS BOARDED UP AUGUST 15 2010
8. DRUMS WITH LIQUID WERE CONSOLIDATED DURING AUGUST 2011

LEGEND

- RESTRICTED ACCESS ZONE
- 165.0 EXISTING CONTOURS AT 2.0m INTERVAL
- SITE GRID (100m INTERVAL)
- EXISTING TREELINE
- DRUM STOCKPILE AREA
- WASHING AND DECONTAMINATION AREA
- B-SS4 SOIL SAMPLING (DCS JUNE 2011)
- SBAC-2 SAMPLE LOCATION (2011)
- CRUSHED DRUMS
- DRUM WITH SAND

SENES Consultants

REVISIONS	DESCRIPTION	DATE
0	POST REMEDIATION	

A detail number / number du detail
B source drawing no. / de dessin no.
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project title / titre du projet
GREAT BEAR LAKE SITES REMEDIATION PROJECT NORTHWEST TERRITORIES
PHASE 1

drawing title / titre du dessin
SAWMILL BAY FORMED OLD AIR STRIP

designed by / concu par	J.MAUCHAN
drawn by / dessine par	S.TAYLOR
approved by / approuve par	C.GAVELLE
PWGSC Project Manager / Administrateur de Projets TPSGC	G.WIATZKA
scale / echelle	1:1000
project no. / projet no.	R.015211
date	OCTOBER 2011
sheet / feuille	Figure 5
	OF 6

R.015211

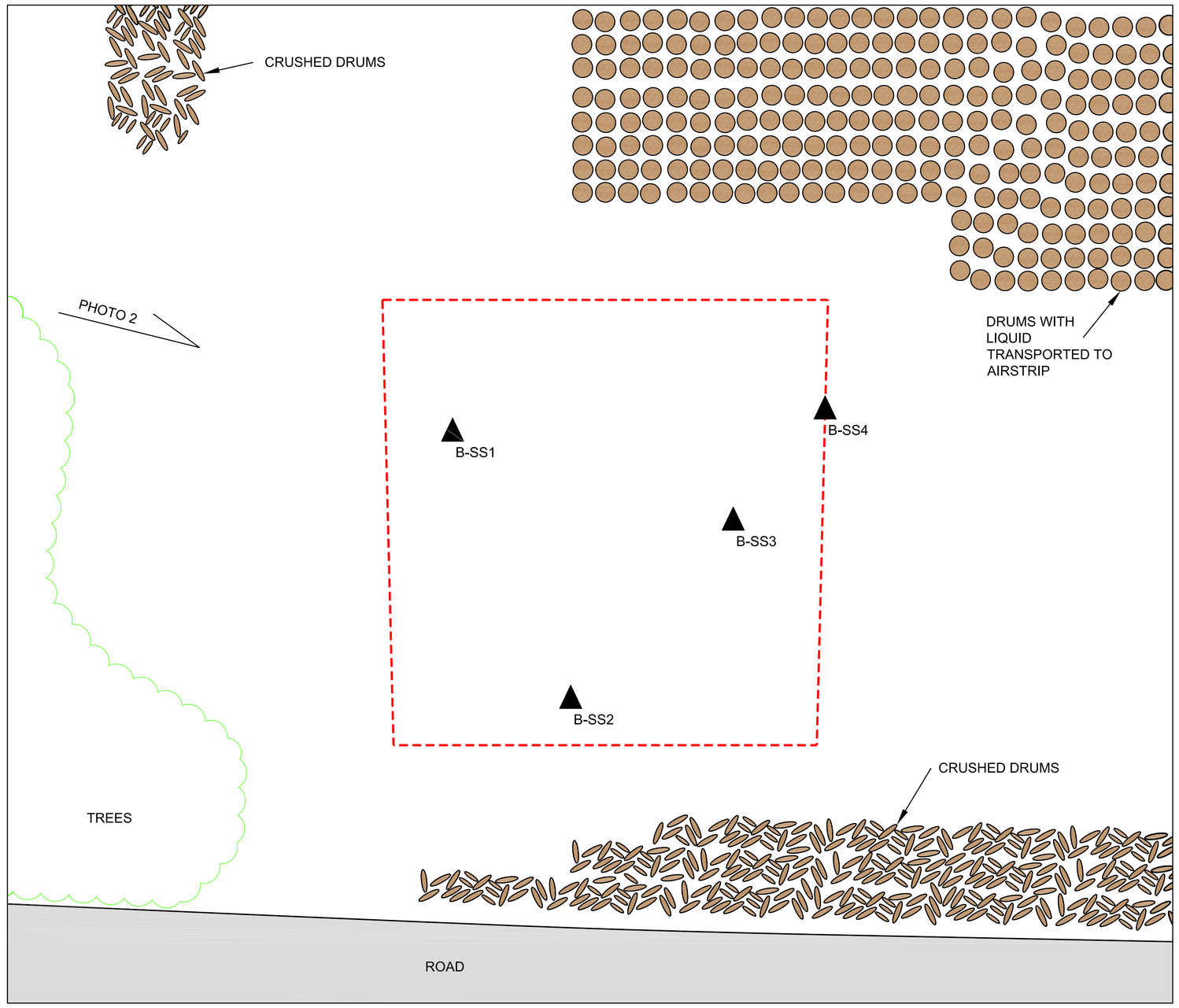


PHOTO 1 JUNE 2011

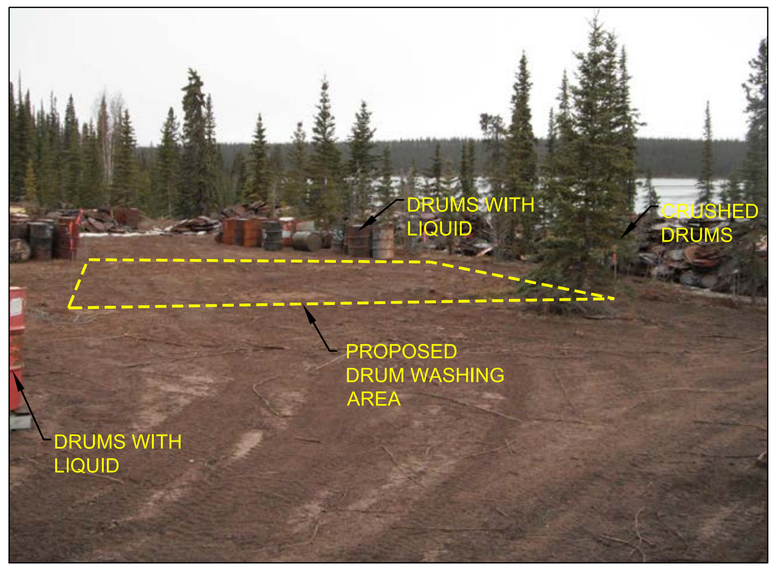
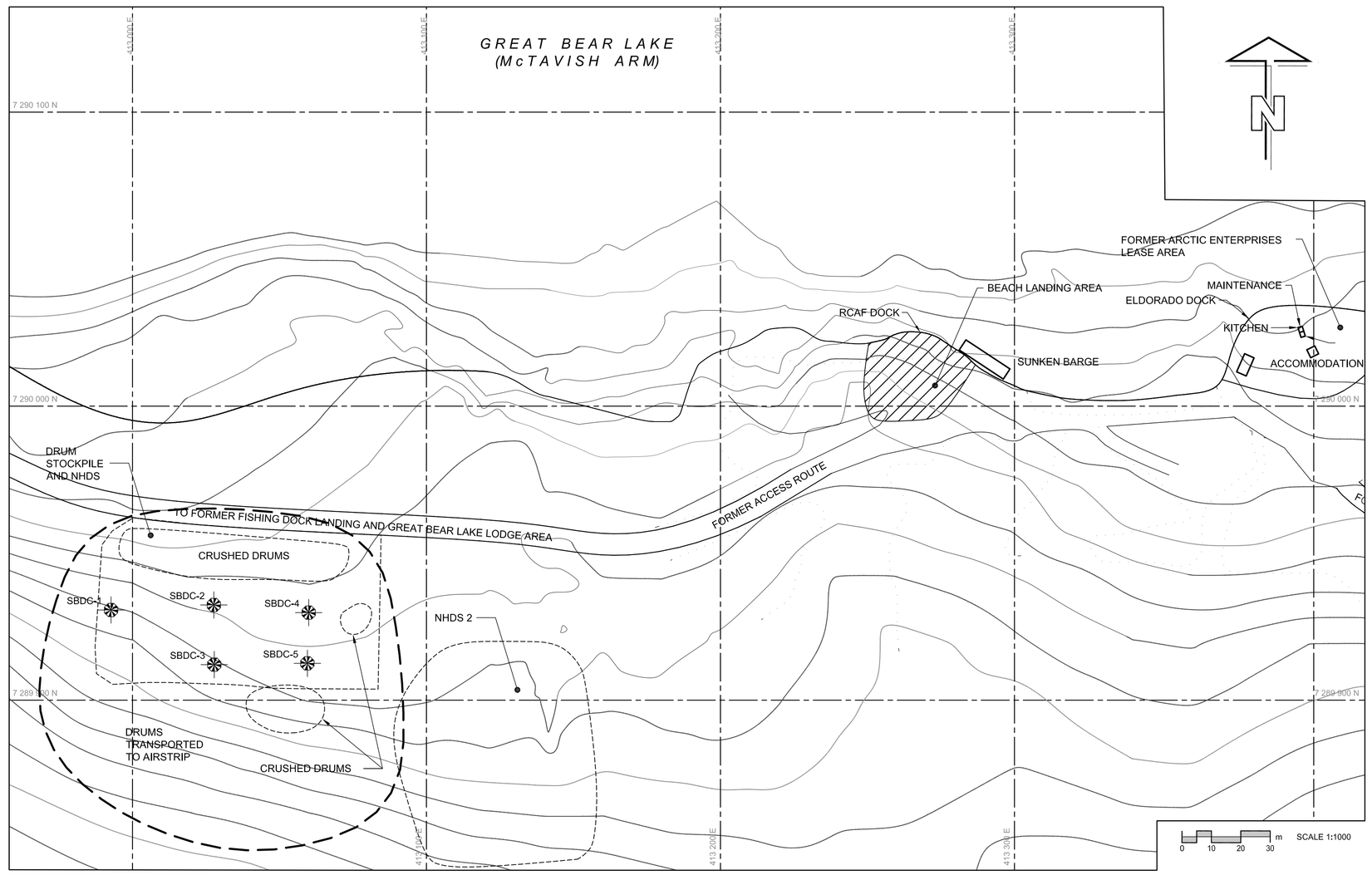


PHOTO 2 - JUNE 2011

PHOTO 3 - DRUMS WITH LIQUID TRANSPORTED TO AIRSTRIP



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Western Region

Client: Indian and Northern Affairs Canada / Affaires indiennes et du Nord Canada

Canada

CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.

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3. CONTROL POINTS "559147" AND "559M060" PROVIDED BY CANADIAN SPATIAL REFERENCE SYSTEM.
4. DRAWING BASED ON UMA/AECOM DRAWING R.015211.027-C12 AUGUST 2010
5. SITE PLANS AND TOPOGRAPHIC INFORMATION BASED ON AIR PHOTOS AND SURVEY PROVIDED BY OTHERS. CURRENT CONDITIONS MAY NOT BE EXACTLY AS SHOWN.
6. FORMER ACCESS ROUTE LOCATIONS SHOWN ARE APPROXIMATE
7. EXTENTS OF NHDS ARE APPROXIMATE
8. BUILDING CLOSED UP AUGUST 15 2010
9. RESTRICTED ACCESS ZONES WERE FLAGGED
10. DRUMS WITH LIQUID TRANSPORTED TO THE AIRSTRIP FOR CONSOLIDATION, CLEANING AND CRUSHING AND STOCKPILING

LEGEND

- RESTRICTED ACCESS ZONE
- 165.0 — EXISTING CONTOURS AT 2.0m INTERVAL
- SITE GRID (100m INTERVAL)
- EXISTING TREELINE
- DRUM STOCKPILE AREA
- WASHING AND DECONTAMINATION AREA
- B-SS4 — SOIL SAMPLING (SENES JUNE 2011)
- SBDC-4 — SAMPLE LOCATION (2011)
- DRUM WITH LIQUID
- CRUSHED DRUMS

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BARGE LANDING AREA

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PWGSC Project Manager / Administrateur de Projets TPSGC	G. WIATZKA
scale / échelle	1:1000
project no. / projet no.	R.015211
date	OCTOBER 2011
sheet / feuille	Figure 6 OF 6

R.015211

APPENDIX B

SITE PHOTOGRAPHS

Photograph No. 1: Aerial view of Sawmill Bay lodge and camp.

Photograph No. 2: Bear fence surrounding camp.

Photograph No. 3: Restricted access zones near main camp area.

Photograph No. 4: Restricted access zone demarcation at airstrip.

Photograph No. 5: Discharge location adjacent to former old airstrip.

Photograph No. 6: View from adjacent to discharge location toward drum washing station.

Photograph No. 7: Setting up the drum wash station.

Photograph No. 8: Constructing the drum wash.

Photograph No. 9: Near miss reporting sheet.

Photograph No. 10: Drum for heating tents on drip tray adjacent to tent.

Photograph No. 11: Camp water containers with 1 m^3 volume each.

Photograph No.12: Drip tray for gas for use with pump.

Photograph No. 13: Grey water lagoon

Photograph No. 14: Trip hazard demarcated.

Photograph No. 15: Non-hazardous debris stockpile adjacent to main camp area.

Photograph No. 16: Drum openner.

Photograph No. 17: Drum wash station construction.

Photograph No. 18: Drums at airstrip prior to washing.

Photograph No. 19: View of wash water collected from Great Bear Lake.

Photograph No. 20: .View of drum wash station. Drums in foreground awaiting pumping of contents into white tanks

Photograph No. 21: Drums on the drum rack.

Photograph No. 22: A typical drum prior to washing.

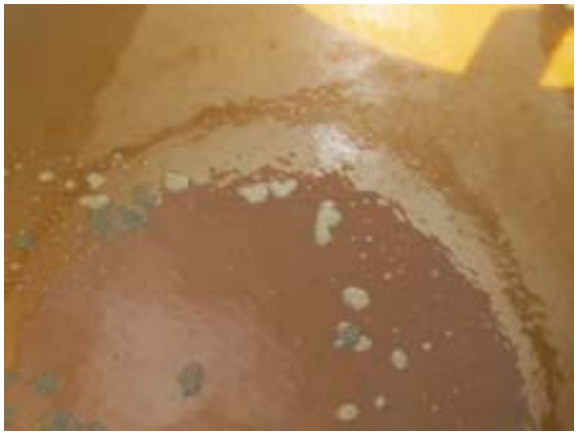
Photograph No. 23: A typical drum after washing.

Photograph No. 24: Grey holding bladders which store treated water prior to discharge.

Photograph No. 25: Drums awaiting washing.

Photograph No. 26: Holding bladder reaching capacity.

Photograph No. 27: Drums at the Bay cache awaiting transport to the Airstrip cache.



Photograph No. 28: Liquid within white tank.

Photograph No. 29: Barge with contractor equipment and supplies prior to departure on August 3rd.

Photograph No. 30: Typical sleeping quarters.

Photograph No. 31: The barrier device for use during crushing activities.

Photograph No. 32: Side view of barrier device.

Photograph No. 33: Transporting drums from Bay cache to Airstrip cache using ATV trailer.

Photograph No. 34: Transporting drums from Bay cache to Airstrip cache using pick-up truck.

Photograph No. 35: Transporting drums from Bay cache to Airstrip cache using 'rhino' and trailer.

Photograph No. 36: Drums awaiting consolidation activities at Airstrip cache.

Photograph No. 37: Drums awaiting washing at Airstrip cache.

Photograph No. 38: Flow from oil-water separator to polishing unit restricted by valve.

Photograph No. 39: Flight departing from Sawmill Bay.

Photograph No. 40: Signage on main road into camp.

Photograph No. 41: Bear fence warning

Photograph No. 42: Transport of daily garbage.

Photograph No. 43: Burning garbage.

Photograph No. 44: Demobilization activities.

Photograph No. 45: Broken hand-held drum opener.

Photograph No. 46: Washing drums.

Photograph No. 47:‘Demobilization containers.

Photograph No. 48: Diffuser at point of discharge.

Photograph No. 49: Close-up of diffuser

Photograph No. 50: Treated water being recycled back into system for further drum washing.

Photograph No. 51: Site tour with representatives from the LLRWMO.

Photograph No. 52: Drum washing activities.

Photograph No. 53: Changing the filter.

Photograph No. 54: Cleaning the o-w separator

APPENDIX C

AEL SUBMITTALS AND SUPPORTING DOCUMENTS (CD ROM ONLY)

AEL Submittals

- GBL Barrel Processing Plan – Draft (July, 2011)
- AEL Barrel Crushing SOP (July, 2011)
- GBL Barrel and Wastewater Treatment Processing Plan (July, 2011)
- GBL Demobilization Plan (2011)

SENES Submittals

- Sawmill Bay Drum Sampling Program (June 2011)
- GBL Phase I Sawmill Bay Drum Sampling Laboratory Summary (July, 2011)

Project Title:

Great Bear Lake Phase 1 Remediation
Additional Work Program

Submittal I.D.:

v1-GBL-Barrel & Wastewater Treatment Process Plan

ORIGINAL

Prepared for:
Public Works and Government Services Canada

Prepared by:
Aboriginal Engineering Ltd.
Unit 20 Stanton Plaza, 100 Borden Drive
PO Box 133
Yellowknife, NT
X1A 2N1

July 8, 2011

BARREL and WASTEWATER TREATMENT PROCESS PLAN

All barrels will go through a detailed measurement survey to be conducted by the Departmental Representative (DR). The measurement survey will include inspections of drums, such as initial screening of drum vapours using a VOC and LEL meters to determine if the level of explosive gases is safe for processing, as well as developing a numbering and labelling system for the drums. Before any barrel processing work has started, AEL will ensure that the DR has inspected each drum prior to and after processing the drums.

AEL acknowledges that the drum processing protocol is not suitable for every type of sample or substance potentially in the drums as each substance has different properties, and each type of substance requires different protocols, therefore AEL will work closely with the DR to address the handling of drums in a tiered manner.

Barrel Processing Plan

Barrel Processing Facility Construction

AEL will construct a Barrel Washing Facility near the barrel cache at the former old airstrip. The Barrel Crushing Facility will not be within the Barrel Processing Facility but near it and in the treeline. The Barrel Processing Facility will be constructed on the old airstrip. Once all the barrels at the barrel cache at the airstrip have been processed, AEL will move the barrel processing facility and Crushing Facility to the other barrel cache located near the lake where the barge is staged.

Prior to the construction of this facility, soil samples will be taken by the Department Representative to determine if contaminants are present. When test results indicate a clean site and permission is granted by the Department Representative, the Barrel Washing and Crushing Facility will be constructed. This area will be lined and bermed for wash water containment. The liner is a 30’ x 30’ engineered impermeable liner sourced from Layfield Environmental. The following is the barrel processing facility layout and berm construction specification:

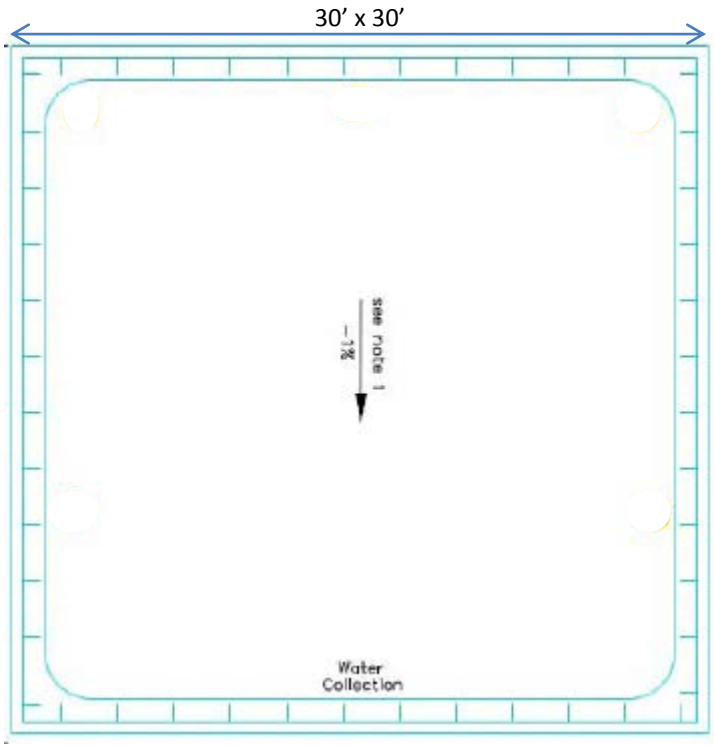


Figure 1: Barrel Processing Facility Layout

Note 1: The longitudinal slope of the containment area must be a minimum of -1% and not to exceed a maximum slope of -5% towards the water collection end.
Note 2: Barrel Processing Facility will need signage of hazards present.
Note 3: Spill Kits to be placed within Facility.

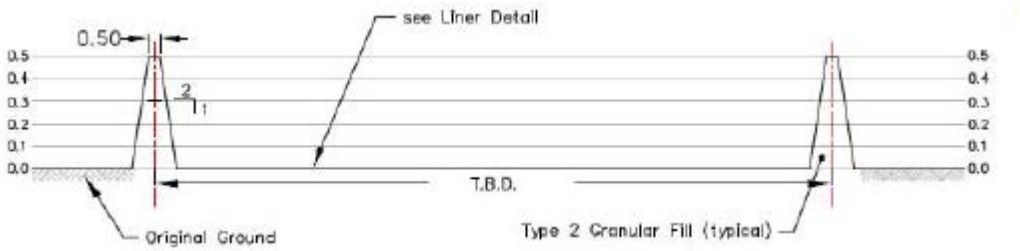


Figure 2: Berm Construction Specification

The Barrel Processing Facility will be constructed with a 1% interior slope and upgrades will be performed on an as needed basis to achieve a 1% grade. This will assist with controlling water which may collect in the lined facility. Water within the cells can be pumped with a sump pump into drums until such time water treatment begins.

AEL will complete surface drainage improvements to re-direct surface water away from the barrel processing facility. Absorbing booms will be placed down grade of the facility to collect any potential runoff. As this storage site will hold hazardous liquids, 4 spill kits will be provided as a contingency. Any spills, leaks, or other releases of liquid, sludge or sediment will be immediately cleaned up per RFP Section 01 35 43 - Environmental Protection, and in accordance with the Site Specific Health and Safety Plan. In the event of a spill, we will

immediately alert the Hazardous Waste Specialist and Department Representative for further instructions on proper mitigative measures.

The facility will have discreet sections allocated for different processes within the 30'x 30' bermed area. There will be 3 areas within the facility for the following barrel cleaning process:

1. Barrel Washing Station with clean barrel storage **(Station 1)**
2. Barrel Deheader Area with storage for barrels with product **(Station 2)**
3. Wastewater Treatment System Area **(Station 3)**

Activities that will be carried out at the Barrel Processing Facility will consist of:

Under direction from the DR, drum liquids will be dealt with in the following manner:

- Compatible barrel contents with liquid depths < 50 mm will be consolidated. When consolidating barrel product with compatible like product, AEL will use the 50 barrels that the Crown shipped to Sawmill Bay from Terra Mine. Crown will also supply the bungs. AEL will also choose drums that are in the best condition to consolidate the product into.
- Black oil content will not be consolidated and if the drum is leaking, AEL will place in an overpack container.
- Liquids will be inspected and classified by the DR as containing water or organic materials
- Small volumes of liquids will be agitated with oil-absorbent material to remove organic matter. Oil-absorbent material in excess of the required criteria will be packaged for disposal off-site in accordance with TDGA regulations at a licensed disposal facility.

Barrels will be dropped off by Quad with attached trailer (trailer has max capacity of 4 barrels that will be strapped down) to the Barrel Deheader area of the facility. 2 personnel will be staged at the deheader area to take the lids off the drums with a non-sparking deheader. For barrels under pressure, see safety note below. The drum deheader personnel and the Departmental Representative will inspect the content of the drum to determine if the product is to either be sent to the Barrel Washing area (station 1) or to the oil/water separator (station 3) or to the Product Storage Area (station 2). 2 personnel will be staged at the barrel washing area to clean drums and facilitate the movement of drums.

1. Barrels with product will be sent to the product holding area within Station 3. When the barrels (with product) storage area within Station 2 reaches capacity, the barrels from that stockpile will be placed into a designated area near the crushing facility before the stockpile has a chance to create an unsafe work hazard. Additional liner will be on-site for this designated area.
2. Barrels with water and minimal amounts of petroleum hydrocarbons will be sent to Station 3 and put through the oil/water separator and then stored in a suitable drum until such time water treatment begins. The drum will be temporarily stored within Station 3. The empty drum will be sent to Station 1 to be washed and then the clean barrel will be stored within station 1 until such time the barrel crushing program begins.

The barrel washing facility will have a barrel wash stand constructed on site with 2'x 4' and 2'x6' lumber and bolts and will also have bracing built in for support. The barrels will sit on the stand at a decline of 45^{o} angle with the barrel opening at the bottom. The barrel wash stand will sit in a box that will be constructed on site and it will be lined with an impermeable membrane liner. A walkway will be constructed with lumber in front of the barrel wash stand. The barrel wash stand will be used for the washing of barrels with a pressure washer. The wash water will continually be re-circulated back to the pressure washer for re-use to wash barrels.

Recirculation Process is as follows: Barrel wash water will be continually re-circulated to promote conservation of water. There will be (2) 205L drums that will be inter-connected with a connection kit to allow water to flow through both drums. AEL will fill these drums with water and a sump pump will send the water to the pressure washer to wash barrels. The barrel wash stand containment unit will have a sump pump to re-circulate the water back to the (2) 205 L drums to be re-used over and over again. Periodically the wash water will go through the oil/water separator and sent back to the barrel washing facility.

Safety Note: Quad drivers will wear helmets and obey traffic regulations for site. Barrels under pressure which cannot be safely vented by twisting off the cap will be vented at a remote location with a non-sparking device. This will be done in the barrel crushing contained area. There will be a physical barrier between the HAZMAT employees and the venting barrel for protection. The barrel will be put in an overpack drum for transportation.

Barrel Crushing Plan

The barrel crushing facility will be at the same location as last year's location which is near the airstrip in the treeline. The barrels will be crushed using a 245E excavator with attached bucket. This method of crushing will crush the barrels down to 75% of its original size. Prior to crushing with the excavator and attached bucket, we will lay down a liner and lay rig mats down on the liner. The rig mats will be the platform to crush the barrels on. The rig mats will have the perimeter built up by placing /attaching another rig mat @ 90 degrees to the floor rig mat to act as barricade to flying material. This barrier will ensure safety for all crew during crushing operations.

The excavator operator will position the excavator near the rig mat, while one or two workers will load one barrel into the proper position on the rig mat, those workers will walk off the rig mat to a designated area where the excavator operator has a clear view of them. The barrel will then be crushed with the excavator. The operator will then move the bucket to a safe position and direct the two workers to retrieve the crushed barrel and stockpile the barrel.

AEL has a Barrel Crushing Safe Operating Procedure (SOP) in place and instructed to the crew handling this phase of work and ensure they have understood the procedures and sign off that they have read and understood the SOP.

Wastewater Treatment Plan

The above in series pump and treat system will start after all barrels have been washed, as the barrel wash water will be continually re-circulated to promote conservation of water. Once

treatment starts, the wastewater generated from the barrel wash water will go through an in series pump and treat system as follows.

1. The wastewater will first be sump pumped to an oil/water separator from the wastewater holding tank (1500L polyethylene) at a max flow rate of 37.85 litres/minute to remove the majority of the hydrocarbons from the water.

2. The water exiting the oil/water separator will be pumped to a bag filter to remove any dirt which would foul the media (clay based media and activated carbon).

3. The water exiting the bag filter will be pumped to a liquid phase vessel filled with clay media (vessel 1) to adsorb organics and petroleum hydrocarbons and act as a pre-polisher.

4. The water exiting vessel 1 (filled with activated carbon) will be pumped to vessel 2 (filled with activated carbon) to remove trace amounts of heavy metals and any residuals from vessel 1 filtration phase.

5. The water exiting vessel 2 will flow into bladders (4 bladders @ 5700L each) on-site until time to discharge, depending on discharge criteria lab test results.

The liquid phase vessels are made of heavy gauge steel with a removable lid that will be securely clamped to the vessel. The top of the lid has an inlet, outlet and a pressure relief port. Each vessel will have a tee that will be threaded onto the pressure relief port located on the top of the lid of the vessel. The tee will also be threaded onto a PVC flow control valve and a regulator. The regulator will be installed to mitigate measures in the event the system component is subject to pressures beyond its design point. The regulator and flow control valve makes it easy to check pressure drop across the media and to get convenient influent and effluent water samples. The 2 vessels will have a connection kit which will allow the two vessels to be connected in series from vessel 1 outlet port to vessel 2 inlet port. Both vessels inlet and outlet ports will also have female camlocks with flow control valves. Camlock quick connections will also be installed on hoses and the treated water holding tanks (bladders) to minimize the potential for water leaking. At the end of the train there will be a flow meter to monitor the amount of water treated, this amount will be confirmed each day of treatment by the DR and logged into a logbook. Above and beside is a picture of the type of system AEL will have at site. Each

vessel will be placed on a pallet to ease lifting. A loader can lift and move the pallet with the vessel to a pre-determined location. AEL has ensured that all inlet and outlet ports on the oil and water separator, bag filter, and vessels are the same pipefitting size and come equipped with camlocks with valves to take into account the pressure drop which will affect the flow rate. This method will achieve optimal performance of the system.

The pictures that are shown above is not the system that will be on-site, but is shown here, as the principle design will be the same. The only difference in design will be that picture 1 shows two pressure relief ports and the vessel AEL will use has only one pressure relief port.

Once barrel washing is complete, the wastewater will go through the treatment train described above. The treated water (effluent) will be tested at a CALA certified lab by the DR to confirm that the treated water meets discharge criteria as stated in the RFP's SOW. Discharge Criteria is as follows:

Table 1: Wastewater Discharge Criteria

Parameter	Maximum Allowable Concentration
pH	6-9
Oil and Grease	5mg/L and none visible
Arsenic (total)	100 µg/L
Benzene	300 µg/L
Cadmium (dissolved)	10 µg/L
Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Copper (dissolved)	200 µg/L
Lead (dissolved)	50 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
PCB: discharge to barren area	50 µg/L
PCB: discharge to vegetated area	5 µg/L
Zinc (total)	1000 µg/L
Total Suspended Solids	180 mg/L

Once analytical results from the Lab show that the discharge criteria concentration is within guidelines the treated water can be pumped from the holding tanks (4 bladders @ 5700L each) and discharged at a location near the facility and will be determined at site to find the best topography for it, with the approval of the DR. Treated wastewater will be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters and conform to the discharge requirements set out in the Water License.

AEL will ensure that the treated water will not be discharged until test results confirm that the samples are under guideline levels.

If test results confirm that the samples do not meet discharge criteria, AEL will recirculate the water through the treatment system again and test the water again after it's passed through the treatment system for the 2nd time.

Details of wastewater treatment system components, as well as operating instructions.

Each system component below and the vessels will have a max. flow rate of 3.785 Litres/minute x 60 minutes = 227.1 Litres/hour and because there are 2 vessels it will double that time, and when you add the time to separate the oil from the water at 37.85 L/minute you triple that time and when you add the time it takes to go through the bag filter it would quadruple that time. AEL has included the contact time with the media which should be approximately 5 minutes of contact time to calculate the time to treat up to 20,000 litres of wastewater. AEL's calculation to treat up to 20,000L of water will take a total of approximately 23 hours if the system is running at peak performance.

AEL has added contingency time by doubling the time it takes if the system was operating at peak performance and have come up with a total treating time of 46 hours. AEL will be working 10 hour days, therefore it will take 5 days to treat up to 20, 000L of water.

Bag Filter Specifications

Filter area = 115.2 inches^2

Max Flow Rate = 94.625 litres per minute

Oily Water Separator

Oil water separators are systems used as an efficient method to separate oils and some solids from a variety of wastewater discharges. They are typically installed in industrial and maintenance areas and receive oily wastewater. The oil water separator will assist in the removal of large quantities of free oil from the wastewater before any further treatment step.

Fabrication

The oil water separator is a special purpose prefabricated parallel corrugated plate, rectangular, gravity displacement, oil water separator. The separator is comprised of a tank containing an inlet compartment, separation chamber, sludge chamber, and clean water outlet chamber as pictured here.

Tank

The tank is a single wall construction. Welding provides a watertight tank that will not warp or deform under load. Pipe connections to the exterior are as follows:

Pipe Connections

All connections are 2" and are FNPT couplings.

Lifting Lugs

The tank is provided with properly sized lifting lugs for handling and installation.

Covers

The tank is provided with a vapour tight cover for vapour control. Gas vents and suitable access openings to each compartment is also provided. The cover is constructed of the same material

as the tank and is fastened in place. A gasket will be provided for vapour tightness. 304 SS Latches will be provided for cover attachment.

Inlet Compartment
The inlet chamber is comprised of a non-clog diffuser to distribute the flow across the width of the separation chamber. The inlet compartment is of sufficient volume to effectively reduce influent suspended solids, dissipate energy and begin separation. The media will sit elevated on top of a sludge baffle. The sludge baffle will retain settable solids and sediment from entering the separation chamber.

Separation Chamber
The oil separation chamber contains HD Q-PAC Coalescing Media containing a minimum of 132 square feet per cubic foot of effective coalescing surface area. The medias needle like elements (plates) will be at 90 degrees to the horizontal or longitudinal axis of the separator. Spacing between these elements will be spaced 3/16" apart for the removal of a minimum of 99.9% of free droplets 40 micron in size or greater. The elements are positioned to create an angle of repose of 90 degrees to facilitate the removal of solids that may tend to build up on the coalescing surfaces, which would increase velocities to the point of discharging an unacceptable design. Flow rate shall be maintained throughout the separator packed bed including entrance and exit so as to prevent re-entrainment of oils with water. Flow through the polypropylene coalescing media will be cross flow perpendicular to the vertical media elements such that all 132 square feet/cubic foot of coalescing media surfaces shall be pointing upwards so as not to be available for contact with the cross flowing oily water. The media will have a minimum void of 87% void volume to facilitate sludge and dirt particles as they fall off the vertical elements and settle in the sludge compartment.

Baffles
An oil retention & underflow weir, and overflow weir. AEL will position the underflow weir to prevent re-suspension of settled solids.

Sludge Chamber
The sludge chamber is located prior to the coalescing compartment for the settling of any solids. It will also prevent any solids from entering the clean water chamber.

Oil Skimmer
The oil separation chamber has a rotatable pipe skimmer for gravity decanting of the separated oil to an external product storage tank.

Clean Water Chamber
The tank has a clean water chamber which allows the water to leave the separator by pumped / gravity flow through the clean water outlet port.

Vents
1" vents is provided with vent piping to atmosphere.

The hydrocarbons and sludge removed by the oily-water separator will be contained in separate 45-gallon drums and appropriately labelled.

Vessel Operating Instructions

Installation: Fill vessel with water at a rate of 3.785 to 7.57 Litres per minute through the outlet port to force trapped air out the inlet of vessel. Allow vessel to stand 24 hours with inlet port open to permit de-gassing of carbon bed. Add additional water to completely fill vessel before placing in service. During initial start-up, recycle water to remove carbon fines. Do this until water runs clear.

Operation: The granular activated carbon in vessels will adsorb impurities from the water flow. Removal efficiency is reduced as flow rates are increased. The recommended maximum flow rate is 37.85 Litres per minute, however some impurities may require less flow to increase carbon contact time. As the carbon becomes saturated, some impurities will begin to pass through. To extend the useful life of the vessel it is recommended that two vessels be plumbed in series. Replace the first vessel when influent and effluent concentrations in the first vessel are equal. Move the second vessel to the first position and place the new vessel last.

Pressure relief valve: Lift the pressure release valve from time to time to release any built up gasses. The relief port will be plumbed into an upstream source to prevent uncontrolled discharge of impure liquid should pressures exceed 30 psig.

Caution: 1) Do not exceed 30 psig operating pressure. All air must be purged from vessel to prevent storage of energy from the compression of gas 2) Activated carbon has been known to react adversely with some contaminants. Test carbon before if affects are unknown. 3) Pre-filter for suspended solids should be used to prevent particulate fouling of carbon bed. 4) PH of water may be elevated during start up. Water may require neutralization until effluent meets influent values

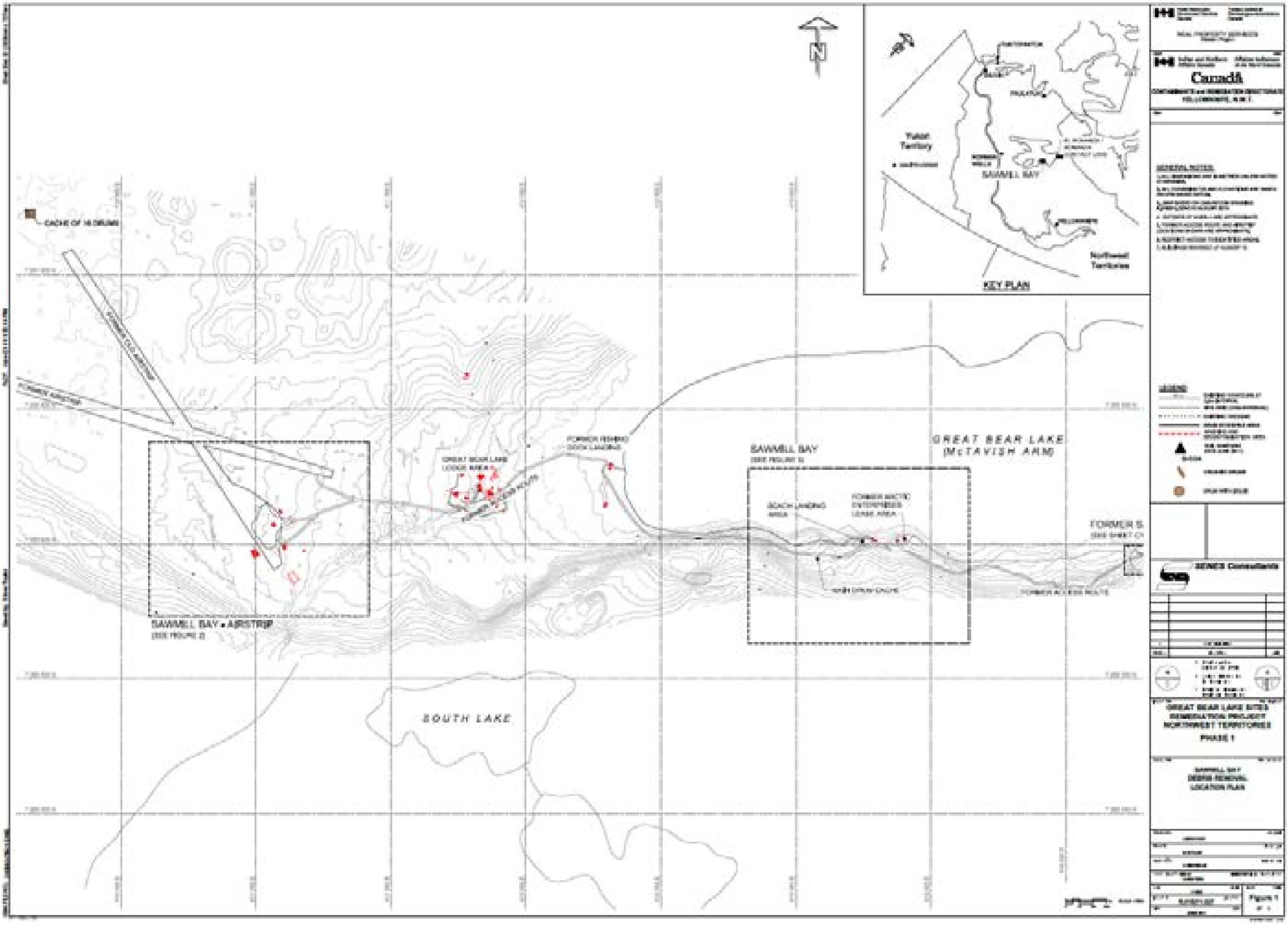
Decommissioning the Barrel Processing Facility and the Barrel Crushing Facility

AEL will decommission the constructed Barrel Processing Facility and Crushing Facility, based on the classification of material that each facility contained. Facilities containing non-hazardous material will have the liners disposed of in the landfill in Yellowknife. The liner that contained hazardous waste will have the liners containerized and shipped off-site as hazardous waste. Confirmation samples will be collected in the immediate vicinity of the MPA to confirm that no contamination of the original ground has occurred. If contamination is present, AEL will thoroughly clean the area to the acceptable standards of the DR.

On-site Training

In order for the activated carbon water treatment system to operate effectively and efficiently, proper operation is crucial. Once the system has been setup and optimized AEL will develop standard operating procedures for the activated carbon treatment system. In addition, AEL will properly train personnel on the operation and maintenance of the system. This training will include but not be limited to the operation and maintenance of the oily water separator, the bag filter, operation and maintenance of the activated carbon tanks, and the procedure and techniques for field sampling and analysis.

APPENDIX A – Sawmill Bay, Debris Removal Location Drawing


Canada
Yukon Territory
Northwest Territories
SAWMILL BAY
KEY PLAN
CACHE OF 16 DRUMS
FORMER AIRSTRIP
FORMER FISHING DOCK LANDING
GREAT BEAR LAKE LODGE AREA
FORMER ACCESS ROUTE
SAWMILL BAY (SEE FIGURE 3)
GREAT BEAR LAKE (McTAVISH ARM)
BEACH LANDING AREA
FORMER ARCTIC ENTERPRISES LEASE AREA
MAIN DRUM CACHE
FORMER ACCESS ROUTE
SAWMILL BAY - AIRSTRIP (SEE FIGURE 2)
SOUTH LAKE
SENES Consultants
GREAT BEAR LAKE SITES REMEDIATION PROJECT NORTHWEST TERRITORIES
PHASE 1
SAWMILL BAY DEBRIS REMOVAL LOCATION PLAN
Figure 1

APPENDIX B – Sawmill Bay, Debris Removal Airstrip Drawing

PHOTO 1

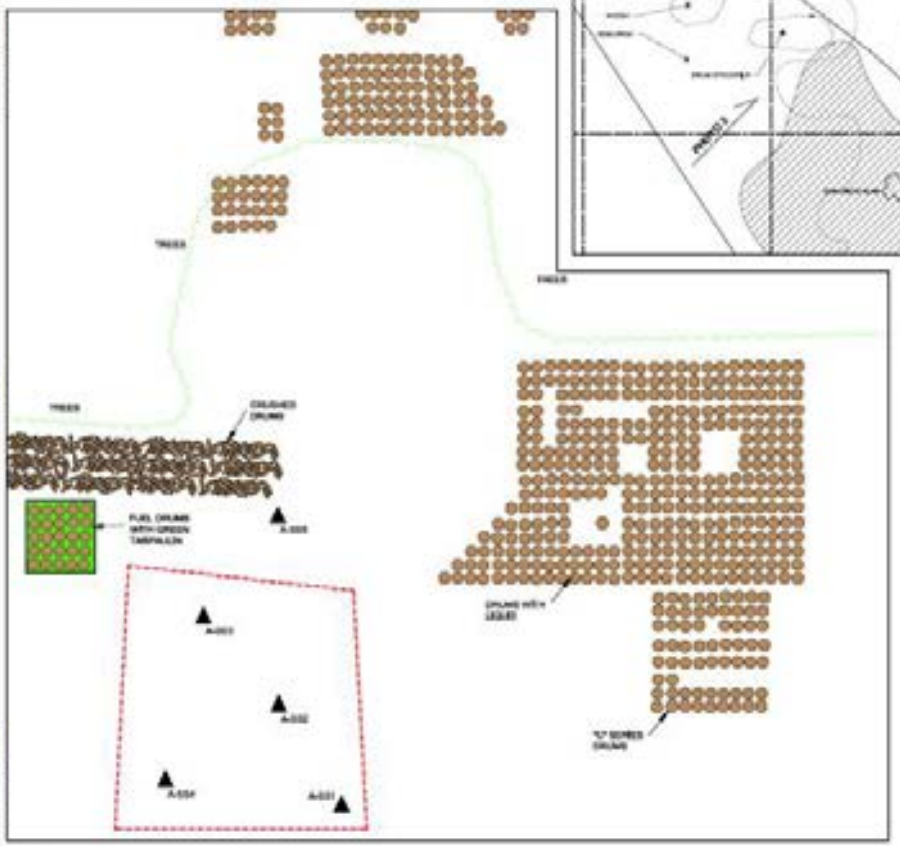


PHOTO 2

Canada

CONTAMINATE and REMEDIATION OBJECTIVES
YELLOWKNIFE, N.W.T.

GENERAL NOTES:

LEGEND

SENES Consultants

GREAT BEAR LAKE SITES
REMEDIATION PROJECT
NORTHWEST TERRITORIES

PHASE 1

MAXWELL BAY
DEBRIS REMOVAL
AIR STRIP

Figure 2

APPENDIX C – Barge Landing Area Drawing

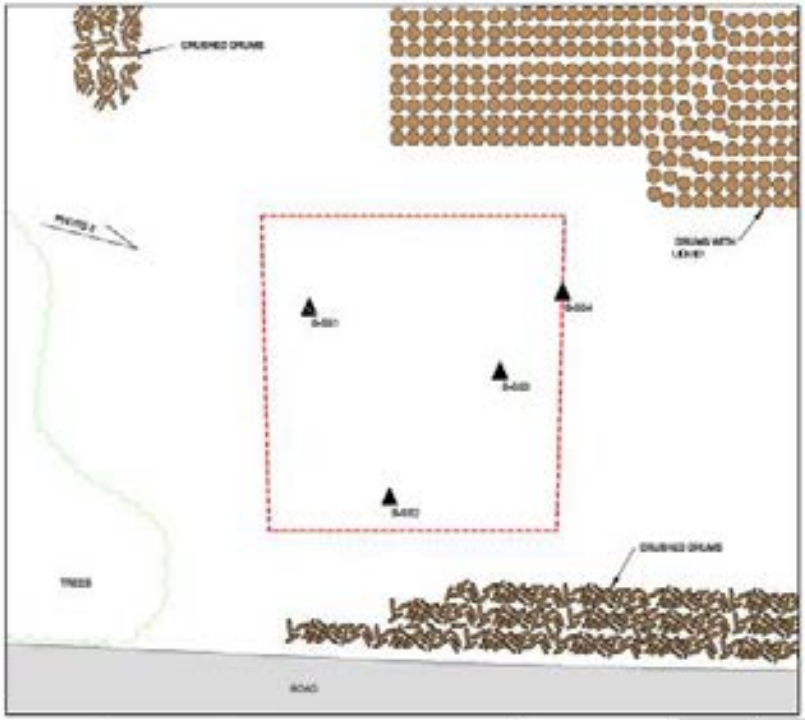
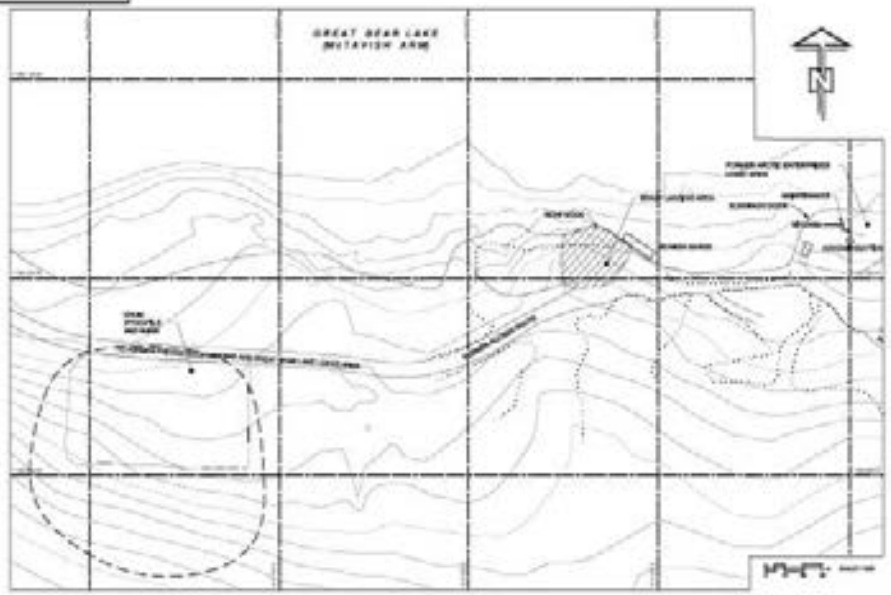


PHOTO 1

PHOTO 2

PHOTO 3



Canada

SENES Consultants

GREAT BEAR LAKE SITES
REMEDIATION PROJECT
NORTHWEST TERRITORIES
PHASE 1

SAWMILL BAY
BARGE LANDING AREA

Figure 2

GBL – Barrel & Wastewater Treatment Safe Work Plan

Information

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INTRODUCTION

Herein is contained the procedure for the safe procedures for emptying, washing and crushing of barrels as well as treatment of wastewater at the GBL site.

This Safe Work Plan and associated procedures will be submitted for review to Public Works.

All work is to be performed in accordance with the NWT Mine Act and regulations, associated Canada Labor Code regulations and also the Tlicho Health and Safety Plan

Table of Contents

Contents

1.0 Scope and Objective

The purpose of this task is to safely undertake the treatment of identified barrel contents, wash and crush barrels at the Sawmill Bay site on Great Bear Lake, Northwest Territories.

In summary the works to be undertaken are:

- Empty barrel contents, wash and crush barrels
- Process wastewater by use of an oil separator system.

As this task is undertaken, more appropriate techniques / sequences of works may be identified. Where this is the case, amendments to this task method statement will be prepared and sent to authorities having jurisdiction for review prior to the commencement of work.

No work will proceed without prior review and confirmation that all persons are properly trained and aware of all hazards associated with the work.

JHA (Job Hazard Analysis) will be completed / reviewed on a daily basis and will be logged at the end of each shift. Hot work permits will be issued on a daily basis (when required).

2.0 Hazards and Risks

The hazards and risks associated with this operation are predominately physical related.

- Tissue damage/puncture from cut metal edges
- Noise from heavy equipment
- Dust
- Inhalation of toxic dust and fumes
- Fire
- Injury from slips, trips and falls

3.0 Equipment

- 6 Quads

- 1 Polaris side by side
- 1 Caterpillar Loader 950
- 1 Excavator (with thumb attachment) 320
- 1 Caterpillar D-5 Dozer
- 1 F-350 Pick-up
- 1 Wizard Barrel De-Header
- 1 Honda “Hotsi”
- 1 Drum “barrel” Incinerator

4.0 Personal Protective Equipment

Workers will wear appropriate PPE for the hazards on the project and as well as to the task being undertaken.

Standard PPE for working on the site are:

- Hard Hat
- Long sleeves to be worn at all times during work
- Safety gloves
- Safety footwear
- Safety glasses
- Rain Gear
- Safety vest
- Hearing protection (as required)
- Communication – Radio and/or hand signals

5.0 Work Procedures

- Only authorized workers shall be allowed in the work area.
- All work will be completed by trained and competent workers
- Meetings will be held at the start of every shift to coordinate workers to the tasks requiring completion.

5.1 De-Heading and Emptying Barrels

All barrels which are destined for de-heading procedures will be physically inspected for content and affirmation that contents have been tested as per criteria for processing during oil water separation process.

Personal Protective Equipment

- Leather gloves
- Safety Glasses / mono goggles

- Steel Toe safety boots / safety rubber boots
- Reflective Vest

Tools & Equipment

- Rubber Mallet
- Wizard de-header
- CAT 950 Loader
- ATV Quad with trailer

STEP 1

Procedure	*PROCESS*	*Responsibility*
Prepare for De-Heading	• Ensure that barrel contents are meeting criteria for barrel washing and oil separation process. • By using the rubber mallet, ensure that inside and heel of barrel are round and have also been hammered free of the rim to be cut. • Ensure that barrel is centered within cage. • Ensure that Wizard de-heading tool is properly chained to header of cage. • Ensure that de-header is squarely fitted to drum and that travel around the drum is clear of major dents.	***Lead Hand D.R*** ***Operator***

STEP 2

Procedure	*PROCESS*	*Responsibility*
De-Heading Barrels & Emptying contents	• Ensure that Wizard de-header is placed squarely on the barrel to be cut. *(Wear leather gloves during entire process).* • Do not follow cutter around the barrel. Operator is to stand in one place while cutter is functioning. • Increase pressure on cutting edges by ¼ turn of the adjusting screw after completing a complete barrel revolution of the cutting edges. (Increasing the pressure by more than ¼ turn, increases the wear of the cutting edges). • It may take 1 – 6 revolutions of the cutter to completely cut the rim from the barrel. • Once the rim has been completely been cut, use the rubber mallet and strike the inside plate sharply in the center. This action will allow the entire inside plate to fall inside the barrel.	**operator**

STEP 3

Emptying barrel contents & washing	• Place barrel with cut rim onto emptying stand. • This will allow all contents to flow from the barrel into the waste oil supply tank. • The operator will then wash the inside of the barrel by using the	**Operator**

barrels	"Hotsy". • Waste water will the flow into the waste oil supply tank for treatment	

5.2 Washing Barrels

All barrels which have been emptied of Hydro carbon content will be thoroughly washed prior to being sent to crushing area.

Personal Protective Equipment

- Rubber Gloves
- Face Shield / Mono Goggles
- Rain suit
- Rubber safety boots

Tools and Equipment

- Hotsy Hot water cleaner
- Brushes

Step 1

Procedure	*Process*	*Responsibility*
Washing Barrel	• Operator will ensure to always stand at an angle to the direction of spray, to avoid getting "spray-back" of water during cleaning operation. • Cleaning will start from the top rear inside of barrel, working in a circular motion towards the front of the barrel. This action will ensure that all waste is removed from barrel, with a minimum amount of water being used. • A visual inspection of the inside of barrel will be completed after the wash cycle, to ensure that all waste material has been removed.	**Operator**

Step 2

Procedure	*Process*	*Responsibility*
Clean-Up	• Once wash cycle is complete, washed barrel is to be removed from rack. • Loose lids will be removed from wash area. Operator is to use caution while handling lids watching for sharp edges. • Rack area will be inspected for spillage and rinsed immediately to prevent build-up of waste hydro carbons. • Walk area is also to be inspected and rinsed if required. • **(Operator is to use caution when walking on platform as slippery conditions may exist).**	**Operator**

Step 3

Procedure	*Process*	*Responsibility*
Barrel Removal	• Quad operator will transport washed barrel to crushing facility. • Operator will ensure that barrels are secure within trailer prior to transport • Washed barrels will be placed in a uniform order alongside the crushing platform in preparation to crushing. • Quad operator will ensure that he is in visible contact with the hoe operator prior to entering the crushing area.	**Quad Operator**

5.3 Barrel Crushing

All barrels to be crushed will be inspected for content, approved for processing and pressure washed of all contaminates prior to being brought to the barrel crushing facility.

All workers will wear the proper Personal Protective Equipment during all barrel crushing operations.

All workers will review this Safe Work Plan and complete a Job Hazard Analysis prior to completing any Barrel crushing procedure.

Safe Work Plans and completed JHA will be reviewed and approved by the site manager prior to any crushing operations being started.

Personal Protective Equipment

- Hard Hat
- Safety Vest
- Steel Toe work Boots
- Leather Gloves
- Hearing protection
- Rig Mat Barrier

Tools and Equipment

- Quad and Trailer
- 2-way radio
- 320 Excavator (W/ thumb attachment).
- 950 Loader

Step 1

Procedure	*Process*	*Responsibility*
Placing of Barrels on Pad	• Only designated workers will place clean barrels on pad for crushing. • All equipment will be placed in the "rest" position prior to the worker placing material on the Pad. • Eye contact is to be made with the worker and the excavator operator prior to the worker stepping on to the pad. • Worker is to ensure that the barrel to be crushed is placed squarely on the pad in an upright position. • Worker will remove himself completely from the pad area and place himself behind the barrier prior to crushing operations.	**Worker**

Step 2

Procedure	*Process*	*Responsibility*
Crushing barrels with excavator	• Worker will only place barrels on pad once all equipment has been put into "rest" position. (buckets down to ground). • Operator will place "heel" of excavator bucket squarely over top of drum and apply downward force. • This action will be repeated (2 to 3 times) until the drum is compressed to 25% of original size. • When drum has been crushed to desired height, the excavator will pick up the crushed barrel by using the thumb attachment and lift/carry the compressed drum to the loader and drop/place drum inside the loader bucket. • Excavator will then return to drum crushing position and place his machine at "rest" in preparation for another drum. • These actions will continue throughout the drum crushing operation.	**Operator**

NOTE: *Workers will stand behind rig-mat barrier during crushing operations at all times. Excavator operators will use equipment horns for notifying personnel of "ALL CLEAR" conditions. Operators will keep their equipment at "REST" whenever workers or other personnel are outside of the safety barrier*

TEES / AEL		TEES-OPS-SOP-003 BARREL CRUSHING	
Author: J. MacKenzie	Approved By: B. Landry	Date Created: 06/07/2011	Revision No: 002

INTRODUCTION

This procedure has been established to ensure that there is a safe process for employees to follow, while crushing barrels at all TEES / AEL sites. The review of this procedure by/with employees ensures that workers are made aware of the known hazards while crushing barrels, and are also aware of the protective measures which have been put into place to ensure the health & Safety to workers while completing this task.

HAZARDS

Slips, trips & Falls	Risk while working on rig mat (slippery surface) from washed barrels	Ensure that metal mat is clear of debris and wiped of any liquids
Lifting (repetitive)	Strain from twisting while lifting, repetitive motion, improper lifting process	Review proper lifting procedures, take sufficient work breaks to reduce repetitive strain injuries
Heavy Equipment	Struck by swinging equipment. Injuries related to excessive noise.	Ensure to stay outside of the work perimeter and behind the safety barrier while heavy equipment is being operated. Wear proper hearing protection while work is being completed
Minor cuts and scrapes	Cuts and scrapes from rough edges of barrels after crushing.	Wear proper hand protection while manipulating barrels.
Struck by metal	Metal fragments releasing due to impact and striking workers	Wear proper PPE: Coveralls, safety glasses, steel toe boots,ensure that workers are outside of work perimeter (rig mats). Rig mat to be placed /attached @ 90 degrees to floor mat to act as barricade to flying material

NOTE: Work will be assessed for hazards on a regular basis. Any new hazards identified, will be documented and corrective actions will be reviewed with workers prior to continuing work.

TEES / AEL		TEES-OPS-SOP-003 BARREL CRUSHING	
Author: J. MacKenzie	Approved By: B. Landry	Date Created: 06/07/2011	Revision No: 002

WORK PROCEDURE

STEP	PROCEDURE	RESPONSIBILITY
1. Site Preparation	• Install Rig Mats. • One (1) mat placed flat on the ground • One (1) mat attached/secured lengthway to the floor mat, at a 90 degree angle to form a barricade • Ensure mats are on a level surface. • Level ground with excavator, if required.	Supervisor Operator
2. Equipment Preparation	• Place all barrels to be crushed, outside of the rig mat perimeter. • Excavator to be used for crushing is to be placed opposite to barrel lay-down area. • Loader to be used for transporting crushed barrels is to be placed beside the excavator ensuring that there is sufficient clearance for excavator to swing and not make contact with loader.	Supervisor Excavator operator Loader operator
3. Worker placing barrels	• Worker will place the barrel to be crushed in the center of the rig mat, and immediately return to behind the standing rig mat; in preparation of excavator performing crushing.	Barrel Handler
4. Excavator crushing barrels	• Excavator operator will place the bucket over the barrel in such a position as to give a flat surface for crushing requirements. • Excavator will lower the bucket with sufficient force to crush the barrel ensuring that the downward stroke is straight and level. This action ensures that the bucket is crushed evenly. • The excavator operator will repeat this action as many times as necessary to ensure that the barrel is sufficiently crushed.	Excavator operator
5. Worker placing crushed barrels into loader	• Once the excavator has completed the crushing operation, the excavator operator will pick up the crushed barrel with the bucket and thumb and place it in the loader bucket. This action will ensure that the operator is not required to enter the active work area, minimizing the risk of injury. • In the event that a crushed drum is to be placed in loader bucket by hand or when the excavator operator is ready to crush another drum, the excavator operator will put his bucket at the rest position, which is signaling that it is safe to enter the working perimeter and hand place another drum on the rig mat. • Ground crew, excavator operator and loader operator will have hand held radios so that all individuals are in continual	Excavator operator Loader operator

	verbal communication with one another.	

These actions will continue in the above stated procedure during the complete task of barrel crushing.

In an emergency, crucial messages must be conveyed quickly and accurately. Site staff must be able to communicate information such as the location of injured personnel, orders to evacuate work area even through noise and confusion. Outside support sources must be reached, help obtained and measures for external support notification ensured, if necessary. To do this, a separate set of internal emergency signals should be developed and rehearsed daily. External communication systems and procedures should be clear and accessible to all workers.

Internal emergency communication systems are used to alert workers to danger, convey safety information and maintain site control. Any effective system or combination may be employed. Radios will be used to maintain verbal communication between all workers and operators. This primary system must have a backup. Hand signals will be used as a backup if radio communications fail. All internal systems should be clearly understood by all personnel and practiced daily.

A special set of emergency signals will be set up that are different from ordinary signals, brief and exact. The signals chosen should be limited in number so that they are easily remembered. Signals to be implemented for the barrel crushing operation at Sawmill Bay include:

- Stop – Hands up with palms facing out, hold in place
- Evacuate to muster station – Waving hands and arms above head from vertical position above head to sides repeatedly
- Help, need assistance – Hands on top of head
- All Clear – Thumbs up

When designing and practicing communication systems, we must remember that:

- Background noise on site will interfere with talking and listening
- Wearing personal protective equipment will impede hearing and limit vision (e.g., the ability to recognize hand and body signals)
- Inexperienced radio users may need practice in speaking clearly

2.3.5 Barrel Processing

Barrel Processing, Handling, Treatment, and Tracking System
A total of 11,504 barrels have been identified at the Great Bear Lake sites, of which the majority (11,372) are located at Sawmill Bay. All barrels will be numbered, labelled, and inspected by the Department Representative before any other action is taken. The following schematic taken from the scope of work has been taken into account when developing the remedial plan for barrel processing, cleanup and disposal.

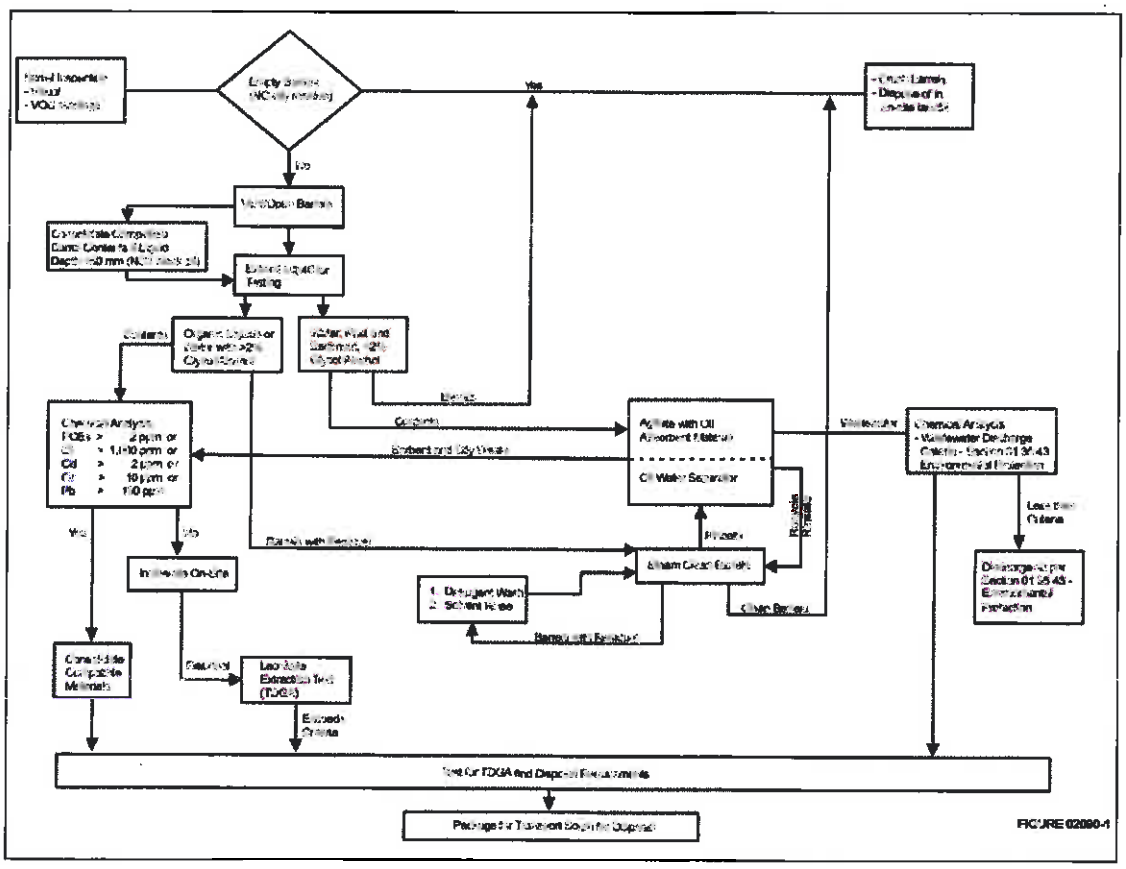

Figure 4 - Flow Diagram for Methodology for Processing, Cleanup and Disposal of Barrels

Approach

The barrels will be numbered and inspected by the Department Representative. The inspection will consist of looking for symbols and markings on the barrels to indicate its contents, evidence of spills and/or contamination on the barrel surface, signs of deterioration, rusting, and pressure. A Volatile Organic Compound (VOC) instrument will be used to test the Lower Explosive Limit (LEL) of the barrel.

Barrels under pressure which cannot be safely vented by twisting off the cap will be vented at a remote location with a non-sparking device. The barrel will be put in an overpack drum for transportation. A device with a 20kg weight will be dropped from a height of 1m to puncture and vent the barrel. This will be done in a contained area. There will be a physical barrier between the HAZMAT labourer and the venting barrel for protection.

Empty and clean barrels as indicated by the Department Representative will be sent for crushing. The barrel crushing site will be stationed at Sawmill Bay beside the largest barrel cache for convenience. All barrels will be transported to this site for crushing. There are 132 barrels identified at the El Bonanza/Bonanza and Contact Lake sites. Due to the comparatively small quantity, these barrels will be transported to Sawmill Bay via barge for processing. All barrels will be transported in seacans on the barge. All barrels containing liquids, are pressurized, or are contaminated will first be put in overpack drums and then into the seacan. This will ensure environmental protection.

There will be two barrel crushers on site. Prior to crushing, all barrels will be checked to ensure they have been vented so as not to create internal pressure during crushing operations. This step should have already occurred during the barrel inspection by the Department Representative. AEL will be using the DC 85-00 Drum Crusher/Compactor. The barrel crusher specifications are shown in the following diagram.

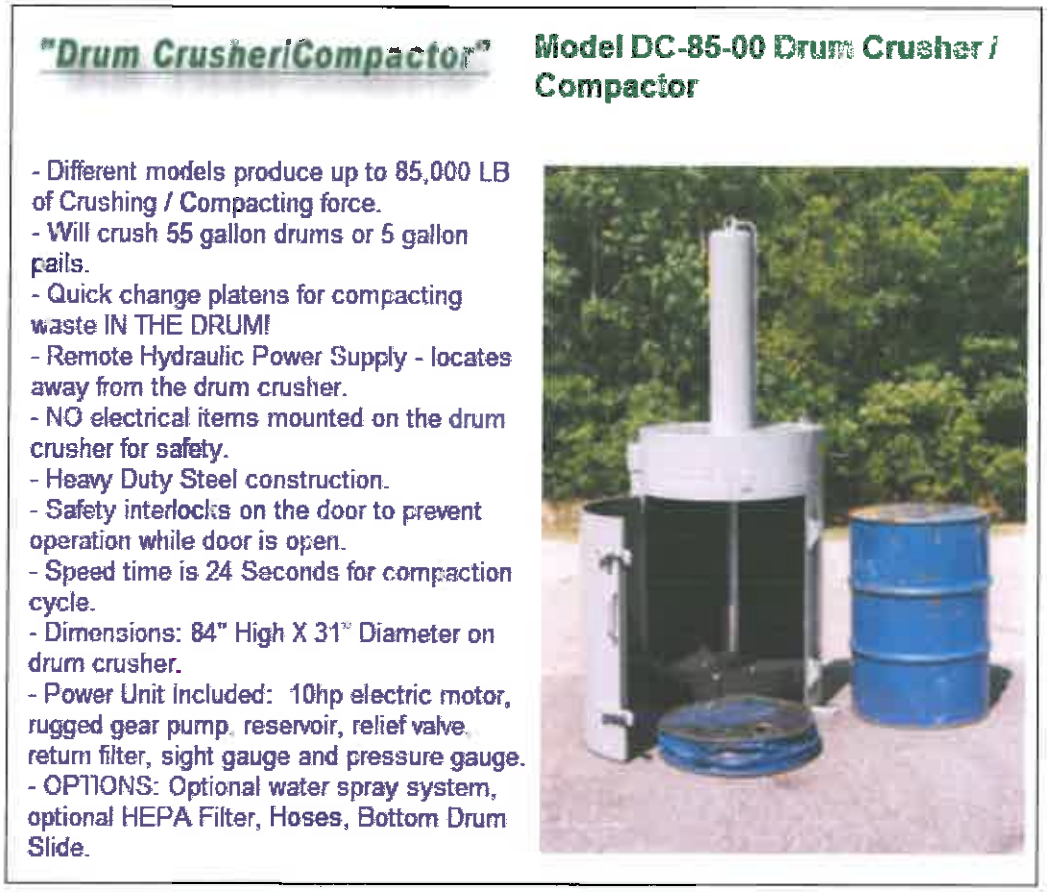

Figure 5 - Barrel Crusher Specifications

Based on the above stated cycle time for barrel compaction (24 seconds), AEL has estimated with handling and positioning, it will take 2 minutes to process each barrel. If a 50% contingency is added to that time, it will take 3 minutes to process each barrel. Based on these rates and keeping in mind there will be 2 barrel crushers on site, it will take approximately 30 continuous ten-hour days to process all identified barrels. A dedicated crew of 5 labourers will be assigned for barrel processing at Sawmill Bay. There is also a possibility of double shifting during the 24 hour daylight months, if required.

All other barrels will be sent to the barrel holding area for further instruction from the Department Representative.

If required, the following procedures for barrel processing will be set in place after identification and testing of contents by the Department Representative.

Under direction from the Department Representative, liquids will be dealt with in the following manner:

1. Compatible barrel contents with liquid depths <50mm will be consolidated

2. Black oil contents will not be consolidated
3. Liquids will be inspected and classified by Department Representative as containing water or organic materials
4. Small volumes of liquids will be agitated with oil-absorbent material to remove organic material
5. Water with glycol and/or alcohol or organic phases and oil-absorbent material tested to meet the following criteria will be incinerated on-site in accordance with site permit requirements:
    a. PCBs < 2 ppm
    b. Chlorine < 1000 ppm
    c. Cadmium < 2 ppm
    d. Chromium < 10 ppm
    e. Lead < 100 ppm
6. Liquids and oil-absorbent material in excess of the above criteria will be packaged for disposal off-site in accordance with TDGA regulations at a licensed disposal facility

Empty barrels will be ready for cleaning and crushing. This will be performed at the barrel washing and crushing facility. Detergent will be used to remove residue from the barrels. AEL has selected the "Enviro Chem Tough Job Cleaner", manufactured by Rochester Midland Ltd., as the detergent for barrel washing as this detergent is environmentally friendly. Two detergent washes will be applied and then a solvent rinse will be utilized if there is still residue on the barrel. The solvent will have a flash point of less than 60°C, and an MSDS will be available on-site. After the wash, barrels will be steam cleaned and sent to the barrel crusher. The barrel crusher will compact the barrel to at least 25% of its original volume. Cleaned and crushed barrels will be disposed of at the non-hazardous storage area, in the "steel" section.

Barrel Tracking System

A barrel tracking system is required for efficient barrel processing. There will be a tracking system to inventory all barrels found. Each barrel will be numbered before any action is taken. The tracking system will include the following information on the barrels:

1. Barrel Number
2. Location found (i.e. Sawmill Bay, El Bonanza/Bonanza, Contact Lake)
3. Visual inspection comments and VOC reading
4. Barrel contents (hazardous, nonhazardous)
5. If testing is required
6. Date opened/handled
7. If temporary HAZMAT containerization or storage required
8. Date crushed
9. Date washed, if applicable

All information pertaining to barrel contents and hazardous handling requirements will be supplied by the Department Representative. All information will be updated daily. This tracking system will be enforced and monitored by the Hazardous Waste Specialist, and will require daily review by the Department Representative.

Barrel Washing and Crushing Facility

AEL will construct a Barrel Washing and Crushing Facility. Prior to the construction of this facility, soil samples will be taken by the Department Representative to determine if contaminants are present. When test results indicate a clean site and permission is granted by the Department Representative, the Barrel Washing and Crushing Facility will be constructed. This area will be lined and bermed for wash water containment. All wash water and steam rinsate will be sent to the water treatment plant for treatment. Solvent will be tested, after which instruction will be sought from the Department Representative on the method of treatment.

Wash Water Treatment

The water treatment will be set up with three holding tanks. Two will be for holding untreated water and one for treated. These will be set up so that there will always be a holding tank for untreated water that can be reused at the barrel washing facility, while the other tank feeds the water treatment plant. The water from the treated holding tank will be tested and discharged only after test results confirm it meets the discharge criteria listed in the following table.

Table 6 - Water Discharge Criteria

Parameter	Maximum Allowable Concentration
pH	6-9
Oil and Grease	5mg/L and none visible
Arsenic (total)	100 µg/L
Benzene	300 µg/L
Cadmium (dissolved)	10 µg/L
Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Copper (dissolved)	200 µg/L
Lead (dissolved)	50 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
PCB: discharge to barren area	50 µg/L
PCB: discharge to vegetated area	5 µg/L
Zinc (total)	1000 µg/L
Total Suspended Solids	180 mg/L

The following page provides a diagram of the above mentioned set up.

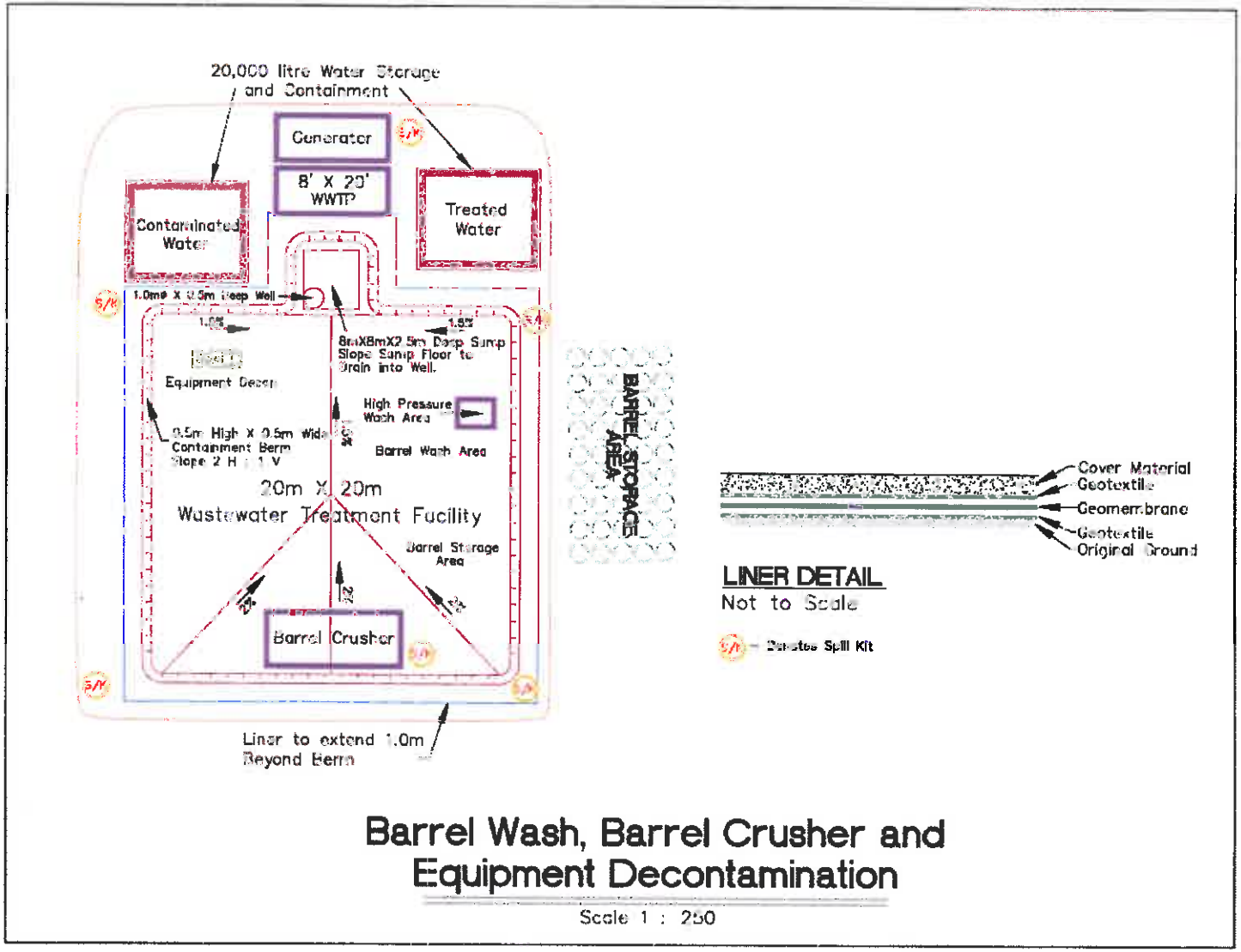

Figure 6 - Waste Water Treatment Facility

The oily water from the bladder will first be pumped through a Filter Innovations Inc. density-based coalescer to remove the majority of the hydrocarbons from the water. The hydrocarbons removed by the coalescer will be contained in 45 gallon drums and appropriately labeled. The water exiting the coalescer will flow into an intermediate storage tank where a sock filter will be used to remove any dirt which would foul the activated carbon. From the intermediate storage tank the water will gravity feed into two 1000 L tanks filled with activated carbon.

Figure 7 - Filter Innovations Coalescer

Figure 8 - AEL Setup of the Activated Carbon Tanks

A filtration manifold system will be installed at the bottom of each 1000 L activated carbon tank to eliminate carbon from being pumped out of the tanks during discharge.

This step is essential to minimize the overall amount of activated carbon used and the uncontrolled discharge of carbon adsorbed with hydrocarbons.

Each activated carbon tank will be placed on a pallet to ease emptying and refilling the tanks. It should be noted that each 1000L tank approximately holds one super-sack of carbon. When the activated carbon is spent, it will be tested for contaminant concentration and disposed of accordingly, either packaged for on-site landfill disposal or off-site at the waste facility.

Finally, the water will go through a final polishing step for any residual metals and contaminants through the FlexRO 100-gpm reverse osmosis unit from Siemens Water Technologies. It is skid-mounted and self-contained. It is designed to be able to facilitate add-on components to address any unforeseen treatment needs to ensure the water discharge criteria is met. A technician will be dedicated to ensure proper operation of this treatment plant. Below is a picture of the system along with its specifications.

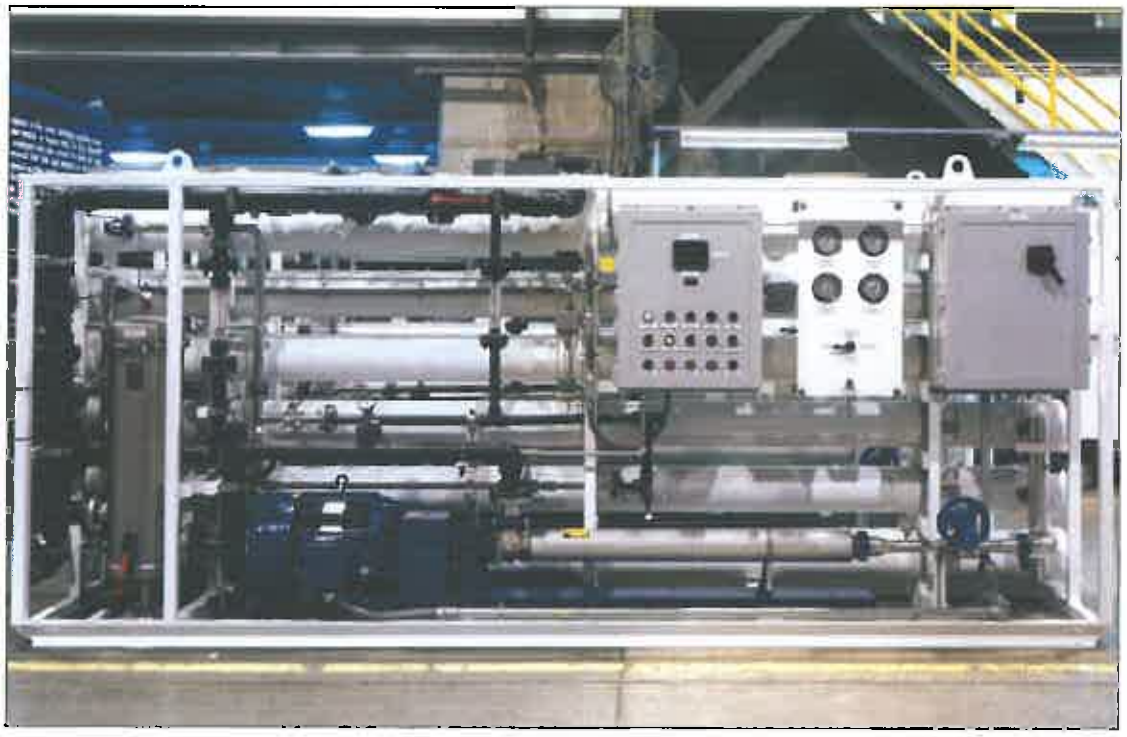

Figure 9 - Water Treatment Plant

Table 7 - Water Treatment Plant Specifications

	FlexRO Units
Flow Rate @ 59 F Permeate/Concentrate/Feed	100/33/133
Recovery/Flux	75%/16.4 GPD
Membranes (TFC or CA*) Array/Quantity Membrane Area (sq. ft.)	3:2:1 (4M)/24 365/400/440 (Depending Upon Application)
Starter Panel Motor Size, HP/Amps Electrical Requirements	NEMA 4X – Includes 120 VAC Step down Transformer 50/65 100 Amp/460 VAC/3 ph/60 Hz
Control Panel Option	NEMA 4X with Allen-Bradley SLC-5/03 PLC Remote I/O Panel/PLC Interface
Connections (Schedule 80 PVC) Feed/Permeate/Concentrate	3"/3"/1.5" Flanged
Dimensions	16' L X 3' D X 6'10" H
Weight (lbs.) Shipping/Operating	5,200/6,500
Pressure Gauge	Cartridge Filter In/Out; Pump Discharge (Feed to Membranes); Interstage; Concentrate; Permeate
Temperature Gauge	Feed
Flow Indicator	Permeate and Concentrate
Conductivity Analyzer	Feed and Permeate
Cartridge Filter Housing	SS, 12 Round x 3 High
Feedwater Requirements (Min./Max.)	Pressure (psi) 20/100 Temperature (F) 35/100 SDI (15 Min.) <5 TDS (Design) 2,000

AEL has extensive experience treating impacted water on remote sites throughout the North. We are familiar with troubleshooting difficulties encountered with treatment of water. We have developed a treatment procedure that will operate and treat water with low operational hours, thereby allowing the overall wear and tear of the treatment plant.

Safety Concerns and Mitigative Methods

Problem	Mitigation
Barrel crusher breaks down	There will be 2 identical barrel crushers on-site and spare parts will be kept on-site as a contingency. In the event that a barrel crusher cannot be fixed on-site, there is still another for operation. In that event, a night shift will be considered to remain on schedule.
Productivity of barrel processing	There will be 2 barrel crushers on-site. If required, long daylight hours will allow for double shifting during early summer months. A crew of 5 will be specifically dedicated to perform this work to ensure the barrel crushers are constantly working.
Barrel crushing hazards: injuries from crushing activities	Barrel crushers have safety guards equipped with locks which must be closed in order to trigger the hydraulic ram to crush the barrel. The crews will be fully trained on the equipment safety procedures.
Barrel crushing hazards: internal pressure from crushing activities	All barrels will be vented as part of the barrel inspections prior to crushing activities.
Safe handling of barrels for venting, crushing, handling activities	All crew involved in barrel processing activities will be properly trained on safe procedures before work.
Environmental concerns with barrel processing	Barrels will be vented and inspected in a lined area. All crushing and washing activities will be completed on a lined area. When transporting barrels with any potential for leaks or surface contamination, it will be placed in an overpack drum.
Unknown barrel contents	All barrel contents will be identified by the Departmental Representative. Barrels with potential for leaks or surface contamination will be placed in overpack drums.
Excessive wear on water treatment plant	The treatment process designed by AEL has been sized to require operation every 10 days for one shift. This will alleviate the demand on the plant and significantly reduce wear of parts. The plant is new hence wear on the plant is not a concern.

Problem	Mitigation
Build up of materials on filters.	The wash water will be stored in large containment bladders for up to 10 days to allow settlement of fines. Water will also travel through an oily/water separator and carbon filtration system so build up of suspended solids is not considered to be a concern. AEL will also supply replacement parts on site and should additional parts be required they will be flown in.
Non-effective water treatment	AEL has supplied large containment bladders to store water. In the event the treatment plant does not operate as intended we will have several options. Since the plant is over-design for capacity we can process water numerous times without impacting the capacity of the system. The bladders supplied by AEL are cheap and light, should additional bladders be required they can be sourced and flown to the site within 7 days. Each Bladder has the capacity to contain 20-30 days of wash water from the camp. AEL has over designed the capacity of holding tanks on site. If the plant has operational issues that cannot be rectified by the supplier, AEL will ship in another plant since these plants are airlift capable.
Increased demand on water treatment plant	AEL has over-designed this plant so unforeseen weather can be accounted for in the operation flow rates of the plant. AEL can mobilize cheap additional containment.
Delay time for water results	AEL has taken this into account with the containment volumes that we will supply to the project site. Additional containment can easily be brought to site should it be required.
Excessive demand on carbon system	AEL will supply additional carbon and we can either barge or fly in additional carbon for the system.
Risk of damage to the bladders	The bladders will be in a secured area with a bear fence around the bladders to keep wildlife away from the bladders.

Project Title:

Great Bear Lake Phase 1 Remediation
Demonization Plane

Submittal I.D.:

v1-GBL-Demobilization Plan, 2011

ORIGINAL

Prepared for:
Public Works and Government Services Canada

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October 20, 2011

DEMOBILIZATION

Upon completion of the construction on Sawmill Bay. AEL will notify the Departmental By mid-September at EL Bonanza and Contact Lake demobilization will take place by barging all materials, equipment, and supplies to the Sawmill Bay storage location identified under land use permit No. S08T-004.

The beach area (barge landing area) has a soft landing area which mainly consists of a sandy beach. due to this soft landing area, AEL will equip the soft landing area with Rig Mats (working platforms) that will be leading from the barge to the sandy beach to aid in the loading and offloading of equipment and supplies from the barge onto the shore. Rig Mats are designed to reduce environmental impact during operations and provide a solid temporary foundation for any environment. As mentioned earlier, the mat consists of wide flange structural beam welded frame with grade two or better spruce or pine wood members creating the working platform. Every mat is designed with standard loading throats at each end of the mat making deployment fast and efficient. The rig mats have been proven in the field, and all rig mats come standard with boxed in side rails, which add strength and durability and decrease cleanup costs upon removal from location.

Fewer barge trips will be required. Only 2 will be required for demobilization due to consumption of fuel and materials.

Upon completion of the Sawmill Bay clean up by the middle of August, demobilization of any equipment and supplies will be via barge over to Deline. All equipment will be demobilize by the upcoming winter road to Yellowknife. The Barge and two boats will be stored in Deline.

As just mentioned, the demobilization will utilize Barging the camp, supplies and equipment to the AEL storage in Deline.

The loading of the barge for demobilization shall follow the principles outlined in the mobilization section, as a) the loads on the barge need to be balanced; b) the centre of gravity of the barge loads must be taken into account; and c) all loads must be securely fastened by chains, ropes, and straps to the rig mats.

In terms of loading the barge the 950 loader will load the barge.

In terms of accommodations, the bulk of the camp shall be decommissioned and loaded onto the barge. Site Communications will be available during the demobilization stage through satellite phones. The kitchen, sanitary, and 1-2 accommodations tent frames will remain until the end, for shelter. It is expected that only a skeleton crew of the most experienced operators and supervisory staff is required during the demobilization period. Upon the final barge trip, the tent frames shall be taken down, and all tent canvasses, incinerators, and camp gear is to be demobilized onto the barge. The hydrocarbon contaminated soil will be flown out of Deline and KBL Environmental Services Ltd will be the receiver of the Hydrocarbon contaminated soil as they are a Licensed Hazardous Waste Disposal Facility.

The AEL barge is sectional allowing us to take the barge apart and remove it from the water. The sections will be disassembled and stored in Deline.

All demobilization methods will comply with the requirements of all applicable codes, standards.

Prior to demobilizing from any site, AEL will request a final inspection from the Crown Representatives and the applicable regulators who will complete a deficiency list of any outstanding land use concerns or contractual issues. All such concerns will be addressed before the AEL demobilizes from the sites.

APPENDIX D

LOW LEVEL GAMMA RADIATION INFORMATION

Health & Safety Briefing Highlights and Notes

SAWMILL BAY AND DÉLĮNĘ, NORTHWEST TERRITORIES

September 14-15, 2010

Prepared by Terriplan Consultants and AMEC
on behalf of the Low Level Radioactive Waste Management Office (LLRWMO)

October 12, 2010

Terriplan
CONSULTANTS

TABLE OF CONTENTS

1 BACKGROUND AND OVERVIEW

Consultants representing the Low Level Radioactive Waste Management Office (LLRMWO) of Atomic Energy of Canada Limited (AECL) travelled to Dél̨ne NWT and to the remote camp of Sawmill Bay. The latter is one of the sites along the Northern Transportation Route (NTR) which is now in the multi-year process of remediation planning and site preparation by INAC-NWT and the LLRWMO. The work this year is focused on barrel crushing and general site clean-up by INAC-NWT. This year's work project is funded by INAC-NWT with the assistance of Public Works and Government Services (PWGSC) and on-site management is under contract to Aboriginal Engineering Ltd (AEL). A number of people from Dél̨ne are employed in the project.

The briefings was to raise awareness and to discuss safe work practices concerning working in areas where historic waste may be present, such as at Sawmill Bay. Historic waste along the NTR is mostly soil mixed with uranium ore spilled many years ago during transport from the mine site in the north to the refinery in the south. The target audience was current workers and potential future workers at the Sawmill Bay site. There was also the opportunity to brief members of the public in Dél̨ne. The trip had been planned in advance by LLRWMO with the assistance of INAC. The two representatives were John DeJong and Ricki Hurst. John, who is associated with AMEC Consultants, has extensive experience working with radioactive waste and with the LLRWMO office across Canada, including within the NWT and specifically at Sawmill Bay; and has considerable experience as an instructor. Ricki Hurst, who is involved through contract with the LLRWMO as well as with CARD-INAC on Sawmill Bay and other NWT cleanup projects, accompanied and assisted John throughout the trip.

In planning for the visit, Ricki and John were assisted by the LLRWMO and AMEC. Orlena Modeste, who is the community coordinator of the Sawmill Bay project within Dél̨ne, provided valuable assistance as did several staff of the CARD-INAC office. Mr. Bob Zelmer, Director of the LLRWMO, wrote the Dél̨ne Chief in advance to announce the visit and volunteer meetings with the Chief or Council, however, many members of the Sahtu leadership were out of town for the week. Richard Hamilton of Aboriginal Engineering Ltd (AEL) hosted the visitors at Sawmill Bay. Meetings in Dél̨ne were held at the Dél̨ne Land Corporation boardroom and were translated by Michael Neyelle.

A float plane was used to transport John DeJong and Ricki Hurst as well as three Dél̨ne observers from Dél̨ne to Sawmill Bay. They were elder Alfred Taniton (Dél̨ne First Nation-DFN), Paul Modeste (Dél̨ne Renewable Resources Council-DRRC) and Collin Bayha (Dél̨ne Land Corporation - DLC). The pilot was concerned about weather conditions, including winds, rain and some snow but the flight was reasonable and the plane arrived at Sawmill Bay at 12:30 where the team was picked up by the camp manager – Richard Hamilton of AEL. Original plans had been to brief most of the Sawmill Bay crew and then fly to Contact Lake to brief the rest of the crew. However, the Contact Lake crew had been weathered out and the entire group of 22 workers were at the Sawmill Bay camp, participated in the health and safety briefing and signed the attendance sheet. This included all site staff, the cooks, and paramedic and

helicopter pilot. John, Ricki and the three Délįnę observers returned to Délįnę the evening of September 14th, and two more health and safety briefings were held in Délįnę on September 15th. The morning session was attended by six Délįnę people and the afternoon session was attended by 9 Délįnę people which included six workers from the second shift at Sawmill Bay.

Collectively, the health and safety briefing was given to 28 Sawmill Bay workers. Attendees suggested that were probably 6 or 7 workers missing. This was later confirmed by Orlena Modeste who provided the names of the 6 Sawmill Bay Workers who were out of town on their vacation when the training was offered.

This report provides a brief summary of the content of the health and safety briefing provided at each of the three sessions (Section 2). This is supplemented by a prepared summary which was handed out to all attendees (see Appendix 2). A summary of the questions and answers raised at the sessions is provided (see Appendix 3)

2 ATTENDANCE AT SESSIONS

2.1 Sawmill Bay Camp

In the Sawmill Bay Camp there were a total of 27 people which included 22 people in Camp, 3 observers from Délįnę, and John DeJong and Ricki Hurst representing the LLRWMO. The camp crew included 19 people employed by AEL, 2 by DCS (INAC consultant), a pilot from Canadian Helicopters and one paramedic. This totalled 13 from Délįnę, 3 from Yellowknife and a few from other cities. Richard Hamilton of AEL was the camp manager and Jason Mauchan and Ryan Dillon were employed by the consulting company DCS. Please see the sign in sheet (Appendix 1) for all names, company affiliation and community.

2.2 Délįnę Land Corporation Boardroom September 15 (a.m.)

There were a total of 8 people which included 6 people (including Orlena and the translator Michael) from Délįnę and John and Ricki. (See Appendix 2 for all names).

2.3 Délįnę Land Corporation Boardroom September 15 (p.m.)

There were a total of 11 people which included 9 people from Délįnę and John and Ricki. Six workers from the second shift at Sawmill Bay attended the briefing, including two women in support roles. Two of the Délįnę attendees had also attended the morning session. (See Appendix 2 for all names).

3 CONTENT OF HEALTH AND SAFETY BRIEFINGS

A similar, but not an identical, presentation was made during the three sessions; the focus changed somewhat in response to the level of interest and questions of a particular audience. The instruction was in the form primarily of a plain language briefing about the use of good hygiene, behavioral practices and awareness of personal location in relation to areas of historic waste. The summary below tries to capture the thrust and main components of the three presentations.

Ricki Hurst of Terriplan Consultants began each session by thanking the attendees, providing a brief introduction of John and himself, and describing the purpose of the meeting. It was characterized as a session to speak with workers at Sawmill Bay, or people who may work at Sawmill Bay in the future, and particularly those who may work with the soil in future years. He noted that this is a health and safety briefing with emphasis on how to handle yourself around areas with historic waste, but that it also included some history and context.

John De Jong of AMEC provided the health and safety briefing and fielded most of the questions. Ricki provided some clarification and prompted questions and interaction. All attendees were provided with a copy of the handout (Appendix 2) and at times consulted maps or handled the three instruments demonstrated by John. These instruments were a scintillometer which measures gamma radiation only; an open-faced pancake Geiger counter which measures surface contamination of alpha particles, beta particles and gamma radiation; and a dose meter or “direct reading dosimeter”.

John DeJong began each presentation with anecdotal references of his own background and 35 year career, including his work at Port Hope beginning in the mid 1970s. He provided a background that included the history of uranium mining in Canada, radium and some of its uses, the discovery and exploitation of uranium ore containing the radium from Port Radium, and the location of remaining soils on Sawmill Bay with elevated levels of radiation. He noted that he had been to Contact Lake and Port Radium but that this presentation is focused on Sawmill Bay. Throughout the presentation he emphasized that his job was to help workers limit their exposure to radiation, even at low levels as present here.

He gave a brief background on the early uses of radium including:

- luminous dials on watches and clocks (e.g. the Big Ben clock with green glowing hands)
- luminous gauges in aircraft cockpits and used by the Allied fighters in the 2nd World War so that the pilots could see the gauges but the enemy would not be able to detect them by light
- early treatment of cancer - a gold pellet or seed of radium was sewed into a cancerous tumor
- radium creams used to remove skin blemishes like strawberry birth marks. Ironically, this had been used on John DeJong to cauterize a birthmark when he was a baby - something that would now probably be considered a frivolous use of radium

John mentioned the use of radiation beams now to treat cancer using the isotope cesium (radium was the "grandfather" of that type of treatment). He pointed out that the ships and barges are named for Radium (i.e. *Radium Franklin* and *Radium Gilbert, Radium series barges*) because until the mid 1940s radium was the cargo. One gram of radium was worth about $120,000. The presentation included a discussion of the fact that radiation is everywhere. John described how the levels of Gamma radiation onboard an airline at 30,000 feet is moderately elevated because of being closer to the sun, with less atmospheric shielding. He also used instruments, including the gamma radiation scintillometer and the pancake Geiger counter to demonstrate the existing background levels of radiation in the meeting room and on parts of the Sawmill Bay site.

John provided a brief history of the discovery, exploitation and transportation of radium ore from Port Radium and the transport to Sawmill Bay and subsequently on to Port Hope Ontario - both by barge -

and truck transfers over portages along the Northern Transport Route (NTR) to the railway terminal at Fort McMurray, and by DC3 plane from Sawmill Bay to Edmonton and by rail to Port Hope Ontario. He noted that the ore, in the form of a concentrate, was moved to Port Hope, Ontario where a huge amount of chemicals were needed to process the ore to recover uranium metal. He provided a simple chronology of developments which included:

- 1930s - discovery of radium or pitchblende at the site of Port Radium on Great Bear Lake
- 1935 – building a sawmill at Sawmill Bay
- 1946 - construction of the Sawmill Bay airstrip (by 'two men and a bulldozer'); DC3 planes bringing in perishables and people to Sawmill Bay and taking out uranium ore to Edmonton, and from there to Ontario by rail
- Sawmill Bay as part of the DEW Line system built by the American and Canadian army as part of the Russia cold war. A Loran beacon for pilots was placed at Sawmill Bay.
- 1960 – shut down of the Eldorado Port Radium mine and Sawmill Bay operations
- Fishing Lodge at Sawmill Bay from 1960s to 1980 to take advantage of the airstrip and infrastructure on site. The lodge built the second airstrip.
- 1992 Investigation and identification of NTR sites by the LLRWMO.
- 1996 – Surveys of all contaminants and waste by Royal Military College Kingston along with the LLRWMO. This included an inventory of drums, hydrocarbons, radioactive soils, etc. It recommended moving soils from the Sawmill Bay site.
- 1997 – the best technique was to use hand digging and removal of 87 barrels of contaminated soils to make Sawmill Bay site safe from a regulatory perspective (work in which John DeJong was a participant). He noted how you have to take a lot of soil to get all of the radioactive material.
- 2007 – re-survey of Sawmill Bay radiation levels using a more sophisticated GPS linked Computer Assisted Radiological Survey (CARS) system mounted on an ATV or carried by backpack to measure and accurately map the distribution of contaminated soils.

- 2010 – marking off by AEL using flagging tape of the three areas with elevated levels of radiation

John discussed the three means of minimizing exposure to radiation as captured by:

Time: Don't spend too much time. Avoid the area if you can. If you have to be in the area, limit your time there.

Distance: If the source of radiation is known (as it is at Sawmill Bay) stay away from that source. At Sawmill Bay, the areas are flagged in an extra safe manner, so that you are safe to walk right up to the flagging.

Shielding: We don't really apply shielding in this situation. However, in other cases we have used shielding (e.g. soil or water cover or lead encapsulation) to limit radiation reaching the surface.

John used an analogy of spilling a box of salt and how this was comparable to spilling a bag of ore at Sawmill Bay. He explained how, like salt, the material would be tracked around. This tended to spread out the soil with elevated levels of radiation. John asked if all had been told about the areas to stay away from; the three areas marked with flagging tape. He drove home the importance of these three common sense techniques to minimize exposure and limit risk. He talked about potential internal doses from ingestion and inhalation with comparisons to other decontamination work.

With respect to the question of acceptable dosage, he used the analogy of iodine and iodized salt. For example, at high concentrations iodine is toxic but without low amounts, you will become sick. If you didn't have iodine in your diet (as added to commercial salt) you could get goitre and damage your

thyroid gland. Another example is fluoride in municipal water supplies which is added to protect teeth. We don't know with radiation what the acceptable level of radiation is because we can't test the hypothesis of ~~0~~ zero exposure; there is radiation everywhere. However, world radiation protection authorities agree at this time that what you will be exposed to at the Sawmill Bay site is safe. Nonetheless, John's advice was to stay away and limit your personal exposure.

John used various instruments, including a scintillometer, to explain how radiation levels are measured. He noted how radiation is everywhere.

He discussed the use of standard construction type Personal Protection Equipment (PPE) which is identical to that used for other industrial protection including coveralls, steel toed boots and safety glasses. This type of PPE is recommended when working in the low level areas in which the Sawmill Bay crew is working now - where gamma radiation is near background levels. He provided recommendations on avoiding, where possible, the three areas at Sawmill Bay which have been cordoned off and where radiation levels in soil are above background levels as a result of early spills of uranium ore; and limiting time in those areas whenever it is necessary to work there. He suggested that everything boils down to avoiding certain areas and using good hygiene. John mentioned the value of a "dry"; a place where workers remove and leave potentially contaminated work clothes.

He used anecdotes from the clean-up of uranium contaminated soils in Fort Smith, which he had undertaken the week before, to illustrate the concepts. He discussed the difference in techniques (e.g. the addition of a radiation specialist on site; air monitoring; and personal radiation dosimeter) as well as differences in behavior, between this year and future years when the crew may be working with the soil in the cordoned off areas with somewhat elevated radiation levels.

John took the opportunity to say that he personally had been involved in the Sawmill Bay remediation of 2007. At one session he was asked if he had seen the workers' recommendations contained in the TK Report. He answered yes and used this opportunity to explain his version of what had happened in 1997, including the role of Délînê Management Ltd; the reason for the lack of water on site (dead mice in water system); and the PPE required and used on site. He recounted how workers were protected during their five or six days on the site. He was also able to explain the three ways in which radiation levels were monitored and the fact that no elevated levels of radiation were detected in the air or on workers' clothes. The attendees seemed genuinely interested and John's credibility seemed helpful to explain that workers had not been exposed to any dangerous levels of radiation.

John talked about doses and how "safe" limits have come down (i.e. from 5 mSv/year to 1 mSv/year above normal background between 1975 and now). This could change again in the future. He was consistent in his message that workers should avoid any personal exposure to areas with elevated radiation in soils that was not necessary. His job and his mantra are to keep exposure of workers to ALARA – as low as reasonably achievable.

Following the instruction at Sawmill Bay attendees all were invited for a walk and meter testing over the flagged area immediately beside the camp. With a worker taking the readings, a small group walked to the barrier with all readings less than 10 µR/h (i.e. the background). Stepping over the barrier, the readings exceeded 10 and remained at 10 to 12 until the group approached the central contaminated area where the readings jumped to 25 µR/h. People stopped and talked about the detritus covering the contamination and used this as a real world example of how we should make some "distance" since we had been there for some "time". Given the very low gamma exposure levels in the area of contaminated soils, the actual dose received in this short time would be so low as to be difficult to even measure. At the barrier on leaving the site John used the pancake Geiger counter to monitor everyone's boots (nothing detected). The marked area by the landing was much larger than required and has certainly captured the area of concern. There was no time to ground proof in detail but the area on the runway, like the area near the camp, appeared to be conservative and larger than that required, also.

4 CONCLUSION

The three radiation protection training sessions described in these notes were held in support of the INAC-NWT Phase I work advancing this year at Sawmill Bay and in preparation for future work at this same site.

The site worker radiation protection training sessions supplemented conventional safety briefings given to workers by INAC's contractor AEL .

It is felt that the awareness of workers has been sufficiently raised at this time for the current work underway. Also, a basis for continued growth of knowledge, confidence and safe work practices has been established.

APPENDIX 1: Participant Lists



Radiation Protection Briefing Attendance Form

Project: Sawmill Bay Workers (+ community)

Date: Sept 15/10 5pm Location: Land Corp Boardroom

Instructor: John de Tonj

Name (Please Print)	Employer (Please Print)	Signature
Ricki Hurst	Terrytan Consultant	[signature]
Brian Gaudet JR	AEL	Brian Gaudet JR
Tahti Bayha	AEL	[signature]
Simon Neyelle	AEL	Simon Neyelle
Michael Neyelle	Interpreter	[signature]
Joe Blondin JR.	R.R.C.	[signature]
Valerie Nackeinzo	AEL	[signature]
Kyle Bayha	AEL	[signature]
Gary Elemie	Deline see other sheet	
Danise Bayha	AEL	[signature]

Attendees:
Your signature indicates that you have attended and understood the Radiation Protection Briefing given by the instructor, on the date, and at the location shown above.

Instructor:
I have given the Radiation Protection Briefing as indicated above in accordance with LLRWMO requirements and believe that the attendees listed ~~have~~ have the knowledge, skills and attitude to perform their work with radioactive ~~materials~~ safely while under 100% direct supervision.

Instructor's Signature: [signature]

Radiation Protection Briefing Attendance Form

Project: SAWMILL BAY WORKERS (ALL PEOPLE ONSITE)

Date: 16 SEPT/10 10:30am Location: LAND CORP BOARD ROOM Deline

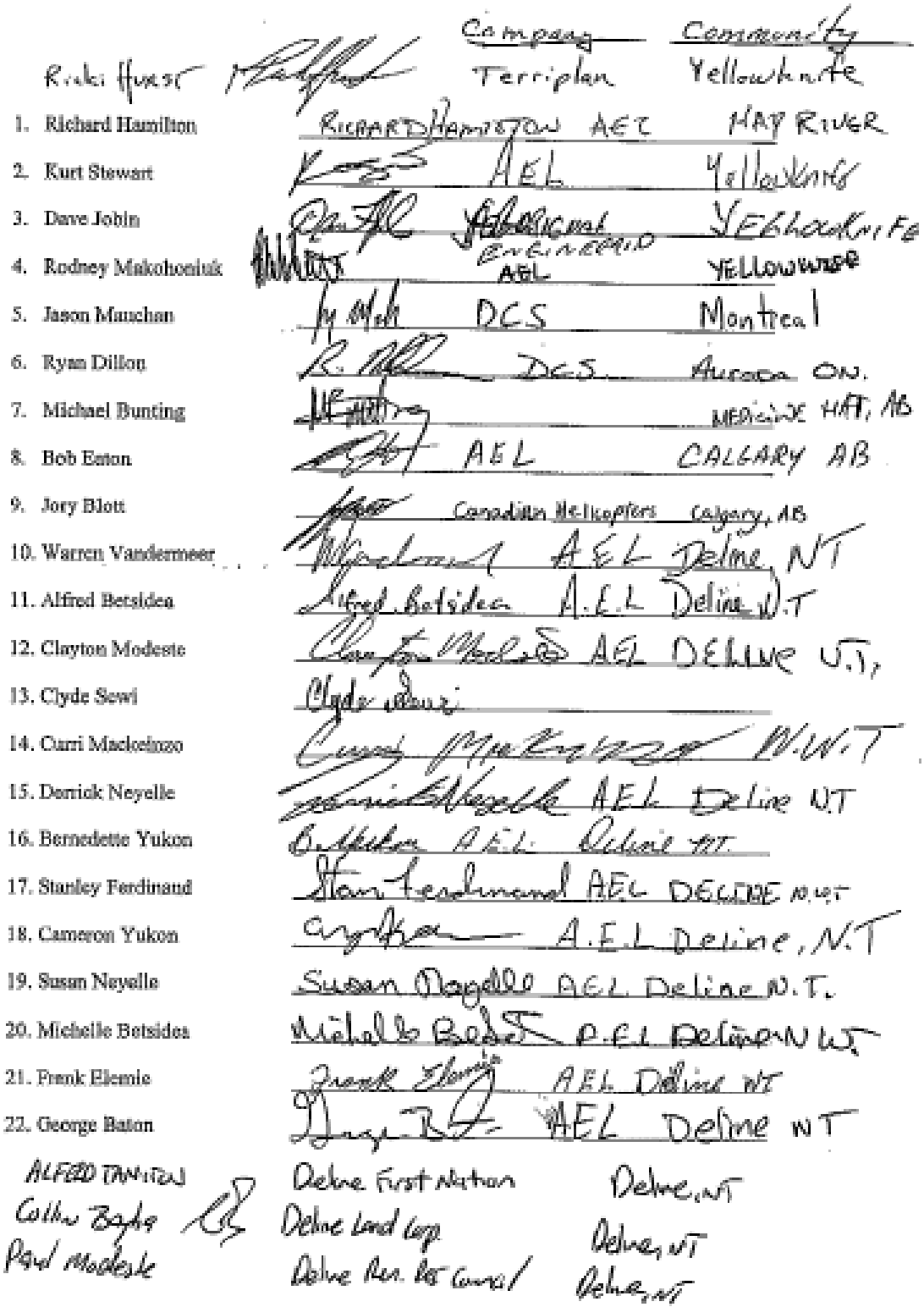
Instructor: John de Jong

Name (Please Print)	Employer (Please Print)	Signature
Rick HURST	Terriplan Consultants	
JOE BLONDIN JR.	D.R.R.C.	
Michael R. Neylle	Interpreter	
George Kenny	DRRC	
Orlena Modeste	Deline First Nation	
Alfred Taneton	Deline First Nation	
Garry E Lennie	Deline	

Attendees:
Your signature indicates that you have attended and understood the Radiation Protection Briefing given by the instructor, on the date, and at the location shown above.

Instructor:
I have given the Radiation Protection Briefing as indicated above in accordance with LLRWMO requirements and believe that the attendees listed here have the knowledge, skills and attitude to perform their work with radioactive materials safely while under 100% direct supervision.

Instructor's Signature:



	Company	Community
Ricki Hurst	Terriplan	Yellowknife
1. Richard Hamilton	RICHARD HAMILTON AEC	MAY RIVER
2. Kurt Stewart	AEL	Yellowknife
3. Dave Jobin	ABORIGINAL ENGINEERING	YELLOWKNIFE
4. Rodney Makohoniuk	AEL	YELLOWKNIFE
5. Jason Mauchan	DCS	Montreal
6. Ryan Dillon	DCS	Aurora ON.
7. Michael Bunting		MEDICINE HAT, AB
8. Bob Eaton	AEL	CALGARY AB
9. Jory Blott	Canadian Helicopters	Calgary, AB
10. Warren Vandermeer	AEL	Deline NT
11. Alfred Betsidea	A.E.L	Deline N.T
12. Clayton Modeste	AEL	DELINE N.T,
13. Clyde Sewi		
14. Carri Mackenzo		N.W.T
15. Dorrick Neyelle	AEL	Deline N.T
16. Bernedette Yukon	A.E.L	Deline NT
17. Stanley Ferdinand	AEL	DELINE N.W.T
18. Cameron Yukon	A.E.L	Deline, N.T
19. Susan Neyelle	AEL	Deline N.T.
20. Michelle Betsidea	A.E.L	Deline N.W.T
21. Frank Ekennie	AEL	Deline NT
22. George Baton	AEL	Deline NT
ALFRED TANTIEN	Deline First Nation	Deline, NT
Collin Bayha	Deline Land Corp	Deline, NT
Paul Modeste	Deline Ren. Res Council	Deline, NT

APPENDIX 2: Safety Briefing Document



Sawmill Bay - 2010 Site Worker Radiation Safety Briefing

History

First Nations people have used this place for countless years for hunting, fishing and trapping. At a camp near the bay, a logging operation to supply timbers for the Eldorado mine employed First Nations people before and after construction of the first airstrip at Sawmill Bay.

Eldorado's larger aircraft could land on skis, but not on water. In 1946, two ground crewmen and a "cat bulldozer" cut a 1500 m runway out of the bush near Sawmill Bay in nine days. Using this new airstrip, DC-3s delivered personnel, perishables and packaged goods to Great Bear and uranium ore and concentrates to Edmonton.

The original lodge was constructed in 1947 to service the airstrip in support of the DEW Line project and a Loran Beacon was installed to aid pilots flying to and through the area. The service buildings were added to and expanded over the years until 1960 when the mine closed.

The ore and concentrates were transported by barge to the landing, loaded onto a truck for delivery to the south end of the airstrip where they were loaded onto the aircraft. At times, these shipments were stockpiled at the landing and the airstrip awaiting transport. Spills of the ore occurred at these handling points.

Great Bear Lodge opened at the abandoned site in 1961 and provided summer fishing charter services until 1987. The second airstrip was built during this period. Occasional visitors still fly in to explore the site.

Radiation Surveys and Cleanup at Sawmill Bay

In 1993, during a survey of all portages and ore handling points along the uranium shipping route, spill locations of uranium ore and concentrates were found at the beach landing, in front of the Lodge and at the south end of the original 1947 runway. No evidence of spills was found on the haul roads or on the newer runway. A small number of trucks used to haul the ore showed some evidence of contamination on the deck and other crevices. No evidence of radioactive contamination was found in any of the buildings on site.

In 1996, an extensive detailed characterization and delineation survey was carried out. In addition to radiological work, the site was investigated to determine the presence of other chemical and mineral contaminants (asbestos, PCBs, hydrocarbons, etc.). A recommendation of the report was that soil exhibiting radioactivity levels that would be regulated for possession and disposal by the Atomic Energy Control Board (AECB) be excavated, containerized and shipped to a facility licensed to handle these materials.

In 1997, a cleanup crew providing the labour and assisted by Radiation Specialists, hand-excavated the three locations identified in the 1996 survey. 87 drums of uranium-contaminated soil were moved by aircraft to Yellowknife and from there to Chalk River, Ontario by truck. Over the course of the work, measurements for airborne radioactivity (dust) were run continuously near to and downwind from each controlled work area. All results showed no detectable levels of long-lived alpha emitters. Direct-reading dose meter instruments worn by each worker showed that the external doses from gamma radiation were very low. Routine surface contamination monitoring (frisking) of all workers' clothing upon leaving any controlled area showed no evidence of the presence of uranium or its decay products on their clothing, boots, gloves, etc even when handling the more active soils. Personal Protective Equipment (PPE), supplied, consisted of cloth coveralls, safety boots, cloth gloves and eye protection. Hardhats were optional because there was no overhead work. Respiratory protection (dust masks) were available for some who did use them, but as mentioned above, no long-lived alpha emitters (evidence of uranium) were found in the dust samples.

In 2007, the Low-Level Radioactive Waste Management Office (LLRWMO) conducted additional radiation surveys of the area. No new areas of uranium ore impacted soils were discovered on the Sawmill Bay site and surrounding area.

Description of the Hazards

The uranium ore and concentrates range in size from small black chips of rock down to sand-sized grains. Special radiation monitoring equipment is required to detect the radiation emitted by the uranium and its decay products. At Sawmill Bay, the uranium is found at locations where ore was mishandled; at the landing, in an area by the former lodge, at the south end of the older runway and, to a lesser extent, on trucks used to transport the ore.

In the native rock containing uranium, other metals including silver and arsenic are present. The uranium ore and concentrate contaminated areas at Sawmill Bay have shown the presence of arsenic at levels above Canadian guidelines for areas to be developed for residential or parkland use. Where you find the uranium, you will also find arsenic mostly locked into the particles of ore.

External Dose (Gamma Radiation)

The uranium ore and concentrates emit gamma radiation which can travel through materials such as soil, concrete and air. Gamma rays are a contributor to the external radiation "dose" we all receive on Earth. Everything around us emits some gamma radiation...like the soil, the sun, your house, even your body...it is part of the natural "background" radioactivity everyone gets by living on Earth. Some places on the Precambrian Shield, like the Port Radium area away from the tailings and waste rock, exhibit natural background levels of radiation that are similar to the residual levels left at Sawmill Bay.

If you were to spend an entire “work year (2000 hours)” inside the area that is contaminated with uranium at Sawmill Bay, you could NOT exceed 1 mSv, a level agreed internationally to be an acceptable maximum incremental dose to members of the “General Public” and in regulation here enforced by the Canadian Nuclear Safety Commission (CNSC).

A basic guideline of radiation protection is that, even if the dose an individual may get is considered acceptable, any “unnecessary” exposure should be avoided and the dose should be “as low as reasonably achievable” (ALARA).

Three things to minimize your gamma radiation dose are:

1. Reduce the amount of TIME you spend in an area known to exhibit gamma radiation in excess of background radiation.
2. Increase your DISTANCE from the source of gamma radiation. A few metres distance is sufficient to get to “background” at Sawmill Bay.
3. Place SHIELDING between yourself and the source of gamma radiation. This applies to persons in situations where higher levels are encountered. This is NOT the case at Sawmill Bay.

At Sawmill Bay, simply reduce the time you spend in the areas containing uranium ore.

Internal Dose (Ingestion and Inhalation)

Internal exposure is the result of eating or breathing radioactive material, and comes mainly from alpha and beta radiation emitted from the surface of particles of ore which may get inside your body. Alpha and beta emissions are not very penetrating and only travel a short distance in air. Alpha particles are blocked by a layer as thin as a piece of tissue paper. Beta particles are blocked by a slightly thicker layer of material like the plastic lens of safety glasses.

The small particles of ore, when eaten or breathed can get closer to sensitive internal parts of the body. Internal exposure is minimized by using good work practices such as not eating, drinking or smoking in areas known to contain uranium ore, wearing the proper protective clothing and eye protection, keeping dust levels from radioactive contamination low, and using appropriate respiratory protection if conditions indicate. One reason that all equipment and personnel working with radioactive materials are checked for contamination before leaving controlled work areas is to minimize the chance of internal exposure.

At Sawmill Bay, avoid contact with the uranium-contaminated areas and with the trucks used to haul the ore. A good practice when handling ANY materials that might be harmful to you is to wash your hands before eating or smoking.

General Recommendation

Note that the areas at Sawmill Bay contaminated with uranium ore have been identified and that work in these areas will NOT begin until 2011. Detailed worker safety briefings will be prepared to address working in these radiologically impacted areas at that time. Currently, all persons on site should be aware of the areas where the soils contaminated with uranium ore are present and where the ore haulage trucks are located. Casual access to these areas will not result in any significant dose to workers. Workers should avoid these areas and should not remove found materials from these areas. Workers should observe proper hygiene practice such as washing hands before eating or smoking if they have entered areas contaminated with uranium ore.

APPENDIX 3: Questions and Answers



Q. Why was the uranium ore a yellow colour?

A. John DeJong answered that all ore or "pitch blend" coming from the Eldorado Mine and all ore that he had ever worked is black. He noted that yellowcake is produced at refineries but that this was done in Port Hope, Ontario in the 1940s onward and never on Great Bear Lake to his knowledge. To do so would require bringing in tons of chemicals. He suggested that the material assumed to be yellowcake may have been elemental sulphur.

Q. Why are the maps of Contact Lake not more clear about the location of elevated radiation levels, and how do they compare to the flagging at Sawmill Bay?

A: John referred to contract drawing maps which were provided by DCS and noted the areas of elevated radiation levels on the maps and subsequently flagged by AEL. He also noted that the marking used at Contact was not the same as that at Sawmill Bay. John noted his surprise that the radiation surveys at Contact Lake were not apparently clearly shown on the available drawings, and offered to pursue this with INAC and others.

Q. How well do the areas flagged with tape at Sawmill Bay reflect the areas with elevated uranium levels?

A. He noted that the three barricaded and marked areas at Sawmill Bay are accurate and indeed conservative; the excluded areas were much larger (i.e. 5 times or more) than those indicated by testing and mapping. This was seen as safe but overly conservative. For example, the areas marked in yellow in the 2007 CARS surveys are not highly elevated but are only up to twice background level.

Q. Shouldn't all workers be told about this?

A. John emphasized how all workers, including the camp cooks, should have been told about these areas and the importance of avoiding them. He talked about how you really want to limit exposure and also prevent any possibility of spreading the uranium ore around.

Q. There was some concern expressed that the camp was located so close to one of the contaminated areas and a question as to whether people passing through and the helicopter propellers could spread the radioactive materials around.

A. John answered that moving across the areas with elevated radiation level could track the material around and that is why those areas are flagged. He noted that the airstrip with elevated radiation is no longer used by planes. He suggested that the helicopter landing is also suitably distant from an area with elevated levels that it would not cause contaminated soil or dust to be spread around.

John also answered that right now you could spend your entire work year on the site and your gamma radiation dose would still be below a level considered acceptable for the general public.

Q. *If the workers go for a walk there in the evening, do they have to be careful? What about picking berries?*

A. They want to be careful for a number of reasons. In terms of the elevated levels of radiation, it is best if they stay outside of the three flagged areas. In terms of picking berries they should not take berries from within those areas, or from around barrels, equipment or other disturbed areas where there may be other contaminants.

Q. *What does the uranium actually look like?*

A. Most of the uranium material here is the size of sand and black. It is not a problem when it is locked within the bedrock itself, but can become a problem once man has crushed it up and concentrated it. The rock may also contain small quantities of silver, arsenic, and other chemicals.

Q. *How do you know when you are being exposed? We are near those areas 16 hours a day.*

A. Nature does a good job in terms of covering up the radioactive material with decaying leaves and needles and that has been happening over the past 50 years. It is mostly below the surface and is not blowing around. The way you will be exposed to it will be by digging it up.

Q. *But when you are digging, is the material blowing around and getting in your lungs?*

A. In 1997 at Sawmill Bay we measured the radiation in the air as well as on the clothing of the workers as we were putting contaminated soil in drums. There was never an elevated level detected.

A. If you were to sit on that elevated area all work year you would still be exposed to less than 1 milli-seivert above background; a number which is considered safe for the general public. 2000 hours x 0.5 micro-seivert is 1 milli-severt. However, the level considered safe was reduced to this point (i.e. from 5 to 1 milli-severt above background) in 2000. My whole aim is that you keep your dose as low as possible

Q. *You talk about internal exposure but how would you end up eating the material?*

A. You could inhale fine dust into the lungs if the material is disturbed, but also if you handle the material and then eat a sandwich or smoke a cigarette without washing your hands. In 1997 there was no running water so every time a worker left the area they were measured using the pancake Geiger counter, but there was never any elevated level of radiation found on hands or clothes.

Q. *How come they never told us about the radioactive soil in the area (at Sawmill Bay)?*

A. They should have told you where the areas are. It should have been identified. They also should have explained the use of good hygiene. Although the levels of radiation there are so low that they are not considered a serious problem, you should have known.

Q. *But workers are still walking and working around the areas; aren't they in danger?*

A. It is perfectly safe to do that. The tape is placed in a very conservative way and even if you do walk across the area, the source material is at a low level. You would not be able to measure it in the dust there now and the pitchblende sand is very heavy; it doesn't tend to stick to you.

I would say the risk is very, very low but it is not zero. You can never say that there is no risk. My job is to help workers limit their exposure to radiation. I am telling you that the less you expose yourself to radiation – the better.

Q. *Why didn't AEL tell us about this and tell us to be careful about exposure to the area and about taking care of ourselves? No one told us there was radioactive uranium on site. There were no exclusion areas when we arrived at site. Even later when the areas were taped off, some workers would still walk through as a shortcut. We did work just outside of the flagged area on the strip with our barrel crushing. All they told us was that the area was "hot" but they didn't tell us why it was hot; I thought it might have been oil or PCBs.*

A. I see your concern and I think that it could have been handled better. We will certainly convey that message to AEL and INAC.

Q. *Why weren't the camp cooks given a briefing about the areas to stay away from?*

A. You should have been included. It is important to brief everyone in camp, including the support people, as we are doing now.

Q. *What about the old barrels and all of the army materials?*

A. I believe that DCS is sampling the materials including the barrels and you will be cleaning the barrels.

Q. *What about barrels and other stuff that is pretty much buried? We have found new caches of barrels which were not mapped out.*

A. Unfortunately, that is pretty typical. There are no guarantees that materials hidden or buried on the site have been located and uncovered. Remember too that the site was used for several different purposes over the years. You want to be particularly careful with the barrels because you never know what is in there.

Q. *What about the old barrels on the sand of the old air strip we found?*

A. This could have been barrels to mark out a grid for sampling purposes in 1996.

Q. *Shouldn't there be someone on site who knows about radiation?*

A. Yes, personally I believe that in the future there should be someone on site all the time that is trained to use the various meters and can check the workers, check workers boots and clothes, and check any new materials (e.g. barrels or equipment) found by the workers. This is something I will be recommending.

A. I would also suggest that we re-analyze the data concerning the location of elevated levels in soil and better map those three areas at Sawmill Bay. My feeling is that the flagging is too conservative and gives the impression that the areas of concern are much larger than they really are.

Q. *Are you going to be making your recommendations to AEL and INAC?*

A. Yes, we will.

Q. *When are you going to be working with that contaminated soil?*

A. We don't know at this time. It will be a coordinated effort of INAC with assistance of the LLRWMO. It will not be this year and could be in the next three to four years.

Q. *At the first health and safety presentation at Sawmill Bay it was noted that one Elder, Alfred Taniton, has poor English skills. Has there been any arrangement for translation?*

A. Ricki apologized and noted that we had understood that no translation would be necessary at Sawmill Bay. However, he also noted that a translator (Michael Neyelle) would be present in Délı̨nę on the two tomorrow Elder Alfred Taniton subsequently attended one of those Délı̨nę sessions.

Q. *What about the dump truck at the Délı̨nę dump that was brought back from Port Radium.*

A. In response to this concern, John and Ricki went to the dump that afternoon and checked all the dump trucks there with the scintillometer and Geiger counter. They reported back in the afternoon session that they couldn't find any elevated levels of radiation on any of the trucks.

APPENDIX E

AEL SITE-SPECIFIC HEALTH & SAFETY PLAN (CD ROM ONLY)

SITE SPECIFIC HEALTH and SAFETY PLAN (SSHSP)

PROJECT ID: *GREAT BEAR LAKE PHASE 1 CLEAN-UP*

SUBMITTAL ID: *AEL GBL PHASE 1 – SSHSP 2011 – version 2*

DATE OF SUBMISSION: June 3, 2011

SUBMITTED BY: Johanne Black (AEL)

SUBMITTED TO: Mike Bernardin (PWGSC), Corrine Stokowski (PWGSC)

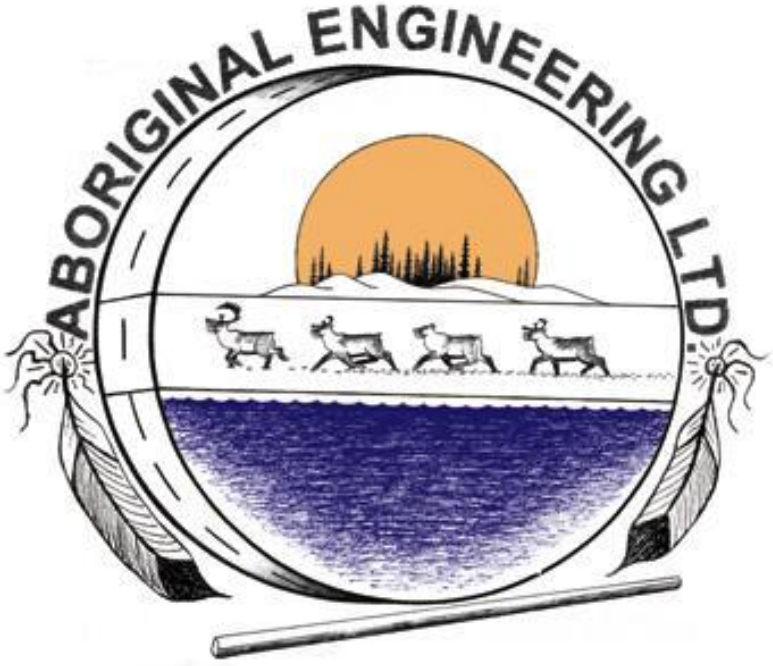
CC.: Bob Johnson (AEL Project Manager); John Mackenzie (AEL H&S Manager)

REVISION LIST

The following table tracks the process of the Draft Site Specific Health and Safety Plan (SSHSP) revision and ensures that all stakeholders have the most up to date copy of the SSHSP. The table must be updated each time a revision is made to the SSHSP.

Table 1: SSHSP Revision Table

VERSION # or REVISION #	AEL APPROVAL	DATE	CROWN APPROVAL	DATE	SECTIONS REVISED	COMMENTS	REVISION DISTRIBUTION DATE
Version #1	Bob Johnson, Project Manager	July 15, 2009			ALL	FIRST APPROVAL	
Revision #2	Bob Johnson, Project Manager & John Mackenzie, H&S Manager	June 2, 2011			ALL	SECOND APPROVAL	
Revision #3							



Great Bear Lake Phase I Remediation Project

Site Specific Health and Safety Plan

TABLE OF CONTENTS

1 SITE SPECIFIC INFORMATION

1.1 Site Location

Great Bear Lake Phase I Mine Clean-up, NWT
Latitude: 65 50 N
Longitude: 118 25 W
Site Phone #: TBD
Site Fax #: TBD

1.2 Project Management Staff & Emergency Numbers

Name	Position	CONTACT #	ORGANIZATION
PROJECT MANAGEMENT			
Michael Bernardin	Project Manager	Ph: (780) 497-3886 Cell: (780) 982-1887	Public Works and Government Services Canada
Jessica Mace	Project Manager	Ph. (867) 669.2499	Indian and Northern Affairs Canada, Contaminant and Remediate Directorate
Joel Gowman	Acting Project Manager	Ph. (867) 669.2499	Indian and Northern Affairs Canada, Contaminant and Remediate Directorate
Bob Johnson	Project Manager, Corporate Safety Officer, off-site Emergency Response Coordinator	Ph. (867) 669.9481 Mobile (867) 445.4523 Fax (867) 669.9482	Aboriginal Engineering Ltd.
Brad Landry	Site Superintendent, Level 2 Mine Supervisor	Ph. (867) 669.9481 Mobile (867) 445.4529	Aboriginal Engineering Ltd.
Bianca Siebrand	Medic	Ph: TBD	Colonel R,B Eaton School of Survival
John Mackenzie	Health and Safety Manager	Ph: 867-920-7288 ext 245	Tlicho Logistics
Jason Mauchan	Departmental Representative	Ph: TBD	DCS Consulting
Marie Douglas	Logistics Coordinator	Ph. (867) 669.9481 Mobile (867) 445.4527	Aboriginal Engineering Ltd.

Table 1: List of Emergency Numbers

Name	Position	CONTACT #	ORGANIZATION
SPILL RESPONSE NUMBERS			
NWT 24 Hour Spill Reporting Line	GNWT and INAC	Ph. (867) 920.8130 (call collect if required)	Triggers multiple governmental and private organizations for spill response
CANUTEC	Federal Department of Transportation	Ph. (613) 996.6666 (call collect if required)	Triggers multiple governmental and private organizations for spill response for dangerous goods
Bob Bailey	NWT Chief Environmental Protection Officer	Ph. (867) 873 7401	Government of the Northwest Territories
Clint Ambrose	Resource Management Officer	Ph. (867) 669.2794 Fax (867) 669 2720	Indian and Northern Affairs

Name	Position	CONTACT #	ORGANIZATION
Ken Dahl	Resource Management Officer	Ph. (867) 669.2757	Indian and Northern Affairs
Rhonda Bachelor	Corporate Environment	Ph. (867) 873.7063	Government of the Northwest Territories Department of Highways
MEDICAL EMERGENCY			
Déline Health Centre	Nurse in Charge	Ph. (867) 589-5555	Government of the Northwest Territories
24 Hour - Stanton Territorial Emergency Evacuation	N/A	Ph. (867) 669 4115 (call collect if required), or Ph. (867) 669-4111 (Yellowknife Hospital) or Ph. (867) 873-2222 (Yellowknife Ambulance)	Triggers the resources required for an emergency evacuation for an injured or ill employee
DISASTER RELIEF			
Canadian Red Cross	-	Ph. (780) 423.2680 Fax. (780) 428.7092	Canadian Red Cross
AIR CHARTERS			
North Wright Air	Air Charter – Plane	Ph. (867) 587-2288 Fax (867) 587-2962	Private Company
Air Tindi	Air Charter – Plane	Ph. (867) 669.8200 Fax. (867) 669.8219	Private Company
Arctic Sun West	Air Charter – Plane	Ph. (867) 873.4464 Fax (867) 873.9334	Private Company
Summit Air	Air Charter – Plane	Ph. (867) 669.9789 Fax (867) 669.9649	Private Company
Great Slave Helicopters	Air Charter - Helicopter	Ph. (867) 873.2081 Fax (867) 873.6087 After Hours Ph. (867) 873.2081	Private Company
Canadian Helicopter Ltd.	Air Charter - Helicopter	Ph. (867) 669-0779	Private Company
OCCUPATIONAL HEALTH AND SAFETY			
Michelle Pond	Health and Safety Coordinator	Ph. (867) 669.2770	Indian and Northern Affairs Contaminant and Remediate Directorate
Peter Bengts	Chief Inspector of Mines	(867) 669 4412	NWT Workers Compensation Board – Mine Safety
FIRE EMERGENCY			
Roger Fraser	Forest/Wildlife Officer	Ph. (867) 920.6456 Fax (867) 873.6230	GNWT Forest Services
Reid Douglas	Fire Chief	Ph. (867) 766.5501	Yellowknife Fire and Rescue Services
Deline Fire Response	N/A	Ph. (867) 589-2222	Deline Fire Response
24 Hour Forest Fire Emergency Phone Number (NWT Fire)	N/A	Ph. 1-877-698-3473 Ph. (867) 873-2222	Yellowknife Fire and Rescue Services
RCMP			
Déline RCMP	Déline Headquarters	Ph. (867) 589-1111	RCMP
Yellowknife RCMP	Yellowknife Headquarters	Ph. (867) 669-1111	RCMP
SAHTU LAND AND WATER BOARD			
Rhianna Leighton	Land Technician	Ph. (867) 598-2413	Sahtu Land and Water Board
LAND USE INSPECTOR			
DIAND Land Use Inspector	Land Use Inspector	Ph. (867) 587-2911	Indian and Northern Affairs

2 SITE SPECIFIC HEALTH AND SAFETY PLAN

2.1 Introduction

The site specific health and safety plan (SSHSP) is a governing system document that makes up Aboriginal Engineering Ltd.'s Health and Safety System in the Northwest Territories.

The Document will be used as a reference document for all Aboriginal Engineering Ltd. employees, supervisors, field staff and management, its purpose is to:

- Promote health and safety;
- Protect legal rights of employees;
- Protect life and health;
- Maintain WCB costs at a minimum;
- Enable supervisors and employees to fulfill their legal duties and show due diligence;
- Produce positive side effects of a well-managed Health & Safety Program that includes increased productivity, improved quality service and customer satisfaction.

2.2 Prime Contractor

This SSHSP is designed for guidance of Aboriginal Engineering Ltd. employees and managers in matters of health and safety. There is a significant difference in responsibility and liability between Prime Contractor and Sub-Contractor.

When Aboriginal Engineering Ltd. acts as a Prime Contractor, we are legally responsible for the health and safety of all employees, including other sub-contractor, on site. This responsibility mirrors that of an employer of a company, facility, etc., hence, it carries an increased:

a) liability,
b) regulatory responsibility, and
c) care (beyond that of a professional/engineer's liability or code of ethics).

It is recognized that the responsibility of sub-contractor is less than that of a Prime Contractor.

Acting as Prime Contractor, it is the responsibility of Aboriginal Engineering Ltd. to ensure that all sub-contractors complete their work in conformance to this Health and Safety Management Plan as a minimum.

2.3 Health and Safety Policy Statement

Aboriginal Engineering Ltd. is committed to providing and maintaining a safe and healthy work environment for its employees and sub-contractors, through the use of a comprehensive health and safety program. It is the responsibility of the management and supervision of Aboriginal Engineering Ltd to ensure that all personnel involved on any project are protected and that unforeseen hazards are eliminated.

To meet this objective, management, supervisors and employees will promote and support the Health and Safety Program. Managers will ensure that;

1. Supervisors and employees understand their responsibilities regarding health and safety.
2. All project members are informed of the policy, and the health and safety program.
3. Industry standards are to be met as a minimum.

Employees will be required to follow the rules set out in the Health and Safety Policy adopted by Aboriginal Engineering Ltd.

Managers and supervisors are responsible to ensure that the Health and Safety Standards are followed by all individuals involved on the projects undertaken.

Aboriginal Engineering Ltd. recognizes that it cannot meet this goal without full cooperation from all personnel. This cooperation is needed and expected and will be adopted as part of the team building skills from the project teams.

2.4 General Practices

Administration

1. Aboriginal Engineering Ltd., will develop, implement, and maintain an Occupational Health and Safety System, consisting of specific Occupational Health and Safety (OHS) Programs, which will fulfill Aboriginal Engineering Ltd. Policy Statement on Occupational Health and Safety.

2. Aboriginal Engineering Ltd. will communicate its Health and Safety Policy to all employees by:
    a) Posting the policy in company offices
    b) Reviewing the policy with every new employee during orientation

Philosophy

3. The concept behind Aboriginal Engineering Ltd. Occupational Health and Safety System is that all members involved on a project are part of a team that work together to meet the objectives of the project. Part of the objectives is to work in a healthy and safe environment.

4. Every employee has the right and responsibility to insure a safe work environment for all on site personal.

5. Aboriginal Engineering Ltd. recognizes its responsibilities as an –Employer":
    a) For the health and safety of all of its own employees, contract employees, and employees on loan to the Company, whether employed in the office or in the field.
    b) On a work site, for the health and safety of the employees of any other –Employer" or –Sub-Contractor", under contract with Aboriginal Engineering Ltd. to work at that work site.

c) And at home. It is important to the management of Aboriginal Engineering that all project members have a healthy and safe home life as well.

Occupational Health and Safety Act

6. Aboriginal Engineering Ltd. will set OH&S legislation as the minimal standards to meet. Specific legislation includes the Canada Labour Code, National Building Code of Canada, National Fire Code of Canada, Worker‘s Compensation Board, the applicable OH&S Regulations, and Territorial and local statutes and authorities.

7. Aboriginal Engineering Ltd. Safety Policy or Safety Procedures does not take precedence over the requirements of the aforementioned acts and regulations, unless it exceeds those requirements.

8. The Company‘s Managers and Project Managers shall administer compliance by the Company‘s personnel with all requirements of the Occupational Health and Safety Act and its Regulations.
    a) On any work site where Company personnel are present on a continuous basis, the Company shall keep available, at least, the following:
        i. a current copy of the Company‘s Safety Manual,
        ii. a current copy of the Provincial/Territorial Occupational Health and Safety Act, and
        iii. a current copy of the Provincial/Territorial General Safety Regulation.
    b) Each Department shall maintain a current copy of the above documents for inspectors and supervisors to access as required. To review specific regulations, refer to Section 13.

Responsibilities

9. It is the responsibility of the Supervisors to ensure that all employees are properly instructed to do their jobs safely, and that employees comply with applicable rules, regulations, and practices. Supervisors shall take prompt corrective action when unsafe acts or conditions become evident.

10. Employees are required to observe and follow all safety rules and regulations and conduct themselves in a manner that does not endanger the well being of themselves, others, or cause property damage.

11. Visitors shall comply with the Company Health and Safety System.

    ✓ AEL shall maintain at site CSA approved rubber boots, hard hats with liners, safety glasses, and high-visibility vests for use by visitors

12. Subcontractors will be required to meeting applicable requirements of Aboriginal Engineering Ltd. OHS Policy and Programs when their workers are employed or under direct supervision of Aboriginal Engineering Ltd.

Safety Audit

a) AEL Project Manager, or appointed Safety auditor to inspect the site on a monthly basis
b) Safety audit to include review of site safety and security, and environmental and regulatory compliance.
c) Findings shall be reported to the PWGSC appointed Resident Engineer
d) Safety audit shall identify corrective measures and procedures

Worker Orientation Seminar
All workers are to be indoctrinated on site procedures during a 1 day Worker Orientation Seminar. Worker Orientation Seminar is to be held for supervisors and project personnel at site. When required, Worker Orientation Seminar will also be conducted on-site for new employees who have not attended the earlier Worker Orientation Seminar.

2.5 Management Responsibilities

Aboriginal Engineering Ltd. management will be responsible for the Company Safety Policy while at all times encouraging individual initiative. The responsibilities of management include:

a) Appointing a Corporate Safety Coordinator to oversee Aboriginal Engineering Ltd. Safety Program, and ensuring that the Safety Program meets or exceeds professional standards or provincial/federal Safety Regulations. Most importantly, establishing the policy guidelines for Aboriginal Engineering Ltd. personnel to work in an efficient, cooperative, safe, and healthy manner.
b) Assign sufficient budget to projects so that supervisors can successfully implement and maintain the health and safety systems.
c) Promote the health and safety of the company.
d) Ensure that audits are performed on the systems and review the policies.
e) Reviewing all accident investigation reports to ensure they are serving their intended purpose and initiating change to prevent accidents from reoccurring.

2.6 Site Supervisor Responsibilities

The Supervisor‘s responsibilities include:
a) Implementation of the health and safety policy of Aboriginal Engineering Ltd.
b) Ensure compliance with:

- Local safety regulations;
- WHMIS legislation; and

c) Regular Site inspections for compliance with safety codes and this manual.
d) Ensure that safety meetings are attended and that daily toolbox meetings are being performed.
e) Ensuring employees are properly trained and new employees are orientated to the Company‘s Safety Procedures.
f) Supplying PPE and ensuring its proper use.
g) Reporting serious accidents to the appropriate authorities, including when necessary:
    - Provincial authorities as required in their regulations
    - RCMP or local Police office

- Owner or developer
- Company manager
- The employer of the injured employee

h) Act to eliminate unsafe working conditions that may cause a threat to health and safety.
i) Ensure that all safety reports are reviewed and any recommendations made are investigated.
j) Designating or hiring safety personnel, if certain safety requirements warrant, such as:

I. Floor Fire Marshall
II. Site Safety Manager
III. First Aid Technician (Standard Level)
IV. A Work Site Safety Representative
V. Work Site First Aid Personnel

2.7 Site Health and Safety Coordinator Responsibilities

The Site Health and Safety Coordinator has the following responsibilities and authority:

a) To implement the program and monitor its effectiveness
b) To attend any safety meeting at any workplace
c) To consider and act upon any recommendations dealing with safety
d) To recommend to Aboriginal Engineering Ltd. , new safety practices and changes to safety practices and general policy with respect to occupational health and safety
e) To direct employees and supervisors to correct any violations of the Provincial/Territorial or Company safety regulations
f) To consider recommendations from employees regarding occupational safety and health matters.
g) To promote safety awareness and activities within the work force.
h) To audit the Safety Program and report the findings to management

2.8 Site Employee Responsibilities

All employees are required to observe their personal safety and to assist the safety of all team members. This basic responsibility includes, but is not limited to, the following:

a) Reading the Corporate Health & Safety Manual
b) Maintaining cleanliness within the work area
c) Promptly reporting all accidents and injuries, no matter how slight and obtaining required medical attention
d) Immediately reporting unsafe conditions to the supervisor
e) Complying with the job applicable Safety Rules and Provincial/Territorial Safety Regulations
f) Complying with applicable safe work procedures
g) Cooperating in accident investigations in order to help prevent reoccurrence

Site personnel are the first line of defence to ensure that all team members are following the safety rules of the job site and the requirements of this document.

3 COMPANY SAFETY RULES

3.1 Safety Execution Plan

a) Policy Statement
   i. Contained in Aboriginal Engineering Ltd. Safety Policy and Procedures Manual, a copy is included.

b) Supervision
   i. As per the NWT Mine Health and Safety Act, AEL shall ensure that all workers are on-site are to be under the supervision of a Level II Supervisor if no drilling or blasting is done on-site
   ii. If drilling and blasting is done on-site, all workers shall be under the supervision of an open pit shift boss certificate
   iii. Any person that supervises a portion of the work site shall possess a Level I certificate.

c) Site First Aid
   i. All vehicles, including All Terrain Vehicles where applicable, will contain safety materials such as:
      - First Aid Kit
      - Fire Extinguisher
      - White Out Kits
      - Tow Rope
      - – Spare tires
      - Jackal
      - Radio
      - Satellite Phone/cell phone
      - Hand Held GPS
   ii. Any minor first aid requirements will be handled directly by the Supervisor. Any perils requiring more specialized attention will be handled at the Managers on-site First Aid facility.

d) Safety Meetings
   i. Daily Tool Box Meetings will outline the work that is required for the day and discuss any safety issues relating to the work or the project.
   ii. Due to the nature of the work proposed it is deemed that weekly safety meetings will be adequate. Scheduling will be decided once final crew allotments have been verified.
   iii. Supervisors will be responsible for chairing meetings and taking minutes. A copy of each week‘s minutes will be made available to the Manager and forwarded to Aboriginal Engineering Ltd. Yellowknife office.

e) Safety Audits by Contractor
   i. Safety audits will be undertaken by Aboriginal Engineering Ltd.‘s Health and Safety Manager.
   ii. These audits will occur in conjunction with monthly visits to site.
   iii. A bi-monthly assessment of deficiencies in health, safety, medical/first aid supplies shall also be performed. This list shall be compiled by the AEL Site Supervisors,

and submitted to the Resident Engineer, along with a schedule for upgrading deficiencies.

f) Accident and Incident Reporting
   i. Contained in Aboriginal Engineering Ltd. Safety Policy and Procedures Manual
g) W.H.M.I.S. Training
   i. All employees of Aboriginal Engineering Ltd. or their sub-consultants will have completed W.H.M.I.S.
   ii. W.H.M.I.S. training may be provided on-site by AEL.

3.2 Company Safety Rules

All Aboriginal Engineering Ltd. employees are required to follow the following rules as part of their employment contract with the company. The rules are:

1. The consumption of alcoholic beverages and illicit drugs is strictly forbidden.
2. Ensure that all required emergency white out supplies are in vehicles before traveling. Book your travel and let people at your destination know the expected time of your arrival.
3. Running, horseplay, scuffling, or fooling around is strictly forbidden on the job.
4. Theft and vandalism of Company property will not be tolerated.
5. Seat Belts must be worn at all times. The only exception to the seat belt use is if it is not recommended on ice road travel.
6. Do not wear torn or loose clothing that could be caught in equipment, machines, tools or other objects, and be aware of the dangers associated in wearing rings, wrist watches, bracelets, or dangling neckwear.
7. Floors must be clear of oils, grease, refuse, or other types of materials, which may create a slipping hazard.
8. Store hoses, cables, ropes, wires, etc. when not in use to prevent tripping hazard.
9. Identify, store, and handle hazardous material in accordance with the Workplace Hazardous Materials Information System (WHMIS) regulations.
10. Do not remove guards, except for repair or adjustments, and replace them before operating equipment.
11. Never leave loose tools or materials where there is a danger of them falling.
12. Always face a ladder when ascending or descending it.
13. Maintain good house keeping, keep the truck and work areas clean.
14. Never smoke in a –NO SMOKING" area.
15. Always store gasoline, oil, grease, and other flammable liquids clear of the work area. Prominently display –NO SMOKING" signs in the storage areas.
16. Always turn in fire extinguishers to Supervisor immediately after use for recharging.

3.3 Camp Rules and Security

All Aboriginal Engineering Ltd. employees are required to follow the following rules as part of their employment contract with the company. The rules are:

1. Property damage – Theft, vandalism, and/or damage to any Aboriginal Engineering Ltd. property will not be tolerated.
2. Vehicle and equipment use – No vehicles or equipment (including snow machines and ATVs) are to be used for recreational purposes within the camp or onsite. Only trained and authorized persons are permitted to operate equipment and/or vehicles.

3. Smoking – Smoking will only be permitted in smoking areas. No smoking is allowed in sleeping quarters, washroom area, and kitchen/dinning area. All none smoking areas are equipped with smoke detectors/alarms and at no time are the smoke detectors/alarms permitted to be turned off or disabled.
4. Alcoholic beverages – The possession and/or consumption of alcoholic beverages is strictly forbidden anywhere in camp or onsite.
5. Drugs – The possession and/or consumption of illegal drugs is strictly forbidden anywhere in camp or onsite.
6. Firearms – The possession or use of firearms, ammunition or other lethal weapons, unless approved by the Project Manager, are strictly forbidden.
7. Security – Only authorized personnel are permitted onsite and within the camp. A list of persons approved at the site will be maintained by the Site Superintendent. All persons entering the camp must check in with the site health and safety coordinator and attend a site orientation meeting prior to any site activities.
8. Housekeeping – The camp and work areas are to be maintained in a clean and orderly manner. All wastes are to be disposed of in waste receptacles. Keep stairways, doors, access ways, and ladders clear of materials. Cleanup all spills immediately.
9. PPE – All personnel entering work areas must wear these minimum requirements: full length pants, shirt, CSA safety boots, CSA hard hat, CSA safety glasses, and reflective vest/outerwear. In addition, each personnel shall don Tyvek coveralls, half-mask respirators, and dosimeters where required in the work area.
10. Nuisance – No horseplay, harassment, verbal abuse, or shouting will be allowed in the camp or work areas.
11. Emergency procedures, exits, signals, and alarms – In the case of an emergency, all personnel are to follow the applicable emergency procedures. The location of every emergency exit will be posted in a conspicuous location for all personnel to observe. Emergency signals and alarms shall be placed such that they are audible and visible throughout the camp. During an emergency situation all personnel are to report to the muster station immediately and await further instructions.

The following activities will result in dismissal and immediate removal from site upon the first available plane as follows:

- tampering with smoke or fire detectors/alarms, any other safety equipment or electrical outlets/fixtures;
- possession and/or consumption or use of alcohol or illegal drugs;
- possession or use of firearms, ammunition or other lethal weapons unless approved by the Project Manager;
- fighting, physical violence, stealing, vandalism or destruction of property; and
- harassment in any form.

4 WILDLIFE RESPONSE PLAN

4.1 Potential Encounters

The following animals, if encountered during the Great Bear Lake Phase 1 Work, could present a risk to the safety of employees and visitors:

- Black Bear;
- Grizzly Bear;
- Wolverine;
- Moose;
- Caribou;
- Wolf
- Muskox

Of the above listed animals the bears present the greatest risk to human health as they are likely to be encountered in the Barren Lands. As such, the plan will focus on bear encounters. However, the basic principles of the plan can be applied to other dangerous animals such as a wolverine, if encountered.

4.2 Roles and Responsibilities

The following outlines the roles and responsibilities of employees with respect to the Wildlife Contingency.

Table 2: Roles and Responsibilities With Respect to Wildlife Contingency

POSITION	RESPONSIBILITY
Project Manager	Preparing Wildlife Contingency Plan and ensuring the necessary resources are available to efficiently implement the plan Ensuring the necessary training resources are available and that a training program based on the Wildlife Contingency Plan is developed Implementing the Wildlife Contingency Plan at site when required (i.e., Primary Designate) Ensuring that Firearms and ammunition are stored as per regulations
Site Superintendent	Issuing Firearms and ammunition Ensuring that the response team is properly trained and certified as per the Plan Documenting Training Reporting bear encounters as per the Wildlife Response Plan Issuing bear deterrents
Health and Safety Officer	Providing training to employees prior to Work as per the Wildlife Response Plan Responding to wildlife encounters
Employee	Immediately reporting wildlife encounters as per regulations to the designate Responding to wildlife encounters as per the Wildlife Response Plan
AEL Field Engineer	Monitoring the Wildlife Response Plan actions from camp to ensure the safety of the response team

Training

All persons entering the site are to undergo wildlife safety training. The Health and Safety Officer is responsible to provide such training to employees prior to any Work or site visits. The training is to include the information contained herein and the viewing of the video –Working in

Bear Country for Industrial Managers, Supervisors and Workers". The trainees are to complete a test following the training and are to sign off that the training has been issued, using the form titled Bear Safety Training Checklist attached in Appendix A.

Acts, Regulations and Guidelines

The following Wildlife Contingency Plan has been developed in accordance with:

- DIAND EH&S SOP – 017 (A) & (B);
- the Northwest Territories Hunting Regulations; and
- the Firearms acts and its applicable regulations.

In addition the following publications were referenced:

- Safety in Black and Grizzly Bear Country, RWED; and
- Canadian Firearms Safety Course Student Handbook, Aiming for Safety, Department of Justice Canada.

Emergency Numbers

Emergency Numbers are attached in section 1.2 of this plan at the beginning of this document.

Firearm and Ammunition Protocol

Ammunition

All ammunition must be of .23 or larger calibre. The empty cartridges are not to be less than 44mm in length. Ammunition of the following type is NOT to be used:

- rim fire;
- non-expanding bullets;
- steel-jacketed;
- tracer or
- prohibited ammunition, such as
    - any cartridge that can be fired from a commonly available semi-automatic handgun or revolver and has projectile specifically designed to penetrate body armour;
    - any projectile that can ignite on impact, is made to be used in or with a cartridge, and is not more than 15mm in diameter;
    - any cartridge that can be fired from a shotgun and contains projectiles, know as flechettes, or any similar projectiles.

Only center-fire ammunition is permitted. All ammunition is properly fit the firearm that is being used.

Firearms

Non-restricted firearms are to be used at the Great Bear Lake site, including:

- rifles; and‘
- shotguns.

Only under exceptional circumstances is a handgun that is not a prohibited firearm to be used. The use of such a firearm will require a restricted firearm license and pre-approval by the Crown.

Firearms are only to be used by the following persons:

- Wildlife Monitor;
- Health and Safety Officer; and
- Site Superintendent.

No prohibited devices are to be used with firearms, including but not limited to,

- any part of a weapon or accessory of a weapon that is prescribed by regulation to be a prohibited device;
- a handgun barrel that is equal to or less than 105 mm in length;
- a device designed to muffle or stop the sound of a firearm (silencer);
- a cartridge magazine prescribed by regulation to be a prohibited device; and
- replica firearms.

Unauthorized use of a firearms and failure to abide by the above listed points are very serious offenses and will result in immediate removal from site and potential charges under various legislation.

Firearms are not to be loaded when not in use.

Storage

Ammunition must not be stored along with any flammable goods. The ammunition is to be stored along with the firearm in the Site Superintendents room. The firearm and ammunition are to be locked in the closet at all times when not in use. No trigger lock is required as the firearms and ammunition are strictly for use in controlling animal predators in a remote wilderness area. Firearms are to be Proven Safe and stored unloaded.

License Requirements

All persons who carry a firearm must have a valid Federal Possession and Acquisitions License. The license must be available for issuance to an inspector upon request. Copies of the license are to be stored in personnel files. Wildlife response team members shall be experienced in using firearms at remote Northern locations and will have a hunting background. In addition, all firearm(s) are to be licensed.

Issuing Firearms

Only the Site Superintendent can issue firearms. A logbook will be maintained and stored with the firearms that tracks the following:

- the date that the fire arm was issued;
- the type of firearm that was issued;
- the number of ammunition issued;

- the type of ammunition issued;
- the person issuing the firearm;
- the person receiving the firearm; and
- the reason for issuing the firearm.

The above information is to be entered into the form titled Tracking Firearm Issuance attached in Appendix A.

However, in the event of an emergency, the logbook can be filled out following the issuance of the firearm. Notwithstanding, the logbook must be filled out prior to issuing the firearm for any other reason than an emergency situation. An emergency situation is defined as any time a bear or other dangerous animal has been spotted within five km of the camp or is threatening the health and safety of an employee.

Tracking Ammunition

If a firearm is discharged the number of rounds and the reason for discharging are to be recorded. Such information is to be recorded by the Site Superintendent in the form titled Tracking Firearm Use attached in Appendix A.

BASIC SAFETY PRINCIPLES

Basic ACTS of Safety for Firearms

The four basic Acts of firearm safety are as follows

1. **A**ssume every firearm is loaded.
    a. Regard any firearm as a potential danger;
2. **C**ontrol the muzzle direction at all times.
    a. Identify the safest available muzzle direction;
    b. Keep the firearm pointed in the safest available direction at all times;
    c. The muzzle of a firearm **MUST NOT** be pointed towards yourself or any other person at any time. Pointing firearms at persons is a federal offense and will treated as a serious incident.
3. **T**rigger finger must be kept of the trigger and out of the trigger guard.
    a. Resist the temptation to put your finger on the trigger or inside the trigger guard when you pick up a firearm;
    b. Accidental discharge is far more likely to occur if your finger is on the trigger or inside the trigger guard;
4. **S**ee that the firearm is unloaded when not required to be loaded for Wildlife Response – **PROVE** it safe
    a. Do not initially handle the firearm unless you can PROVE it safe;
    b. Check to see that both chamber and magazine are empty. Do this any time you initially handle a firearm
    c. Pass or accept only open and unloaded firearms. This is an **IMPORTANT HABIT** to develop.

PROVE it Safe

Proving a firearm safe requires the following step to be completed in the listed order:

1. **P**oint the firearm in the safest available direction (Not at yourself or any other person);
2. **R**emove all cartridges;
3. **O**bserve the chamber;
4. **V**erify the feeding path; and
5. **E**xamine the Bore.

The firearm is now unloaded and safe until it leaves the direct control of the person who unloaded and completed proves it safe procedures on the firearm.

Social Responsibilities of a Firearm User

The following is a summary of the social responsibilities of a firearm user:

- Store all firearms and ammunition properly;
- Explain firearms safety to all persons who are within the general area of the firearms storage;
- Remove firearms from situation of potential violence;
- Act sensibly and carefully while around firearms;
- Never consume drugs or alcoholic beverages when around firearms;
- Always get permission when shooting on someone else‘s property;
- Maintain your firearm in good working condition;
- Have your eyesight checked regularly;
- Avoid firing near any buildings or roads, unless an emergency situations requires otherwise;
- Know and respect firearms regulations and local by-laws; and
- Wear safety equipment.

Preventing and Responding to Bear Encounters

Distinguishing Between Grizzly and Black Bears

Grizzlies and black bears are generally dormant during the winter months. They usually enter dens in October or November, and emerge in April or May. However, a bear may leave its den early during warm winters or if it is disturbed. Up to four (but usually two) squirrel-size cubs are born in the den in midwinter.

Black bears are sometimes confused with grizzly bears because the two species may appear similar in size, and both vary in color from black to brown, cinnamon or blond. The two species can be distinguished by several physical features.

Grizzly Bears

Grizzlies have a stout, chunky build, a prominent shoulder hump, a massive head with an upturned muzzle or "dishface," and long claws (about 6- 8 cm). Adult male grizzlies can weigh more than 300 kg. Females are smaller than males.

Black Bears

Black bears have a smaller, less robust build, flat or straight shoulders, a straight muzzle, and short, curved claws. Adult males average 100-150 kg, but can weigh more than 275 kg. Females are smaller than males.

The following figure presents the visual features that can be used to distinguish a black bear from that of a grizzly bear.

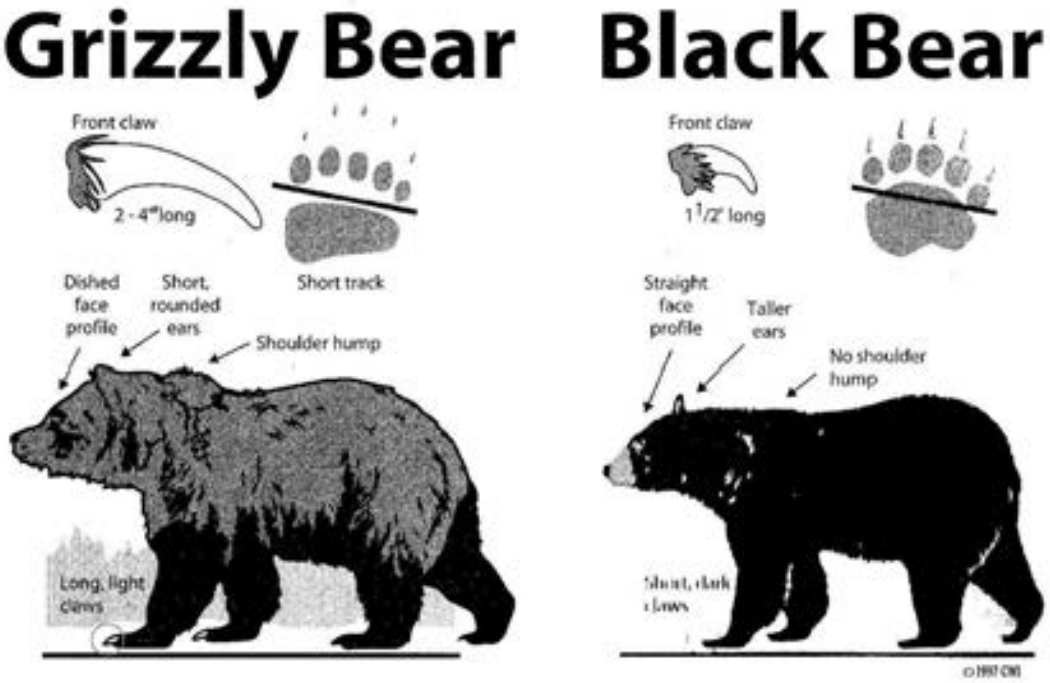


Figure 1: Distinguishing Features of Grizzly and Black Bears

Eating Habits

Grizzly bears and black bears are both omnivorous. That is, they eat whatever is available. They rely mainly on vegetation, such as roots, grass and berries, but also eat fish, remains of dead animals, insects, small mammals such as ground squirrels, and garbage. Grizzlies also prey on moose, muskox and caribou. Grizzly bears have been known to prey on black bears. Both animals are extremely dangerous when near a food source as they will aggressive defend such resources.

Behaviour

A bear‘s reaction to you will be influenced by many factors and is therefore never entirely predictable. Given the opportunity, bears usually avoid people. Some bears are more dangerous or aggressive than others. Old or wounded bears may bi in pain or starving. They may aggressively seek food from people if they are unable to obtain enough on their own. Any bear that has become accustomed to people and shows no fear of them is dangerous.

Every bear defends a critical space. The size of the space varies with each bear and each situation: it may be a few hundred metres. Intrusion into this space is considered a threat and may provoke an attack. All female bears aggressively defend their cubs. If a female with cubs is surprised at close range, or separated from her cubs she is likely to charge. A sudden charge is the mother‘s natural defence against danger to her young. A female black bear may act less aggressively if her cubs can escape up a tree and she can defend them by standing at its base.

However, she is still dangerous and may become suddenly aggressive if provoked, bears also aggressively defend their food, and are often reluctant to leave it until it is all eaten. In some cases, a bear that is threatened may engage in displays intended to scare away an opponent. These may include huffing, panting, hissing or growling; looking directly at you, sometimes with lowered head or ears laid back; slapping on or both feet on the ground; jaw popping; or charging to within several metres, then stopping suddenly or veering to the side. Threat displays may be followed by an attack, but may also end with the bear walking or running away.

A bear standing on its hind legs is probably trying to pick up your scent and figure out what you are. It may sniff the air or swing its head from side to side. Bears do not charge standing on their hind legs.

Most grizzlies avoid contact with humans if possible. However, there is good reason for their reputation for ferocity. If cornered, threatened, or surprised, the grizzly can be very aggressive, and will usually stand its ground or charge.

Black bears are often less aggressive and flee from danger. However, because they are more curious and adaptable than grizzlies, they quickly become accustomed to human activity, and may develop aggressive food seeking habits, which make them dangerous. Therefore, treat all black bears with caution.

In a very few cases, a bear has stalked a person that it apparently considered potential prey. Although such incidents are rare, you should know the difference between the behaviour of a hunting bear, and the behaviour of a threatened bear. A hunting bear does not bother with

displays and shows no signs of annoyance of fear. It may approach you directly at a fast walk or run, follow you, or circle carefully making cautious approaches.

Preventing Bear Encounters

CAMP FACILITIES

BEAR FENCE

The camp shall be surrounded by an electrified bear fence that will have:

- back up solar power; and
- an alarm to indicate when the fence has been breached.

The fence is to be inspected daily by the Site Health and Safety Officer to ensure its integrity.

WILDLIFE MONITORS

One wildlife monitor will monitor the area within the site work limits at all times during Work. The Site Superintendent and Health and Safety Officer will determine the site work limits at the site prior to Work beginning.

Any employee working within or visitor entering the area outside of the limits are to be accompanied by a personal bear monitor. The bear monitor will be patrolling the Work area and outside the Work area.

Daily Area Checks for Wildlife or Signs of Wildlife

The wildlife monitor is to perform a check on the general area prior to and following Work. The morning check is to be performed prior to breakfast. The evening check is to be conducted after dinner. The checks will be conducted using an available truck and are to follow a prescribed route. The exact route is to be selected following mobilization to the site. The bear monitor is to be accompanied by another employee during the check and is to keep in radio contact with the Site Superintendent. A firearm is to be taken during such checks. The results of the previous night and morning patrols are to be discussed in the daily morning toolbox meetings. However, any wildlife sighting and/or signs of wildlife are to be immediately reported to the Site Superintendent who is to take appropriate actions as per the Wildlife Contingency Plan

Food

- Do not feed any wildlife;
- All food must be consumed in the diner. No food is to be consumed outdoors;

Garbage

- Food wrappers and juice containers must be deposited in the dining-room garbage containers;
- Garbage from dining-room garbage containers must be stored inside a building in a securely closed container until ready for incineration;
- All food waste and garbage is to be incinerated on a daily basis by the camp manager or other authorized employee using the on-site garbage incinerator. All persons incinerating garbage are to be trained in proper use of the incinerator to ensure safe work and

complete combustion of garbage. Incomplete combustion can leave behind organic matter that will remain a wildlife attractant.

Buildings

- Check the area immediately outside doors before exiting buildings;
- Check the interior of all rooms of abandoned building prior to entrance for signs of bear or other large animal activity. This includes initial entrance into the building and also when moving from one room to another within a building. If signs of bear activity are present leave immediately by the same path that was used to enter. Under no circumstances is a room to be entered if bear signs are present or even suspected to be present as interiors of buildings are confined spaces within which animals will react aggressively;
- Watch for signs of digging under skirting of buildings;
- Watch for bear tracks;
- Keep all doors closed, unless moving personnel or equipment into or out of buildings.
- Ensure that all access doors to areas under buildings are closed and secured, unless work is actually being performed.

Dead Wildlife

- DO NOT APPROACH any dead wildlife. Bears will aggressively defend food resources. Such encounters are often result in either a person or bear casualty;
- Report any dead wildlife found immediately to the Site Superintendent.
- Report any sightings of ravens or sea gulls diving and circling an area.

Fuel Handling and Storage

- Fuel and synthetic materials can act as strong bear attractants;
- Store fuel only in designated container and areas;
- Fill equipment prior to leaving Work area to avoid the necessity of carrying additional fuel supplies;
- Avoid spills and clean up spill of fuel immediately;
- Only store materials impacted by hydrocarbons as per the Spill Contingency Plan;
- Do not use vehicles or equipment that are leaking fuel or other hydrocarbons.

Responding to a Bear

In The Vicinity

- Take note of the location of the sighting;
- If safe to do so, take note of what direction the bear is heading;
- Record a brief description of the bear;
- If you have a radio, contact the Site Superintendent and report the presence of the bear. The Site Superintendent will immediately report the sighting to the Health and Safety Officer and the Wildlife Monitor;
- If you do not have a radio, report the bear sighting to the Site Superintendent verbally as soon as possible. The reporting takes precedent over work;
- Monitor the movement of the bear, if it is within sight of camp and it is safe to do so (i.e., It is several hundred meters away and there is a vehicle or a secure building nearby).

IN THE CAMP

- Take note of the location of the bear.
- Take note of the direction of travel and what it is doing.
- Contact the Site Superintendent and report the presence of the bear. The Site Superintendent will immediately report the sighting to the Health and Safety Officer and the Wildlife Monitor;
- Sound the bear alarm – a central air horn will be located at the camp. One long blast means that a bear or other dangerous animal is in the camp and that all persons must seek nearby shelter;
- Immediately after hearing the alarm, contact the Site Supervisor with your location and if you are in immediate danger and require assistance. The Site Supervisor will advise on the last known location of the bear;
- The Site Superintendent is to ensure, as soon as possible after the bear sighting, that all persons are accounted for and their locations and current status are known;
- Monitor the movement of the bear, if safe to do so, until bear response personnel arrive;
- Stay indoors or in your vehicle. **DO NOT APPROACH** the bear under any circumstances;
- Keep all doors closed and close all windows; and, Obey all instruction issued by the Site Superintendent.

BEAR TEAM RESPONSE PROCEDURES

WILDLIFE RESPONSE TEAM

The Wildlife Response Team (WRT) shall consist of the following people:

- the Site Superintendent; and
- the Health and Safety Officer; and
- the Wildlife Monitor; and
- a Camp Monitor (who will be designated in the field) (maintain communication at camp).

BEAR RESPONSE EQUIPMENT

Bear response equipment shall consist of:

Firearms

- 1 x 12 gauge pump action defender shotgun;
- 12 gauge, 3 in. Magnum slugs;
- 12 gauge Cracker Shells;
- 12 gauge Rubber Bullets;
- 45-70 9 shot lever action rifle; and
- 400 grain ammunition.

The following figures display the firearms that will be present on-site for bear response.

Figure 2: Defender Shot Gun

Figure 3: 45-70 9 Shot Lever Action Rifle

Bear Deterrents

- starter Pistol
- .22 cal blanks for pistol
- screamer and banger tubes for starter pistol.
- knife; and
- bear spray.

Response Vehicles

- diesel crew cab trucks for response in areas where roads exist;
- tracked quad for response on tundra terrain. The tracked quad will reduce ground pressure and thus prevent extensive damage to the thermal regime of the tundra.

Communications

- hand held radio;
- satellite radio cw/ impact and water resistant case and emergency numbers; and
- emergency flare.

RESPONDING TO A BEAR

A. Bear sighted in general vicinity

- General vicinity means not within the Work area, but within 5 km of the Work area;
- When a bear is reported in the general vicinity, the wildlife response team will collect the bear response equipment and proceed to the last known location of the bear. There must be at least two people responding to bear sightings. The shotgun magazine shall be fully loaded with slugs when responding to a bear. 12 gauge deterrents are to be hand loaded, one at a time. The defender shot gun can accommodate 3 slugs. The 45-70 level action rifle can accommodate 4 shells.

Bear between 2 km and 5 km away from camp

- If the bear is not headed towards the camp, the team will only observe its behaviour and direction of travel until they are confident that it is not heading towards the camp;

- If the bear is headed towards the camp, the team will fire cracker shell and/or screamer rounds in an effort to drive it further away from camp; and
- Upon returning to the camp the team leader shall report the incident to the Site Superintendent who will in turn report to Raymond Bourget at the Department of Resources, Wildlife and Economic Development. Telephone #:867-920-3049. or to his alternate: Albert Bourque, at 867-873-7184.

Bear between camp and 2 km away from camp

- The team will fire deterrent rounds and aggressively drive the bear away from the camp;
- Upon returning to the camp the team leader shall report the incident to the Site Superintendent who will in turn report to Raymond Bourget at the Department of Resources, Wildlife and Economic Development. Telephone #: 867-920-3049 or to his alternate: Albert Bourque, at 867-873-7184.

B. Bear in camp

- An attempt to move the bear out of the camp shall only be made if it is safe to do so and no personnel are in immediate danger;
- If personnel are in immediate danger, or if it is not possible to remove the bear without endangering someone, the bear is to be shot;
- Wildlife response team shall ensure that everyone has been notified and accounted for the location of all personnel. An update list of employees will be kept by the health and safety officer;
- Ensure that the bear has a clear avenue of escape;
- Ensure that there are no people in the direction that the bear is likely to take in leaving the camp.
- Ensure that there is not more than one bear;
- If it is safe to do so, use rubber bullets, screamers and/or cracker shells to drive the bear out of camp;
- Follow the bear and continue to use deterrents until you are confident that it is leaving the area;
- If you loose sight of the bear, STOP and return to camp; and
- Upon returning to the camp the team leader shall report the incident to: Raymond Bourget at the Department of Resources, Wildlife and Economic Development. Telephone #: 867-920-3049. Or to his alternate: Albert Bourque, at 867-873-7184.

C. Destroying a Problem Bear

- A problem bear is a bear that either is directly threatening health and safety or has returned to camp more than once;
- If the bear is standing sideways, it shall be destroyed by shooting at the large shoulder bones, into the chest area;
- When facing head on, a bear shall be destroyed by shooting into the chest area;
- A minimum of two shoots shall be fired into the vital areas;
- The bear is not to be approached until it is certain that it is dead;
- The shotgun is to be reloaded, cocked and ready to fire before approaching the dead bear;

- Before shooting, consider what is beyond the bear, as the slug may pass through the bear;
- Upon killing a bear, the hide shall be removed, with the claws and the head attached. The hide shall be placed into a freezer. The body shall be disposed of as per directions issued by a Renewable Resource Officer;
- The incident must be reported immediately to the Wildlife emergency line at (867) 873.7181;
- All reasonable efforts must be made to ensure the hide and other valuable parts do not spoil and that these are turned over to a Renewable Resource Officer.

D. Close Encounter with Bear by Employees other than Wildlife Response Team

There is always the possibility that you may surprise a bear at close range, or

The bear is unaware of you and feeding

- If you can do so undetected, leave the area. Quietly go back the way you came. Move only when the bear's head is down. Stop when it lifts its head to look around. Stay downwind. When you are a safe distance away, wait until the bear leaves or make a wide detour around it; and
- If you cannot leave undetected, let the bear sense you by smell first. Quietly move upwind. If possible, keep the bear in sight. The bear may leave when it smells a person nearby.

The bear is unaware of you, but approaching

- Give the bear the right-of-way.
- Try to get out of the way without being noticed. If that is not possible, announce your presence. Bears should be able to determine that you are a human by the time they are 100-150 m away; and
- Give the bear a chance to leave

The bear is aware of you, but distant:

- Stay calm;
- Continue walking slowly, but head away from the bear;
- Do not run unless you are sure you can reach safety;
- If the bear follows, leave behind a cap, scarf, etc. to distract it and allow it to identify you as a person from your scent;
- If you are dealing with a grizzly bear, climb a tree if a large one is available. Remember, however, that black bears can climb trees easily, and grizzlies may climb if the spacing of limbs permits; and
- If there is a bird colony nearby, or something else that could be a distraction to the bear, you could head in that direction.

The bear is aware of you and close

- In close confrontations, the bear is likely to feel threatened. Its natural tendency is to reduce or remove the threat. Help it by acting as non-threatening as possible, particularly if it is an adult bear or a female with young. Do not make sudden movements. Monitor the bear's movements but avoid direct eye contact. If the bear is young and possibly

curious, you may have to be more aggressive to drive it away. To help you act appropriately, assess the situation and try to determine why the bear is acting the way it is;

- Help the bear identify you as a person. It may leave. Stay upwind if possible. Talk in low tones and slowly wave your arms;
- Give the bear the opportunity to leave. Make sure it has an open escape route;
- Back away slowly and/or climb a tree if appropriate; and
- Try to deter the bear if you are in a safe position.

The bear is close to you and threatening

- Try to scare the bear off with an appropriate deterrent if you are equipped to do so;
- If you have no deterrent, or if the attempt is unsuccessful, act as non-threatening as possible;
- Talk in a calm, but authoritative voice;
- Do not make fast or sudden movements that might startle or provoke the bear;
- Do not imitate a bear's aggressive sounds, signals, or postures; and
- Feed a slug or cartridge into the chamber of your gun, keeping an eye on the bear. Back off slowly and steadily and drop a hat or scarf or other article to distract the bear. Do not drop your backpack as it can help protect the spine in the event the bear charges. Drop food only as a last resort (this provides a bad example for this bear‘s next encounter with a person).

The bear is very close (less than 50 m in open areas, closer in forests) and approaching

- If the bear does not respond to a deterrent, stand your ground;
- If you are unarmed, do not play dead unless the bear charges;
- Standing will enable you to dodge an attack, to distract the bear by dropping something or by flashing clothing; you will also be able to monitor the bear's actions; and
- If you are armed and the bear continues to approach and act aggressively, be prepared to shoot.

The bear charges

- A bear charges at high speed, on all four legs, often crouched low to the ground. It does not charge on its hind legs;
- Many charges made by grizzlies and black bears are bluffs. These bears often stop or veer to the side at the last moment. However, it may be difficult to know if a charge is a bluff until the bear is very close;
- If you are faced with a charging bear (or a bear at close distance that is hunting you as potential prey), you have two options: shoot to kill if you have a gun, or play dead (see below) if you are unarmed.
- If the bear definitely knows what you are and it is not deterred, you are likely considered prey, (its next meal). aggressively fighting and trying to hurt it as badly as possible is your best option.

4.3 Minimizing the Impact on Wildlife

Wildlife may be impacted by the loss or modification of habitat and disturbance from vehicles and equipment during sensitive life-cycle periods (e.g., breeding and rearing). The following guidelines are intended to minimize impacts on wildlife from project activities:

- Drivers will maintain a safe and appropriate speed on the roads especially the winter road, and drivers will not chase animals down roads. Instead, drivers will stop and turn off their headlights to allow stressed animals to disperse;
- Recreational or sustenance hunting, firearm use, and/or fishing are not permitted on any site;
- Dogs are not permitted on any site unless prior authorization is obtained from the PWGSC Departmental Representative;
- When encountering wildlife, remember they have the right of way;
- Never feed wildlife. Feeding wildlife may cause them to stay at the site and become used to human contact. The consequences of feeding may result in serious harm to humans, and/or the animal being relocated or destroyed; Feeding animals will result in removal from site and termination of employment;
- If encountering wildlife on the road, stop the vehicle and allow wildlife to pass. Be sure to:
    - Remain in the vehicle;
    - Avoid using the horn;
    - Avoid provoking the animals; and
    - Wait for the animal(s) to pass before continuing.

5 EMPLOYEE ENFORCEMENT

The employee‘s enforcement is a **zero tolerance - three strikes - you’re out** as follows:

VERBAL WARNING - Infraction discussed with employee to rectify and modify any work practice.

STRIKE ONE - ***First infraction***

Written warning requesting compliance given to offender by Supervisor.

- Copy of warning forwarded to Manager.

STRIKE TWO - ***Second infraction***

Written warning requesting compliance given to offender by Manager.

- Copy of warning letter forwarded to Supervisor.

STRIKE THREE - ***Third infraction***

Written acknowledgment of the third infraction signed by the Manager is to be given to the offender with an order to immediately leave the workplace.

- The offender is to be denied future access to the workplace.

An individual having three strikes may request for reinstatement after a 2 month duration. The request must be to the Manager.

6 FIRE SAFETY PLAN

6.1 Purpose

The purpose of the Fire Safety Plan is to:

1. Prepare employees and visitors to efficiently and safely identify and respond to fires so as to prevent or minimize, in order of importance:
    a. injuries or loss of life;
    b. damage to the environment; and
    c. damage to equipment and supplies; and
2. To provide the necessary resources and education to prevent a fire from occurring; and
3. To contain the necessary information to act as a training reference.

6.2 Scope

6.2.1 General

The Fire Safety Plan is applicable to: all work undertaken by AEL employees; and any activities conducted by visitors, during the course of the Great Bear Lake Phase 1 Clean-up Project.

6.2.2 Incipient Stage Fires

All employees are expected to fight incipient stage fires within the immediate limits of their work areas. An incipient stage fire is defined as a fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, Class II standpipe or small hose systems without the need for protective clothing or breathing apparatus.

6.2.3 Controlled Burning

Some controlled burning of infrastructure/debris may occur during the work. To limit the risk of the spread of fire, select employees will be expected to apply water spray on adjacent infrastructure or other resources. The intent of the water spray is to:

- cool the adjacent infrastructure/resources to a temperature below the applicable flash point temperature; and
- to extinguish any air born embers that could act as a source of ignition.

Under no circumstances are such employees to approach to an unsafe distance or enter any burning infrastructure/resources.

6.2.4 Uncontrolled Fires beyond the Incipient Stage

No employees, under any circumstances, are to fight any uncontrolled fires beyond the incipient stage.

6.2.5 Infrastructure Fire

Only employees trained in fire response for infrastructure are to fight incipient stage fire within the infrastructure. No employees, under any circumstances, are to fight any uncontrolled fires (beyond the incipient stage) of the infrastructure.

6.2.6 Petroleum Hydrocarbon Fires

All employees are responsible to fight incipient stage Petroleum Hydrocarbon (PHC) fires. No employees, under any circumstances, are to fight any uncontrolled fires (beyond the incipient stage) of PHC.

6.2.7 Burn Pits

Burnt pits may be established at locations on the site to allow for the controlled burning of wood waste. The burn pits shall be located in areas with a wind break to one side of the burn pile, to avoid embers from spreading. The burn pit labourers are to radio notify the site when burning is to take place, and a burn permit must be obtained from the local authorities. Personnel shall be advised to stay 100 metres from the burn pit, and appropriate fire pumps shall be set up to ensure that wind blown embers are extinguished.

6.3 Compliance

6.3.1 General

The Fire Safety Plan has been developed to be in accordance with:

- NWT WCB Mines Health and Safety Act and the corresponding regulations;
- Canadian Labour Code Part II – Occupational Health and Safety Act and the corresponding regulations; and
- NWT Fire Prevention Act
    - Fire Prevention Regulations R.R.N.W.T. 1990
        - National Building Code, 1995: Canadian Commission on Building and Fire Codes, National Research Council of Canada
        - National Fire Code of Canada, 1995: Canadian Commission on Building and Fire Codes, National Research Council of Canada

6.3.2 References

The following references were reviewed and sections/materials were adopted as required:

- INAC Environment, Health & Safety Standard Operating Procedures Manual SOP, SOP – 013 Fire Protection has been used as an information reference only;
- Occupational Safety and Health Administration 29 Code Of Federal Regulations 1910 Occupational Safety and Health Standards;
- Canadian Center for Occupational Health and Safety (CCOHS);
- 2007 Tibbett to Contwoyto Winter Road Emergency Response/Spill Contingency Plan.
- Handbook of Occupational Safety and Health 2nd Edition; and
- Hazardous Waste Operations and Emergency Response Manual, Wiley.

6.4 Responsibilities

6.4.1 Project Manager

The Project Manager is responsible to:

- ensure that the Site is assessed for conformance to the NFC prior to Work;
- ensure that a fire safety plan is developed, including hazard assessment, first responder, response plans, education and training/drills.
- ensure the necessary resources are available to ensure that the Site conforms to the NFC;
- ensure that the proper training is made available to all Employees to ensure that they understand their responsibilities as per the NFC. Training will be included in Worker Orientation Seminar, as well as additional hands-on training provided to workers.

6.4.2 Site Superintendent

The Site Superintendent is responsible to:

- acting as the Fire Safety Plan designate;
- ensure that fire drills are executed no less than monthly;
- ensuring that occupancy lists are up to date daily and that employees remain in their assigned rooms;
- ensuring that the site meets the requirements of the NFC.

6.4.3 Medic

The site medic is responsible to:

- respond to any medical emergencies resulting from fire;
- assist an investigation team, when required, monitoring the team health and safety.

6.4.4 AEL Field Engineer

The AEL Field Engineer is responsible to:

- operate field analytical equipment and interpret the results within the context of environmental and occupational health and safety; and
- provide technical assistance regarding fire safety, when required, to the Site Superintendent or any other person authorized by the Site Superintendent; and
- conduct monthly internal risk assessments of fire safety and report the results to the Project Manager.

6.5 Emergency Numbers

The emergency numbers that are applicable to the Fire Safety Plan is included in section 1.2 of this plan at the beginning of this document.

6.6 Background Information

6.6.1 Key Properties

The following table presents key properties of flammable or combustible hazardous materials/wastes that are present at the Great Bear Lake Phase 1 sites.

Table 3: Explosive Limits of Hazardous Materials/Wastes at Great Bear Lake Phase 1 sites

SUBSTANCE	LOWER EXPLOSIVE LIMIT (% VOL. AIR)	UPPER EXPLOSIVE LIMIT (% VOL. AIR)	FLASH POINT (°C)	AUTO IGNITION TEMP (°C)	VAPOR DENSITY (S.G.)	WHMIS CLASSIFICATION
Diesel fuel (No.1)	0.6	7.5	38	~254	~4	Class B Division 3
Gasoline	1.4	7.6	-43	~280	3 to 4	Class B Division 2
Propane	2.1	9.5	-103.4	~432	1.52	Class B Division 1
Jet B	1.3	8.0	-31	~240	3.5 to 4	Class B Division 2

6.6.2 Fire Triangle

The "Fire Triangle" (refer to Figure 4) illustrates the rule that in order to ignite and burn, a fire requires three factors:

- heat,
- fuel, and
- oxygen

The fire is prevented or extinguished by "removing" any one of the three factors. A fire naturally occurs when the factors are combined in the right mixture (e.g., more heat needed for igniting some fuels, unless there is concentrated oxygen).

When a fire runs out of fuel it will stop. Fuel can be removed naturally, as where the fire has consumed all the burnable fuel, or manually, by mechanically or chemically removing the fuel from the fire.

Without sufficient heat, a fire cannot begin, and it cannot continue. Heat can be removed by dousing some types of fire with water; the water turns to steam, taking the heat with it. Note that water will actually increase or spread some other types of fires (such as combustible metal fires, see comments below). Separating burning fuels from each other can also be an effective way to reduce the heat. In forest fires, burning logs are separated and placed into safe areas where there is no other fuel. Scraping embers from a burning structure also removes the heat source. Turning off the electricity in an electrical fire removes the heat source, although other fuels may have caught fire and continue burning until the firefighter addresses them and their fire triangles too.

Oxygen may be removed from a fire by smothering it with aqueous foam, or some inert gas (e.g., carbon dioxide & halon), dry chemicals, or enclosing it where the fire will quickly use up all of the available oxygen. A candlesnuffer uses this principle.

Figure 4: Fire Triangle

6.6.3 Explosion

An explosive is something that can burn very rapidly and an explosion is essentially a rapidly accelerated combustion event. Burning is caused by a chemical reaction between oxygen and some kind of fuel (like gasoline or C-4 plastic explosive). Generally, heat or a physical blow triggers the reaction.

The burning process releases various gases. Explosive material burns very quickly, so it releases a huge amount of gas in an extremely small amount of time. All of this concentrated gas rapidly expands to fill the available space, applying a lot of pressure on everything nearby. This is the actual explosion: expanding gas that is powerful enough to destroy cars, buildings, or whatever else is around. The reaction also releases a lot of heat

Explosions occur quicker than one can physically react and as such cannot be outrun, or avoided, following ignition.

Gasoline vapour is highly explosive and may ignite as a "fireball" with a temperature of 15,000 degrees F. Explosions can become even more dangerous when vapours are contained within an enclosed space such as a drum. In this situation, the expanding gases will break apart the drum, releasing airborne shrapnel, which can impact persons within a certain radius. As such, all drums containing flammable liquids should be vented to the atmosphere to prevent the accumulation of dangerous concentrations of vapours within the tank.

6.6.4 Sources of Heat – Vapour Ignition

There are at least six sources of heat that may cause ignition of vapours:

- The sun
- Open flames
- Electricity
- Chemical reaction
- Friction
- Gas compression

6.6.5 Upper and Lower Explosive Limits

The explosive limit of a gas or a vapour is the limiting concentration (in air) that is needed for the gas to ignite and explode. There are two explosive limits for any gas or vapour, the Lower Explosive Limit (LEL) and the Upper Explosive Limit (UEL). At concentrations in air below the LEL there is not enough fuel to continue an explosion; at concentrations above the UEL the fuel has displaced so much air that there is not enough oxygen to begin a reaction. Concentrations of explosive gases are often given in terms of Percent Of Lower Explosive Limit (%LEL). LEL and UEL are generally expressed in terms of percent volume of air (% vol air)

Controlling gas and vapour concentrations outside the explosive limits is a major consideration in occupational safety and health. Methods used to control the concentration of a potentially explosive gas or vapour include use of sweep gas, an inert gas such as nitrogen or argon to dilute the explosive gas before coming in contact with air. Use of scrubbers or adsorption resins to remove explosive gases before release is also common. Gases can also be maintained safely at concentrations above the UEL, although a breach in the storage container can lead to explosive conditions or intense fires.

The explosive limits of flammable and combustible hazardous materials/wastes present at the Great Bear Lake Phase 1 sites are displayed in **Table 3**. (Note: concentrations are given in percent by volume of air.

6.6.6 Flash Point and Fire Point

The flash point of a flammable liquid is the lowest temperature at which it can form an ignitable mixture with oxygen. At this temperature the vapor may cease to burn when the source of ignition is removed. A slightly higher temperature, the fire point, is defined at which the vapor continues to burn after being ignited. Neither of these parameters is related to the temperatures of the ignition source or of the burning liquid, which are much higher. The flash point is often used as one descriptive characteristic of liquid fuel, but it is also used to describe liquids that are not used intentionally as fuels.

Every flammable liquid has a vapour pressure, which is a function of that liquid's temperature. As the temperature increases, the vapour pressure increases. As the vapour pressure increases, the vapour phase concentration of the flammable liquid in the air increases. Hence, it is the temperature which determines the concentration of evaporated flammable liquid in the air under equilibrium conditions. Different flammable liquids require different concentrations of the fuel in air to sustain combustion. The flash point is that minimum temperature at which there is a sufficient concentration of evaporated fuel in the air for combustion to propagate after an ignition source has been introduced. **Table 3** presents flash points for flammable or combustible hazardous materials/waste that are present at the Great Bear Lake Phase 1 sites.

6.6.7 Flammable and Combustible Liquids

Flammable and combustible liquids are liquids that can burn. They are classified, or grouped as either flammable or combustible, by their flashpoints. Generally speaking, flammable liquids will ignite (catch on fire) and burn easily usually at normal working temperatures. Combustible liquids have the ability to burn at temperatures that are usually above working temperatures.

There are several specific technical criteria and test methods for identifying flammable and combustible liquids. Under the Workplace Hazardous Materials Information System (WHMIS), flammable liquids have a flashpoint below 37.8°C (100°F). Combustible liquids have a flashpoint at or above 37.8°C (100°F) and below 93.3°C (200°F).

Flammable and combustible liquids themselves do not burn. It is the mixture of their vapours and air that burns. Gasoline, with a flashpoint of -40°C (-40°F), is a flammable liquid. Even at temperatures as low as -40°C (-40°F), it gives off enough vapour to form a burnable mixture in

air. Bunker C Oil a combustible liquid, with a flashpoint of approximately 65°C (175°F) (dependent upon degree of weathering), so it must be heated above that temperature before it can be ignited in air. **Table 3** displays the WHMIS flammability/combustibility ratings for hazardous materials/waste present at the Great Bear Lake Phase 1 sites.

6.6.8 Vapour Density

Vapour density is the ratio of the density of a vapour/gas to that of the density of air, measured at standard conditions (i.e., $Vd_{x\text{- std.}} = Vd_x/Vd_{air\ -std.}$). The vapour/gas of a substance with a vapour density greater than one will sink and will accumulate in depressions. Alternatively, the vapours/gas of substance with a vapour density less than one will rise and disperse within the ambient atmosphere.

6.6.9 Flammable Solids

A flammable solid is one that will ignite through friction or spontaneous chemical reaction with moisture in the air. The temperature at which a solid begins to burn is called the ignition or kindling temperature

6.6.10 Auto Ignition Temperature

A material's auto ignition or ignition temperature is the temperature at which a material self-ignites without any obvious sources of ignition, such as a spark or flame. Most common flammable and combustible liquids have auto ignition temperatures in the range of 300°C (572°F) to 550°C (1022°F). Some have very low auto ignition temperatures. For example, ethyl ether has an auto ignition temperature of 160°C (356°F) and its vapours have been ignited by hot steam pipes. Serious accidents have resulted when solvent-evaporating ovens were heated to temperatures above the auto ignition temperature of the solvents used. Auto ignition temperatures, however, are intended as guides, not as fine lines between safe and unsafe. When working with substances with low auto ignition temperatures, supervisors shall instruct personnel to avoid applying any heat sources to the substances.

6.6.11 Oxidizer

An oxidizer is a type of chemical which a fuel requires to burn. Most types of burning on earth use oxygen, which is prevalent in the atmosphere. However combustion can be supported by oxidizers in the absence of atmospheric oxygen. For example, hydrogen peroxide can support combustion by providing an alternative source of oxygen, to that of the atmosphere.

6.6.12 National Fire Protection Association Fire Classification

The National Fire Protection Association (NFPA) has classified fires by the type of fuel and contributing hazards. Classifications are listed below. Workers are to be made aware of different types of fires, but are to contact supervisors immediately in the case of a fire.

CLASS A – WOOD, PAPER AND CLOTH – SYMBOL: A

Water is the extinguishment of choice for Class A fires because it not only interferes with the chemical chain reaction and extinguishes the fire; it cools the fuel and remains with the fuel to keep the fire from rekindling. Certain dry chemical extinguishers are also approved for Class A fires. The following presents symbols for Class A fires.

CLASS B – FLAMMABLE LIQUIDS – SYMBOL: B

The fires in the vapour-air mixture over the surface of flammable liquids such as gasoline, oil, grease, paints and thinners cannot be extinguished by a solid stream of water. The water is likely to spread the liquid and make the fire worse. Water will sink to the bottom of the flammable liquid and be very ineffective at extinguishing the blaze. Carbon dioxide and dry chemical extinguishment are the recommended extinguishing agents for Class B fires.

CLASS C – FIRES INVOLVING ENERGIZED ELECTRICAL EQUIPMENT – SYMBOL: C

Water and other electrically conductive extinguishing agents cannot be used on electrical fires because of the electrical shock hazard and because they may make the fire situation worse. Carbon dioxide, halon and dry chemical extinguishers are recommended for all Class C type fires.

CLASS D – FIRES INVOLVING FLAMMABLE METALS – SYMBOLS: D

Water cannot be used to extinguish a fire involving a burning metal (magnesium, titanium, etc.). Although each flammable metal presents a unique case, water generally will react chemically with the metal and make the fire situation worse. Each type of flammable metal has a particular type of extinguishing agent recommended which should not be used for other type of flammable metals. Carbon dioxide, B/C, and A/B/C dry chemical extinguishers are generally ineffective on combustible metal fires and may react chemically with the burning metal to make the fire situation much worse.

CLASS K – KITCHEN GREASE AND OILS

Fires involving cooking media (grease, fats, and oils) in commercial cooking appliances are unlike most other fires because these oils have a wide range of auto-ignition temperatures. Auto-ignition occurs when the oils reach high temperatures, typically above 400°F. Once the oil is burning, the entire mass of oil must be cooled below its auto-ignition temperature to be extinguished. In the mid 1960‘s, fire protection engineers discovered that by applying sodium bicarbonate dry chemical or potassium bicarbonate dry chemical to burning cooking oil, a unique phenomenon called ―saponification” occurred. The free fatty acids from the saturated fats, combined with alkaline dry chemical, form soapy foam on the surface of the oil. This foam acts much like traditional fire fighting foams to hold in the vapours and steam, and extinguish the fire. ABC (multi-purpose type) dry chemicals will not produce the saponification effect because the base chemical (ammonium phosphate) is acidic in nature. Recent tests show that, compared to sodium bicarbonate dry chemical agents, wet chemical agents using liquid solutions containing an alkaline mixture (typically potassium acetate, potassium citrate, potassium carbonate or a combination of these chemicals) are generally more effective in extinguishing grease fires. The combination of a fine mist spray from an extinguisher using an alkaline mixture and the saponification characteristics of the agent itself holds in the vapours.

Based on the fire classifications listed above, fire extinguishers shall be selected. All machinery and site vehicles shall have type ABC fire extinguishers. The kitchen shall have a K fire extinguisher, due to the presence of kitchen grease.

6.6.13 Ventilation

Well-designed and maintained ventilation systems remove flammable vapours from the workplace and reduce the risk of fire and health problems. The amount and type of ventilation needed to minimize the hazards of flammable and combustible liquid vapours depend on such things as the kind of job, the kind and amount of materials used, and the size and layout of the work area.

An assessment of the specific ways flammable and combustible liquids are stored, handled, used and disposed of is the best way to find out if existing ventilation controls (and other hazard control methods) are adequate. Some workplaces may need a complete system of hoods and ducts to provide acceptable ventilation. If flammable vapours are likely to condense, the ducts should have welded joints. Other workplaces may only require a single, well-placed exhaust fan. Use non-ferrous fan blades and shrouds (housing), and explosion-proof electrical equipment in ventilation systems for these liquids. Regular cleaning of the ducts, filters, plenums, etc. will decrease the severity of any fires and will reduce the likelihood of spontaneous combustion if some self-heating material is present. Ventilation equipment used to handle solvent vapours should meet the relevant fire code requirements.

If the ventilation keeps vapour levels below the occupational exposure limit of a chemical, usually there is little risk of fire or explosion. Vapour levels harmful to people are, in most cases, much below the lowest concentration of vapour in air that can burn. For example, toluene has a workplace exposure limit of 50 ppm). This is far below the Lower Explosive Limit (LEL) for toluene, which is 12,000 ppm.

In baking and drying ovens, enclosed air-drying spaces, ventilation ductwork or other enclosures where workers are not normally exposed to the vapour, keep vapour levels to 20 percent or less of the LEL.

6.6.14 Portable Fire Extinguishers

PORTABLE FIRE EXTINGUISHERS

INTRODUCTION

A portable fire extinguisher can save lives and property by putting out a small fire (incipient stage fire) or suppressing it until addition support can arrive. Portable extinguishers, however, have limitations. They are not designed to fight large fires (post incipient stage) or fires that are spreading quickly. Most portable fire extinguishers have a short range of 6 – 10 feet and discharge completely in a very short time of 8 – 10 seconds. Portable extinguishers will do little against large or established fires.

TYPES OF FIRE EXTINGUISHERS

It is essential that the type of extinguisher used is appropriate for the type of fire present. For example, you spray water on a grease fire, the water will cause the grease to splatter and the fire may spread. Similarly, lf you dowse live electrical equipment with water, you are putting yourself in danger of electrical shock. There are many types of portable fire extinguishers on the

market. Depending on their intended use, fire extinguishers use a variety of "fire extinguishing agents"– the water or the chemicals(s) that put out the fire.

Independent testing laboratories test and rate portable fire extinguishers to determine the type and size of fire each model can put out. Fire extinguishers that do not carry the label of an independent testing lab are not be used or purchased. Report such fire extinguishers immediately to the Site Supervisor. The Site Supervisor is to ensure that such extinguishers are removed and replaced. The Project Manager is responsible to ensure that certified fire extinguishers are purchased.

The A, B, C, D, K classifications describe a *fire's fuel* (*i.e. what's burning*). When the classifications are used for rating fire extinguishers, they tell you what classes of fire the unit should or should not be used on. The following describes the *fire's fuel*:

Class A
Class A Extinguishers will put out fires in ordinary combustibles, such as wood and paper. The numerical rating for this class of fire extinguisher refers to the amount of water the fire extinguisher holds and the amount of fire it will extinguish. The following symbols identify a Class A fire extinguisher:

Class B
Class B Extinguishers should be used on fires involving flammable liquids, such as grease, gasoline, oil, etc. The numerical rating for this class of fire extinguisher states the approximate number of square feet of a flammable liquid fire that a non-expert person can expect to extinguish. The following symbols identify a Class B fire extinguisher:

Class C
Class C Extinguishers are suitable for use on electrically energized fires. This class of fire extinguishers does not have a numerical rating. The presence of the letter "C" indicates that the extinguishing agent is non-conductive. The following symbols identify a Class C fire extinguisher:

Class D
Class D Extinguishers are designed for use on flammable metals and are often specific for the type of metal in question. There is no picture designator for Class D extinguishers. These extinguishers generally have no rating nor are they given a multi-purpose rating for use on other types of fires. The following symbol identifies Class D fire extinguishers:

Class K
Class K Extinguishers are the newest classification providing for protection of cooking appliances that use combustible cooking media (vegetable or animal oils and fats). These extinguishers do not carry a numerical rating. The following symbol identifies Class K fire extinguishers.

Class B-C

It should be noted that extinguishers provided for the protection of cooking grease fires shall only be of the sodium bicarbonate or potassium bicarbonate dry chemical type (Class B-C). Cooking grease fires are a special hazard requiring agents suitable for this application. Sodium bicarbonate and potassium bicarbonate dry chemicals are considered suitable for the special nature of heated grease fires; others may not be due to agent characteristics. Additionally, the residues of multipurpose dry chemical extinguishers (Class A-B-C) can cause corrosion when left in contact with metal surfaces.

Multi-Class Ratings

Multi-class rated fire (Class A-B-C) extinguisher may be used on Ordinary Combustibles, Flammable Liquids, or Electrical Equipment fires. Many extinguishers can be used on different types of fires and will be labelled with more than one designator, (e.g. A-B, B-C, or A-B-C.). The following traditional symbols identify multi-class fire extinguishers:

Alternatively, a new style of labelling for multi-class rated fire extinguishers can be present. The following displays such new style:

The new labelling style uses a diagonal red line drawn through the picture to indicate what type of fire this extinguisher is NOT suitable for. In the above example, the fire extinguisher could be used on Ordinary Combustibles and Flammable Liquids fires, but not for Electrical Equipment fires.

EXTINGUISHER SIZE

A–rated and B–rated portable fire extinguishers are rated for the size of fire they can extinguish. When selecting a fire extinguisher, the rule of thumb, of course, is the bigger the better. Larger extinguishers, however, can be heavy and therefore difficult to operate. A compromise must be reached based on the anticipated extent of fire, extinguisher users, the risk of fire, available storage space and other factors. The Project Manager is responsible to ensure that the correct size of fire extinguisher is selected for each form of anticipated fire and as per regulatory requirements.

It is important for safety reasons that employees are aware of a portable extinguisher's capacity before they attempt to fight a fire. The "size" of an extinguisher is determined by standard tests during which experienced laboratory technicians attempt to put out fires in a controlled setting. All extinguishers rated for Class A or B fires are labelled with a number: from 1 to 40 for an A rating, and from 1 to 640 for a B rating. This number is a relative indication of the extinguisher's "size" or fire-fighting effectiveness. The larger the number, the larger the fire that extinguisher can put out. Most extinguishers sold for uses in the home have 1-A, 2-A, or 3-A ratings for Class A fires and 5-B, 10-B, 20-B, or 40-B ratings for B fires.

A typical rating for an ABC household model might be "2-A: 10-B: C." A typical rating for a BC extinguisher might be "10-BC." There is no number to indicate size attached to the C rating. The C rating is included to state only that the extinguisher can be used on fires involving energized electrical equipment.

HOW TO OPERATE A PORTABLE FIRE EXTINGUISHER

There are four basic steps to operating a portable fire extinguisher. An easy way to remember the procedure is to think of the word "PASS."

1) **P**ull the Pin: Holding the extinguisher with the nozzle pointing away from you, release the locking mechanism. In most cases, this means pulling out the pin located below the trigger.
2) **A**im low: Standing 6 to 8 feet away from the fire, point the extinguisher nozzle at the base of the fire – the lowest point of the fire nearest you. Extinguishers are designed to be operated in an upright position. Always hold the extinguisher vertically. Never cradle it horizontally or at an angle in your arms.
3) **S**queeze the trigger: Squeeze the trigger slowly and evenly. This will release the extinguishing agent and expel it through the nozzle.
4) **S**weep side to side: As the extinguishing agent is expelled, sweep the nozzle from side to side – "driving the fire back." As the fire closest to you goes out, you may move closer to the fire and continue the sweeping motion until the fire is extinguished. Remember, hold the extinguisher upright. If the fire does not diminish immediately, get out of the building!

6.7 Fire Prevention

6.7.1 Hazardous Materials/Waste – Flammable and Combustible Liquids

PROPERTIES AND SAFE WORK PRACTICES

GASOLINE

Properties

Gasoline is extremely flammable. It will readily ignite at room temperature. It can release vapours that form explosive mixtures with air. Liquid can accumulate static charge by flow or agitation. Vapours can be ignited by a static discharge. Gasoline vapour is heavier than air and may travel a considerable distance to a source of ignition and flash back to a leak or open container. Liquid can float on water and may travel to distant locations and/or spread fire. During a fire, irritating/toxic gases may be generated and can accumulate in confined spaces, resulting in a toxicity and flammability hazard. Containers may explode in heat of fire.

Safe Work Practices

This material is an EXTREMELY FLAMMABLE LIQUID and a SUSPECTED CANCER HAZARD. Before handling it is very important that engineering controls are operated and that protective equipment requirements are being followed. Only persons trained in the safe use of gasoline shall handle gasoline products. Eliminate all ignition sources (e.g. sparks, open flames, hot surfaces). Keep away from heat. Post "NO-SMOKING" signs. No smoking is to occur within 20 m of any gasoline. It is very important to keep areas where this material is used clear of other materials which can burn. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas of use.

Keep aisles and exits free of obstruction. Immediately report leaks, spills or ventilation failures. Ground all drums, transfer vessels, hoses and piping. Ground clips must contact bare metal.

When dispensing in other than a closed system, ensure dispensing container is bonded to receiving transfer equipment and container. Liquid can accumulate charge. In large-scale operations, increase conductivity with additive designed for that purpose, reduce flow rate in transfer operations, increase time the liquid remains in transfer piping and/or handle at lower temperature. To prevent sparking, generously wet hard surfaces before they are chipped, ground, etc, in potentially hazardous areas.

Never perform any welding, cutting, soldering, drilling or other hot work on an empty vessel, container or piping until all liquid and vapours have been cleared. Hot work permits must be issued prior to any hot work. Have suitable emergency equipment for fires, spills and leaks readily available.

Use in smallest possible amounts in a well ventilated area separate from the storage area. Avoid generating vapours or mists. Prevent the release of vapours and mists into the workplace air. Do not use with incompatible materials such as strong oxidizing agents (e.g., peroxides, nitric acid and perchlorates). These can increase the risk of fire and explosion. Do not dispense in storage area unless dispensing area is segregated by fire-resistant construction. Only use portable containers and dispensing equipment (faucet, pump, drip can) approved for flammable liquids. Do not siphon by mouth. Never return contaminated material to its original container. Label containers. Keep containers closed when not in use. Avoid damaging containers. Empty containers may contain hazardous residues.

Follow handling precautions on the Material Safety Data Sheet. Practice good housekeeping. Maintain handling equipment in good condition. Comply with applicable regulations.

Personal Protective Equipment
When vapours are present, workers are required to wear:

- a half mask respirator with organic vapour cartridges;
- fire resistant chemicals;
- splash proof chemical safety goggles;
- nitrile rubber gloves;

TRANSFER

BONDING AND GROUNDING – STATIC ELECTRICITY

Static Electricity
Static electricity is the electric charge generated when there is friction between two things made of different materials or substances, like clothes tumbling in your dryer. Static electricity is what causes the sparks when you comb your hair or touch a metal object, like a doorknob, after walking across a carpet on a cold, dry day (especially during Canadian winters). It can also be generated by repeated contact and separation between unlike materials, like a flat belt on a rotating pulley.

Electric charges can build up on an object or liquid when certain liquids (e.g., petroleum solvents, fuels) move in contact with other materials. This can occur when liquids are poured, pumped, filtered, agitated, stirred or flow through pipes. This build-up of electrical charge is

called static electricity. Even when liquids are transported or handled in non-conductive containers, something rubbing the outside surface of the container may cause a static charge to build up in the liquid. The amount of charge that develops depends, in part, on how much liquid is involved and how fast is it flowing or is being agitated or stirred.

Depending on circumstances, static electricity can be a nuisance or a hazard. Static cling in your clothes can be a nuisance but a spark that has enough energy to cause a fire or explosion is a definite hazard. To decide if static electricity is likely to be a hazard, you must consider several factors:

- Can a static electric charge be generated under the operating conditions?
- Can the charge accumulate?
- If it discharges, will it cause a spark?
- Is there an ignitable mixture (e.g., solvent vapour or dust in the air) in the area where a static electricity discharge can occur?
- Will the discharge generate an incendive spark (i.e., a spark that has enough energy to ignite the mixture of flammable/combustible vapour in air)?

If the answer to the above five questions is yes where a solvent or fuel is used, then static electricity can be a fire/explosion hazard. It means that the spark can ignite a vapour/air mixture that is within its flammable range, the concentration range between the upper and the lower flammable limits.

Flammable and combustible liquids can present a static electricity hazard depending on their ability to generate static electricity, how well they conduct electricity (conductivity), and their flash point.

Solvents and fuels produced from petroleum (e.g., benzene, toluene, mineral spirits, gasoline, jet fuel, diesel, jet-b etc.) can build up a charge when they are poured or flow through hoses. They tend to hold a charge because they cannot conduct electricity well enough to discharge when in contact with a conducting material, like a metal pipe or container that is grounded. When enough of a charge is built up, a spark may result. If the vapour concentration of the liquid in air is in the "flammable range" and the spark has enough energy, a fire or explosion can result.

According to the NFPA (Code 77), solvents that are soluble in water (or can dissolve some water themselves) do not build up static electricity. Examples of such liquids include alcohols and ketones like acetone. However, when liquids are transferred into non-conductive containers (e.g., plastic, glass), even conductive solvents may build up a charge because the plastic or glass containers decrease the rate at which the charge in the solvent dissipates.

Transferring a liquid from one metal container to another may result in static electrical sparks. To prevent the build up of static electricity and prevent sparks from causing a fire, it is important to bond metal dispensing and receiving containers together before pouring. Bonding is done by making an electrical connection from one metal container to the other. This ensures that there will be no difference in electrical potential between the two containers and, therefore, no sparks will be formed.

The best way to bond containers is to securely attach a special metal bonding strap or wire to both containers. Some liquid transfer pumps have self-bonding hoses. Bonding can also be done by keeping a solid metal-to-metal contact between the containers themselves or between a metal container and a conducting nozzle. These latter two methods are usually not reliable because a good electrical contact is often hard to make and maintain during the entire transfer.

In the flammable liquid storage and dispensing area, ground dispensing drums. Grounding is done by connecting the container to an already grounded object that will conduct electricity. This could be a buried metal plate, a metallic underground gas piping system, metal water pipes or a grounded, metal building framework. Bonding both containers and grounding one of them "drains off" static charges and prevents the discharge of sparks. All grounding and bonding connections must be bare metal to bare metal. Remove all dirt, paint, rust or corrosion from points of contact. Specially designed and approved bonding and grounding wire assemblies are available from safety equipment retailers.

Even if a liquid is conductive, filling or handling plastic or other non-conducting containers can be hazardous. The splashing and turbulence of the liquid in the container can cause a static electric charge to build up in the liquid or on conductive parts on the container that are not grounded. A spark with enough energy to ignite a vapour/air mixture in its flammable range (an incendive discharge) can originate from the liquid or from the container.

For medium-sized containers (5 - 60 U.S. gallons or about 19 - 227 L) it is advisable to ground any metal parts on the container (and nearby conductive surfaces that the container may come in contact) and fill the container from the bottom through a long, grounded metal pipe. This procedure will reduce the amount of static charge produced and will enable the generated charge to relax (dissipate) through the metal pipe.

When filling non-conducting portable containers, the NFPA recommends that a grounded dip pipe or grounded wire be in the liquid in the container while it is being filled. The filling rate should be minimized, especially if there is a filter in the line. Any metal parts of the container and metal funnel, if one is used, should also be grounded. When filling containers with low-conductivity liquids (i.e., ones with a conductivity less than 50 picoSiemens, pS), one should keep the grounded dip rod in the liquid for around 30 seconds after the filling is completed.

Similarly, filling an ungrounded portable fuel tank on a plastic-lined truck bed can cause spark-induced gasoline fires. For that reason, portable fuel tanks should be removed a safe distance from the vehicle (which, of course, is turned off) and be filled on the ground. The nozzle should be held in contact with the container while it is being filled.

Bonding and grounding are required when dispensing flammable or hot combustible liquids from storage drums to smaller electrically conductive containers. Similarly, whenever you transfer these liquids between conductive containers in any work areas, for example, when filling or draining dip tanks, mixers, rinse tanks or other equipment, bond both containers together and ground one of them. Check bonding and grounding connections regularly to ensure they are in good condition.

Bonding
Bonding means that two or more objects are either touching directly or are connected by a conductor such as a wire. The charge from one object is automatically shared with the other connected objects so that they all have the same charge and potential. Therefore, no spark can jump between objects.

Grounding
Bonding means that one or more objects are connected to the earth by a conductor such as a wire and/or grounding rod. Any charge on the object goes immediately to the ground, and the object remains neutral. Often several objects will be bonded together, and one of them will also be grounded. This results in all of the objects being effectively grounded.

Examples of Bonding and Grounding
Not Bonded or Grounded
If a truck has a static charge and is insulated from ground, it will hold its charge. The charge will stay in the truck. Truck is not grounded. The following figure displays a not bonded or grounded fuel transport truck.

Grounded
If a truck is properly grounded, the charge will continuously go to ground and not build up to a dangerous level. It must be grounded before loading starts. The charge is not stored and no hazard is created . The truck is grounded. The following figure displays a grounded fuel transport truck.

Bonded
If a truck has a static charge and it is bonded to another truck, it will share the charge with the second truck. This will prevent a static discharge between the vehicles, if and when a spark gap is created. A charge is still present in both trucks and could present a hazard if another body is nearby.

Bonded and Grounded
If a truck has a static charge and it is bonded to another truck, and one of the trucks is grounded, the static charge created will go to ground from both vehicles and eliminate the chances of a discharge through a spark gap. If a transfer of product must be done from one vehicle to another, this is the safest method.

The clamp used to ground a truck, drum or slip tank, must have a strong spring. If it is a toothed-type, the teeth must be sharp and not bent. Some clamps are made to snap over a round ball on the truck (Appleton Posts). A continuity tester must be used to determine if the load rack and the clamp are properly grounded. Some common reasons for failure are broken wires (sometimes inside a plastic cover), rust and paint under the ground clamps. A grounding clamp must be attached to clean bare metal. Never attach it to a dirty or painted surface, or to a non-conductive material such as a fibreglass fender.

Grounding at a Load Rack (National Fire Code 4.6.4.5 & 4.11.3.2)

A ground rod must be driven into the ground and be firmly affixed to a ground cable. The ground cable, "A", should be firmly affixed to the load rack and piping. A clamp, to ground the truck, may run from the ground rod or from the grounded load rack (See "B" and "C"). In either case, both clamp and load rack must be grounded.

Grounding While Unloading Into Above Ground Storage Tank

A ground rod must be driven into the ground and be firmly affixed to a ground cable. The ground cable must be firmly affixed to the off-loading piping. A second cable, firmly affixed to the off-loading piping, must have a clamp on the other end in order to ground tile truck. Both the truck and the off-loading rack or piping must be grounded.

Hazardous Materials/Waste other than Flammable and Combustible Liquids

OXIDIZING MATERIALS

PROPERTIES AND SAFE WORK PRACTICES

Oxidizing materials support combustion by providing a source of oxygen (O_2), other than atmospheric O_2, to react with a combustible or flammable substance. Oxidizers are extreme fire hazards, as they can support and feed fires in the absence of atmospheric O_2, and thus can render useless, firefighting techniques that eliminate atmospheric O_2. For strong oxidizers such as concentrated Hydrogen Peroxide, simple contact with a reducer such leather clothing can result in combustion in the absence of alternative ignition source. The heat of reaction released by the interaction between the oxidizer and the reactant supports the heat required for combustion and the oxidant provides the O_2.

STORAGE

Before storing, inspect all containers to ensure that they are undamaged and properly labelled. Do not accept delivery of defective containers. Store oxidizing materials in containers recommended by the chemical supplier. Normally these are the same containers in which the material was shipped. Repackaging can be very dangerous especially when using contaminated or incompatible containers. Protect containers against banging or other physical damage when storing, transferring or using them. Do not use wooden pallets or other combustible pallets for storing containers of oxidizing materials.

Make sure containers are suitably labelled. For oxidizing materials requiring temperature control, the recommended storage temperature range should be plainly marked on the container. It is also a good practice to mark the date that the container was received or packaged and the date it was first opened or sealed.

Normally keep containers tightly closed when storing unless the supplier's instructions state otherwise. This helps to avoid contamination of the material or evaporation of solvents used to dilute oxidizers, such as organic peroxides, to safer concentrations. Some oxidizing agents, such as solutions of 8% or higher hydrogen peroxide in water, must be stored with specially vented caps. Hydrogen peroxide gradually decomposes at room temperature to produce oxygen gas and water. The properly working vent will prevent the build-up of pressure inside containers. The normal build-up of pressure could rupture an unvented container. Check vent caps regularly to

ensure that they are working properly. Keep vented containers in the upright position. NEVER stack vented containers on top of each other.

Store oxidizing materials separately, away from processing and handling areas and away from other materials. Separate storage can reduce the risk of personal injury and damage in case of fires, spills or leaks. If totally separate storage is not possible, store oxidizing materials away from incompatible materials especially organic or other oxidizable materials (sometimes called reducing materials or reducing agents). Some oxidizing materials are incompatible or may react with each other, sometimes violently. Do not store them beside each other. Check the reactivity data and storage requirements sections of the MSDS for details about what materials are incompatible with a specific oxidizer.

Walls, floors, shelving, and fittings in storage areas should be constructed of non-combustible materials. Wood impregnated with a fire-retardant material is not fully protected against the increased fire hazard caused by contact with oxidizers. Protect metal construction materials against corrosion by painting them with a compatible coating. Ensure that floors in areas where oxidizers are stored are watertight; do not have cracks where these materials can lodge. Contain spills or leaks by storing in trays made from compatible materials. For larger containers, such as drums or barrels, provide dikes around storage areas, and sills or ramps at door openings.

Store oxidizer containers at a convenient height for handling, below eye level if possible, to reduce the risk of dropping containers. Avoid overcrowding in storage areas. Do not store containers in out-of-the-way locations where they could be forgotten. Store containers away from doors. Although it is convenient to place frequently-used materials next to the door, they could cut off the escape route if an emergency occurs. Store oxidizing materials in areas that are:

- labelled with suitable warning signs;
- well-ventilated;
- supplied with adequate firefighting equipment including sprinklers, where appropriate;
- supplied with suitable spill clean-up equipment and materials;
- free of ignition sources; and
- accessible at all times.

At all times:

- Allow only trained, authorized people into storage areas;
- Keep the amount of oxidizing materials in storage as small as possible;
- Inspect storage areas regularly for any deficiencies including damaged or leaking containers and poor housekeeping; and
- Correct all deficiencies as soon as possible.

All liquids shall be stored with appropriate containment underneath to avoid spills.

TRANSFER

Be very careful when dispensing oxidizers from storage containers into other containers. Avoid spilling material and contaminating your skin or clothing. Spills from open, unstable or, breakable containers during material transfer have caused serious accidents.

Dispense from only one container at a time. Finish all the dispensing of one material before starting to dispense another. Dispense the smallest amount possible, preferably only enough for immediate use. Keep containers closed after dispensing to reduce the risk of contaminating their contents.

Take care that the oxidizing materials do not contact combustible or other incompatible materials when they are dispensed. Use containers and dispensing equipment, such as drum pumps, scoops or spatulas that the chemical supplier recommends. These items must be made from materials that are compatible with the oxidizing materials you are using. Keep them clean to avoid contamination.

NEVER transfer liquids by pressurizing their usual shipping containers with air or inert gas. Ordinary barrels or drums may be damaged by the pressure. Moreover, if air is used, it may create a flammable atmosphere inside the container. NEVER pipette oxidizing liquids (or other chemicals) by mouth. Use a pipette bulb or aspirator instead.

Since some solid oxidizers may be shock sensitive, do not chip or grind lumps to break them up. If crystals have precipitated in containers of an oxidizing agent, contact your health and safety officer about their safe handling and disposal. Follow the chemical supplier's advice. Avoid sliding or skidding heavy metal containers such as drums or barrels across floors.

HANDLING

Make sure that all areas where oxidizing materials are used are free of combustible and other incompatible materials. Do not allow tobacco smoking or any other ignition sources around oxidizing materials. Ensure that temperatures in these areas do not become high enough to cause rapid decomposition of the materials. For example, hydrogen peroxide decomposes almost twice as fast for every 5.6°C (10°F) temperature rise. Always,

- Inspect containers for damage or leaks before handling them;
- Handle containers of oxidizers carefully to avoid damaging them;
- Keep containers of oxidizers tightly closed, except when actually using the material, to help avoid spillage or contamination of the container contents;
- Keep only the smallest amounts possible (not more than one day's supply) of oxidizers in work areas;
- Return unopened containers to the proper storage area and opened containers to a dispensing area at the end of the day;
- Check that all containers are properly labelled, and handle the containers so that the label remains undamaged and easy to read.
- Never return "used" or unused oxidizers to original containers of uncontaminated material. Trace amounts of contaminant might cause a dangerous decomposition.

COMPRESSED GAS

There are three major groups of compressed gases stored in cylinders: liquefied, non-liquefied and dissolved gases. In each case, the pressure of the gas in the cylinder is commonly given in

units of kilopascals (kPa) or pounds per square inch gauge (psig) (note: gauge pressure = total gas pressure inside cylinder - atmospheric pressure)

Atmospheric pressure is normally about 101.4 kPa (14.7 psi). It should be noted that compressed gas cylinder with a pressure gauge reading of 0 kPa or 0 psig is not really empty. It still contains gas at atmospheric pressure.

Safe Work Practices – Cutting Scrap Metal with Oxygen-Acetylene
Scrap metal on-site may be cut using oxygen and acetylene and cutting torches. The following guidelines shall apply to ensure that the use of an oxidant and flammable substance are managed properly.

- Oxygen and acetylene cylinders must be stored separately with safety caps secured;
- Oxygen and acetylene may be transported together for the sole purpose of cutting using cutting torches;
- During transport, cylinders must be securely strapped to a pickup truck, standing up;
- During transport, safety valves must remain closed;
- During use, cylinders and hoses shall be routinely inspected by workers and supervisors for the presence of leaks;
- Personnel utilizing cutting torches, oxygen, and acetylene must wear flame retardant coveralls at all times;
- Truck carrying oxygen and acetylene cylinders to contain a 20 lb ABC fire extinguisher; and
- All personnel to carry out cutting operations with a cutting torch are to receive appropriate fire safety training.

6.7.2 EXPLOSIVES

No forms of explosives shall be present at the Great Bear Lake Phase 1 sites.

6.7.3 STORAGE AREAS AND CLEARANCES

OUTDOOR STORAGE

CLASS I to IV COMMODITIES & GROUP A TO C PLASTICS
The size and clearances for Individual Storage Areas (ISA) not located adjacent to buildings shall conform to the values presented in Table 4 (NFC 3.3.2.1)

Table 4: Size and Clearance for Individual Storage Areas Not Adjacent to Buildings- Products other than Hazardous Materials/Wastes

PRODUCT CLASSIFICATION	MAXIMUM BASE AREA (M^2)	MAXIMUM HEIGHT OF STORAGE (M)	MINIMUM CLEARANCE SPACE AROUND EACH ISA (M)
Class III and IV commodities, Group A, B and C plastics, lumber, timber and wrecked vehicles	1,000	≤3	6
Manufactured buildings	1,000	>3 but ≤ 6	Twice the height of storage

PRODUCT CLASSIFICATION	MAXIMUM BASE AREA (M^2)	MAXIMUM HEIGHT OF STORAGE (M)	MINIMUM CLEARANCE SPACE AROUND EACH ISA (M)
Wood chips, hogged materials	15,000	18	9
Rubber tires, combustible pallets	1,000	3	15

However, if a building is located adjacent to a storage area the minimum clearance between the building and the storage area shall be not less than 15m (NFC 3.3.2.2).

PREPARATION AND MAINTENANCE

The storage area site shall be level and on solid ground (NFC 3.3.2.11.1). All storage areas and access routes or gateways to and into storage areas, respectively, shall be kept free of piles of snow (NFC 3.3.2.7.1). All outdoor storage areas shall be arranged such that there is a clear space of not less than:

- 30m between stored products and brush or forested areas; and
- 6m between stored products and uncontrolled grass or weeds.

IGNITION SOURCES

Unless operated in a controlled manner that will not create a fire hazard, a device, operation or activity that produces open flames, sparks or heat shall not be permitted in an outdoor storage area (NFC 3.3.2.8.1). No smoking or burning of materials are permitted at any time, within the limits of any outdoor storage area (NFC 3.3.2.8.2 and 3.3.2.8.3)

FIRE EMERGENCY PROCEDURES

At least one copy of the fire emergency procedures shall be prominently posted at each outdoor storage site (NFC 3.3.2.9.3).

RUBBER TIRES

Any access route to a storage area shall be located such that a clear space of not less than 6m is provided between stored rubber tires and the nearest side of the access route (NFC 3.3.3.3.1).

INDOOR STORAGE

AREAS AND CLEARANCES – CLASS I to IV COMMODITIES & GROUP A TO C PLASTICS

The size and clearances for Individual Storage Areas (ISA) located indoors shall conform to the values presented in **Table 5** (NFC 3.3.3.2)

Table 5: Size Limits for Individual Storage Areas - Class I - IV Commodities and Group A, B and C Plastics

PRODUCT CLASSIFICATION	UNSPRINKLERED BUILDINGS		SPRINKLERED BUILDINGS	
	AREA, (M^2)	HEIGHT OF STORAGE (M)	AREA, (M^2)	HEIGHT OF STORAGE (M)
Class I Commodities	500	6.5	1,500	9.0
Class II Commodities	500	6.5	1,500	9.0
Class III Commodities, Group C Plastics	250	4.5	1,000	9.0
Closed Containers of Distilled Beverage Alcohol	250	4.5	1,000	9.0

Class IV Commodities, Group B Plastics	250	3.6	1,000	9.0
Group A Plastics	250	1.5	500	6.1

The following applies to the indoor storage of materials other than dangerous goods:

- tires shall not be stored indoors;
- combustible materials shall not be stored indoors;
- up to 3 m^3 of loose combustible fibres are permitted to be kept in a fire compartment provided they are stored
- no individual storage are of baled combustible fibres shall exceed 250 m^2;
- no fuel-fired appliances and electrical heating elements are not permitted in a storage area for combustible fibres;

6.7.4 Hot Work

Refer to Hot Work Plan within this document

6.8 Fire Response in Camp Facilities

6.8.1 Potential Fire Scenarios

The potential forms of fire/explosion are of concern for the Great Bear Lake Phase 1 Clean-up Project:

Table 6: Potential Fire Hazard

ID	LOCATION	DESCRIPTION	NFPA CLASSIFICATION
1	Camp	Major and Minor	Class A and Potentially Class C and Class B
2	Site Infrastructure Other Than Camp	Major and Minor – not including hazardous materials and waste other than petroleum hydrocarbons.	Class A and Potentially Class B
3	Site Infrastructure Other Than Camp	Major and Minor – including hazardous wastes other than petroleum hydrocarbons (i.e., process residuals).	Class A and Class B and also other Hazardous Fumes products.
4	Fuel Storage – Petroleum Hydrocarbons	Hazardous materials (Diesel, Gas, Jet – B) and hazardous waste (bunker C waste oil).	Class B
5	Location of Blasting – TBD	Explosion of blasting agents	Other – explosive agent
6	Widespread wilderness	Forest Fire	Other – wildfire

6.8.2 Fire Detection

CAMP UNITS

The Weatherhaven and tent framed camp structures are to be individually outfitted with smoke detectors and carbon monoxide sensors.

In the event that a Carbon Monoxide (CO) detector is triggered, the following actions are to be taken.

If no one is feeling ill:

- Evacuate the area – the Site Superintendent is to ensure that no ones enters the area following evacuation;
- Silence the alarm – only the Site Superintendent has the authority to silence any alarm, including a carbon monoxide alarm. The alarm must be tagged out following silencing, to act as reminder that the alarm is to be reactivated following an inspection;
- Turn off all appliances and sources of combustion (i.e. furnace and fireplace);
- Ventilate the general area with fresh air by opening doors and windows;
- The Site Superintendent, the AEL Field Engineer and the employee chair of the Workplace Health and Safety Committee (WHSC) are to investigate the cause of the alarm and are to identify any sources of CO emission. The medic is to be put on stand by. The medic is to monitor the status of the investigators via radio, from a safe location, exterior to the building/area;
- Prior to and during the inspection, the AEL Field Engineer is to monitor the CO concentrations and %LEL in the ambient air using the RKI Eagle Portable Gas Detection System;
- If the carbon monoxide concentration in the ambient air is, at any point during the investigation, ≥25 ppm (28.75mg/m^3) (ACGIH TWA), then the investigation team is to immediately leave the area. The LEL for CO is 12.5% and the UEL is 74% (10% LEL, 12,500 ppm (14,375 mg/m^3). As such, the ACGIH TWA concentration will also protect against explosion hazard;
- The area is then to be re-ventilated until concentrations of CO are below the ACGIH TWA (25 ppm (28.75mg/m^3);
- The building is not to be re-entered by employees until the source of CO has been identified and properly mitigated.

If illness is a factor:

- Evacuate all occupants immediately – the Site Superintendent is responsible for coordinating the evacuation and ensuring all employees are accounted for. The muster point is the same muster point that is to be used in the case of a fire emergency;
- Turn off all appliances and sources of combustion (i.e. furnace and fireplace);
- Ventilate the general area with fresh air by opening doors and windows;
- The medic is responsible to determine how many occupants are ill and determine their symptoms;
- The medic is responsible to apply first aid and, if required, initiate an emergency evacuation;
- The same investigation procedure, as described above, is to be undertaken.

Immediately Dangerous to Life or Health Atmospheres

- Use a full-facepiece Self Contained Breathing Apparatus (SCBA) or a combination full-facepiece supplied-air respirator with auxiliary self contained air supply;
- Use intrinsically safe equipment and ensure all sources of ignition are removed.

WORK AREAS

- hot work is to be conducted with spotters;

- any controlled burning of infrastructure is to be undertaken with fire spotters. Fire spotters are to watch for fires 12 to 24 hours post burning;
- employees are to be aware of their working areas and are to watch for fires.

6.8.3 Fire Reporting

All persons are responsible to immediately report a fire when discovered. For situation where an automatic detector is not engaged employees are to shout three times –Fire". This is to be done loudly so as all persons within the general area can here the verbal alarm. The employee is to then responsible to immediately report the fire to the Site Superintendent. In the absence of the Site Superintendent, the AEL Field Engineer is responsible to act as the fire reporting designate.

6.8.4 Evacuation

SCOPE

All persons are to evacuate the area of a fire upon notice. Only incipient stage fires are to be responded to. All other persons are to immediately evacuate the area of the incipient fire upon notice.

RESPONSIBILITIES

The site superintendent is responsible for ensuring all persons report to the muster station. Employees are responsible for immediately leaving the fire area and reporting to the pre-defined muster stations.

INTRODUCTION

In less than 30 seconds, a small flame can get completely out of control and turn into a major fire. It only takes minutes for thick black smoke to fill a residence. In minutes, a residence can be engulfed in flames. Most fires occur when people are asleep. If you wake up to a fire, you won't have time to grab valuables because fire spreads too quickly and the smoke is too thick. There is only time to escape.

A fire's heat alone can kill. Room temperatures in a fire can be 100 degrees at floor level and rise to 600 degrees at eye level. Inhaling this super hot air will scorch your lungs. This heat can melt clothes to your skin. In five minutes a room can get so hot that everything in it ignites at once: this is called flashover.

Fire starts bright, but quickly produces black smoke and complete darkness. If you wake up to a fire, you may be blinded, disoriented and unable to find your way around a building you are familiar with.

Fire uses up the oxygen you need and produces smoke and poisonous gases that kill. Breathing even small amounts of smoke and toxic gases can make you drowsy, disoriented and short of breath. The odorless, colorless fumes can lull you into a deep sleep before the flames reach your door.

Time is the biggest enemy in a residence fire. The longer you are inside the structure, the greater the risk that you will not make it out unharmed or alive.

PROCEDURE

Never stand up in a fire, always crawl low under the smoke and try to keep your mouth covered. If the hallway cannot be safely accessed, leave through the window. Report immediately to the Minor Fire muster station.

MUSTER STATION

Three muster stations have been identified:

1. Minor A/B/C and Camp Fire Muster Station – 150 m from major hazards;
2. Major Class B Fire Muster Station - >800 m from major hazards; and
3. Emergency Air Evacuation Muster station (Air Field) ~ 5 km from major hazards.

A major wildfire could represent a circumstance for which a site evacuation would be necessary.

6.8.5 Response

EXTINGUISHING COMMON FIRES

The following is a brief overview of how to extinguish various common forms of fires. For a more detailed discussion, refer to Appendix A.

Even a small fire should be treated with respect, and you should never attempt to fight a fire unless it is safe to do so. Before fighting a fire, be sure you have an unobstructed exit route. If the fire you are fighting begins to spread or the room fills with smoke, leave the area immediately. Remember: big fires start small, and portable fire extinguishers have their limitations.

Grease Fire – Frying Pan

The safest and easiest way to extinguish a frying-pan fire is to smother it by sliding a tight-fitting lid over the pan, and then turning off the burner. This will cut off the fire's supply of oxygen. Do not remove the lid or attempt to move the pan until the pan has cooled completely. Never attempt to carry the pan to a sink or outdoors. If you use a dry-chemical extinguisher, remember to stay back at least 6 feet to avoid splashing burning grease out of the pan. Never use water on this type of fire

Grease Fire – Oven or Broiler

Turn off your oven or broiler. Because kitchen ranges are vented, simply keeping the oven door or broiler drawer shut will usually contain, but probably not smother, the fire. However, opening the door or drawer will invariably cause the fire to flare up. When opening your oven door or drawer, do it slowly and with extreme care. Have a BC or ABC rated extinguisher ready. Do not attempt to move the pan or baking dish until the fire is out and the pan or dish has cooled completely.

A Wastebasket Fire

A fire in a wastebasket usually involves burning paper. Staying back from flames as far as possible, apply water to the fire until it is out, or use a portable fire extinguisher rated for Class A fires. A dry-chemical extinguisher that is rated only for Class B and C fires could be appropriate; however, because a BC extinguisher has no ~~–~~A" rating it may not be fully effective.

Fires Involving Furniture, Drapes, or Tablecloths

These are Class A fires and they can be extinguished with water. Unlike wastebasket fires, fires involving furniture, drapes, or tablecloths are not "contained" and can spread rapidly. For this reason, it is often best to fight them with a portable fire extinguisher rather than buckets of water. Once the burning fabric is extinguished and completely cooled, it should be removed from the house; *the potential for rekindling, especially with furniture, is very high*. Be sure to protect yourself from burns when removing the item.

A Vehicle Fire

If a car fire involves only upholstery (for example, a fire in the back seat started by a cigarette), use any fire extinguisher available. If the fire involves the engine or dashboard, however, the fire could quickly become very dangerous. Always shut off your engine. Such car fires can be fought with a fire extinguisher with a B:C or ABC rating. Do not open your hood; aim your extinguisher through the car's grill. If you cannot extinguish the fire immediately, leave the area, keep everyone far way from the car.

A Fire Involving Gas Lines

The only safe way to fight a fire in a kitchen range, furnace, or space heater involving natural gas or propane is to shut off the supply of gas. Know where gas-line shutoff valves are. The same is true for any fire involving heating oil under pressure (such as in a furnace burner). Never attempt to extinguish a gas fire without shutting off the fuel supply. An open gas line is a potential explosion hazard.

Additional Important Extinguishers

In addition, the following are important facts regarding the various forms of fire extinguishers;

- Dry Chemical extinguishers are usually rated for multiple purpose use. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant;
- Halon extinguishers contain a gas that interrupts the chemical reaction that takes place when fuels burn. These types of extinguishers are often used to protect valuable electrical equipment since they leave no residue to clean up. Halon extinguishers have a limited range, usually 4 to 6 feet. The application of Halon should be made at the base of the fire, even after the flames have been extinguished;
- Water extinguishers contain water and compressed gas and should only be used on Class A (ordinary combustibles) fires; and
- Carbon Dioxide (CO2) extinguishers are most effective on Class B and C fires (liquids and electrical). Since the gas disperses quickly, these extinguishers are only effective from 3 to 8 feet. The carbon dioxide is stored as a compressed liquid in the extinguisher; as it expands, it cools the surrounding air. The cooling will often cause ice to form around the "horn" where the gas is expelled from the extinguisher. Since the fire could re-ignite, continue to apply the agent even after the fire appears to be out.

PROCEDURE
Never stand up in a fire, always crawl low under the smoke and try to keep your mouth covered.

6.9 Training

All persons entering the site are to undergo fire safety training. The Health and Safety Officer is responsible to provide such training to employees prior to any Work or site visits. The training is to include the information contained herein and other visual aids. The trainees are to complete a test following the training and are to sign off that the training has been issued, using the form titled Fire Safety Training Checklist attached in Appendix A.

7 SAFE WORK PRACTICES

7.1 Policy for Safe Work Practices

Aboriginal Engineering Ltd. does not expect any team member to work in an environment that is not safe or does not follow safety regulations.

The safety information in this policy does not take precedence over Occupational Health and Safety Regulations. All employees should have a general knowledge of the Occupational Health and Safety Act and Regulations, and have access to a copy if and when required.

7.2 Working On or Near Water

This Safe Work Practice alerts all employees to the hazards of working on or near water.

Signage shall be posted to remind the team members about PPE in the area. The sign shall list the specialized PPE required prior to working in the area.

Guidelines
Wear a personal floatation device that meets regulatory requirements when working on or near water.

Wear an approved safety harness, secured to a solid fixed point by a short safety line when working near fluid filled tanks, ponds, lagoons, or natural waterways.

7.3 Control of Site

In order to mitigate risks associated with having multiple users of the site roads, the following shall be implemented:

- ✓ Third party users will be required to notify AEL by radio if they will be entering the work areas occupied by AEL, specifically the areas East of the airstrip access road;
- ✓ Third party users will be required to notify AEL by radio of any incoming or outbound fixed wing planes or helicopters; and
- ✓ AEL will be required to notify on-site third party users by radio of any incoming or outbound fixed wing planes or helicopters;

7.4 Material Safety Data Sheets (MSDS)

The MSDS‘s provide more product information than is found on the product label. These sheets have more detailed information about a substance‘s properties, its hazards, and how to prevent overexposure.

The MSDS‘s for controlled products at a work site are kept where they are easily accessible to employees. Employers may transfer the information from suppliers‘ MSDS‘s to their own standardized MSDS form. This is to make it easier for employees to find the information they require. If a municipality uses this practice, the MSDS‘s received from the supplier will remain on file so that employees can refer to them, if they desire.

There is no required format for the WHMIS MSDS's, but each of the nine required categories of information must be included. More detailed information in each category must also be included, if available.

The MSDS's must list all of the ingredients of a particular substance that are considered hazardous, along with their concentrations. These ingredients are included if:

- ✓ The most hazardous controlled product ingredients are listed if they make up more than 0.1% of the product.
- ✓ Other, less hazardous, controlled product ingredients are listed only if they make up more than 1% of the product.
- ✓ Ingredients that are included on the Ingredient Disclosure List (IDL) and that are present in the product in concentrations greater than the cut-off limits listed on the IDL.
- ✓ Ingredients that have not been tested for their toxic properties.
- ✓ Ingredients that the writer of the MSDS considers to be hazardous, even if they do not meet any of the first four conditions.

Preparation

- ✓ All employees who enter a project site have been instructed in and can demonstrate knowledge of WHMIS requirements.
- ✓ An inventory of and applicable MSDS's for products used is in place and is maintained in each office.
- ✓ Employees who are or may be exposed to hazardous products on the work site are trained in the safe use and handling of the products.
- ✓ A current set of MSDS sheets is maintained and is readily available to all employees on all shifts. The MSDS's are current (within 3 years).
- ✓ A method of workplace labelling for products transferred to containers other than the original, is developed and implemented prior to the start of the project. All employees on the project are instructed in and are familiar with the workplace labelling system.

Handling and Use of Controlled Substances

- ✓ Prior to the use of any hazardous product, employees have reviewed the product label and the MSDS for the product to ensure knowledge of the safe use of the product.
- ✓ Products are used only for their original purposes and are used only according to the manufacturer's directions provided on the label and MSDS and as instructed by Safety Officer.
- ✓ Employees wear and use personal protection equipment (PPE) as determined by a review of the label and product MSDS.
- ✓ If a product is removed from original container and placed in another container, employees are responsible for obtaining and placing the appropriate workplace label on the new container.
- ✓ Workplace labels are to be obtained by the supplier.

Clean Up and Storage of Controlled Substances

- ✓ Should there be a spill or leak involving a hazardous product, employees involved shall immediately notify the Supervisor and Safety Officer. Cleanup is done by knowledgeable personnel and is in accordance with the product label and MSDS.

- ✓ Empty hazardous materials containers are disposed of according to the product label or MSDS.
- ✓ All products are stored according to the requirements of the product label or MSDS. Special care is taken not to store incompatible products in proximity to each other.

7.5 Platforms and Guard Rails

A platform or ramp, to which an employee has access and from which falls may occur (from a vertical distance of 1.2 m (4‘) or more), is protected from open sides and ends by standard railing on all open sides. The exception to this is where there is an entrance to a ramp, stairway, or fixed ladder.

Guidelines
Never work under a scaffold or platform that is being erected, altered, or dismantled and never move the scaffolding when someone is working on it.

Platform Requirements:
- ✓ The platform supports are placed on a smooth foundation to prevent lateral displacement. Masonry blocks, bricks or tiles are not to be used as scaffold or platform supports.
- ✓ The platform should be supported to prevent excessive deflection, and secured to prevent tipping or displacement (CSA Standard 269.2-M87). Equivalent manufactured planking may be used if designed and approved by a Professional Engineer.
- ✓ Planks should be secured from movement by cleats or by being wired in place.
- ✓ Planks are to be kept clean and free of any obstructions that could cause slipping or tripping hazards.
- ✓ Planking must be construction grade No. 1 fir (or equivalent material), measuring at least 38 mm by 235 mm (2” X 10”).
- ✓ The maximum span should not exceed 2.3 m (7.5‘) for heavy duty use and 3.1 m (10‘) for medium and light duty use. Planking used for working surfaces should be of uniform thickness and tightly laid.

Guardrail Requirements
- ✓ Guardrails are installed between 1 m (3‘) and 1.5 m (5‘) above floor, ground or platform level, with a mid-rail halfway in between. Toe boards are a minimum of 10 cm (4”) in height.
- ✓ Top rail surfaces are smooth.
- ✓ Guardrails are constructed and mounted so that they are capable of supporting at least 90 kg (200 lbs.) of lateral force.
- ✓ Hand rails measure between 75 and 85 cm (30-33”). Handrails receiving additional stress from employees or materials are further supported by the closer spacing of posts or by additional bracing.

7.6 Electrical Equipment

No employee shall use any power tool, or similar type of equipment, unless he/she is familiar with the use and operation of the equipment or has received specific instruction on its use and operation.

Guidelines

- ✓ Report all shocks and/or sparks from electrical tools, no matter how minor. The tool in question must not be used until it has been checked for ground fault.
- ✓ Verify that the power source is the same voltage and current (alternating or direct) as indicated on the nameplate of the tool. Using a higher voltage can cause serious injury to the operator as well as burn out the tool.
- ✓ Ensure the switch on the tool is in the OFF position before connecting it to a power source.
- ✓ Maintain electrical cords and appliances in good working order.
    - Cords and appliances must be CSA approved.
    - Never carry an electric tool by the cord or disconnect the plug by pulling or jerking on the cord (can damage, loosen, or separate connections).
    - Check cords frequently for such damage such as kinks, cuts, and cracked or broken outer jackets (any cord that feels more than comfortably warm to the touch should be checked by an electrician for overloading).
- ✓ Store electrical cords in a clean, dry area off the ground to prevent damage to cord.
- ✓ Unless it is double insulated, the electric tool must be grounded to protect the operator from electrical shock.
    - The tool must have an approved three-wire cord with a three-prong plug so that it can be used only in a properly grounded three-hole receptacle.
- ✓ Do not impair, remove, or render ineffective any machine guards that are in place for employee protection.
- ✓ Ensure equipment has the proper guards and that they remain in place. If, due to damage or deterioration, the original guard provided on a piece of equipment cannot be put in place, employees should use a temporary method, offering equal or better protection, as approved by the WCB.
- ✓ Stand to one side when throwing (engaging or disengaging) an electrical circuit breaker to avoid electrical flash backs.
- ✓ Avoid using electric tools in rain, snow or wet or damp locations. If work under such conditions is necessary, use a ground fault circuit interrupter (GFCI or GFI) available in portable or fixed models.
    - GFCI are fast-acting devices that detect any current leaking to ground from an electric tool and can quickly cut off electricity before damage or injury can occur.
    - It‘s strongly advisable to use GFCI with all portable electric tools at any time.

7.7 Work With Hand Tools (Non-Powered)

No employee shall use any hand tool, unless he/she is familiar with the use and operation of the equipment or has received specific instruction on its use and operation. Instruction in the use, handling, and maintenance of tools will be given to employees who require it.

Guidelines

- ✓ Ensure the right tool is being used for the job to reduce chance of unexpected occurrences. Do not submit or use makeshift tools.
- ✓ Check tools for damage or wear prior to each use to reduce chance of unexpected occurrences.
    - Watch for loose or broken handles and mushroomed heads.

- Replace cracked or broken handles on files, hammers, screwdrivers, or sledges.

✓ Replace worn jaws on wrenches, pipe tools, and pliers. Redress burred or mushroomed heads on striking tools.
✓ Sharpen cutting tools frequently to reduce chance of unexpected occurrences.
✓ Store hand tools properly after each use.
✓ Ensure that tools are clean and dry to avoid slippage when in use.
✓ Never leave tools on ladders, scaffolds, or overhead work areas when they are not in use (e.g. high number of injuries occurs from objects/tools falling from overhead work areas in construction).
✓ Always keep tools being used in overhead work areas in containers that will prevent them from falling.
✓ Carry tools using a heavy belt or apron and hang tools at your sides.
    - Never carry tools in your pockets or hanging behind your back.
✓ Avoid muscle strain and fatigue by doing the following:
    - Choose tools that allow you to keep your wrist straight as much as possible when using them.
✓ Avoid using hand tools with your wrist bent:
    - Always PULL on wrenches and pliers. Never push unless you hold the tool with your palm open.
    - ALWAYS cut away from yourself when using cutting tools.
✓ Ensure balance and stable footing when using a bar for prying.
    - Pry bars can slip or break without warning
✓ Be aware of other employees when using picks or axes.

7.8 Lifting

This Safe Work Practice provides guidelines to reduce the risk of back strain.

Guidelines

✓ Assess the item to be lifted. Ensure pathway to and from item is clear to avoid a tripping hazard and that the area where item is to be placed is clear of obstacles.
✓ Stand as close as possible to the item and have feet comfortably spaced.
✓ Bend your knees keeping your back straight.
✓ Test the lift. Grasp the item firmly and attempt to lift it. If the item cannot be lifted without causing discomfort, place item down and get help.
✓ If you can safely perform the lift, straighten your legs, keeping your back as straight as possible.
✓ Do not twist while holding item. If you have to turn with the load, move your feet.
✓ Short steps are better for walking with the item. Ensure that your load is small enough so it will not obscure your visibility while transporting.
✓ Set your item down ensuring you bend your knees while lowering, keeping your back as straight as possible. Be sure not to leave your hands under the item when setting it down.
✓ It is much easier to lift an item when it is sitting at waist height. If the item to be lifted can be raised mechanically to waist height, then do so (i.e. raising pallet up with forks).
✓ Some items may be in awkward positions and these particular procedures cannot be followed.

- ✓ Ensure that you minimize the amount of back strain it takes to manoeuvre these items to a position of easier lifting.

7.9 Housekeeping

Good housekeeping involves everyone in the workplace. Employees are responsible for the maintenance of good housekeeping in all work areas.

Guidelines

- ✓ Employees are to keep their work area clean and free of clutter at all times.
- ✓ Work and storage areas are arranged to allow for the safe movement of employees, equipment, and materials.
- ✓ Keep floors are clear of oil, grease, and other materials that could cause slipping hazards.
- ✓ Keep aisles and passageways clear of debris and materials that could create tripping hazards.
- ✓ Put rubbish and waste in the receptacles provided. Receptacles are emptied at regular intervals, preventing the hazardous accumulation of rubbish and waste.
- ✓ Put oily rags in the approved receptacles only.
- ✓ Recoil and store hoses, cables, ropes, and wires in the appropriate location.
- ✓ Replace all grates and covers on openings once work is completed. If the task is incomplete, the openings are barricaded.
- ✓ Do not store heavy articles on high shelves. Only the bottom two shelves of racks are used for heavy items.
- ✓ Do not remove or render ineffective any guards on tools or machinery. Only approved electrical tools and machinery are used.
- ✓ Do not store aerosol cans where the temperatures may exceed 48°C (120°F). Cans must be handled with caution to prevent rupturing. Dispose of aerosol cans properly in well marked containers.
- ✓ Do not leave lumber with protruding nails in the work area. Protruding nails are removed or clinched over.

7.10 Use of Site Vehicles

Equipment Inspection

- ✓ Inspect vehicles at the beginning of each shift. Fill out a pre-shift vehicle/equipment checklist and do not operate vehicles/equipment deemed unsafe;
- ✓ Report any vehicle and/or equipment defects at the daily safety meeting;
- ✓ Maintain a record of maintenance and inspections and submit these records daily to the site supervisor;
- ✓ Operate vehicle and/or equipment in accordance to manufacturer specifications and in manner which does not endanger wildlife or staff or cause damage to the vehicle and/or equipment.

Road Safety

- ✓ Motor vehicles shall be operated at safe speeds, under 30 km/h within the site and under 10 km/h within the camp limits;
- ✓ Watch for heavy equipment and other vehicles in locations with limited visibility and proceed with caution;

- ✓ Workers must make their presence known to the vehicle and/or equipment operators;
- ✓ For greater visibility, headlights must be on at all times on all motor vehicles.

Motor Vehicles Left Unattended

- ✓ Park equipment clear of traffic. Do not block access to:
  - ➢ electric distribution equipment
  - ➢ ramps
  - ➢ fire fighting or emergency equipment
  - ➢ the airstrip
- ✓ Park equipment in the following manner:
  - ➢ turn toward the wall if on an incline
  - ➢ shift in park position, or in gear for manual transmissions
  - ➢ lights and motor off
  - ➢ master switch off
- ✓ Vehicles must be backed into camp when parking in the camp parking lot.

Idling Vehicles

- ✓ Do not idle vehicles unnecessarily; and
- ✓ Vehicles can be left idling if there is a safety concern (i.e. wildlife, etc.)

At the beginning of each shift, the Light Vehicle daily checklist must be filled out. The checklist can be found in Appendix A.

7.11 Heavy Equipment Operation

A variety of heavy equipment may be used to perform various work tasks. The following guidelines outline the general safe work practices for heavy equipment operations.

Guidelines

Only trained heavy equipment operators (HEO) shall operate heavy equipment. All HEO shall sign off on how many hours they have spent operating each piece of heavy equipment.

- ✓ HEO-in-training shall be required to read equipment operation and maintenance manuals. The Site Superintendent shall monitor the HEO-in-training‘s progress and performance.
- ✓ HEO‘s shall inspect their equipment and log it in a logbook prior to the start of each shift. Any deficiencies will be reported to the Site Supervisor and/or Site Mechanic.
- ✓ All HEO must wear appropriate PPE including hearing protection.
- ✓ Excavations shall be graded to a 1:1 slope for ground stability or flat as site conditions dictate. Slope cut angles may be determined by the Site Supervisor and PWGSC Resident Engineer.
- ✓ Persons on foot shall stay out of the reach of excavator booms and gain eye contact with the HEO prior to approaching the equipment

At the beginning of each shift, personnel must complete the heavy equipment daily checklist, shown in Appendix A.

7.12 Cold Weather Survival

Safety Gear

The following will be available in each work vehicle and ATV in case personnel are stranded in cold weather conditions.

- ✓ 2-way radio;
- ✓ Sleeping bag;
- ✓ Gloves;
- ✓ Solar blanket or Wool blanket;
- ✓ Waterproof matches;
- ✓ 8 hour candles;
- ✓ 30 minute high-intensity light stick;
- ✓ Emergency body heat packs;
- ✓ Shovel;
- ✓ Axe;
- ✓ 100‘ nylon rope, and tow rope; and
- ✓ First aid kit;

Site Procedures

In the event that short term extreme cold temperatures (-40 °C) are experienced on-site, personnel shall be instructed to:

- ✓ Stay inside camp structures until weather warning is nullified by Site Supervisor;
- ✓ Check the heating oil level on the oil-fired heaters – if heating oil levels are low, notify Site Supervisor, or move to another heated structure;
- ✓ Ensure snow does not build up against the door of each camp structure – shovels to be used to remove snow build-up;

In the event of long-term extreme cold temperatures (-40 °C), the Site Supervisor shall call for a chartered plane or helicopter to retrieve crew from site, and site shall be evacuated.

Breakthrough through ice

Personnel should be aware of the following, to be properly aware and informed about what may happen during a breakthrough event.

a) Immediately upon submersion into ice water, the victim involuntarily intakes a sudden gasp of air, referred to as the cold gasp reflex. If the victims head is underwater when the gasp takes place, this will result in instant drowning.
b) The person will continue to hyperventilate for one to two minutes; this is normal and will subside.
c) The person will have good control of their hands and limbs for five to seven minutes. After that point, the victim will be unable to grasp onto ropes or reaching aids.
d) Humans will not become even mildly hypothermic for a full 15 minutes when submerged in cold water. If capable of floating or otherwise remaining on top of the water, humans will survive one hour or more in ice water.

e) The body naturally redirects warm blood from the hands and limbs to the inner core in an attempt to preserve heat. While this preserves the vital organs, it also deprives the victim of their ability to swim. The overwhelming majority of ice water victims die by drowning, not hypothermia.

Self-Rescue Techniques (not vehicle mounted)

a) Immediately upon entering the water, relax and control breathing. Your clothing will provide some measure of buoyancy.
b) Turn and swim back in the direction you initially traveled from; the distance to that ice is known and was capable of supporting your weight up to the area you broke through.
c) Swim as quickly as possible to the ice edge; your clothing will begin absorbing water, making swimming and extracting from the ice more difficult.
d) If carrying ice picks, use them. The time and effort to recover these tools from your clothing, and while your hands still have dexterity are worthwhile.
e) Raise your feet horizontal with the ice, begin kicking hard and pull yourself onto the ice. Maintain a horizontal position when moving onto and across the ice to distribute your weight.
f) The ice edge may be weakened due to the wave action of your submersion, you may continue breaking through the edge for several feet. Continue working in the same direction; do not move to a different area.
g) If unable to extract yourself from the water, hold onto the edge and stop moving. Allow your clothing to freeze onto the ice to ensure you stay in place, allowing rescuers an opportunity to reach you.
h) Once out of the water, roll or crawl until you are sure you are on solid ice.
i) Immediately get into a heated vehicle or shelter.
j) Remove wet clothing.
k) Immediately report the incident and request medical support.

Extraction Drills from Vehicles

a) Do not panic. Although every situation is unique, the majority of vehicles that break through ice either float for several seconds to minutes or become partially hung up on ice. Floatation times vary according the vehicle type, degree of air tightness and cargo.
b) Exit the vehicle as quickly as possible. Do not wait for the vehicle to stop moving or fill up with water.
c) If the doors cannot be opened, exit through the side window. If necessary, kick out the windshield and exit.

If the Vehicle is Hung Up or Floating

a) If possible, avoid becoming wet. If able to step directly onto ice, immediately adopt a horizontal position and crawl, log roll or slide away from the vehicle.
b) If unable to step directly onto the ice, enter the water slowly, and control your breathing.
c) Move away from the vehicle quickly. Large objects that sink do not create suction; however, the creation of massive air bubbles created by sinking vehicles temporarily destroys water tension, making floatation in the immediate area difficult or impossible.
d) Follow self-rescue techniques described above.

If Vehicle Cab is submerged

a) Do not panic. Rushed, uncontrolled efforts to exit the cab is your greatest danger.

   - Be prepared to have extremely limited to no vision underwater; and
   - The vehicle is likely to roll in any direction and sink upside down.

b) Grasp the door handle and orient yourself to the front of the vehicle before undoing your seat belt.
c) If the vehicle is rolling, you will float towards the surface as soon as you undo your seat belt. This means you may be floating towards the floor or corner of your cab. Remain oriented; your exit might be below you.
d) Carry out the following drill:
   - Keep one hand on the door handle or opened window;
   - Orient your head and body forward in the cab;
   - With your other hand, undo your seat belt;
   - Immediately turn 90 degrees to the open door or window and exit;
   - Kick hard to the surface; and
   - Grab and hold onto any floating debris.
e) Carry out your self-rescue drills as described above

All personnel to be recovered from the icy water are to be treated with first aid immediately, and transported to the nearest treatment facility.

Assisted Rescue

Upon discovery of a breakthrough, rescue personnel shall proceed with extreme caution. A quick assessment shall be conducted, to assess a) if a person is underwater; b) extent of the breakthrough; and c) safe distance from the breakthrough. If a person is underwater, rescue personnel shall never dive into the water to perform a rescue. Such shall only be done by qualified diving personnel with appropriate cold-climate diving gear. The procedure is as follows:

Coherent victim floating in water:

a) Tie a loop in the nylon rope, and throw towards the person floating in the water; and
b) Pull victim to safety from a safe distance from the ice breakthrough.

Incoherent or unconscious victim floating in water:

a) Supervisory personnel trained in ice rescue dons ice rescue dry suit;
b) Ice rescue sled is tied off with a long rope, to a truck or ski-doo;
c) Ice rescuer to walk ice sled to the vicinity of the breakthrough;
d) Ice rescuer pulls victim onto ice sled;
e) Support personnel pull in the ice sled, to assist ice rescuer and victim to safety.

All personnel to be recovered from the icy water are to be treated with first aid immediately, and transported to the nearest treatment facility.

Should a drowning occur, only certified divers shall be brought in to retrieve the victim.

7.13 Heat Stress Management

Heat stress can lead to loss of fluids, fatigue, and may lead to heat-related illness, disability, and even death. Labourers on-site who are to perform physically demanding work may be prone to heat stress, and the following measures shall be taken to ensure that heat stress is avoided.

- ✓ Labour workers to be issued water bottles, so that workers can replenish fluids during the day‘s work;
- ✓ Workers to be instructed to take breaks in the shade, to avoid fatigue;
- ✓ Sun screen to be made available on-site for employees;
- ✓ Supervisors to monitor ambient temperature, and issue advisory to labour workers regarding the potential for heat stress during hot days; and
- ✓ Supervisors to reinforce causes and prevention of heat stress during daily safety meetings.

7.14 Incineration of Waste

Camp waste shall be incinerated using a forced-air, fuel-fired incinerator. AEL shall utilize Elastec Smart Ash II incinerators to incinerate food scraps, miscellaneous camp waste, honey bags, and waste oil. The Elastec Smart Ash II incinerators have received emission testing and certification for incineration of camp wastes and oil.

Figure 5 below shows the procedure to load and incinerate solid waste using the Elastec Smart Ash II incinerator.

Figure 5 INCINERATION OF SOLID WASTE

The incinerator is also equipped with a fuel/oil feed line, which meters fuel or waste oil into the incinerator. Waste oil from equipment maintenance shall be metered into the incinerator to ensure proper disposal of the waste oil.

Guidelines

- ✓ Incinerator operator to be trained on the use of the incinerator
- ✓ Incinerator operator to thoroughly review the operating manual of the incinerator
- ✓ Fire extinguisher must be kept in close proximity to incinerator
- ✓ Aerosol cans, gasoline, or liquid fuels shall not be loaded directly into the incinerator
- ✓ Operator to adjust air flow to ensure optimal incineration of waste
- ✓ Waste ash to be stored in a barrel, for subsequent off-site disposal.

7.15 Lockout Tag out Procedures

Introduction

Every practical effort must be taken to protect personnel working on electrical lines and equipment. The source of POWER or ENERGY to the electrical lines and equipment must be INTERUPTED AND SECURED WITH A PADLOCK or PROTECTIVE DEVICE before the work begins. This procedure outlines the standard method for LOCKING OUT EQUIPMENT and includes the use of the RED TAG OUT CARD to advise people of the reason for the LOCKOUT. The LOCKOUT and TAG OUT are SAFETY DEVICES used to protect the LIVES OF OUR PEOPLE and must not be removed WITHOUT PROPER AUTHORIZATION.

Essential Personal Protective Equipment Requirements

- ✓ HARDHAT
- ✓ CSA APPROVED WORK BOOTS
- ✓ SAFETY GLASSES
- ✓ RUBBER OR LEATHER GLOVES
- ✓ PADLOCK
- ✓ TAGOUT CARD

Lockout Procedures

Step #1 - Inspection of Area

- ➢ Identify piece of equipment to be locked out.
- ➢ The worker performing the lockout must ensure equipment being shut down will not cause a hazard to anyone working in the area (i.e.: ventilation hazards; flooding hazards, etc.).

Step #2 – Notification of Personnel

- ➢ Notify the supervisor in charge of the area of the lockout that is to take place whether it is maintenance, an installation, testing or servicing of equipment.
- ➢ Notify the workers and/or operators working in the area of the lockout prior to stoppage of equipment.

Step #3 – Interrupt Power

- Turn the local control switch to the off position. LOCAL CONTROL SWITCHES MUST NEVER BE USED FOR LOCKOUT LOCATION.
- Ensure the MAIN POWER SOURCE is interrupted to prevent unexpected or inadvertent energizing and/or start up of the equipment.

Step #4 – Secure the Main Source of Power

- Attach you personal lockout padlock to the MAIN POWER SOURCE to secure it in the OPEN/OFF position so it cannot be closed.
- All personnel working on the equipment MUST install their own lock on the MAIN POWER SOURCE switch. The use of a scissor locking device may be required when more than one lock is attached to the power source switch.

Step #5 – Install the Tagout Card

- Indicate the date, time and reason for the lockout on the RED TAG OUT CARD and attach it to the padlock or the controls to inform anyone concerned.

Step #6 – Control or Eliminate Residual or Secondary Energies

- Before any work is done on the equipment, the person performing the work will be responsible for controlling or eliminating any secondary or residual energies affecting the equipment he/she has locked out. The following are some examples:
    - Block or release springs
    - Block elevated parts
    - Discharge capacitors
    - Relieve system pressures
    - Drain Fluids
    - Vent gases
    - Stop rotating flywheels
    - Allow systems to cool

Step #7 – Confirm Zero Energy

- Activate the equipment controls and test the lines to certify that ZERO ENERGY has been attained.
- When required, test circuits dead by having a Journeyman Electrician test with a voltage meter.

Step #8 – Install the Grounds

- Where necessary install grounds to protect against STRAY CURRENT such as lightening strikes or contact with other live lines.

Step #9 – Removing Locks and Tags

a) The EMPLOYEE who INSTALLS the lock and tag out is the only EMPLOYEE permitted to REMOVE them.
b) Put the equipment back into a safe state. All guards and safety devices have been replaced; all workers are accounted for and the area is safe for operation.
c) When the work is completed ensure that the lock or protective device, and tags are REMOVED.
d) Test and inspect equipment for proper operation.
e) Inform production personnel that the work is COMPLETED and the equipment is available for service.
f) When the work is NOT COMPLETED at the end of the shift, replace your PERSONAL LOCK with a SHOP LOCK, update the TAGOUT CARD to include the work left to be completed and give the SHOP LOCK KEY to the electrical supervisor, or……
g) A Journeyman Electrician completely disconnects all electrical leads at the MAIN SOURCE OF POWER and at the equipment. All disconnected lines must be taped at their ends and a RED TAGOUT CARD attached to the equipment identifying the present status.

Step #10 – Unauthorized Removal

- UNAUTHORIZED REMOVAL of lockout padlocks or tagout cards is a VERY SERIOUS SAFETY VIOLATION and ANY EMPLOYEE performing an UNAUTHORIZED REMOVAL will be subject to corrective action up to and including dismissal. Only the supervisor may authorize the removal of a lock, only after every effort has been made to contact he installer of the lock and after ensuring the equipment is safe to operate. If the installer forgets to remove his or her lock, they will be responsible at their own expense to return to the mine site and remove it.

7.16 Hot Work Safe Work Plan

Purpose
The purpose of this procedure is to establish the requirements for the hot works program for the Great Bear Lake Phase 1 Project.

Training
Training required to complete hot work is as follows;

- competency in the task being completed (i.e., welding, grinding, cutting etc) and an understanding of the tasks hazards;
- Use and implementation of the Hot Works Permit System; and
- Training and knowledge of basic fire extinguisher use and operations.

Safe Work Procedures

Pre-Program Inspection

Prior to the project commencement, the AEL Field Engineer will conduct an inspection of the project to identify areas that contain flammable or combustible materials or explosion hazards. The inspections will be repeated monthly or after any significant change in operations that could affect fire conditions. Warning signs shall be posted in areas with such hazards.

Hot Work Permit

A hot work permit must be completed before any hot work is conducted. The Hot Work Permit form is in the end of this document. Job tasks that span for a week or more may have long-term permits issued. The issuance of such a permit is at the discretion of the Site Superintendent. The Site Superintendent and the worker and the fire watch (if required) will sign the permit. Keep the hot work permit on file in the project office. The Site Superintendent has the right to issue any conditions or limits to any license at any time.

Hot Work Procedures

- The Site Superintendent and the employee conducting the work will inspect the job site before commencing work to identify any flammable or combustible materials or explosion hazards in the immediate area. Fire prevention precautions will include the following:
    - All flammable or combustible material and explosion hazards found shall be removed to a safe location if possible;
    - If removal is not possible, the flammable or combustible material or explosion hazard material shall be protected with a fire-proof insulating blanket or shield;
    - The floor shall be swept clean;
    - Combustible floors shall be wetted or covered with fire resistant sheets;
    - Pressurized vessels, piping and equipment shall be removed or isolated and vented;
    - All wall and floor openings shall be covered;
    - Area shall be tested for explosive atmospheres;
    - Explosive atmospheres shall be eliminated;
    - Welding flash screen shall be in place, and
    - Supervision in the surrounding area shall be notified.

Fire Watch

If required by the Site Superintendent as a permit condition, assign a standby employee as a fire watch in the area while the hot work is being performed. Train the fire watch in fire prevention and fire fighting methods. The fire watch shall stay at the site of the work for 30 minutes after completion of the work to ensure any smouldering embers are extinguished before they can ignite into fire. Fire watch for major burning activities shall be assigned time periods based on an assessment of the hazards.

Fire Extinguisher

Bring appropriate portable fire extinguishing equipment to the hot work site. A minimum 20-1b type ABC is required. The fire watch or employee shall operate the equipment as necessary.

Job Completion

Return the completed hot work permit to the project office for filing.

On-site Burning

Regulatory Requirements

The Forest Protection Act (NWT) requires that anyone wishing to start or kindle a fire during the closed season (May 1 to September 30) within a forested area must obtain a Permit to Burn from the local GNWT Renewable Resource Officer. The following provides contact information to obtain a burn permit:

Roger A. Fraser
Forest/Wildlife Officer
GNWT North Slave Region
Environment and Natural Resources
Tel. (867) 920.6456
Fax: (867) 873.6230
Email Roger_Fraser@gov.nt.ca

This permit is not required for burning waste in a device designed for and capable of confining the fire. For open fires during the closed season, the Site Superintendent is responsible for obtaining a permit and ensuring that all burning is undertaken as per the burn permit conditions and the conditions of the contract.

Contractual Requirements

The following describes the contractual conditions that must be met with respect to fires and burning of waste at the Great Bear Lake sites.

Fires

- Fires and burning of rubbish on-site is permitted only when approved by the Crown Engineer and in accordance with GNWT burn permit conditions;
- Provide supervision, attendance and fire protection measures as directed by the Crown Engineer.
- No burning of structures in-place is permitted;
- incineration of hydrocarbons must be complete as per the *NWT Used Oil and Waste Fuel Management Regulations.*

Disposal of Operation Center and Camp Waste

- Burn Operations Center and Camp combustible wastes in fuel fired incinerators, except for Styrofoam and plastics. AEL will containerize the Styrofoam, plastics and ash/debris resultant from burning, and transport back to Yellowknife to be placed in the landfill;
- Kitchen and non-hazardous waste materials are to be kept to a minimum. Burn these wastes in the incinerator, and containerize and transport any residual waste to Yellowknife to be placed in the landfill;
- Materials not suitable for burning must be containerized and shipped to Yellowknife and either placed in the Yellowknife Landfill or AEL will find an appropriate disposal location once in Yellowknife.

FORMS

Hot Work Permit form – located in Appendix A.

7.17 Working from Heights

Purpose
The purpose of this procedure is to establish the requirements for Working at Heights during the Great Bear Lake Project.

Hazards
The hazard of working at heights is a personal injury due to a fall from heights.

Equipment
Safety harnesses, lanyards, lifelines and fall arresting devices must be approved under these CSA standards:

- Z259.1-1976, *fall-arresting safety belts and lanyards for the construction and mining industries*;
- Z259 M1978, *fall-arresting devices, personnel lowering devices and lifelines;*
- Z259.10-M90, *full- body harnesses*; and
- Z259.11-M92, *shock absorbers for personal fall arrest systems.*

Training
Training is to include knowledge of required PPE use, maintenance, limitations, and safe work practices as per this plan.

Requirements
The following requirements of the NWT MHSA Section 8.11 must be met as a minimum level of safety with respect to working at heights.

- Subject to subsection (5), where a person is exposed to the hazard of falling more than 3 m, a fall arresting device shall be provided to the person and he or she shall use the device;
- (2) The fall arresting device required by subsection (1) shall comply with the relevant design and performance requirements of CAN/CSA-Z259.10-M90 Full Body Harnesses;
- (3) Safety belts, harnesses, lanyards and lifelines shall not be knotted and shall not be allowed to become knotted or damaged;
- (4) When in use with a fall arresting device, a lifeline shall be anchored so that a person cannot fall, free of arrest, for more than 1.22 m, and the lifeline shall be connected to an object that is free from sharp edges and capable of resisting the force of an arrest
- (5) Subsection (1) does not apply to a person employed in shaft sinking where measures are in effect to provide equal or greater protection against falling.

Safe Work Practices
General
- As a general guideline any time that work is to be performed at a height of 3 m (10 ft) or more, or within 2 m (10 ft) of an open hole or edge, a fall hazard may exist.

- Other fall hazards include: falling more than 1.2 m (4 ft) if the work area below is used as a travel way by people or equipment, any fall into operating machinery, and any fall into or onto a hazardous substance or object;
- There are two acceptable options for addressing a fall hazard. The preferred option is the elimination of the hazard. As it is not always possible or practical to eliminate the fall hazard, other measures such as wearing personal protective equipment (PPE) may be required;
- Whenever a worker may be exposed to the hazard of falling 3m (10ft) the worker shall use a fall arrest system, which meets the requirements of the CSA standards listed in the Equipment section;
- A fall arrest system must be rigged to limit free fall distance to a maximum of 1.22 m. Arresting forces must be limited to 8 kN (816 kg-f or 1800 lb-f).
- Fall arrest systems are approved for use only if the combined employee and tool weight is less than 140 kg (310 lb);
- Full body harnesses must meet the requirements of standard CAN/CSA-Z259.10-M90. A safety belt is not acceptable for use in a fall arrest system connecting devices such as, shock absorbers / lanyards (recommended), rope or web lanyards, rope grabs or retractable lifelines;
- Retractable lanyards must be anchored vertically and must not exceed 15 degrees off vertical;
- Anchorage connectors and points, such as eyebolts, support beams, cross arm straps, and beam trolleys must be capable of supporting 22.2 kN (2,268 kg-f or 5,000 lb-f) per worker. Each worker should have a separate anchorage point. Anchorage points should be installed above the level of the worker‘s harness D-ring, but in all cases must be high enough to prevent a worker from hitting a lower elevation when the worker‘s fall arrest system is fully deployed;
- 100% fall protection is required. Two lanyards must be used at all times. When changing locations one lanyard must be attached to the anchor point at all times and the second attached to another anchor point before undoing the first;
- Harnesses shall be adjusted so they fit snugly to the body. Workers shall review and follow the manufacturer‘s instructions on care and use of harnesses;
- Lanyards shall only be attached to secure anchor points. Care shall be taken to avoid damage from heat or sharp objects;
- Horizontal and vertical lifelines and components shall be a manufactured system used in accordance with the specifications, or a system designed, used and installed in accordance with the specifications of a professional engineer;
- Fall arrest systems or equipment shall only be used for the purpose intended. Fall arrest equipment should only be used in a load-bearing manner in the event of a fall.

Travel Restraint/Restriction Systems

A travel restraint/restrict system limits a worker‘s movement so the worker is unable to reach a location where there is a risk of falling. A travel restraint/restrict system consists of:

- One harness;
- Two lanyards; and
- An anchor point, capable of supporting a static load of 1,136 kg (2,500 lb) and installed at least 1 m (39 in) above working level.

- Do not tie two or more safety lanyards together to allow additional distance from the anchor point. Use one lifeline of proper length;
- Do not use a retracting device as a restraint device;
- Do not use a shock-absorbing device as a restraint device.

Guardrails

Guardrails must be installed on any scaffold, temporary work staging, or permanent platform or walkway from which a person could fall more than 1.5 m (5 ft). The heights of guardrails are specified by NWT legislation (top rail 910 mm – 1,070 mm) and second mid rail at mid point between the top rail and the floor. The top guardrail must be capable of withstanding a load of 900 N (92 kg-f or 202 lb-f) of force applied to the rail in any direction.

Care of Equipment

When caring for equipment:

- Follow manufacturer‘s instructions for care, maintenance and replacement of all fall protection components. The worker must inspect all components of a fall restraint system before use;
- Equipment must be stored in a manner and location which prevents damage from environmental factors such as heat, light, moisture, oil, chemicals and their vapours or other degrading elements. Do not drop fall arrest equipment, as cracks may develop in metal parts. Small cracks may be hard to detect during a visual inspection;
- Keep all components clean, as dust, grease, etc. may shorten the service life. Follow manufacturer‘s recommendations for cleaning;
- Do not remove any tags, labels or other markings. Do not use markers, paint, etc. to label fall arrest equipment except on areas designated by the manufacturer;
- Do not use any fall arrest component, which has passed its expiry date regardless of its apparent condition. Personal fall arrest systems or components subjected to impact loading (falls) must be immediately removed from service and destroyed.

7.18 Barrel Crushing

7.18.1 WORK PROCEDURE

STEP	PROCEDURE	RESPONSIBILITY
1. Site Preparation	• Install Rig Mats. • Ensure mats are on a level surface. • Level ground with excavator if required	Supervisor Operator
2. Equipment Preparation	• Place all barrels to be crushed, outside of the rig mat perimeter. • Excavator to be used for crushing is to be placed opposite to barrel lay-down area. • Loader to be used for transporting crushed barrels is to be placed beside the excavator ensuring that there is sufficient clearance for excavator to swing and not make contact with loader	Supervisor Excavator operator Loader operator
3.	• Worker will place the barrel to be crushed in the	Barrel Handler

Worker placing barrels	center of the rig mat, and immediately return to the outside of the perimeter area; in preparation to the excavator performing crushing.	
4. Excavator crushing barrels	• Excavator operator will place the bucket over the barrel in such a position as to give a flat surface for crushing requirements. • Excavator will lower the bucket with sufficient force to crush the barrel ensuring that the downward stroke is straight and level. This action ensures that the bucket is crushed evenly. • The excavator operator will repeat this action as many times as necessary to ensure that the barrel is sufficiently crushed.	Excavator operator
5. Worker placing crushed barrels into loader	• Once the excavator has completed the crushing operation, the excavator operator will push the crushed barrel towards the loader operator. This action will ensure that the operator has minimal lifting requirements, and is also not required to enter the active work area, minimizing the risk of injury. • Excavator operator will then put his bucket at the rest position, which is signaling that it is safe to enter the working perimeter and place another drum on the rig mat. • When the barrel has been slid to the loader operator, the loader operator will pick-up the crushed barrel and place it in the loader bucket.	Excavator operator Loader operator

These actions will continue in the above stated procedure during the complete task of barrel crushing.

8 TRAINING AND COMMUNICATION

8.1 Policy

It is Aboriginal Engineering Ltd. policy to ensure that Safety Training is made available to employees at all levels of the organization. This Safety training program is provided for all employees by Aboriginal Engineering Ltd., and employee participation is mandatory. It is the objective of the Safety Program to minimize losses of human and/or physical resources. The program is divided into orientation, job training, and Health & Safety meetings sectors.

The goal of the Safety Program is ~~"n~~o accidents". To attain this goal, it is crucial that the work force is trained in safe work practices, emergency procedures, accident prevention and safety awareness. The training program must instil safety responsibility and provide the skills necessary to protect employees from injury in the work environment. Special attention is given

to new employees by providing an orientation program that familiarizes them with corporate procedures and ensures that they can perform their duties in a safe and efficient manner.

8.2 Health and Safety Orientation

The Health & Safety Orientation session serves as an introduction for newly hired employees to Aboriginal Engineering Ltd. Health & Safety Program. New employees learn what their safety responsibilities will be while employed by Aboriginal Engineering Ltd., as well as what the responsibilities of company management entail.

New employee orientations are conducted by a member of the management team, and they take place on the first day on the job for a new employee. Orientations include interactive discussions regarding Aboriginal Engineering Ltd. commitment to workplace safety.

The orientation will include:

- ✓ Heath and Safety Policy
- ✓ Safe Work Practices and Job Procedures pertinent to the job in question
- ✓ Company Safety Rules
- ✓ Personal Protective Equipment
- ✓ Emergency Procedures

8.3 Health and Safety Meetings

Regular Health and Safety meetings serve to ensure ongoing safety awareness and the exchange of safety information throughout the company. The meeting agenda includes the following components:

- ✓ A review of the previous meeting, including an outline of the status of concerns raised at the previous meeting.
- ✓ A review of any incidents that have taken place since the previous meeting, and of the corrective action(s) that have been put in place to rectify the incident(s).
- ✓ Employee comments and concerns.
- ✓ Presentation of a safety topic.

Minutes are recorded and are maintained on file. A form for the meeting agenda is included in Appendix A, titled ‗Meeting Agenda Form'.

Individual work crews working on specific work tasks shall also attend a safety meeting with the Site Supervisor, to identify hazards and risks. If necessary, Safe Work Plans will be reviewed, and Job Hazard Analyses (JHA) shall be conducted. The aim shall be to identify hazards and risks, and ensure that the crew is aware of the hazards and risks, and that controls are in place to mitigate such risks.

8.4 WHMIS

All employees of Aboriginal Engineering Ltd. must be WHMIS certified as well as trained if needed to perform to specified tasks, and or job duties. The cost of the training will be carried by the company.

Prior to commencing work team members must complete the WHMIS training. In most cases the training is delivered as part of the orientation, however if this is not the case then the company will arrange to have the course taken by the employee.

As part of the WHMIS training all workers will ensure safe and appropriate storage of all chemicals utilized.

8.5 Record of Training

At a minimum, a record of each safety-training course taken by employees will be maintained. This will include the person‘s name and signature, name of course, instructor or company providing training, date and time course completed.

9 EMERGENCY PROCEDURES

9.1 First Aid and Medic Requirements

All project members are encouraged to have First Aid background. Employees will be offered First Aid courses and training throughout the project.

A site medic shall be present at all times on-site. The medic shall hold a current St. John Ambulance Advanced First Aid Level 2 Certificate, or Canadian Red Cross First Responder Certificate. These are requirements of the Mine Health and Safety Act for mine sites with 21 to 60 persons on-site. It is not expected that manpower loading will exceed 60 persons.

In the case of any medical issue or medical emergency, the medic shall be contacted via radio. The medic shall organize any appropriate emergency response if necessary, such as a medivac from site.

9.2 General Site Emergency

A muster station shall be established in close proximity to the camp. A sign shall clearly mark "MUSTER STATION". In the case of a site emergency:

- ✓ Site Supervisor or medic must be notified of emergency;
- ✓ Site Supervisor or medic shall blow an air horn, and notify personnel via radio of the emergency;
- ✓ Personnel shall gather at the muster station; and
- ✓ Site Supervisor or medic shall perform a head count;

Following these site-specific activities, Emergency Response shall adhere to the Emergency Response Plan.

9.3 Catastrophic Incident Plan

9.3.1 Purpose

The purpose of the Catastrophic Incident Plan is to coordinate the implementation of a response to a catastrophic incident.

9.3.2 Scope

The Catastrophic Incident Plan is applicable to: all AEL employees, all AEL sub-contractors, and all site visitors. A catastrophic incident is defined as any natural or man-made incident, including terrorism that results in extraordinary levels of mass injuries/casualties, damage, or disruption severely affecting the people, infrastructure, environment, and business. A catastrophic incident could include, but is not limited to:

1. Aircraft crash;
2. Major forest fire;
3. Tornado;
4. Major illness outbreak;

5. Cold climate conditions; and
6. Barge and boat capsizing/sinking.

9.3.3 Responsibilities

9.3.3.1 Project Manager

The Project Manager is responsible to:

- ensure that a Catastrophic Incident Plan is developed;
- notifies the appropriate levels of government of a catastrophic incident occurrence; and
- ensure the necessary resources are available to respond to a catastrophic incident on-site.

9.3.3.2 Site Superintendent

The Site Superintendent is responsible to:

- notify the Project Manager of the occurrence of a catastrophic incident;
- ensure on-site resources are available to respond to a catastrophic incident;
- ensures all on-site personnel respond to the catastrophic incident according to the Catastrophic Incident Plan; and
- coordinate medical evacuation with external medical support and on-site medic;

9.3.3.3 Medic

The site medic is responsible to:

- respond to any medical emergencies resulting from catastrophic incidents;
- assist an investigation team, when required, by acting as an external post that monitors the team‘s health and safety;
- possess a valid St. John Ambulance and First Aid Level 2 Certificate or Canadian Red Cross First Responder Certificate; and
- ensuring medical and first aid supplies, equipment, and facilities are maintained in a well manner.

9.3.3.4 Employees

All AEL employees are responsible to:

- immediately report the occurrence of a catastrophic incident to the Site Supervisor; and
- respond to the catastrophic incident according to this Catastrophic Incident Plan.

9.3.4 Requesting a Medivac

The medical travel unit at the Stanton Hospital is to be contacted by calling the 24-hour phone number of:

(867) 669-4115

You can request to be transferred directly by the Emergency Department. You must provide the following information to the medical travel unit.

1. Name of person calling and the phone #.
2. Patients Name

3. Home Address, full mailing address if not from the NWT (Do not delay response if not immediately available)
4. Date of birth
5. Health care number (Can be issued following response)
6. Next of kin
7. Language spoken
8. Employer and full mailing address as follows:

Aboriginal Engineering Ltd.
100 Borden Dr.
Unit 20 – Box 133
Yellowknife, NT
X1A 2N1

9. Is this a WCB case?
10. Location (coordinates, latitude and longitude) as follows:

Great Bear Lake, NWT
Latitude: ***65°43'16.60" N***
Longitude: ***118°54'42.18" W***

11. Current weather situation, (visually)
12. Patient's diagnosis provided by on-site Medic
13. Special Equipment Needs applicable (ie. a stretcher/oxygen/IVs/Wheelchair or Other)
14. Ground transportation required. Check off Ambulance/Taxi/Other.

Once all of this information has been provided, you will be advised that North Wright Air or the helicopter company will have to check the weather, which can take up to one hour. You will be given the name of the Medflight nurse that is on call and to expect a call from the Medflight nurse to provide them with the clinical situation of the patient in more detail. You will be kept in the loop from the Medical Travel Unit as to what type of aircraft will be coming to pick up the patient and the estimated time of arrival.

9.3.5 Catastrophic Incidents

9.3.5.1 Aircraft Crash

Helicopters and airplanes will frequently access the Great Bear Lake sites during the entire duration of the project. In the event an aircraft crashes at the site the following steps are required to be followed:

1. Obtain the following information at the crash site:
    a. Civilian and/or military aircraft;
    b. Fatalities and/or injuries;
    c. Aircraft type;
    d. Registration number; and
    e. Debris on airstrip.
2. Contact the AEL Project Manager. The AEL Project Manager shall contact the PWGSC Project Manager.
3. Contact the appropriate air charter company and inform them of the crash;

9.3.5.2 Forest Fire

All employees are expected to fight incipient stage fires within the immediate limits of their work areas. An incipient stage fire is defined as a fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, Class II standpipe or small hose systems without the need for protective clothing or breathing apparatus. However, workers are not responsible for fighting major forest fires that are beyond the incipient stage. Major forest fires are to be fought by trained professionals.

All forest fires are to be reported to the Government of the Northwest Territories (GNWT) Department of Environment and Natural Resources (ENR). If any employees see smoke or a wildfire they are to immediately call the ENR Forest Fire Report Line at the following phone number:

1 – 877 – 698 – 3473

You should report the approximate location of the fire, how to get there, and if there is any life or property threatened.

9.3.5.3 Tornados and High Winds

In Canada, more than 70 tornadoes a year strike populated regions. However, most are too weak to cause damage. Every province in Canada is prone to the risk of tornadoes. The figure below shows the number of tornadoes occurring in each province annually.

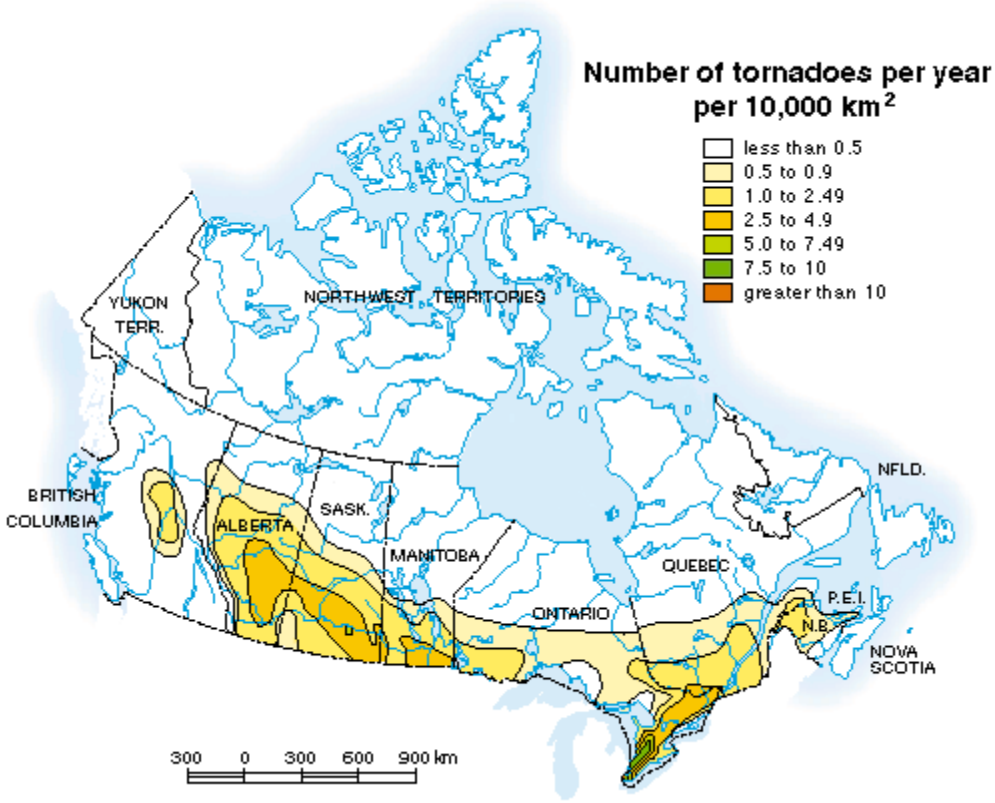


Figure 6: Map of Annual Number of Tornados in Canada

The risk of tornadoes is highest in southern Ontario. The extreme southern part of the Prairies receives the second largest number. The tornado risk is high in south central Alberta, southern Saskatchewan and Manitoba, northeastern Ontario, and western Quebec. Overall, a third of the tornadoes formed in Canada occur in Ontario.

The rest of Canada (British Columbia, Yukon Territory, Northwest Territories, northwestern Ontario, the St. Lawrence valley in Quebec, and the Atlantic Provinces) rarely experiences tornadoes. Therefore, tornadoes shall not be further discussed.

High winds may be experienced along the shoreline of Great Bear Lake in some areas. The work at Great Bear Lake will be coordinated with weather reports/monitoring throughout the duration of the project. In the case where high winds are detected, the Site Supervisor shall issue a high wind warning where no work shall commence at the high wind site until the high wind warning is lifted by the Site Supervisor. In addition, all workers working along the shoreline of Great Bear Lake at any time must wear a certified Transport Canada personal floatation device (PFD).

9.3.5.4 Major Illness Outbreak

A major illness outbreak is the spread of an infectious disease (such as H1N1, SARS, anthrax, small pox, influenza, etc.) from human-to-human. If any workers believe they have been in contact with an infectious disease they are to immediately report to the on-site medic. The medic shall then evaluate the worker and situation. Following the medic evaluation, a medivac may be requested by the medic. In this situation, refer to AEL‘s Major Illness and Injury Plan.

9.3.6 Cold Climate Conditions

PROTECTIVE MEASURES

Proper planning and preparation for exposure to cold conditions is essential. Sudden heart attacks increase during a cold snap. Cold air can cause blood pressure to go up, especially when skin is exposed. Hypothermia and frostbite can be avoided by following these guidelines:

1. Dress so that comfort is maintained, moisture dissipates adequately and excess heat radiates freely from the body.
2. Wear layered clothing. Proper layers trap warm air near the body but do not trap perspiration next to the skin. Breathable fabrics, such as cotton and wool, fulfill both functions. Layers might include thermal underwear, undershirt, tracksuit, sweater, snowsuit, hat, scarf and mittens or gloves. Minimize sweating by changing clothing to suit the activity level.
3. Wear a warm hat. At near-freezing temperatures almost half of body heat lost escapes through the head if it is uncovered.
4. One of the primary ways our bodies lose heat is through our breath. A scarf or mask conserves body energy and heat.
5. Protect feet and hands. Wear loose waterproof boots. If the boots have felt liners, carry an extra pair to replace damp ones. Mittens warm the hands more effectively than gloves. Carry an extra pair of mittens or gloves.
6. Try to stay in a heated environment, but avoid excessive sweating. Clothing wet with perspiration increases heat loss. In situations where it is likely that clothing may get wet

from water exposure or excessive perspiration, it is necessary to have extra dry clothing available.

9.3.6.1 Whiteout

Whiteout conditions are common on the Great Bear Lake sites due to occurrence of sustained high velocity winds which entrain snow. Such whiteouts can last for days. As such, sufficient fuel and food will be on-site to provide rations for one week at a time. Food rations are to be monitored and ordered when required by the Site Superintendent.

In the event of a whiteout, or a pending whiteout, the following actions are to be undertaken in the following order:

1. Stop work and contact the Site Superintendent via radio with your current location;
2. The Site Superintendent is to ensure that all persons have contacted him or her by radio;
3. When advised to do so by the Site Superintendent, and if safe to do so, return to the camp immediately; and
4. While operating a vehicle or piece of heavy equipment, ensure that the headlights are turned on.

9.3.6.2 Hypothermia

When exposed to cold temperatures, the body begins to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up the body‘s stored energy. The result is hypothermia, or abnormally low body temperature. Low body temperature affects the brain, making the victim unable to think clearly or move properly. This makes hypothermia particularly dangerous because a person may not know it is happening or be able to do anything about it. Every person should watch for signs of hypothermia in every other person in the group.

Hypothermia is most likely to occur at very cold temperatures. However, because water can extract heat from the body more than ten times faster than air, hypothermia can occur even at cool temperatures (above 4 ºC), if a person becomes chilled from rain, sweat or submersion in cold water.

SYMPTOMS

There are three stages of hypothermia: (1) mild hypothermia, (2) moderate hypothermia, and (3) severe hypothermia. As a person passes through each stage of hypothermia, the severity increases. Therefore, it is imperative to seek medical attention immediately when a person enters the first stage of hypothermia. The following sections outline the symptoms of each stage of hypothermia and are meant as a guideline to assist in identifying hypothermia.

A person with mild hypothermia will show the following symptoms:

a. shivering may be intermittent or constant and uncontrolled;
b. goosebumps;
c. numb hands, fumbles to perform tasks with fingers;
d. grogginess;
e. muddled thinking; and
f. normal breathing and pulse.

A person with moderate hypothermia will show the following symptoms:

a. violent shivering or an absence of shivering;
b. inability to think and pay attention;
c. slow, shallow breathing;
d. slow, weak pulse;
e. lack of muscle coordination, may stumble frequently;
f. lethargy;
g. drowsiness;
h. exhaustion;
i. memory loss; and
j. slurred and mumbled speech.

A person with severe hypothermia will show the following symptoms:

a. shivering stops;
b. weak, irregular or non-existent pulse;
c. rigid muscles;
d. dark and puffy skin;
e. irregular heartbeat;
f. little or no breathing; and
g. unconsciousness.

TREATMENT

If you notice any of these signs, take the person's temperature. If it is below 35 °C (95 °F), the situation is an emergency. Get medical attention immediately.

If medical care is not available, begin warming the person as follows:

1. Do not treat with direct heat;
2. Get the victim into a warm room or shelter;
3. If the victim‘s clothing is wet, remove it;
4. Warm the torso and head first (groin, abdomen, chest, neck and head) using an electric blanket, if available, or use skin-to-skin contact under loose, dry layers of blankets, clothing, sleeping bag, towels or sheets. Wrap heated objects before placing them next to the skin (torso). A victim should wear dry socks and toque to prevent further heat loss;
5. Warm beverages can help increase the body temperature, but do not give alcoholic or caffeinated beverages. Do not try to give beverages to an unconscious person;
6. After the body temperature has increased, keep the person dry and wrapped in a warm blanket, including the head and neck; and
7. Get medical attention as soon as possible. Take immediate action when someone is suffering from hypothermia. Prevent the victim from losing more body heat. Address mild hypothermia symptoms to prevent more advanced symptoms from developing. A person with severe hypothermia may be unconscious, and may not seem to have a pulse or to be breathing. In this case, stabilize the victim and handle very gently and get emergency assistance immediately. Even if the victim appears dead, cardio-pulmonary resuscitation (CPR) should be provided. CPR should continue while the victim is being

warmed and until the victim responds or medical aid arrives. In some cases, hypothermia victims who appear to be dead can be resuscitated.

9.3.6.3 Frostbite

Frostbite is an injury to the body caused by freezing. Frostbite causes a loss of feeling and colour in affected areas. It most often affects the nose, ears, cheeks, chin, fingers or toes. Frostbite can permanently damage the body and severe cases can lead to amputation. The risk of frostbite is increased in people with reduced blood circulation and among people who are not dressed properly for extremely cold temperatures. Because the frozen tissue is numb, victims are often unaware of frostbite until someone else points it out. Use the buddy system and watch out for other members of the group to prevent frostbite.

SYMPTOMS

Symptoms vary with severity and damage:

1. Mild frostbite:
   - redness or pain in any skin area; and
   - numbness.
2. Moderate frostbite:
   - waxy, white or grayish-yellow skin;
   - numbness; and
   - burning sensation.
3. Severe frostbite:
   - skin turns blue to purple;
   - skin may be blistered or splotchy;
   - skin feels unusually firm or waxy; and
   - numbness.

TREATMENT

If you detect symptoms of frostbite, seek medical care. Because frostbite and hypothermia both result from exposure, first determine whether the victim also shows signs of hypothermia, as previously described. Hypothermia is a more serious medical condition and requires emergency medical assistance. Refer to AEL‘s Major Illness and Injury Plan.

If there is frostbite but no sign of hypothermia, and immediate medical care is not available, proceed as follows:

1. Get the victim into a warm room as soon as possible.
2. Unless absolutely necessary, do not walk on frostbitten feet or toes – this increases the damage.
3. Immerse the affected area in warm, not hot, water. The temperature should be comfortable to the touch for unaffected parts of the body.
4. If warm water is not available, try to warm the affected area using body heat. For example, the heat of an armpit can be used to warm frostbitten fingers.
5. Do not use direct heat, rub the area, break blisters or rub the frostbitten area with snow. These actions can cause more damage.

6. Do not use a heating pad, heat lamp, or the heat of a stove, fireplace or radiator for warming. Affected areas are numb and can be easily burned.

9.3.7 Barge and Boat Capsizing/Sinking

All barge trips across the Great Bear Lake, NT shall be conducted with the proper boat safety equipment onboard. The following safety equipment shall be onboard and in proper working conditions at all times:

- Foghorn, bell, or whistle;
- Transport Canada approved life jackets;
- An appropriately sized anchor;
- A bilge pump;
- Class B fire extinguisher;
- Buoyant heaving line connected to a life buoyant;
- Water tight flashlight;
- 12 type A, B, C, or D flares; and
- A first aid kit.

If severe weather is forecast for the duration of the trip, the boat and barge shall not leave the dock until the severe weather has passed or the weather warning has been lifted. However, if in mid-trip and severe weather is encountered the following measures shall be followed to mitigate capsizing or sinking:

1. Turn on navigation lights;
2. Reduce speed to best handle conditions;
3. Maintain enough power to allow steerage;
4. Direct bow of vessel into waves at 45º;
5. All crew shall put on life jackets;
6. Close and secure all doors, hatches, and other openings;
7. Make sure all overboard drains and freeing ports are open and clear of obstruction;
8. Head for nearest port of refuge or shore that is safe to approach;
9. Keep bilges free of water; and
10. If engine fails, run out a sea anchor on a line from the bow to keep the boat headed into the waves.

In the case where the boat is capsizing/sinking the standard marine distress signal shall be issued by the boat captain over the radio. The following are the steps during a radio distress signal:

1. Use 156.8 MHz, Channel 16, 2182 kHz
2. Call –Mayday!"
3. Give the name of the boat and the position

If an incident (i.e. casualty, fatality, disappearance) has occurred, it must be reported by radio communication to a marine radio station, a Marine Communications and Traffic Services (MCTS) Centre, a Canadian harbour radio station, or by the quickest means possible. Within 30

days of the occurrence, the owner or operator shall submit a Marine Occurrence/Hazardous Occurrence Report (TSB 1808/06-94) on the incident.

When a reportable marine accident or incident takes place, the report shall contain as much of the following information as is available:

(a) the name or identification number, nationality and type of the ship;
(b) the names of the owner, operator, charterer and agents of the ship;
(c) the names and qualifications of the master and pilot of the ship;
(d) the date and time of the accident or incident;
(e) the weather and sea conditions at the time of the accident or incident;
(f) a description of the navigational aids on board the ship;
(g) the last point of departure and intended destination of the ship, including the date and time of the departure;
(h) where the ship is not missing,

1. the location of the accident or incident by reference to an easily defined geographical point, or by latitude and longitude,
2. the number of crew members, passengers and other persons that were killed or sustained a serious injury,
3. a description of the accident or incident and the extent of any resulting damage to the ship, the environment and other property, and damage to the ship, the environment and other property, and
4. a description of any dangerous goods on board, or released from, the ship

(i) where the ship is missing,

1. the last known position of the ship by reference to an easily defined geographical point, or by latitude and longitude, including the date and time of that position,
2. the number of crew members and passengers on board the ship,
3. a description of any dangerous aboard the ship, and
4. the action being taken to locate the ship

(j) the technical specifications of the ship such as the tonnage, length and type of propulsion;
(k) a description of the cargo aboard the ship; and
(l) the name and address of the person making the report and, where applicable, the name or identification number of the ship from which the report is being made.

In addition to the reporting requirements set out above, the person making the report shall, in a form approved by the Board, submit to the Board within 30 days after the accident or incident all the above information, unless otherwise exempted by the Board.

All commercial marine incidents can be reported 24 hours a day, 7 days a week by calling (collect):

1 – 613 – 720 – 5540

9.4 Emergency Response Plan

9.4.1 Introduction

The objectives of the following Emergency Response Plan (ERP) is to:

- protect the safety and well-being of employees (permanent or contract);
- protect the environment and the nearby communities;
- remediate any negative effects on the environment and nearby communities; and
- return the work site to safe operating conditions as soon as possible to avoid project delays and cost overruns;

Documentation must be prepared to outline responsibilities and required actions of Aboriginal Engineering Ltd. (AEL) employees in the event of an emergency situation. An emergency situation is any incident that has the potential to seriously and negatively affect:

- the environment;
- wildlife;
- the health and safety and well being of the Client, employees, neighboring communities and the public at large;
- AEL‘s ability to conduct business; and
- AEL‘s corporate and public reputation.

Emergencies do not occur as a planned event and can vary in magnitude. Therefore,

1. emergency situations must be anticipated and assessed for risk;
2. appropriate response plans must be developed;
3. workers and sub-contractors must know their basic responsibilities so they will be able to react positively in an emergency situation; and
4. all stakeholders, including applicable Government Agencies (GA), Local Communities (LC), Local Emergency Response Teams (LERT) and Non Government Organizations (NGO) must be: informed of applicable emergency plans so: available resources can be identified; and all parties can be prepared to respond as per planned in the event of an emergency.

In any emergency situation, time is the most critical factor with respect to the damage that an emergency situation can affect: the quicker the initiation, the more orderly and effective the response. The first person that notices an incident must act as a first responder and activate the plan immediately.

The Great Bear Lake site is a remote site and as such third party resources cannot be expected to act as first responders. As such, all AEL Great Bear Lake Phase 1 employees are required to act as first responders when on-site. The appropriate training will be provided prior to Work. Furthermore, mobilizing third party resources to respond to an emergency event, if possible, will take considerable time. As such AEL must be prepared to respond to an emergency event in the most efficient and effective manner using the available on-site resources and communications.

9.4.2 Plan Design and Revision

9.4.2.1 Plan Design

The following Emergency Response Plan (ERP) has been designed to be in accordance with the Northwest Territories Guidelines for Contingency Planning (NWT GCP). The AEL Project Manager (PM) is responsible for ensuring that: (a) the ERP is designed in accordance with the NWT GCP; and (b) the necessary resources required to complete the ERP are identified and made available.

The ERP is designed by the Contingency Planning Team (CPT). The CPT will be lead by the AEL Field Superintendent who is responsible to liaison with governmental and non-governmental organizations, community emergency planners, and other key stakeholders during ERP development. The CPT reports directly to the PM. **Figure 7**, present on the following page, displays the lines of communication for ERP design.

The ERP has been deemed a working document. As such the information is subject to change as required to fit site specific conditions. The current revision has been drafted with the most up to date information available. Any changes made to the ERP will be reflected in updated revisions and are subject to the approval as per the protocol described herein. The document has been prepared in accordance to the applicable water license and land use permit.

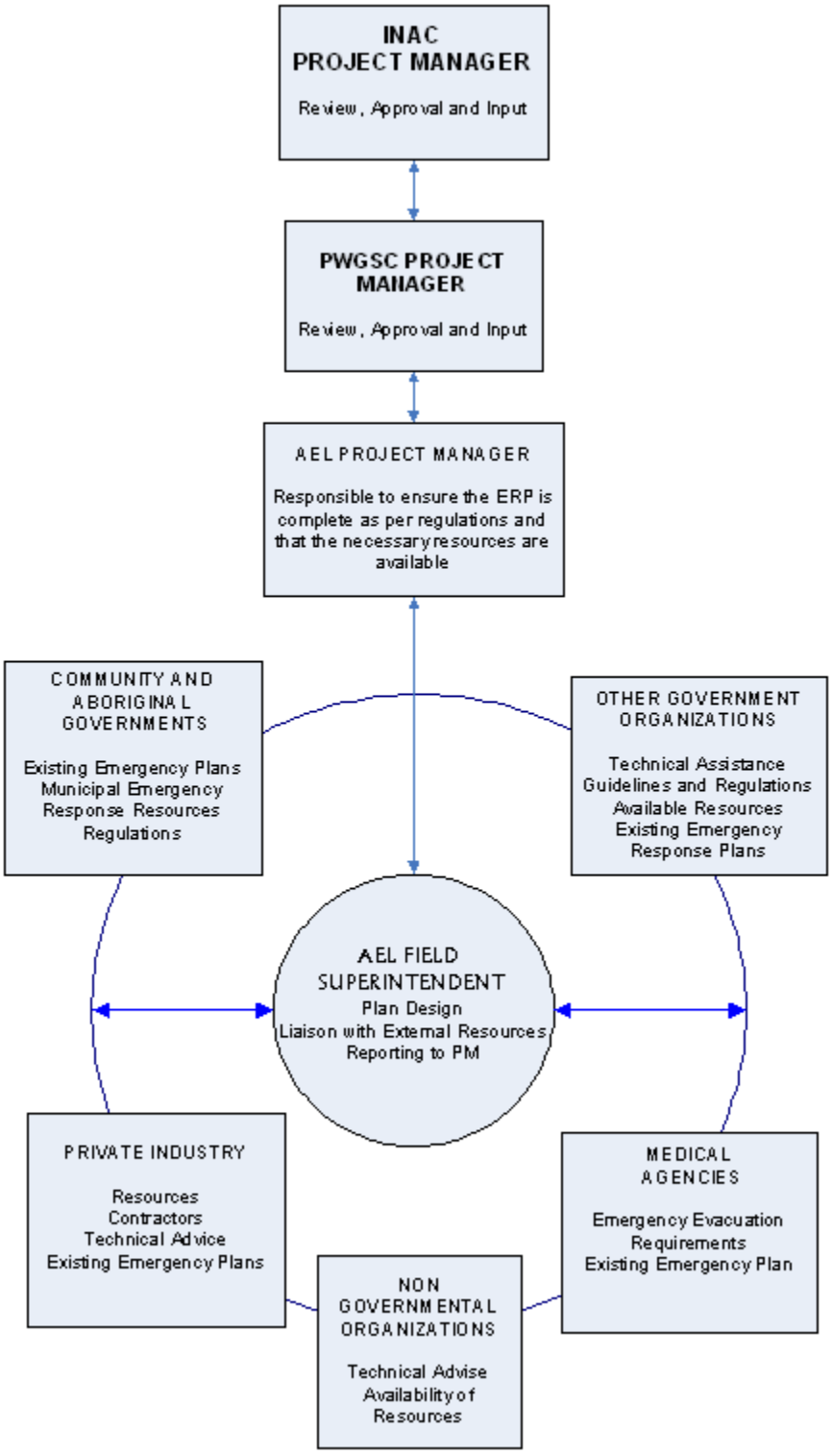


Figure 7: ERP Design - Lines of Communication

9.4.3 Lines of Communication for ERP Distribution

The following figure displays the appropriate lines of communication with respect to ERP plan distribution.

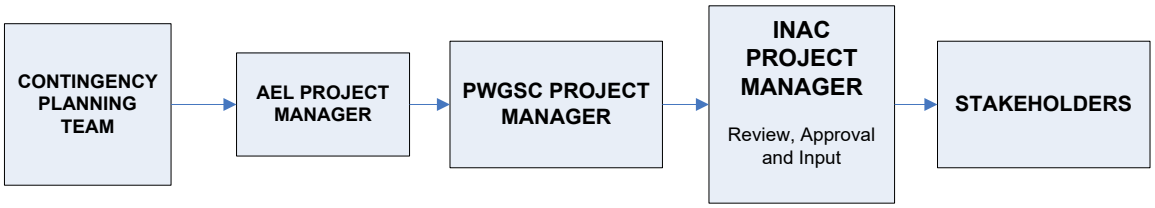


Figure 8: Lines of Communication for ERP Distribution

9.4.4 Communication

9.4.4.1 Resources

The Great Bear Lake site is a remote Northern site and as such extensive communications infrastructure is not available for reporting, initiating and coordinating emergency response. The available means of communication will be limited to:

9.4.4.2 Site Internal Communications

1. verbal communication;
2. hand held radios;
3. satellite phones; and
4. emergency indicators such as flares and horns.

9.4.4.3 Site External Communications

1. facsimile;
2. internet;
3. office phones; and
4. satellite phones

Two satellite phones will be available for use and will be charged at all times. In addition, the satellite phones will be stored in water tight, impact resistant case, along with a list of emergency phone numbers. The operations center will contain facsimile, internet and phones. Workers will be required to have at a minimum one hand held radio per work area and supervisors, field engineers and medical staff will be required to have a hand held radio on their person at all times.

9.4.5 Managing Communications

9.4.5.1 AEL Internal

All communications by employees responding to or engaged within an emergency situation are to be directed to the AEL designated person for the emergency situation. The Site Superintendent is the primary site designate who is responsible for coordinating emergency

response. In the absence of the Site Superintendent the AEL Field Medic is the alternate designate. The AEL designate is responsible for contacting and coordinating with all third party responders. In addition, the AEL designate is to report to the Project Manager who is responsible to manage all external communications with the Client, media, government, communities and other stakeholders. To the extent possible, all communications are to be direct voice (i.e., person to person). There is no guarantee that a voice, email or fax message will received or reviewed immediately. **Figure 9** displays the general lines of communication that apply to AEL internal communications during an emergency response.

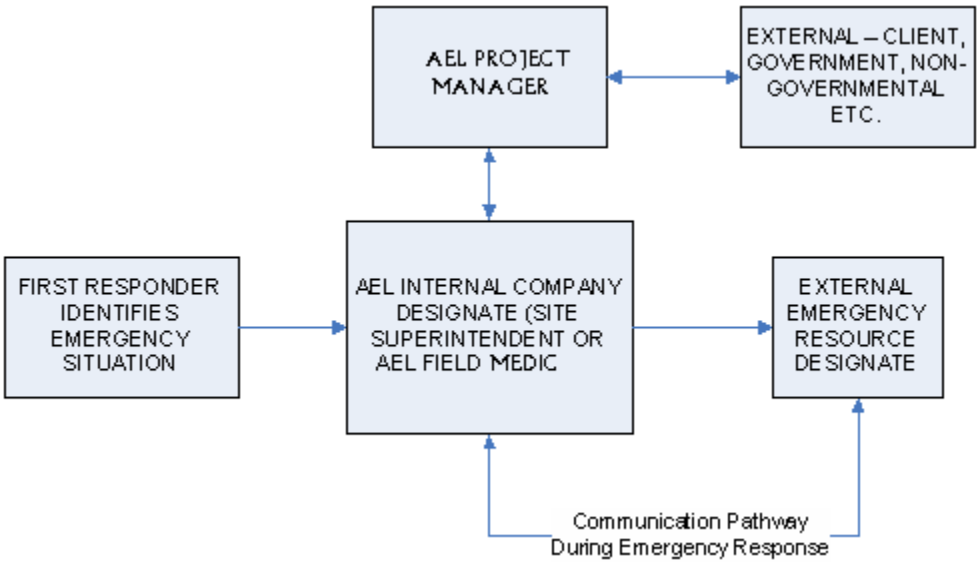


Figure 9: AEL Internal Communications During Emergency Response

9.4.5.2 Media

No one other than the AEL Project Manager Bob Johnson is to discuss any incident either on or off the record with the media. Non governmental organizations are to be treated as media, unless defined within an emergency response plan as a specific external emergency resource. AEL is to direct all media inquiries to INAC Communications Representative Dawn Curtis, through PWGSC. All media questions must be forwarded to PWGSC, who shall in turn forward to INAC. The INAC Communications Representative shall either answer media inquiries directly, or advise AEL as to what response is appropriate.

9.4.5.3 Stakeholders

GENERAL PUBLIC

The following figure applies to communications between with the public during and emergency response.

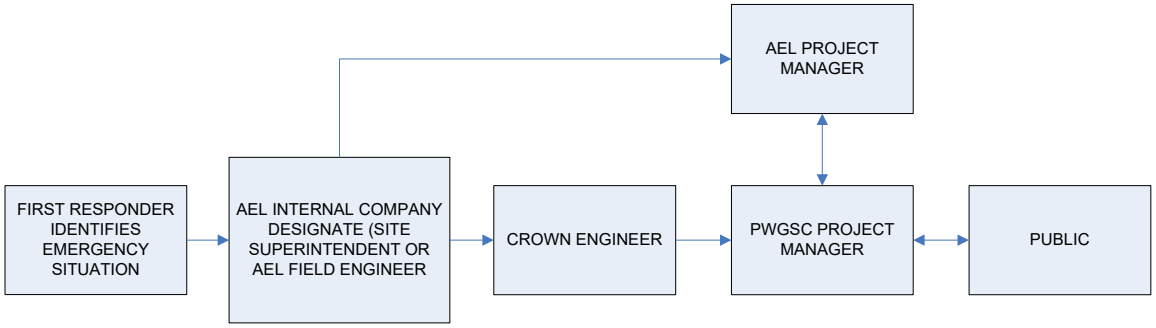


Figure 10: Communications with the General Public during an Emergency Response

EMPLOYEE SERIOUS INJURY, DEATH OR ILLNESS

In the event of a serious employee injury, death or illness the immediate next of kin is to be contacted as soon as possible. The Project Manager, with assistance from the medical personnel, is responsible to contact the next of kin.

LAND CLAIMS GOVERNMENTS

The Great Bear Lake sites lies within the Sahtu Dene and Metis Land Claim, with the Community of Deline being the impact community and within the Tlicho Land Claim and Self-Government Agreement with the Community of Gameti being the impact community.

In the event of a serious environmental spill the AEL designated person shall contact the Crown Engineer, who will in turn contact the PWGSC Project Manager. The PWGSC Project Manager is responsible for informing the heads of the aboriginal groups of the emergency event as per Crown protocol. All communications during and following the environmental emergency are to be undertaken between the aboriginal heads of government and the Crown. The AEL Project Manager will provide information to the Crown as required upon request.

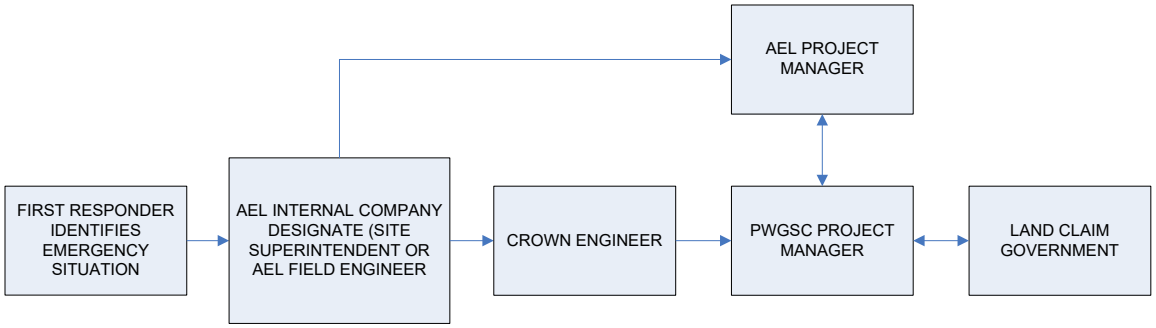


Figure 11: Communication with Land Claims Government During an Emergency Response

CLIENT

In the event of an emergency the client (PWGSC) is to be informed as soon as possible. Such communication is to take place as displayed in the following figure.

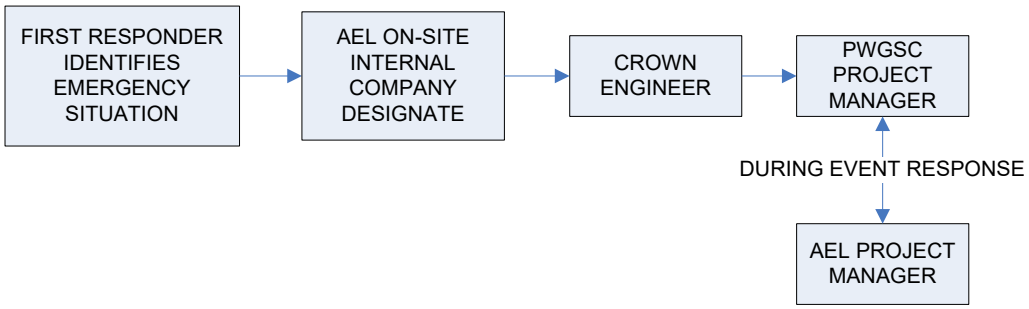


Figure 12: Procedure for Contacting and Communication with the Client during an Emergency Response.

EXTERNAL RESOURCES

External resources are an important aspect of an overall emergency response and can include equipment, supplies, personnel, information and services. Such resources are available from government agencies such as hospitals and CANUTEC, private contractors, non-governmental organizations, volunteers and some instances collective emergency response teams funded by multiple private organizations.

The appropriate external resources, their contact and coordinated pre-response planning have been identified and clearly defined for each of the anticipated potential emergency situations. However, in all instances, the first responder is to contact the internal company designate who will in turn inform the appropriate external resource designate during plan initiation. To avoid confusion and increase efficiency, during the emergency response all communications are to occur only between the AEL internal company designate and the external resource designate.

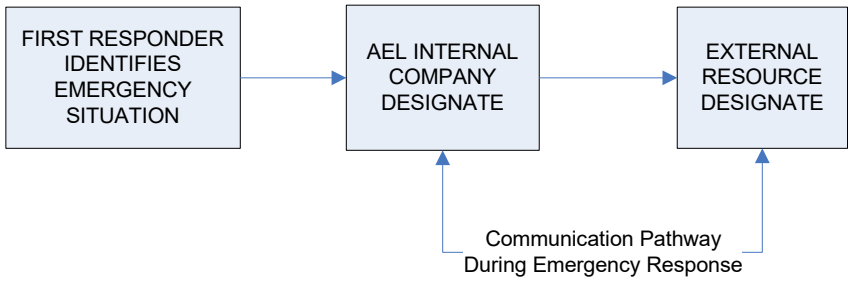


Figure 13: Procedure for Contacting and Communication with External Resources during an Emergency Response.

4.0 Definitions

HEALTH HAZARD

"Health hazard" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system and agents which damage the lungs, skin, eyes, or mucous membranes.

Source: OSHA Hazard Communication 1910.1200 (c)

PHYSICAL HAZARD

"Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.
Source: OSHA Hazard Communication 1910.1200 (c)

BIOLOGICAL HAZARD

–Biological Hazard" means a pathogenic organism, including a blood-borne pathogen, which due to its known or reasonably believed ability to cause disease in humans, would be classified as Risk Group II, III or IV as defined by the Medical Research Council of Canada, or any material contaminated with such an organism.

Source: British Columbia Workers Compensation (Occupational Health and Safety) Amendment Act (1998), Occupational Health and Safety Regulations, Part 6, Substance Specific Requirements, Bio-hazardous Materials, Section 6.33 Definitions.

HAZARDOUS WASTE

–Hazardous Waste" means a contaminant which is a dangerous good that is no longer used for its original purpose and is intended for recycling, treatment, disposal or storage. A hazardous waste does not include a contaminant that is

(a) household in origin;
(b) included in class 1, Explosives or class 7, Radioactive materials of TDGR Clear Language;
(c) exempted as a small quantity;
(d) an empty container; or
(e) intended for disposal in a sewage system or by land filling that meet the applicable standards set out in schedules I, III or IV of the Guideline for Industrial Waste Discharges in the NWT.

Source: Guidelines for the General Management of Hazardous Waste in the NWT 1.1, Definitions.

HAZARDOUS MATERIAL

–Hazardous Material" means a product, substance or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals or plant life when released into the environment.

DANGEROUS GOOD

–Dangerous Good" means any product, substance or organism included by its nature or by the Transportation of Dangerous Goods Regulations (TDGR) in any of the classes listed in the schedule provided in the Transportation of Dangerous Goods Act (TDGA).

Source: Transportation of Dangerous Goods Act, 1992, Transportation of Dangerous Goods Regulations, Clear Language, Coming Into Force, Repeal, Interpretation, General Provisions and Special Cases, Section 1.4 Definitions.

OIL

–Oil" means oil of any kind or in any form including, but not limited to:

- Petroleum and fuel oils
- Sludge
- Synthetic oils
- Mineral oils
- Oil refuse
- Oil mixed with wastes other than dredged spoil
- Animal fats, oils, and greases
- Vegetable oils

Source: EPA 40 CFR Part 112 (Oil Pollution Prevention Regulation)

9.4.6 Potential Emergency Situations

9.4.6.1 Identification of Potential Scenarios

The following emergency situations could arise either during mobilization or Work with respect to the Great Bear Lake Phase 1 Clean-up Project.

Table 7: Potential Emergency Situations

ID	EMERGENCY SITUATION	IMPACT (HUMAN ENVIRONMENTAL OR CAPITAL)
1	Spill of the following petroleum products (hazardous material) and/or hazardous materials while in transportation to or from the site by barging across Great Bear Lake: a. Diesel b. Gasoline; c. Lubricants.	Human, Capital and Environmental
2	Spill of the following petroleum products (hazardous material) and/or hazardous wastes while in storage at the site a. Diesel; b. Gasoline; c. Lubricants. d. Hazardous Waste Collected for Off-Site Disposal	Human, Capital and Environmental
4	Forest Fire – brush	Human, Capital and Environmental
5	Infrastructure Fire	Human, Capital and Environmental
6	Employee attacked by wildlife.	Human and Capital
7	Employee injured at work site (i.e., physical injury and/or chemical exposure)	Human and Capital
8	Major employee illness such as a heat attack.	Human
9	Employee injured during mobilization or demobilization by barging across Great Bear Lake	Human and Capital

9.4.7 Contingency Plans

In order to allow a systematic, planned and effective response to the above potential emergency situations, the following contingency plans have been completed:

Table 8: Required Contingency Plans

Contingency Plan	Emergency Situation ID
Spill Contingency Plan	1, 2 & 3
Barge and Boat Safety Plan	1 & 9
Fire Contingency Plan	4 & 5
Wildlife Contingency Plan	6
Major Illness or Injury Contingency Plan	7 & 8

9.5 Major illness & injury plan

9.5.1 Purpose

The purpose of the Major Illness and Injury Contingency Plan is to:

- Establish procedures for initiating and coordinating an emergency evacuation of a seriously injured or ill person from the Great Bear Lake sites to the nearest available medical facility (Stanton Territorial Hospital); and
- Minimize discomfort to injured or ill persons at the site while awaiting emergency evacuation.

9.5.2 Responsibilities

Table 9: Roles and Responsibilities With Respect to Major Illness and Injury Contingency Plan

POSITION	RESPONSIBILITY
Project Manager	Preparing Major Illness and Injury Contingency Plan and ensuring the necessary resources are available to efficiently implement the plan.
	Ensuring that the necessary training resources are available and that a training program based on the Major Illness or Injury Contingency Plan is developed.
Site Superintendent	Ensuring that on-site resources other than medical response equipment are available and efficiently used during an emergency response.
	Ensuring that all WCB requirements are met following an employee injury.
	Coordinating medical evacuation with external medical and emergency response resources and the on-site medic.
Medic	Acting as the designate for any injuries and illness.
	Identifying medical situation that require emergency MEDIVAC and initiating the MEDIVAC plan.
	Maintaining medical records such that the privacy of the employee is maintained as per regulations.
	Providing and maintaining the required medical supplies.
	Providing training to employees prior to Work as per the Major Illness and Injury Contingency Plan.
	Providing medical care as required at the Site for injured or ill persons
Employee	Immediately reporting any injuries or illnesses, or near misses as per the plan.
	Providing any medical information required to the Medic to allow treatment of medical conditions.
	Ensuring that any medications or medical requirements are filled in sufficient quantity prior to mobilizing to site.

9.5.3 Initial Response – Major Injury and Major Illness

9.5.3.1 Definitions

A major injury is considered an injury for which the injured person cannot report safely by his or herself to the site medic for treatment. A major illness is an immediate event such as a heart attack, where the person is incapacitated and cannot report safely by his or herself to the site medic for treatment.

9.5.3.2 Initial Response

Immediately following the identification of a Major Illness and Major Injury the following steps are to be undertaken:

- Immediately report the medical emergency over the hand held radio using the following steps
    - Cleary announce verbally –MEDICAL EMERGENCY" three (3) times;
    - State your location;
    - State the type of medical emergency (i.e., injury or illness);
    - Report the condition of the person and the situation that cause of the emergency if known;
    - Report if any hazards that could affect the safety of the responders is present; and
    - Begin medical first responder procedures until the Site Medic Arrives – DO NOT APPROACH the injured person unless it is safe to do so.

9.5.3.3 Emergency Evacuation

Only the Site Medic can request an emergency MEDIVAC. The Site medic is to evaluate the injured or ill person and decide if an emergency evacuation is required. If MEDIVAC is not required then the person is to be treated on-site by the Medic.

9.5.3.4 Procedures for Emergency Evacuation

If the injured or ill person requires MEDIVAC then the Medic will issue a request to the Site Superintendent to issue a request for MEDIVAC. The Site Superintendent is then to liaison between the on-site medic and the external emergency resources from the AEL Head Office. The Medic is to remain with the injured person to provide emergency medical assistance and/or to ease pain and discomfort until external emergency resources arrive.

The Site Superintendent is to request a MEDIVAC via the following steps. The steps were provided by Stanton Territorial Hospital Emergency Services.

REQUESTING A MEDICAC

The medical travel unit at the Stanton Hospital is to be contacted by calling the 24-hour phone number of:

(867) 669-4115

You can request to be transferred directly by the Emergency Department. You must provide the following information to the medical travel unit

1. Name of person calling and the phone #.
2. Patients Name
3. Home Address, full mailing address if not from the NWT (Do not delay response
4. if not immediately available)
5. Date of birth
6. Health care number (Can be issued following response)

15. Next of kin

7. Language spoken
8. Employer and full mailing address as follows:

Aboriginal Engineering Ltd.
100 Borden Dr.
Unit 20 – Box 133
Yellowknife, NT
X1A 2N1

16. Is this a WCB case?
17. Location (coordinates, latitude and longitude) as follows:

Great Bear Lake, NWT
Latitude: ***65°43'16.60" N***
Longitude: ***118°54'42.18" W***

6. Current weather situation, (visually)
7. Patient's diagnosis provided by on-site Medic
8. Special Equipment Needs applicable, ie: a stretcher/oxygen/IVs /Wheelchair or Other.
9. Ground transportation required. Check off Ambulance/Taxi/Other.

Once all of this information has been provided, you will be advised that North Wright Air or the helicopter company will have to check the weather, which can take up to one hour. You will be given the name of the Medflight nurse that is on call and to expect a call from the Medflight nurse to provide them with the clinical situation of the patient in more detail. You will be kept in the loop from the Medical Travel Unit as to what type of aircraft will be coming to pick up the patient and the estimated time of arrival.

10 INVESTIGATION OF ACCIDENTS AND INCIDENTS

10.1 Policy

The Company will investigate all accidents and incidents it deems necessary, including the following:

a) All medical and time loss accidents.
b) All accidents that result in death or injury requiring medical treatment.
c) All causes of occupational illness.
d) All accidents that cause property damage or interrupt operation with potential loss exceeding $500.00.
e) All near miss incidents that had the potential for causing injury or property damage.
f) All incidents that by regulation must be reported to Occupational Health and Safety, WCB, or other regulating agencies.

10.2 Responsibilities

- Employees shall report all incidents to their immediate Supervisor.
- Supervisors shall conduct initial investigations and submit their reports to their Manager and the Safety Coordinator.

- The Safety Coordinator/Manager shall determine the need for and, if necessary, direct detailed investigations. They shall also determine causes, recommend corrective action, and report to the Manager.
- The Safety Coordinator/Manager shall review all reports, determine corrective action to be taken, and ensure that such action is implemented to prevent recurrence.

10.3 Reporting and Appeal Procedure

Disabling injuries and industrial diseases are to be reported to Workers' Compensation Board as required by their regulations. Fatalities are to be reported immediately.

The Corporate Safety Coordinator, following discussion with all parties involved, will decide whether or not the claim should be contested.

10.4 Accident Reporting/Investigation

All accidents and incidents must be reported immediately to the Supervisor and the Regional Safety Coordinator and Office Manager. In the case of serious injury and/or property damage, the Provincial Inspector and Head Office must be notified. The Corporate Safety Coordinator will take part in the investigation of any serious accident or incident.

The Supervisor is to immediately report any accident to the Regional Safety Coordinator and forward a completed Incident Investigation Report within 24 hours.

An accident involving a fatality is to be reported to the Supervisor and Regional Safety Coordinator immediately. This should be followed within 24 hours by a written report. In addition:

a) Arrangements shall be made with the legal firm for Aboriginal Engineering Ltd. to have a representative present at the Coroner's inquest.
b) Aboriginal Engineering Ltd. will be represented at the Coroner's inquest, by the supervisor or his designate.

The investigation is to determine the real cause or causes of the accident and attempt to find unsafe conditions, acts or procedures. The Safety Committee, where applicable, will be involved in the investigation of accidents and will recommend corrective action to prevent recurrence.

The basic steps in an investigation:

a) The scene should be secured.
b) The injured person should be treated and removed by trained personnel.
c) Sketches should be made and photos taken, if required.
d) Accurate records should be made.
e) Recommendations to prevent recurrence must be made.
f) Immediate follow-up in recommendations.
g) Review outcome of investigation with all participants.

10.5 Near Miss Investigation

All incidents which have the potential for serious injury or property damage should be investigated by the Supervisor and Regional Safety Coordinator.

Pertinent information should be gathered and an Incident Investigation Report completed.

11 PERSONAL PROTECTIVE EQUIPMENT

11.1 Policy for Personal Protective Equipment (PPE)

It is Aboriginal Engineering Ltd. policy to have all employees use the proper PPE as required to carry out their duties in a safe manner.

All PPE used by Aboriginal Engineering Ltd. will conform to Occupational Health and Safety Regulations.

a) The safety information in this policy does not take precedence over Occupational Health and Safety Regulations. All employees should be familiar with the Occupational Health and Safety Act and Regulations.

Introduction

Personal Protective Equipment (PPE) is equipment worn by a worker to minimize exposure to specific occupational hazards such as injurious physical chemical or biological agents. Examples of PPE are respirators, gloves, aprons, fall protection, and full body suits, as well as head, eye and foot protection. However, respiratory protection is addressed separately within AEL Respiratory Protection Plan. Using PPE is only one element in a complete safety program that would use a variety of strategies to maintain a safe and healthy occupational environment. PPE does not reduce the hazard itself nor does it guarantee permanent or total protection. PPE must always be used as per training and must not be allowed to ensure a false sense of protection against workplace hazards.

Controlling a hazard at its source should be the first choice because this method will eliminate it from the workplace altogether or isolate it from the worker. This "safe place" approach may require substitution of a material with non-hazardous ones, isolation of hazards, addition of safety features to existing equipment, redesign of the work processes, or purchase of new equipment. When the hazard cannot be removed or controlled adequately, PPE must be used if the work process is to continue and should be used in conjunction with additional engineering controls, guards, and safe work practices, if possible. PPE is considered a point-of-contact form of worker protection in that is protects the worker during the contact with a hazard.

11.2 Purpose

The purpose of the Personal Protective Equipment Program (PPEP) is to perform a hazard assessment of the workplace to determine if hazards are present, or are likely to be present, which require the use of PPE. If such hazards are present, or likely to be present, the following shall be completed:

- Select, provide and require the use of appropriate PPE for each affected employee;
- Communicate PPE selection decisions to each affected employee;
- Select and provide PPE that properly fits each affected employee.
- Conduct and document appropriate employee training.

The PPEP does not include an evaluation of respiratory hazards and the assignment of respiratory protection measures. These matters are addressed in the Respiratory Protection Plan.

11.3 Requirements

The PPEP shall include the following elements:

- PPE selection based on site hazards;
- PPE use and limitations;
- PPE maintenance and storage;
- PPE decontamination and disposal;
- PPE training and proper fitting;
- PPE donning and doffing;
- PPE inspection procedures prior to, during and after use;
- Evaluation of the effectiveness of the PPEP; and
- Limitations during temperature extremes, heat stress and other medical considerations.

The above elements of the PPEP are based on the requirements of Title 29 CFR Part 1910.120(g)4(iii)(5).

11.4 Responsibilities

The Project Manager shall:

- Ensure that the PPEP is developed according to regulations;
- Ensure that the necessary resources are available to implement the plan and training in a timely manner;
- Ensure that a qualified persons is appointed to develop and execute the PPEP;
- Ensure that a comprehensive Hazard Assessment is carried out prior to the project initiation to ensure that proper PPE has been selected and will be made available prior to Work;
- Ensure that the PPEP is reviewed:
    - when PPE was responsible for avoiding or causing an incident; and
    - regularly at a monthly interval.

The Site Superintendent shall:

- ensure that all employees are issued the proper PPE according to the requirements of the PPEP;
- ensure that employees are adhering to the PPEP through daily inspections of all worksites;
- monitor the inventories of PPE at site to ensure that the necessary supplies of PPE are available when required;
- order the necessary PPE supplies when required;
- report immediately to the Project Manager and AEL Field Engineer when a violation of PPE protocol has occurred; and
- ensure that all employees are properly trained in the requirements of the PPEP prior to any Work.

The AEL Field Engineer shall:

- conduct the pre-Work hazard assessment;
- assign the required PPE based on the initial hazard assessment;
- conduct assessment of the PPEP:
    - as scheduled on a monthly basis;
    - when PPE was responsible for avoiding or causing an incident; and
    - for all other instances when required by the Project Manager;
- report the findings/recommendations of all assessments of the PPEP to the Project Manager;
- implement any recommendations based on an assessment of the PPEP; and
- follow up on recommendations to ensure that they are implemented and effective.

The Employee shall:

- partake actively in all training in accordance with the PPEP;
- wear PPE as per training and the requirements of PPEP;
- not use defective PPE;
- report immediately to their direct supervisor any malfunctioning PPE or incidents involving PPE or the lack of use of PPE;
- properly dispose of any malfunctioning PPE.

11.5 PPE Selection Based on Site Hazards

The following assesses the hazards of the Work with respect to the requirements to use PPE.

Hazard Classes

The following hazard classes will be employed:

1. Impact;
2. Penetration;
3. Compression (roll over);
4. Chemical;
    a. ingestion;
    b. absorption; and
    c. puncture[1]
    d. skin irritant
    e. eye splash
5. Biological
    a. ingestion;
    b. absorption; and
    c. puncture[2]
6. Heat;
7. Harmful Dust (Particulate);

[1] Inhalation exposure route is addressed within the Respiratory Protection Plan.
[2] Inhalation exposure route is addressed within the Respiratory Protection Plan

8. Nuisance Dust (Particulate);
9. Radiation – Non-Ionizing;
10. Radiation – Ionizing;
11. Drowning;
12. Pinch Point;
13. Falling;

Assessment and Selection of PPE

Figure 15 presents the hazard assessment and the selection of the corresponding PPE. PPE levels of protection have been assigned based on the NFPA 471 Recommended Practice For Responding to Hazardous Materials Incidents, 2002 Edition definitions.

In addition to the PPE identified in Figure 14, the following common PPE is required to be worn by all persons entering a worksite at any time. It is implied in Figure 15 that the basic PPE is to be worn in addition to the work specific PPE.

Figure 14 Common PPE Requirements

PPE	PROTECTION	COMMENTS
Hard Hat	Vertical impact to head	Requires conformance to CAN/CSA Z94.1 Industrial Protective Headwear-Performance, Selection, Care and Use. Class C – no protection from electrical hazards is required for hard hats for common work activities.
Work Gloves	Pinch and impact to hand	Basic leather work glove – not required for tours or non-work situations. Refer to Figure 15 for chemical specific gloves.
High Visibility Vest	Prevents injury due to high visibility of worker by other workers	Requires conformance to CAN/CSA Z96-02 High Visibility Safety Apparel.
Steel Toed Work Boots	Impact to foot	Requires conformance to CAN/CSA Z195.1 Guideline on Selection, Care and Use of Protective Footwear. Refer to Figure 15 for chemical specific work boots.
Coveralls	Nuisance dust and material from contacting cloths and body.	Refer to Figure 15 for chemical specific clothing.
Safety Glasses	Impact to eye	CAN/CSA Z94.3.1 Protective Eye Ware: A User‘s Guide

Figure 15 Hazard Assessment - Personal Protective Equipment

ID	WORK DESCRIPTION	HAZARD CLASS	REQUIRED PPE – NON RESPIRATORY		RESPIRATORY PROTECTION3	PPE LEVEL OF PROTECTION	COMMENTS
			PROTECTION	DESCRIPTION			
2	Fuel transfer	Chemical	Skin protection (irritant and burn)	Pyrolon CRFR coveralls	Half mask air purifying with organic vapour cartridge	C	-
			Eye protection (irritant and burn)	Chemical splash goggles			
			Hand protection (caustic)	Unsupported or Supported Nitrile 13” to 18”			
			Foot protection (caustic)	CSA approved steel toed rubber boots			
			Eye protection (absorption)	Chemical splash goggles			
			Hand protection (absorption)	Unsupported or Supported Nitrile 13” to 18”			
			Foot protection (caustic)	CSA approved steel toed rubber boots			

[3] Refer to Respiratory Protection Plan

11.6 PPE Use and Limitations

Tychem Garments

HOODED CHEMICAL PROTECTIVE GARMENTS

The following hooded chemical protective garment will be used at the Great Bear Lake sites – Tychem TK 122T. The Tychem TK 122T is not fully encapsulating and thus provides a lesser degree of splash protection to the face and neck.

USE AND LIMITATIONS

Potential Misuse

All Tychem® garments are not intended for protection against ionizing radiation. All Tychem® garments are not intended for protection from cryogenic liquids and gases (colder than -200° C). If there is a risk of exposure to liquefied gases warmer than 163° K (-100° C), the use of an ensemble certified to the optional liquefied gas requirements of NFPA 1991 (2000 edition) should be considered. The wearer should be protected from cold temperature hazards, such as frostbite, by use of insulating undergarments. If the danger of exposure to biological aerosols or chemical warfare chemicals exists, the use of a protective ensemble certified to the optional Chemical and Biological Terrorism requirements of NFPA 1991 (2000 Edition) or garments certified to Class 1 or Class 3 of NFPA 1994 should be considered. Each of these provides a different level of performance. If the danger of flash-fire exists, actions such as substitution, engineering controls, work practices and administrative controls should be implemented to mitigate that risk. Exposure of personnel should be minimized or avoided. At a minimum, fire suppression equipment and personnel should be ready and manned to conduct fire suppression should a flash fire occur. No Tychem® garment is intended for fire fighting activities, nor for protection from hot liquids, steam, molten metals, welding, electrical arc or thermal radiation. All Tychem® garments are not suitable for use in all situations and environments with all chemical and hazardous materials.

Always Use the Buddy System

Never enter a contaminated area alone. A minimum of two people should enter contaminated areas together. Two additional people, in equally protective garments should be available to affect rescue of the entry team. All persons entering the contaminated area should wear appropriate protective equipment.

Static Electricity

Under certain conditions, such as cold and dry weather, it is possible that garments might build and discharge static electricity. Discharges are not normally dangerous except in situations where the generation of an electrical spark could ignite a flammable atmosphere or startle the wearer. When operating around flammable chemicals, steps to eliminate potential static discharges should be used. In these situations, steps have been recommended such as, but not limited to, water spray, the use of an over-cover, raising humidity level of the work area, use of a commercial, anti-static application coating, grounding straps on equipment and personnel,

inherently static-dissipating under- and over-garments, and testing of the worker‘s static dissipation before entry into the classified area. However, in the case of explosive or flammable atmospheres, even if sophisticated and elaborate steps are taken to manage static formation and dissipate static charge, the risk of severe injury remains if an uncontrolled or accidental ignition occurs. Tychem® chemical protective garments should not be worn in potentially flammable or explosive atmospheres. Should wearers of any Tychem® garments determine they are in such an environment, they should retreat immediately.

Avoid Exothermic Reactions
Certain chemicals produce a large amount of heat when they react with water. If garments are heavily contaminated with a water-reactive chemical, there is a possibility that the garment may be damaged during field decontamination from the high reactive heat. The excess chemical may have to be removed with dry sand or non-reactive absorbent before water decontamination.

Avoid Continuous Exposure
These garments should not be immersed in chemicals. These garments should not be exposed to continuous hazardous liquid chemical splash or deluge. Do not wade through liquid pools of hazardous chemicals if it is not necessary. Direct, liquid chemical exposure to the ensemble should be as limited as possible. If exposed to direct splash or a deluge of hazardous chemicals, leave the area immediately and decontaminate.

Use of Adhesive Tape to Seal Tychem® Garments
Adhesive tape cannot provide a completely liquid- or vapour-tight seal. Taping can reduce bulk flow if carefully applied. During an emergency situation it may be difficult to carefully apply tape. Taping should be viewed, primarily, as a means to hold clothing items in place; to hold a hood over the respirator, to hold a sleeve over a glove, to hold a pant leg over a boot, or to hold a closure flap closed. Taping does not provide reliable barrier.

Limitations of Liquid-Splash Protection
Hooded Tychem® garments without visors are not liquid-tight around the hood/respiratory interface. Careful taping may reduce bulk liquid flow around this interface, but should not be relied upon for total barrier. The wrist and ankle openings of garments without attached gloves or socks have similar limitations. Garments with more protective designs should be used in lieu of taping as well as implementation of engineering controls, work practices and administrative controls to reduce the potential for exposure.

Exposure to Heat and Flame
Tychem® chemical protective garments, other than Tychem® ThermoPro, will burn. No Tychem® garment should be worn around heat, open flames, sparks or any other possible ignition source nor in potentially explosive or flammable environments. Wearing garments made of NOMEX® or any other flame-resistant fabric, under Tychem® garments, other than Tychem® ThermoPro, will not reduce burn injury during a flash fire. Tychem® garments, other than Tychem® ThermoPro, will burn and possibly melt when exposed to a flash-fire; this is likely to increase burn injuries even when worn over garments made of NOMEX® or any other flame-resistant fabric. Tychem® garments, other than Tychem® ThermoPro, melt when

exposed to heat and flame, these garments should not be worn under a garment made of NOMEX® or any other flame resistant fabric, if the potential for flash-fire exists.

CHEMICAL RESISTANT GLOVES

SILVER SHIELD 4H – 4 Mil

Silver Shield 4H chemical resistant gloves are not to be worn by themselves as they do not provide resistance to tear, abrasion or puncture. Silver Shield gloves are to be worn inside a pair Saranex or Barricade type gloves so as to act as an additional inner barrier, should it be required. The Silver Shield gloves can be re-used following decontamination and are not to be disposed of unless physically damaged so as to allow direct penetration of chemicals.

BARRICADE AND SARANEX

- Chemical protective gloves made of Barricade or Saranex, and that are resistant to tear, abrasion or puncture, are to be worn as the outer glove during when working with tailings water.

Saranex or Barricade outer gloves are only to be disposed of if physically damaged so as to allow direct penetration of chemicals.

TYVEK COVERALLS

Tyvek coveralls provide a barrier to particles less than 1 micron in size and is for use against dry particulate hazards, aerosols and light liquid splashes. Tyvek suits are only to be used as per Figure 15. Tyvek suits are not vapour protective in any manner and do not protect to any significant degree against chemical penetration. Tyvek suits are to be disposed of at the end of each shift as per the decontamination plan.

11.7 PPE Maintenance and Storage

MAINTENANCE

PPE is to be worn as per training and is to be properly decontaminated after each use. Defective PPE is to be immediately destroyed or flagged. Under no circumstances is defective PPE to be simply left or placed back into storage. All PPE is to be stored in the designated location following use.

STORAGE

General

No specific storage life data is available. Garments are to be labelled and retired to "Training Use Only" after 5 years. Garments may be used as long as they pass a full visual inspection. Uncontaminated garments that do not pass a visual inspection should be retired and labelled "For Training Use Only" or be discarded.

Optimum Storage Conditions

Preferably, garments should be stored in a cool, dark, dry location free of dirt and insects. Sunlight, ozone, high temperatures (>120° F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Site Specific Storage
A separate area will be constructed for storing clean PPE. No contaminated PPE is to be transfer to or stored within this unit under any circumstances. Separate lockers are to be constructed for workers. A locked room will store PPE prior to issuance to employees.

11.8 PPE Decontamination and Disposal

Refer to the Decontamination Plan.

11.9 PPE Training

TRAINING

Training with respect to PPE will include:

- When PPE is necessary;
- What PPE is necessary and which PPE has been selected for each work task;
- How to properly put on (don), take off (doff), adjust and wear PPE;
- The limitations of the PPE
- How to determine if PPE is no longer effective or is damaged
- How to get replacement PPE
- How to properly care for, maintain, store, and dispose of PPE

Retraining is required whenever:

- Changes in the workplace render the previous training obsolete.
- Changes in the type of PPE render previous training obsolete.
- An observation of inadequacies in an employees' knowledge or use of assigned PPE that indicates an employee has not retained the necessary understanding or skill.

It must verify that each employee who is required to use PPE has received and understood the required training

11.10 PPE Donning and Doffing

DONNING

The wearer is to be helped by a second person in donning and doffing a chemical protective ensemble. A ground cloth is to be used to avoid contamination and damage to the garment. A stable chair, bench or stool which is free of sharp edges and projections is also be utilized.

NON ENCAPSULATING SUITS

- Conduct a visual inspection of the garment before you begin donning:
- Remove all jewellery and personal items (pens, key rings, badges, pagers, knife cases, etc.) that might damage the garment;
- Check function of respirator and place nearby donning location;
- Visually check size and condition of outer boots and place nearby;
- Open garment closure completely;
- Read garment size label to assure proper fit;
- Apply anti-fog to inside of visor, if present;

- Remove shoes. If the garment has attached socks, these socks are worn inside outer chemical boots. These sock boots do not have adequate durability or slip resistance to be worn as the outer footwear covering;
- An assistant should help the wearer don the garment;
- While sitting, insert feet into garment legs and down into sock boot, if so equipped. Stretch legs out to maximum extension while pulling garment up around hips;
- If the garment has outer boot covers, pull the boot covers up and don outer boots. Then pull boot cover down over boots as far as possible. If the garment does not have socks, pull the garment cuff up before donning the boot, then pull the cuff down over the outside of the boot;
- Place one hand in the sleeve and pull garment sleeve to shoulder. Make sure hand is securely inside the glove, if attached;
- Place other hand in sleeve and glove, if attached, and pull the garment over that shoulder;
- If gloves are not attached to the garment, pull up the sleeve, don the gloves and pull the sleeve opening over the gauntlet of the glove;
- Don respirator face-piece and check its function. If using an SCBA, disconnect the air supply from the face-piece, if possible, to save air supply;
- Don protective headgear, if it is worn underneath the garment hood, and communication equipment;
- Place attached hood over the head and close zipper;
- After checking that the zipper is completely closed, the flaps should be folded over the zipper and sealed;
- In the case of an air-line breathing system, complete all connections and adjustments;
- If not already done, connect the respirator face-piece to the air supply and make sure the respirator is functioning properly and adequate air is being provided to the wearer;
- Place separate hood over head and attach underarm straps (NFPA 1994, Class 3 only).

DOFFING

NON ENCAPSULATING GARMENTS

- Decontaminate as per the *Decontamination Plan*;
- If the garment has been contaminated or is suspected of being contaminated, the wearer should continue to use his respirator until the garment has been doffed and removed;
- An assistant should help the wearer doff the garment after field decontamination. If the garment has been contaminated, the assistant should wear protective clothing and respiratory equipment;
- If a separate outer hood is used, it should be removed and discarded;
- If the wearer is wearing an SCBA or PAPR, the assistant should help the wearer remove the respirator tank or filter unit without disconnecting the face-piece. The tank or filter unit should either be held by another person or placed in a safe, dry position. While the wearer stands, the assistant should remove the hood, then open the closure and peel the garment down and away from the wearer‘s shoulders. The assistant should help the wearer remove his arms from the sleeves;
- Lower the garment below the hips and sit down. Have the assistant remove the boots, pull the garment off the legs and remove the garment to a remote location;
- Once the garment has been removed, the wearer can disconnect and remove the respiratory face-piece and harness.

11.11 PPE Inspection Procedures prior to, During and After Use

TYCHEM GARMENT INSPECTION

The following inspection procedures apply to the Tychem TK 122T.

All Tychem® garments should be inspected at the following times:

- Upon receipt from supplier;
- After the garment is worn and before the garment is worn again. Contaminated, damaged or altered garments should not be re-used; and
- Annually.

Garment inspection is important. It ensures that the integrity of the garment has been maintained. The first inspection should be performed upon receipt to ensure that the integrity was not compromised during transit. This inspection should be done immediately upon receipt in order to ensure no damage occurred during shipping. An inspection must also be performed before wearing. Contaminated, damaged or altered Tychem® garments should not be used. Annual follow-up inspection is recommended for garments in storage. Inspection of garments should include the following steps:

1. Lay the garment on a clean, smooth surface;
2. Use a flashlight inside and examine the outside of the garment for holes, cuts, or tears. Apparent stitch holes covered by seam sealing tape do not constitute a defect;
3. Examine the seam tape for lifts or inadequate seal;
4. Examine the garment material and seams for signs of damage. Fabrics and seams sometimes have visual blemishes that do not affect barrier performance. Such blemishes can include dullness or white frosted areas adjacent to the seam tape. A breach or rupture of the barrier film is cause for rejection. Tincture of Iodine is used to confirm a physical breach. Apply Tincture of Iodine to the suspect area and wipe off the excess with a dry towel. If a dark brown stain remains, the barrier layer has been breached and the garment should be rejected. Areas immediately adjacent to the seam tape may take a slight yellow stain as a result of heat exposure during manufacture. This slight yellow stain is not a defect. The edges of the seam tape may also develop a thin, but prominent staining of the exposed edge. This is not a defect;
5. Examine the visor (if present) for a tight seal and make sure the visor offers clear vision;
6. Examine the garment air distribution system (if present) to make sure that it is connected properly and appears to be in working order;
7. Examine the garment gloves (if present) to make sure they are in good working order;
8. Examine the interface between the gloves and the garment if gloves are attached to the garment;
9. Examine the interface between the boots and the garment if the boots are attached to the garment;

10. Examine the garment zipper and zipper cover to make sure they are in good working order. Lubricate the zipper using a small amount of paraffin wax or lubricant supplied by the closure manufacturer;
11. Examine the garment exhalation valves (if present) to make sure they are not obstructed and are in good working order;
12. Examine all garment snaps, closures, adjustment straps and options to make sure they are not obstructed and are in good working order;
13. Examine garment-warning label(s) to make sure they are firmly attached and can be read easily;
14. Non-certified vapour-protective (Level A) garments and garments compliant with NFPA 1991 and Class 1 of NFPA 1994 should be checked for pressure integrity during each garment inspection.

TYCHEM GARMENT INSPECTION

Tyvek garments should be examined prior to use for any tears rips or other defects. If such defects are identified, the Tyvek coveralls are to be disposed of and and new pair is to be issued.

11.12 Evaluation of the Effectiveness of the PPE Plan (PPEP)

The AEL Field Engineer will review the PPEP

- monthly;
- in response to a PPE incident; and
- at any time in response to a request for review by the Project Manager.

In response to a PPE incident, the RPP will be reviewed in accordance with the Formal Risk Assessment procedures described in AEL's Risk Management Program. Formal monthly reviews will include the following:

- a review of program elements against regulatory requirements;
- identification of management processes, which include the clear definition of roles and responsibilities and adequate resources;
- a review of documented program procedures;
- examination of records to verify that documented procedures are being followed;
- confirmation that workplace practices comply with program requirements;
- documentation of performance problems and subsequent resolution or corrective action plans;
- employee input to verify worker acceptance (comfort, ease of breathing, fatigue, vision, mobility, job interference, utility);
- proper selection, use, and maintenance of PPE;
- effective training of all employees;
- proper inspection of PPE; and
- proper storage and maintenance of PPE.

11.13 Limitations during Temperature Extremes, Heat Stress and other Medical Considerations

WEARERS MUST BE PHYSICALLY FIT

All Tychem® garments should only be worn by persons who are in good physical condition. Working in chemical protective clothing is strenuous. In an emergency situation or hot environment, the wearer may experience heat stress. Persons who show symptoms of heat stress such as nausea, dizziness, high heart rates, or excessive heat build-up should leave the work area immediately and remove the ensemble as quickly as possible after decontamination. Persons in doubt about their physical condition should check with a physician before wearing chemical protective ensembles.

MANAGE AND PREVENT HEAT STRESS

These garments interfere with the natural regulation of body temperature. This can lead to a rise in core body temperature and heat stress. The wearer should be aware of the symptoms and treatment of heat stress. The wearer can take several steps to limit and/or prevent heat stress, such as the use of a cooling system, and implementing a conservative work/rest schedule. The maximum time the ensemble can be worn depends on such variables as the air supply, ambient condition, climate inside the ensemble, physical and psychological condition of the wearer, work rate and work load.

12 RESPIRATOR PROTECTION PLAN

12.1 Introduction

The respiratory tract offers the greatest amount of contact between the human body and the environment and a vast majority of existing occupational health standards are based on this form of exposure. The amount of contaminants generated depends on the process occurring in the workplace, as well as the physical and chemical properties of the contaminant (i.e., vapour pressure, boiling point, volatility, particle size, etc.). The amount of contaminant in a unit volume of air is called the concentration of the contaminant and is typically expressed in mass of contaminant per cubic meter of air. However, concentration can also be expressed as parts per million or number of particles per cubic meter (most common for asbestos).

Respiratory protection shall be used to protect a user from inhaling a hazardous atmosphere when engineering or administrative control measures are not practicable or not adequate, while such controls are being instituted, or during shutdown for maintenance, repair, or emergency.

The following sections of the Respiratory Protection Plan (RPP) outline the management of respirator protection, including respirator selection, use and care. Respirator protection shall only be considered when administrative and engineering controls are unavailable or unfeasible. Mechanisms have been put in place to routinely review the effectiveness of the RPP.

12.2 Purpose

The purpose of the RPP is to:

- anticipate, recognize, evaluate and control respiratory hazards so as to protect the respiratory health of employees required to work in hazardous atmospheres or the atmospheres where a potential for hazard exists; and
- to provide the necessary information to allow the proper use and maintenance of respirators.

12.3 Requirements

NWT Mines Health and Safety Regulations

Section 9.32 of the NWT MHSR states that the Project Manager shall cause to be investigated the need for engineering controls where the airborne concentration of a contaminant exceeds the TLV-TWA or 50% of the TLV-C of the occupational exposure limit as listed in the *"1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices published by the American Conference of Governmental Industrial Hygienists*", or as set out in the NWT MHSR.

Section 9.36 of the NWT MHSR states that the Project Manager shall provide respiratory protective devices that comply with the CSA Standard *"Z94.4-93, Selection, Use and Care of Respirators".*

Section 9.37. of the NWT MHSR states that the Project Manager shall ensure the use of respirators in place of engineering controls where the Project Manager determines, in consultation with the Committee, that:

- engineering controls are not feasible because an emergency exists or because maintenance requiring a temporary shutdown is being conducted;
- engineering controls are not reasonable and practicable because of the nature of the maintenance work being conducted; or
- engineering controls are not reasonable and practicable because the work is undertaken on an infrequent and irregular basis

The Project Manager shall inform the chief inspector of the reason for every determination made under subsection 9.37. The Chief Inspector will be informed via the submission of this Site Specific Health and Safety Plan.

Canada Occupational Health and Safety Regulations (Reference Only)

Section 12.7 of the Canada Occupation Health and Safety Regulations (COHSR) states that where air is provided for the purpose of a respiratory protective device:

- the air shall meet the standards set out in clauses 5.5.2 to 5.5.11 of CSA Standard CAN3-Z180.1-M85, Compressed Breathing Air and Systems; and
- the system that supplies air shall be constructed, tested, operated and maintained in accordance with the CSA Standard CAN3-Z180.1-M85, Compressed Breathing Air and Systems

Canadian Standards Association

Z94.4-02 SELECTION, USE, AND CARE OF RESPIRATORS

Section 3.3 of Z94.4 – 02 states that a respiratory protection program shall consist of the following components:

- roles and responsibilities (Clause 4);
- hazard assessment (Clause 5);
- selection of the appropriate respirator (Clause 6);
- respirator fit testing (Clause 7);
- training (Clause 8);
- use of respirators (Clause 9);
- cleaning, inspection, maintenance, and storage of respirators (Clause 10);
- health surveillance of respirator users (Clause 11);
- program evaluation (Clause 12); and
- record keeping (Clause 13)

Z180.1-00 COMPRESSED BREATHING AIR AND SYSTEMS

Z180.1-00 Compressed Breathing Air and Systems:

- provides the minimum requirements for the purity of compressed breathing air supplied to the service outlet and for breathing air and systems required to produce, store, and distribute such air;
- is limited to compressed breathing air and compressed breathing air systems used in the following applications:
    - supplied-air respirators;
    - supplied-air suits;
    - self-contained breathing apparatus (SCBA) (open-circuit); and
    - other applications for which qualified persons deem it appropriate to reference the compressed breathing air purity requirements described in this Standard; and
- includes requirements applicable to the design, construction, testing, commissioning, operation, and maintenance of components for compressed breathing air systems that supply compressed breathing air

It should be noted that the quality requirements for breathing gas in closed circuit SCBA are addressed in CSA Standard CAN/CSA-Z94.4.

12.4 Roles and Responsibilities (Z94.4-02 Clause 4)

EMPLOYER

The employer (AEL) shall be responsible for preparing and implementing, in consultation with users (Committee), a written respiratory protection program, including all of the elements listed in Section 3.3 of the CSA standard *"Z94.4 selection, use and care of respirators"*.

PROJECT MANAGER (PROGRAM ADMINISTRATOR)

The Project Manager shall act as the CSA Z94.4-02 *Program Administrator* and shall

- ensure that a Respiratory Protection Plan (RPP) is prepared in accordance with:
    - Regulatory requirements;
    - CSA standard *"Z 94.4 selection, use and care of respirators"; and*
    - CSA Standard CAN3-Z180.1-M85, *"Compressed Breathing Air and Systems"*
- be responsible for all aspects of the respiratory protection program, including the requirements of:
    - CSA standard *"Z 94.4 selection, use and care of respirators"; and*
    - CSA Standard CAN3-Z180.1-M85, *"Compressed Breathing Air and Systems";*
- ensure that appropriate personnel have been assigned the defined roles as stated in the CSA standard *"Z 94.4 selection, use and care of respirators";*
- ensure that assessments for respiratory hazards are conducted by qualified person(s);
- ensure that a list of accepted respirators selected for use in the workplace is maintained for each respiratory hazard;
- ensure that all persons required to use respirators receive training prior to initial use of a respirator, and refresher training;
- monitor the use of respirators on a regular basis;
- ensure that the respiratory protection program is reviewed to assess the effectiveness of all its elements:
    - monthly, independent of change; and
    - immediately, when the scope of Work changes such that new respiratory hazards are introduced or when addition respiratory hazards are identified;

- ensure that any revisions to the RPP are implemented in timely manner and a follow up review of the revisions is completed to ensure their efficiency;
- ensure that a monitoring system and associated performance measures are in place to track the efficacy of the procedures and training adopted under the respiratory protection program;
- ensure that records required by the CSA standard *"Z 94.4 selection, use and care of respirators"* are maintained;
- develop and maintain a system to manage and review the respiratory protection program;
- ensure that appropriate regulatory authority and/or standards organizations are consulted on interpretations relevant to criteria affecting the use of respirators in the workplace;
- ensure the development of procedures in anticipation of emergency and rescue operations. Such procedures should include
    - the consequences of equipment or power failures, uncontrolled chemical reactions, fire, explosion, or human error;
    - an analysis of emergency and rescue uses of respirators that may occur in each operation;
    - consideration of past occurrences requiring emergency or rescue uses of respirators;
    - rescue in IDLH environments; and
    - the appropriate types and numbers of respirators that need to be maintained and stored so that they are readily accessible and operational when needed;
- periodically update the respiratory protection program to maintain, for example, consistency with regulatory criteria, consensus standards and feedback from program evaluations, investigation reports, users comments, and product alerts that may impact on the respirators used in the workplace;
- ensure that procedures are established for health surveillance to determine if a worker meets the medical requirements to use a respirator;
- ensure that the necessary resources for training in the RPP are available; and
- ensure that the necessary resources for implementing the RPP are available

SITE SUPERINTENDENT

The Site Superintendent shall act as the Z94.4-02 *Supervisor* and shall:

- issue respirators to employees as per the RPP (assigning workers to specific duties and then assigning the specific type of respirator to be fit tested);
- ensure that health screening, fit testing, and training are completed prior to assigning a user any task that requires the use of a respirator;
- ensure respirators are cleaned, sanitized, inspected, maintained, repaired, and stored in accordance with written instructions and manufacturer's recommendations;
- ensure the respirator is used in accordance with the instructions, the training received, and the safe operating procedures established for the workplace. Each worksite shall be inspected at a minimum once per day for compliance;
- in the case of a tight-fitting face-piece, ensure respirator users maintain their required clean-shaven condition, and do not have any object or material that would interfere with the seal or operation of the respirator;

- notify, immediately, the Program Administrator and AEL Field Engineer of any respirator users concerns, changes in processes, equipment, or operating procedures that have an impact on environmental conditions, and respiratory protection requirements;
- notify the Program Administrator and Field Engineer of investigation reports that revealed that the use of a respirator may have prevented or contributed to an incident or injury; and
- ensure that the use of the respiratory equipment is tracked on a per person basis to ensure that proper supplies are at the site when required and supplies that have been issued are not expired and are returned in good working condition following use and change out schedules are adhered to.

AEL FIELD ENGINEER

The AEL Field Engineer shall act as the Z94.4-02 *Fit Tester* and shall:

- ensure that the Site Superintendent receives the required technical training to implement his or her duties as described above in an efficient and effective manner;
- ensure that the required technical assistance is provided to the Project Manager, Site Superintendent and Committee to implement the RPP and all revisions to the RPP, if required, in a timely manner;
- ensure that a respiratory hazard assessment is completed prior to Work and the proper level of respiratory protection is provided in accordance with the requirements of the Authorities having Jurisdiction (AHJ);
- compete a monthly review of the RPP and submit the results to the Project Manager and Committee;
- complete a follow up review of any implemented revisions to the RPP to ensure that the identified risks have been lowered to acceptable levels. Report the results of the follow up review to the Project Manager;
- provide details of the type of respirator selected and the anticipated working conditions to the health care professional conducting the medical assessment of a respirator user; and
- commission and test all supplied air systems to ensure they meet the requirements of CSA Z180.1-00 and CSA Z94.4-02

The AEL Field Engineer is also responsible to:

- complete all air monitoring required to define air borne respiratory hazards; and
- sample compressed air to ensure that it is of sufficient quality for breathing as per CSA Z180.1-00

MEDIC

The Medic shall:

- ensure that medical surveillance forms are filled out prior to fit testing;
- all medial surveillance forms are documented and stored in hard copy and electronically at site and at the AEL office in personnel files;
- if the screening form indicates that wearing a respirator may be harmful to an employee‘s health ensure that he or she is not issued a respirator and that the Project Manager, Site Superintendent and AEL Field Engineer are aware that the employee cannot use a respirator; and

- storing and managing medical results to ensure privacy laws are adhered to

Respirator User

The respirator user shall:

- in the case of a tight-fitting face-piece, maintain their required clean-shaven condition, and refrain from having any object or material that would interfere with the seal or operation of the respirator;
- check that the respirator is clean and in good operating condition prior to each use;
- perform a negative and/or positive pressure user seal-check after each donning of a tight-fitting respirator;
- remove from service a respirator that they determine to be defective and report it to their immediate supervisor or other responsible person;
- report to their supervisor or other responsible person any condition or change that may impact on their ability to use a respirator safely;
- use the respirator in accordance with the written instructions and training received; and
- maintain the respirator issued to him or her as per instruction, including but not limited to
    - proper cleaning following use; and
    - proper storage of all respirator equipment following use

12.5 Hazard Assessment (Z94.4-02 Clause 5)

Table 10 summarizes the respiratory hazards that could be present during Work at the Great Bear Lake Sites. The list of hazards will be reviewed and updated, if required, on a monthly basis by the AEL Field Engineer.

Table 10 Respiratory Hazard Assessment

CONTAMINANT	WORKSITE LOCATION	PHYSICAL STATE	OCCUPATIONAL EXPOSURE LIMITS					WARNING PROPERTIES	OIL (Y/N)	ADDITIONAL COMMENTS
			REF.	TWA.	C/STEL	IDLH CONC.	IDLH PRESENT			
Asbestos	Site Buildings	Dust		0.1fibre/cc	0.1fibre/cc	-	-	None	N	(F) Respirable Fibres: length > 5 µ; aspect ratio > 3:1
Gasoline, Jet fuel (flammable liquids)	Storage and distribution sites	Vapour	ACGIH	300 ppm (890 mg/m^3)	500 ppm (1480 mg/m^3) (STEL)	ND	-	Hydrocarbon odour	Y	Gasoline, volatile solvents and aviation fuels present the highest respirator hazard due to low boiling and flash points(i.e., flammable)
Diesel/Bunker C (combustible liquids)	Storage and distribution and incineration sites	Vapour	ACGIH	100 mg/m^3 as total hydrocarb.	-	ND	-	Hydrocarbon odour	Y	Lower risk of vapour inhalation than flammable liquids as flash point lower
Nickel Oxide	Throughout site – welding and cutting (depend. on metal)	Fume	ACGIH	0.2 as Ni[4]	-	10 mg/m^3	Low Risk	None	N	Cutting and welding to be preformed in well ventilated areas
Carbon Monoxide	Throughout site – welding and cutting	Gas	ACGIH & NIOSH REL	25 ppm (29 mg/m^3) (ACGIH)	200 ppm (229 mg/m^3) (C) (NIOSH) 30,000 ppm	1200 ppm	Low risk	None	Y	Cutting and welding to be preformed in well ventilated areas
Carbon Dioxide	Throughout site – welding and cutting	Gas	ACGIH	5000 ppm (9000 mg/m^3)	(54,000 mg/m^3) (STEL)	40,000 ppm	Low Risk	None	Y	Cutting and welding to be preformed in well ventilated areas
Oxides of Nitrogen (Nitric Oxide)	Throughout site – welding and cutting	Gas	ACGIH	25 ppm (31 mg/m^3)	-	100 ppm	Low Risk	None	Y	Cutting and welding to be preformed in well ventilated areas
Ozone	Throughout site – welding and cutting	Gas	ACGIH & NIOSH REL	0.08 ppm (0.16 mg/m^3)	0.1 ppm (0.2 mg/m^3)	5 ppm	Low Risk	None	Y	Cutting and welding to be preformed in well ventilated areas

[4] Measured as respirable fraction.

CONTAMINANT	WORKSITE LOCATION	PHYSICAL STATE	OCCUPATIONAL EXPOSURE LIMITS					WARNING PROPERTIES	OIL (Y/N)	ADDITIONAL COMMENTS
			REF.	TWA.	C/STEL	IDLH CONC.	IDLH PRESENT			
					(C)					
					NIOSH					
Sodium Nitrate	Mill and/or Foundry Bldg.	Dust	No Established Limits	No Established Limits	No Established Limits	No Est. Limits	No Established Limits	None	Y	Particulate as such P100 particulate filters are appropriate. Packing group 3 and low hazard materials as such half-mask air-purifying respirator appropriate along with SWP.

12.6 Selection of Respirator (Z94.4-02 Clause 6)

Respirator selection shall be carried out for both non-emergency and emergency use. The respirator selected in both instances may be the same, but respirators approved for escape only shall not be used for non-emergency applications. The following sub-sections describe key aspects of respirator selection.

Grouping of Respirators

For the purpose of selection, accepted respirators are grouped as follows:

- atmosphere-supplying respirators:
  - supplied-air – demand, pressure-demand, or continuous-flow;
  - self-contained breathing apparatus – demand or pressure-demand; and
  - combination supplied-air with auxiliary self-contained air supply;
- air-purifying respirators:
  - non-powered air-purifying respirators;
  - powered air-purifying respirators; and
  - gas masks;
- special-use respirators:
  - supplied-air suits; and
  - escape-only respirators

Protection Factors

The following table presents the Protection Factors (PF) for classes and styles of respirators.

Table 11 Respirator Protection Factors

RESPIRATOR CLASS	RESPIRATOR STYLE				
	QUARTER FACE PIECE	HALF FACE PIECE	FULL FACEPIECE	HELMET/HOOD	LOOSE-FITTING FACEPIECE/VISOR
Air-purifying (negative pressure)	5	10	100 (10 if QLFT used)	-	-
Powered air-purifying	-	50	1000	1000	25
Supplied-air (demand)	-	10	100 (10 if QLFT used)	-	-
Supplied-air (pressure demand)	-	50	1000	-	-
Supplied-air (continuous flow)	-	50	1000	1000	25
SCBA (demand)	-	1-	100 (10 if QLFT used)	-	-
SCBA (pressure demand)	-	-	10,000	10,000	-

Hazard Ratio

Refer to Table 12

The Hazard Ratio is defined in the following equation:

$$Hazard\_Ratio = \frac{Measured\_or\_Estimated\_Air\_Borne\_Concentration}{Occupational\_Exposure\_Limit}$$

Equation 1 Hazard Ratio Calculation

The Hazard Ratio (HR) calculated for a selected respirator for a specific respiratory hazard must be equal to or less than the Protection Factor (PF) for that respirator (i.e., HR ≤ PF).

Identification of Contaminants

Refer to Table 10

The following factors concerning an operation or process shall be taken into account:

- operation or process characteristics as they relate to the release of air contaminants through routine, non-routine procedures, or through malfunctioning of equipment or processes or spills;
- the period of time for which the respirator is to be used and the physical demands made on the worker;
- work area layout, work activities, temperature, relative humidity, atmospheric pressure, escape routes, and maintenance procedures;
- materials used, produced, or stored, including raw materials, end products, by-products, chemical reactivity, and wastes; and
- emergency repair, shutdown procedures, escape, or rescue operations

Identification of Physical State

Refer to Table 10

The following physical states for all airborne contaminants are to be identified, as they are likely to be encountered:

- dust;
- fibre;
- fumes;
- mists;
- gases;
- vapours; and
- smoke.

Refer to Appendix B, B-2 Airborne Hazards for a detailed description of the above listed contaminants.

Measure or Estimate Concentration(s)

Refer to Table 12

An estimate of the airborne concentrations of contaminants to which persons may be exposed shall be conducted by a qualified person. The following methods of measuring or estimation are acceptable:

- air sampling and analysis conducted in accordance with accepted practice;
- mathematical modeling or estimating based on the workplace volume and physical properties (e.g., vapour pressure); or
- experience from similar circumstances and materials

Anticipated exposures should account for variations in process operation, rate and direction of air movement, temperature (ambient or process), and seasonal variations.

Determination of Oxygen Level

Where the potential for an oxygen-deficient atmosphere exists, the oxygen concentration shall be measured. Where oxygen concentration is confirmed to be below 19.5% (at sea level), the cause of the deficiency shall be understood and corrected and ongoing monitoring shall be performed, or the atmosphere shall be assumed to be IDLH.

Determination of the Presence of Oil

Refer to Table 12

If there is a particulate hazard, a potential for any oil to become airborne shall be determined. If the presence of oil is unknown, it is assumed to be present. Examples of activities that are known to produce airborne oil include the use of air compressor systems with oil lubricators, the operation of motor vehicles, or any other operation that may generate airborne oil. Monitoring is not required to make this judgment.

Determination of an IDLH Atmosphere

Refer to Table 10.

An IDLH atmosphere is one that poses an immediate threat to life, will cause irreversible adverse health effects, or will impair an individual's ability to escape. An IDLH atmosphere shall be assumed in any of the following situations:

- structural firefighting;
- an untested confined space;
- an area where a known hazardous contaminant is present at or above published IDLH concentrations;
- an area where a known hazardous contaminant is present at an unknown concentration;
- an area where a reduced oxygen concentration may produce a level of hypoxia that is IDLH (refer to Appendix B, *B-5 Reduced Oxygen Concentration*); or
- an area where in the opinion of a qualified person the condition presents a potential IDLH atmosphere.

Identification of Occupational Exposure Limits

Refer to Table 10.

STANDARD CONDITIONS – 8 HOUR DAY/40 HOUR WEEK

Occupational Exposure Limits (OEL) shall be identified. These may be, for example, regulated limits; the ACGIH publication, Threshold Limit Values and Biological Exposure Indices; and the AIHA publication.

EXTENDED WORK HOURS

For work cycles that exceed eight-hour shifts or 40-hour workweeks, the concentration equivalent shall be calculated taking into account the number of hours worked per shift, the days worked and the days in the work cycle. For purposes of this calculation, the work cycle shall not be longer than 14 consecutive days worked plus days off.

The standard Threshold Limit Value (standard TLV) is based on five consecutive days of eight-hour shifts followed by two consecutive days off (standard work cycle). The standard TLV shall be used to determine the concentration equivalent as follows:

$$\frac{factor\_for\_Std.\_Work\_Cycle}{factor\_for\_Other\_Work\_Cycle} \times Std.\_TLV \equiv Concentration\_Equiv.$$

Equation 2 TLV Concentration Equivalent Calculation for Extended Work Hours

Factor for Standard Work Cycle = Days Worked in Cycle X Hours Worked Per Day;
Factor for Other Work Cycle = Days Worked in Cycle X Days Off in Cycle

Determination of an Applicable Substance Specific Standard

If an OEL is explicitly listed in regulations, the regulated value shall take precedent over Non Governmental concentrations determined by institutions, such as the following:

Determination of the Existence of Adequate Warning Properties

Refer to Table 10

The published warning properties for each contaminant if existing, shall be identified. Adequate warning properties can be assumed when the odour, taste, or irritation effects of the contaminant are detectable and persistent in concentrations at or below the OEL. When the odour, taste, or irritation threshold of a contaminant is greater than the OEL, this contaminant should be considered to have poor warning properties. The following reference documents should be consulted:

- Odour Thresholds for Chemicals with Established Occupational Health Standards (Publication No.7 08-EA-89 by the American Industrial Hygiene Association); and
- NIOSH Pocket Guide to Chemical Hazards (Publication No. OHHS (NIOSH) 2000-730) by the National Institute for Occupational Safety and Health).

Extreme caution should be exercised when interpreting odour threshold data. Some of the data produced may not represent real world working conditions where:

- workers are focusing on their job task and not the odour of the chemical; or
- where masking odours or individual odour insensitivity may prevail

Determination of Skin/Eye Adsorption and Irritation Characteristics

Determine if the contaminant is an eye irritant at concentrations normally encountered in the workplace or anticipated during and emergency. Determine if information is available, indicating possible systemic injury from absorption of the contaminant through the skin or eyes.

Site Specific Selection – Non-Emergency Use

Table 12 presents the selection of the respirators for the hazards identified in Table 10 and the RP displayed in Table 11. Refer to the CSA Standard *"Z94.4-93, Selection, Use and Care of Respirators"* respirator selection flowchart for a detailed description of the selection logic.

Site Specific Selection – Emergency Use

The following respirators have been selected for emergency use only:

- 2 x ISI Vanguard SCBA.

The ISI Vanguard is NIOSH/MSHA approved and meets 30 CFR Part 11 for open-circuit SCBA. The Vanguard is a pressure-demand type full-face pieced SCBA and therefore provides the highest possible protection against the respiration of air-bone contaminants. The PF is rated at 10,000.

Table 12: Non-Emergency Respirator Selection

HAZARD	WORST CASE EST. AIRBORNE. CONCENTRATION	RESPIRATOR CLASS	STYLE	PROTECTION FACTOR	HAZARD RATIO[5]	CARTRIDGE	MODEL	ADDITIONAL EXPOSURE CONTROLS	JUSTIFICATION OF SELECTION OF PPE OVER ENGINEERING CONTROLS
Asbestos (low/moderate) risk	<1fibre/cc	Air-purifying (negative pressure)	Half facepiece	10	<10	P100	North 7700 series silicone half-mask.	*Engineering Control:* Industrial HEPA vacuum system, 385 SCFM @ 9" Hg Model: DVR852 Supplier – Texas Electronics	Engineer controls are in place. PPE provides layered protection.
Asbestos (high Risk)	<100fibres/cc (high risk)	Supplied Air (positive pressure)	Powered Full Face (high risk)	<1000	<1000	AEP3 (OV/AG/HEPA)	3M Breathe Easy Turbo PAPR Assembly – belt mounted cw/ 3M 6900 series full facepiece pressure demand respirator	*Engineering Control:* Industrial HEPA vacuum system, 385 SCFM @ 9" Hg Model: DVR852 Supplier – Texas Electronics	Engineer controls are in place. PPE provides layered protection.
Gasoline, Jet fuel (flammable liquids)	<30 ppm	Supplied Air (positive pressure)	Full facepiece	<1000	<1000	AEP3 (OV/AG/HEPA)	3M Breathe Easy Turbo PAPR Assembly – belt mounted cw/ 3M 6900 series full facepiece pressure demand respirator	Handling outdoors	Engineering Controls Not Reasonable and practicable because of the Nature of the Work and the Frequency of the Work
Diesel/Bunker C (combustible liquids)	<1000mg/m^3	Air-purifying (negative pressure)	Half facepiece	10	<10	P100/Organic Vapour	North 7700 series silicone half-mask. Note: When starting Bunker C tank demolition until conditions known use PAPR.	Handling outdoors	Engineering Controls Not Reasonable and practicable because of the Nature of the Work and the Frequency of the Work
Flocculant	<50 mg/m^3	Air-purifying (negative	Half facepiece	10	<10	P100	North 7700 series silicone half-mask.	*Engineering Control:* Industrial HEPA	Engineer controls are in place. PPE provides

[5] Hazard Ration = Estimated Airborne Concentration/Occupation Exposure Limit

HAZARD	WORST CASE EST. AIRBORNE. CONCENTRATION	RESPIRATOR CLASS	STYLE	PROTECTION FACTOR	HAZARD RATIO[5]	CARTRIDGE	MODEL	ADDITIONAL EXPOSURE CONTROLS	JUSTIFICATION OF SELECTION OF PPE OVER ENGINEERING CONTROLS
		pressure)						vacuum system, 385 SCFM @ 9" Hg Model: DVR852 Supplier – Texas Electronics	layered protection.

12.7 Respirator Fit Testing (Z94.-02 Clause 7)

A qualitative fit test shall be used to determine the ability of a user to obtain a satisfactory fit and an effective seal when using a tight-fitting face-piece. A user seal check shall not be used as a substitute for a qualitative test. The results of the fit test shall be used to select the specific model and size of face-piece for individual users.

A fit test shall be carried out,

- prior to initial use and after completing the health surveillance evaluation;
- annually thereafter;
- whenever there is a change in respirator face-piece (e.g., brand, model, or size); and
- whenever changes to the user's physical condition could affect the respirator fit

Under no circumstances shall a person use a tight-fitting respirator until a satisfactory quantitative fit test has been achieved. The person conducting the fit test shall not perform the test unless the person undergoing the test is clean-shaven where the face-piece seals to the skin. A sufficient variety of respirator face-piece sizes and models shall be provided to ensure a satisfactory fit to each respirator user.

A respirator user screening form shall be completed by each employee and the results shall be reviewed by the Medic. The Medic must sign off that the employee is physically and physiologically fit to use a respirator, prior to conducting a fit test. Refer to Appendix A: *Form A-6, Respirator User Screening Form.*

Tight-fitting respirator face-pieces shall be tested only in the negative-pressure mode regardless of the mode of operation in which the respirator is used. This can be accomplished by temporarily converting a user's actual face-piece into a negative-pressure respirator, or by using a negative-pressure air-purifying respirator with identical face-piece sealing surface. When other personal protective equipment, such as eye, face, head, and hearing protectors, are required to be worn, they shall be worn during the respirator fit tests to ensure that they are compatible with the respirators and do not break the facial seal.

Additional detailed information regarding fit testing procedures is presented in Appendix B, *B-4 Quantitative Respirator Fit Test.* The selected method of fit-testing is irritant smoke qualitative fit test.

12.8 Respirator Training (Z94.4-02 Clause 8)

Employees required to wear respirators will receive training in the following subjects:

Selection Process

The selection process includes a detailed review of, for example, the workplace conditions, hazardous materials and exposures, and relevant standards, in order to specify a range of appropriate respirator options. Refer to Section 8.6 for further detail regarding respirator selection.

Medical Assessment

This activity requires an understanding of the medical assessment process, medical conditions that may require reassessment, and individual accountabilities. This medical assessment involves a review and a written opinion by a health care professional of the suitability of the worker to safely use a respirator (i.e., Respirator Screening Form). This activity also requires the maintenance of accurate records.

Fit Testing

The process requires an understanding of the steps which are to be completed during the fit test, the types of fit testing, the importance of fit testing, the required frequencies for fit testing and the employees responsibility to actively cooperate during fit testing.

General Knowledge

General knowledge includes an understanding of the RPP, including

- local policies and procedures;
- the respiratory hazards encountered in the workplace, their potential health effects on the worker, and the means to control them;
- the rationale for the respirator selected;
- where to find information; and
- procedures to follow in case of an emergency

Care and Practical Use

Care and practical use training shall encompass:

- user seal checks;
- care;
- cleaning;
- inspection;
- end-of-service recognition;
- change-out of filter elements;
- replacement of air cylinders;
- identification of problems;
- use under failure or emergency modes;
- storage;
- removal from service;
- basic maintenance; and
- familiarity with and adherence to the manufactures instructions

12.9 Respirator Use (Z94.4-02 Clause 8)

Air Purifying Respirators

HALF FACEPIECE RESPIRATORS

SITE SPECIFIC MODEL

North 7700 Series Half-Mask

SITE SPECIFIC APPLICATION

The following table displays the work tasks for which the North 7700 Series Half-Mask has been approved, when used with the corresponding cartridge.

Table 13: Site Specific Application of the North 7700 Series Half Mask

WORK TASK	CONTAMINANT	CARTRIDGE	COMMENTS
Asbestos Removal (low/moderate risk)	Asbestos Fibres	North P100 (Part #7580P100)	Use only where atmospheres require a protection factor of 10 or less.
Work in fuel storage and transfer of fuel.	Diesel fuel	Organic vapor/P100 (Part # 7581P100) or Defender/P100 (Part # 75SC)	Use only where atmospheres require a protection factor of 10 or less.
Welding/Cutting	Fumes and various potential organic vapours	Organic vapor/P100 (Part # 7581P100) or Defender/P100 (Part # 75SC)	For cutting/welding outdoors with minimal coating on pipes.
Hydrocarbon Incineration (inversion of smoke)	Hydrocarbon smoke	North P100 (Part #7580P100)	Use only where atmospheres require a protection factor of 10 or less.

REQUIRED AMBIENT AIR QUALITY

- Not for use in IDLH atmospheres;
- Not for use in oxygen deficient atmospheres;
- Not for use in cyanide abatement; and
- Not for use in atmospheres requiring protection factors greater than 10

Refer to Appendix B, *B-3 Respirator Classification, Characteristics and Limitations,* for a detailed discussion regarding the ambient air quality requirements for use of air purifying respirators.

CHANGE OUT SCHEDULE

The following table presents the change out schedule for the selected North 7700 Series Half-Mask respirator cartridges.

Table 14: North 7700 Series Half Mask Cartridge Change out Schedule

WORK TASK	CONTAMINANT	CARTRIDGE	CHANGE OUT CRITERIA
Asbestos Removal (low/moderate risk)	Asbestos Fibres	North P100 (Part # 7580P100)	When excessive breathing resistance is encountered.
Work in fuel storage and transfer of fuel.	Diesel fuel	Organic vapor/P100 (Part # 7581P100) or Defender/P100 (Part # 75SC)	When petroleum hydrocarbon odours are detected. When petroleum hydrocarbon odours are detected.
Hydrocarbon Incineration (inversion of smoke)	Hydrocarbon smoke	North P100 (Part #7580P100)	And/or When excessive breathing resistance is encountered. When petroleum hydrocarbon odours are detected.
Welding/Cutting	Fumes and various potential organic vapours	Organic vapor/P100 (Part # 7581P100) or Defender/P100 (Part # 75SC)	And/or When excessive breathing resistance is encountered.

SAFE WORK PRACTICES

Refer to Appendix B, *B-13 North Half-Mask Air Purifying Respirator Operating and Maintenance Instruction Manual*

FULL FACEPIECE

SITE SPECIFIC MODEL

North 7600 Series full-Mask.

SITE SPECIFIC APPLICATION

Table 15 displays the work tasks for which the North 7600 Series Full Face-piece has been approved with the corresponding cartridge. The North full face-piece respirator is to be used as an alternative to the North half mask respirator when additional eye protection is required or protection by safety glasses/goggles is inconvenient or uncomfortable.

Table 15: Site Specific Application of the North 7600 Series Full Face Piece

WORK TASK	CONTAMINANT	CARTRIDGE	COMMENTS
Asbestos Removal	Asbestos Fibres	North P100 (Part #7580P100) Organic vapor/P100	Use only where atmospheres require a protection factor of 10 or less.
Work in fuel storage and transfer.	Diesel fuel	(Part # 7581P100) or Defender/P100 (Part # 75SC) Organic vapor/P100	Use only where atmospheres require a protection factor of 10 or less.
Welding/Cutting	Fumes and various potential organic vapours	(Part # 7581P100) or Defender/P100 (Part # 75SC)	For cutting/welding outdoors with minimal coating on pipes.

REQUIRED AMBIENT AIR QUALITY

- Not for use in IDLH atmospheres;
- Not for use in oxygen deficient atmospheres;
- Not for use in cyanide abatement; and
- Not for use in atmospheres requiring protection factors greater than 10

Refer to Appendix B, *B-3 Respirator Classification, Characteristics and Limitations,* for a detailed discussion regarding the ambient air quality requirements for use of air purifying respirators.

CHANGE OUT SCHEDULE

Table 16 presents the change out schedule for the North 7600 Series Full Face Piece respirator cartridges.

Table 16: North 7600 Series Full Face Piece Change Out Schedule

WORK TASK	CONTAMINANT	CARTRIDGE	CHANGE OUT CRITERIA
Asbestos Removal	Asbestos Fibres	North P100 (Part # 7580P100) Organic vapor/P100	When excessive breathing resistance is encountered.
Work in fuel storage and transfer.	Diesel fuel	(Part # 7581P100) or Defender/P100 (Part # 75SC) Organic vapor/P100	When petroleum hydrocarbon odours are detected.
Welding/Cutting	Fumes and various potential organic vapours	(Part # 7581P100) or Defender/P100 (Part # 75SC)	When excessive breathing resistance is encountered.

SAFE WORK PRACTICES

Refer to Appendix B, *B-12 North 7600 Series Full Face-piece Air Purifying Respirator Operating and Maintenance Instruction Manual.*

POWERED – FULL FACE PIECE

SITE SPECIFIC MODEL

Respirator – *3M 6900 series full face-piece (Positive Pressure Application)*
Breathing Tube – GVP-123
Belt Mounted Air Supplying and Filtering Unit – *Breathe Easy Turbo PAPR Assembly*
Filter Cartridge – *AEP3 Organic Vapour/Chlorine/Hydrogen Chloride/Sulfur Dioxide/High Efficiency Cartridge 453-03-01R06, AEP3 6/Case*

SITE SPECIFIC APPLICATION

Table 17 displays the work tasks for which the 3M Powered Full Face-piece respirator has been approved with the corresponding cartridge.

Table 17: Site Specific Application of the North 7600 Series Full Face Piece

WORK TASK	CARTRIDGE	COMMENTS
Asbestos Removal (high risk)	AEP3	Use only where atmospheres require a protection factor of 1000 or less
Gasoline transfer	AEP3	Use only where atmospheres require a protection factor of 1000 or less
Welding/Cutting	AEP3	Use only where atmospheres require a protection factor of 1000 or less. For use when welding/cutting indoors or pipes with noticeable paint or surface coating.

REQUIRED AMBIENT AIR QUALITY

- Not for use in IDLH atmospheres;
- Not for use in oxygen deficient atmospheres;
- Not for use in cyanide abatement; and
- Not for use in atmospheres requiring protection factors greater than 1000.

Refer to Appendix B, *B-3 Respirator Classification, Characteristics and Limitations,* for a detailed discussion regarding the ambient air quality requirements for use of air purifying respirators.

CHANGE OUT SCHEDULE

Filters are to be changed out when the flow rate drops below 6 cfm (0.17 m^3/min) or when petroleum hydrocarbon odours are noticed.

SAFE WORK PRACTICES

Refer to Appendix B, *B-10 3M 6000PD Series Respirator Full Face Piece User's Instructions* and *B-11 3M Breathe EasyTM Turbo PAPR Assembly User Instructions*.

Supplied Air Respirator – Tight Fitting Full Faced Pressure-Demand

SITE SPECIFIC APPLICATION

AEL will not be using the Supplied Air Respirators at the Great Bear Lake Sites.

Self Contained Breathing Apparatus – Open Circuit and Pressure Demand

SITE SPECIFIC MODEL

The ISI Vanguard SCBA with pneumatic indicators (30 min @ 40 LPM) has been selected as the emergency use SCBA.

SITE SPECIFIC APPLICATION

The ISI Vanguard will be used only be trained employees for emergency rescue.

REQUIRED AMBIENT AIR QUALITY

Approved for use in IDLH atmospheres.

REQUIRED SUPPLIED AIR QUALITY

Refer to Respirator Protection Plan.

CHANGE OUT SCHEDULE

The ISI Vanguard must be fully charged with breathing quality air prior to use.

SAFE WORK PRACTICES

Refer to Appendix B, *B-14 International Safety Instruments Vanguard SCBA With Pneumatic Indicators User's Manual for detailed information.*

NIOSH CAUTIONS AND LIMITATIONS

D - Airline respirators can be used only when the respirators are supplied with respirable air meeting the requirements of CGA G-7.1 Grade D or higher quality (i.e., CSA Z180.1-00)

E - Use only the pressure ranges and hose lengths specified in the User's Instructions (refer to Appendix B, B-14 International Safety Instruments Vanguard SCBA With Pneumatic Indicators User's Manual)

J - Failure to properly use and maintain this product could result in injury or death.

M - All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations (i.e., CSA Standard Z94.4-02, refer to Table 10 and **Table 12**)

N - Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer.

O - Refer to User's Instructions, and/or maintenance manuals for information on use and maintenance of these respirators (refer to Appendix B, B-14 International Safety Instruments Vanguard SCBA With Pneumatic Indicators User's Manual)

S - Special or critical User's Instructions and/or specific use limitations apply. Refer to User's Instructions before donning (refer to Appendix B, B-14 International Safety Instruments Vanguard SCBA With Pneumatic Indicators User's Manual)

NIOSH SPECIAL OR CRITICAL USER'S INSTRUCTIONS

- Approved for respiratory protection during entry into or escape from oxygen-deficient atmospheres, gases and vapours at temperatures above -25°F;
- Approved only when compressed gas container is charged with air meeting the requirements of CGA G-7.1 Grade D or higher quality (i.e., CSA Standard Z180.1-00);
- The compressed gas container shall meet applicable DOT specifications.
- When used as a combination apparatus, only 20% of the service pressure may be used on entry.
- This approval applies only when the device is supplied with respirable breathing air through 6 to 300 feet of hose at air pressures between 80 to 120 pounds per square inch gauge or from self-contained air supply.
- If the supplied air fails, open the cylinder valve and proceed to fresh air immediately.
- Use adequate skin protection when worn in gases and vapours that poison by absorption (example: hydrocyanic-acid gas).

REFILLING COMPRESSED AIR CYLINDERS

A Junior II High Pressure Breathing Air Compressor will be used to refill pressurized cylinders at site with breathing quality air. Both the ISI Vanguard and the ARAP/E 10 min escape bottles are to be filled using the Junior II. The 30 min Vanguard requires 2216 PSI and the ARAP 10 min escape bottles require 3000 PSI. Only trained employees are to refill cylinders. No cylinder is to be filled until it has been verified by the AEL Field Engineer that the Junior II system is supplying air to the requirements of the CSA Z180.1-00. For additional information regarding the Junior II refer to Appendix B, *B-15 Bauer Junior II High Pressure Breathing Air Compressor.*

12.10 Cleaning, Inspection, Maintenance and Storage (Z94.4-02 Clause 10)

Each respirator shall be cleaned to retain its original effectiveness. An acceptable program of care and maintenance shall include:

- cleaning and sanitizing;
- inspection, testing and repair;
- storage; and
- record keeping.

CLEANING and SANITIZATION

Respirators shall be cleaned and sanitized according to the respirator manufacturer‘s instructions (refer to applicable manual contained within Appendix B). Respirators designed not to be cleaned shall be disposed of after use as directed by the manufacturer‘s instructions.

INSPECTION

GENERAL

Users shall inspect their respirators before and after each use. Defective or non-functioning respirators shall be identified as ―out of service” or equivalent (e.g., tagged) and shall be removed from service until repaired or replaced. Employees shall:

- not use a defective respirator under any circumstances,
- prevent others from using the defective respirator by properly placing it out of commission (i.e., destroy or label, do not place the defective respirator back in storage or leave it laying around the worksite); and
- immediately report the defective respirator to his or her immediate supervisor.

Respirator inspection shall include, where applicable, the following:

- condition of component parts (e.g., face-piece, head harness, valves, connecting tubes, harness assemblies, filters, cartridges, canisters, and cylinders;
- tightness of connections;
- end-of-service-life indicator;
- shelf-life dates; and
- proper functioning of regulators, alarms, and other warning systems.

Pressure gauges of all breathing gas cylinders in service shall indicate that the cylinders are within the ―Full" range. Cylinders with gauges indicating less than the ―Full" range shall be recharged in accordance with the manufacturer's instructions.

Respirators shall be examined in accordance with the manufacturer's instructions. If they do not pass the inspection, the respirator shall be tagged and removed from service.

INSPECTION OF SCBA CYLINDERS

GENERAL REQUIREMENTS FOR INSPECTION OF STEEL, ALUMINUM AND FIBRE REINFORCED CYLINDERS

The AEL Field Engineer shall inspect cylinders externally and internally according to the requirements of CSA Standards CAN/CSA-B339 and CAN/CSA-B340, the appropriate CGA publications C-6, C-6.1, and C-6.2, the Transport Canada Regulations under the Transportation of Dangerous Goods Act, and the manufacturer's instructions. After each use and before refilling, the AEL Field Engineer shall inspect the exterior of cylinders for obvious signs of external damage. Cylinders showing signs of obvious external damage shall be immediately depressurized and removed from service and, prior to return to service, inspected in accordance with the requirements the of CSA Standards CAN/CSA-B339 and CAN/CSA-B340, the appropriate CGA publications C-6, C-6.1, and C-6.2, the Transport Canada Regulations under the Transportation of Dangerous Goods Act, and the manufacturer's instructions.

Cylinders showing damage to the paint shall be inspected. If required, damaged cylinders shall be repaired as soon as possible by a qualified person in accordance with the manufacturer's instructions and specifications.

SPECIAL INSPECTION REQUIREMENTS FOR EMERGENCY USE SCBA

SCBA shall be inspected on a schedule to ensure readiness for the anticipated emergency use. The inspection records shall include the:

- date of use of the respirator and cylinder (includes training, non-emergency and emergency use);
- date of inspection;
- physical condition of the respirator and cylinder;
- cleaning and sanitizing of respirators;
- repairs done to respirators and cylinders; and
- tests performed on respirators and cylinders or remedial actions taken.

A record of all inspections and service performed on a respirator and cylinder shall be maintained in a bound logbook.

12.11 Health Surveillance of Respirator Users (Z94.4-02 Clause 10)

Prior to Respirator Use

Prior to fit testing and respirator use, the AEL Field Engineer shall ensure that documentation is completed that confirms that the individual is free from any physiological or psychological condition that may preclude him or her from being assigned the use of the selected respirator. All health information shall be treated as medically confidential. As discussed previously, a screening form for respirator users will serve as the screening tool. Refer to Appendix A: *Form A-6, Respirator User Screening Form.* Where the program administrator or respirator user is concerned that a physiological or psychological condition exists that may preclude the use of a respirator the employee will not be assigned work tasks that require the use of a respirator.

Exposure Monitoring

The AEL Field Engineer will be responsible to ensure that air quality monitoring is completed. The purpose of air quality monitoring is to ensure that the correct respirators have been selected for the actual airborne concentrations of contaminants present during Work. The analytical results obtained will be compared to the estimated concentrations presented in **Table 12**. Hazard Ratios (HR) will be calculated for the actual sampled air born concentrations of contaminants and compared to respirator Protection Factors (PF). If the sampling based HR is less than the PF than the correct respirator has been chosen. However, if the sampling based HR is greater than the PF then work will be stopped immediately and the hazards will be reassessed.

Two forms of air quality monitoring will be completed:

- Area sampling; and
- Personal breathing zone sampling.

The specific method of air quality monitoring will be selected by the AEL Field Engineering based on site specific Work conditions. The type of sampling will be submitted with the analytical laboratory results and will be stored on site and at the AEL office for ease of reference.

The selected area pump is an Allegro Industries High Volume Sampling Pump. Refer to Appendix B, *B-16 Allegro Industries High Volume Sampling Pump Owners Manual* for additional information. The personal breathing zone air-sampling pump selected is the Gilian BDX II Abatement Air Sampler. Refer to Appendix B, *B-17 Gilian BDX II Abatement Air Sampler Operation and Service Manual* for additional information.

12.12 Program Evaluation (Z94.4-02 Clause 11)

The AEL Field Engineer will review the RPP

- monthly;
- in response to a respiratory incident; and
- at any time in response to a request for review by the Project Manager.

In response to a respiratory incident the RPP will be reviewed in accordance with the Formal Risk Assessment procedures described in AEL‘s Risk Management Program. Formal monthly reviews will include the following:

- a review of program elements against regulatory requirements;
- identification of management processes, which include the clear definition of roles and responsibilities and adequate resources;
- a review of documented program procedures;
- examination of records to verify that documented procedures are being followed;
- confirmation that workplace practices comply with program requirements;
- documentation of performance problems and subsequent resolution or corrective action plans;
- employee input to verify worker acceptance (comfort, ease of breathing, fatigue, vision, mobility, job interference, utility);
- proper selection, use, and maintenance of respirators;
- effective training of all employees;
- proper inspection of respirators; and
- proper storage and maintenance of respirators.

12.13 Record Keeping (Z94.4-02 Clause 12)

General

The Site Superintendent shall ensure that appropriate records are kept of all respiratory protection program activities as required by the RPP. Recordkeeping shall include

- hazard assessments, including periodic monitoring of the workplace atmosphere;
- respirator fit testing;
- training;
- program reviews; and
- commissioning, testing, operation, maintenance and results of analysis of compressed breathing air systems (CSA Z180.1-00 Section 5.8).

Both electronic and hard copy records are to be maintained. The records shall be kept for 20 years following the project.

12.14 Respirator Pre-Screening Form

Part 1: Employer Information

Employer Name: Employer #:
Date:
Worksite Address: Supervisor Name:
Telephone: ( ) Facsimile: ( )

Part 2: Respirator User Information

Name: Employee #:
Title/Occupation: Telephone: ( ) Facsimile: ( )

Part 3: Conditions of Use

Activities requiring respirator use: _____, _____, _____

Frequency of respirator use: ❑ daily ❑ weekly ❑ monthly ❑ yearly ❑ uncertain

Exertion level during use: ❑ light ❑ moderate ❑ heavy ❑ other

Duration of respirator use per shift: ❑ <1/4 hr ❑ >1/4 hr ❑ >2 hr ❑ variable ❑ unknown

Temperature during use: ❑ < 0°C ❑ >0 and <25°C ❑ > 25°C

Atmospheric pressure during use: ❑ reduced ❑ normal/ambient ❑ increased

Special Work Considerations

Uncontrolled Hostile Environment:

❑ Emergency escape ❑ Fire fighting ❑ Riot/Police activity ❑ Rescue operations
❑ IDLH
❑ Hazardous materials (Emergency) ❑ Oxygen deficiency ❑ Confined spaces
❑ Other _____

Other Personal Protective Equipment:

❑ Additional types of personal protective equipment required, specify:_____

❑ Estimated total weight of tools/equipment carried during respirator use: Maximum:____Average:____

Part 4: Types of Respirators Used (check all that apply)

❑ Tight-fitting	❑ Non-tight-fitting (eg, hood)	❑ SCBA-open circuit
❑ Mouth bit	❑ Supplied-air, demand	❑ SCBA-closed circuit
❑ Air-purifying, nonpowered	❑ Supplied-air, continuous-flow	❑ SCBA-escape
❑ Air-purifying, powered	❑ Supplied-air, pressure-demand	❑ SCBA-closed circuit escape

❑ Combination pressure demand/supplied-air with escape ❑ Supplied-air suit
❑ Combination supplied-air with air-purifying elements ❑ Other — specify:

Part 5: Respirator User's Health Conditions (check YES or NO box only. Do not specify)

(a) Some conditions can seriously affect your ability to safely use a respirator. Do you have or do you experience any of the following, or another condition that may affect respirator use? ❑ YES ❑ NO

Shortness of breath	Breathing difficulties	Chronic bronchitis	Emphysema
Lung disease	Chest pain on exertion	Heart problems	Allergies
Hypertension	Cardiovascular disease	Thyroid problems	Diabetes
Neuromuscular disease	Fainting spells	Dizziness/nausea	Seizures
Temperature susceptibility	Claustrophobia/fear of heights	Hearing impairment	Dentures
Panic attacks	Colour blindness	Asthma	Pacemaker
Vision impairment	Reduced sense of smell	Reduced sense of taste	
Back/neck problems	Facial features/skin conditions		

Prescription medication to control a condition

Other condition(s) affecting respirator use:

(a) Have you had previous difficulty while using a respirator? ❑ YES ❑ NO

(b) Do you have any concerns about your future ability to use a respirator safely? ❑ YES ❑NO

A "YES" answer to "a" "b" or "c" indicates further assessment by a health care professional is required prior to respirator use. NOTE: Medical information is NOT to be offered on this form.

Signature of Respirator User: Supervisor's Initials:

Date:

Part 6: Health Care Professional Primary Assessment (if required)

Assessment date:

Respirator use permitted?: ❑ YES ❑ NO ❑ UNCERTAIN

Referred to medical assessment: ❑ YES ❑ NO

Comments:

Reassessment date:

Name of Health Care Professional: Title: Signature of HCP:

Part 7: Medical Assessment (if required)

Assessment Date:

❑ Class 1. NO restrictions

❑ Class 2. Some specific restrictions apply: _____

❑ Class 3. Respirator use is NOT permitted.

Name of Physician: Signature of Physician:

12.15 User Seal Check Using Tight-Fitting Elastomeric Facepieces

Negative Pressure Seal Check

A negative-pressure user seal check can be conducted on air-purifying respirators and atmosphere supplying respirators equipped with tight-fitting facepieces. This check may be difficult or impossible to conduct on respirators incorporating air-purifying elements (size or shape) that do not allow the inhalation inlets to be temporarily sealed.

The procedure for conducting the negative-pressure user seal shall be conducted as follows:

- The user seal check consists of closing off the inlet opening(s) of the respirator air-purifying elements so that upon inhalation, passage of air into the facepiece will not occur. In the case of air-supplied respirators, the user seal check consists of closing off the air supply hose;
- To avoid possible disruption of the facial seal, a non-permeable, flexible plastic wrap may be used to seal the air inlet(s) instead of attempting to maintain a seal with the hands;
- The user shall inhale gently and hold his/her breath for at least 5s. The facepiece will collapse slightly on the face and shall remain collapsed while the breath is held;
- During this period, the facepiece shall not be disturbed by the user attempting to maintain a seal on the inlet opening of the air-purifying elements.
- If the facepiece remains collapsed while a breath is being held, the user seal check is successful;
- If the facepiece does not remain collapsed while a breath is being held, the user shall verify that nothing obstructs the sealing surface, adjust the facepiece and harness, and repeat the user seal check;
- If the facepiece still does not remain collapsed while a breath is being held, the user shall remove the respirator, inspect the components for the cause of the leakage, correct any problems discovered, or obtain a replacement respirator and repeat the user seal check;
- Users shall not use a respirator for which a user seal check cannot be completed successfully.

Positive-Pressure User Seal Check

A positive-pressure user seal check can be conducted on respirators equipped with tight-fitting facepieces that contain both inhalation and exhalation valves. It should be noted that for some respirators, the positive-pressure user seal check requires that the exhalation valve cover be removed, then replaced following completion of the user seal check.

The procedure for conducting the positive-pressure user seal check shall be as follows:

- The user shall don the respirator facepiece, closing off the exhalation valve or breathing tube or both, and exhale gently;
- During this period, the facepiece shall not be disturbed by the user attempting to maintain a seal on the exhalation valve;
- If a slight positive pressure can be maintained inside the facepiece without detection of any outward leakage of air, the user seal check is successful;
- If a slight positive pressure cannot be maintained inside the facepiece for 5 s, the user shall verify that nothing obstructs the sealing surface, adjust the facepiece and harness, and repeat the user seal check;

- If a slight positive pressure still cannot be maintained inside the facepiece, the user shall remove the respirator, inspect the components for the cause of the leakage, correct any problems discovered, or obtain a replacement respirator and repeat the user seal check;
- The user shall not use a respirator for which a user seal check cannot be completed successfully.

12.16 Airborne Hazards

Dust
Dusts are particles that are formed or generated from solid organic or inorganic –materials by reducing their size through mechanical processes such as crushing, grinding, drilling, abrading, or blasting.

Fumes
Fumes are particles formed when a volatilized solid, such as a metal, condenses in cool air. This physical change is often accompanied by a chemical reaction, such as oxidation. Examples are lead oxide fumes from smelting and iron oxide fumes from arc-welding. A fume can also be formed when a material such as magnesium metal is burned or when welding or gas cutting is done on galvanized metal.

Mists
Mist is a state that is formed when a finely divided liquid is suspended in the air. These suspended liquid droplets can be generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, or atomizing. Examples are the oil mist produced during cutting and grinding operations, acid mists from electroplating, acid or alkali mists from pickling operations, paint spray mist from spraying operations and the condensation of water vapour to form a fog or rain.

Gases
Gases are formless fluids that occupy the space or enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Examples are welding gases such as acetylene, nitrogen, helium and argon; and carbon monoxide generated from the operation of internal combustion engines. Another example is hydrogen sulfide, which is formed wherever there is decomposition of materials containing sulfur under reducing conditions.

Vapour
Vapours are the gaseous form of substances that are normally in the solid or liquid state at room temperature and pressure. They are formed by evaporation from a liquid or solid, and can be found where parts cleaning and painting takes place and where solvents are used.

Smoke
Smoke consists of carbon or soot particles resulting from the incomplete combustion of carbonaceous materials such as coal or oil. Smoke generally contains droplets as well as dry particles.

12.17 Respirator Classification, Characteristics and Limitations

General

NEGATIVE VS. POSITIVE PRESSURE RESPIRATORS

An important aspect of respirator operation and classification is the air pressure within the facepiece. When the air pressure within the facepiece is negative during inhalation with respect to the ambient air pressure, the respirator is termed a negative-pressure respirator. When the pressure is normally positive with respect to ambient air pressure throughout the breathing cycle, the respirator is termed a positive-pressure respirator. The concept of negative and positive pressure operation is important when considering potential contaminant leakage into the respirator.

LOOSE FITTING VS. TIGHT FITTING

TIGHT FITTING

The tight-fitting respirator is designed to form a seal with the face of the wearer. It is available in three types: quarter mask, half mask, and full facepiece. The quarter mask covers the nose and mouth, where the lower sealing surface rests between the chin and the mouth. The half mask covers the nose and mouth and fits under the chin. The full facepiece covers the entire face from below the chin to the hairline.

LOOSE FITTING

The loose-fitting respirator has a respiratory inlet covering that is designed to form a partial seal with the face. These include loose-fitting facepieces, as well as hoods, helmets, blouses, or full suits, all of which cover the head completely. The best known loose-fitting respirator is the supplied air hood used by the abrasive blaster. The hood covers the head, neck, and upper torso, and usually includes a neck cuff. Air is delivered by a compressor through a hose leading into the hood. Because the hood is not tight-fitting, it is important that sufficient air is provided to maintain a slight positive-pressure inside the hood relative to the environment immediately outside the hood. In this way, an outward flow of air from the respirator will prevent contaminants from entering the hood.

CLASSIFICATION OF RESPIRATORS

Respirators may be classified according to mode of operation as follows:

- atmosphere-supplying respirators:
  - self-contained (open- and closed-circuit, demand and pressure-demand);
  - supplied-air (demand, pressure-demand, and continuous-flow); or
  - combination self-contained and supplied-air;
- air-purifying respirators:
  - gas- and vapour-removing;
  - particulate-removing; or
  - combination gas, vapour, and particulate-removing; or
- combination atmosphere-supplying and air-purifying respirators.

Atmosphere Supplying Respirators

Atmosphere Supplying Respirators (ASR) provide a breathing atmosphere that is independent of atmospheric conditions.

Except for some supplied-air suits, no protection is provided against skin irritation by material such as ammonia and hydrogen chloride, or against the absorption of materials such as hydrogen cyanide, tritium oxide, or organic phosphate pesticides through the skin. Fit testing of every user of tight-fitting facepieces shall be required.

SELF CONTAINED BREATHING APPARATUS

The supply of air, oxygen or oxygen-generating materials is carried by the user. The period over which the device will provide protection is limited by the amount of air or oxygen in the apparatus, the ambient atmospheric pressure (service life is cut in half by doubling the atmospheric pressure) and the degree of physical activity. The actual service time is usually less than the NIOSH rated service time. Some SCBA devices have a short service life (less than 15 min) and are suitable only for escape from an IDLH atmosphere. SCBA devices are typically heavy and bulky. Their use requires more physical exertion, more training, and more maintenance than most other respirators.

CLOSED CIRCUIT SCBA (OXYGEN ONLY)

Demand or pressure-demand closed-circuit SCBA are typically available in the following configurations and types:

- compressed gaseous oxygen; or
- chemical oxygen generation.

All types are equipped with either a facepiece or a mouthpiece and nose-clamp. Compressed oxygen systems use high-pressure gaseous oxygen from a gas cylinder that passes through a pressure-reducing valve to a reservoir. Compressed oxygen systems utilize pressure-relief valves, bypass systems, saliva traps, etc. In both systems, the user inhales, and the gaseous oxygen is delivered from the reservoir to the facepiece or mouthpiece utilizing appropriate tubing, check valves, regulators, etc. Exhaled breathing gas is directed into a carbon dioxide removal medium and then the breathing gas recirculates through the system.

Makeup oxygen may enter the reservoir on a continuous basis or when the volume of breathing gas in the reservoir is reduced sufficiently to activate an oxygen admission valve. Some types of oxygen closed- circuit SCBA may utilize both a continuous flow as well as a demand system to supply gaseous oxygen to the reservoir.

Chemical oxygen systems generate gaseous oxygen by a chemical reaction. Water vapour and carbon dioxide in the exhaled breath react with the chemical in the canister, causing gaseous oxygen to be generated. The gaseous oxygen passes into a breathing bag reservoir from which the user of the SCBA inhales. The exhaled breathing gas is returned to the canister where carbon dioxide and moisture contained in the exhaled breath react with the chemical to generate gaseous oxygen. The process is continuous until the oxygen-generating chemical is consumed. The volume of oxygen generated by this system is directly proportional to the volume of moisture and carbon dioxide in the exhalation breath of the user of the SCBA.

The closed-circuit operation conserves oxygen and permits longer service life at reduced weight. Units are available with up to 4 h rated service time. Closed-circuit devices provide high-temperature breathing air due to the chemical reactions inherent to their operation.

OPEN CIRCUIT SELF CONTAINED BREATHING APPARATUS

Open-circuit SCBA are available in the following configurations:

- demand; and
- pressure-demand.

Unlike closed circuit SCBA, exhaled air passes through a valve(s) in the facepiece to the ambient atmosphere. Demand types are equipped with a facepiece, or mouthpiece and nose-clamp combination. The demand valve permits oxygen or air flow only during inhalation. Demand-type respirators are equipped with a demand valve that is activated on initiation of inhalation and permits the flow of breathing atmosphere to the facepiece. On exhalation, pressure in the facepiece becomes positive and the demand valve is deactivated.

The pressure-demand type maintains a positive pressure in the facepiece or hood by utilizing special regulators and exhalation valves. The apparatus may have provision for the user to select the demand or positive-pressure mode of operation, in which case the demand mode should be used only when donning or removing the apparatus.

Except on escape-type units, a manually operated bypass system shall be required if the mode of failure of regulator or demand valve cuts off the air supply. This bypass permits the user to breathe and to conserve the breathing-gas supply.

Demand SCBA are considered negative-pressure respirators and are not suitable" for use where an SCBA is required.

SUPPLIED AIR RESPIRATORS

For supplied air respirators the respirable air supply is not limited to the quantity a person can carry. The devices are lightweight and simple. However, supplied-air respirators are limited to use in atmospheres from which the user can escape unharmed without the aid of the respirator (non-IDLH), should the air supply fail. Maximum use concentrations based on contaminant toxicity apply. The user is restricted in movement by the air-supply hose and must return to a respirable atmosphere by retracing the route of entry.

AIR-LINE RESPIRATOR

Respirable air is supplied through a small diameter hose from a compressor or compressed-air cylinder(s). The hose is attached to the user by a belt and can be detached rapidly in an emergency. A flow-control valve or orifice is provided to govern the rate of airflow to the user. Exhaled air passes to the ambient atmosphere through a valve(s) or opening(s) in the enclosure (facepiece, helmet, hood, or suit). Up to 90 m of hose length is permissible.

Air line respirators are available in the following configurations:

- demand;
- pressure-demand; and
- continuous-flow.

Demand types are equipped with a facepiece and a demand valve that is activated on initiation of inhalation and permits the flow of breathing atmosphere to the facepiece. On exhalation, pressure in the facepiece becomes positive and the demand valve is deactivated.

Pressure-demand types are equipped with a facepiece, an exhalation valve, and a regulator, all of which are configured to contribute to maintaining positive pressure in the facepiece when a proper face-to-facepiece seal is maintained by the user.

Continuous-flow types are equipped with a facepiece, hood, helmet, or suit. It requires at least 115 L/min (4 ft^3/min) of air to tight-fitting face pieces and 170 L/min (6 CFM) of air to loose-fitting helmets, hoods, and suits. Air is supplied to a suit through a system of internal tubes and valves to the head, trunk, and extremities.

Continuous-flow and pressure-demand types are designed to maintain a positive pressure in the facepiece and are less apt to permit inward leakage of contaminants. Supplied-air suits may protect against atmospheres that irritate the skin or that may be absorbed through the skin.

Air line respirators provide no protection if the air supply fails. The demand-type respirator develops a negative pressure in the facepiece on inhalation and therefore can only be used in an atmosphere where a non powered air-purifying respirator is suitable. Continuous-flow types require a higher volume of breathing air than demand or pressure-demand, because the air is flowing at a constant rate independent of breathing rate.

An instantaneous negative pressure may be created in pressure-demand and continuous-flow supplied – air respirators if the respirator is over breathed. The material of the air line itself may be permeable to substances such as aromatic hydrocarbons. For this reason, only air supply hoses made expressly for air line respirators should be used. The NIOSH approved respirator includes the air supply hoses, therefore substitution of other hose or other respirator manufacturer's air supply hose voids the approval and the respirator is no longer considered accepted. Some contaminants, such as tritium, may penetrate the material of an air line suit.

COMBINATION AIR LINE RESPIRATOR WITH AUXILIARY SELF-CONTAINED AIR SUPPLY

The auxiliary self-contained air supply on this type of device allows the user to work in an IDLH atmosphere. To escape from an IDLH atmosphere in the event that the primary air supply fails to operate, the user switches to the auxiliary self-contained air supply.

The escape route shall be planned such that the time needed to escape does not exceed the rated service time of the auxiliary air supply. The auxiliary air supply shall only be used to enter the hazardous atmosphere before connecting to an air supply line if the rated service time is at least 15 min, and the time for entry does not exceed 25% of the rated service time of the auxiliary air supply.

AIR PURIFYING RESPIRATORS

For the case of an air-purifying respirator, ambient air, prior to being inhaled, is passed through a filter, cartridge, or canister that removes particles, vapours, gases, or a combination of these contaminants. Air-purifying respirators are available in two modes of operation:

- non powered; and
- powered.

The breathing action of the user operates the non-powered types. The powered types contain a blower carried by the user that passes ambient air through an air-purifying component, and then supplies purified air to the facepiece. Non-powered types are equipped with a facepiece or mouthpiece and nose clamp. Powered types are equipped with a facepiece, helmet, hood, or suit.

Certain types of air-purifying devices may be used for escape purposes only. Selection and application of respirators for escape purposes should be conducted in close consultation with the manufacturer of the device and the regulatory authority.

Air-purifying respirators shall not be used where the oxygen content of the air is less than the equivalent of 19.5% at sea level. In addition, air-purifying respirators shall not be used in IDLH atmospheres. Maximum use concentrations based on contaminant toxicity, respirator facepiece style, and mode of operation apply.

The proper type of canister, cartridge, or filter shall be selected for the particular atmosphere and conditions. The time period over which protection is provided is dependent on the canister, cartridge, or filter type, the concentration of a contaminant, humidity levels in the ambient atmosphere, and the user's respiratory rate.

Non-powered, air-purifying respirators may cause discomfort due to a noticeable resistance to inhalation. This problem is minimized in powered respirators. Powered respirators are limited by battery life.

Fit testing is required for users of all tight-fitting facepiece respirators. Some respirator facepieces may present special problems to individuals required to wear corrective lenses.

Escape-only air-purifying respirators shall not be used for entry into contaminated atmospheres.

VAPOUR AND GAS REMOVING RESPIRATOR

Vapour- and gas-removing respirators are equipped with cartridge(s) or canister(s) to remove a single vapour or gas, a single class of vapours or gases (for example, organic vapour), or a combination of two or more classes of vapours and gases from the air.

Vapour- and gas-removing respirators are available in the following inlet configurations:

- a full-facepiece respirator that provides protection against eye irritation in addition to providing respiratory protection;
- quarter- and half-facepiece respirators; and
- mouthpiece respirator that is used only for escape applications.

For a mouthpiece respirator, mouth-breathing prevents detection of contaminant by odour. The nose clamp must be secured in place to prevent breathing through the nose.

The use of vapour- and gas-removing respirators should be avoided in atmospheres where the contaminant(s) lacks sufficient warning properties (e.g., odour, taste, or irritation), unless the cartridges contain an end-of-service-life indicator for the contaminant, or a change-out schedule has been established that would ensure that the cartridge is changed before the service life has ended.

Little protection is provided against particulate contaminants. A rise in the canister or cartridge temperature indicates that a gas or vapour is being removed from the inhaled air. An uncomfortably high temperature indicates a high concentration of gas or vapour and requires an immediate return to fresh air.

PARTICULATE REMOVING RESPIRATOR

Particulate-removing respirators are equipped with filter(s) to remove particulate matter from the air. The filter may be a replacement part or a permanent part of the respirator. The filter may be of the single-use or reusable type. Particulate filters for non-powered respirators are available in three minimum efficiencies and three classes. The three efficiencies are 95%,99%, and 99.97% (referred to as 100%). The three classes are Class N, Class R, and Class P.

Class N filters are suitable for any particulate not containing oil. Class R and P filters are suitable for any particulate. Particulate filters for powered air-purifying respirators are available in one efficiency only (99.97%), and these filters are designated as He.

Particulate-removing respirators are available in the following inlet configurations:

- a full-facepiece respirator that provides protection against eye irritation in addition to providing respiratory protection; and
- quarter- and half-facepiece respirators, including a filtering facepiece type.

Protection is provided against non-volatile particles only. No protection is provided against gases and vapours. The following limitations apply:

- Class N filters are not suitable for particulates where oil is present;
- Class R filters are restricted to a maximum of 8-h use or total respirator particulate load of 200 mg;
- Class N and P filters may also have restrictions on their useful life; the manufacturer should be consulted; and
- He filters should be replaced before the airflow falls below the required volume.

COMBINATION PARTICULATE, VAPOUR AND GAS REMOVING

Combination particulate- and vapour/gas-removing respirators are equipped with cartridge(s) or canister(s) to remove particulate matter, vapours, and gases from the air. The filter may be a permanent or a replaceable part of a cartridge or canister. The limitations of both vapour/gas- and particulate-removing air-purifying respirators apply.

COMBINATION ATMOSPHERE-SUPPLYING AND AIR-PURIFYING RESPIRATORS

An atmosphere-supplying respirator with an auxiliary air-purifying attachment may provide protection in the event that the air supply fails. A combination atmosphere-supplying respirator with an auxiliary air-purifying element may be used only when the concentration of airborne contaminants in the workplace does not exceed the maximum use concentration of the respirator when used in the air-purifying mode.

12.18 Quantitative Respirator Fit Test

Health and Safety Issues

To date, CSA is not aware of any study that concluded that the use of CSA approved qualitative fit test protocols present a danger to the health and safety of the person conducting the QLFT or of the test subject when they are conducted in the prescribed manner. Unique issues associated with each challenge agent are addressed in the respective QLFT protocols. Refer to the manufacturer's MSDS for appropriate handling and disposal procedures of the challenge agents.

Diligence in adhering to the protocols will ensure that the respirator user is fitted and assigned a respirator that is protective within the specifications and limitations defined and/or referenced in the CSA Standard Z94.4-02.

Introduction of QLFT to Respirator Users

The person conducting the QLFT shall address the following topics with the test subject:

- an explanation of the QLFT procedure, the reasons it is required, and the importance of using a respirator that provides an effective, reproducible face-to-facepiece seal;
- explanations of the importance of the test to convince the test subject to co-operate fully in the QLFT;
- a description of the challenge agent used in the QLFT and how to identify it;
- selection by the test subject of a properly fitting and comfortable respirator from those that are appropriate to the application;
- the respirator being equipped with the appropriate filters and/or chemical cartridges for the challenge agent being used;
- the necessity for the test subject to successfully complete the positive or negative pressure user seal check with the selected respirator prior to proceeding with the QLFT;
- proper donning of the respirator in accordance with the manufacturer's instructions;
- the necessity, during the QLFT, to wear other personal protective equipment that the test subject may be required to use in the workplace that may affect the face-to-facepiece seal;
- an explanation of the QLFT exercises and how to perform them during the QLFT;
- the importance of using, in the workplace, the specific brand, model, and size of face piece that was used to pass the QLFT; and
- the necessity to always inspect a respirator before using it in order to ensure that it is in proper working condition.

Selection and Assessment of Respirators

Each facepiece represents a different size and shape. The test subject shall select the most comfortable facepiece from a variety of appropriate models and sizes. The test subject is to hold each facepiece against their face and chooses one that they feel will provide the best fit and comfort. The test subject shall be shown how to don a respirator, how to position it on the face, how to set strap tension, and how to assess a comfortable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. If the appropriate facepiece for the application cannot be found, a protective alternative shall be made available. A small percentage of users will not be able to use any tight-fitting facepiece.

The more comfortable facepieces are recorded and the most comfortable facepiece is donned and worn at least 5 min to assess comfort. Assessment of comfort shall include reviewing the following points with the test subject:

- proper placement of the chin;
- fit and position of the facepiece on the nose (if a half facepiece);
- strap tension;
- accommodation of spectacles and/or eye protection, without adversely affecting face-to-facepiece seal;
- intelligible speech without an obvious break in the face-to-facepiece seal;

- tendency for the facepiece to slip (stability);
- full contact of the sealing surface of the facepiece to the face;
- self-observation in the mirror; and
- time for assessment of comfort in relation to the face-to-facepiece seal.

Consideration should be given to the respirator configuration (eg, with combination cartridges) that is to be worn in the test subject's workplace, including other protective equipment The test subject shall be told to seat the facepiece by rapidly moving the head side to side and up and down, within a comfortable speed range and motion. The test subject shall perform the positive-pressure and/or negative-pressure user seal checks. Failure of the user seal check shall be cause to select an alternative respirator. Upon obtaining a successful user seal check, the subject is then ready for fit testing. After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried. The user shall be given the opportunity to select a different facepiece and be retested if during the on the-job use the chosen facepiece becomes increasingly uncomfortable.

Fit Test Exercises

The following exercises shall be performed while the person conducting the QLFT challenges the respirator seal with the test agent. Each exercise described as follows shall be performed for at least 30 seconds;

- normal breathing;
- deep breathing. Be certain breaths are deep and regular;
- turning head from side to side. Be certain movement is complete, within the test subject's comfortable range of motion. Alert the test subject to inhale and exhale when the head is at either side and to avoid bumping on the shoulder;
- nodding head up and down. Be certain that the test subject's movements are complete, within a comfortable range of motion. Alert the test subject to inhale when the head is in the fully up position, to exhale when the head is in the fully down position, and to avoid bumping the respirator on the chest;
- talking. Talk aloud and slowly for the duration of this exercise. The person being tested should be instructed to talk about a subject that is relevant to work activities, or if they wish they can read the Rainbow Passage:

  > *"When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow";* and

- normal breathing.

Irritant Smoke (Stannic Chloride) QLFT Protocol

INTRODUCTION

The sensitivity screening test and the QLFT procedure for the irritant smoke protocol requires exposure of the test subjects to challenge concentrations of irritant smoke containing hydrogen chloride in excess

of regulated OEL and maximum use concentration for certain types of respiratory protective equipment. The person conducting the QLFT may also be exposed. The person conducting the QLFT and the test subject must be aware of this fact.

The test subject shall not be placed in a hood or enclosure during the irritant smoke fit testing. The irritant smoke sensitivity screening test and the QLFT shall be performed in a location with exhaust ventilation sufficient to prevent contamination of the testing area or contamination of the ventilation system.

The person conducting the QLFT shall ensure that the test subject has successfully completed a positive or negative-pressure user seal check.

The prescribed QLFT protocol shall be used to ensure a controlled exposure to the challenge agent. Avoid continuing to expose the test subject as soon as it is evident that they do not react to the test agent.

PREPARATION OF THE QLFT IRRITANT SMOKE TUBE

Preparation of the QLFT irritant smoke tube shall be as follows:

- Use the tube breaking tool provided by the manufacturer to break both ends of a glass irritant smoke tube.
- Attach a short length of rubber tubing to the outlet end of the irritant smoke tube.
- Attach the other end of the irritant smoke tube to the tubing and aspirator bulb provided by the manufacturer.
- To produce smoke for the fit test, gently squeeze the aspirator bulb to force air through the irritant smoke tube.

Appropriate hand and eye protection should be worn while breaking the tube.

SENSITIVITY SCREENING TEST

The test subject shall be exposed to a weak concentration of the irritant smoke to become familiar with its characteristic odour in the following manner. By squeezing the aspirator bulb to create positive-pressure air flow through the irritant smoke tube, the person conducting the irritant smoke sensitivity-check generates a weak concentration of the irritant smoke within approximately 1 m of the test subject. The test subject then brings a handful of the smoke to within approximately 20 cm of the nose and inhales gently. The result should be a slight involuntary cough or verbal acknowledgement of the odour of the smoke.

RESPIRATOR SELECTION

Respirators shall be selected as described in B-2.3, except that each respirator shall be equipped with combination organic vapour/acid gas and HEPA filter cartridges; N-100, R-100, or P-100 filters may replace the HEPA filter component of the combination cartridge.

FIT TESTING

When conducting QLFT on subjects using half-facepiece respirators, advise the test subjects that the smoke can be irritating to the eyes. Instruct the QLFT subject to keep his or her eyes closed throughout the complete test and until the conductor of the QLFT instructs them the test has been completed.

When conducting QLFT on subjects using full-facepiece respirators, the test subjects may keep their eyes open throughout the QLFT.

The qualitative fit test utilizing the irritant smoke method shall be done in the following manner:

- Remind the test subjects to ensure their eyes remain closed if they are using a quarter- or half-facepiece respirator for the test;
- Obtain verbal confirmation from the test subject that this instruction is understood;
- Using the aspirator bulb provided with the irritant smoke kit, the person conducting the QLFT directs the stream of irritant smoke from the tube towards the respirator face-to-facepiece seal area on the test subject. Start from a distance at least 300 mm from the facepiece and gradually move to within approximately 50 mm, moving around the entire perimeter of the facepiece while continuing to generate only sufficient irritant smoke to challenge the periphery of the facepiece seal.;
- Gradually direct the smoke around the entire perimeter of the face-to-facepiece seal of the respirator, paying particular attention to the areas under the chin and in the area of the bridge of the nose if quarter- or half-facepiece respirators are involved;
- Avoid directing the irritant smoke directly into the air-purifying element(s) of the respirator.

The exercises described in B-2.4 shall be performed while the person conducting the fit test challenges the respirator seal with the test agent. Each exercise shall be performed for 30 s. The person conducting the QLFT shall control the stream of smoke as described by the supplier of the kit.

If the test subject detects the irritant smoke, the person conducting the QLFT shall stop the test and attempt to determine the reason for and the location of the leak. If possible, the person conducting the QLFT should attempt to correct the cause of the leak and repeat the test. If the repeated QLFT is unsuccessful, then the test respirator is rejected and another respirator shall be selected and the QLFT repeated.
When a test subject passes the irritant smoke fit test without evidence of a response, the person conducting the fit test shall repeat the sensitivity screening test using the smoke from the same irritant smoke tube used in the QLFT to confirm their reaction to the smoke. If the test subject fails to recognize the characteristic odour, the result of this QLFT shall be considered void.

12.19 Guidelines for the Selection, Installation, Maintenance, and Cleaning of Compressor/Purification- Type Breathing Air Systems

Introduction

The following guidelines on the fundamentals of the selection process and the basic requirements for safe installation, maintenance, and cleaning procedures are provided to assist the Project Manager, Site Superintendent and AEL Field Engineer in complying with the requirements of this CSA Z180.1-00 *Compressed Breathing Air and Systems*. This information is in addition to the Manufactures recommendations. In the event of conflict between B-5 and manufactures recommendations, the manufactures recommendations take precedent.

Selection

Three important factors should be carefully considered when selecting a compressed breathing air system:

- the operating (or working) pressure (specific to each model of air-line respirator);
- the output airflow rate capacity (compressor must match range required for proper function of respirator model. Required output flow rate also dependent on number of airlines per compressor and hose length/diameter); and
- the air storage capacity required for the end-user application.

The type and size of compressor and/or purification system selected will limit output airflow rates at the specified pressure. By working closely with the manufacturer and/or supplier, ensure that:

- the compressor output matches both the purification system's volume and pressure rating capabilities; and
- the complete system has the capacity to supply all of the compressed breathing air requirements at the rated pressure to all air-supplied respirators that will be used on the air distribution system under normal and emergency conditions.

The selection process should take into account current, future, and anticipated emergency requirements.

Minimum airflow rate requirements for air-supplied respirators can vary from 114 L/min (4 cfm) (for tight-fitting facepieces) and 170 L/min (6 cfm) (for loose-fitting helmets/hoods) to a maximum of 425 L/min (15 cfm) at rated pressures ranging from 241 kPa (35 psig) to 827 kPa (120 psig). If supplied-air suits are being used, the airflow rates could increase significantly. For specific airflow rates and pressure ratings, contact the manufacturer or supplier of the equipment being used.

When selecting a compressor/purification system, ensure the equipment can effectively remove liquid condensate and water vapour. Water vapour is a prime contaminant in compressed breathing air systems. Condensed water can trap and carry other contaminants.

For more detailed information on the selection process for compressed breathing air systems, refer to NIOSH Guide to Industrial Respiratory Protection (September, 1987), DDHS (NIOSH) 87-116, Appendix F, Breathing Air Systems for Use with Pressure-Demand Supplied Air Respirators in Asbestos Abatement".

Operating Pressures

Low-pressure systems operate in the range of 345-1379 kPa (50-200 psig). Medium-pressure systems generally operate in the range of 2.1 – 10.3 MPa (300-1500 psig). High-pressure systems operate in the range of 13.8 – 41.4 kPa (2000-6000 psig). Consider selecting a compressor and/or purification system that is rated at a much higher pressure than is required at the point of usage (i.e., respirator face-piece). Higher operating pressures will allow the compressor and purification/filtering systems to remove the contaminants form the air more effectively, allow the storage of a greater volume of air in a smaller area, and compensate for pressure drop when air is delivered through long lengths of pipeline.

Air Output Rates

Low-pressure and medium-pressure air compressors generally have air output rates ranging from 283 L/min (10 cfm) to 14,158 L/min (500 cfm). High-pressure compressors deliver air in the range of 142-,7,079 L/min (5-250 cfm).

Air Compressor System

Multi-stage, oil-lubricated, reciprocating air compressors, driven by electric motors or internal combustion engines, are the most commonly used equipment in compressed breathing air applications. If the compressor is electric motor-driven, ensure the appropriate rated electrical power is available at the point of installation and that the electrical wiring, starter, compressor motor, controls, alarms, etc, conform to the provisions of the local electrical code. Always consult the manufacturer when supplying power from a generator to ensure that the compressor is not damaged.

Carbon Monoxide Danger

Internal combustion engines can produce high levels of deadly carbon monoxide in the exhaust gases. If an internal combustion engine-driven compressor is selected, it is very important to make sure that the exhaust gases are not ingested into the compressor air intake.

Mobile breathing air compressor systems driven by internal combustion engines shall be equipped with monitoring equipment to detect carbon monoxide contamination in the breathing air. The monitoring shall have a 5 mL/m3 (ppm) CO level audiovisual alarm and have an automatic shutdown device that: activates when the concentration of carbon monoxide exceeds the acceptable exposure level determined by the authority having jurisdiction. The carbon monoxide monitor shall be calibrated to the manufacturer's specifications, and written calibration records shall be kept.

Other Features

The reciprocating compressor is available with either an air-cooled or water-cooled system. Standard compressor equipment shall include, but not necessarily be limited to:

- inter-stage coolers and after-coolers;
- low-oil-pressure shutdown switch with light and alarm;
- high-compressor temperature switch with light and alarm;
- hour meter for monitoring operating time;
- final stage pressure gauge;
- on-off magnetic starter switch;
- automatic pressure shutdown switch; and
- drain traps with drain valves and pressure-relief valves on each stage.

Safety Features

In order to enhance the overall efficiency and safe operation of the system, the inclusion of the following additional equipment should be considered:

- automatic condensate drain system to allow trapped oil and water condensate to be automatically flushed out into a drain collection box while the compressor is operating and on shutdown;
- complete set of air-pressure gauges to monitor all stages of compression and oil pressure: this allows the operator to easily and quickly check that the compressor is performing within the manufacturer's specifications. The gauges are also very useful during troubleshooting procedures;
- electronic cartridge monitoring system with alarm light and automatic compressor shutdown switch: this will allow the operator to confirm that the purification cartridges are actually in the chamber and installed correctly, and also alert the operator when the cartridges are contaminated with water; and

- countdown controller with alarm light and audible alarm that will automatically shut down the compressor and alert the operator to change the purification cartridge(s).

Air Purification Systems

The purification system shall be capable of continuously eliminating harmful matter in order to produce compressed breathing air that meets the requirements of CSA Z180.1-00 *Compressed Breathing Air and Systems.* This requires that the purification system be correctly installed in an area providing ample space on all sides to ensure good ventilation and maintenance accessibility. The purification system shall be placed in an area in accordance with the manufacturer's instructions.

Purification Elements

The effectiveness of the typical air-purification train requires that the purification elements making up the system be placed in the correct sequence. A basic unit shall consist of

- a coalescing filter with a manual or automatic liquid drain and coarse particulate filter (designed to remove liquid water and oil, mists, and some particulate matter); followed by
- several chemical sorbent beds, such as a molecular sieve (designed to trap water; may also have the capacity to remove certain acid gases and reduce the concentration of carbon dioxide), activated carbon (for removing certain organic vapours/odours), and a catalytic bed (to convert carbon monoxide to carbon dioxide); followed by
- a fine particulate filter (to trap "fines" that may break away from the sorbent beds).

It is essential to protect the activated charcoal and the catalytic beds from water vapour contamination. Water contamination of the chemical beds renders them ineffective in removing contaminants. Some low-pressure purification systems do not dehydrate the air. To ensure the delivery of dry air into the breathing air pipelines, the inclusion of a regenerative desiccant or refrigerant dryer may be appropriate. Dry air will reduce the possibility of ice blockage in the pressure-reduction system of the air-supplied respirator, reduce the frequency of system maintenance to correct corrosion and contamination caused by water condensate, and extend the life of the sorbent/catalytic beds.

Additional Equipment

Additional equipment that should be considered includes:

- check valves on the inlet and outlet of the purification system to prevent sudden backflow that could damage the purification filter media and chemical sorbent beds;
- cartridge end-of-service life indicator - for example, an electronic indicator with an integral visual/audible alarm and shutdown capability;
- carbon monoxide monitor with an in-the-line sensor connected to the outlet pipeline of the purifier, an integral visual and audible alarm, and the ability to accurately detect and indicate the presence of carbon monoxide in air within the limit specified in CSA Z180.1-00 *Compressed Breathing Air and Systems.* of this Standard; and
- Pressure Maintaining Valve (PMV) to provide back-pressure to the system, prevent pressure loss in the purification chambers, and maintain air flow until a preset shutoff pressure is reached.

Storage Vessels and Cylinders

Air storage vessels and cylinders are available in a broad variety of types, sizes, and pressures, and can be custom-manufactured to meet the needs of the application. It is important to ensure that all

pressurized vessels are properly tested, marked, and labelled in accordance with the applicable requirements of local, provincial, and federal regulations. All breathing air storage vessels shall have internal surfaces, valves, fittings, etc, properly cleaned for breathing air use to ensure they are free of contaminants. All pressure vessels shall be periodically inspected and tested in compliance with the applicable standards and regulations.

Deterioration

Stored breathing air, if not changed regularly, may become stale, and if stored wet, may lead to loss of oxygen caused by metal oxidation in steel receivers and cylinders or corrosion in alloy cylinders.

Sources of Information

For detailed information on pressure storage vessels and cylinders and their respective inspection and testing requirements, refer to:

- CSA Standard B340;
- CSA Standard CAN/CSA-B339;
- CSA Standard B51; and
- CSA Standard C-1, C-6, C-6.1 and C-6.2.

12.20 Reduced Oxygen Concentration

Hypoxia means any condition in which there is an inadequate supply of oxygen to the tissues. Three types of tissue hypoxia are discussed below:

- Arterial Hypoxia;
- Anaemic Hypoxia; and
- Histotoxic Hypoxia.

Arterial Hypoxia

Arterial hypoxia is characterized by a lower-than-normal partial pressure of oxygen (pO_2) in arterial blood, and hence, in the capillary blood. The causes are;

- low pO_2 in inspired air, (e.g., at high altitude); or
- breathing air in a confined space or other environment where the p02 is lower than that found in normal atmospheric air.

Anaemic Hypoxia (Hypoxemia)

Anaemic hypoxia (hypoxemia) results when the oxygen capacity of the blood is reduced. The oxygen content falls more rapidly than normal as it flows through the capillary beds and becomes inadequate in maintaining the required oxygen tension throughout the tissues. The causes of this type of oxygen deficiency include:

- less-than-normal haemoglobin content (anaemias);
- haemoglobin rendered ineffective, as in carbon monoxide poisoning; and
- alteration of haemoglobin to methaemoglobin following poisoning with chlorates, nitrates, ferricyanides, etc., which prevents haemoglobin from combining with oxygen.

Histotoxic Hypoxia

Histotoxic hypoxia is a condition in which the cells are not able to utilize oxygen that is available at normal partial pressure in the arterial blood. Cyanide poisoning is known to affect the cells in this manner.

Hypoxia Immediately Dangerous to Life or Health

When, for any reason, the oxygen partial pressure of inspired air falls to approximately 14 kPa or less, there exists an oxygen deficiency considered immediately dangerous to life or health. This corresponds to breathing air;

- in which the oxygen content has been reduced from the normal 20.95% to approximately 14% (14% x 101.3 kPa = 14.2 kPa oxygen partial pressure); or
- having a normal oxygen content (20.95%) at altitudes where the pressure is approximately 68 kPa (20.95% x 68 kPa = 14.2 kPa oxygen partial pressure).

Effects of Oxygen Deficiency

The effects of oxygen deficiency are illustrated in the following table:

Table 18: Effects of Oxygen Deficiency

STAGE	% O_2 at 101.3 kPa	PARTIAL PRESSURE O_2 IN ARTERIAL BLOOD (kPa)	PARTIAL PRESSURE OF O_2 IN LUNG (kPa)	EFFECTS
0	21	13.3	18.7	Normal
I	16	10.0	15.0	Increased pulse and breathing rates; some uncoordination; some impairment in attention and thinking.
II	14	8.0	13.3	Abnormal fatigue upon exertion; emotional upset; faulty coordination; impaired judgment
III	12	6.3	11.3	Very poor judgment and coordination; impaired respiration that may cause permanent heart damage, vomiting and nausea.
IV	Less than 10	Less than 4.4	Less than 9.5	Nausea; vomiting; inability to perform vigorous movement; loss of consciousness, convulsions and death

Table 18 suggests that oxygen deficiency immediately dangerous to life and health is expected when the partial pressure of oxygen in arterial blood is reduced below 8 kPa. This type of oxygen deficiency usually results from a reduction in the oxygen partial pressure of inspired air and is known as hypoxic

or arterial hypoxia. However, it should be clearly understood that oxygen deficiency may also occur as a result of anaemic hypoxia or histotoxic hypoxia as described in B-3.2 and B-3.3, respectively.

13 DECONTAMINATION PLAN

13.1 Introduction

Purpose

The purpose of the following decontamination plan is:

1. to ensure that Hazmat workers are protected from exposure to hazardous waste; and
2. to protect all workers from exposure to hazardous waste by preventing the spread of contamination to adjacent work areas and living spaces.

Decontamination is required to protect worker health during the work associated with the Phase 1 Great Bear Lake (GBL) Site Restoration. The level of the decontamination effort varies directly with the magnitude of the hazards of the materials being removed/demolished. All of the extensive efforts to protect emergency responders or HAZMAT workers from exposures to hazardous materials are wasted if decontamination is not effective.

Definitions

OSHA 1910.120(a)(3) defines decontamination as follows:

Decontamination means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.

13.2 Contamination Reduction Corridor

Decontamination takes place through a decontamination line, within the Contamination Reduction Corridor (CRC). The decontamination line is an organized series of procedures performed in a specific sequence to reduce levels of contamination on personnel, PPE, equipment and additional items such as the exterior of waste bags. Each procedure is preformed at a separate station within a Contamination Reduction Corridor (CRC) The stations are arranged linearly in order of decreasing contamination (i.e., the items with the highest potential for contamination are decontaminated first such as boot covers and exterior gloves). The CRC consists of a hotline, hot and warm zone a cold zone and a support zone. The exclusion zone is located adjacent to the hot zone. The CRC is located within the larger Contamination Reduction Zone (CRZ), the margin surrounding the hazard in which contamination decreases from the interior to the exterior, eventually reaching acceptable levels. The CRZ can be thought of as a buffer surrounding the entire exclusion zone (location of hazard). The CRC consists of a defined section which spans the CRZ, through which workers enter and exit from the exclusion zone, in a controlled manner, while being decontaminated. The CRC is to be located in an area that is sufficiently far from the work within the exclusion zone, so as to reduce the risk of exposing CRC workers. HAZMAT PPE that has been issued for use is to remain within the CRC at all times unless it has been properly packaged for off-site disposal or properly decontaminated and approved by the chemical engineer for removal from the CRC. The CRC must facilitate:

1. Personnel and equipment decontamination (e.g., separate lines for workers and heavy equipment such as tractors, earth-moving equipment, and trucks);
2. Emergency response functions (including transport of injured personnel, first-aid equipment, and containment equipment);
3. Equipment re-supply;

4. Sample packaging and preparation for onsite or offsite laboratories;
5. Location of worker temporary rest areas;
6. Drainage of water and other liquids used in the decontamination process;
7. Waste minimization; and
8. Reduction or elimination of mixed waste production.

Exclusion Zone

The exclusion zone is the area where the decontamination work occurs and thus the hazard is present. The size and configuration of the exclusion zone is determined by the nature of the work to be performed, the physical and chemical hazards associated with the contaminant, environmental conditions such as wind and general topography, work practices aimed at containing contaminants, the structural configuration of the work area and the location of access and egress points. Full PPE is required within the exclusion zone, as specified by safe work practices. The limits of the exclusion zone is to be clearly marked and access into and exit from is to be strictly controlled through warnings or physical barricades. Once inside the exclusion zone (i.e., crossed the hotline), independent of time, all workers and equipment will require decontamination prior to returning to the cold zone and/or outside area.

Hotline

The hotline separates the hot zone within the CRC and the exclusion or work zone. Once crossed (hot to exclusion) all persons will require decontamination through the CRC, independent of time within the exclusion zone. The hotline defines the perimeter of the exclusion zone.

Hot Zone and Warm Zone

The hot zone and warm zone are the areas in which decontamination within the CRC occurs. Within the hot zone exterior, more heavily contaminated clothing is decontaminated and removed. In the warm zone, less heavily contaminated clothing is decontaminated and removed. Contamination decreases as one moves from the hot zone to the warm zone. Hot zone workers require a greater level of protection from hazards than do the warm zone workers.

Cold Zone

The cold zone is free of contamination. Within this area the worker is freed from interior gloves and face pieces and is medically assisted if required.

Contamination Control Line

Defines the boundary between the CRZ and the support zone.

Support Zone

The support zone is an area free of contamination in which no HAZMAT PPE is required (general work PPE is required). The support zone houses administrative and support staff and equipment necessary to maintain effective operation of the exclusion zone and the CRC.

Access and Exit Points

Access and entry points are a key component of the CRC. Access and exit points specifically and clearly locate where workers are to enter into and exit the exclusion zone. The pre defined entrance and exit points are the only locations where entry and exit from the exclusion zone is to take place.

Entry from alternate locations is strictly forbidden and will result in immediate removal from the site. In addition, to specifying access and exit points, the flow of personnel through the CRC must also be pre-planned and carefully executed. Failure to do so could result in confusion within the CRC due to a congested work place and/or the exposure of employees who enter or exit the exclusion zone improperly. Separate access and exit points are to be created for personnel and heavy equipment.

Worker Rest Area

Worker rest zones are located in predetermined areas of the exclusion zone and are constructed to allow a HAZMAT worker to take intermittent breaks while remaining in full PPE. The following figures present examples of a CRZ and

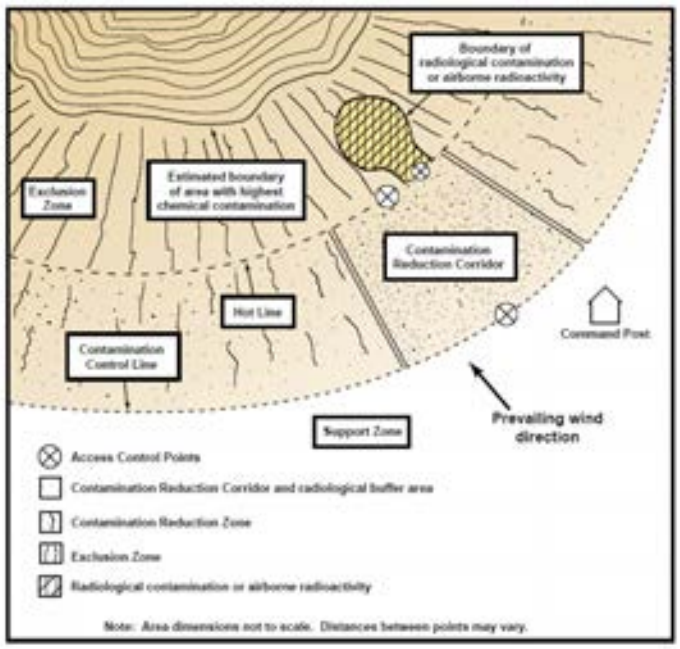


Figure 16 Example of a Contamination Reduction Zone

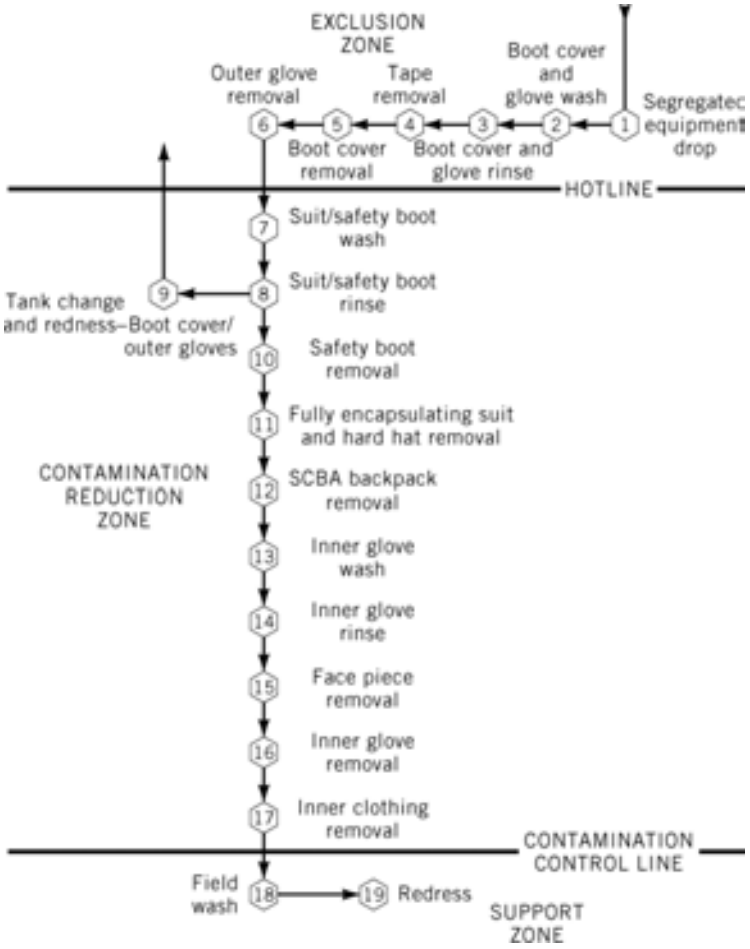


Figure 17 Example of a Contamination Reduction Corridor

13.3 Work Practices – Preventing Contamination

A proper decontamination plan considers the reduction of direct exposure to chemicals, prior to decontamination, as well as the removal of chemicals from PPE, equipment etc. during decontamination. Safe Work Practices have been designed to remove the worker from direct contaminant exposure, to the extent practical. For example, (a) HEPA vacuums will be used to collect dust, rather than sweeping, which presents a high risk of exposure due to the generation of air born particulate matter; and the exterior of piping will be wrapped in polyethylene plastic prior to cutting, to contain any air borne particulate.

In addition, workers are to avoid such activities as walking directly through contaminated plumes or any other activity that directly brings himself/herself into contact with concentrated hazardous materials in any phase. Furthermore, if possible, equipment such as analytical equipment will be placed in temporary bags, from which the sensing portion will protrude. This practice will avoid costly and time consuming decontamination of analytical equipment, which can also be damaging to delicate sensors. If possible, workers are not to directly touch contaminants and are to properly use the tools provided, which allow remote handling. For work with cyanide, disposable boot coverings will be used to allow ease of boot decontamination.

13.4 Positions and Responsibilities

The following positions are required to operate the CRC

(a) HEPA Vacuum Operator (Hot Zone)– removes particulate matter adhered to the exterior of PPE (suit, gloves, boot);

(b) Washer (Warm Zone)– initially washes the exterior of PPE to flush contaminants contained in pockets and irregularities in the PPE; Inspects PPE for rips, tears, wearing or other deformities prior to application of wash water; and decontaminates waste bags, tools etc, left in the drop area.

(c) Rinser (Warm Zone) **–** rinses the exterior of PPE, equipment and waste bags, following washing. Assists worker in doffing chemical protective clothing.

(d) Medic *(Support Zone)***–** during cyanide removal is stationed in the support zone and is ready to respond to any cyanide related emergencies. All other times, located within close proximity to CRC as to allow immediate response to Medical Emergencies. The medic is responsible for ensuring medical supplies are stock in sufficient quantity and working order.

(e) Chemical Engineer **–** responsible for ensuring that decontamination procedures are effective through analytical monitoring and supervision of the process from the support zone.\

(f) Support Zone Supervisor *(Site Superintendent)* – responsible for co-coordinating the Mill/crusher building and Leach tank work, ensuring resources are made available when required, communication with other personnel at the site such as Major Civil Works contractor and Care and Maintenance contractor, leading emergency response.

13.5 Entering/Exiting the Exclusion Zone

Personnel

All personnel, equipment and supplies must enter/exit into and from the exclusion zone through the CRC. The warm zone is then entered from the cold zone, next the hot zone is entered from the warm zone and finally the exclusion zone is entered by passing thorough the hot line. Once in the hot zone, decontamination is required to pass back into the warm zone.

When exiting the exclusion zone, the hot zone is entered at a specified location, by crossing the hot line, next the warm zone is entered from the hot zone and finally the cold zone is entered from the warm zone. The flow path for decontamination is to be adhered to.

13.6 Work Zones & Decontamination Stations

A CRC will be required for specific grouping of chemicals. The following chemicals will require the same method decontamination and thus are grouped for the purpose of work and associated decontamination

1. *Asbestos*
2. *Hydrocarbons*
3. *Mercury and PCB's*

Exclusion Zone and Contamination Reduction Zone

In all cases the exclusion zone will consist of the area contained within the walls buildings, depending upon the work being undertaken. Separate sub –zones will be identified within the overall exclusion zone, to allow ease of inspection and monitoring work. The extent of the contamination reduction zone has been planned based on work practices and migration of contamination.

Asbestos

The general exclusion zone for Asbestos is the area contained by the walls of the structure in which the asbestos removal is occurring. As such, full PPE for Asbestos will only be required in the direct area where contamination removal is taking place. The sub-zone within the general exclusion zone, for the Asbestos work, in which full Asbestos PPE is required, will be within 15 m of the area in which the asbestos containing material (ACM) is being removed. The exact limits of work will be based on the location and will be adjusted as work progresses. Clear boundaries will be established for the sub zone and a route to both decontamination stations (personnel and heavy equipment) will also be marked off, in which only persons wearing Asbestos PPE are permitted to travel. Travel within the general area of the exclusion zone, outside of the sub zone for Asbestos, will have separate routes for exiting and entering the work area from the CRC. Separate access from and exit points to the CRC will also be established. Prior to the establishment of another sub zone, the previous sub zone must be inspected by the chemical engineer to ensure that all Asbestos has been removed to a point where the risk is acceptable. This will include a visual inspection for traces of Asbestos and air sampling of the general limits. Airborne monitoring will be undertaken to ensure that the areas outside of the Asbestos sub zone are suitable for the respective PPE.

Hydrocarbons

The general exclusion zone for hydrocarbons will include the direct area containing the hydrocarbon contamination. Within the hydrocarbon exclusion zone full hydrocarbon PPE will be required at all times. Decontamination through the CRC will be required for any person or equipment entering the hydrocarbon CRZ independent of time. The CRZ will remain established until the contamination has been mitigated and the chemical engineer ensures that all hydrocarbons have been removed from the CRZ.

Mercury and/or PCB's

The general exclusion zone for hydrocarbons will include the direct area containing the mercury or PCB contamination. Within the exclusion zone full mercury or PCB PPE will be required at all times. Decontamination through the CRC will be required for any person or equipment entering the CRZ independent of time. The CRZ will remain established until the contamination has been mitigated and the chemical engineer ensures that all mercury and/or PCB's have been removed from the CRZ.

13.7 Asbestos Decontamination Method

Asbestos Hot Zone

The HAZMAT worker will enter the hot zone from the exclusion zone at the specified location. In the hot zone, the following activities will be completed:

Sub – zone #1: any waste that is not to be directly removed from the exclusion zone will be dropped for temporary storage (i.e., contaminated HEPA filters.)

Sub – zone #2: equipment will be dropped and bagging around analytical equipment will be removed and disposed of. Analytical equipment probes will be removed and placed in a storage box.

Sub – zone #3: suit, exterior gloves and boots covers will be vacuumed using a HEPA vacuum to remove as much dust as possible from the exterior, prior to washing.

Sub – zone #4: gloves and boot coverings will be washed and any tape will be removed.

Sub – zone #5: boot covers will then be removed;

Sub – zone #6: exterior gloves will be removed;

Asbestos Warm Zone

Workers will enter the warm zone from a fixed point in the hot zone/warm zone boundary.

Sub – zone #1: Suit and interior rubber boot washed with soap and water;

Sub – zone #2: Suit and interior boot will be rinsed using clean water;

Sub – zone #3: safety boots will be removed

Sub – zone #4: fully encapsulating suit is to be removed along with the hard hat

Sub – zone #5: inner glove wash with soap and water;

Sub – zone #6: inner glove rinse with clean water;

Asbestos Cold Zone

Sub – zone #1: face piece removal;

Sub – zone #2: inner glove removal;

Sub – zone #3: inner clothing removal (occurs in receiving end of decontamination trailer)

Asbestos Support Zone

Sub – zone #1: shower;

Sub – zone #2: redress;

13.8 Hydrocarbons Decontamination Method

Hydrocarbon Hot zone

The HAZMAT worker will enter the hot zone from the exclusion zone. In the hot zone, the following activities will be completed:

Sub – zone #1: any waste that is not to be directly removed from the exclusion zone will be dropped for temporary storage (i.e., contaminated HEPA filters).

Sub – zone #2: equipment will be dropped and bagging around analytical equipment will be removed and disposed of. Analytical equipment probes will be removed and placed in a storage box.

Sub – zone #3: suit will be vacuumed using a HEPA vacuum to remove as much dust as possible from the exterior, prior to washing.

Hydrocarbon Warm Zone

Workers will enter the warm zone from a fixed point in the hot zone/warm zone boundary.

Sub – zone #1: Suit and rubber boots and gloves washed with soap and water;

Sub – zone #2: Suit and rubber boots and gloves will be rinsed using clean water;

Sub – zone #3: safety boots will be removed;

Sub – zone #4: suit is to be removed along with the hard hat.

Hydrocarbon Cold Zone

Sub – zone #4: face piece removal;

Sub – zone #6: glove removal;

Sub – zone #7: inner clothing removal (occurs in receiving end of decontamination trailer)

Hydrocarbon Support Zone

Sub – zone #8 shower;

Sub – zone #9: redress;

13.9 Mercury and/or PCB's Decontamination Method

Mercury and/or PCB's Hot Zone

The HAZMAT worker will enter the hot zone from the exclusion zone. In the hot zone, the following activities will be completed:

Sub – zone #1: any waste that is not to be directly removed from the exclusion zone will be dropped for temporary storage (i.e., contaminated HEPA filters).

Sub – zone #2: equipment will be dropped and bagging around analytical equipment will be removed and disposed of. Analytical equipment probes will be removed and placed in a storage box.

Mercury and/or PCB's Warm Zone

Workers will enter the warm zone from a fixed point in the hot zone/warm zone boundary.

Sub – zone #1: Suit and rubber boots and gloves washed with soap and water;

Sub – zone #2: Suit and rubber boots and gloves will be rinsed using clean water;

Sub – zone #3: safety boots will be removed;

Sub – zone #4: suit is to be removed along with the hard hat.

Mercury and/or PCB's Cold Zone

Sub – zone #1: face piece removal;

Sub – zone #2: glove removal;

Sub – zone #3: inner clothing removal (occurs in receiving end of decontamination trailer)

Mercury and/or PCB's Support Zone

Sub – zone #1: shower;

Sub – zone #2: redress;

Decontamination of CRC Workers

The vacuum operator is to be decontaminated by the same method as the HAZMAT worker. The rinser will then wash and rinse the washer. Next the washer will decontaminate the rinser.

13.10 Asbestos Decontamination Equipment

Asbestos Hot Zone

Sub – zone #1:

- *45 gallon drum containing a large polypropylene bag for storing bagged waste such as HEPA vacuum filters – only 1 bag is to be placed at a time to allow ease of management of decontamination of waste collection bag and accumulation of waste.*

Sub – zone #2:

- *ca. 12' x 12' sheet of 12 mm polyethylene sheet;*
- *a 45 gallon drum containing a large polypropylene bag for collecting the wrapping of any decontamination equipment;*
- *a box for collecting probes from analytical equipment.*

Sub – zone #3:

- *HEPA Vacuum.*

Sub – zone #4:

- *decontamination shower station;*
- *bucket for soapy water for use by decontamination worker;*
- *waste water collection basin cw/ plumbing;*
- *soap source;*
- *clean water line supplied from source in clean zone or plant water tank adjacent to the CRC;*

Sub – zone #5:

- *45 gallon drum containing a large polypropylene bag for storing washed boot covers*

Sub – zone #6:

- *45 gallon drum containing a large polypropylene bag for storing washed exterior gloves*

Asbestos Warm Zone

Sub – zone #1:

- *Soft bristled brush cw/ telescopic handle;*
- *wash basin for collecting wash water*
- *wash water storage container for temporary storage prior to disposal;*
- *bucket for mixing and use of soap/water;*
- *source of soap;*
- *source of clean water imported from support zone*

Sub – zone #2:

- *spray gun;*
- *wash basin for collecting rinse water;*
- *rinse storage container for temporary storage prior to disposal;*

- *source of clean water imported from support zone.*

Sub – zone #3:
- *storage bin for boots*

Sub – zone #4:
- *a seat for assisting the removal of suits;*
- *tarp for placing suits on.*

Sub – zone #5:
- *basin for washing gloves;*
- *source of clean water;*
- *source of soap;*
- *collection tank to store temporary wash water*

Sub – zone #7:
- *basin for rinsing gloves;*
- *source of clean water;*
- *collection tank to store temporary rinse water*

Asbestos Cold Zone

Sub – zone #1:
- *box to store face piece;*
- *area to clean face piece with basin and clean water and soap provided along with method of collecting wash and rinse water*

Sub – zone #2:
- *bag for disposing of inner gloves*

Sub – zone #3: inner clothing removal (occurs in receiving end of decontamination trailer)
- *personal locker for storing inner work clothes*

Asbestos Support Zone

Sub – zone #1: shower;
- *personal showering area;*
- *soap and shampoo; and*
- *towels.*

Sub – zone #2: redress;
- *personal lockers for storing outside clothes*

13.11 Hydrocarbon Decontamination Equipment

Hydrocarbon Hot Zone

Sub – zone #1:
- *45 gallon drum containing a large polypropylene bag for storing bagged waste such as HEPA vacuum filters – only 1 bag is to be placed at a time to allow ease of management of decontamination of waste collection bag and accumulation of waste.*

Sub – zone #2:
- *ca. 12' x 12' sheet of 12 mm polyethylene sheet;*

- *a 45 gallon drum containing a large polypropylene bag for collecting the wrapping of any decontamination equipment;*
- *a box for collecting probes from analytical equipment.*

Sub – zone #3

- *HEPA Vacuum.*

Hydrocarbon Warm Zone

Workers will enter the warm zone from a fixed point in the hot zone/warm zone boundary.

Sub – zone #1:

- *Soft bristled brush cw/ telescopic handle;*
- *wash basin for collecting wash water*
- *wash water storage container for temporary storage prior to disposal;*
- *bucket for mixing and use of soap/water;*
- *source of soap;*
- *source of clean water imported from support zone*

Sub – zone #2:

- *spray gun;*
- *wash basin for collecting rinse water;*
- *rinse storage container for temporary storage prior to disposal;*
- *source of clean water imported from support zone.*

Sub – zone #3:

- *container for storing boots*

Sub – zone #4:

- *seat for assisting in removing suits*

Hydrocarbon Cold Zone

Sub – zone #1:

- *box to store face piece;*
- *area to clean face piece with basin and clean water and soap provided along with method of collecting wash and rinse water*

Sub – zone #2:

- *bag for disposing of inner gloves*

Sub – zone #3: inner clothing removal (occurs in receiving end of decontamination trailer)

- *personal locker for storing inner work clothes*

Hydrocarbon Support Zone

Sub – zone #1: shower;

- *personal showering area;*
- *soap and shampoo; and*

- *towels.*

Sub – zone #2: redress;

- *personal lockers for storing outside clothes*

13.12 Mercury and/or PCB's Decontamination Equipment

Mercury and/or PCB's Hot Zone

Sub – zone #1:

- *45 gallon drum containing a large polypropylene bag for storing bagged waste such as HEPA vacuum filters – only 1 bag is to be placed at a time to allow ease of management of decontamination of waste collection bag and accumulation of waste.*

Sub – zone #2:

- *ca. 12' x 12' sheet of 12 mm polyethylene sheet;*
- *a 45 gallon drum containing a large polypropylene bag for collecting the wrapping of any decontamination equipment;*
- *a box for collecting probes from analytical equipment.*

Mercury and/or PCB's Warm Zone

Workers will enter the warm zone from a fixed point in the hot zone/warm zone boundary.

Sub – zone #1:

- *Soft bristled brush cw/ telescopic handle;*
- *wash basin for collecting wash water*
- *wash water storage container for temporary storage prior to disposal;*
- *bucket for mixing and use of soap/water;*
- *source of soap;*
- *source of clean water imported from support zone*

Sub – zone #2:

- *spray gun;*
- *wash basin for collecting rinse water;*
- *rinse storage container for temporary storage prior to disposal;*
- *source of clean water imported from support zone.*

Sub – zone #3:

- *container for storing boots*

Sub – zone #4:

- *seat for assisting in removing suits*

Mercury and/or PCB's Cold Zone

Sub – zone #1:

- *box to store face piece;*

- *area to clean face piece with basin and clean water and soap provided along with method of collecting wash and rinse water*

Sub – zone #2:

- *bag for disposing of inner gloves*

Sub – zone #3: inner clothing removal (occurs in receiving end of decontamination trailer)

- *personal locker for storing inner work clothes*

Mercury and/or PCB's Support Zone

Sub – zone #1: shower;

- *personal showering area;*
- *soap and shampoo; and*
- *towels.*

Sub – zone #2: redress;

- *personal lockers for storing outside clothes*

13.13 CRC Personal Protective Equipment

HEPA Vacuum Operator (*Hot Zone*) – the same PPE required in the sub – zone.

Washer (*Warm Zone*) - Level B with a full face air purifying respirator cw/ P100 particulate cartridge and Tychem SL suit

Rinser (*Warm Zone*) **–** Level B with a full face air purifying respirator cw/ P100 particulate cartridge and Tychem SL suit

Medic *(Support Zone)***–** None unless responding to an emergency, emergency response is to be undertaken with the same PPE as that of the injured HAZMAT worker.

Support Zone Supervisor *(Site Superintendent)* – none, unless entering exclusion zone for inspection.

13.14 Disposing of Waste Water and Disposable PPE

Waste water will be collected, pumped to a temporary storage tank (same as the tank for storing general wash water). If the water stored in the tanks meets discharge criteria this water will be discharged to the environment. In the event the stored water does not meet the applicable discharge criteria, this water will be treated to the point where the applicable discharge criteria have been achieved.

13.15 Emergency Decontamination

A portable wash unit that can rinse down a critically injured HAZMAT worker will be made available. The Emergency responder is to rinse the injured worker thoroughly and then remove PPE prior to administering first aid. The worker is to be removed from the sub zone within the exclusion zone, if possible to do so safely. When responding to an Emergency, the emergency responder is to wear appropriate PPE as required for the sub zone.

13.16 Compatibility of Wash Solution with Chemical Hazards

There are no concerns with reaction or non-compatibility between asbestos, hydrocarbons, mercury, or PCB's and the water or materials used within the contaminant decontamination corridor.

13.17 Disposal and Laundering

The Tychem suits will be decontaminated and reused, until visible wear and tear makes them unsuitable for use. The safety officer is to inspect the suits on a regular basis. Suits deemed not appropriate for use will be immediately removed from circulation following decontamination, placed into a barrel and shipped to Yellowknife for disposal in the solid waste land fill. Laundering of clothes under PPE will be done in the general washing facilities.

13.18 Hygiene

Workers are to practice proper hygiene when working with Hazardous wastes. Proper hygiene includes:

1. *No smoking until fully decontaminated;*
2. *No eating until fully decontaminated;*
3. *Do not put hand in mouth and/or chew finger nails;*
4. *Workers must shower in the portable showering facilities, prior to entering the support zone/general facilities;*
5. *Workers are not to use the bathroom facilities in the portable trailer, unless fully decontaminated;*
6. *Workers are to fully decontaminated prior to: lunch breaks and the end of working with a hazardous waste;*
7. *PPE is not to be transferred between employees, unless instructed to do so by the chemical engineer.*

13.19 Tracking PPE

All PPE is to be tracked by an ID number specific to the employee. This will ensure that the length of use is known, that cross contamination does not occur between employees, and that hygiene practices are adhered to. The following variables will be tracked:

1. *An ID number specific to the employee;*
2. *The date that the PPE was issued to the employee;*
3. *The job that the PPE is required for;*
4. *The date that the job specific to the PPE was completed; and*
5. *Methods of daily and post job decontamination.*

ID #s are to be placed on PPE as to not affect its performance. PPE must be tracked per job and between jobs. For each new job duty, PPE must be reassessed and re-issued, even if the same PPE is required for both job duties.

14 SPILL CONTINGENCY PLAN

14.1 Introduction

The purpose of this Spill Contingency Plan (SPC) is to describe measures to be implemented by Aboriginal Engineering Ltd. (AEL) to,

1. prevent oil or hazardous waste discharges from occurring; and
2. to prepare AEL to respond in a safe, effective, and timely manner to mitigate the impacts of a discharge on the environment, human health, company assets, project completion and public perception.

The SPC has been prepared in accordance with the Government of Northwest Territories, Fuel Spill Contingency Planning and Reporting Regulations (NWT SCPRR), promulgated under the Northwest Territories Environmental Protection Act (NWT EPA).

In addition, the SPC is used as: a reference for oil and hazardous waste storage information and testing records; as a tool to communicate practices on preventing and responding to discharges with employees; as a guide to facility inspections; and as a resource during spill emergency response.

The SPC provides guidance on key actions that AEL is to perform to comply with the NWT SCPRR and industry best practice. Such actions include, but are not limited to:

- Complete monthly site inspections as outlined in the Inspection, Tests, and Records section of the Plan, using the inspection checklists included;
- Perform preventive maintenance of equipment, secondary containment systems, and discharge prevention systems described in the SPC as needed to keep them in proper operating conditions. Visual inspection of the bulk fuel and hazardous waste storage facilities is to be preformed by the Site Superintendent on a daily basis;
- Conduct initial and supplementary employee training as outlined in the Training section of the Plan and document them on the log included;
- Review the Plan as required. Update the Plan to reflect any ~~"a~~dministrative changes" that are applicable, such as personnel changes or revisions to contact information, such as phone numbers. Administrative changes must be documented and the SPC must be recertified by the AEL Project Manager and Health and Safety Manager, the Client and the Chief Environmental Protection Officer;
- Amend the SPC within one (1) month whenever there is a change in facility design, construction, operation, or maintenance that materially affects the facility's spill potential;
- Respond to spill events in a safe and economical manner that limits the impacts of the spill on human health, safety, the environment and surrounding communities to as minimal as is practically achievable; and
- Return impacted land to as close to original condition as is reasonably achievable, as soon as possible following a spill event.

14.2 Scope

The SPC applies to all activities undertaken by AEL employees, sub-contractors and approved site visitors during the execution of the Work in relation to the Phase 1 Remediation of the Great Bear Lake sites. All persons entering the site are to be aware of the spill response procedures prior to work or site visits.

14.3 Compliance

14.3.1 Introduction

The Northwest Territories Spill Contingency Planning and Reporting Regulations (NWT SCPRR) promulgated under the NWT EPA are the binding regulations with respect to spill contingency planning at facilities located on Commissioners land, within the NWT. It is assumed that the federal authorities have adopted the NWT SCPRR for the Great Bear Lake Project.

Subsection 3.(1) of the NWT SCPRR states that,

> *"no person shall store contaminants in a facility where the storage capacity of the facility equals or exceeds the storage capacity shown in Schedule A unless a spill contingency plan has been prepared and filed in accordance with these regulations"*

Schedule A item No.1 provides information that states above ground facilities with liquid storage capacity equal to or greater than 20,000L are required to submit a SCP. For the site works to be completed by AEL at the Great Bear Lake Site, a SCP is required.

In addition, Schedule B presents the minimum reportable quantities for various hazardous wastes. The definition of hazardous has been adopted from the Transportation of Dangerous Goods Act (TDGA). Spilled products are classified according to the classifications outlined in the TDGA Regulations, Clear Language. Schedule B of the SCPRR is reproduced herein as **Figure 18.**

TRANSPORTATION OF DANGEROUS GOODS CLASS	SUBSTANCE	IMMEDIATELY REPORTABLE QUANTITIES FOR NWT 24-HOUR SPILL REPORT
1	Explosives	Any amount
2.3	Compressed Gas (Toxic)	
2.4	Compressed Gas (Corrosive)	
6.2	Infectious Substance	
7	Radioactive	
None	Unknown Substance	
2.1 2.2	Compressed Gas (flammable) Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100L
3.1 3.2 3.3	Flammable Liquid	≥ 100L
4.1 4.2 4.3	Flammable Solid Spontaneously Combustible Solid Water Reactant	≥ 25 kg
5.1 9.1	Oxidizing Substance Miscellaneous Products or Substances Excluding PCB Mixtures	≥ 50L or 50 kg
5.2	Organic Peroxides	≥ 1L or 1 kg

TRANSPORTATION OF DANGEROUS GOODS CLASS	SUBSTANCE	IMMEDIATELY REPORTABLE QUANTITIES FOR NWT 24-HOUR SPILL REPORT
9.2	Environmentally Hazardous	
6.1 8 9.3	Poisonous Substance Corrosive Substance Dangerous Waste	≥ 5L or 5 kg
9.1	PCB Mixtures of 5 or More ppm	≥ 0.5L or 0.5 kg
None	Other Contaminants (e.g., crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, wastewater etc.)	≥ 100L or 100 kg

Figure 18: Schedule B of the SCPRR

14.3.2 References

The following references were used in the creation of the SPC.

INDUSTRY STANDARDS

- Steel Tank Institute Standard SP001 – Standard for the Inspection of Aboveground Storage Tanks (STI SP001); and
- American Petroleum Institute Standard 653 – Tank Inspection, Repair, Alteration, and Reconstruction

IMPORTANT GUIDLINES

- Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products, 1994, Canadian Council of Ministers of the Environment
- Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products, 2003, Canadian Council of Ministers of the Environment

In addition, to ensure all other regulatory requirements have been met and to ensure due diligence the following acts, regulations, codes and guidelines were reviewed.

TERRITORIAL ACTS AND REGULATIONS

- NWT Fire Prevention Act
  - Fire Prevention Regulations R.R.N.W.T. 1990
    - National Building Code, 1995: Canadian Commission on Building and Fire Codes, National Research Council of Canada
    - National Fire Code of Canada, 1995: Canadian Commission on Building and Fire Codes, National Research Council of Canada
    - Installation Code for Oil-Burning Equipment, 2000 B139-00 Canadian Standards Association
- Transportation of Dangerous Goods Act 1990, R.S.N.W.T., 1998
  - Transportation of Dangerous Goods Act Regulations

FEDERAL ACTS AND REGULATIONS

- Canadian Environmental Protection Act 1999
  - Environmental Emergency Regulations SOR /2003-307
  - Federal Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands or Aboriginal Lands Regulations SOR/97-10
    - Federal Above Ground Storage Tank Technical Guidelines PC 1996 – 1233
    - Federal Underground Storage Tank Technical Guidelines
- Fisheries Act Paragraph 36 (3) and (4) of considerable importance[6]
- Transportation of Dangerous Goods Act 1992
  - Transportation of Dangerous Goods Act Clear Language Regulations
- Canadian Shipping Act

ADDITIONAL GUIDELINES AND STANDARDS

- Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks, Canadian Council of Ministers of the Environment
- Environmental Guideline for Contaminated Site Remediation, R.S.N.W.T., 1998
- CSA – B836 Storage, Handling and Distribution of Aviation Fuels on Airports

ADDITIONAL RESOURCES

- Google Earth
- Spill Containment and Clean-Up Course, Environment Protection Service Department of Resources, Wildlife and Economic Development Government of the Northwest Territories[7]
- USEPA Oil Program, Understanding Oil Spills and Oil Spill Response[8]
- Emergency Response Guidebook 2009, Transport Canada
- 2nd Edition, The Basics of Oil Spill Cleanup, Lewis Publishers[9]
- Handbook for Oil Spill Protection Clean Up Priorities EPA – 600 8-81 002[10]
- Field Guide for Oil Spill Response in Arctic Waters, Emergency Prevention, Preparedness and Response[11]

[6] (3) Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

[7] Sections of the 1997 Spill Containment and Clean-Up Course, Environment Protection Service Department of Resources, Wildlife and Economic Development Government of the Northwest Territories[7] have been reproduced herein for the purpose of employee education and training

[8] http://www.epa.gov/oilspill/pdfbook.htm <accessed December 25, 2006> Note: Sections of the USEPA Oil Program, Understanding Oil Spills and Oil Spill Response have been reproduced herein for the purpose of employee education and training.

[9] Sections of the 2nd Edition, The Basics of Oil Spill Cleanup, have been reproduced herein for the purpose of employee education and training

[10] Sections of the 2007 Tibbitt to Contwoyto Winter Road Emergency Response/Spill Contingency Plan have been reproduced herein for the purpose of employee education and training

[11] Sections of the Field Guide for Oil Spill Response in Arctic Waters, have been reproduced herein for the purpose of employee education and training

14.4 Authorities Having Jurisdiction

The following figure defines the authorities that have jurisdiction over various forms of spills, based on the NWT/Nunavut Spills Working Agreement.

ID	SPILL INCIDENT	LEAD AGENCY
1	Spills on Land outside Comissioners Land, Except for:	Indian and Northern Affairs Canada
a	Spills at Federal Facilites not permitted under Federal or Territorial legislation	Environment Protection, Environment Canada
b	Spills at oil and gas exploration and production facilities	National Energy Board
c	Spills at National Parks	Environment Protection, Environment Canada
2	Spills on Commisioners Land, Except for:	Government of the Northwest Territories
a	Spill at federal facilities not permitted under Federal or Territorial legislation	Environment Protection, Environment Canada
b	Spills at oil and gas exploration and production facilities	National Energy Board
c	Spills at facilities permitted under federal legislation	Indian and Northern Affairs Canada
d	Those sections of territorial highways on ice surfaces	Indian and Northern Affairs Canada
3	Spills on Water, Except:	Indian and Northern Affairs Canada
a	Spills at Federal Facilites not permitted under Federal or Territorial legislation	Environment Protection, Environment Canada
b	Spills at oil and gas exploration and production facilities	National Energy Board
c	Spills from ships and bardges	Canadian Coast Guard
4	Spills on lands set aside under the Inuvialuit Land Claim	Inuvialuit Land Administration

Figure 19: Authorities Having Jurisdiction With Respect to Spill Response

14.5 SCP Administration

14.5.1 Management Approval and Designated Person

AEL is committed to preventing discharges of oil to the environment, and to maintaining the highest standards for spill prevention control and countermeasures through the implementation and regular review and amendment to the SCP. AEL will commit the necessary resources to implement the measures described in SCP. The PM is responsible for: ensuring the SCP is developed according to regulatory requirements; and that the necessary resources to implement the SCP are identified and made available as required.

The Site Superintendent (SS) is the designated person accountable for oil spill prevention and response at the facility and has the authority to commit the necessary resources to implement the SCP. In the absence of the SS, the AEL Field Engineer (AFE) is the AEL designate.

14.5.2 SCP Plan Enactment

The Site Superintendent, or the AEL Field Engineer in the absence of the Site Superintendent, is responsible for enacting the SPC following contact from a first responder. All AEL employees at the site are responsible to act as first responders to a spill event and will be provided the necessary training. All communications with respect to spill response plan coordination are to be directed towards the site designate (Site Superintendent or AEL Field Engineer) who will act as the Emergency Commander (EC).

14.5.3 SCP Submittal

Subsection 5.(1) of the NWT SCPRR states that

–the person responsible for preparing a spill contingency plan shall file the plan with the Chief Environmental Protection Officer before making use of a facility"

The Project Manager (PM) is responsible for ensuring that a SCP is developed in accordance with the NWT SCPRR. The SCP shall be submitted by the PM to the PWGSC Project Officer (PO). The PWGSC PO is then responsible to submit the SCP to the INAC Project Manager (INAC PO) who will in-turn submit the SCP to the NWT Chief Environmental Protection Officer (CEO) for review and approval. The submittal must be accompanied with a letter of transmittal from the Crown stating that, on their behalf, the GNWT CEO is review and comment on the SCP.

14.5.4 SCP Revision

Subsections 6.(1), (2), (3) and (4) of the NWT SCPRR state,

"(1) The Chief Environmental Protection Officer shall review each spill contingency plan after it is filed.

(2) The Chief Environmental Protection Officer may require the person who filed the spill contingency plan to make changes to it.

(3) Where the Chief Environmental Protection Officer requires changes under subsection (2), he or she may indicate a reasonable period of time within which the changes must be filed.

(4) The person who filed a spill contingency plan shall make and file any changes required under subsection (2)."

The PM is responsible for revision and re-certification by the CEO of the SCP as per the requirements of submittal outlined in Section 5.5.3 SCP Submittal.

Revision of the SCP can be triggered by:

- required changes in facility configuration or operation; or
- a quarterly review by the SCP formally scheduled by the PM.

CHANGES IN FACILITY CONFIGURATION AND/OR OPERATION

AEL will periodically review and evaluate the SPC following any change in the facility design, construction, operation, or maintenance that materially affects the facility's potential for an oil discharge, including, but not limited to:

- commissioning of containers;
- reconstruction, replacement, or installation of piping systems;
- construction or demolition that might alter secondary containment structures; or
- changes of product or service, revisions to standard operation, modification of testing/inspection procedures, and use of new or modified industry standards or maintenance procedures.

Amendments to the SCP made in response to such changes of this nature are referred to as technical amendments.

Alternatively, non-technical amendments include the following:

- change in the name or contact information (i.e., telephone numbers) of individuals responsible for the implementation of the SCP; and
- change in the name or contact information of spill response or cleanup contractors.

AEL must make and implement the needed revisions to the SCP as soon as possible, but no later than one (1) month after the change occurs.

SCHEDULED REVIEWS - QUARTERLY

AEL will regularly review the SCP at least once every quarter (four months), independent of facility change. Revisions to the Plan, if needed, are made as soon as possible, but no later than one month from the completion of the quarterly SCP review. The PM is responsible to ensure that quarterly review and potential revisions to the SCP are executed. The CEO will be required to review and approve any potentially revisions of the SCP.

14.6 Facility Information

14.6.1 Fuel Capacity

HAZARDOUS MATERIALS - FUEL

AEL will not have more than 20 drums of fuel stored at site at any one time. The below table reflects the total amount of fuel needed for the duration of the project. AEL will only store fuel in drums at site and they will not be stored in above ground storage sites. The following figure describes the amount of fuel that will contain hazardous materials (Oil – diesel, Jet-B & gasoline) at the site.

Table 19: Fuel Drums - Hazardous Materials (Fuel)

ID	DESCRIPTION	CONDITION	PRODUCT	CAPACITY (L)	LOCATION
A	3 drums	Unknown	Diesel	600	Bulk Fuel Storage Area
A[1]	3 drums	Excellent	Diesel	600	Bulk Fuel Storage Area
B	1 drums	Excellent	Gasoline	200	Bulk Fuel Storage Area
C	10 drums	Excellent	Aviation fuel	2,000	Bulk Fuel Storage Area

HAZARDOUS WASTE – WASTE OIL

Limited quantities of waste oil will be found on the site from a) waste cooking oil from the camp; and b) waste oil generated from equipment maintenance. Waste oils will be collected in buckets and pails, and incinerated inside of the camp incinerator for disposal. Waste oils shall not be stored on-site.

Table 20: Drums - Hazardous Waste (Waste Oil)

ID	DESCRIPTION	CONDITION	PRODUCT	CAPACITY (L)	LOCATION
D	Cooking and food preparation	Unknown	Cooking oil	Unknown	Camp Kitchen
E	Equipment maintenance	Unknown	Waste oil, hydraulic fluids, etc.	Unknown	Service Shop Area

14.7 Contaminant Properties

14.7.1 Automotive Diesel

Diesel is a clear yellowish oily liquid with a mild petroleum odour. Diesel fuel is a complex mixture of aliphatic, olefinic, naphthenic and aromatic hydrocarbons from a variety of chemical processes blended to meet standardized product specifications. Composition varies greatly and includes C9 to C20 hydrocarbons with a boiling range of about 325-675^{o}F. Diesel vapour is heavier than air with a vapour density of 4 (air = 1) and does not form a significant vapour pressure (4 kPa at 38^{0}C). The flash point is > 40^{o}C and the LEL and UEL are 0.7 and 6.5%, respectively. Avoid contact with strong oxidants.

14.7.2 Gasoline

Gasoline is a colorless liquid with characteristic odour. May be dyed yellow. EXTREMELY FLAMMABLE LIQUID AND VAPOUR. Liquid can accumulate static charge by flow or agitation. Vapour is heavier than air and may spread long distances. Distant ignition and flash back are possible. Liquid can float on water and may spread to distant locations and/or spread fire. POSSIBLE CANCER HAZARD. May cause cancer, based on animal data. Central nervous system depressant. High vapour concentrations may cause headache, nausea, dizziness, drowsiness, unconsciousness and death. Aspiration hazard. Swallowing or vomiting of the liquid may result in aspiration into the lungs". Gasoline has a variable and significant vapour pressure of 400 to 775 mmHg at 20^{o}C and is more dense than air with a vapour density range of 2.5 to 3.7 (air =1). The saturation vapour concentration is 100% and evaporation rate is rapid. Gasoline is insoluble in water. The flash point of gasoline ranges from -43^{o}C to -30^{o}C and the LEL and UEL are 0.6% and 8.0%, respectively.

14.7.3 Jet Fuel

Jet Fuels are manufactured by blending gasoline, naphtha, and kerosene in varying proportions. Therefore, jet fuels may contain a carbon range that covers gasoline through kerosene. Jet fuels are used in both military and commercial aircraft. Some examples of jet fuels include Type A, Type A-1, Type B, JP-4, JP-5, and JP-8. The aromatic hydrocarbon content of these fuels ranges from 20 to 25 percent. The military jet fuel JP-4 has a wide boiling point range (65 to 290 °C), whereas commercial jet fuels, including JP-5 and Types A and A-1, have a narrower boiling point range (175 to 290 °C) because of safety considerations. JP-8 jet fuel contains hydrocarbons with 9 to 15 carbon atoms per molecule. Type B jet fuel has a boiling point range of 55 to 230 °C and a carbon range of 5 to 13 atoms per molecule. Jet fuels have volatility and flash point intermediate to that of gasoline and diesel.

14.7.4 Lubricating Oils

Lubricating oils can be distinguished from other crude oil fractions by their high boiling points (greater than 400 °C) and viscosities. Materials suitable for production of lubricating oils are composed principally of hydrocarbons containing 25 to 35 or even 40 carbon atoms per molecule, whereas residual stocks may contain hydrocarbons with 50 to 60 or more (up to 80 or so) carbon atoms per molecule. Because it is difficult to isolate hydrocarbons from the lubricant fraction of petroleum,

aliphatic to aromatic hydrocarbon ratios are not well documented for lubricating oils. However, these ratios are expected to be comparable to those of the source crude oil. Lubricating oils do not produce significant vapour pressures at ambient temperatures and have high flash point.

14.7.5 Properties Affecting Migration

The rate at which an oil spill spreads will determine its effect on the environment. Most oils tend to spread horizontally into a smooth and slippery surface on top of the water, called a slick. Factors which affect the ability of an oil spill to spread include *surface tension, specific gravity*, and *viscosity*. Refer to the appended Material Safety Data Sheets for specific information regarding the physical properties of the hazardous materials stored at the facility.

SURFACE TENSION

Surface tension is the measure of attraction between the surface molecules of a liquid. The higher the oil‘s surface tension, the more likely a spill will remain in place. If the surface tension of the oil is low, the oil will spread even without help from wind and water currents. Because increased temperatures can reduce a liquid‘s surface tension, oil is more likely to spread in warmer waters than in very cold waters.

SPECIFIC GRAVITY

Specific gravity is the density of a substance compared to the density of water. A substance with specific gravity less than 1 is less dense than water (i.e., will float); and a substance with a specific gravity greater than 1 is denser than water (i.e., will sink). Since most oils are less dense than water, they float on top of it. However, the specific gravity of an oil spill can increase if the less dense (more volatile) substances within the oil evaporate. More dense oils may sink and form tar balls or may interact with rocks or sediments on the bottom of the water body. It is essential that all oil spills be mitigated as quick as possible to prevent changes in specific gravity due to weathering which can lead to potentially more difficult remedial situations and greater impacts to the environment (i.e., sinking tar balls).

VISCOSITY

Viscosity is the measure of a liquid‘s resistance to flow. The higher the viscosity of the oil, the greater the tendency for it to stay in one place. Honey is an example of a highly *viscous* liquid. Denser oils tend to be more viscous than less dense oils [i.e., a heating oil (denser) vs. gasoline or aviation fuel (less dense)].

SOLUBILITY

Solubility is defined as the ability to dissolve in a liquid. The solute is the substance that is being dissolved and the solvent is the liquid into which the solute is being dissolved. For example, sodium cyanide and sodium hydroxide (both salts) are solutes, while water is a solvent. Solutions differ from mixtures as in solutions the solute has chemically dissolved and cannot be physically separated, while in mixtures such as sand and water, the sand is only suspended in water and settle out or be filtered by conventional means. Oils are generally sparingly soluble in water.

The following table presents the solubility in water of specific hazardous wastes/materials that will be present during the Great Bear Lake Project.

Table 21: Solubility in Water of Hazardous Waste/Material at Great Bear Lake

HAZARDOUS WASTE/MATERIAL	SOLUBILITY IN WATER	COMMENTS
Diesel Fuel	Practically insoluble	Small components such as benzene are slightly soluble. Less dense than water and will therefore float on water
Gasoline	Practically insoluble	Small components such as benzene are slightly soluble. Less dense than water and will therefore float on water
Jet Fuel	Practically insoluble	Small components such as benzene are slightly soluble. Less dense than water and will therefore float on water
ACM	Insoluble	NA

14.7.6 Migration on Land - Oil

Several factors influence the extent and rate of movement of oil on land. These include the type of oil product spilled, its viscosity, pour point and temperature. Other equally important factors include the presence of snow, types of soils, vegetation and season of the year.

SNOW

The nature of the snow cover is dependent upon terrain conditions. In forested areas, such as the taiga, the snow may be quite light, fluffy and deep, whereas on the tundra, wind action may compact the snow and make it hard and dense. This will affect the penetration of spilled oil.

Snow is a very effective absorbent for oil having the ability to contain more than 50% oil by volume, depending upon the nature of the snow. Light, fluffy snow will absorb more oil than will hard, dense snow. Hard, dense snow can also act as an effective physical barrier; therefore it should be used whenever possible for creation of dikes and containing oil spills. Application of water to the snow can create a less permeable, frozen, snow dike. Oil can also flow for considerable distances under snow cover without being seen from above.

SOILS AND VEGETATION

The movement of oil through soils and rocks is complex and largely unpredictable. The topography will determine the direction of oil flow and the shape of the spill. Movement downward will depend on the type of overlying soil, vegetation and the presence of impervious layers of clay or permafrost.

Soils and rocks consist of small fragments or grains, which, when compacted together, form small openings or pores. Interconnected pores allow a material to be permeable to fluids such as oil and water. Clay, silt or shale have very small pores which are not extensively interconnected and act as barriers to oil movement. In the treeless tundra, the mineral soil is overlain by 20 to 30 cm of organic detritus (i.e., peat) such as mosses, sedges, and lichens. In the taiga, the organic detritus layer may be 30 to 100 cm deep. Mineral soils generally have a very high absorptive capacity for oil, especially in the late summer when the frost level and water table are low.

The organic mat overlying the permafrost in the tundra and taiga regions has a high insulating value and any modification to its thermal properties by oil may cause an increase in thaw depth, possibly leading to thermocarst conditions. One must weight the damages created by remediation efforts vs. the benefit that a spill clean up will impart to the environment. Following the initial bulk removal of spilled material, the impacts of remediation effort could begin to quickly offset the net benefit gained by removal of additional spilled product.

The extent of vertical oil penetration will be controlled by the absorptive capacity of the ground. Figure 16 presents some rough estimates of absorptive capacities for various soils. The absolute values are less important than the relative differences. Note that the finer the soil, the greater the absorptive capacity; the exception being clay and shale which will absorb very little. Tundra will typically absorb 60 L/m^3 of crude oil.

Table 22: Oil Absorptive Capacities for Various Soil Types

SOIL TEXTURE	OIL ABSORBTIVE CAPACITY (L/m^3)
Stone - coarse gravel	5
Gravel - coarse sand	8
Coarse - medium sand	15
Medium - fine sand	25
Fine sand - silt	40

Low viscosity oils (e.g., gasoline, jet fuel and diesel) will produce the fastest rate and greatest depth of penetration into the soil. In seasonally frozen soil or permafrost, the rate of oil penetration will be very slow and will proceed only through melting caused by the oil as it spreads over the frozen soil. Many soils in NWT permit fast water movement (i.e., saturated marsh and bedrock). This means oil spilled in such areas would be difficult to contain.

If the amount of product spilled is not large, or the water table is low, the oil will be absorbed during its descent, and will leave behind a trail of relatively immobile material in a roughly vertical column. Rainfall may cause further downward movement of the oil and leach out water soluble components. If the main body of the liquid slug reaches the water table, there could be significant pollution. The rate of downward movement depends primarily on product spilled and the permeability of the soil layers.

14.7.7 Migration on Water - Oil

Oil spreads to a lesser extent and more slowly on land than on water. Oil spilled on or under ice spreads relatively rapidly but does not spread as thin a slick as on water. On any surface other than water, such as ice or land, a large amount of oil is retained in depressions, cracks, and other surface irregularities. After an oil spill on water, the oil tends to spread into a slick over the water surface. This is especially true of the lighter products such as gasoline, diesel fuel, and light crude oils, which form very thin slicks. Heavier crudes and Bunker C spread to slicks several millimetres thick. Heavy oils may also form tar balls and tar mats and thus may not go through progressive stages of thinning.

Oil spreads horizontally over the water surface even in the complete absence of wind and water currents. This spreading is caused by the force of gravity and the interfacial tension between oil and water. The viscosity of the oil opposes these forces. As time passes, the effect of gravity on the oil diminishes, but the force of the interfacial tension continues to spread the oil. The transition between these forces takes place in the first few hours after the spill occurs. The rates of spreading under ideal conditions are shown in the following figure.

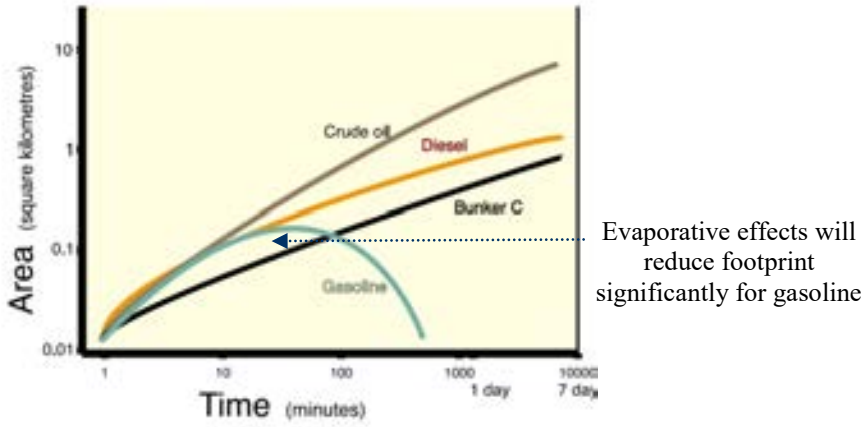


Figure 20: Rate of Oil Slick Spreading for Various Oils (Evaporation Effects Included)

As a general rule, an oil slick on water spreads relatively quickly immediately after a spill. The outer edges of a typical slick are usually thinner than the inside of the slick at this stage so that the slick may resemble a ~~"f~~ried egg." After a day or so of spreading, this effect diminishes. Winds and currents also spread the oil out and speed up the process. Oil slicks will elongate in the direction of the wind and currents, and as spreading progresses, take on many shapes depending on the driving forces. Oil sheens often precede heavier or thicker oil concentrations. If the winds are high (more than 20 km/h), the sheen may separate from thicker slicks and move downwind.

WEATHERING

The changes that oil undergoes during exposure to the environment of the spill will have drastic effects on the properties of the oil and thus the clean up of the spill. The following points highlight the key changes that oil will undergo during weathering, with respect to spill response:

- Evaporation is usually the most important weathering process as it has the greatest effect on the fate of oil;
- At 15°C and over a two-day period, gasoline evaporates completely, while about 60% of diesel fuel evaporates, about 40% of a light crude, about 20% of a heavy crude, and about 3% of Bunker C; and
- The formation of water-in-oil emulsions is the second most important weathering process because it can drastically change the properties of the oil. For example, liquid oil can become a viscous and heavy mass.

14.8 Contaminant Risk Properties

14.8.1 Potential Discharge Volumes

The following table identifies the types of spills that could occur and the potential volumes of spilled product that could result for various response times.

Table 23: Hazardous Materials (Oil) - Potential Spill Scenarios

LOCATION	ID	SPILL TYPE	RATE (L/MIN)	DURATION (MIN)[12]	TOTAL DISCHARGE (L)
BULK FUEL STORAGE	1	Discharge from 205L drum – Slow Leak.	0.1 to 1	1 to 1440 (24h)	0.1 to 205
	2	Discharge from 205L drum – Medium Leak	1 to 10	1 to 1440 (24h)	1 to 205
	3	Discharge from 205L drum – Catastrophic Failure.	Assume entire contents of tank	Instantaneous	205
	4	Discharge from 205L drum – Valve Left Open.	100	1 to 1440	100L to complete discharge
	5	Discharge from equipment – Overfilling	20	1	20
	6	Discharge from operator error during filling such as overfilling	10	1	10
	7	Leak or Complete failure of 205 L hazardous waste drum of waste oil	Assume entire contents of tank	N/A	205
SITE WIDE	1	Oil spilled due to equipment leaks	0.1 to 1	1 to 1440	0.1 to 1440
	2	Oil spilled due to equipment accident	Assume entire contents of reservoirs	instantaneous	1000L

14.9 Discharge Prevention

14.9.1 Containment and Diversionary Structures

BULK FUEL STORAGE FACILITY

AEL will not have more than 20 drums of fuel stored at site at any one time. The below amounts reflects the total amount of fuel needed for the duration of the project. AEL will only store fuel in 205L drums at site and they will not be stored in above ground storage tanks. AEL plans to mobilize the following quantities of fuel to the Great Bear Lake sites:

- ✓ 3 drums (600 L) diesel fuel
- ✓ 1 drums (200 L) gasoline
- ✓ 10 drums (2,000 L) aviation fuel

On-Site Storage Capacity

All drums in use (maximum 1 barrel of each fuel at a time) will be stored on spill pallets, each with a capacity of 30 gallons for spill containment, and minimizing spills during refuelling. Transfer of fuel from drums will be completed by utilizing 12-volt fuel transfer pumps. Pumps will be dedicated for a) diesel; b) gasoline; and c) aviation fuel to ensure there is no cross-contamination of fuel.

AEL shall adhere to the Land Use Permit (LUP) regarding fuel storage, with the storage being 100 metres away from the nearest high water mark.

AEL has identified one location for staging fuel at the mine site which will be nearest to the work site. The volumes stored at the sites will be minimal. The location at Sawmill Bay will be in close proximity to the airfield in order to allow for easy off-loading of the cargo plane to the storage area.

[12] Minimum response time assumes operator is adjacent to tank and maximum response time assumes leak detected during daily inspection by site superintendent. However, staff will be trained to identify and respond to minor leaks and staff will be frequently visiting storage.

The proposed fuel storage location for Sawmill Bay is shown in **Figure 21** below.

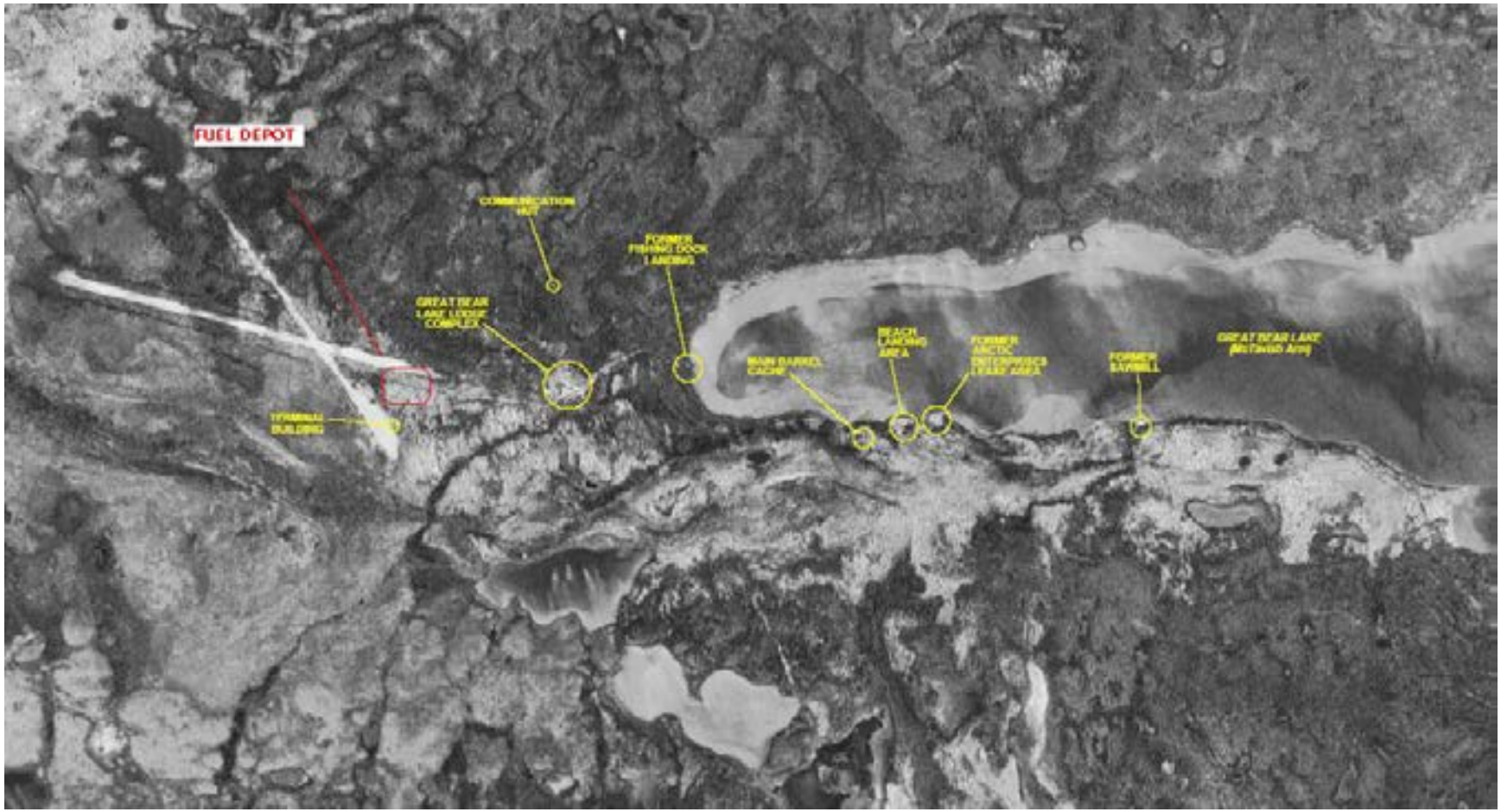


Figure 21: Proposed fuel storage location for Sawmill Bay

14.9.2 Inspections, Tests and Records

DAILY EQUIPMENT CHECKLIST

Operators are to inspect their equipment on a daily basis. The inspection will be documented on the daily inspection checklists – a copy of the checklist is included in the Site Specific Health and Safety Plan. Minor leaks are to be immediately addressed by the on-site certified heavy duty mechanic.

DAILY INSPECTION

A daily inspection of the bulk fuel and hazardous waste storage areas are to be undertaken by the Site Superintendent on the checklist titled _Spill Prevention Daily Checklist' that is provided in Appendix A. The Site Superintendent is to note the general conditions of the bulk fuels, signs of fuel spills, and the condition of any secondary containment. In addition the volume of fuel used is to be recorded daily. The following table presents the daily inspection checklist. Any item that receives –yes" as an answer must be described and addressed immediately.

DAILY FUEL QUANTITIES

In addition, the Site Superintendent is also to track the use of diesel and gasoline on a daily basis on the form titled Daily Fuel Consumption Checklist. The tracking form is provided in appendix a. The checks are to be done every day at the same time – in the evening @ approximately 6:00 pm, following dinner. Any major discrepancies from expected fuel consumption are to be immediately reported to the Project Manager. Such discrepancies can indicate a major leak or theft of product.

WEEKLY SOLVENT, LUBRICANT AND OTHER OILS INSPECTION

The Heavy Duty Mechanic (HDM) is responsible for tracking on a weekly basis:

- the quantities of lubricants and fuels consumed;
- the quantity of waste oil/fuel generated; and
- the quantity of anti-freeze consumed; and
- the method of disposal of waste oil and antifreeze.

At no time is:

- solvents to be mixed with any other oils than that of other waste solvent; and
- antifreeze to be mixed with any other oils than that of other waste antifreeze.

The HDM is responsible for completing the Weekly Solvent, Lubricant and Other Oils Consumption Check List form every Sunday of the week. The Site Superintendent is to sign off that the inspection has been completed.

MONTHLY INSPECTION

The Spill Prevention Monthly checklist inspection record must be completed each month. Provide further description and comments, if necessary, on a separate sheet of paper and attach to this sheet. Any item that receives –yes" as an answer must be described and addressed

immediately. Monthly inspections are to be carried out by the Site Superintendent and are to be signed off by the Crown Engineer. The checklist is in Appendix A.

INSPECTION OF DRAINAGE AREAS

The Drainage Checklist record must be completed when rainwater from diked areas is drained. The form is in Appendix A.

14.10 Training

INTRODUCTION

Briefings will be developed, scheduled and conducted by the Site Superintendent for operating personnel at regular intervals to ensure adequate understanding of this SCP. Resources for training will be ensured by the Project Manager. The briefings will also highlight and describe known discharge events or failures, malfunctioning components, and recently implemented precautionary measures and best practices. Personnel will also be instructed in operation and maintenance of equipment to prevent the discharge of oil, and in applicable pollution laws, rules, and regulations. Facility operators and other personnel will have an opportunity during the briefings to share recommendations concerning health, safety, and environmental issues encountered during facility operations. Training will occur prior to work and must be documented in the table provided in Appendix A. Refresher training will be undertaken at intervals no longer than one month and can be addressed during toolbox meeting and weekly safety meetings or as events scheduled.

14.10.1 Security

Both the bulk fuel storage facility and the hazardous waste storage facility will be inspected at the start and end of each shift to ensure that contents are secure, stable and have not been tampered with. Any signs of vandalism to any area of the site are to be immediately reported to the Site Superintendent. Vandalism events that threaten the safety of the staff will be reported to the Royal Canadian Mounted Police by the Project Manager.

14.10.2 Explosion and Fire Prevention

All tanks and filling equipment are to be properly grounded prior to filling to ensure that static electricity does not accumulate and discharge, thus causing an explosion. No smoking is to occur within 20m any fuel transfer or storage area. No fuel transfer is to be undertaken in doors or poorly ventilated areas. Operators are to not to be inside equipment during refuelling.

14.10.3 Equipment Refuelling

While refuelling equipment and vehicles on-site, spill pads and drip trays are to be used by workers, to catch any drops of fuel. Used spill pads shall be disposed of in a designated waste basket, and fuel in the drip trays shall be drained into a 45 gallon drum of waste oil/waste fuel for on-site incineration.

14.10.4 Boat Refuelling

While refuelling boats at the site, spill containment booms and spill pads are to be present at all times. Two workers must work in conjunction to pass and receive the fuel hose and refuelling

14.10.5 Equipment Maintenance

When performing regular service of heavy equipment or site vehicles, the site mechanic shall ensure that drip trays are used to collect any oils or fuels drained from the equipment. Oil collected in drip trays is to be stored in 45 gallon drum for waste oil for on-site incineration. Should antifreeze (ethylene glycol) be drained from equipment, it shall be collected in drip trays and transferred to a separate antifreeze container for off-site disposal.

14.11 Spill Reporting

NWT 24 HOUR SPILL HOTLINE
(403) 920 – 8130 (can call collect)
Reporting spills to the NWT 24 Hour Spill Hotline is a legislated requirement in NWT and is the primary reporting mechanism. The purposes of reporting a spill through this telephone service are:

- To provide a uniform and consistent approach to spill response in NWT;
- To assist field personnel in responding to the spill, in undertaking proper site assessments, and in identifying recovery and disposal methods;
- To elicit technical backup from personnel in various government agencies in the Territories and from specialized firms and organizations in Canada;
- To dispatch (when needed) personnel and equipment to the spill site;
- To provide technical information on material properties, response and site restoration procedures, as required;
- To monitor the progress of response and clean-up actions; and
- To provide a central clearing house or command post for progress of spill response actions.

TRANSPORT CANADA – CANUTEC
(613) 996-6666 (call collect)
CANUTEC is a federal spill reporting line that **must** be notified in the case of:

- lost, stolen or misplaced infectious substances;
- an incident involving infectious substances;
- an accidental release from a cylinder that has suffered a catastrophic failure;
- an incident where the shipping documents display **CANUTEC's** telephone number 613-996-6666 as the emergency telephone number; or
- a dangerous goods incident in which a railway vehicle, a ship, an aircraft, an aerodrome or an air cargo facility is involved.

CANUTEC is the Canadian Transport Emergency Centre operated by Transport Canada to assist emergency response personnel in handling dangerous goods emergencies. This national bilingual advisory centre was established in 1979 and is part of the Transportation of Dangerous Goods Directorate. It has the mandate to regulate the handling, offering for transport and the transport of dangerous goods by all modes in order to ensure public safety. CANUTEC is one of the major programs instituted by Transport Canada to promote public safety during movement of people and goods in Canada.

Taking into consideration the characteristics of the dangerous goods involved and the particular conditions at the emergency site, CANUTEC's professional staff can provide immediate advice on:

1. chemical, physical and toxicological properties and incompatibilities of the dangerous goods;
2. health hazards and first aid;
3. fire, explosion, spill or leak hazards;
4. remedial actions for the protection of life, property and the environment;
5. evacuation distances; and
6. personal protective clothing and decontamination.

CANUTEC staff does not go to the site of an incident. Advice and information are provided by telephone. In some instances, standard information and data can also be transmitted in printed copy to the site. This complements the verbal advice and recommendations given by CANUTEC staff members. CANUTEC can also provide communication links with the appropriate industry, government or medical specialists. The shipper of the dangerous goods involved can also be linked to the site to deal with instructions on cleanup, disposal and/or recovery.

Should on-site assistance be required, CANUTEC can assist in the activation of industry emergency response plans such as TEAP, the Transportation Emergency Assistance Plan, operated by the Canadian Chemical Producers' Association or on-site assistance from other industry or government specialists.

14.12 First Response

Due to the remote nature of the Great Bear Lake sites, all AEL employees are responsible to act as first responders. As such all employees will be given basic training in first response, as professional first responders will not be readily available. The Project Manager is responsible to develop the training based on information contained herein. First responder training will be provided during the pre-project training or if deemed to be required by the PM.

The first responder to a spill event has specific responsibilities that must be completed timely, safely and efficiently to ensure that the SCP is enacted in such a manner to allow the clean up of the spilled product without endangering people, property or the environment. The actions of the first responder are often the most important in minimizing the spread of a spill. The steps which are to be taken when initially responding to a spill event are presented in Figure 22.

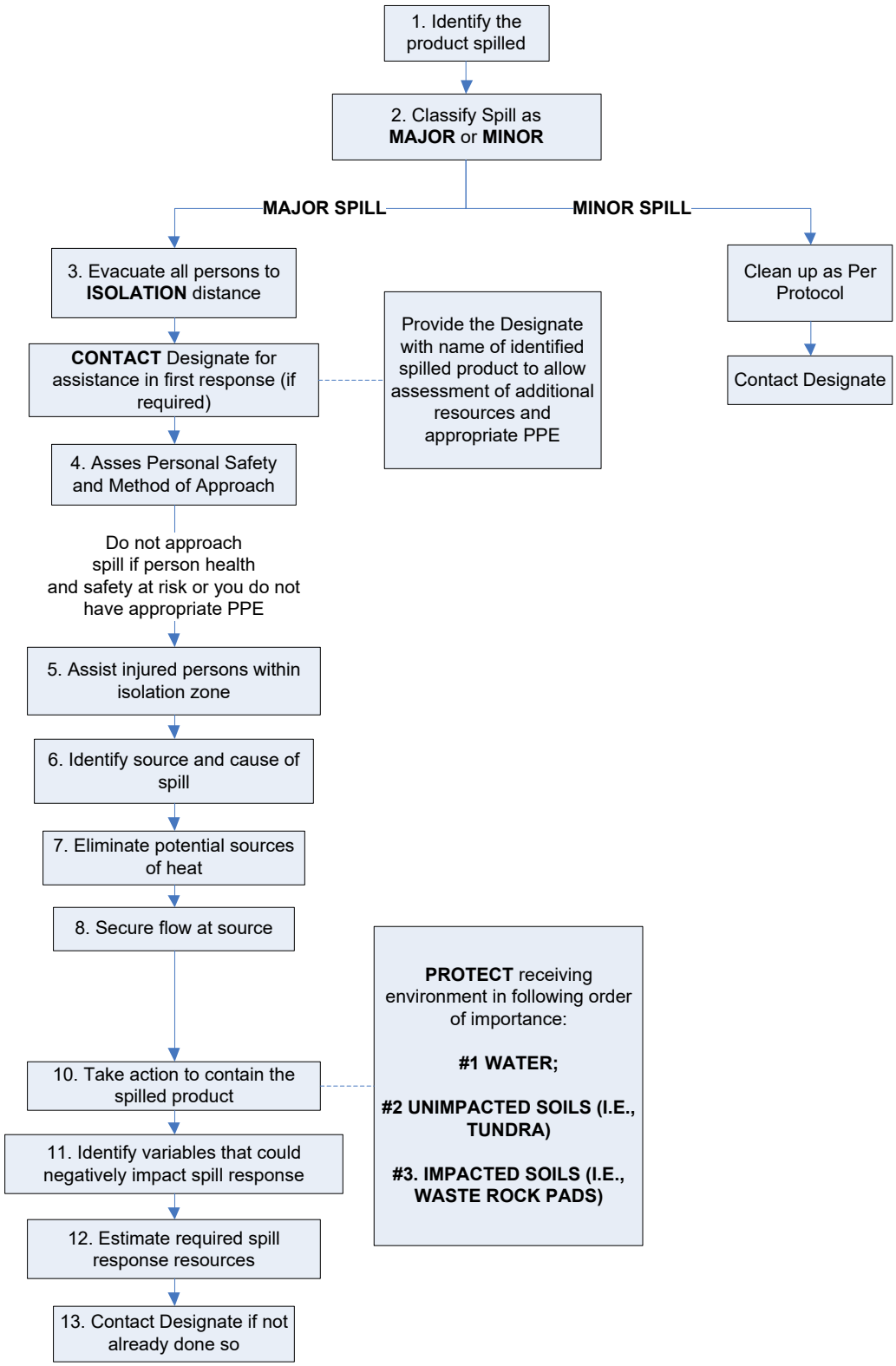


Figure 22: Steps to be Taken in Order for First Response to a Spill Event

The above thirteen action items should be completed as quickly as possible. Inability to collect all the information or timely data collection should not prevent one from contacting the designate (Site Superintendent or in his or her absences the AEL Field Engineer, or Hazmat Foreman) to enact the SCP. The longer one takes to assess the initial situation the longer the time the spill has to spread and thus the greater the impact on the receiving environment. Data collection should be balanced with the need to quickly implement the SCP.

The following subsections provide detailed information on how to implement the above listed response steps.

STEP 1 – IDENTIFY THE PRODUCT SPILLED AND ASSESS THE ASSOCIATED IMMEDIATE HEALTH HAZARDS

HAZARDOUS MATERIALS/WASTES

The hazardous materials most likely to be spilled during operation of the facility include,

1. Jet B;
2. Diesel;
3. Gasoline;
4. Waste Oils
    a. Ethylene Glycol (Antifreeze)
    b. Waste Engine Oil;
    c. Waste Transmission Fluid
    d. Solvents etc.

The identification of which product has been spilled can be assessed by;

- the time of the spill (i.e., occurring during the filling of equipment with a specified product);
- the properties of the spill;
- the location of the spill;
- which infrastructure the spill has been released from; and
- others that have observed the spill.

CANUTEC ID NUMBER AND NAME

If possible, the CANUTEC ID and Name should be identified. Such information will aid in determining the method of response and the proper evacuation procedures. The following table lists the CANUTEC ID for key hazardous materials and wastes present at the Great Bear Lake sites.

Table 24: CANUTEC ID Numbers and Names

NAME	CANUTEC ID	CANUTEC Guide No.
Unknown Substance	-	111
Diesel Fuel	1202	128
Gasoline/Jet-B	1203	128
Asbestos	2212	171

ALTERNATE CLASSIFICATION METHOD FOR OILS

In addition to reporting the specific type of oil, general classification schemes can also be used that are reflective of the properties of weathered oil under certain circumstances. Such general classifications can aid in preparing for the spill response based on overall characteristics of the spill and often reflect the properties of the oil following weathering during the period between spill identification and response. Such weathered oil can be identified according to the following categories:

- Free Flowing;
- Viscous; and
- Semi-Solid Tar-Like

Free Flowing
These oils contain volatile components that evaporate readily when the oil is released to the environment. Because of this, the ignition potential is high and a fire or explosion hazard exists in the spill area. In addition, a personnel exposure hazard (i.e., vapours) may exist because of the vapours. These oils flow easily, spread rapidly and penetrate porous substrate deeply. They usually appear transparent or slightly opaque and easily rinse off surfaces.

Viscous
These oils contain some volatile components but are less likely to create a fire hazard. They are usually opaque, form emulsions readily, have variable soil penetrability and can be removed from surfaces by applying low-pressure water spray

Semi-Solid Tar-Like
These oils are opaque and spread slowly or form tar balls. They have low substrate penetrability, feel sticky and are difficult to remove from contaminated surfaces. Emulsions formed by these oils are very stable.

ASSOCIATED IMMEDIATE HEALTH HAZARDS

All employees are to receive training in the health hazards of all hazardous materials and wastes on site. Material Safety Data Sheets for all materials present on-site shall be kept in a binder in the site office. AEL will ensure MSDSs are valid and up to date (3 years).

STEP 2. – CLASSIFY THE SPILL AS MAJOR OR MINOR

For the purpose of establishing an appropriate response, the spill must be classified as either minor or major, depending on the volume and characteristics of the material released.

MINOR DISCHARGE

A minor discharge is defined as one that poses no significant harm (or threat) to human health and safety or to the environment. Minor discharges are generally those where:

- the quantity of product discharged is small (e.g., may involve less than reportable quantities);
- the discharged material is easily stopped and controlled at the time of the discharge;
- the discharge is localized near the source;
- the discharged material is not likely to reach water (i.e. fully contained in secondary containment);

- there is little risk to human health or safety; and
- there is little risk of fire or explosion.

Minor Discharges can generally be cleaned up by the first responding employees with little or no additional resources other than the readily available spill response supplies and a few additional labourers, if required.

MAJOR DISCHARGE

A major discharge is defined as one that cannot be safely controlled or cleaned up by the first responder(s) and thus requires additional resources from the facility operations or from additional third parties such as contractors, government agencies etc. Such spills have the following properties.

- the discharge is large enough to spread beyond the immediate discharge area;
- the discharged material enters water;
- the discharge requires special equipment or training to clean up;
- the discharged material poses a hazard to human health or safety; or
- there is a danger of fire or explosion.

Major spills are often a serious threat to the occupational health and safety of the first responder. In the event of a major discharge, the following guidelines apply, in the stated order:

1. Refer to steps outlined in Step 3. *Evacuate Persons From the Immediate Area*
2. Once outside the isolation zone, immediately contact the designate for assistance in first response (i.e., Site Superintendent or in his or her absence the AEL Field Engineer).
3. Provide the designate with the identification of the spilled product so that he or she can bring additional resources and proper Personal Protection Equipment (PPE);
4. Proceed with steps 5. to 12 as outlined herein.

3. EVACUATE PERSONS FROM THE IMMEDIATE AREA

The evacuation distance will depend on the product that has been spilled, the type of spill and the environmental conditions of the site. The responder is to note the direction and relative magnitude of the wind speed. All persons should be directed towards an area upwind of the spill.

CANUTEC EVACUATION DISTANCES

General Evacuation Distances for Hazardous Materials That DO NOT Readily Produce Highly Toxic Gases

The following table presents evacuation distances for key hazardous materials and wastes that are present at the site.

Table 25: General Evacuation Distances for Key Hazardous Materials and Wastes (CANUTEC)

NAME	CANUTEC ID	CANUTEC GUIDE NO.	EVACUATION DISTANCES IN ALL DIRECTIONS		
			IMMEDIATE	FIRE	LARGE SPILL
Unknown Substance	-	111	100 m (330 ft)	800 m (1/2 mile)	-
Diesel Fuel	1202	128	50 m (150 ft)	800 m (1/2 mile)	300 m (1000 ft)
Gasoline/Jet-B	1203	128	50 m (150 ft)	800 m (1/2 mile)	300 m (1000 ft)
Asbestos	2212	171	25 m (75 ft.)	800 m (1/2 mile)	Increase distance as necessary

Initial Isolation and Protective Action Distances for Substances that can Release Toxic Gas/Vapour

For substances that release vapours that are considered toxic by inhalation, specific evacuation distances are dependent not only on total evacuation distance, but also on the wind direction, size of spill and day or night time conditions. CANUTEC treats such substances separately and provides recommended distances for areas likely to be affected within the first 30 min following a spill. However, the areas of concern can increase with time.

The **Initial Isolation Zone (IIZ)** defines an area SURROUNDING the incident in which persons may be exposed to dangerous (upwind) and life threatening (downwind) concentrations of material. **The Protective Action Zone (PAZ)** defines an area DOWNWIND from the incident in which persons may become incapacitated and unable to take protective action and/or incur serious or irreversible health effects. Distances are provided for small and large spills occurring day or night.

Adjusting distances for a specific incident involves many interdependent variables and should be made only by personnel technically qualified to make such adjustments. Only the Site Superintendent and the AEL Field Engineer can make such adjustments. For this reason, no precise guidance by CANUTEC is provided to aid in adjusting the table distances; however, general guidance follows.

Factors That May Change the Protective Action Distances

The CANUTEC guide for a material clearly indicates under the section EVACUATION – Fire, the evacuation distance required to protect against fragmentation hazard of a large container. Such distances are listed herein in **Table 25**. If the material becomes involved in a FIRE, the toxic hazard may become less important than the fire or explosion hazard. If more than one tank car, cargo tank, portable tank, or large cylinder involved in the incident is leaking, LARGE SPILL distances may need to be increased. For a material with a protective action distance of 11.0+ km (7.0+ miles), the actual distance can be larger in certain atmospheric conditions. If the dangerous goods vapour plume is channelled in a valley or between many tall buildings, distances may be larger than shown due to less mixing of the plume with the atmosphere. Daytime spills in regions with known strong inversions or snow cover, or occurring near sunset, accompanied by a steady wind, may require an increase in protective action distance. When these conditions are present, airborne contaminants mix and disperse more slowly and may travel much farther downwind. In addition, protective action distances may be larger for liquid spills when either the material or outdoor temperature exceeds 30°C (86°F).

Method of Response

Step #1 - Assess

Determine if the incident involves a small or large spill and if day or night conditions exist. Generally, a small spill is one which involves a single, small package (e.g., a drum containing up to approximately 200 litres), a small cylinder, or a small leak from a large package. A large spill is one which involves a spill from a large package, or multiple spills from many small packages. Day is any time after sunrise and before sunset. NIGHT is any time between sunset and sunrise.

Step #2 – Isolation

Look up the initial ISOLATION distance (refer to Table 25). Direct all persons to move, in a crosswind direction, away from the spill to the distance specified—in meters and feet. The following figure displays a graphical representation of the initial isolation zone.

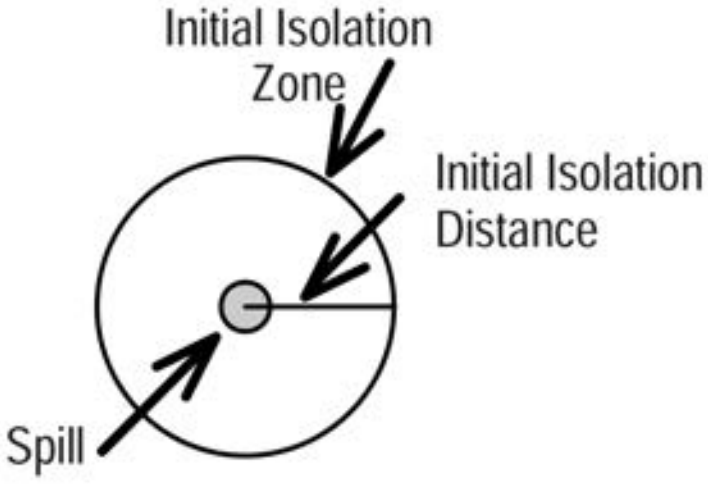


Figure 23: Graphical Representation of Initial Isolation Zone

Step #3 Identify the Protective Action Distance

For practical purposes, the Protective Action Zone (i.e., the area in which people are at risk of harmful exposure) is a square, whose length and width are the same as the downwind distance shown in **Figure 24**.

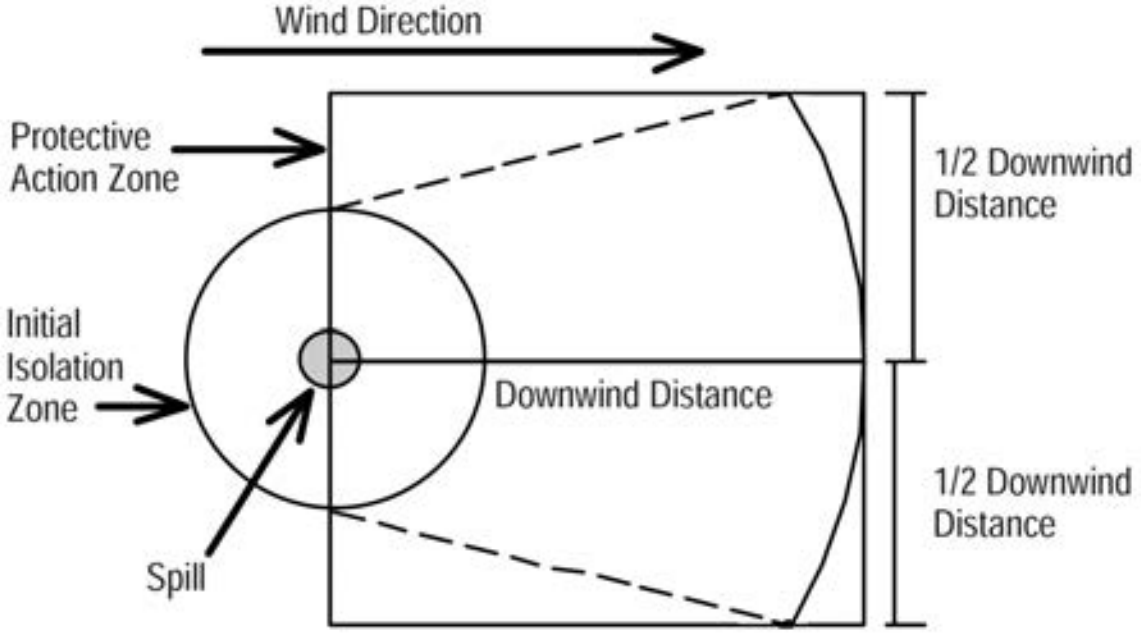


Figure 24: Graphical Representation of Protective Action Distances

The following figure presents the Beaufort Wind Scale for estimating the magnitude of wind. Supervisory personnel can utilize the Beaufort Scale in the field, by keeping a small copy of the Beaufort Scale in their field books.

Table 26: Estimating Wind Speeds – Beaufort Wind Scales

BEAUFORT RATING	SPEED (KM/H)	DESCRIPTIONS	SPECIFICATIONS FOR USE ON LAND
0	<2	Calm	Calm; smoke rises vertically.
1	~ 4	Light Air	Direction of wind shown by smoke drift, but not by wind vanes.
2	~ 8	Light Breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind.
3	~ 15	Gentle Breeze	Leaves and small twigs in constant motion; wind extends a light flag.
4	~ 25	Moderate Breeze	Raises dust and loose paper; small branches are moved.
5	~ 35	Fresh Breeze	Small trees in leaf begin to sway; created wavelets form on inland waters.
6	~45	Strong Breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	~ 55	Near Gale	Whole trees in motion; inconvenience felt when walking against the wind.
8	~ 70	Gale	Breaks twigs off trees; generally impedes progress.
9	~ 80	Severe Gale	Slight structural damage occurs.
10	~ 100	Storm	Trees uprooted; considerable structural damage.
11	~ 110	Violent Storm	Widespread structural damage.

Step #4 – Initiate Protective Actions

Initiate Protective Actions to the extent possible, beginning with those closest to the spill site and working away from the site in the downwind direction.

Definitions

Protective Actions

Protective Actions are those steps taken to preserve the health and safety of emergency responders and the public during an incident involving releases of hazardous materials and/or hazardous waste. Initial Isolation and Protective Action Distances predict the size of downwind areas which could be affected by a cloud of toxic gas. People in this area should be evacuated and/or sheltered in-place inside buildings.

Isolate Hazard Area and Deny Entry

–Isolate hazard area and deny entry" means keep everybody away from the area if they are not directly involved in emergency response operations. Unprotected emergency responders should not be allowed to enter the isolation zone. This –isolation" task is done first to establish control over the area of operations. This is the first step for any protective actions that may follow. Refer to the CANUTEC guide for Isolation and Protective Action Distances.

Evacuate

–Evacuate" means move all people from a threatened area to a safer place. Begin evacuating people nearby and those outdoors in direct view of the scene. When additional help arrives, expand the area to be evacuated downwind and crosswind to at least the extent recommended in the tables presented herein. However, even after people move to the

distances recommended, they may not be completely safe from harm. They should not be permitted to congregate at such distances. Send evacuees to a definite place, by a specific route, far enough away so they will not have to be moved again if the wind shifts.

Shelter In-Place

Shelter in-place means people should seek shelter inside a building and remain inside until the danger passes. Sheltering in-place is used when evacuating the public/employee(s) would cause greater risk than staying where they are, or when an evacuation cannot be performed. Direct the people inside to close all doors and windows and to shut off all ventilating, heating and cooling systems. In-place protection may not be the best option if

- the vapours are flammable;
- it will take a long time for the gas to clear the area; or
- buildings cannot be closed tightly.

Vehicles can offer some protection for a short period if the windows are closed and the ventilating systems are shut off. Vehicles are not as effective as buildings for in-place protection. It is vital to maintain communications with competent persons inside the building so that they are advised about changing conditions. Persons protected-in-place should be warned to stay far from windows because of the danger from glass and projected metal fragments in a fire and/or explosion.

Every dangerous goods incident is different. Each will have special problems and concerns. Action to protect the public/employee(s) must be selected carefully.

Protective Action Decision Considerations

The choice of protective actions for a given situation depends on a number of factors. For some cases, evacuation may be the best option; in others, sheltering in-place may be the best course. Sometimes, these two actions may be used in combination. In any emergency, officials need to quickly give the public/employees instructions. The public/employees will need continuing information and instructions while being evacuated or sheltered in-place.

Proper evaluation of the factors listed below will help to determine the effectiveness of evacuation or in-place protection. The importance of these factors can vary with emergency conditions. In specific emergencies, other factors may need to be identified and considered as well. The following list indicates what kind of information may be needed to make the initial decision.

Hazardous Material/Waste

- Degree of health hazard;
- Chemical and physical properties;
- Amount involved;
- Containment/control of release; and
- Rate of vapour movement.

The Population Threatened

- Location;

- Number of people;
- Time available to evacuate or shelter in-place;
- Ability to control evacuation or shelter in-place;
- Building types and availability; and
- Special institutions or populations, (e.g., lodge, junior mining companies etc)

Weather Conditions

- Effect on vapour and cloud movement;
- Potential for change; and
- Effect on evacuation or protection in-place.

4. ASSESS PERSONAL SAFETY AND METHOD OF APPROACH TO SPILL

PROTECTION OF FIRST RESPONDER HEALTH AND SAFETY

The protection of the first responder's health and safety is of the highest priority. The first responder is to assess the site of the spill and the surrounding areas for the following variables, prior to entering the direct area of the spill.

- **Exposure**
  - ***Method***
    - The methods of exposure to hazardous substances in various physical forms are: Inhalation, dermal exposure, injection and puncture;

  - ***Physical Form of Contaminant***
    - Exposure can occur by all physical forms of hazardous substances such as gas, vapours, liquids and/or solids (listed in order of most probable increasing risk to health and safety). **Table 27** presents the volatility of hazardous wastes/materials that are expected to be present at the Great Bear Lake sites. High volatility indicates that a substance will release vapours quickly and thus toxic or combustible concentrations of vapours can readily accumulate. Notwithstanding, non-volatile substances can still be a hazard if left long enough in confined space for vapours to reach equilibrium vapour pressure. Both volatility and vapour pressure are temperature sensitive. High temperature results in increased equilibrium vapour pressure and rates of volatility. Liquids tend to be more volatile than solids, however, even a solid can release significant gas/vapour under the correct ambient conditions due to sublimation.

Table 27: Volatility and Vapour Pressure of Hazardous Waste/Material at the Great Bear Lake Sites

HAZARDOUS WASTE/MATERIAL	Volatile (Yes/No)	COMMENTS
Diesel Fuel	Yes	Vapours can reach combustible concentrations if a confined space is present. Less volatile than gasoline and Jet fuel.
Gasoline	Yes	Vapours will quickly reach combustible concentrations, especially in a confined space.
Jet Fuel	Yes	Vapours will quickly reach combustible concentrations, especially in a confined space.

- **Explosion**
  - ***Sources of heat;***

- Sources of heat include: the sun, open flames, electricity (most likely source is generator); chemical reaction; friction and/or gas compression.

- The following is a brief description of the various sources of heat:

  - **The Sun** is the ultimate source of all heat. The sun‘s radiation can heat surfaces or vapours, and if the oxygen is available, combustion will occur. When the ambient air temperature is high or when the sun has heated the product the risk of explosion or exposure is greater as the increase in heat leads to an increase in vapour emission.

  - **Open Flames** - If vapour and oxygen are present in the right mixture near an open flame, combustion will occur.

  - **Electricity** - Most industrial fires are ignited by an electrical heat source. There are four types of electricity that may produce heat sufficient to ignite combustibles or flammable liquids:

    - ***Electrical sparking*** – a sudden one-time discharge of electricity. Sparking will not normally ignite combustible materials but it can ignite flammable vapours.

    - ***Electrical arcing*** – refers to electrical energy ―jumping‖ between two points.

    - ***Electrical resistance*** – all conductors have a characteristic resistance to the flow of electricity. The electrical energy lost to resistance is transformed to heat and/or light. (Light bulbs, electrical heaters, and stoves all use electrical resistance to function.)

    - ***Static sparking*** – may occur when two substances that were joined together are separated. Unless the two substances are grounded or bonded together to prevent a static spark, ignition of flammable liquid vapours may occur.

  - **Chemical Reaction** – Any two (or more) chemicals, when mixed together, may react. Some chemical reactions require an input of heat to occur, but many chemical reactions occur at any temperature, and give off heat. The heat given off in a chemical reaction may cause some vapour to form, or it may heat up vapours already present in the vicinity. The combination of heat, vapour, and oxygen (from the reaction, or in the atmosphere) can cause combustion. This combustion due to chemical reaction in the absence of any visible external heat source is called spontaneous combustion. Chemical reactions with strong oxidizers are especially dangerous, as the oxidizer will release oxygen and thus fire can be supported independent of atmospheric oxygen.

  - **Friction** – Any two surfaces, when rubbed against each other, produce heat due to friction. If there is vapour in the vicinity, and oxygen in the atmosphere, then the heat caused by friction could raise the temperature of the vapours to the fire point, and cause a fire.

- **Environment**
  - ***wind direction;***
    - Do **NOT** approach downwind – approach from upwind or crosswind;
  - ***confined spaces***
    - First responders are **NOT** to enter a confined space as this is by far the most dangerous environment as hazardous gases (toxic, combustible etc.) can accumulate and oxygen deficient atmospheres may be present. A recent example of an unsafe entry into a confined space, without proper preparation, occurred at the Sullivan Mine in British Colombia. Two paramedics responding to an emergency situation entered a shed in which an oxygen deficient atmosphere existed. The emergency responders were not wearing external sources of oxygen and were quickly overcome.
  - ***topography***

Topography can effect the dispersion of hazardous materials/wastes. Gases that are denser than air, can will sink and can accumulate leading to toxic or explosive concentrations.

- **Table 28** displays the vapour density with respect to air for hazardous waste/materials expected to be at the Great Bear Lake sites. Vapour density >1 indicates that the vapours will sink to the ground and can accumulate in depressions. Vapour density <1 indicates that the vapours will rise and disperse into the ambient air. However, vapour hazard should not be assessed solely on vapour density. For example, a highly toxic vapour can still be extremely dangerous if it has a vapour density <1, as this trait does not prevent it from being inhaled or absorbed.

Table 28: Vapour Density (Relative to Air) of Hazardous Waste/Material at the Great Bear Lake Sites

HAZARDOUS WASTE/MATERIAL	Vapour Density Relative to Air	COMMENTS
Diesel Fuel	~4	Will sink
Gasoline	3 – 4	Will sink
Jet Fuel	3.5 – 4	Will sink
Ethylene Glycol	~2.14	Will sink
Tailings Dust	<1	Does not produce vapour at ambient temperatures. Dispersion of dust particles highly dependent on atmospheric conditions
Asbestos fibres	<1	Does not produce vapour at ambient temperatures. Dispersion of fibres highly dependent on atmospheric conditions

- Topographical features can focus the flow of a hazardous liquids. Flow can be concentrated in valleys, rills, drainage swails, lows between bedrock outcrops, erosion gullies etc;.

  - ***Method of Egress***
    - When approaching any spill, one must always ensure that he or she has a clear and hazard free method of egress. Ensure that the flow and vapour migration of the spill is assessed as a clear route of egress can be cut off if the hazardous waste/material spreads quickly.

5. ASSESS INJURIES – BASIC FIRST AID (IF SAFE TO DO SO)

If it is safe to approach persons that have been injured, then the first responder is to assess injuries. However, the first responder is not to approach accident victims if it is not safe to do so.

Approaching an injured person in unsafe conditions will only result in additional injuries to the first responder and will create a worse situation. The following describes basic steps to be undertaken by the first responder when attempting to assess injured persons.

- Assess the area to ensure it is safe to approach the injured person. Refer to step four for assistance in determining the safety of the area;
- **If it is safe** to approach the individual then the first responder is to apply the basic principles of emergency first aid. All persons on the site are to have basic first aid with CPR.

EMERGENCY FIRST AID PROCEDURES

There are six emergency action principles to follow in order:

1. Survey the scene;
2. Check the casualty for unresponsiveness. If the person does not respond, the on-site medic will be required;
3. Do a primary survey and care for life-threatening problems;
4. Do a secondary survey, when appropriate, and care for additional problems;
5. Keep monitoring the casualty‘s condition for life-threatening problems while waiting for EMS to arrive; and
6. Help the casualty rest in the most comfortable position and give reassurance.

The above listed steps help keep you, the casualty, and other bystanders safe and increase the casualty‘s chance of survival.

Only the site medic is to move the injured person or apply any first aid other than that listed above.

The site medic is to immediately request the Site Supervisor to issue a request for emergency MEDIVAC if in his or her opinion such measures are required.

6. IDENTIFY THE SOURCE OF AND CAUSE OF THE SPILL (IF SAFE TO DO SO)

A. SOURCE

Spill of hazardous materials at the facility will most likely originate from the following sources:

- fuel drums (205L);
- greases and lubricants stored in various small containers;
- transport trucks, atv‘s, and an excavator;

In addition, one should record the location of the spill (preferably in GPS coordinates). Be specific and accurate. The potential for the spill discharging to water should be reported.

B. CAUSE OF THE SPILL

General actions that cause spills are as follows:

- natural causes (heavy rains, snow, ice, high winds etc,);
- equipment failure (improper equipment, poor maintenance, and poor condition of existing equipment);

- human error (carelessness, neglect, deliberate acts).

The following list outlines some of the specific causes of spills which occur at bulk storage facilities:

- spills due to overfilling of the tanks;
- rupture of the tanks;
- leaks in pipes, valves, pumps, fittings and other equipment;
- leaks in containment dikes;
- inadequate secondary containment systems;
- oil flow from diked area through open dike valve;
- piping and tank damage by collision with mobile equipment;
- spills from water draw off tanks;
- spills from tank bottom cleanout and sludge disposal;
- poor maintenance of pipes, valves, pumps, fittings and other equipment;
- spills from line flushing;
- spills from pipe and tank changes;
- spills from underground storage tanks; and
- possible sabotage.

7. ELIMINATE POTENTIAL SOURCES OF HEAT (IF SAFE TO DO SO)

No persons should carry to the scene any personal source of ignition such as lighters or matches. Radios should be verified that they will not ignite a combustible vapour prior to entry into the isolation zone when combustible vapours are of concern (important for gasoline spill). All storage tanks, including those used in the response are to be grounded. No smoking is permitted within 100m of the scene. Electricity may have to be shut off to the scene. All operators are to be aware of main power fuses and are to train in how to shut off power to sources, if required in an emergency. Sparking tools are to be avoided when responding to a spill.

8. SECURE THE FLOW AT THE SOURCE (IF SAFE TO DO SO)

Once the product has been identified and the dangers and hazards to the response team, public and environment have been assessed, further risk may be minimized by preventing additional loss of material. If the entire contents are already lost, the immediate action is to contain the spill on site.

Time is of critical importance in securing a leaking source. The response team should be prepared, upon arrival on site, to quickly assess the situation and be prepared with the necessary tools and equipment to secure the source.

The first assessment to be made in proceeding to secure the source is to identify the leak. Potential routes of leakage include, but are not limited to:

- orifice leak (puncture, rupture); or
- vessel failure (fire, explosion).

General procedures for securing the source are presented in the following table.

Table 29: General Procedures for Securing the Source of A Spill

NATURE OF LEAK/FAILURE	ACTION
Discharge due to an outlet leak	A. Transfer contents into another vessel B. Patch the rupture C. If leak is from a small vessel (i.e., a barrel), realign to have level of liquid below leak point

9. TAKE ACTION TO CONTAIN THE SPILLED PRODUCT (IF SAFE TO DO SO)

Although the resources may be limited, a first responder may have to contain a spill. The implementation of readily available spill containment kits may be an option to prevent the spread of a spill. Extensive measures to contain the spilled product may have to be provided during the spill response action. A discussion regarding spill containment measures is appended.

10. ASSESS SENSITIVE RECEPTORS (IF SAFE TO DO SO)

An evaluation of any sensitive downstream receptors that may be impacted by the spill is to be recorded. For example, if the spill is to migrate to a water body that is a source of drinking water then the municipality will have to be notified immediately and additional emergency planning will be required. In addition, if the spill is to migrate to sensitive fishing resources, additional resources may be required. Evaluating the risk of impacting sensitive downstream receptors will allow decisions regarding the need for additional resources and the manner in which the resources will be allocated to mitigate the spill (i.e., one downstream resource may be protected at the expense of another).

11. IDENTIFY ENVIRONMENTAL VARIABLES THAT COULD AFFECT SPILL RESPONSE (IF SAFE TO DO SO)

ENVIRONMETNAL VARIABLES

A spill is profoundly affected by climatic conditions. Important variables include, but are not limited to,

1. wind speed and direction;
2. air temperature;
3. snowfall and/or snow present on ground
4. type of snow (i.e., compactness, depth, moist or dry);
5. presence or absence of ice on water bodies and the condition and thickness of ice;
6. if open water is present, degree of wave action;
7. frozen ground or thawed active layer; and
8. if thawed active layer then degree of saturation of soils (i.e., wet, moist or dry).

Often numerical numbers cannot be estimated for many of the above listed environmental variables. Best estimates are an acceptable alternative to numerical measurements. However, thickness of ice should only be reported if absolutely known. If no ice thickness measurements are known, assume the ice is thin and cannot be traveled upon.

12. ESTIMATE THE REQUIRED SPILL RESPONSE RESOURCES (IF SAFE TO DO SO)

An estimate of the resources required to contain the spill should be provided. Order of magnitude will suffice, however detailed information is preferred.

13. CONTACT THE DESIGNATE (IF NOT AREADY CONTACTED) TO:

- initiate the Spill Contingency Plan;
- report the spill; and
- coordinate and monitor the spill response.

13. INITIATE THE SPILL REPORTING

The designate is to immediately initiate the spill reporting plan by contacting and engaging the necessary resources to contain, recover and remediate a spill.

SPILL REPORTING

1) Spills Less Than 100L

All spills of oil less than 100L are to be reported to the Site Superintendent. All spills will be internally logged and strictly adhered to. Such logs will be available to the client upon request.

2) Spills Greater Than 100L

In NWT, all spills of Class 3 hazardous materials in excess of 100L must be reported. A telephone line dedicated for this service is known as the:

24-HOUR SPILL REPORT LINE: (867) 920-8130

The purposes of reporting a spill through this telephone service are:

- To provide a uniform and consistent approach to spill response in NWT;
- To assist field personnel in responding to the spill, in undertaking proper site assessments, and in identifying recovery and disposal methods;
- To elicit technical backup from personnel in various government agencies in the Territories and from specialized firms and organizations in Canada;
- To dispatch (when needed) personnel and equipment to the spill site;
- To provide technical information on material properties, response and site restoration procedures, as required;
- To monitor the progress of response and clean-up actions; and
- To provide a central clearing house or command post for progress of spill response actions.

3) Reporting Procedure

The procedure for reporting a spill to the 24Hour Spill Hotline (spill line) is:

1. Fill out the spill report form as completely as possible before contacting the 24-Hour Spill Report Line (Spill Line). If incomplete information is available, the Spill Line should be contacted regardless.
2. Report the spill immediately to the Spill Line (867) 920-8130. Collect telephone calls can be made by informing the operator that you wish to report a spill.

3. Where facsimile machines are available, follow up immediately by sending a faxed copy of the spill report (867) 873-6924.

4) Required Information

The reporting of spills in NWT requires the reporting of specific information. A spill report form is available for these purposes and a sample copy is provided as **Error! Reference source not found.**30. In addition, the following reporting regime satisfies the requirements of paragraphs 11.(1) (a) to (k).

The information specifically needed when reporting a spill is as follows,

Report date and time

The written report should be prepared as soon as possible after the spill event to ensure completeness.

Date and time of spill (if known)

Reporting the time of spill will determine the measures and approaches which may be used for response; the greater the period of time the less that can be done to contain and control the spilled material.

Original Report or Up To Date

If you know, indicate if the report is an original report or an updated report. If it is an updated report, the update number should be identified.

Location and Direction (If Moving)

Record the location of the spill (preferably in GPS coordinates). Be specific and accurate. The potential for the spill discharging to water should be reported.

Party Responsible for Spill

The party who allowed or caused the spill to occur is to be reported along with the OM contact information.

Product(s) Spilled and Estimated Quantities (Mass (kg)/Volume (m^3 or L)

The material spilled should be positively identified. Product names should be reported correctly, ensure correct spelling. If the material is not known, assistance should be requested. An estimate of the spill quantity should be made, providing metric volumes or weights if possible. Identification of container type (tank truck, barge, etc.) will assist in providing an initial estimate of the magnitude of the spill.

Cause of Spill

Identify the general incident category (truck overturn, barge grounding, tank overfill, pipeline rupture, etc.) causing the spill.

Is the Spill Terminated? (Y/N)

Is the spilled material continuing to leak from the source? A yes or no response is required.

If the Spill is Continuing

Calculate and provide the estimated rate. If the spill is of a continuing nature, assistance can be provided to identify options for securing the source.

Is Further Spillage Possible? (Y/N)
A yes or no response is required.

Extent of Contamination (Area = m^2)
Estimate the land or water area covered by the spill. This will assist in determining the potential environmental effects and types of measures needed to contain the spill.

Factors Affecting Spill or Recovery
Factors such as manpower and equipment availability, temperature, wind, snow, ice, terrain, buildings, etc. will require consideration when undertaking an effective spill response program. Record and report such conditions as they pertain to the spill area.

Containment (Natural Depressions, Dikes, etc.)
Is containment by natural or artificial means? Provide information on how the spill has been contained so that assessments may be made regarding the need for further actions

Action, If Any, Taken
Provide information on the actions that have already taken place to contain, recover, clean up or dispose of spill material.

Do you require assistance? (Y?N)
A yes or no response required. If yes, provide information on additional manpower and equipment needs, fire response, medical aid, safety equipment requirements, etc.

Federal – INAC Mining Spill Reporting Protocol
NWT 24 Hour Spill Report Line - (403) 920 – 8130 (can call collect)

The INAC Spill Reporting Protocol for Mining Operations:

- applies to companies authorized to carry on exploratory or production activities (assumed to further apply to remediation) in the NWT who satisfy the spill reporting protocol;
- applies to spills where INAC would be designated as lead agency as per the NWT/Nunavut Spills Working Agreement;
- be consistent with the reporting triggers in the NWT SCPRR; and
- require that each operator have an approved spill contingency plan implemented for their respective operation.

For the purpose of this spill protocol, an ~~"i~~immediate reportable spill" to the 24 hour NWT Spill Line, is defined as a release of substance that poses an imminent environmental or human health hazard or meets or exceeds the volumes in Schedule 1. All other releases can be handled as part of ongoing operations and maintenance and do not need to be immediately reported but should be immediately cleaned up. An on-site record of all spills, immediately reported or not, shall be maintained by the proponent and submitted to the INAC District Inspector either monthly, or at an interval acceptable to the Inspector. The Site Superintendent is responsible for ensuring that such a list is created, maintained and submitted monthly to the INAC District Inspector. Spill

quantities the trigger the requirement to report to the authorities are the same as the GNWT criteria.

Federal – Transport Canada CANUTEC
(613) 996-6666 (call collect)

CANUTEC is a federal spill reporting line that must be notified in the case of:

- lost, stolen or misplaced infectious substances;
- an incident involving infectious substances;
- an accidental release from a cylinder that has suffered a catastrophic failure;
- an incident where the shipping documents display CANUTEC's telephone number 613-996-6666 as the emergency telephone number; or
- a dangerous goods incident in which a railway vehicle, a ship, an aircraft, an aerodrome or an air cargo facility is involved.

CANUTEC is the Canadian Transport Emergency Centre operated by Transport Canada to assist emergency response personnel in handling dangerous goods emergencies. This national bilingual advisory centre was established in 1979 and is part of the Transportation of Dangerous Goods Directorate. It has the mandate to regulate the handling, offering for transport and the transport of dangerous goods by all modes in order to ensure public safety. CANUTEC is one of the major programs instituted by Transport Canada to promote public safety during movement of people and goods in Canada

Internal Spill Reporting
Appendix A of the INAC Mining Spill Reporting Protocol Section 7. states that,

> *" All minor spills shall be reported to the District INAC Inspector(s) either monthly in the condensed form attached or at an interval acceptable to the Inspector(s)"*

As such, all non-reportable minor spills will be documented in the following form titled ‗INAC Monthly Minor Spill Reporting Form' by the AEL Field Engineer and submitted monthly to the Crown Engineer. The Crown Engineer is to forward the form to the PWGSC Project Manager who will in turn issue the form to the appropriate INAC Resource Office. This form is located in Appendix A of this document.

COORDINATE AND MONITOR THE SPILL RESPONSE
All communications are to be directed to the Operations Manager, who is responsible for coordinating and monitoring the spill response. The Operations Manager is responsible to ensure that the Spill Headquarters are erected (if required) and properly fitted with staff, communications, office space and other additional resources. The exact location of a Spill Headquarters and contracts to ensure its delivery will be put in place following contract award.

14.12.1 Site Specific Spill Response Plans

PRITORITY OF PROTECTION
The following site specific spill response plans have bee constructed to protect resources in the following order:

PRIORITY #1 – PROTECTION OF HUMAN HEALTH

Avoiding or limiting exposure to the spilled product and associated vapours and any related fires/explosions is the first priority of the spill response plans. No spill response is to be undertaken without the proper response methods and personal protective equipment.

PRIORITY #2 – PROTECTION OF WATER RESOURCES

Once employee health and safety has been assured, water resources must be protected. The highest priority is to protect water quality of Great Bear Lake.

PRIORITY #3 – PROTECTION OF PEATLAND AND WETLANDS

Following water resources, unimpacted peatland and wetlands are to be protected.

PRIORITY #4 – PROTECTION OF SITE SOILS

The last resource to be protected during spill response are the site soils such as waste rock, roads, packed soils etc.

DESIGNATE

The Site Superintendent or the AEL Field Engineer in absence of the Site Superintendent, are the spill response designate.

SPILL RESPONSE EQUIPMENT INVENTORY

The following tables present basic emergency and spill response equipment that AEL will provide at all times adjacent to fuel storage. The exact number of spill kits is dependent upon the volume of hazardous materials/waste that is stored.

Table 30: Spill Kit Contents

ITEM	SITE KIT	VEHICLE KIT	REMARKS
Sorbent Socks	25	5	3 inch x 4 feet
Hole Repair Putty	5 Tubes	1 Tube	Emergency repair of leaks
Super Kleen sorbent	60 in sot	1 bag each	4 kg (12 bags in storage)
Sorbent Boom	2 – 20ft x 4 inch 1 – 40 foot x 4 inch		Protect ditches and resupply operation
Sorbent Pads	200 pads	5 pads per vehicle	12 x 18 inch (60 in storage)
Granular Sorbent	50 x 25 kg bags	10 x 25 kg bags	50 bags in storage
Drums for containment/disposal	5		Removable lids
Heavy Duty plastic bags	24	16	Large garbage bag size
Drain covers (heavy plastic sheets)	15	1 each vehicle	1M x 1M
Aluminum shovel	2 each in office and garage	Each vehicle	For granular sorbent, sand, dirt , snow etc

SPILL RESPONSE – HAZARDOUS MATERIALS (OIL)

DISCHARGE FROM DRUM – SLOW LEAK

Discussion
A slow leak from any containment of oils is not a high risk situation. However, such a leak could indicate a more serious structural problem with the containment. As such all slow leaks MUST be reported immediately to the designate. The designate is to ensure that an investigation into the cause of the leak is undertaken and the root cause is identified. Potential reasons for minor leaks include, but are not limited to,

- corrosion around weak structural areas of the drum such as welds, riveted seams, entrances etc.;
- general corrosion of the drum (a very serious problem that will lead to drum failure in the near future);
- a valve not properly closed;
- changes in volumes of the contents of the drum due to changes in ambient temperature. Such volume changes are most significant when volatile fuels such as Jet-A/B, gasoline, AVGas etc. are filled in the winter and are stored over summer. In the winter the vapour pressure in the void inside the drum will be lower than that in the summer. When the temperature increases in the summer, the vapour will expand and can cause minor to major drum rupture.

Minor leaks can be identified by:

- staining from a point source on the exterior of a drum;
- staining on the ground;
- odour near a drum; and
- unidentified volume losses.

Environmental Impact
Due to the frequency of inspection, the total volume spilled as a result of the minor leak is not expected to be significant. Spills are most likely to effect the immediately surrounding soils. Volumes will most likely be less than reportable quantities. No impact to water is likely.

Spill Response Method
Following first response the contents that have been spilled are to be cleaned up using standard available spill response equipment. The impacted material is to be collected by hand and placed in a hazmat drum. The drum is to be labelled as per TDGA and WHMIS regulations and placed into the on-site hazardous waste storage facility. Do not overfill the barrels. The AEL Field Engineer will assess the clean up and determine if the efforts are satisfactory.

Occupational Health and Safety
Minor spills of oils will not pose a major threat to worker safety. However basic safety measures must be observed. No smoking or other source of ignition is to be on the worker or within 20 m of the area.

DISCHARGE FROM DRUM – MEDIUM LEAK

Discussion
A medium leak from any containment of oils is an immediately high risk situation. Such a leak can indicate a soon to occur failure of the drum containment. Medium leaks can be caused by:

- advanced corrosion around weak structural areas of the drum such as welds, riveted seams, entrances etc.;
- advanced general corrosion of the drum (a very serious problem that will lead to drum failure in the near future);
- significant overfilling;
- changes in volumes of the contents of the drum due to changes in ambient temperature. Such volume changes are most significant when volatile fuels such as gasoline are filled in the winter and are stored over summer. In the winter the vapour pressure in the void inside the drum will be lower than that in the summer. When the temperature increases in the summer, the vapour will expand and can cause major drum rupture.

Medium leaks can be identified by:

- significant staining from a point source on the exterior of a drum;
- widespread general staining on the exterior of the drum;
- significant staining on the ground;
- odour near a drum; and
- unidentified volume losses;
- vehicular impact with the storage drums;
- fire or explosion

Environmental Impact
Medium leaks represent a significant risk to the environment. Diesel, Gas and Jet-B fuels will rapidly and vertically penetrate the soil profile. A portion of the fuels will be adsorbed by the soil matrix. However, if the leak is not identified immediately, there is a significant risk that the adsorptive capacity of the soil will be exhausted and the fuels will leach into the subsurface, travel along the bedrock or permafrost at the bottom of the active layer or along a less permeable substrate. Such leaching can eventually discharge to a surrounding water body.

Spill Response Method
Initiate first responder protocol which includes contacting the Site Superintendent. The Site Superintendent is to immediately inform the Crown and AEL Field Engineers. All three are to report to the site of the spill with the following equipment:

- half mask air purifying respirators fitted with hydrocarbon vapour/P100 particulate cartridges,
- first aid kit;
- fire extinguisher; and
- the RKI Eagle Portable Gas Detection System

The specific response will depend upon:

- the amount of product that has been spilled;
- if the product is continuing to leak; and
- the immediate health risks associated with the leak

The following describe three specific response scenarios for the differing conditions that could arise from a medium sized leak.

Scenario #1

Conditions
The following conditions apply to medium leak Scenario #1:

- The leak was noticed and reported quickly;
- minor amounts of product have spilled;
- product is not longer leaking;
- exposure to vapours and risk of fire and/or explosion is insignificant; and
- drum failure is not likely to occur.

Response
For such a spill the response will be similar to that of a minor spill. However, some excavation may be required to remove soils that have been impacted at depth.

Occupational Health and Safety
Refer to Minor Spill Response Method

Scenario #2

Conditions
The following conditions apply to medium leak Scenario #2:

- the leak was noticed and reported quickly;
- minor amounts of product have spilled;
- the product continues to leak, cannot be easily repaired by first responder;
- exposure to vapours and risk of fire and/or explosion is significant as free product is continually being released and thus vapours are being replenished, decreasing ambient air dilution effects; and
- failure of the drum could occur.

Response

Initial Investigation
The AEL Field Engineer (AFE) and Site Superintendent (SS) are to immediately report to the site of the spill. The following items are to be mobilized along with the AFE and the SS:

- half mask air purifying respirators fitted with hydrocarbon vapour/P100 particulate cartridges,
- first aid kit;
- fire extinguisher; and
- the RKI Eagle Portable Gas Detection System

Any vehicle used by the AFE and the SS is to be parked outside the isolation zone. This is to ensure that the vehicle, which is an ignition source, does not ignite any vapours that are present adjacent to the leak at ignitable concentrations. The AFE and the SS are to don the respirators and ensure that no sources of ignition are on their person. The leak is to then be assessed to determine if it can be stopped.

Leak Can be Fixed Prior to the Significant Loss of Product

If the leak can be fixed then the necessary measure are to be immediately implemented to fix the leak. Once the leak has been stopped and the site is safe, the impact of the leak is then to be assessed by the AEL Field Engineer. The impacted matrix is to be immediately removed to prevent the long term leaching of product into the surrounding environment. The exact method of product disposal is to be determined in the field by the AEL Field Engineer.

Leak Cannot be Fixed Prior to the Significant Loss of Product
If the leak cannot be fixed then a temporary containment drum is to be immediately mobilized to the site of the leak to allow removal of the product from the compromised drum. Since AEL will only be using 205 L drums to store fuel, an empty drum can be used to all for reception of fuel.

A water truck could be required if the potential for fire and/or explosion exists. Spill kits can be used to create surface dikes to contain the fuel. If the leak is considerable an excavator or backhoe can be mobilized to the site to excavate an interception ditch. Water resources must be protected at all times.

Once the product flow has ceased the impacted matrix is to be immediately excavated and removed to prevent additional subsurface product migration. The AEL Field Engineer is to determine when sufficient soils have been excavated using the PetroFLAG System. The area is then to be backfilled with clean borrow and compacted.

Scenario #3

Conditions
The following conditions apply to medium leak Scenario #3:

- the leak was not detected immediately and significant product has escaped from the fuel drum into the surrounding environment.
- the extent of sub-surface plume is not known;
- the product may or may not continue to leak. The leak may or may not be easily repaired by first responder;
- product is leaking from a fuel drum and as such significant release of product could result (i.e., high risk to water resources); and
- failure of the drum could occur.

Response
The key aspect of response scenario #3 is that significant product has escaped and that the extent of the subsurface plume is not known. As such the:

- The Site Superintendent is to immediately ensure the mobilization of an excavator or backhoe, a dozer and a water truck to the site following confirmation from the AEL Field Engineer that the concentrations of vapours in the isolation zone are below 10% of the LEL. Additional temporary drums are required if the leak continues and product remains in the drum;
- The AEL Field Engineer is to immediately assess the safety of the site with the RTK Eagle gas sniffer and is then to determine the extent of the spill. The primary

delineation goals are to protect water resources and prevent further sub-surface migration of product. For such an assessment, the following steps are to be taken:

- The local receiving bodies of water are to be visually inspected for any presence of hydrocarbons;
  - If hydrocarbons have reached a water source, adsorbent booms are to be immediately deployed and aqueous oil recovery is to be initiated to prevent further oil slick development;
- If hydrocarbons are not present, the excavator or backhoe is to dig test pits, from the water shorelines towards the source of the spill. This will allow the outer edge of any sub-surface plume to be first detected and will keep the excavator operator as far as is possible from the source of the spill and thus any ignitable vapours. The soils of the test pit are to be tested for hydrocarbons by the AEL Field Engineer using the PetroFLAG Field Kit Prior to entering any test pit the atmosphere is to be tested by the AEL Field Engineer.

Any product remaining in the drum is to be transferred to secondary storage drums if safe to do so. Free product pooled in local topographical low points can also be collected into temporary containment.

Once the oil slick (if present) has been contained and the extents of impacted soils have been determined, the impacted matrix is to be immediately excavated and removed to prevent additional subsurface product migration. The AEL Field Engineer is to determine when sufficient soils have been excavated using the PetroFLAG Field Kit. Confirmatory samples from the base and edges of the excavation are to be taken and submitted to a CAEAL and CCME certified laboratory for Fraction F1 to F4 analysis. The area is then to be backfilled and compacted.

Occupational Health and Safety

- following first response the immediate area is to be evacuated by all persons with the exception of the Site Superintendent and AEL Field Engineer who will assess the situation – a medium leak could quickly leak to catastrophic failure, thus rapidly increasing the health and safety risk of the situation;
- persons assisting the Site Superintendent and the AEL Field Engineer are only to approach the site of the spill following request by the Site Superintendent;
- no sources of ignition are to be present on persons responding to the spill or within 100 m of the spill;
- no sparking tools or electrically powered tools are to be used to attempt to seal the leak;
- the Site Superintendent and AEL Chemical Engineer are to wear oil resistant gloves and half mask respirators fitted with hydrocarbon vapo/P100 particulate cartridges.
- the Site Superintendent and AEL Chemical Engineer are to bring a fire extinguisher with them when investigating the leak.

DISCHARGE FROM DRUM – CATASTROPHIC FAILURE

Discussion
A catastrophic failure can result from:

- further weakening of a minor opening or major leak (during a spill response);
- failure at a location on the drum with advanced corrosion or other structural instability that is not leaking;
- impact from a vehicle or other moving object; or
- fire and/or explosion.

Environmental Impact
A major structural failure of multiple fuel drums (205L) represents the greatest risk to environmental health with respect to spills that could occur during the Great Bear Lake Phase 1 Remediation. A portion of the spilled fuels will be adsorbed by the soil matrix. However, as the contents of the drum(s) are most likely to be released instantaneously, the absorptive capacity of the soil will quickly be exceeded. Furthermore, the general area surrounding the bulk fuel storage site is hard packed and will thus not readily permit infiltration. As such, the majority of oil is expected to flow overland, within the confines of the bermed bulk storage fuel area. Such a spill could result in migration of oil to the receiving water bodies.

Spill Response Method
Initiate first responder protocol including contacting the SS and evacuating the area as per CANUTEC recommendations. The SS is to immediately contact the AFE, Crown Engineer (CE), Medic (ME) and Health and Safety Officer (HSO). The ME and HSO are also to report to the site, but are to stay outside of the evacuation limits. The site ME is to be prepared to respond to burns, vapour exposure, cuts, and impact injuries from explosions etc. The Health and Safety Officer is to monitor the AFE and SS from a distance and is to document the response steps. Non sparking radios are to be used for communications between the AFE/SS team and the HSO/ME team. The following items are to be mobilized along with the AFE and the SS:

- 2 x half mask air purifying respirators fitted with hydrocarbon vapour/P100 particulate cartridges,
- 1 x first aid kit;
- 1 x fire extinguisher; and
- 1 x RKI Eagle Portable Gas Detection System

Any vehicle used by the responders is to be parked outside the immediate isolation zone limits. This is to ensure that the vehicle, which is an ignition source, does not ignite any vapours. The AFE and the SS are to don the respirators and ensure that no sources of ignition are on their person. The following steps are then to be taken by the AFE and the SS

1. The Site Superintendent is to immediately ensure the mobilization of an excavator or backhoe, dozer, water truck and any available secondary storage tanks. The excavator or backhoe and the dozer are to remain outside of the immediate isolation zone until the AEF has determined that concentrations of vapours are below 10% of the LEL. In addition, temporary storage drum(s) are required if the leak continues and product remains in any drum(s);
2. The AEF is to immediately assess the safety of the isolation zone area with the RTK Eagle gas sniffer.

- If the concentration of vapour in the isolation zone is less than 10% of the LEL then the excavator or backhoe and a dozer are to be immediately enter the isolation zone to install ditches and dikes to protect the surrounding water bodies. The excavator or backhoe is to dig an interceptor trench to bedrock (if possible). The dozer is to construct a dike. The inceptor ditch is to collect any subsurface product and the dike is to contain any overland flow. The inceptor ditch and dikes are to be placed between the leak and water resources, in the most likely migration paths. The material excavated from the ditch can be used to construct the dike. If available, the ditch and dyke are to lined with an impermeable liner. Notwithstanding, the dike is to be compacted as best as possible (dependent upon available material). The dikes and ditches are to be placed as close as possible to the water body without impacting the shoreline and water quality with suspended solids and entering areas with saturated soils that cannot support the loading of the heavy equipment. The following figure displays the most probable location for interception ditches and containment dikes.

The 3" hydrocarbon diaphragm pump and empty 45 gallon drums and any other means of free product containment are to be mobilized to the ditch location so any free product can be pumped and containerized.

The trenches and dikes are to be monitored until either the leak has been contained or the contents of the tank have emptied or are below the level of the leak. Any hydrocarbons that report to the ditch or collect behind the dike are to be immediately removed.

Any product remaining in the drum(s) is to be transferred to storage drum(s) if safe to do so. Free product pooled in local topographical low points can also be collected into temporary containment.

Water resources are to be inspected by the AFE following the assessment of safety. The method is as follows.

- The local receiving bodies of water are to be visually inspected for any presence of hydrocarbons;
    - If hydrocarbons have reached a water source, adsorbent booms are to be immediately deployed and aqueous oil recovery is to be initiated to prevent further oil slick development;

Once the oil slick (if present) has been contained and the trenches and dikes have been constructed the AFE is to determine the extents of impacted soils. The excavator is to dig test pits from the trench/dike towards the source of the spill. The RKI Eagle Portable Gas Detection System is to be used to ensure that the test pits are safe to enter. Next the soils are to be tested using the PetroFLAG Field Kit.

Once the extent of the impact has been determined, the impacted matrix is to be immediately excavated and removed to prevent additional subsurface product migration. The AEL Field Engineer is to determine when sufficient soils have been excavated using the PetroFLAG Field Kit. Confirmatory samples from the base and edges of the excavation are to be taken and

submitted to a CAEAL and CCME certified laboratory for Fraction F1 to F4 analysis. The area is then to be backfilled and compacted.

Occupational Health and Safety

- following first response the immediate area is to be evacuated by all persons with the exception of the Site Superintendent, AEL Field Engineer who will assess the situation;
- persons assisting the Site Superintendent and the AEL Field Engineer are only to approach the site of the spill following request by the Site Superintendent;
- no sources of ignition are to be present on persons responding to the spill or within 100 m of the spill;
- no sparking tools or electrically powered tools are to be used to attempt to seal the leak;
- the Site Superintendent and AEL Chemical Engineer are to wear oil resistant gloves and half mask respirators fitted with hydrocarbon vapo/P100 particulate cartridges.
- the Site Superintendent and AEL Chemical Engineer are to bring a fire extinguisher with them when investigating the leak.

DISCHARGE FROM OPERATOR DURING FILLING – OVERFILLING EQUIPMENT TANK

Refer to *Discharge From Drum – Minor Spill.*

LEAK OR COMPLETE FAILURE OF 45 GALLON HAZARDOUS WASTE DURM BARREL CONTAINING WASTE OIL

Waste oil is to be transferred from the AST D and E into 45 gallon empty metal fuel drums. Drums are to be strapped to pallets. 2 m is to be maintained between each row of pallets to allow ease of daily inspection by the Site Superintendent. Leak of waste oil from 45 gallon drums can be caused by:

- bung not properly placed on the barrel or bung missing coupled with storage on its side or upside down;
- leaking orifice caused by impact, intentional damage or other mechanism such as corrosion.

A leaking 45 gallon drum is to be placed into an over pack container or any leaking orifice are to be sealed. Over packs will be stored along with the waste oil and supplies for sealing leaking orifices in drums are to be contained in spill response kits. Any impacted soils are to be collected and placed in temporary storage for subsequent remediation during phase 2.

Figure 25, present on the following page, displays various methods for sealing a leaking 45 gallon drum.

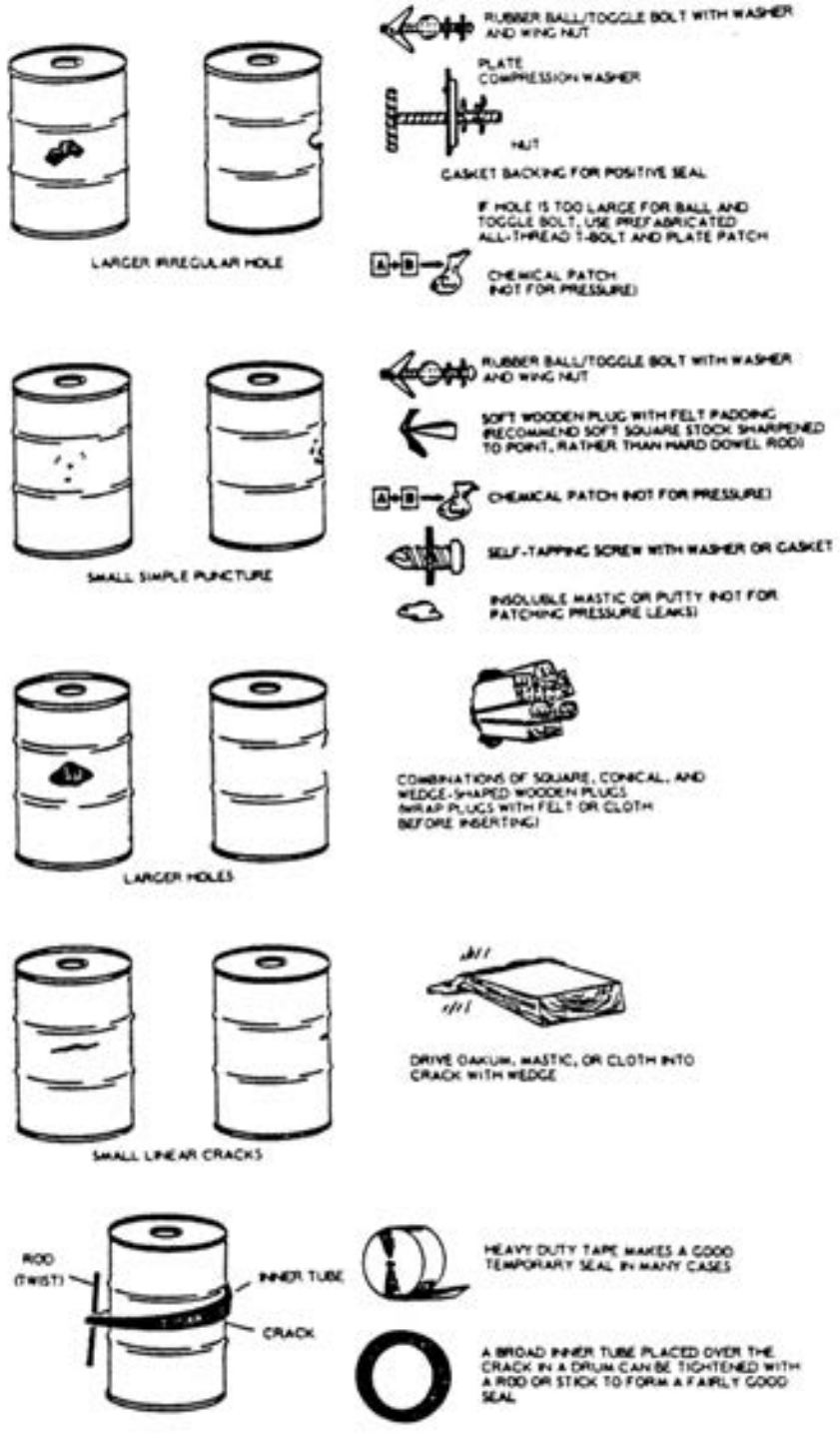


Figure 25: Methods of Sealing Leaking Orifices in 45 Gallon Drums

OIL SPILLED DUE TO EQUIPMENT LEAK AT SITE

The equipment is to be inspected daily before operation. Any leaks are to be immediately reported to the Site Superintendent. The leak is then to be repaired by the on-site heavy duty mechanic. If the mechanic is not immediately available a collection pan is to be placed under the equipment and the contents are to be monitored to ensure that the pan does not overfill. Any impacted soils are to be collected and placed in temporary storage for subsequent remediation during phase 2. Leaking equipment is not to be used.

OIL SPILLED DUE TO EQUIPMENT ACCIDENT AT SITE

Equipment accidents can involve one or more pieces of equipment. The priority during response to equipment accidents is to ensure that the operators are safe and if required administered the proper medical services.

The first responder is to immediately contact the SS. Along with the First Response protocols, the First Responder is to report if fire response is required and the degree of the accident. The SS is to contact the ME and the ME is to immediately report to the scene along with the SS and the AFE. If a fire has occurred or could potentially occur, the water truck along with fire extinguishers is to immediately report to the scene. The priority in this situation is to ensure that the equipment operator is provided the necessary first aid. However, if the equipment is not safe to approach due to fire or explosion or chemical hazard, no one should risk their own well being until the fire has been suppressed or proper PPE is available, respectively.

Following confirmation from the SS that the scene is safe to approach, spill response is to be initiated. Additional heavy equipment may be required to remove the damaged equipment to allow spill response to occur. The source of the spill may need to be secured and contents of the equipment reservoirs may need to be transferred to temporary storage. Following the securing of the source, the impacted matrix is to be collected and placed in temporary storage for subsequent remediation during phase 2. Berms can be deployed to contain free product and protect water resources.

LEAK OF SOLUTION FROM HAZARDOUS WASTE 45 GALLON DRUM IN CONTAINMENT AREA

Leave the site and Immediately contact the SS. Do not attempt to clean such a spill on your own. The Site Superintendent will immediately warn all persons on-site not to enter the isolation zone. The SS and the AFE will assess the situation and develop an appropriate response. The site is to be evacuated according to the CANUTEC recommended isolation and protective distances. If possible, the 45 gallon tank is to be placed into an over pack container or any leaking orifice are to be sealed (refer to **Figure 25**). Supplies for sealing leaking orifices in drums are to be contained in spill response kits. All impacted soils are to be treated as hazardous waste and according to the substance released.

POST SPILL RESPONSE INVESTIGATION

Following a spill response effort (identification → initial response → spill contingency plan → remediation), the Project Manager is responsible to ensure that an investigation is undertaken to identify:

1. root cause of the spill;

2. the efficiency of the initial response with respect to protection of the environment;
3. the efficiency of the SPC with respect to protection of the environment;
4. the efficiency of the remedial measures implemented post recovery;
5. efficiency in the coordination of resources and personnel;
6. health and safety;
7. public perception and readiness; and
8. lessons learned.

The report is to be issued to PWGSC Project Manager for review and approval. The PWGSC Project Manager is responsible for issuing the report to any applicable third parties.

15 LEGISLATION

This section gives an overview of the Legislation pertinent to the reporting of workplace accidents and incidents, employee and employer responsibilities, and medical surveillance for the reduction of workplace illnesses and injuries. It also gives a brief description of the applicable regulations and defines some critical terms contained therein.

15.1 Accident/Incident Reporting and Investigation

Definitions

Term	Description
Accident	An undesired event that results in physical harm to a person or damage to property.
Incident (near-miss)	An undesired event that has the potential to result in harm to a person or damage to property.
Accident/incident Investigation	The analysis of facts and data gathered following a thorough examination of all factors involved.
Serious injury or accident	Injuries and accidents considered serious include the following: ➢ an injury or accident that results in death ➢ an injury or accident that results in an employee‘s being admitted to a hospital for more than two days ➢ an unplanned or uncontrolled fire, explosion, or flood that causes or has the potential to cause a serious injury ➢ an incident that may have caused serious harm or death.

The investigation of accidents and incidents attempts to locate preventative solutions in order to:

- ✓ reduce future risk
- ✓ Identify any flaws to the work methodology that may impact safety.
- ✓ implement necessary changes to job training or to PPE
- ✓ identify unsafe acts and/or conditions.
- ✓ Reduce the risk of repeat incidents.

15.2 Legal Requirements for Accident/Incident Reporting and Investigation

OH & S Act s13
Employers are required to investigate and report any serious work place injuries or accidents. The investigation report must be retained for a period of two years.

First Aid s15
A record book containing documentation on any First Aid administered at the work site must be maintained and available for 3 years.

WCB Act s28
The employer must report a lost time (or a potential lost time) accident to the Worker's Compensation Board within 72 hours of learning of the accident. Appropriate forms must be completed by the employer and the employee following a work place injury

15.3 Responsibilities for Occupational Health and Safety

OH & S Act s2
The employer shall ensure, as far as it is reasonably practicable to do so:

1. The health and safety of
    a) employees engaged in the work of that employer, and
    b) those employees not engaged in the work of that employer but present at the work site at which that work is being carried out, and

That the employees engaged in the work of that employer are aware of their responsibilities and duties under this Act and the regulations.

Employer Responsibilities
In the event of a serious injury or accident, the employer shall:

- ✓ Carry out an investigation.
- ✓ Prepare an investigation report and retain this report for two years.
- ✓ Ensure that the accident scene remains as undisturbed as possible until the investigation is complete.

Employees are to:
- ✓ Ensure the health and safety to one self, and that of others as much as is reasonably possible.
- ✓ Follow the guidelines outlined in Legislation.
- ✓ Report any work place injuries to their supervisor immediately.
- ✓ Undergo training for safe work practices and use PPE as required.

15.4 Right to Refuse Unsafe Work Legislation

OH & S Act s27
No employee shall:

1) carry out work that he/she believes to present imminent danger to himself/herself or to others at the work site
2) operate any tools or equipment that present an imminent danger to himself/herself or others at the work site

Imminent danger means a danger that is not normal to the occupation.

Employers pay premiums to the WCB (Worker's Compensation Board) to provide injury insurance coverage to employees in the event of a work place accident that results in time lost from the job. The Worker's Compensation Act requires that:

1) The employer:
   - ✓ Report all time lost injuries to the WCB within 72 hours using standard forms.
   - ✓ Provide necessary First Aid and retain records of this First Aid.
   - ✓ Provide transportation to treatment facilities.
   - ✓ Ensure that the employee receives pay for the day of the injury.

2) The employee:
   - ✓ Obtain First Aid following an injury and notify the employer regarding the injury.
   - ✓ Visit a doctor for an assessment of the injury and not change doctors without the consent of the WCB.
   - ✓ Complete an accident report.
   - ✓ Not leave the province without the permission of the WCB.

APPENDIX A – FORMS

Form Title: Bear Safety Training Checklist

DATE	SUBJECTS COVERED	EMPLOYEES IN ATTENDANCE	INSTRUCTOR(S)	EMPLOYEE SIGNATURE	TRAINER SIGNATURE

Form Title: Tracking Firearm Issuance

DATE	FIREARM TYPE	# OF AMMUNITION	TYPE OF AMMUNITION	ISSUER NAME AND SIGNATURE	RECEIVER NAME AND SIGNATURE	REASON FOR ISSUANCE OF FIREARM

Form Title: Tracking Firearm Use

PERSON WHO DISCHARGE AMMUNITION	NO. OF ROUNDS FIRED	TYPE OF AMMUNITION FIRED	REASON FOR DISCHARGE	SIGNATURE

Form Title: Fire Safety Training Checklist

DATE	SUBJECTS COVERED	EMPLOYEES IN ATTENDANCE	INTSTRUCTOR(S)	EMPLOYEE SIGNATURE	HEALTH AND SAFETY OFFICER SIGNATURE

Form Title: Light Vehicle Daily Checklist

Aboriginal Engineering Ltd.

DAILY LIGHT VEHICLE CHECK LIST
TO BE COMPLETED PRIOR TO USING EQUIPMENT

EMPLOYEE NAME:_____ UNIT #:_____

LOCATION: ☐YELLOWKNIFE ☐OTHER WEEK ENDING:_____

LAST SERVICE: _____ WEEK ENDING MILEAGE:_____

NEXT SERVICE: _____ HR. METER:_____

EQUIPMENT CONDITION REPORT MUST BE COMPLETED EACH SHIFT	MON	TUE	WED	THU	FRI	SAT	SUN
1. Engine Oil - Level and Leaks							
2. Radiator Coolant - Level and Leaks							
3. Fuel Level							
4. Seat Belts							
5. Tires - Condition and Inflation							
6. Brakes - Service/Parking							
7. Steering							
8. Heater/Defroster							
9. Glass/Mirrors							
10. Windshield Wipers							
11. Lights/Reflectors/Beacons/Strobes							
12. Gauges/Instruments							
13. Horn/Back Up Alarm							
14. Fire Extinguisher							
15. First Aid Kit							
16. Survival Kit/Sleeping Bag							
17. Radios/Antennas							
18. Safety Issues/Concerns							

These items should be checked each shift before operating this piece of equipment. Each item is to be checked individually.

Report ALL items in need of repair to the Maintenance Department at the time of inspection. Check lists must be turned in every Monday to the Maintenance Department. Week ending mileage must be recorded. If any problem is found with brakes or steering, the vehicle is NOT to be moved, call the Maintenance shop immediately.

DRIVER'S SIGNATURE: _____

DATE REPORTED	REPAIRS	DATE REPAIRED

Form Title: Heavy Duty Equipment Checklist

3750

Aboriginal Engineering Ltd.

HEAVY DUTY EQUIPMENT CHECK LIST
TO BE COMPLETED PRIOR TO USING EQUIPMENT

EMPLOYEE NAME:_____ DATE:_____

EQUIPMENT #_____ Hr. Meter at start-up_____ Hr. Meter at shut-down_____

EQUIPMENT CONDITION REPORT MUST BE COMPLETED EACH SHIFT.		
General	X	Exception
Engine Oil Level & Leaks		
Hydraulic Oil Level & Leaks		
Fuel System & Leaks		
Coolant Level & Leaks		
Tires Inflation & Condition		
V-Belt Condition		
Air Cleaner, Intake & Exhaust System		
Parking, Service & Emergency Brake		
Retarder		
Wheel Chocks		
Air System, Tank, Air Leaks & Drain Water		
Steering & Secondary System		
Transmission Oil Level & Operation		
Light, Electrical System & Back-up Alarm		
Cab Gauges & Instruments		
Horn, Glass & Mirrors		
Wipers & Heater		
Fire Extinguisher & Supp. System		
Steps & Railings		
Wheel Lugs & Nuts		
Radio Communication Operational		
Suspension & Main Frame		
Lubrification System		
ROPS & Seat Belt		
Liters Used		
Grader		
Cutting Edge & Teeth		
Blade Linkage & Cylinders		
Circle Drive & Articulation		
Tandem		
Dozer & Excavator		
Cutting Edge & Cylinders		
Bucket, Teeth & Segment		
Sprockets, Idlers & Rollers		
Tracks Adjustment		
Under-carriage Cover & Guard		
Gravel Truck		
Dump Body		
Loader		
Bucket, Teeth & Segment		
Cylinders		

Form Title: Hot Work Permit Form

CONTRACTOR:	**PERMIT ISSUE DATE:**
LOCATION:	**NO. OF PERSONS ON JOB:**

DESCRIPTION OF WORK:

TYPE OF WORK

- ☐ ***Cutting***
- ☐ ***Grinding***
- ☐ ***Burning***

Y/N ***For Burning Has A Burn Permit Been Provided by GNWT?***

Y/N ***Are the Burn Permit Conditions Currently Met?***

NOTE: If No was answered for any of the above two conditions do not burn.

- ☐ ***Welding***

MANDATORY PRE-WORK CONDITIONS

Job Hazard Analysis Required □ YES □ NO
Job Hazard Analysis Attached □ YES □ NO
Hazards Require Formal Hazard Analysis YES □ NO
If so, Formal Analysis Attached YES □ NO
Surrounding Equipment / Facilities Protected □ YES □ NO
Fire Blankets Required □ YES □ NO
Welding Shields in Place □ YES □ NO
Fire Extinguisher at Work Location □ YES □ NO
Welding Machine Grounded □ YES □ NO
Area Identified Flagged Off □ YES □ NO
Oxygen/Acetylene Properly Secured □ YES □ NO
Cables/Gauges/Hoses/Flashback Arrestors Intact □ YES □ NO
Fire Watch- During Hotworks & 1-Hour After Complete □ YES □ NO
Additional Fire Watch Required for Burning Activities □ YES □ NO

PRE-WORK SIGN-OFF

SITE SUPERINTENDENT SIGNATURE NAME (PRINT)

REPRESENTATIVE EMPLOYEE SIGNATURE NAME (PRINT)

N***OTE: This Hot Work Permit is valid for one (1) day only – and may be cancelled without notice at any time by the Site Superintendent***

POST-WORK SIGN-OFF

Job Completed
□ YES □ NO
Comments:

SITE SUPERINTENDENT SIGNATURE	NAME (PRINT)
REPRESENTATIVE EMPLOYEE SIGNATURE	NAME (PRINT)

NOTE: A COPY OF THIS PERMIT WILL BE DISPLAYED AT THE WORK SITE. PERMIT VALID FOR DATE OF ISSUE ONLY.

A COPY OF THE COMPLETED PERMIT MUST BE KEPT ON FILE AT SITE

Form Title: Meeting Agenda Form

Health and Safety Meeting Date: _____

Meeting Coordinator:	
Project:	
Review of the previous meeting:	
Incidents/accidents reviewed:	
Corrective actions taken:	
Employee concerns:	
Safety topic for this meeting:	
Signature of Meeting Coordinator:	
In attendance:	

Form Title: Spill Prevention Daily Checklist

AREA TO INSPECT	Y	N	DESCRIPTION AND/OR COMMENTS
BULK FUEL STORAGE AREA			
Any signs of leakage on exterior of drums			
Any staining on the ground			
Any signs of tampering or theft			
Any signs of leakage on exterior of drums			
Any signs of leaks on the ground surrounding drums			
EQUIPMENT			
Were the daily equipment inspection list completed			
Were there any leaks in equipment			
Any signs of spills due to equipment refueling			
TEMPORARY HAZARDOUS WASTE STORAGE AREA			
Any signs of leakage on exterior of drums			
Any signs of leaks on the ground surrounding drums			
Any signs of precipitates such as white salts on barrels or ground			
Are drums stored in an orderly fashion			
Any signs of tampering or theft			
MECHANICS SHOP			
Shop area is not clean and organized			
Secondary containment for collecting waste oils is not in place			
Inappropriate mixing of waste oils is occurring			
Staining is present			
Mechanic is not quickly addressing leaks			
WATER TREATMENT FACILITY			
Oil/water separator > 2 inches of accumulated oil			
Oil/water separator effluent has a sheen			
Any signs of spills			
SECURITY			
Fencing, gates, or lighting is non-functional			
Any signs of vandalism of theft or other event that could threaten the health and safety of employees or visitors to the site			
INSPECTED BY			
DATE OF INSPECTION			
SIGNATURE			

Form Title: Daily Fuel Consumption Check List

Daily Fuel Consumption Check List

PRODUCT	STORAGE	PREVIOUS VOLUME (L)	CURRENT VOLUME (L)	PRODUCT CONSUMED
Diesel	122 x 205 L Drum = 25,000 L			
Gasoline	30 x 205 L Drum = 6,000 L			
Aviation fuel	10 x 205 L Drum = 2,000 L			
DATE				
INSPECTED BY				
SIGNATURE				
COMMENTS				

Daily Fuel Consumption Check List

PRODUCT	STORAGE	PREVIOUS VOLUME (L)	CURRENT VOLUME (L)	PRODUCT CONSUMED
Diesel	122 x 205 L Drum = 25,000 L			
Gasoline	30 x 205 L Drum = 6,000 L			
Aviation fuel	10 x 205 L Drum = 2,000 L			
DATE				
INSPECTED BY				
SIGNATURE				
COMMENTS				

Daily Fuel Consumption Check List

PRODUCT	STORAGE	PREVIOUS VOLUME (L)	CURRENT VOLUME (L)	PRODUCT CONSUMED
Diesel	122 x 205 L Drum = 25,000 L			
Gasoline	30 x 205 L Drum = 6,000 L			
Aviation fuel	10 x 205 L Drum = 2,000 L			
DATE				
INSPECTED BY				
SIGNATURE				
COMMENTS				

Form Title: Weekly Solvent, Lubricant & Other Oils Consumption Check List

Weekly Solvent, Lubricant and Other Oils Consumption Check List

PRODUCT	STORAGE	INITIAL QUANTITY	CURRENT VOLUME (L)	PRODUCT CONSUMED
Oil A				
Hydraulic Fluid A				
Grease A				
Antifreeze A				
Transmission Fluid A				
DATE				
INSPECTED BY				
HDM SIGNATURE				
SS SIGNATURE				
COMMENTS				

Weekly Solvent, Lubricant and Other Oils Consumption Check List

PRODUCT	STORAGE	INITIAL QUANTITY	CURRENT VOLUME (L)	PRODUCT CONSUMED
Oil A				
Hydraulic Fluid A				
Grease A				
Antifreeze A				
Transmission Fluid A				
DATE				
INSPECTED BY				
HDM SIGNATURE				
SS SIGNATURE				
COMMENTS				

Weekly Solvent, Lubricant and Other Oils Consumption Check List

PRODUCT	STORAGE	INITIAL QUANTITY	CURRENT VOLUME (L)	PRODUCT CONSUMED
Oil A				
Hydraulic Fluid A				
Grease A				
Antifreeze A				
Transmission Fluid A				
DATE				
INSPECTED BY				
HDM SIGNATURE				
SS SIGNATURE				
COMMENTS				

Form Title: Spill Prevention Monthly Checklist

AREA TO INSPECT	Y	N	DESCRIPTION AND/OR COMMENTS
STORAGE DRUMS			
Drum surfaces show signs of leakage			
Drums are damaged, rusted or deteriorated			
Bolts, rivets, or seams are damaged			
Level gauges or alarms are inoperative			
Vents are obstructed			
Secondary containment is damaged or stained			
PIPING			
Valve seals, gaskets, or other appurtenances are leaking			
Pipelines or supports are damaged or deteriorated			
Joints, valves and other appurtenances are leaking			
Buried piping is exposed			
REFUELING STATION			
Refueling area equipment damaged			
Signs of staining			
SECURITY			
Fencing, gates, or lighting is non-functional			
Pumps and valves are not locked if not in use			
RESPONSE EQUIPMENT			
Response equipment inventory is not complete			
INSPECTED BY			
DATE OF INSPECTION			
SITE SUPERINTENDENT SIGNATURE			
CROWN ENGINEER SIGNATURE			

Form Title: Drainage Checklist

Date	Diked Area	Oil Present In Water Y/N	Time Start	Time Finish	Signature

Form Title: Training Checklist

Date	Employee In Attendance	Employee Signature	Subject Covered	Instructor(S)	Superintendent Signature

Form Title: INAC Monthly Minor Spill Reporting Form

DATE OF SPILL (D/M/Y)	PRODUCT SPILLED	QUANTITY (L)	SURFACE AREA CONTAMINATED (m^2)	LOCATION

Form Title: NWT Spill Report Form

Northwest Territories

NWT SPILL REPORT

(Oil, Gas, Hazardous Chemicals or other Materials)

24 – Hour Report Line
Phone: (867) 920-8130
Fax: (867) 873-6924

A Report Date and Time	B Date and Time of spill (if known)	C ☐ Original Report ☐ Update no._____	Spill Number
D Location and map coordinates (if known) and direction (if moving)			
E Partly responsible for spill			
F Product(s) spilled and estimated quantities (provide metric volumes/weights if possible)			
G Cause of spill			
H Is spill terminated? ☐ yes ☐ no	I If spill is continuing, give estimated rate	J Is further spillage possible? ☐ yes ☐ no	K Extent of contaminated area (in square meters if possible)
L Factors effecting spill or recovery (weather conditions, terrain, snow cover, etc.)	M Containment (natural depression, dikes, etc.)		
N Action, if any, taken or proposed to contain, recover, clean up or dispose of product(s) and contaminated materials			
O Do you require assistance? ☐ no ☐ yes, describe:	P Possible hazards to person, property, or environment; eg: fire, drink water, fish or wildlife		
Q Comments or recommendations		FOR SPILL LINE USE ONLY Lead agency Spill significance Lead Agency contact and time Is this file now closed? ☐ yes ☐ no	
Reported by	Position. Employer, Location	Telephone	
Reported to	Position. Employer, Location	Telephone	

NWT 1752/0202

APPENDIX F

HEALTH AND SAFETY DOCUMENT TEMPLATES

JOB HAZARD ANALYSIS FORM (JHA)

SMB JHA-

Job:

Job Steps	Potential Hazards / Risks	Consequences E / I / F/ S	Recommended Safety Measures

Job Steps	Potential Hazards / Risks	Consequences E / I /F/S	Recommended Safety Measures

Information JHA Summary Sheet:

Job Being Analyzed: _____

JHA Supervisor: _____

Worker:	Signature:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Department: _____

Department Supervisor: _____

JHA Date: _____

JHA Revision #: _____

**Consequences:* E-equipment damage, I-injury, F-fatality, S-spill

SAWMILL BAY, GREAT BEAR LAKE

DAILY SIGN IN AND SAFETY MEETING

DATE_____

Please print and sign **Please Print and sign .**

1._____ 11. _ _____

2._____ 12. _____

3._____ 13._____

4._____ 14. _____

5._____ 15. _____

6._____ 16. _____

7._____ 17. _____

8._____ 18. _____

9._____ 19._____

10._____ 20._____

Safety Meeting Topics

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APPENDIX G

BEAR INCIDENT REPORT and WSCC REPORT

To whom this may concerns

We have had a black bear harassing our camp several times in the last few days (Sawmill Bay).

I called the RWED office and spoke with Jeff Walker the Renewable Resource Officer out of Norman Wells on August 8, 2011 about the issue of a nuisance bear that was constantly around the camp. He advised me “If I used all means of bear deterrent to scare the bear off and it did work, and the bear became a Health & Safety issue to the put the bear down.”

Yesterday August 25th the same black bear came back on three separate occasions all within 45 minutes. We followed protocols by using bear bangers and rubber bullets and then ballistics bean bags in an attempt to scare off the bear. Each time the bear left and returned, at which time we would provide another volley of deterrents. This became useless as the bear persisted in coming back to camp and the situation became a Health and Safety issue for the staff outside the bear fence, attempting to complete their work in the field. The bear fence around the camp was always kept up so the bear was not able to get into the camp.

The bear became a Safety concern for all the employees after a week of it not returning to the camp. On August 25th the employees became fearful of the bear and imminent return and as such they were constantly checking over their shoulder looking for the bear and based on that fact they could not focus or concentrate on their job and perform their tasks in a safe manner. I would believe the bear was looking for foods as it was supper time when this all happened. The bear was an older male I was told by the elder on site. The bear keeps coming around when there is cooking going on.

After 3 separate attempts using bear deterrents all to no avail, I took it upon myself to put the bear down for the overall health & safety of all employees on the site. I used a twelve gauge shot gun with slugs to kill the bear. I then disposed of the bear by burying it near the airstrip. I was advised by elders on the site to place tobacco on the burial plot as a peace offering.

Brad Landry

Site Superintendent

Sawmill Bay

Aboriginal Engineering Ltd

403 387 3206

INSPECTION REPORT
Industrial

Report Reference:
Inspection #: 2011-BGG-00546
Provisional #: No number assigned

Print Date: August 2, 2011 Inspection Date: July 27, 2011

EMPLOYER

Name: ABORIGINAL ENGINEERING LTD.
Address: P.O. BOX 133
Yellowknife, Northwest Territories X1A-2N1
Phone: 867-669-9481 **FAX:** 867-669-9482

LOCATION

Territory: Northwest Territories
Region: Inuvik
Community:
Location Name: Sawmill Bay
Address: 65 deg., 44', 1" N
118 deg. 54' 11" W

GPS Coordinates:

INSPECTION DETAILS

Officer/Inspector: Bruce Graney
Secondary Officer(s)/ Inspector(s):
Officer(s)/ Hygienist(s):
Accompanied by: Brad Landry,Site Supt. and Joel Gowman, Sahtu Project Manager
Contact Person:

# of Workers: 18

OBSERVATION(S):

Sawmill Bay camp is about 1 hr & 40 minutes from Yellowknife by float plane. There is also an old airstrip that can be used by wheeled planes

The road to the camp from the landing on the lake, is about 1.5 kilometers, and is accessed by a foot or ATV.

THIS REPORT MUST BE POSTED IN A CONSPICUOUS PLACE

INSPECTION REPORT
Industrial

Report Reference:
Inspection #: 2011-BGG-00546
Provisional #: No number assigned

The Camp has tent frame structures for kitchen, accommodations and first aid station.Separate Pot-a-Potty for Men and Ladies. The Camp buildings are surrounded by an electric fence which is closed in the evening until early morning. Thus far little problem with bears.

The visitors were given an very thorough orientation regarding safety at the site, followed by a tour of the total area

Emergency calls can be made from the Camp by Sat Phone or from the Muster Station. The Sat phone at the Muster Station was tested by Mr. Bert Varkonyi and found it worked well. The Muster station is at an appropriate distance form the Camp in case of a fire at the camp.

The job at hand is to clean drums of oil in preparation for crushing the drums, for later movement to a disposal site elsewhere.

The crew working in fresh air cleaning barrels for crushing were wearing the appropriate PPE at the time and conditions for the task.

It was noted that the first aid station was occupied by workers as other tent frames had been damaged.

A walk around gave the "visitors" a good idea of the scope of the project and work yet to be done.

See the following directions.

INSPECTION REPORT
Industrial

Report Reference:
Inspection #: 2011-BGG-00546
Provisional #: No number assigned

Orders

#001

Status:	Open
Contractor:	
Repeat Order Number:	
Sub-Location:	First Aid/Treatment Room
Observation:	First aid station being used for general accommodations.
Jurisdiction:	Northwest Territories
Legislation:	Safety Regulations
Section:	66. (1)(d)
Legislation Text:	A first aid room or dressing station must be located as near as possible or practical to the work area it is to serve and must be used for no other purpose than to administer first aid or other health care;
Officer/Inspector Order:	**The use of the first aid/treatment room must be used just for that, and not for general accommodation.**
Req'd Compliance Date:	8/10/2011

#002

Status:	Open
Contractor:	
Repeat Order Number:	
Sub-Location:	First Aid Room
Observation:	If doorway too narrow for stretcher.
Jurisdiction:	Northwest Territories
Legislation:	Safety Regulations
Section:	66. (1)(f)
Legislation Text:	A first aid room or dressing station must be located as near as possible or practical to the work area it is to serve and must have a ready means of access for stretcher patients including at least one door 107 cm wide (42 in.).
Officer/Inspector Order:	**Provide wider door opening.**
Req'd Compliance Date:	8/10/2011

#003

Status:	Open
Contractor:	
Repeat Order Number:	
Sub-Location:	First Aid Room
Observation:	Only one bottle of Oxygen available.

INSPECTION REPORT
Industrial

Report Reference:
Inspection #: 2011-BGG-00546
Provisional #: No number assigned

	Jurisdiction:	Northwest Territories
	Legislation:	Safety Regulations
	Section:	66. (2)
	Legislation Text:	Where a first aid room is located more than one hour's travel time from a hospital or nursing station it must contain the necessary equipment to provide overnight care for two injured workers.
	Officer/Inspector Order:	**Necessary equipment for two injured workers required.**
	Req'd Compliance Date:	8/10/2011
#004	**Status:**	Open
	Contractor:	
	Repeat Order Number:	
	Sub-Location:	Camp Site
	Observation:	Means of transportation of injured workers insufficient for serious injuries.
	Jurisdiction:	Northwest Territories
	Legislation:	Safety Regulations
	Section:	77. (1)
	Legislation Text:	An employer shall, at his or her own expense, furnish to a worker injured in his or her place of employment, when necessary, immediate conveyance and transportation to a hospital, medical practitioner or nursing station for initial treatment.
	Officer/Inspector Order:	**Provide suitable transportation from Camp to either the lake side or air strip.**
	Req'd Compliance Date:	8/10/2011
#005	**Status:**	Open
	Contractor:	
	Repeat Order Number:	
	Sub-Location:	First Aid Room
	Observation:	Comfortable Transportation for injured persons to airplane.
	Jurisdiction:	Northwest Territories
	Legislation:	Safety Regulations
	Section:	77. (1)

THIS REPORT MUST BE POSTED IN A CONSPICUOUS PLACE

INSPECTION REPORT
Industrial

Report Reference:
Inspection #: 2011-BGG-00546
Provisional #: No number assigned

	Legislation Text:	An employer shall, at his or her own expense, furnish to a worker injured in his or her place of employment, when necessary, immediate conveyance and transportation to a hospital, medical practitioner or nursing station for initial treatment.
	Officer/Inspector Order:	**Provide Stretchers, and padding for under the stretcher to absorb jarring when transporting in a vehicle.**
	Req'd Compliance Date:	8/10/2011
#006	**Status:**	Open
	Contractor:	
	Repeat Order Number:	
	Sub-Location:	First Aid Station
	Observation:	
	Jurisdiction:	Northwest Territories
	Legislation:	Safety Regulations
	Section:	77. (3)
	Legislation Text:	Where air transportation is used, stretchers suitable for use in aircraft must be provided by the employer.
	Officer/Inspector Order:	**As in order #5**
	Req'd Compliance Date:	8/10/2011

INSPECTION REPORT
Industrial

Report Reference:
Inspection #: 2011-BGG-00546
Provisional #: No number assigned

ABORIGINAL ENGINEERING LTD.
Employer Progress:

Order No.	Progress	Order No.	Progress

EMPLOYER'S SIGNATURE DATE

X

This report has been discussed and a copy left with: X _____

Officer/Inspector: X _____

Once the order(s) is complied with the Employer must:

1. Write in the Order Number
2. Write in the actions taken towards complying with the order in the progress column
3. On the listed compliance date, for each order/s, fax this page only, to the appropriate WSCC Office
4. Sign and date the inspection report

THIS REPORT MUST BE POSTED IN A CONSPICUOUS PLACE

APPENDIX H

DAILY AND WEEKLY REPORTS (CD ROM ONLY)

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Wednesday, July 20th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel

DRAP:	SENES/ DCS
Jason Mauchan	Department Rep.

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from	Hrs
Superintendent-	Brad Landry	N.Aboriginal	13
Carpenter	Charlie Modeste	Sahtu	8
Journeyman	Phil Dowton	Other	8
Field Tech	Clint Baptiste	Sahtu	8
Hazmat specialist	Kurt Stewart	Sahtu	12
Electrician	George Goudet	YK	8
Labourer	Antoine Ferdinand	Sahtu	8
Labourer	Simon Neyelle	Sahtu	8
Labourer	Ed Loutit	N.Aboriginal	8
Labourer	Nathan Modeste	Sahtu	8
Labourer	Clyde Takazo	Sahtu	8
Labourer	Rocky Kenny	Sahtu	8
Wildlife Monitor	Alfred Betista	Sahtu	8
Labourer	Greg Kenny	Sahtu	8
Cook	Betty Modeste	Sahtu	8
Cook's Assistant	Mary Rose Yukon	Sahtu	8
Medic	Bianca Spence	Other	8
TOTAL	18		

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	1 good, 2 require parts, coming in tomorrow
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Weather

	Afternoon (1800hrs)
Temperature:	18^0C
Precipitation:	None
Condition:	Humid, clearing

General

Camp Complement today is 18 persons. All personnel arrived to site today. Four planes arrived.

1. Crew and gear from Yellowknife
2. Crew and gear from Deline
3. Groceries from Yellownife
4. Supplies from Yellownife

Work in Progress

The first plane arrived to site today at 1700. The last plane arrived at 2200. Setting up of camp facilities and sleeping accommodation occurred.

Health & Safety and Environmental Issues

Site safety meeting will be held every day at 0700h.
The bear fence is in operation.
The 'blue zones' will be flagged tomorrow morning.

Comments, Concerns and Correspondence

The 'blue zones' will be discussed during the site orientation tomorrow morning. There is a scheduled visit tomorrow with low-level radioactive waste management office (LLWMO) employees.

Wildlife Observations

The camp is in a similar state compared to the June drum sampling trip. No observed wildlife.

Site Visitors

None

Samples

None

Photos

Communications dish

Grey water pit. It is empty

The main road through camp near time of arrival.

The bear fence in operation.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Thursday July 21st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel

DRAP:	SENES/ DCS
Jason Mauchan	Department Rep.

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from	Hrs
Superintendent-	Brad Landry	N.Aboriginal	11
Carpenter	Charlie Modeste	Sahtu	10
Mechanic	Phil Dowton	Other	10
Field Tech	Clint Baptiste	Sahtu	10
Crew Leader	Kurt Stewart	Sahtu	11
Electrician	George Goudet	N.Aboriginal	10
Labourer	Antoine Ferdinand	Sahtu	10
Labourer	Simon Neyelle	Sahtu	10
Labourer	Ed Loutit	N.Aboriginal	10
Labourer	Nathan Modeste	Sahtu	10
Labourer	Clyde Takazo	Sahtu	11
Labourer	Rocky Kenny	Sahtu	10
Wildlife Monitor	Alfred Betista	Sahtu	10
Labourer	Greg Kenny	Sahtu	11
Cook	Betty Modeste	Sahtu	10
Cook's Assistant	Mary Rose Yukon	Sahtu	10
Medic	Bianca Spence	Other	10
TOTAL ON-SITE	18		

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, 1 require maintenance
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Today	2000 L
2011 Total	7000 L

Includes totals from the June drum sampling program.

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	15^0C	20^0C
Precipitation:	None	None
Condition:	Overcast, clearing	Sunny, hot

General

Camp Complement today is 18 persons. Two planes arrived today.

1. Supplies from Yellowknife
2. Visitors

One Outbound crew member today. The electrician left at 2100hrs.

Work in Progress

Site orientation in the morning. Workers were outfitted with PPE.
Rebuilding of two wall tents and a general clean-up around camp.
Repairing ATVs, checking fire alarms, maintenance on the barge, and general camp maintenance.

Health & Safety and Environmental Issues

Site safety meeting held every day at 0700h.
Site orientation occurred today from 0700h – 0900h
The orientation, included a handout for all members on site, topics were - :

- History of the site
- History of the project
- Camp Rules
- Procedures to call a medic
- Fire extinguisher locations
- Muster points
- PPE
- Instructions to stay out of the 'blue zones'
    - ALARA
    - Distance, time, shielding
- Bear fence
- Garbage and keeping camp tidy
- No tolerance towards harassment
- Time cards
- Equipment monitoring
- Spill reporting
- Participants signed in

The 'blue zones' at the airstrip and near camp were flagged.
The bear fence will be in operation each evening.

The visitors gave a briefing on their roles and the low-level radioactive waste management office (LLRWMO) representatives briefed the crew on the specifics of the 'blue zones' and answered questions from the crew. The briefing concluded with a tour and the use of their meters.

Comments, Concerns and Correspondence
Attempts have been made to contact Dennis Kenny who was scheduled to be the on-site community representative (OCR). There will be additional planes this week from Yellowknife with materials, which will allow for Dennis to come to site, once he has been contacted.

Wildlife Observations
None

Site Visitors

The visitors arrived at approximately 3pm.

Joel Gowman – INAC
Sam Kennedy INAC
Bob Zelmer – LLRWMO
Randy Law – CNSC
Stanley Yee - INAC
Ron Stevenson - CNSC

The visitor left at 5pm

Samples
None

Photos

Blue flagging surrounding the 'blue zone' near camp

Blue flagging near camp, note the road diversion

Blue flagging and markings surrounding 'blue zone' at the former old airstrip.

Site visitors Ron Stevenson, Randy Law, Stanley Lee, and Joel Gowman

Randy Law leading a tour

Randy Law showing Greg Kenny the instruments to measure low-level radiation

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Friday July 22nd, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel

DRAP:	SENES/ DCS
Jason Mauchan	Department Rep.

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from	Hrs
Superintendent-	Brad Landry	N.Aboriginal	12
Carpenter	Charlie Modeste	Sahtu	10
Mechanic	Phil Dowton	Other	10
Field Tech	Clint Baptiste	Sahtu	10
Crew Leader	Kurt Stewart	Sahtu	11
Labourer	Antoine Ferdinand	Sahtu	10
Labourer	Simon Neyelle	Sahtu	10
Labourer	Ed Loutit	N.Aboriginal	10
Labourer	Nathan Modeste	Sahtu	10
Labourer	Clyde Takazo	Sahtu	10
Labourer	Rocky Kenny	Sahtu	10
Wildlife Monitor	Alfred Betista	Sahtu	10
Labourer	Greg Kenny	Sahtu	10
Cook	Betty Modeste	Sahtu	10
Cook's Assistant	Mary Rose Yukon	Sahtu	10
Medic	Bianca Spence	Other	10
TOTAL ON-SITE	**17**		

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	3 good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	2
2011 Total	9

.

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	14°C	21°C
Precipitation:	None	Light rain
Condition:	Cloudy	Clearing

General
Camp Complement today is 17 persons.

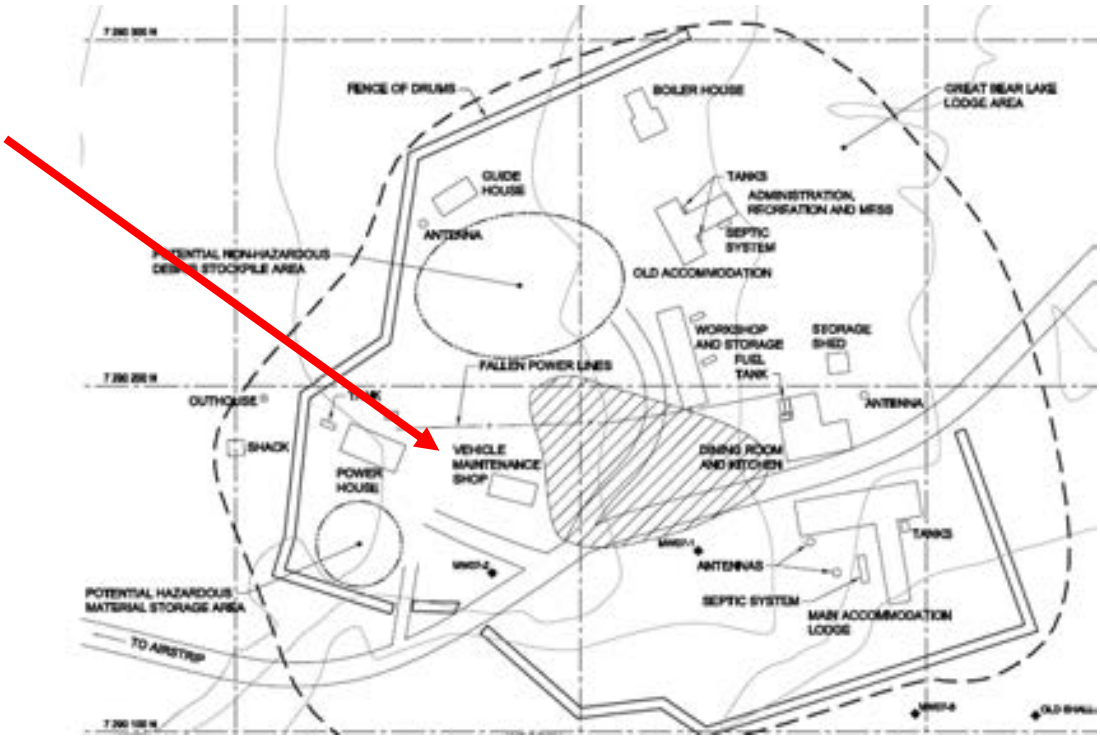
Work in Progress
The barrel wash treatment system is being assembled at the airstrip.

Drums with contents containing liquid with a flash point of below 25°C (from the lab results) were located and tagged. The contents of these drums will be consolidated. The proposed plan is to store the consolidated contents of these drums on-site.

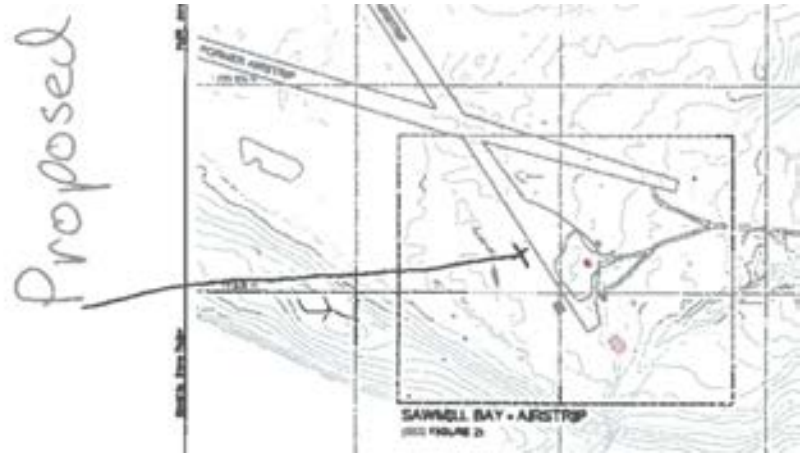
The 'blue zone' near the bay was reflagged.

A general walk around at main camp occurred to check the state of the structures. The inspection by the department representative involved:

- Confirming that the buildings at Sawmill are still boarded up
    - Buildings are in a similar state to last year, with the exception of the boiler house.
        - The roof of the boiler house is in the midst of a slow collapse.
        - No work activities are occurring near this building this year.
- Determine a potential building for storage of the consolidated fuels and environmental supplies
    - The Vehicle Maintenance Shop is proposed, the C-span structure is easily accessible and centrally located. The image below is copied from the AECOM 2010 consolodated spec drawings and shows the location of the Vehicle Maintenance Shop relative to other buildings at the Main Camp area.



The proposed discharge location of the process water from the barrel wash was designated by AEL. Site Superintendent, Brad Landry indicated the proposed discharge location of the process water. The image below is copied from an AEL submittal. Photos of the airstrip location are shown below. Note that a proposed discharge location also exists near the other cache of drums.



Health & Safety and Environmental Issues

Site safety meeting held every day at 0700h.

Topics covered today were bear safety, spill kits, and equipment checklists.

Comments, Concerns and Correspondence
The scheduled on-site community representative (OCR) has not mobilized to site.
Alternate logistical arrangements are being explored.

Wildlife Observations
Bear tracks were identified at the airstrip. The wildlife monitor is patrolling the site continually. No bears were seen.

Site Visitors
None

Samples
None

Photos

Blue flagging surrounding the 'blue zone' near the bay

Boarded up buildings at the main camp area.

The boiler house.

The Vehicle Maintenance building

View toward the barge area at Sawmill Bay

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Saturday July 23rd, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel

DRAP:	SENES/ DCS
Jason Mauchan	Department Rep.
Kuri MacKeinzo **IN**	OCR

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from	Hrs
Superintendent-	Brad Landry	N.Aboriginal	13
Carpenter	Charlie Modeste	Sahtu	10
Mechanic	Phil Dowton	Other	10
Field Tech	Clint Baptiste	Sahtu	10
Crew Leader	Kurt Stewart	Sahtu	12
Labourer	Antoine Ferdinand	Sahtu	10
Labourer	Simon Neyelle	Sahtu	10
Labourer	Ed Loutit	N.Aboriginal	10
HEO	Nathan Modeste	Sahtu	12
Labourer	Clyde Takazo	Sahtu	10
Labourer	Rocky Kenny	Sahtu	11
Wildlife Monitor	Alfred Betsidea	Sahtu	10
Labourer	Greg Kenny	Sahtu	10
Cook	Betty Modeste	Sahtu	10
Cook's Assistant	Mary Rose Yukon **OUTBOUND**	Sahtu	10
Cook's Assistant	Celestine McCauley **INBOUND**	Sahtu	8
Medic	Bianca Spence	Other	10
Pilots	Lauren Cleveland Mike Busado	Other	n/a
TOTAL ON-SITE	**17**		

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	3 good, 1 flat tire
Ford F350 Pickup	1	Good
Cat 250E Loader/Forklift	1	Good
Cat 320C Excavator	1	Good
Ingersoll Rand portable light tower	1	Good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	10

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Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	15°C	20°C
Precipitation:	None	Scattered
Condition:	Cloudy	Clearing

General
Camp Complement today is 20 persons, this includes the 2 pilots who slept over on-site.

The cook's assistant was OUTBOUND today. An ear infection spread to her eyes. The medic has examined her and the decision was made to send her back to Deline. A replacement arrived on the return flight from Deline. The on-site community representative (OCR), Kuri MacKeinzo also arrived today. Kuri worked on the project last year. He was a labourer for the Contact Lake portion of the program.

Work in Progress
Further parts for the barrel wash treatment system arrived today.

Drums identified as having a flash point of between 25°C and 60°C were tagged and grouped together. The drums identified as having a flash point of below 25°C were grouped together.

The propellers on the boat are being repaired.

The clay for the water treatment of the barrel process water arrived today. The barrel wash system is scheduled to start operating on Monday.

Health & Safety and Environmental Issues
Site safety meeting held every day at 0700h.
Topics covered today were job hazard assessment sheets, eye wash stations, and bear spray.
A safety meeting at 1300h covered 'Hazard Correction' sheets. These will be read daily at the morning tailgate meeting.

Comments, Concerns and Correspondence
None.

Wildlife Observations
None.

Site Visitors
Two pilots stayed the night

Samples
None

Photos

Hazard correction sheets for AEL employees.

Putting the pieces together of the water treatment system. Note the oil water separator in the foreground. Also note that these will be assembled on the liner inside the bermed area when in operation.

Setting up the water treatment system inside the bermed area at the airstrip.

The water treatment system being assembled.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Sunday July 24rd, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel

DRAP:	SENES/ DCS
Jason Mauchan	Department Rep.
Kuri MacKeinzo	OCR

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from	Hrs
Superintendent-	Brad Landry	N.Aboriginal	13
Carpenter	Charlie Modeste	Sahtu	10
Mechanic	Phil Dowton	Other	10
Field Tech	Clint Baptiste	Sahtu	10
Crew Leader	Kurt Stewart	Sahtu	12
Labourer	Antoine Ferdinand	Sahtu	10
Labourer	Simon Neyelle	Sahtu	10
Labourer	Ed Loutit	N.Aboriginal	10
HEO	Nathan Modeste	Sahtu	10
Labourer	Clyde Takazo	Sahtu	10
Labourer	Rocky Kenny	Sahtu	10
Wildlife Monitor	Alfred Betsidea	Sahtu	10
Labourer	Greg Kenny	Sahtu	10
Cook	Betty Modeste	Sahtu	10
Cook's Assistant	Celestine McCauley	Sahtu	10
Medic	Bianca Spence	Other	10
TOTAL ON-SITE	**18**		

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 1 flat tire
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	2
2011 Total	12

.

Weather

	Morning (0900hrs)	*Afternoon (1600hrs)*
Temperature:	27°C	31°C
Precipitation:	None	None
Condition:	Clear	Partially cloudy

General
Camp Complement today is 18 persons.

Work in Progress
Drums ready to be washed were assembled adjacent to the drum wash station.
Fittings and hoses were connected between the various parts of the system.

The boat captain is preparing the barge with the help of the carpenter.

The OCR and the DR toured the site including the blue zones and the airstrip drum cache.
The OCR will be filing daily reports to be kept on record for the Deline First Nation.

The OCR and the DR began identifying drums. There will be 3 streams.
1. Ready to be washed –to be deheaded and washed
2. Drums with product and water –to be processed through the treatment system
3. Drums with product –to be consolodated

Health & Safety and Environmental Issues
Site safety meeting held every day at 0700h.
Topics covered today were muster station, signs, and tool safety.
Drip trays are in use underneath heating oil drums for the tents and at the fuel cache for ATVs.
The two inbound personnel completed their on-site orientation.

Comments, Concerns and Correspondence
None.

Wildlife Observations
None.

Site Visitors
None.

Samples
None

Photos

Kurri MacKeinzo inspecting the blue zone markings

The water treatment system

The water treatment system being assembled

The main road through camp

Liquid holding tank

the oil-water separator

sediment remover

Activated charcoal

Clay

Bladder

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Monday July 25th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel

DRAP:	SENES/ DCS
Jason Mauchan	Department Rep.
Kuri MacKeinzo	OCR

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent-	Brad Landry	N.Aboriginal
Carpenter	Charlie Modeste	Sahtu
Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Crew Leader	Kurt Stewart	Sahtu
Labourer	Antoine Ferdinand	Sahtu
Labourer	Simon Neyelle	Sahtu
Labourer	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Labourer	Clyde Takazo	Sahtu
Labourer	Rocky Kenny	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Labourer	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
Cook's Assistant	Celestine McCauley	Sahtu
Medic	Bianca Spence	Other
TOTAL ON-SITE	**18**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	3 good, 1 flat tire
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	2
2011 Total	14

.

Weather

	Morning (0900hrs)	*Afternoon (1400hrs)*
Temperature:	25°C	31°C
Precipitation:	None	Rain
Condition:	Clear	Partially cloudy

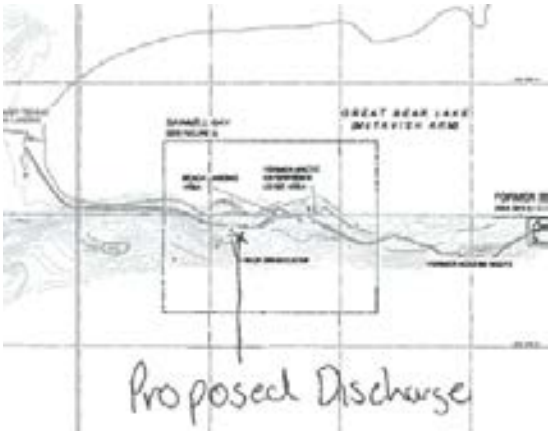
General
Camp Complement today is 18 persons.

Work in Progress

1. The barge and boat are ready to go in the water. The props were fixed.
2. The drum processing began today. Drums containing oil and water mix were pumped into the holding tank. The clay and charcoal were soaked for 24 hours to activate. 20 drums were pumped into the holding tank
3. Drums ready to be washed were 'deheaded'. 6 lids were cut.

Today was a field trial on pumping liquid contents and deheading empty drums.
Further work is required on the system as a whole. This includes building a weather shelter 30 m adjacent to the drum wash, building an additional bermed area for temporary storage of empty barrels, consolidating like products.

The 2nd proposed discharge location was scouted. The image below of the discharge location was copied from an AEL submittal



Health & Safety and Environmental Issues
Site safety meeting held every day at 0700h.
Topics covered today were radio checks, avoiding heat stress, and the JHA for the drum area.

Comments, Concerns and Correspondence
None.

Wildlife Observations
None.

Site Visitors
None.

Samples
SB-Water-1 (water used for the charcoal soak)
The method of sampling water was discussed between the DR and OCR. Training on labelling, documenting, and filing Chain-of-custody (CoC) forms was reviewed.

Photos

The proposed discharge location for the Bay Drum cache

Proposed discharge location for the Bay Drum cache

Deheading an empty drum

Water/Oil being pumped into the holding tank

A bladder to hold the water after treatment.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Tuesday July 26th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel

DRAP:	SENES/ DCS
Jason Mauchan	Department Rep.
Kuri MacKeinzo	OCR

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent-	Brad Landry	N.Aboriginal
Skilled Labourer - Carpenter	Charlie Modeste	Sahtu
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Labourer	Antoine Ferdinand	Sahtu
Labourer	Simon Neyelle	Sahtu
Captain	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Labourer	Clyde Takazo	Sahtu
Labourer	Rocky Kenny	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Labourer	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
Cook's Assistant	Celestine McCauley	Sahtu
Medic	Bianca Spence	Other
TOTAL ON-SITE	**18**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	3 good, 1 flat tire
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	2
2011 Total	17

.

Weather

	Morning (0900hrs)	*Afternoon (1400hrs)*
Temperature:	18°C	20°C
Precipitation:	None	None
Condition:	Partially cloudy	Clear

General
Camp Complement today is 18 persons.

Work in Progress

Work is being done on the boats. The carpenter and the mechanic performed maintenance and upgrades.

40 drums which are ready to have the lids taken off were assembled adjacent to the deheader.

10 drums which contain mostly water with trace oil/fuel were assembled adjacent to the white holding tanks.

On barrels containing 50% oil and 50 % water (e.g. 30 cm water and 30 cm oil), the decision was made by AEL to pump the oil out to consolidate prior to putting into the current treatment system. Yesterday, 4 of these drums were pumped into the white holding tank. It became evident that two distinct phases were in the holding tank. The oil layer in the 2nd white holding tank was transferred into three labelled 'waste oil' drums.

In order for the system to operate at optimum, the majority of the oil requires removing prior to the current oil-water separator. The current oil-water separator will account for drums with water and sheen. The DR indicated to AEL the drums which contain mostly water (e.g 30 cm water and <1 cm fuel) through labelling. Drums were labelled by the DR and OCR.

The DR and OCR continued to label the drums at the airstrip cache. After the indication from AEL on the liquid contents that are suitable for the current system, labelling included paint markers indicating type of liquid contents, height of liquid contents, and grouping designation.

Health & Safety
Site safety meeting held every day at 0700h.
Topics covered today were sunscreen, drinking water, using tyveks, and JHAs for the drum area (deheading and pumping).

Environmental Issues
A minor spill of watery oil resulted in a 10 cm x 10 cm impacted area. The impacted area was on sand. The impacted soil was shovelled into poly bags. The spill volume was estimated at <0.15 litres. The DR was present at the time of spill. The spill was documented on the INAC monthly spill reporting form (pictured below). Spills will be documented.

Comments, Concerns and Correspondence
None

Wildlife Observations
None.

Site Visitors
None.

Samples
SB-S-1 through SB-S-5. Soil samples collected from minor spill area of watery oil as well as sand from in the woods. The samples were used for training the OCR in the use of Petroflag™ test kits. The test kits are capable of determining the petroleum hydrocarbon content in the soil. At the end of the program, soil samples will be collected from the drum processing areas. These samples will be tested by the DR and OCR. Today, the laboratory work was used a training exercise for the OCR. Note that 10-20% of these confirmatory samples taken at the end of the program will be sent to an accredited laboratory. The remainder will be tested using the field method of the Petroflag™ test kits.

Photos

The drums containing oily water were assembled adjacent to the white holding tanks

Spill kits placed adjacent to the treatment area

Sand shovelled into poly bag from a 0.15 L spill of watery oil

Drums with lids cut off, ready to be washed

The lined box will house the drum holder for washing. The yellow tanks will house absorbant booms to remove hydrocarbons. The wash water will be cycled through the system.

Minor spill of old diesel, the impacted sand was shovelled into poly bags

INAC Monthly Spill Reporting Form

Company Responsible:
Project Name and Water Licence #:
Month:

Date of Spill (d/m/y)	Product Spilled	Amount	Extent of Contaminated Area (m^2)	Location (latitude and longitude)

DIAND District Fax Numbers
North Mackenzie District (Inuvik): (867) 777-2090
Norman Wells Sub-District: (867) 587-2928
South Mackenzie District (Yellowknife) (867) 669-2720
Hay River Sub-District: (867) 874-2480
Fort Smith Sub-District: (867) 872-3472
Fort Simpson Sub-District: (867) 695-2615
Nunavut District: (867) 979-6445

INAC Monthly spill reporting tracking sheet

Greg Kenny, Nathan Modeste, Antoine Ferdinand, Simon Neyelle
The barrel processing Team.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Tuesday July 27th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep(OCR)	Kuri MacKeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal
Skilled Labourer - Carpenter	Charlie Modeste	Sahtu
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Hazmat Labourer	Antoine Ferdinand	Sahtu
Hazmat Labourer	Simon Neyelle	Sahtu
Captain	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Haz mat Labourer	Clyde Takazo	Sahtu
Labourer – Camp Maintenance	Rocky Kenny	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
Cook's Assistant	Celestine McCauley	Sahtu
Medic	Bianca Spence	Other
TOTAL ON-SITE	**18**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	3 good, 1 flat tire
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	18

.

Weather

	Morning (0900hrs)	*Afternoon (1600hrs)*
Temperature:	9 °C	26°C
Precipitation:	None	None
Condition:	Partially cloudy	Clear

General

Camp Complement today is 18 persons.

Work in Progress

A site tour occurred today with people from INAC CARD, DOJ, PWGSC, and WSCC. The Land inspector and a health and safety expert also attended the tour.

The captain and carpenter are working on the boats.

At the drum wash station, drums were labelled into streams by the DR and OCR.

1. Waste Oil
2. Waste Fuel
3. Water with trace product
4. Drums ready for deheading

AEL will consolidate waste oil, waste jet fuel, and waste gas. These drums are being moved into separate smaller caches at the airstrip.

Health & Safety

Site safety meeting held every day at 0645h.
Topics covered today were fumes from the holding tanks, drinking water instead of coffee at breaks, and replacing PPE gear if required.

Environmental Issues

None

Comments, Concerns and Correspondence

The land inspector is satisfied with the proposed discharge location at the airstrip. The land inspector stated that the proposed discharge location at the Bay area cache is not ideal. The land inspector's concern regarding the discharge location at the Bay cache is not ideal because of the elevation and the gradient towards the water. If discharge is to be acceptable there will be a requirement of silt fences. As of today, the second proposed discharge location does not have approval.

Wildlife Observations

None.

Site Visitors
Joel Gowman (CARD)
Melissa Munger (CARD)
Buddy Williams (INAC - ATR)
Scott Duke (DOJ)
Tom Bradbury (INAC Norman Wells District Office)
Michael Bernardin (PWGSC)
Bert Varkonyi (H&S Advisor)
Bruce Graney (WSCC)

Comments during the end of trour roundtable discussion:
Joel Gowman (CARD) – based on the site visit held on the 21st, Joel reiterated that effective and daily ois wanted to ensure that the incinerator was in use and that heating oil drip trays are being pumped out. He reiterated that effective burning daily is a requirement. A safety concern was that the welding area is too close to the road.
Melissa Munger (CARD) – Melissa noted that the barricade at the crusher site had yet to be installed. She requested that when drum crushing activities commence to take a photo of the barricade in action. Melissa also requested to take photos of the discharge diffuser in action and to monitor the grey water lagoon.
Buddy Williams (INAC - ATR) – Buddy appreciated seeing the site. He provides legal advice to CARD and to see the site is beneficial. He told the group that there is private land, leased land, and Crown land at the site.
Scott Duke (DOJ) – Scott thanked the CARD team for the opportunity to tour the site. He stated that is very useful to have been on-site. Having knowledge from a site tour is invaluable.
Tom Bradbury (INAC Norman Wells District Office) – Tom stated that he did not see a problem with the discharge location at the airstrip. Tom was impressed with the clean-up job done to date. He had been to the site previously and really noticed a remarkable improvement in terms of scattered debris collection. He said that for the size of camp and the short duration a sewage treatment plant is not required
Michael Bernardin (PWGSC) – Michael stated that environmental supplies such as spill kits, bladders are to be stored in the Vehicle Maintenance Shop alongside the truck.
Bert Varkonyi (H&S Advisor) – Bert stated that ideally the medic tent would be separate from other tents. He recommended acquiring a reducer for O_2 tanks, in this way there will be 2 hours of supply which is needed for a medevac from Yellowknife. Bert recommended showing all of the people on site how to use the satellite phone. He also recommended a helicopter style stretcher, a 5 gallon jug and wash basin for the medic tent, to post a map of the First Aid trained personnel, and to run a 'mock' scenario. Bert also realized that improvisation is a reality at an isolated camp.
Bruce Graney (WSCC) – Bruce commented that a half mask at the drum treatment area may be more useful for the workers who are standing adjacent to the holding tanks. A dust mask will remove particulates however workers will get hot while wearing the half mask and Tyvek. He recommended a 10 minute break every hour and to rotate workers. This will reduce the exposure and potentially alleviate headaches, along with water consumption. He congratulated AEL on a clean kitchen.

Samples
None.

Photos

Biance Spence, the site medic (right) demonstrating that the satellite phone works. The satellite phone is housed at the muster station.

Jason, Michael, Bruce, Scott, Buddy, Melissa, Tom, Joel

The tour walking the former old airstrip towards the current drum cache.

The tour departed on floats at 1615h

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GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Thursday July 28th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep(OCR)	Kuri MacKeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal
Skilled Labourer - Carpenter	Charlie Modeste	Sahtu
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Hazmat Labourer	Antoine Ferdinand	Sahtu
Hazmat Labourer	Simon Neyelle	Sahtu
Captain	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Haz mat Labourer	Clyde Takazo	Sahtu
Labourer – Camp Maintenance	Rocky Kenny	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
Cook's Assistant	Celestine McCauley	Sahtu
Medic	Bianca Spence	Other
TOTAL ON-SITE	**18**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	3 good, 1 flat tire
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	19

.

Weather

	Morning (0900hrs)	*Afternoon (1700hrs)*
Temperature:	23°C	20°C
Precipitation:	None	None
Condition:	Partially cloudy	Clear

General
Camp Complement today is 18 persons.

Work in Progress
The drum rack for the cleaning of the drums was placed in the processing area. A pressure washer 'hotsie' will be used to clean the drums. Drums will be inspected by the DR and OCR after cleaning. These drums will then be ready to be crushed or require a second cleaning. The wash water is being collected in a lined container.

The first liquid contents were pumped through the entire treatment system. The liquid going into the holding bladders was clear and colourless. The liquid was free of sediment and did not have an hydrocarbon odour.

The captain continued boat maintenance with the carpenter.

Health & Safety
Site safety meeting held every day at 0645h.
Topics covered today were fumes from the holding tanks, drinking water instead of coffee at breaks, and replacing PPE gear if required.

Environmental Issues
None

Comments, Concerns and Correspondence
None.

Wildlife Observations
None.

Site Visitors
None.

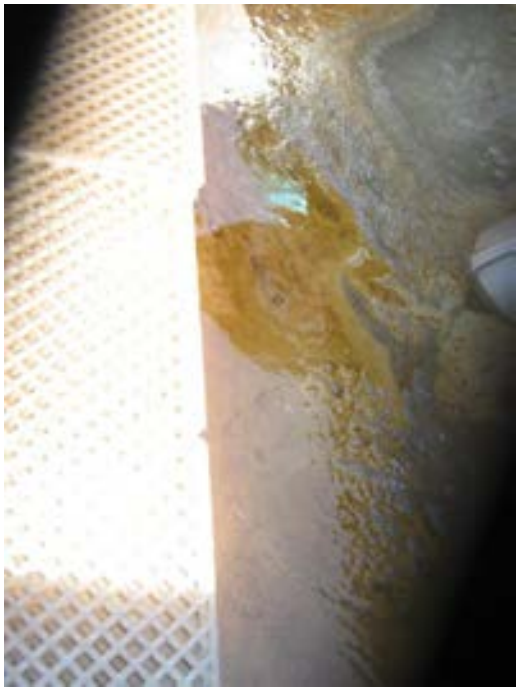
Samples
SB-W-1 (water collected for proposed discharge, being held in bladder)

Photos

The barrel rack with drums ready for cleaning.

An example of a drum ready to be washed

The liquid contents in the white holding tank. The oil layer is 3 cm thick



Liquid contents going through the oil-water separator. The honey comb structure promotes separation.

Liquid inside the oil water separator. The grey tube collects surficial oil.

Liquid contents on the other side of the oil-water separator. Note the turbidity.

Water sample SB-W-1

SENES Consultants Limited
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GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Friday July 29th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep(OCR)	Kuri MacKeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal
Skilled Labourer – Carpenter OUTBOUND	Charlie Modeste	Sahtu
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Hazmat Labourer OUTBOUND	Antoine Ferdinand	Sahtu
Hazmat Labourer	Simon Neyelle	Sahtu
Captain	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Haz mat Labourer	Clyde Takazo	Sahtu
Labourer – Camp Maint. OUTBOUND	Rocky Kenny	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
INBOUND	Frankie Elemie	Sahtu
INBOUND	Hughie Ferdinand	Sahtu
Cook's Assistant	Celestine McCauley	Sahtu
INBOUND	Patrick Goulet	N.Aboriginal
Medic	Bianca Spence	Other
TOTAL ON-SITE	**18**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	2 good, 1 flat tire, 1 broken axle
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	20

.

Weather

	Morning (0900hrs)	*Afternoon (1900hrs)*
Temperature:	21°C	24°C
Precipitation:	None	None
Condition:	Partially cloudy	Partially Cloudy

General

Camp Complement today is 16 persons.

Two planes

1. Norman Wells-Deline-Sawmill Bay –Deline-Norman Wells
   Crew: 3 crew OUTBOUND, 1 crew INBOUND
   Two of the crew went home sick, one crew left for personal reasons.
2. Yellowknife-Sawmill Bay-Yellowknife
   Equipment: pumps, tubes, activated carbon, motor oil, bladder, sample bottles
   Crew: 0 crew OUTBOUND, 2 crew INBOUND

Work in Progress

Drums containing liquid were moved according to waste stream.

Liquid contents were pumped into the holding tanks and put through the treatment system.

There are 20 drums were washed today.

25 drums were deheaded. Drums being deheaded are ready to be washed.

The captain and the carpenter continued to work on the boat.

Health & Safety

Site safety meeting held every day at 0645h.
Topics covered today were drinking water, rain gear, and JHAs for drum contents processing.

Environmental Issues

None.

Comments, Concerns and Correspondence

None.

Wildlife Observations

None.

Site Visitors
None.

Samples
SB-W-1 (sample shipped out)

Photos

Oil being skimmed off the top in the oil-water seperator.

The skimmed oil pouring into a separate compartment

Treated liquid being collected for sample SB-W-1. Note that the three 20 litre jugs are required for toxicity testing. This hose normally inputs into the holding bladder.

An example of a cleaned drum, now ready to be crushed.

.

The drum rack and hotsie in operation.

Liquid contents inside the drum washing station.

Sample bottles ready to be shipped from Sawmill Bay to Edmonton via Yellowknife. Maxxam Analytical accredited laboratory will be used for the analytical program.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Saturday July 30th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep(OCR)	Kuri MacKeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Labourer (departed for El Bonanza)	Simon Neyelle	Sahtu
Captain (departed for El Bonanza)	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Haz mat Labourer	Clyde Takazo	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Boat pilot (departed for El Bonanza)	Hughie Ferdinand	Sahtu
Cook's Assistant	Celestine McCauley	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal
Medic	Bianca Spence	Other
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	2 good at SB, 1 flat tire at SB, 1 at EB
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	21

.

Weather

	Morning (0600hrs)	*Afternoon (1500hrs)*
Temperature:	7°C	20°C
Precipitation:	None	None
Condition:	Clear	Clear

General

Camp Complement today is 15 persons. Three persons on barge to El Bonanza airstrip

Work in Progress

The oil-water separator was in full operation today. Approximately 2500 litres of treated water is in the holding bladder. The capacity of each bladder is 5600 litres.

The barge departed for El Bonanza at 0900 hrs. Three personnel and one quad are on the barge to collect equipment at the El Bonanza airstrip. These activities are part of the demobilization process. The captain, boat pilot, and labourer slept on the boat docked at the El Bonanza airstrip. They are scheduled to return tomorrow.

The generator connected to the 'hotsie' pressure washer required maintenance today. The mechanic replaced the O-rings on the hose. No drums were washed today. T

A further 40 drums were deheaded. Note that the oldest drums require a larger wheel set for the deheader. This part has been ordered.

One quad was fixed. Drums to be pumped into the white holding tanks ('Orange dot' drums) were moved adjacent to the holding tanks.

Health & Safety

Site safety meeting held every day at 0645h.
Topics covered today were using the right gloves for the task, self-respect, and JHA's for the drum wash area. The self-respect topics covered were daily cleanliness, drinking water, and getting enough sleep.
The medic stated that about half of the personnel on-site look tired and have light coughs. The medic said that sleep and drinking water are keys to staying healthy.

Environmental Issues

None.

Comments, Concerns and Correspondence

None.

Site Visitors

None.

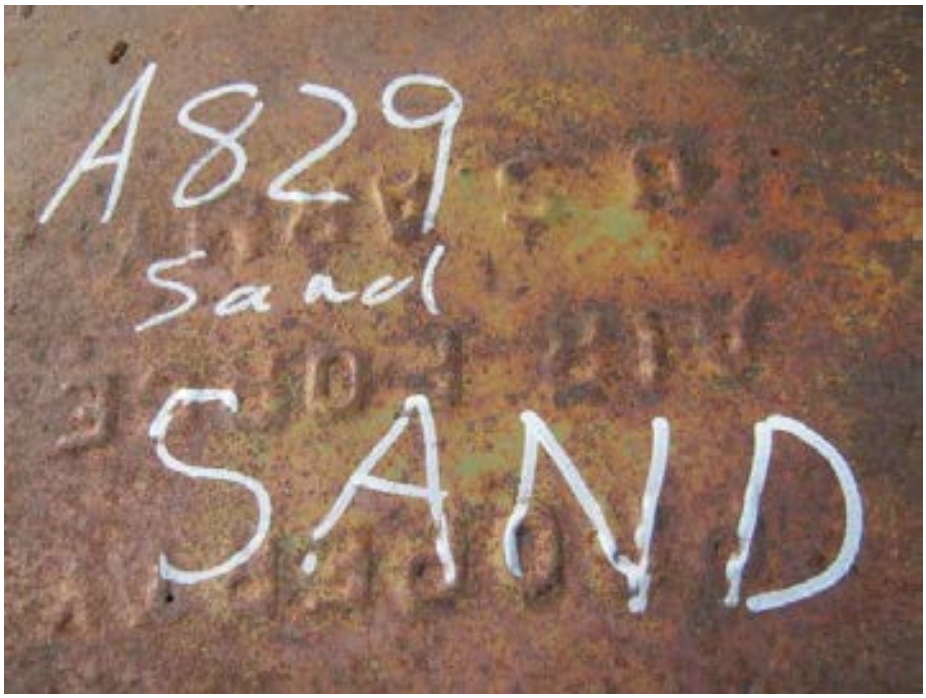
Wildlife Observations
A black bear was spotted at the former old airstrip. The wildlife monitor tracked it heading south east away from current crushing location.

Samples
None

Photos

The 'orange dot' signifies drums to be pumped into white holding tank.

'Red X' signifies to consolidate with like contents and to NOT pump into the white holding tank



There are 10 drums containing various amounts of sand.

Group 1 drums have a flash point of below 25°C.

Group 2 drums have a flash point between 25°C and 60.5°C

Waste oil consolidated from the processing into full drums.

Drums with liquid contents to be consolidated.
Waste fuel drums on the left, waste oil drums on the right. These drums to be consolidated 'like with like' using the INAC provided drums.

First holding bladder at approximately half capacity, second empty bladder in place.

The 'hotsie' pressure washer system. Water will be recycled through the system. Note there will be absorbent diapers used to collect oil from the washed drums.

The blue cartridge collects sediment. Note that the lines are not connected. The orange box has 2 blue cartridges which allows for changing a cartridge while the system is in operation.

Blue 'see through' hose leading to activated carbon from the 'clay'. Note the clear liquid.

Drums washed and ready to be crushed

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Sunday July 31st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep(OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Labourer	Simon Neyelle	Sahtu
Captain	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Haz mat Labourer	Clyde Takazo	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Boat pilot	Hughie Ferdinand	Sahtu
Cook's Assistant	Celestine McCauley	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal
Medic	Bianca Spence	Other
TOTAL ON-SITE	**18**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	4	3 good, the EB ATV returned at 0600hrs
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	22

.

Weather

	Morning (0900hrs)	*Afternoon (1500hrs)*
Temperature:	12°C	22°C
Precipitation:	None	None
Condition:	Overcast	Partially cloudy

General

Camp Complement today is 18 persons. The barge returned from El Bonanza at 0600hrs in the morning.

Work in Progress

At the airstrip:

In operation was the drum deheader; the drum washer; the diaphragm pump for transferring into holding tanks; and the oil-water separator. To date approximately 225 drums have been pumped into the holding tanks, 65 deheaded and washed, and 90 drums moved into consolidation areas. Five drums of waste oil have been filled from the separation process.

Barging Activities:

The barge returned from the El Bonanza airstrip.

61 drums and the Argo were transported back to Sawmill Bay. Four of the drums are new AEL drums from last year's project and 57 drums are old, originating from the El Bonanza and Bonanza sites. These drums were stored at the El Bonanza airstrip through the winter.

The captain, boat pilot and one crew worked on off-loading the boat further boat upgrades.

Health & Safety

Site safety meeting held every day at 0645h.

Topics covered today were keeping your mind on the task, going to bed early, and talking to the medic. .

Environmental Issues

None.

Comments, Concerns and Correspondence

None.

Site Visitors

None.

Wildlife Observations

A black bear was spotted at the intersection the two airstrips. The wildlife monitor observed the bear travelling North, away from the intersection. It is the same bear as seen yesterday.

Samples
None

Photos

Changing out the sediment filter housed in the blue cylinder.

Holding bladder at approximately 85% capacity

Drums being washed concurrently with treated liquid being pumped into holding bladder.

Drums ready to be deheaded.

The 2010 airstrip drum cache reducing in numbers

MINUTES OF MEETING - DRAFT
Weekly Construction Meeting

Project Name: Sawmill Bay, Great Bear Lake. Environmental Site Remediation – Phase 1
Project No.: R.015211.027 and R.015211.038

Date: 1800hrs Wednesday July 27th, 2010.
Location: Sawmill Bay

Purpose: Weekly Construction Meeting and Schedule Review

Attendance and Distribution

Person	Initials	Company	Role	Email	Attended	Distributed
Brad Landry	BL	AEL	Superintendent	blandry@aboriginaleng.com	√	
Jason Mauchan	JDM	SENES/DCS	DR	jmauchan@dcsltd.ca	√	
Michael Bernardin	MB	PWGSC	PWGSC PM	Michael.Bernardin@pwgsc-tpsgc.gc.ca		√
Charles Gravelle	CG	SENES/DCS	DR PM	cgravelle@dcsltd.ca		√
Joel Gowman	JG	AANDC	AANDC CARD PM	Joel.Gowman@inac-ainc.gc.ca		
Mellissa Munger	MM	AANDC	AANDC CARD	Melissa.Munger@aandc-aadnc.gc.ca		
Clint Baptiste	CB	AEL	Field Tech	gbladmin@aboriginaleng.com		
Robert Johnson	RJ	AEL	AEL PM	rjohnson@aboriginaleng.com		
Bianca Spence	BS	AEL	Medic	siebrand6@msn.com		
Kurri Mackeinzo	KM	DFN	OCR	c_mack21@hotmail.com		

i) Introduction

Agenda:

1. Review and approve minutes of previous meetings;
2. Review of Work progress since previous meeting;
3. Field observations, problems, conflict;
4. Problems which impede construction Schedule;
5. Review of off-site fabrication delivery Schedules;
6. Project Schedule review, identifying activities that are behind Schedule and providing measures to regain slippage;
7. Corrective measures and procedures to regain Projected Schedule;
8. Revisions to construction Schedule;
9. Progress Schedule, during succeeding Work period;
10. Review submittal Schedules and expedite as required;
11. Maintenance of quality standards;
12. Review proposed changes for affect on construction Schedule and on completion date;
13. Health, Safety and Security issues;

14. Correspondence from Authorities Having Jurisdiction (AHJ) or expected visits from AHJ;
15. Camp requirements; and
16. Regulatory compliance
17. Other business.

1 Review and approve minutes of previous meetings.

- This is the first weekly meeting.

2 Review of Work progress

- Drum wash station construction
- Moving drums into groups at the Airstrip Cache
- Demobilization activities

3 Field observations, problems, conflicts

- Field crew are wearing the appropriate PPE
- The treatment system cannot handles large amounts of oil
- The treatment system is capable of handling drums containing water and a sheen
- Drums with a majority of product will not be put through the system.

4 Problems which may impede construction Schedule.

- The contractor is working on demob activities concurrently with drum wash activities
- Transporting all drums to the Airstrip Cache vs transport the treatment system to the Bay
    - Based on the inspector's comments, AEL plans to transport all drums to Airstrip

5 Review of off-site delivery schedule

- Awaiting parts and equipment for the drum wash station

6 Project Schedule review, identifying activities that are behind Schedule

- Treating water is behind schedule

7 Corrective measures and procedures to regain and determine Projected Schedule.

- Parts have been ordered
- The subsequent plane will have equipment

8 Revisions to construction Schedule

- BL to submit a construction schedule

9 Progress Schedule, during succeeding Work period.

- Transporting drums into groupings at Airstrip
- Begin treatment of liquid contents
- Continue cleaning drums

10 Review submittal Schedules and expedite as required

- Next plane will have equipment

11 Maintenance of quality standards

- Quality standards being maintained through daily record keeping and monitoring
- Water samples to be sent to an accredited laboratory

12 Review proposed changes for effect on Construction Schedule.

- AEL to submit construction schedule

13 Health, Safety and Security issues.

- The bear fence is in operation during the evenings
- A barrier shield will be constructed for use during crushing activities

14 Correspondence from AHJ or expected visits from AHJ.

- The site inspection and tour occurred on Wednesday July 27th, 2011
- The Land Inspector verbally approved the discharge location at the airstrip during the July 27th site visit. He stated that a diffuser is required.
- A photo of the diffuser in action was requested when discharge begins
- The land inspector verbally disapproved of the discharge location proposed at the Bay Cache.
    - The inspector stated "At the Bay cache, at minimum further actions would be required, including silt fences, diffuser, and increased distance. The airstrip discharge location is preferred."
- The transport of all drums to the airstrip satisfies the land inspector.
    - AEL proposing to transport all Bay Cache drums to the airstrip

15 Camp requirements

- None

16 Regulatory compliances issues and other business

- Tracking daily Water Use. Water inspector requires daily and cumulative totals.
- Monitor grey water lagoon levels, sample will be obtained from end-of-pipe
- Average of 1 m^3 per day being used as camp water

17 Any Other Business

- None

Action *BL to submit the AEL project schedule to JM and MB*

Please advise the writer, in writing, if these minutes contain any errors or omissions, otherwise they will become part of the project documentation as presented.

END OF MINUTES

Minutes prepared by:

Jason Mauchan
Sawmill Bay Great Bear Lake Environmental Site Remediation Phase I – Department Representative
Decommissioning Consulting Services Limited

27 July 2011

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Monday August 1st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Labourer OUTBOUND	Simon Neyelle	Sahtu
Captain	Ed Loutit	N.Aboriginal
HEO	Nathan Modeste	Sahtu
Haz mat Labourer OUTBOUND	Clyde Takazo	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer OUTBOUND	Greg Kenny	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Boat pilot	Hughie Ferdinand	Sahtu
Cook's Assistant OUTBOUND	Celestine McCauley	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal
Medic	Bianca Spence	Other
Hazmat Labourer INBOUND	Derek Neyelle	Sahtu
Hazmat Labourer INBOUND	Roger Football	N.Aboriginal
Hazmat Labourer INBOUND	Ricky Rabesca	Sahtu
Hazmat Labourer INBOUND	Andrew Beaverho	N.Aboriginal
Cook's Assistant INBOUND	Alice Heron	N.Aboriginal
TOTAL ON-SITE	**19**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, note 1 shipped off-site
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	2
2011 Total	24

.

Weather

	Morning (0700hrs)	*Afternoon (1500hrs)*
Temperature:	7°C	19°C
Precipitation:	None	None
Condition:	Overcast	Partially cloudy

General

Camp Complement today is 19 persons.

Two flight arrivals occurred today.
The twin otter charter flew YK-SB-Deline-SB-YK. Personnel and equipment arrived from Yellowknife. Personnel departed for and arrived from Deline.

Work in Progress

An accommodation tent was moved in the morning.

At the airstrip:
No activities in the morning. In the afternoon, the last 'orange dot' drums were moved adjacent to the white holding tanks. These were pumped into the holding tanks. The treatment process was in operation during the afternoon. Approximately 7500 litres of water is now being stored in the bladders.

The DR and OCR sampled water entering the second bladder.

The DR and OCR began labelling drums at the Bay area cache.

Barging Activities:
The 2nd boat was put in the water. The captain and the boat pilot are preparing the barge for demobilization.

Health & Safety
Site safety meeting held every day at 0645h.
Topics covered today were sunscreen, changing sheets, and JHA for moving drums.
The tent was moved due to ash. Prior to site activites, the stove pipe in this tent had fallen over. The ash had covered the floor. The floor was cleaned however, three people in the tent were not feeling well over the past two days. The medic evaluated them. AEL decided to move the entire tent and contents as a precaution. The medic recommended sleep, water, and prescribed Neocitron to two crew.

Environmental Issues
None.

Comments, Concerns and Correspondence
The four Outbound crew decided to go home due to personal reasons.

Site Visitors
None.

Wildlife Observations
None.

Samples
SB-W-2 (contents from the second holding bladder)

Photos

Launching the second boat, to be used for demobilization activities.

The Bay area drum cache. Labelling these drums began today.

The airstrip treatment area.

Water sample SB-W-2. The water is clear, colourless, and odourless.

The second bladder in use. Results pending for the first bladder.

Sawmill Bay

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Tuesday August 2nd, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal – Fort Res
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Captain	Ed Loutit	N.Aboriginal - Hay River
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Boat pilot	Hughie Ferdinand	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Roger Football	N.Aboriginal - Tlicho
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**19**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 1 trailer requires repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Argo	1	Requires repair

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	25

.

Weather

	Morning (0700hrs)	*Afternoon (1500hrs)*
Temperature:	5°C	18°C
Precipitation:	None	None
Condition:	Clear	Clear

General
Camp Complement today is 19 persons.

Work in Progress

A protective shield was built today which will be used during crushing activities.

Drums were deheaded at the airstrip cache.

Road maintenance near the old dock occurred.

Hauling drums from the Bay area cache commenced. Two ATVs were used in the hauling process. Between three and five drums were hauled per trip. The truck was also used for hauling periodically.

Pumping 'orange dot' drums occurred during the morning. Approximately 7000 litres of water has been processed. Laboratory results are expected by Friday for the first bladder.

Demobilization activities occurred with the captain, boat pilot, and a HEO loading the barge for passage to Deline.

Health & Safety
Site safety meeting held every day at 0645h.
Topics covered today were JHAs for barge loading activities, wearing the proper gloves, and eye contact with operators.

Environmental Issues
None.

Comments, Concerns and Correspondence
None.

Site Visitors
None.

Wildlife Observations
A black bear was spotted near the cross roads of the two airstrips.

Samples
None

Photos

Approximately 7000 litres of water being held in the bladders.

Drum deheading adjacent to the drum wash.

The OCR labelling drums at the Bay area cache

Fresh water collection at the Bay. Note each container is 1 m^3.

The Argo returned from El Bonanza airstrip.

The line-up for drums requiring deheading

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Wednesday August 3rd, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal – Fort Res
Journeyman - Mechanic	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman	Kurt Stewart	Sahtu
Captain	Ed Loutit	N.Aboriginal - Hay River
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Boat pilot	Hughie Ferdinand	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Roger Football	N.Aboriginal - Tlicho
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**19**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 1 trailer requires repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Argo	1	Requires repair

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	26

.

Weather

	Morning (0700hrs)	*Afternoon (1500hrs)*
Temperature:	9°C	26°C
Precipitation:	None	None
Condition:	Clear	Sunny

General

Camp Complement today is 19 persons.

Work in Progress

Contract Work

Demobilization activities progress throughout the day. Equipment and materials from the Port Radium project were loaded onto the barge for passage to Deline. These materials included 30 m^3 of 2"x4", 5 rolls of geosynthetic liner, 5 plastic culverts, 40 bags of cement, metal skid, trailer, and a cement truck. Equipment from the Sawmill Bay project was limited to the broken Argo and the unusable drum crusher.

TA Work

Drums labelled with 'orange dots' were transported to the Airport cache from the Bay cache. These drums contain water with a range of depths of product from 5mm to 5 cm. The drums were transported using 2 ATVs with trailer, and the pick-up truck occasionally.

Note that one trailer requires repair.

At the Airport cache, the lid deheader, pressure washer, and oil-water separator were in operation. The contents of the drums transported from the Bay cache were pumped into the white holding tanks.

In total 150 drums have been deheaded and washed.

A summary of the drum activities are presented in the table below.

Progress Table

	Airstrip Cache To Do (A)	Completion	Bay Cache To Do (B)	Completion
Number of Drums	1093		1056	
Transporting Drums with Water Main Phase to pump	232	100%	219	20%
Pumping Drums with Water Main Phase	232	100%	219	18%
Treating of Water (litres)	7680	100%	7700	18%
Transporting Drums with Product Main Phase	121	90%	38	0%
Consolidating Drums with Product Main Phase	121	0%	38	0%
Consolidating Volume Product (litres)^2	12867	0%	822	0%
Drums with Sludge	655		768	
Treating/Consolidating Sludge (litres)	2781	23%	2000	0%
Deheading drums	1093	14%	1056	0%

Health & Safety
Site safety meeting held every day at 0645h.
Topics covered today were proper lifting techniques, slips/trips&falls, and eye contact with the HEO.

Environmental Issues
None.

Comments, Concerns and Correspondence
The project schedule requires submitting by AEL.

Site Visitors
None.

Limiting Factors and Potential Pressures
The current drum 'deheader' does not work for the old style drums. A secondary wheel has been ordered to allow for cutting of the large rim drums.

Transporting the drums from the Bay cache is limited to ATVs and trailers. A holding box was constructed to transport drums using the loader.

When crushing commences, capacity is estimated at 500 per shift. Crushing activities require 1 labourer and 1 HEO.

Observations indicate that the drum deheading is the limiting factor followed by transportation of Bay cache drums.

Wildlife Observations
A black bear was spotted adjacent to the camp area fuel cache, adjacent to the old lodge. The bear monitor fired a warning shot. The bear headed south. Note that yesterday, the bear was seen at the airstrip crossroads.

Samples
None

Photos

The holding bladders.

Liner will be used for crushed drums to be stored on.

Liquid contents in the white holding tank.

The barge being prepared for departure to Deline.

Material on the barge.

The unusable drum crusher wrapped for transport.
Note that it isn't strong enough to crush the old Sawmill drums.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Thursday August 4th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal – Fort Res
Journeyman – Mechanic BARGE	Phil Dowton	Other
Field Tech	Clint Baptiste	Sahtu
Haz-Mat specialist - Foreman OUTBOUND	Kurt Stewart	Sahtu
Captain BARGE	Ed Loutit	N.Aboriginal - Hay River
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Boat pilot BARGE	Hughie Ferdinand	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer BARGE	Roger Football	N.Aboriginal - Tlicho
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**14**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Argo	0	Requires repair, outbound on Barge
Oil-Water seperator	1	good
Pressure washer	1	Requires maintenance as of 6pm

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	27

.

Weather

	Morning (0700hrs)	*Afternoon (1400hrs)*
Temperature:	10°C	32°C
Precipitation:	None	None
Condition:	Clear	Hot

General

A float plane arrived today. Groceries and equipment for both barge and water treatment arrived.

Camp Complement today is 14 persons. One crew member was Outbound for home. Four crew departed on the barge to Deline.

The first results for the process water were delivered by Maxxam Analytics Ltd.

Work in Progress

Contract Work

The barge departed for Deline. Four crew on board.
The materials and equipment on board are from the Port Radium project except for the broken Argo and inadequate barrel crusher.

TA Work

Bay Cache drums continued to be transported to the Airstrip Cache.

The liquid contents in these drums were pumped into the white holding tanks. The oil-water separator and the pressure washer were in operation.

Analytical Results

Analytical results for the process water were delivered to the DR during the evening of August 4th.

The analytical results are presented below with comparison to discharge criteria.

The sample obtained from the first holding bladder, SB-W-1 failed for extractable hydrocarbons.

The sample obtained from the second holding bladder, SB-W-2, has passed discharge criteria. Note however, that results are still pending for both samples.

Parameter	SB-W-1	SB-W-2	Maximum Allowable Concentration
Volatile Hydrocarbons	0.351 mg/L	0.120 mg/L	15 mg/L
pH	Pending	7.71	6-9
Extractable Hydrocarbons	6 mg/L	< 2 mg/L	5 mg/L
NAPL/free product	Not present	Not present	Not present
Phenols	0.028 mg/L	0.046	Not listed
Arsenic (total)	19 ug/L	26	100 ug/L
Copper (dissolved)	<0.3 ug/L	0.3 ug/L	200 ug/L
Cadmium (dissolved)	0.013 ug/L	0.1 ug/L	10 ug/L
Mercury (total)	0.01 ug/L	0.008 ug/L	0.6 ug/L
Nickel (dissolved)	<0.5 ug/L	2.8 ug/L	200 ug/L
Lead (dissolved)	39 ug/L	5.6 ug/L	50 ug/L
Zinc (total)	7 ug/L	11 ug/L	1000 ug/L
Chromium (total)	< 1 ug/L	1 ug/L	100 ug/L
Cobalt (dissolved)	<0.3 ug/L	0.3 ug/L	50 ug/L
LC50(96) Toxicity Testing[2]	pending	pending	Test sample is of acutely lethal toxicity if test population mortality equals or exceeds 50% of the test population in 96 hour time period

The water in the first holding bladder will be pumped through the latter half of the treatment system. AEL proposed to pump the water through the blue sediment filter onward. The sediment filter, clay, and carbon are meant to remove sediment. The flow rate achievable through this process is 30 litres/minute. It is expected that recirculating the water in the first holding bladder will take 3 hours. Note that the flow rate through the entire system is dictated by the flow rate from the white holding tanks into the oil-water separator chamber In order for oil to be skimmed off the top effectively, the flow has been restricted to 4 litres/minute.

Health & Safety

Site safety meeting held every day at 0645h.
Topics covered today were avoiding sprains/strains, taking care of the walkie-talkies, driving at a safe speed, and drinking water. JHA's for the operations were reviewed and signed. The DR will document the steps taken with regards to compliance orders during the morning of August 5th.

Environmental Issues

None.

Comments, Concerns and Correspondence

A revised project schedule was submitted by AEL during the weekly meeting held at 1700 hrs.

The AEL submitted schedule is presented on the following page:
Liquid content and barrel processing is scheduled to be completed on August 11th.
A contingency day and boxing the ash is scheduled for August 12th.
Drum crushing is scheduled for August 13th-15th. Estimated 5 crew required. (HEOx2, labourerx2, WM)
Demob activities are scheduled for 4 days, Aug 16th-19th.
Based on crushing activities being contract work, the last day for TA work is projected to be August 12th.
Completion date for the project as a whole is schedule for August 20th with the departure of the barge.

SUN	MON	TUE	WED	THUR	FRI	SAT
				4	5 TRANSPORT	6 TRANSPORT
7 TREAT & WASH	8 TREAT & WASH	9 TREAT & WASH	10 TREAT & WASH & CONSOL	11 TREAT & WASH & CONSOL	12 ASH & CONTIGENCY	13 CRUSH & STOCKPILE
14 CRUSH & STOCKPILE	15 CRUSH & STOCKPILE	16 DEMOB	17 DEMOB	18 DEMOB	19 DEMOB	20 DEMOB - BARGE DEPARTURE
21	22	23	24	25	26	27
28	29	30	31			

Site Visitors
The Air Tindi float plane was docked for 1 hour to off load groceries and supplies. The two pilots did not come to the main camp.

Limiting Factors and Potential Pressures
The limiting factors are transporting the drums to the airstrip and drum deheading.

Wildlife Observations
The same black bear was spotted at the airstrip by the wildlife monitor.

Samples
None.

Photos

A sediment filter changed out. The sediment filter is housed in the blue box, immediately after the oil-water separator.

The crew aboard the barge, prior to departure.

On-Site Community Rep, Kurri Mackeinzo.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Friday August 5th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal – Fort Res
Field Tech	Clint Baptiste	Sahtu
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**14**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, one trailer requires repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water seperator	1	good
Pressure washer	1	Good, replaced.

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	28

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Weather

	Morning (0900hrs)	*Afternoon (1400hrs)*
Temperature:	12°C	33°C
Precipitation:	None	None
Condition:	Clear	Hot

General

Camp Complement today is 14 persons. The barge arrived in Deline. The barge is expected to return Monday. Monday is the expected return of the Hazmat specialist.

Work in Progress

Today was dedicated to hauling drums from the Bay area cache to the Airstrip cache. Drums were hauled using 3 ATVs with trailers and the truck. As in previous days, at the end of the each day, the DR and OCR tally the completion rate by counting drums.

	Airstrip Cache To Do (A)	**Completion**	**Bay Cache To Do (B)**	**Completion**
Number of Drums	1093		1056	
Transporting drums with Water Main Phase to pump	232	100%	219	50%
Pumping drums with Water Main Phase	232	100%	219	18%
Treating of Water (litres)	7680	100%	7700	18%
Transporting drums with Product Main Phase	121	90%	38	20%
Consolidating drums with Product Main Phase	121	0%	38	0%
Consolidating Product (litres)	12867	0%	822	0%
Drums with Sludge	655		768	
Treating/Consolidating Sludge (litres)	2781	23%	2000	0%
Transporting drums with Sludge	655	90%	768	45%
Deheading drums	1093	14%	1056	0%

Another day of transporting drums is scheduled for tomorrow.

Health & Safety

Site safety meeting held every day at 0645h.
Topics covered today were safe speed while driving, bending knees while lifting, drinking water.

Environmental Issues

None.

Comments, Concerns and Correspondence

AEL addressed the compliance orders today. The DR and site supervisor read through the orders and completed a tour of the items being addressed.

- There were 6 compliance orders
    1. First Aid room to be a separate tent
        - The contractor stated the First Aid room will always be a separate room for an injured worker when required. The contractor stated that beds are available if the transition to a full-time First Aid room is required. The contractor is exploring options to shuffle personnel to the different beds shown. The shuffle will occur when the barge schedule is determined.

The blue first aid room currently houses the medic, cook, and cook's assistant

Two available beds

Two available beds

Main road through camp

2. Widen door on First Aid tent

The contractor stated and displayed that the First Aid tent door will not be widened because the stretcher fits.

3. Increase the amount of on-site oxygen

The oxygen on-site

Additional oxygen tanks arrived August 4th.

AEL provided oxygen calculations for the amount as of August 4th:

$$\frac{\text{PSI in the tank - 200 psi x constant}}{\text{flow rate in litre per min}} = \text{time}$$

Constants: D tank constant is 0.16, E tank constant is 0.28

3 x D tanks at 2000 psi, 1 x E tank at 1500 psi

Calculations:
2000-200 =1800 x 0.16=288 /12 = 24 minutes x 3 tanks = 1 hour 12 min

1500-200=1300 x .28= 364 /12 = 30.3 min

Total O_2 currently available is 1 hour 42 minutes

(plus the 800 psi still usable that they call safe zone 15 minutes) = 1 hour 57 min.

4. Provide suitable transportation for injured worker

   AEL informed the DR that the truck will be used to transport an injured worker. A stretcher with padding and blankets will be deployed.

5. Provide stretchers for injured workers

AEL ordered a new stretcher suitable for transportation in a helicopter and fixed wing aircraft. It is called a Ferno #9. It is en route.

6. Provide stretchers suitable for aircraft
   The medic spoke with charter companies that provide both fixed wing and helicopter. They informed her that the stretcher on order, the Ferno #9, is suitable for transporting injured workers with respect to the stretcher dimensions.

Site Visitors
None.

Limiting Factors and Potential Pressures
There is a large stockpile of drums now ready to be pumped at the airstrip.
The first holding bladder will be pumped through the treatment system again.
The pressure washing of drums requires time.

Wildlife Observations
None.

Samples
Analytical results received so far are included as Appendix A

Pending results:
LC50(96) for SB-W-1 and SB-W-2, expected delivery date is August 8th.

The water licence states that either an EC50(15) or an LC50 (96) test be performed.

From the water license:

"EC50(15)" means in a bioassay test, the effluent is deemed excessively toxic if the light emission of a marine bioluminescent bacterium colony is reduced by more than 50% over 15 minutes when challenged by a sample containing a toxic substance. A test result of greater than or equal to (75) is considered a pass.

"LC50(96)" means in a bioassay test, that effluent is deemed acutely lethal if the undiluted (100%) effluent kills 50% or more of the fish in the test after 96 hours.

The pass threshold of the EC50 bioassay is compatible with the pass/fail results in the 96 hour trout bioassay. For the first two samples, the LC50(96) bioassay was chosen because it was logistically feasible and the bioassay directly tests the effect of the process water on fish population.

Photos

AEL posted the inspection report on the information board adjacent to the kitchen.

The protective shield to be used during crushing activities. It measures 6' x 6'

The protective shield, side view.

Transporting drums using ATV and trailer

Drums at the Bay area cache ready being readied for transport to the Airstrip cache

ATV with trailer departing from the Bay area cache.

The truck departing from the Bay area cache with drums containing varying amounts of water

The Bay area drum cache, looking toward the water.

The Bay area drum cache. Note that close to half of the drums at the Bay cache have now been transported to the Airstrip cache

Drums ready for their liquid contents to be pumped into the white holding tanks.

Drums ready to be washed.

Drums ready for consolidation.

Sampling Requirements for Trout Testing at Maxxam Analytics

As described in Section 4.1 of EPS1/ RM/13 from Environment Canada link below:
http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=3EC01E38-2F98-49E4-BD4C-255310436397

Sample volume requirements are 20L for a Trout 100% Screen, or 60L for a multi-dilution to determine LC50.

Sample storage containers can be provided by Maxxam as either 20L plastic pails with lids or as collapsible 20L bladders with caps. If otherwise provided by a client, the containers must be clean plastic that is comprised of nontoxic material such as polyethylene or polypropelene.

Sampling is performed if required by License or Regulators as a composite or grab sample. Fill each container with a representative aliquot of sample, enough to exclude air (ie no headspace) and then seal bladder caps with tape or fully snap on lids for pails.

Sample Labeling should include sample type, source, date and time of collection, name of sampler(s) and number of containers. All this information should be included on the Chain of Custody Document as well.

Samples are transported to meet the following requirements. The samples must be kept from freezing. During the winter season, sample bladders can be shipped in insulating coolers, along with limiting exposure in open or unheated transport vehicles during extended shipping times. As well, the samples should be kept in the dark, and at a temperature of 1 to 8 ^{o}C, if samples are more than 2 days in transit.
NOTE: Caps with spouts on bladders should be sealed with an external wrap of duct tape to prevent accidental opening during transit.

Sample hold time is 5 days from sampling to when the lab must setup the test. However, testing should start as soon as practical after sampling. Sample submission should ideally be early in the week to avoid shipping or setup delays over a weekend.

9331-48 Street, Edmonton, Alberta T6B 2R4
Tel: 780-577-7100 Fax: 780-450-4187 Website: www.maxxam.ca

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Saturday August 6th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal – Fort Res
Field Tech	Clint Baptiste	Sahtu
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**14**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water seperator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	29

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Weather

	Morning (0700hrs)	*Afternoon (1400hrs)*
Temperature:	11°C	34°C
Precipitation:	None	None
Condition:	Clear	Clear Hot

General

Camp Complement today is 14 persons. The barge is in Deline.

Work in Progress

Transportation of drums

Today, drums were hauled from the Bay area cache to the Airstrip cache. Drums were hauled using 3 ATVs with trailers, the truck, and the loader.

	Airstrip Cache To Do (A)	**Completion**	**Bay Cache To Do (B)**	**Completion**
Number of Drums	1093		1056	
Transporting drums with Water Main Phase to pump	232	100%	219	80%
Pumping drums with Water Main Phase	232	100%	219	18%
Treating of Water (litres)	7680	100%	7700	18%
Transporting drums with Product Main Phase	121	90%	38	70%
Consolidating drums with Product Main Phase	121	0%	38	0%
Consolidating Product (litres)	12867	0%	822	0%
Drums with Sludge	655		768	
Treating/Consolidating Sludge (litres)	2781	23%	2000	0%
Transporting drums with Sludge	655	90%	768	89%
Washing drums	1093	14%	1056	0%

Treatment of the drums containing water is schedule to recommence tomorrow. In the morning, AEL plans to use the loader to haul remaining drums which are close to full. Another half day of transporting drums is anticipated.

The oil-water separator was cleaned using the pressure washer.

Health & Safety
Site safety meeting held every day at 0645h.

Topics covered today were housekeeping, cleaning up camp, removing hazards, and safety observation cards. The housekeeping of camp was performed to mitigate odours and promote a healthy lifestyle.

Environmental Issues
None.

Comments, Concerns and Correspondence
It will be a significant moment when all the drums have been transported to the airstrip cache.

Site Visitors
None.

Limiting Factors and Potential Pressures
There is a large stockpile of drums now ready to be pumped at the airstrip.
The first holding bladder will be pumped through the treatment system again.
The pressure washing of drums requires time.

Wildlife Observations
A bear was spotted twice by the wildlife monitor. At 0600hrs and 1700 hrs a black bear was seen near the fuel cache.

Samples
Pending results:
LC50(96) for SB-W-1 and SB-W-2, expected delivery date is August 8th.

Photos

Drums hauled in groups of 8 using the loader.

The Airstrip Drum Cache growing in numbers.

The Bay area Cache reducing in numbers.

One pail of activated carbon

Activated carbon change, schedule for August 7th

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Sunday August 7th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent	Brad Landry	N.Aboriginal – Fort Res
Field Tech	Clint Baptiste	Sahtu
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**14**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair as of 1800hrs
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water seperator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	30

.

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	8°C	33°C
Precipitation:	None	None
Condition:	Clear	Clear

General

Camp Complement today is 14 persons. The barge departed Deline.

Work in Progress

TA

The honey-comb structure of the oil-water separator was cleaned. The treatment system is scheduled to operate for 4 days. The filter cartridge was changed out and activated carbon is scheduled for a change this week.

Transportation of drums

The vast majority of the old drums from the Bay cache have been transported to the Airstrip cache. The 13 old drums remaining require hauling using the loader. Note there are also remaining drums at the Bay area cache which are AEL drums from the Port Radium project as well as drums transported from El Bonanza which are ready to be crushed.

	Airstrip Cache To Do (A)	**Completion**	**Bay Cache To Do (B)**	**Completion**
Number of Drums	1093		1056	
Transporting drums with Water Main Phase to pump	232	100%	219	98%
Pumping drums with Water Main Phase	232	100%	219	19%
Treating of Water (litres)	7680	100%	7700	18%
Transporting drums with Product Main Phase	121	90%	38	97%
Consolidating drums with Product Main Phase	121	0%	38	0%
Consolidating Product (litres)	12867	0%	822	0%
Drums with Sludge	655		768	
Treating/Consolidating Sludge (litres)	2781	23%	2000	0%
Transporting drums with Sludge	655	90%	768	99%
Washing drums	1093	14%	1056	0%

Health & Safety
Site safety meeting held every day at 0645h. Topics covered today were JHAs for hauling drums, communication, bear safety, and road safety.

Environmental Issues
None.

Comments, Concerns and Correspondence
None.

Site Visitors
None.

Limiting Factors and Potential Pressures
The treatment system is scheduled to be in operation full-time in the next coming days. The limiting factor is the flow rate into the oil-water separator.

Wildlife Observations
Two different black bears were seen during the day. The first was seen by the fuel cache heading south. The second, by the Airstrip cache, heading west. In all cases, the wildlife monitor was informed over the radio. The second bear was seen a second time heading west away from camp.
A bear banger was used by the wildlife monitor during the second and third sighting.

Samples
The toxicity testing results were received today. None of the fish died after a 96 hour exposure to the treatment water in both SB-W-1 and SB-W-2. SB-W-2 represents water awaiting discharge in the second holding bladder.

Note that the sample taken from the first holding bladder, SB-W-1, reported an extractable hydrocarbon level of 6 mg/L. This is 1 mg/L above criteria.

Table 1: Analytical Results Summary

Parameter	SB-W-1	SB-W-2	Maximum Allowable Concentration
Volatile Hydrocarbons	0.351 mg/L	0.120 mg/L	15 mg/L
pH	Pending	7.71	6-9
Extractable Hydrocarbons	6 mg/L	< 2 mg/L	5 mg/L
NAPL/free product	Not present	Not present	Not present
Phenols	0.028 mg/L	0.046 mg/L	Not listed
Arsenic (total)	19 ug/L	26 ug/L	100 ug/L
Copper (dissolved)	<0.3 ug/L	0.3 ug/L	200 ug/L
Cadmium (dissolved)	0.013 ug/L	0.1 ug/L	10 ug/L
Mercury (total)	0.01 ug/L	0.008 ug/L	0.6 ug/L
Nickel (dissolved)	<0.5 ug/L	2.8 ug/L	200 ug/L
Lead (dissolved)	39 ug/L	5.6 ug/L	50 ug/L
Zinc (total)	7 ug/L	11 ug/L	1000 ug/L
Chromium (total)	< 1 ug/L	1 ug/L	100 ug/L
Cobalt (dissolved)	<0.3 ug/L	0.3 ug/L	50 ug/L
LC50(96) Toxicity Testing[2]	0% killed	0 % killed	Test sample is of acutely lethal toxicity if test population mortality equals or exceeds 50% of the test population in 96 hour time period

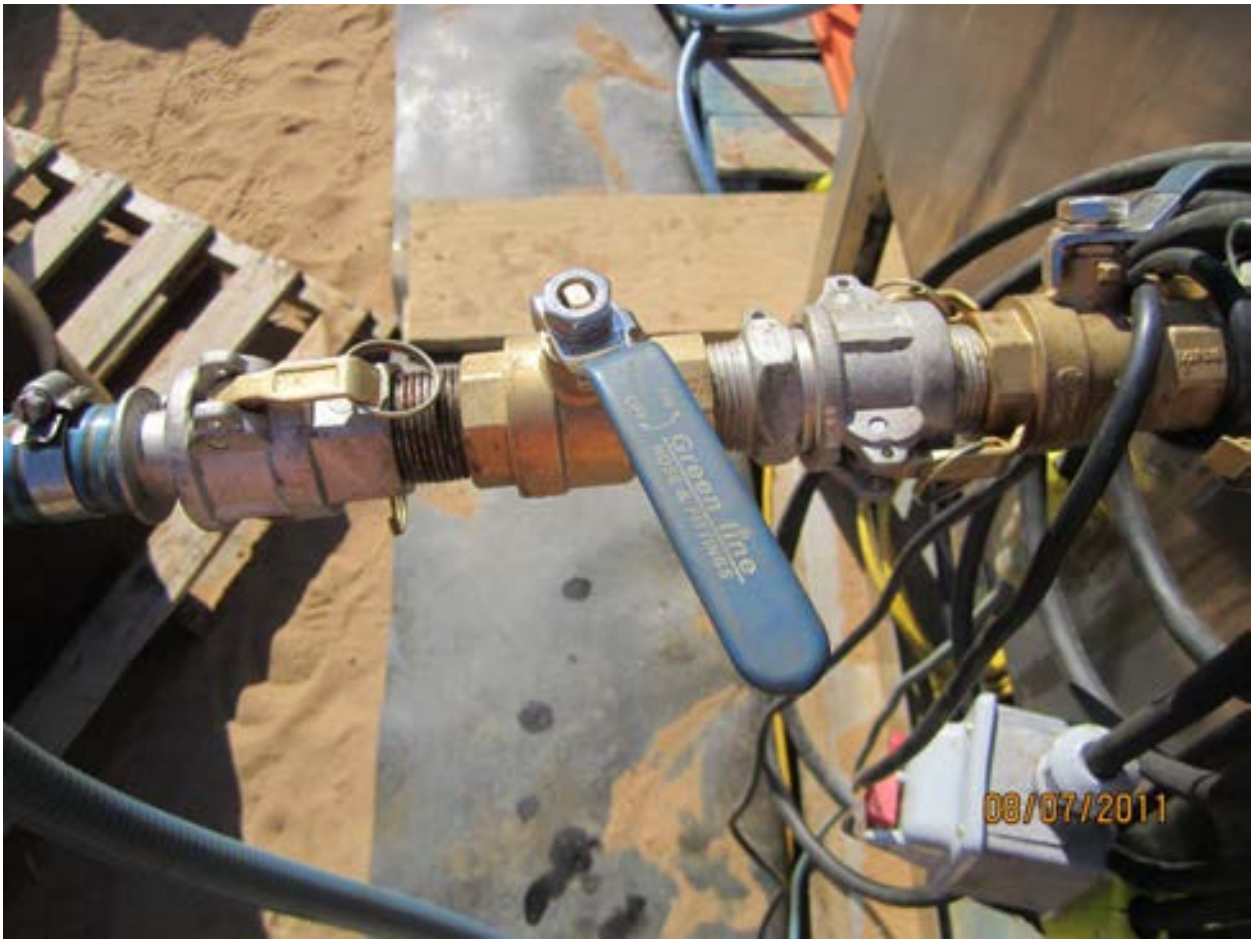
Photos

The new pressure washer on-site.

The white holding tanks ready to receive liquid contents from Bay cache drums.

The Airstrip Cache.

Drums ready to be pumped into the white holding tank.



The flow rate from the white holding tanks into the oil-water separator is a limiting factor.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Monday August 8th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Superintendent – OUTBOUND	Brad Landry	N.Aboriginal – Fort Res
Field Tech	Clint Baptiste	Sahtu
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Captain – Superintendent INBOUND	Ed Loutit	N.Aboriginal-Hay River
Boat Pilot INBOUND	Hughie Ferdinand	Sahtu
Hazmat Labourer INBOUND	Ricki Rabesca	Northerner
Journeyman INBOUND	Phil Downton	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**17**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water seperator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	31

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Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	5°C	15°C
Precipitation:	Light rain	Light rain
Condition:	Overcast	Overcast

General

Camp Complement today is 17 persons. The barge returned from Deline. One flight arrived at 2000hrs.

Work in Progress

Contract

The barge returned from Deline in the early afternoon.

TA

Organizing of the drums in preparation for pumping occurred, followed by pumping of liquid contents from drums into the white holding tanks. Liquid contents were put through the treatment system. At the end of the day, the holding tanks were again filled and left overnight for the sediment to settle, and the product to rise.

The rain shelter at the treatment area was rebuilt. The heavy winds during the previous evening had knocked the shelter over. The shelter provides both rain and sun protection.

	Airstrip Cache To Do (A)	Completion	Bay Cache To Do (B)	Completion
Number of Drums	1093		1056	
Transporting drums with Water Main Phase to pump	232	100%	219	98%
Pumping drums with Water Main Phase	232	100%	219	26%
Treating of Water (litres)	7680	100%	7700	20%
Transporting drums with Product Main Phase	121	90%	38	97%
Consolidating drums with Product Main Phase	121	0%	38	0%
Consolidating Product (litres)	12867	0%	822	0%
Drums with Sludge	655		768	
Treating/Consolidating Sludge (litres)	2781	23%	2000	0%
Transporting drums with Sludge	655	90%	768	99%
Washing drums	1093	14%	1056	0%

Health & Safety
Site safety meeting held every day at 0645h. Topics covered today were bear safety, JHA's for pumping liquid contents, and rain gear. The bear sightings today were closer to camp compared to previous sightings this year. All vehicles were checked for easily accessible bear spray. Bear spray canisters at the work sites were also confirmed. The wildlife monitor has a radio on at all times. The bear fence is in operation during the evenings.

Environmental Issues
None.

Comments, Concerns and Correspondence
The site supervisor called ENR in Norman Wells to discuss options with regards to problem bears. After the conversation, he distributed an email to the Project Team.

The daily burning of garbage is occurring. The incinerator is in use. A major part of the camp maintenance position is dealing with garbage. The DR will document the daily steps of the waste management system in photographs. These photographs will be included in the August 9th daily report.

Site Visitors
The pilot was on the ground for 45 minutes to offload and refuel. He did not stay for a meal.

Limiting Factors and Potential Pressures
The limiting factors are deheading drums and flow rate through the system.

Wildlife Observations
Two bear sightings occurred today. In the morning, a bear was spotted by personnel who were standing inside camp perimeter. The bear was seen going from the old Great Bear Lodge sign area, along the road, and then toward the ravine. The wildlife monitor was informed. For a deterrent, the wildlife monitor deployed a bear banger and a plastic bullet. In the afternoon, another sighting occurred. This sighting was also near camp, at the 'slow down' sign. After the second sighting, the AEL site supervisor called ENR in Norman Wells.

Samples
SB-Grey-1 (grey water sample)

Table 1: Analytical Results Summary for holding tanks 1 and 2

Parameter	SB-W-1	SB-W-2	Maximum Allowable Concentration
Volatile Hydrocarbons	0.351 mg/L	0.120 mg/L	15 mg/L
pH	Pending	7.71	6-9
Extractable Hydrocarbons	6 mg/L	< 2 mg/L	5 mg/L
NAPL/free product	Not present	Not present	Not present
Phenols	0.028 mg/L	0.046 mg/L	Not listed
Arsenic (total)	19 ug/L	26 ug/L	100 ug/L
Copper (dissolved)	<0.3 ug/L	0.3 ug/L	200 ug/L
Cadmium (dissolved)	0.013 ug/L	0.1 ug/L	10 ug/L
Mercury (total)	0.01 ug/L	0.008 ug/L	0.6 ug/L
Nickel (dissolved)	<0.5 ug/L	2.8 ug/L	200 ug/L
Lead (dissolved)	39 ug/L	5.6 ug/L	50 ug/L
Zinc (total)	7 ug/L	11 ug/L	1000 ug/L
Chromium (total)	< 1 ug/L	1 ug/L	100 ug/L
Cobalt (dissolved)	<0.3 ug/L	0.3 ug/L	50 ug/L
LC50(96) Toxicity Testing[2]	0% killed	0 % killed	Test sample is of acutely lethal toxicity if test population mortality equals or exceeds 50% of the test population in 96 hour time period

Photos

The Maxxam Trout Testing Facility in Edmonton

The fuel cache. Note the Power House in the background. Camp is located adjacent to the Power House.

Today, a bear was spotted coming from the Great Bear Lodge sign toward the road to the right. This road to the right leads to a surface debris pile and the main camp gully.

The holding tanks at the end of the day. Note they are approaching capacity.

The upper layer of liquid in the first white holding tank.

The upper layer in the second white holding tank.

The honey comb structure of the oil-water separator. Note the beads of oil.

Bear spray at the airstrip weather haven.

Bear spray in the truck side door.

Bear spray attached to all ATVs as shown.

The bear fence in operation during the evenings.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Tuesday August 9th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Field Tech	Clint Baptiste	Sahtu
HEO	Nathan Modeste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Captain – Superintendent	Ed Loutit	N.Aboriginal-Hay River
Boat Pilot	Hughie Ferdinand	Sahtu
Hazmat Labourer	Ricki Rabesca	Northerner
Journeyman	Phil Downton	Other
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**17**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	32

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Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	5°C	12°C
Precipitation:	None	Scattered rain
Condition:	Overcast	Overcast

General

Camp Complement today is 17 persons.

Work in Progress

Contract

The ramps for the barge were reinstalled. The captain, boat pilot, and mechanic worked on the barge.

TA

The remaining historic drums at the Bay area cache were transported to the airstrip. In the area are: crushed drums from 2010, non-hazardous surface debris stockpiles, drums transported from the El Bonanza airstrip, and drums from the contractor's Port Radium project.

During the morning, holding bladder #2 was filled to capacity. A sample was collected upon reaching capacity. 65 litres of water was collected by the DR and OCR for sample analysis.

Drums containing product to be consolidated which were located beyond the tree line at the Airstrip cache were transported to their appropriate grouping location.

The liquid contents of drums with water as the main phase were pumped into the white holding tanks.

Twenty-four drums were washed in the morning.

During the afternoon, the water in the first holding bladder was pumped into a third holding bladder. This process ran at 20 litres/minute. The water being held in the third holding bladder was sampled by the DR and OCR.

The deheader was used at a rate of 6 lids cut per hour over the course of the day.

Water for the hot water pressure washer (the 'hotsie') was refilled.
The contractor is no longer recycling the drum wash water through the pressure washer. The wash water is being treated. The previous hotsie broke down. The treating of wash water has increased the amount of water to treat along with the accumulation of rain.

	Airstrip Cache To Do (A)	Completion	Bay Cache To Do (B)	Completion
Number of Drums	1093		1056	
Transporting drums with Water Main Phase to pump	232	100%	219	100%
Pumping drums with Water Main Phase	232	100%	219	35%
Treating of Water (litres)	7680	100%	7700	35%
Transporting drums with Product Main Phase	121	100%	38	100%
Consolidating drums with Product Main Phase	121	0%	38	0%
Consolidating Product (litres)	12867	0	822	0
Drums with Sludge	655		768	
Treating/Consolidating Sludge (litres)	2781	35%	2000	0%
Transporting drums with Sludge	655	100%	768	100%
Washing drums	1093	18%	1056	0%

All of the drums at the Bay Cache have now been transported to the Airstrip Cache. The drums are located in groupings to facilitate consolidation and treatment.
From this point forward, the daily reports will reflect total numbers of drums as the table below indicates.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	10% complete
Volume of Water Treated (litres)[1]	14200 litres
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety
Site safety meeting held every day at 0645h. Topics covered today were the use of proper gloves for each job, JHAs for the various drum activities, and bear awareness. Bear sightings have been occurring everyday. The bear fence will be used during the day effective August 10th.

Environmental Issues
None.

Comments, Concerns and Correspondence
The project is behind schedule.

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is deheading drums.

Rain water is adding to the volume of water to treat.

Laboratory data is pending. Discharge approval is pending.

Wildlife Observations
One bear was seen at camp at 1330hrs. An airhorn was deployed.

Samples
A sample was collected from the third holding bladder. The water in this bladder previously failed for total extractable hydrocarbons (TEH).

A second sample was collected from the second holding bladder. The water in this bladder previously passed for all parameters listed in the water license.

Table 1: Analytical Results Summary for holding tanks 1 and 2

Parameter	SB-W-1	SB-W-2	Maximum Allowable Concentration
Volatile Hydrocarbons	0.351 mg/L	0.120 mg/L	15 mg/L
pH	7.85	7.71	6-9
Extractable Hydrocarbons	6 mg/L	< 2 mg/L	5 mg/L
NAPL/free product	Not present	Not present	Not present
Phenols	0.028 mg/L	0.046 mg/L	Not listed
Arsenic (total)	19 ug/L	26 ug/L	100 ug/L
Copper (dissolved)	<0.3 ug/L	0.3 ug/L	200 ug/L
Cadmium (dissolved)	0.013 ug/L	0.1 ug/L	10 ug/L
Mercury (total)	0.01 ug/L	0.008 ug/L	0.6 ug/L
Nickel (dissolved)	<0.5 ug/L	2.8 ug/L	200 ug/L
Lead (dissolved)	39 ug/L	5.6 ug/L	50 ug/L
Zinc (total)	7 ug/L	11 ug/L	1000 ug/L
Chromium (total)	< 1 ug/L	1 ug/L	100 ug/L
Cobalt (dissolved)	<0.3 ug/L	0.3 ug/L	50 ug/L
LC50(96) Toxicity Testing[2]	0% killed	0 % killed	Test sample is of acutely lethal toxicity if test population mortality equals or exceeds 50% of the test population in 96 hour time period

Photos

The following photos document the daily waste management program.

Waste receptacles are located throughout the camp area. Laundry room is shown.

The waste is collected by Camp Maintenance from housing, kitchen, office, and laundry tents.

On a daily basis, the waste is hauled from camp using an ATV with trailer.

The spill tray set apart from the generator at the burn area.

Once garbage is in place, the lid is placed on.

The flame from the garbage burn.

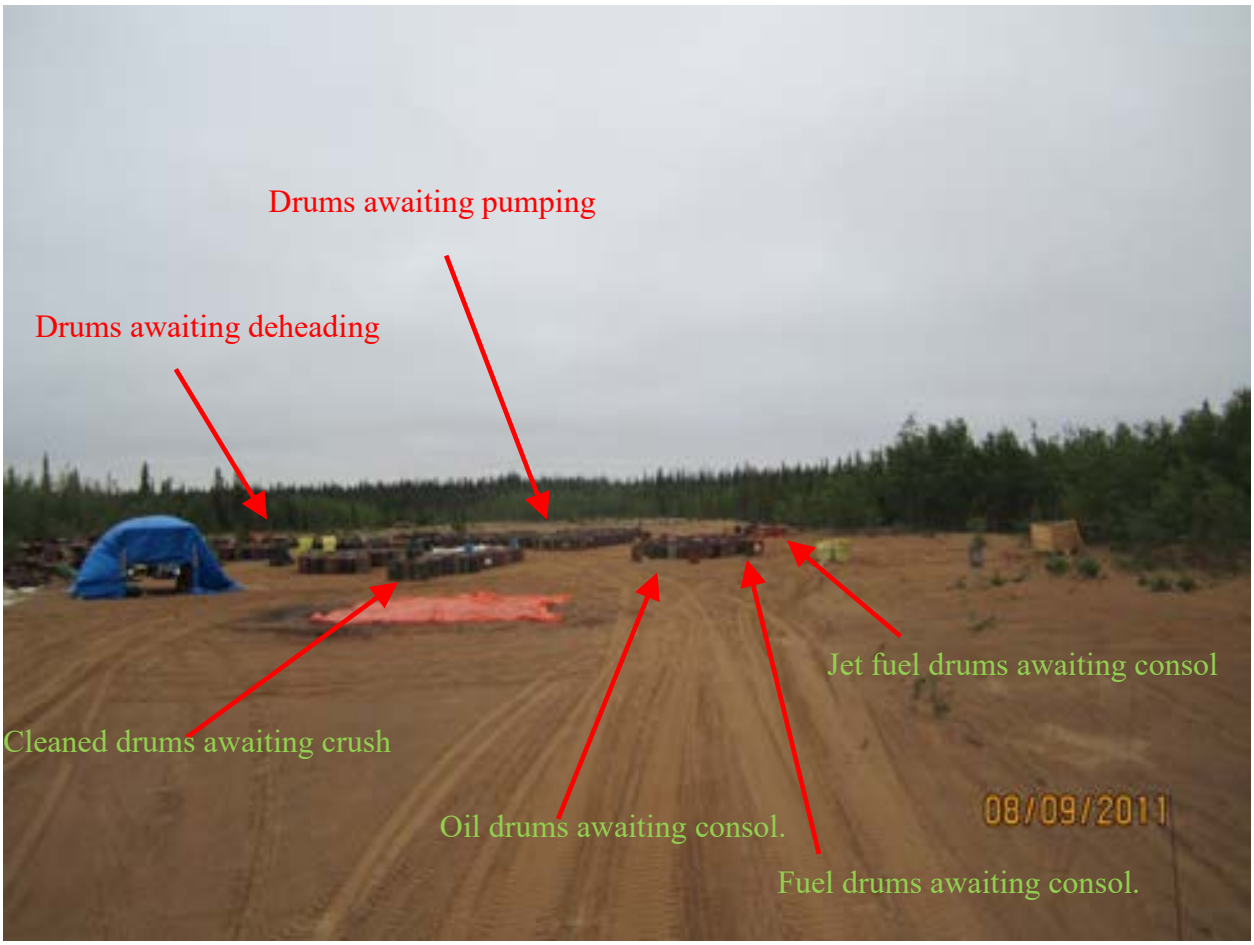
The daily burn.

Experience has shown Camp Maintenance that doing smaller burns has worked well. If there is too much waste, the waste requires stirring.

Once the waste has become ash, the ash is transferred to these receptacles for cooling.

Once cool, the ash is transferred to these receptacles for shipment to Yellowknife. The contractor has hired KBL Environmental Ltd. to receive the ash waste, dispose of the ash, and return the overpacks.

The amount of water for one sample is 65 litres.



The Airstrip Drum Cache.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Wednesday August 10th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent - INBOUND	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Cook – OUTBOUND	Betty Modeste	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Captain – Superintendent OUTBOUND	Ed Loutit	N.Aboriginal-Hay River
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	Northerner
Journeyman OUTBOUND	Phil Downton	Other
Hazmat Labourer INBOUND	Cameron Yukon	Sahtu
Hazmat Labourer INBOUND	Roddy Modeste	Sahtu
Cook's Assistant	Beatrice Wahne	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer OUTBOUND	Ricky Rabesca	Northern
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Cook's Assistant, now cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**16**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	2
2011 Total	34

.

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	8°C	12°C
Precipitation:	Scatter light rain	None
Condition:	Overcast	Overcast

General

Camp Complement today is 16 persons. A twin otter arrived twice today. The flight pattern was YK-SB-Deline-SB-YK. Food, materials, and crew came in.

Work in Progress

Contract

The weather haven which did not last the winter was dismantled for demob.

TA

Drums were deheaded, washed, and readied for crushing.
Drums containing mostly water were pumped into the white tanks.
The oil-water separator was in use.
The loader with a pallet box was used to transport from the cache to close proximity to the white tanks to facilitate pumping.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	12% complete
Volume of Water Treated (litres)[1]	16000 litres
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety
Site safety meeting held every day at 0645h. Topics covered today were the using rain gear, dehydration, JHAs, and the bear fence. The bear fence is in operation during the day.

Environmental Issues
None.

Comments, Concerns and Correspondence
After discussions and correspondence from the project team, the SENES sampling plan will be updated. The OCR will speak to Paul Modeste of Deline tomorrow regarding the abundant bear sightings around camp.

Site Visitors
Two pilots were at the airstrip for loading/unloading the Yellowknife and Deline arrival. They did not stay for a meal.

Limiting Factors and Potential Pressures
The limiting factor is deheading drums. Washing without deheading will trialed tomorrow.

Laboratory data is pending. Discharge approval is pending.

Wildlife Observations
One bear was seen near camp at 1000hrs. The wildlife monitor was informed. An airhorn was deployed along with rubber bullets. There was evidence of a bear being on both boats during the previous evening.

Samples
Outbound samples collected from the holding bladders.
Pending results expected before Friday.

Photos

The Airstrip Processing Area.

Labourer deheading barrels.

The manual deheader broke today.

Drums ready for deheading.

Activated carbon and water on an oil absorbent diaper. Note the beading water. Activated carbon soaking overnight for replacement tomorrow.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Thursday August 11th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	Northerner
Cook's Assistant	Beatrice Wahne	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Cook's Assistant, now cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**16**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	35

.

Weather

	Morning (0900hrs)	*Afternoon (1700hrs)*
Temperature:	10°C	16°C
Precipitation:	Scattered	None
Condition:	Overcast	Cloudy

General

Camp Complement today is 16 persons.

Work in Progress

Contract

One wall tent flooring was dismantled. The barge will be docked at the Bay. Activity at the barge has ceased until demobilization activities commence.

TA

Liquid contents were pumped into the white holding tanks.
Drums were deheaded, washed, and readied for crushing.
The activated carbon and clay were changed. These are in-line after the sediment filter.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	14% complete
Volume of Water Treated (litres)[1]	16000 litres
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were contact stress from operating the deheader hand tool, radio protocol, the bear fence, and JHAs for work activities.

Environmental Issues

None.

Comments, Concerns and Correspondence
The contents of the first holding bladder, which failed for total extractable hydrocarbons (TEH) with a value of 6 mg/L, was circulated through the treatment system a second time. After recirculation, a sample was taken. The sample was analysed for TEH. The reported value of TEH after the second treatment was 2 mg/L.

Based on requests from the Project Team, the full spectrum of parameters was submitted for analysis. These results are pending.

Today, drums were washed without deheading. After each round of washing, the OCR and DR visually inspected the drums. The DR directed the contractor to ensure that proper draining of the washed drum occur. The majority of drums passed the visual inspection. The drums which failed the visual inspection were subsequently rewashed. Note that deheading activities were occurring concurrently. The deheaded drums are easier to clean and easier to drain.

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

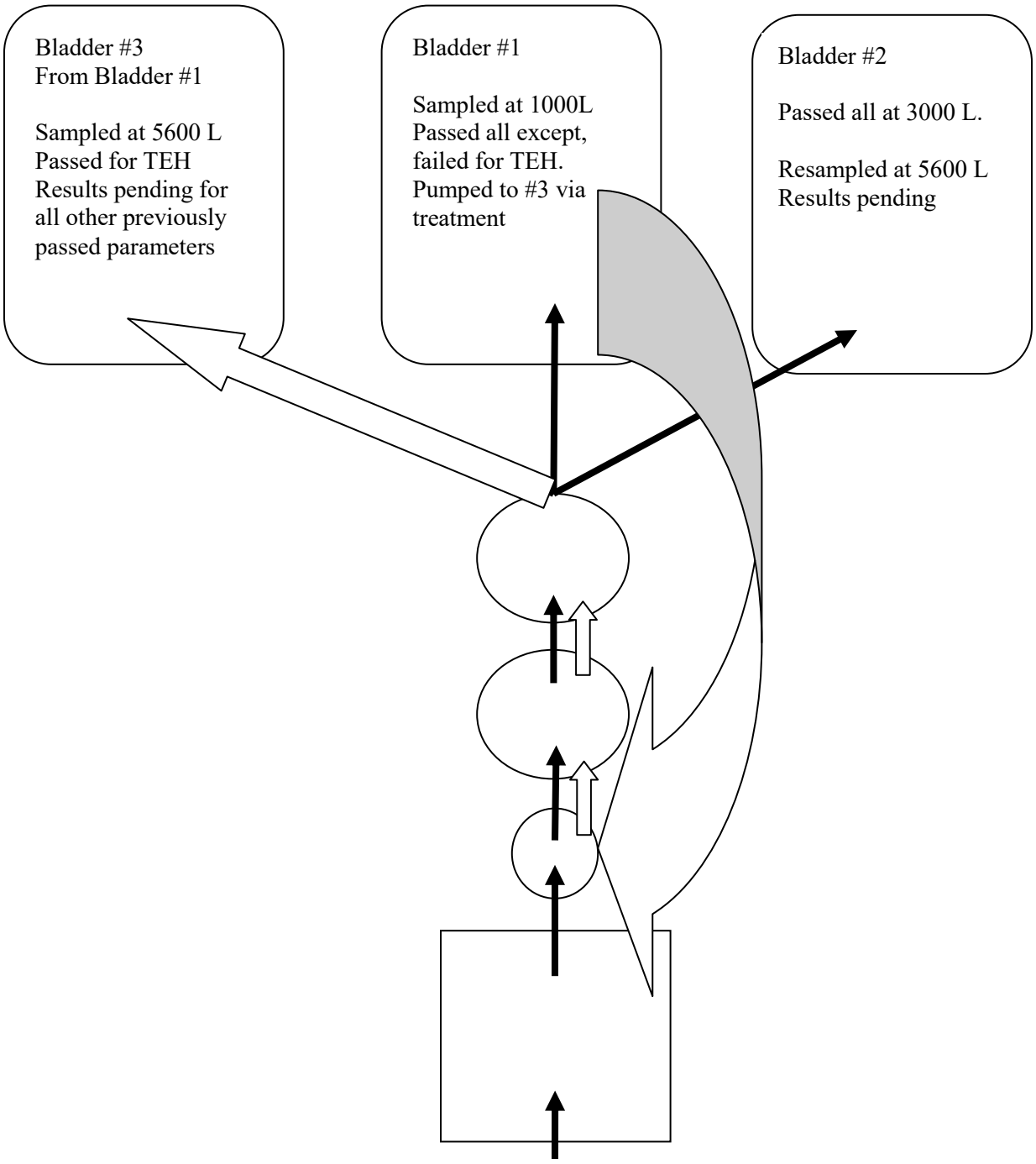
Laboratory data is pending. Discharge approval is pending.

Wildlife Observations
One black bear was seen on the main road to camp. The wildlife monitor deployed a bear banger.

Samples
None.

Results
Reported value of Total Extractable Hydrocarbons (TEH) for water in the third bladder is 2 mg/litre.
Laboratory results attached as an appendix.

Bladder Schematic



Photos

The activated carbon and clay prior to changing out.

Holding tank at lunch.

Holding tanks in late afternoon.

Incinerator in use during the morning.

The trailer used in the Port Radium project on the barge.

Success Through Science®

Your P.O. #: 340962
Your Project #: GBL-1, SAWMILL
Your C.O.C. #: 153453

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/11

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B172814
Received: 2011/08/09, 9:25

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method		Analytical Method
Total Extractable Hydrocarbon C11-C60	1	2011/08/10	2011/08/11	AB SOP-00040 SOP-00037	AB	EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BF2318		
Sampling Date		2011/08/08 17:00		
COC#		153453		
	Units	**SB-W-1A**	**RDL**	**QC Batch**
Extractable Hydrocarbons				
Undecanes (C11)	mg/L	0.06	0.02	5078777
Dodecanes (C12)	mg/L	0.14	0.02	5078777
Triadecanes (C13)	mg/L	0.19	0.02	5078777
Tetradecanes (C14)	mg/L	0.23	0.02	5078777
Pentadecanes (C15)	mg/L	0.33	0.02	5078777
Hexadecanes (C16)	mg/L	0.32	0.02	5078777
Heptadecanes (C17)	mg/L	0.26	0.02	5078777
Octadecanes (C18)	mg/L	0.14	0.02	5078777
Nonadecanes (C19)	mg/L	0.08	0.02	5078777
Eicosanes (C20)	mg/L	0.08	0.02	5078777
Heneicosanes (C21)	mg/L	0.07	0.02	5078777
Docosanes (C22)	mg/L	0.03	0.02	5078777
Triacosanes (C23)	mg/L	0.03	0.02	5078777
Tetracosanes (C24)	mg/L	<0.02	0.02	5078777
Pentacosanes (C25)	mg/L	<0.03	0.03	5078777
Hexacosanes (C26)	mg/L	<0.03	0.03	5078777
Heptacosanes (C27)	mg/L	<0.03	0.03	5078777
Octacosanes (C28)	mg/L	<0.03	0.03	5078777
Nonacosanes (C29)	mg/L	0.06	0.03	5078777
Triacontanes (C30)	mg/L	<0.03	0.03	5078777
C 31	mg/L	<0.03	0.03	5078777
Dotriacontanes (C32)	mg/L	<0.04	0.04	5078777
C 33	mg/L	<0.04	0.04	5078777
Tetratriacontanes (C34)	mg/L	<0.04	0.04	5078777
C 35	mg/L	<0.04	0.04	5078777
Hexatriacontanes (C36)	mg/L	<0.04	0.04	5078777
C 37	mg/L	<0.04	0.04	5078777
Octatriacontanes (C38)	mg/L	<0.04	0.04	5078777
C 39	mg/L	<0.04	0.04	5078777
Tetracontanes (C40)	mg/L	<0.05	0.05	5078777
C 41	mg/L	<0.05	0.05	5078777
Dotetracontanes (C42)	mg/L	<0.05	0.05	5078777
C 43	mg/L	<0.05	0.05	5078777
Tetratetracontanes (C44)	mg/L	<0.05	0.05	5078777

RDL = Reportable Detection Limit

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BF2318		
Sampling Date		2011/08/08 17:00		
COC#		153453		
	Units	**SB-W-1A**	**RDL**	**QC Batch**
C 45	mg/L	<0.05	0.05	5078777
Hexatetracontanes (C46)	mg/L	<0.05	0.05	5078777
C 47	mg/L	<0.05	0.05	5078777
Octatetracontanes (C48)	mg/L	<0.05	0.05	5078777
C 49	mg/L	<0.05	0.05	5078777
Pentacontanes (C50)	mg/L	<0.05	0.05	5078777
C 51	mg/L	<0.05	0.05	5078777
Dopentacontanes (C52)	mg/L	<0.05	0.05	5078777
C 53	mg/L	<0.05	0.05	5078777
Tetrapentacontanes (C54)	mg/L	<0.05	0.05	5078777
C 55	mg/L	<0.05	0.05	5078777
Hexapentacontanes (C56)	mg/L	<0.05	0.05	5078777
C 57	mg/L	<0.05	0.05	5078777
Octapentacontanes (C58)	mg/L	<0.05	0.05	5078777
C 59	mg/L	<0.05	0.05	5078777
Hexacontanes (C60)	mg/L	<0.05	0.05	5078777
Total Extractables C11 to C60	mg/L	2.0	0.05	5078777
Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	108		5078777

RDL = Reportable Detection Limit

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

Package 1	4.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units
5078777	O-TERPHENYL (sur.)	2011/08/11	108	70 - 130	107	70 - 130	107	%
5078777	Total Extractables C11 to C60	2011/08/11	118	50 - 130	111	70 - 130	<0.6	mg/L
5078777	Undecanes (C11)	2011/08/11					<0.02	mg/L
5078777	Dodecanes (C12)	2011/08/11					<0.02	mg/L
5078777	Triadecanes (C13)	2011/08/11					<0.02	mg/L
5078777	Tetradecanes (C14)	2011/08/11					<0.02	mg/L
5078777	Pentadecanes (C15)	2011/08/11					<0.02	mg/L
5078777	Hexadecanes (C16)	2011/08/11					<0.02	mg/L
5078777	Heptadecanes (C17)	2011/08/11					<0.02	mg/L
5078777	Octadecanes (C18)	2011/08/11					<0.02	mg/L
5078777	Nonadecanes (C19)	2011/08/11					<0.02	mg/L
5078777	Eicosanes (C20)	2011/08/11					<0.02	mg/L
5078777	Heneicosanes (C21)	2011/08/11					<0.02	mg/L
5078777	Docosanes (C22)	2011/08/11					<0.02	mg/L
5078777	Triacosanes (C23)	2011/08/11					<0.02	mg/L
5078777	Tetracosanes (C24)	2011/08/11					<0.02	mg/L
5078777	Pentacosanes (C25)	2011/08/11					<0.03	mg/L
5078777	Hexacosanes (C26)	2011/08/11					<0.03	mg/L
5078777	Heptacosanes (C27)	2011/08/11					<0.03	mg/L
5078777	Octacosanes (C28)	2011/08/11					<0.03	mg/L
5078777	Nonacosanes (C29)	2011/08/11					<0.03	mg/L
5078777	Triacontanes (C30)	2011/08/11					<0.03	mg/L
5078777	C 31	2011/08/11					<0.03	mg/L
5078777	Dotriacontanes (C32)	2011/08/11					<0.04	mg/L
5078777	C 33	2011/08/11					<0.04	mg/L
5078777	Tetratriacontanes (C34)	2011/08/11					<0.04	mg/L
5078777	C 35	2011/08/11					<0.04	mg/L
5078777	Hexatriacontanes (C36)	2011/08/11					<0.04	mg/L
5078777	C 37	2011/08/11					<0.04	mg/L
5078777	Octatriacontanes (C38)	2011/08/11					<0.04	mg/L
5078777	C 39	2011/08/11					<0.04	mg/L
5078777	Tetracontanes (C40)	2011/08/11					<0.05	mg/L
5078777	C 41	2011/08/11					<0.05	mg/L
5078777	Dotetracontanes (C42)	2011/08/11					<0.05	mg/L
5078777	C 43	2011/08/11					<0.05	mg/L
5078777	Tetratetracontanes (C44)	2011/08/11					<0.05	mg/L
5078777	C 45	2011/08/11					<0.05	mg/L
5078777	Hexatetracontanes (C46)	2011/08/11					<0.05	mg/L
5078777	C 47	2011/08/11					<0.05	mg/L

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units
5078777	Octatetracontanes (C48)	2011/08/11					<0.05	mg/L
5078777	C 49	2011/08/11					<0.05	mg/L
5078777	Pentacontanes (C50)	2011/08/11					<0.05	mg/L
5078777	C 51	2011/08/11					<0.05	mg/L
5078777	Dopentacontanes (C52)	2011/08/11					<0.05	mg/L
5078777	C 53	2011/08/11					<0.05	mg/L
5078777	Tetrapentacontanes (C54)	2011/08/11					<0.05	mg/L
5078777	C 55	2011/08/11					<0.05	mg/L
5078777	Hexapentacontanes (C56)	2011/08/11					<0.05	mg/L
5078777	C 57	2011/08/11					<0.05	mg/L
5078777	Octapentacontanes (C58)	2011/08/11					<0.05	mg/L
5078777	C 59	2011/08/11					<0.05	mg/L
5078777	Hexacontanes (C60)	2011/08/11					<0.05	mg/L

N/A = Not Applicable
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

Validation Signature Page

Maxxam Job #: B172814

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Janet Gao, Senior Analyst, Organics Department

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
4000 19st N.E. Calgary, Alberta Canada T2E 6P8 Tel (403) 291-3077 Toll-free 800-386-7247 Fax (403) 735-2240 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#4598 SENES CONSULTANTS LIMITED	Company Name:	#11077 SENES CONSULTANTS LIMITED	Quotation #:		MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	CHARLES F. GRAVELLE	Contact Name:	JASON MAUCHAN	P.O. #:	340962 GBL-1	B172GH	153453
Address:	121 GRANTON DRIVE, UNIT 12 RICHMOND HILL ON L4B 3N4	Address:	121 GRANTON DRIVE, UNIT 12 RICHMOND HILL AB L4B 3N4	Project #:		CHAIN OF CUSTODY #:	PROJECT MANAGER:
Phone:	(905)882-5984 Fax: (905)882-8962	Phone:	(905)882-5984 Fax: (905)882-8962	Project Name:	SAWMILL	C#153453-01-01	Ioana Stoica
Email:	cgravelle@dcsltd.ca	Email:	jmauchan@dcsltd.ca	Site #:			
				Sampled By:	JM Km		

REGULATORY CRITERIA:

SPECIAL INSTRUCTIONS

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: Time Required:
Rush Confirmation Number: (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	~~pH and T69~~ TEH60	Residual Chlorine	Biochemical Oxygen Demand	Fecal Coliforms	Oil & Grease (sheen)	ICPMS - Dissolved Cd, Co, Cu, Pb, Ni	ICPMS - Total As, Cr, Zn	Mercury - Low Level (Total)	BTEX C5-C10 and TEH30	Hydrocarbon by IR (Mineral oil & grease)	# of Bottles	Comments
1		SB-W-1A	Aug 8	1700	W			✓										2	
2					W														
3					W														
4					W														
5					W														
6					W														
7					W														
8					W														
9					W														
10																			

ARRIVED AT DEPOT:
AUG 0 9 2011
TEMP: 3 / 4 / 5

RECEIVED
AUG 10 2011

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler? Yes No
J. Mauchan	2011/Aug/8	1930							

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Friday August 12th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR)	Kurri Mackeinzo	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Camp Maintenance	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	Northerner
Cook's Assistant	Beatrice Wahne	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Cook's Assistant, now cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**16**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	36

.

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	10°C	19°C
Precipitation:	None	None
Condition:	Cloudy	Cloudy

General

Camp Complement today is 16 persons.

Work in Progress

Contract

Boxes built to house supplies for demob.

TA

Liquid contents were pumped into the white holding tanks.
Drums were washed and readied for crushing.
The oil-water separator was in operation today.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	21% complete
Volume of Water Treated (litres)[1]	19000 litres
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated and wash water being recycled through the treatment system

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were the bear fence, JHAs for pumping liquid and drum washing.

Environmental Issues

None.

Comments, Concerns and Correspondence
Approval for discharge of the first holding bladder was verbally granted during the late afternoon.

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

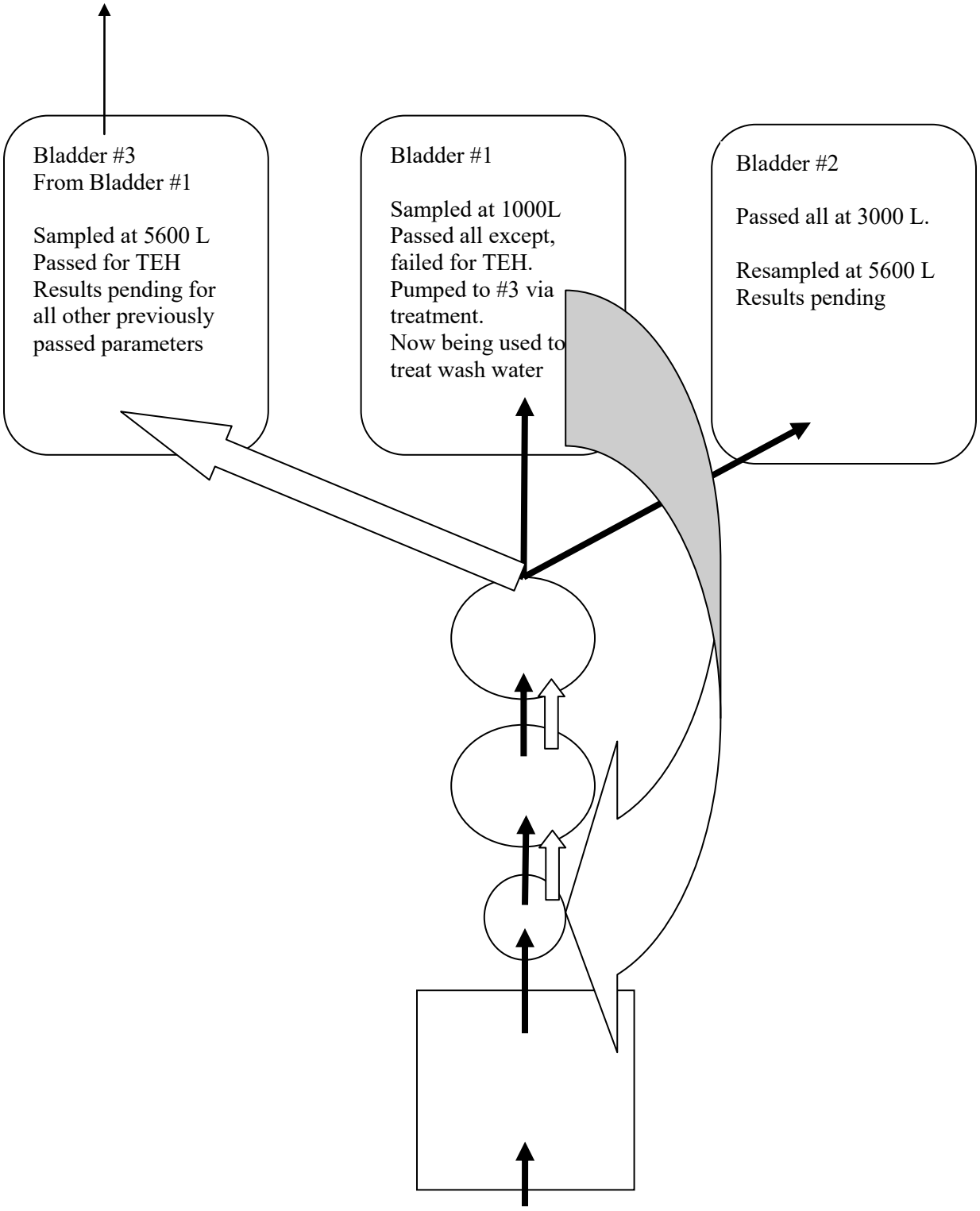
Laboratory data is expected Monday.

Wildlife Observations
One bear was spotted by the wildlife monitor at 1800hrs between the Power House and the main road. Two bear bangers were deployed.

Samples
None.

Results
Pending results are expected Monday

Bladder Schematic



Photos

Boxes were repaired and built to accommodate the demobilization.

The incinerator.

The treated water in the bladders and drums awaiting cleaning.

The treatment area at 1800hrs. Note the two full holding tanks.

Drums awaiting crushing.

Two wooden boxes are now being used to transport drums. The boxes are used for drums with water as the main phase. This allows the contractor to move these drums closer to the white holding tanks in groups of 8.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Saturday August 13th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Jason Mauchan	Other
On-site Community Rep (OCR) OUT	Kurri Mackeinzo	Sahtu
On-site Community Rep (OCR) IN	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Camp Maintenance - OUTBOUND	Frankie Elemie	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	N.Aboriginal
Cook's Assistant	Beatrice Wahne	N.Aboriginal
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	37

.

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	5°C	15°C
Precipitation:	None	Scattered rain
Condition:	Partially cloudy	Cloudy

General

Camp Complement today is 15 persons. A plane arrived today. The flight route was YK-SB-Deline-SB-YK. Two outbound passengers, one inbound passenger.

Work in Progress

Contract

None.

TA

Liquid contents were pumped into the white holding tanks.
Drums were washed and readied for crushing.
One bladder was discharged to the approved discharge location. A diffuser on plywood was used at the 'end of hose'
The oil-water separator was in operation today.
Bladder #4 was pumped into the pressure washer system.
Note that beginning today, the pressure washer is being fed by the 'end of hose' of the treatment system. The wash water (rinsate) is then recirculated through the treatment system.
After feeding the pressure washer system, Bladder #4 was filled to capacity.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	25% complete
Volume of Water Treated (litres)[1]	24000 litres
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated and drum wash water being recycled through the treatment system

Health & Safety
Site safety meeting held every day at 0645h. Topics covered today were the proper lifting techniques, replacing cartridges on half-masks, the bear fence, JHAs for pumping liquid and drum washing, and being aware of your surroundings.

Environmental Issues
5600 litres of water was discharged. The end-of-hose is a diffuser on plywood.

Comments, Concerns and Correspondence
The camp maintenance labourer was sent home today at the direction of the AEL superintendent. The boat pilot will take over camp maintenance duties effective August 14th.

Site Visitors
The pilot of the Cessna 185 arrived twice today. He did not come up to camp.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Laboratory data is expected Monday.

Wildlife Observations
None

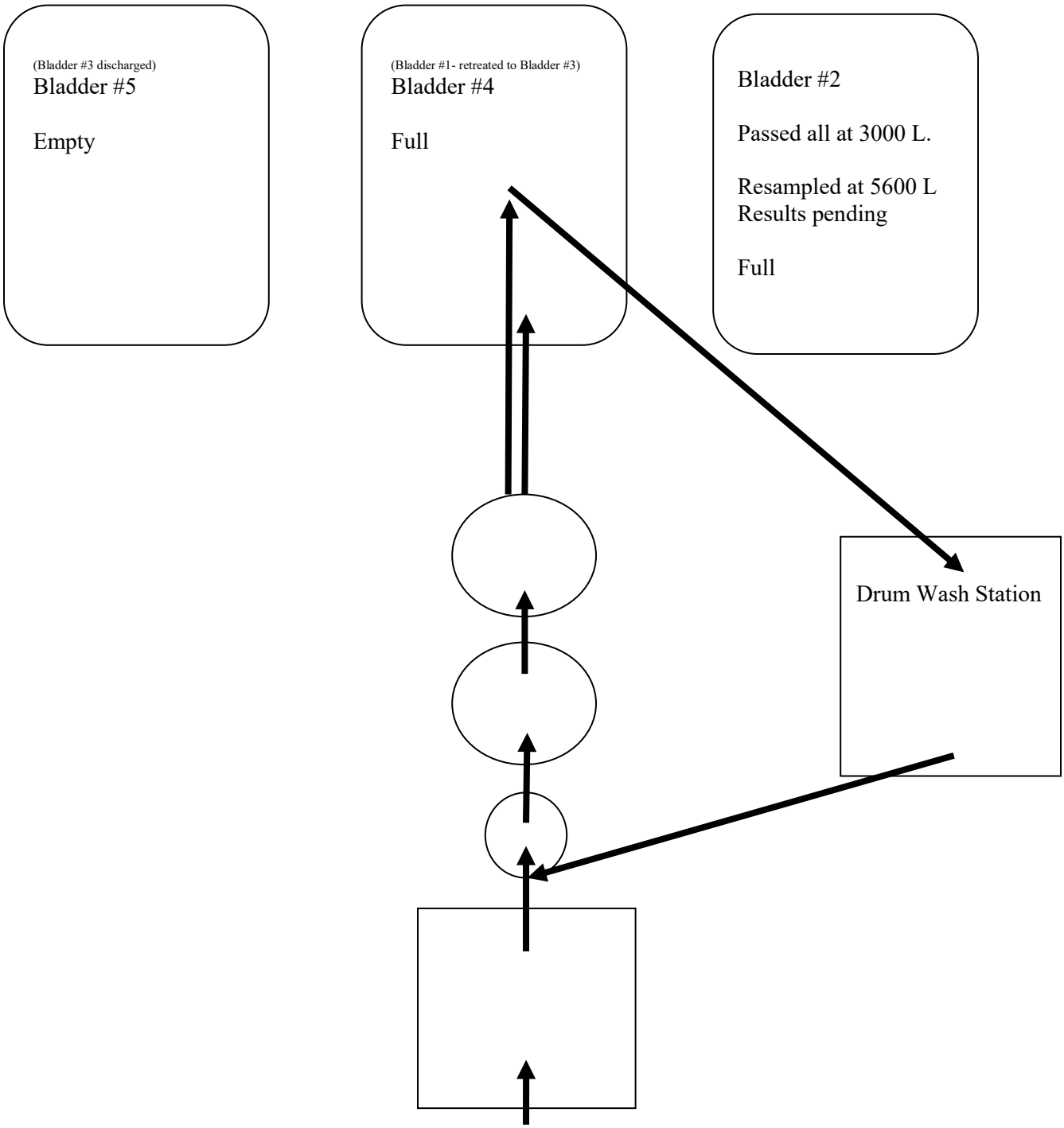
Samples
Sample SB-W-4 and it's duplicate sample collected. Results expected Wednesday for the fourth bladder. The trip blank arrived today. It will be sent out with the next sample.

Results
Pending results are expected Monday afternoon for the second bladder and Wednesday for the fouth.

Discharge Totals

Date	Volume (litres)
August 13th	**5600**
Total	**5600**

Bladder Schematic



Photos

The discharge of treated water at the approved discharge location.

The diffuser.
Note that AEL proposes to rotate the location of the diffuser within a 10 m x 10 m square.

Brad Landry inspecting the diffuser.

The discharge of the near bladder.

Drums awaiting either cleaning or pumping and cleaning.

Treated water pumped into this overpack for 'hotsie' use.
The water is used for cleaning drums using the pressure washer.

The incinerator in use.

The float plane arriving.

The treatment area.

Samples being readied for shipment.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Sunday August 14th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR) – OUT	Jason Mauchan	Other
Department Rep (DR) - IN	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	N.Aboriginal
Cook's Assistant	Beatrice Wahne	N.Aboriginal
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	38

.

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	5°C	14 °C
Precipitation:	Rain	Scattered showers
Condition:	Overcast	Overcast

General

Camp Complement today is 15 persons. A plane arrived today. The flight route was YK-SB-YK.
One inbound passenger, one outbound passenger.

Work in Progress

Contract

None.

TA

Liquid contents were pumped into the white holding tanks.
Drums were deheaded, washed, and readied for crushing.
The oil water separator and one of the white holding tanks was cleaned.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	25% complete
Volume of Water Treated (litres)[1]	24000 litres
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated and drum wash water being recycled through the treatment system

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were the proper lifting techniques, switching out when on washing drums, and for pumping liquid and drum washing.

Environmental Issues

None.

Comments, Concerns and Correspondence
None.

Site Visitors
The pilot of the Cessna 185 was on the ground for 2 hours. He did not come up to camp.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Laboratory data is expected Monday and Wednesday

Wildlife Observations
None

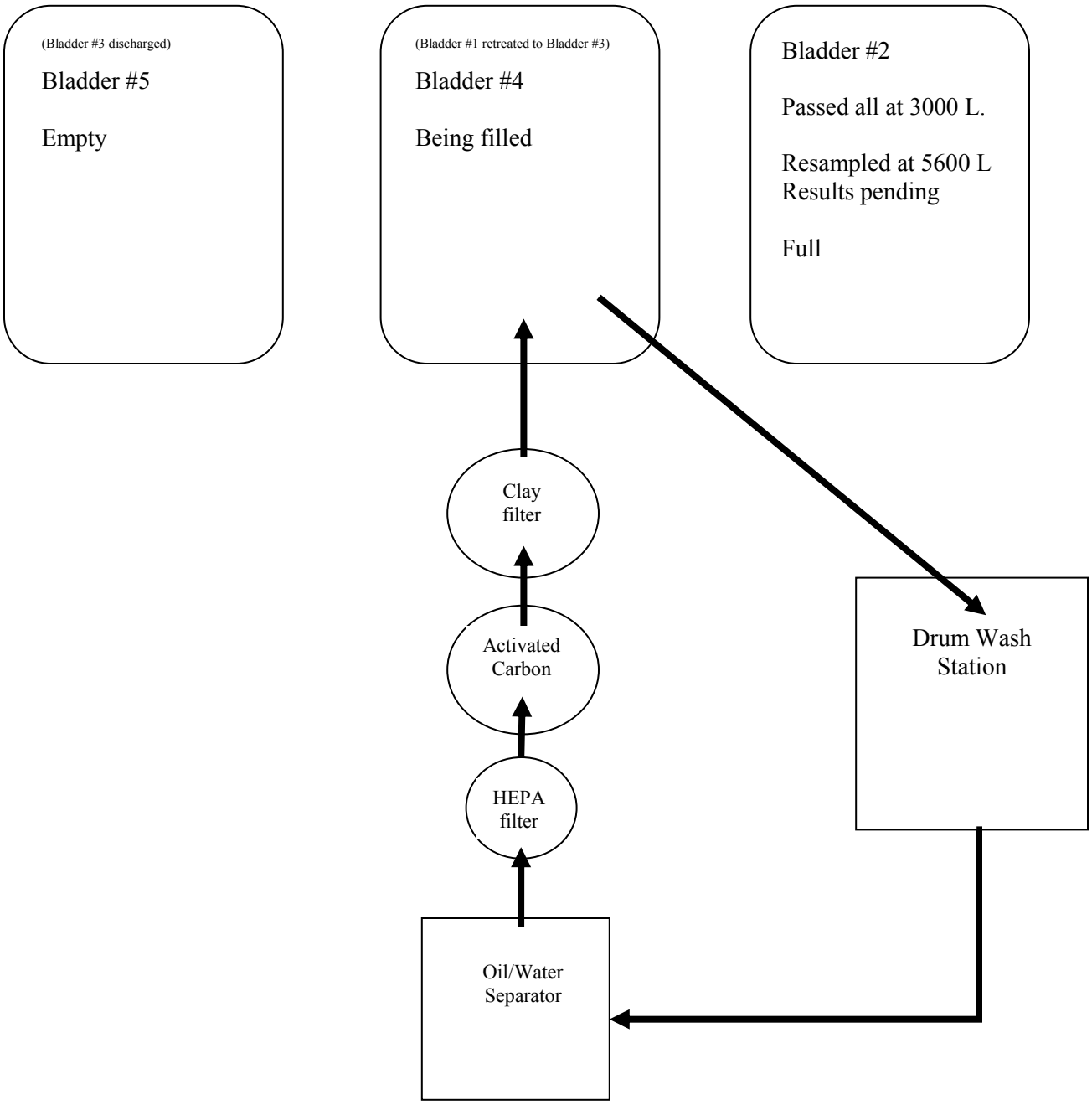
Samples
None.

Results
Pending results are expected Monday afternoon for the second bladder and Wednesday for the fourth.

Discharge Totals

Date	Volume (litres)
August 13th	**5600**
Total	**5600**

Bladder Schematic



Photos

Incinerator site at the end of the day.

Bladder 5 (empty).

Bladder 4, currently being filled.

Two drums of waste oil from oil/water separator.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Monday, August 15th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	N.Aboriginal
Cook's Assistant	Beatrice Wahne	N.Aboriginal
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	39

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	5°C	17°C
Precipitation:	None	Scattered showers
Condition:	Mixed sun and cloud	Mixed sun and cloud

General

Camp complement today is 15 persons.

Work in Progress

Contract

None.

TA

Liquid contents were pumped into the white holding tanks.
Drums were deheaded, washed, and readied for crushing.
The front end loader was used for repair activities on the waterfront access road.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	35%
Volume of Water Treated (litres)[1]	24000
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- after hours quad use,
- bear fence protocol (activating/deactivating),
- motivations to work safely and proper PPE on the jobsite,
- checking the status of equipment (e.g. fuel/oil levels in quads) regularly,

- Ryan Janzen also received camp safety orientation (location of bear spray, fire extinguishers, etc.)

Environmental Issues
None.

Comments, Concerns and Correspondence
One of the 4x4s would not start today. It is being investigated by Brad and the camp maintenance staff.

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Laboratory data was received this evening. Discharge approval is pending.

Wildlife Observations
None.

Samples
None.

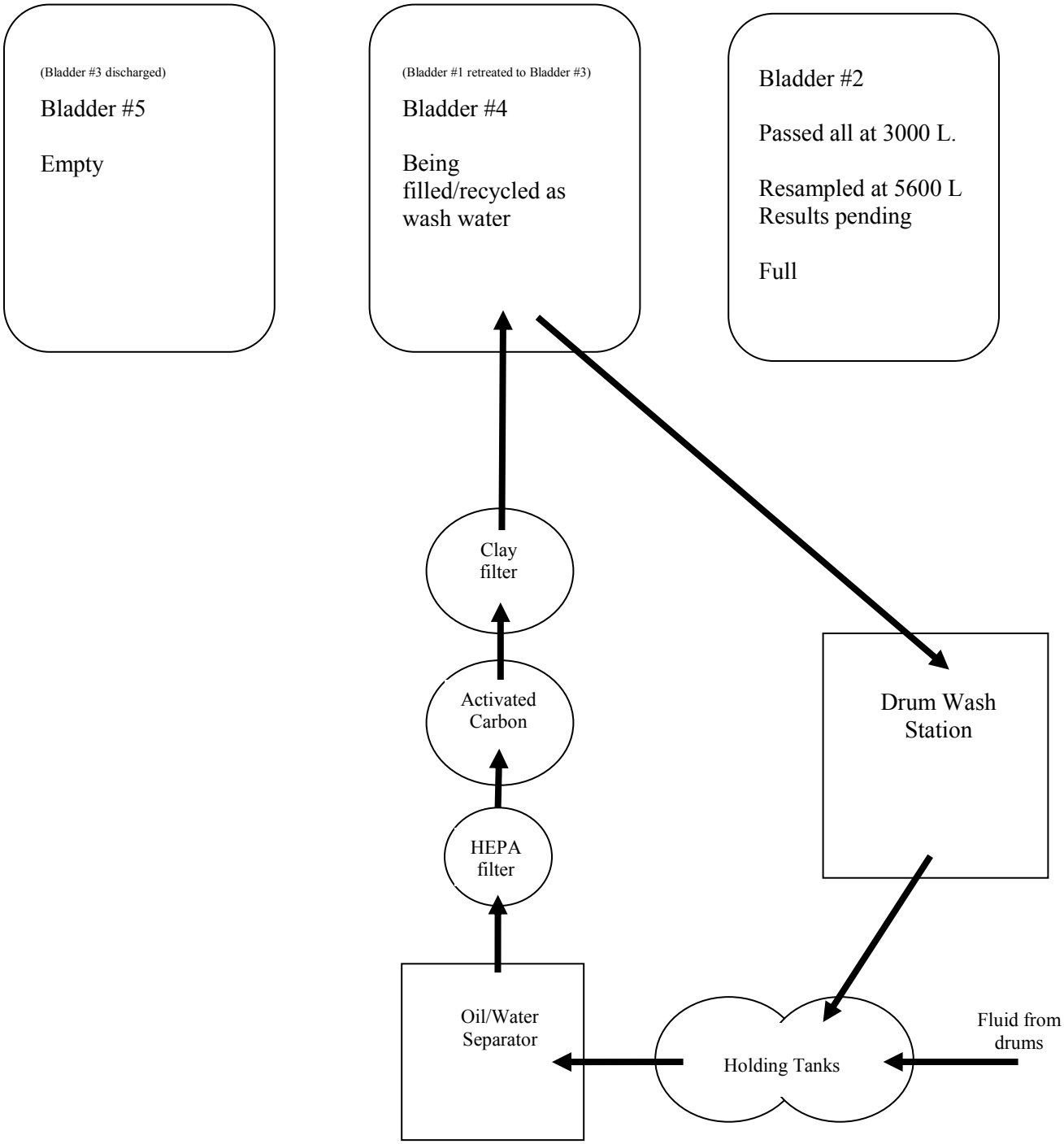
Results
Results for Bladder #2 were received this evening. Below is a summary of the results.

Parameter	SB-W-2B	Maximum Allowable Concentration
Volatile Hydrocarbons	< 0.2	15 mg/L
pH	7.78	6-9
Extractable Hydrocarbons	< 0.03	5 mg/L
NAPL/free product	Not present	Not present
Phenols	0.008	Not listed (mg/L)
Arsenic (total)	49	100 µg/L
Copper (dissolved)	< 2.0	200 µg/L
Cadmium (dissolved)	0.016	10 µg/L
Mercury (total)	0.003	0.6 µg/L
Nickel (dissolved)	< 0.5	200 µg/L
Lead (dissolved)	1.7	50 µg/L
Zinc (total)	38	1000 µg/L
Chromium (total)	< 0.1	100 µg/L
Cobalt (dissolved)	< 0.3	50 µg/L
Toxicity (EC50(15))	> 100%	>75%

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
Total		**5600**

Bladder Schematic



Photos

The covered ash pile on the airstrip.

Drum washing activities.

Manual drum opening.

Holding tank #1. Full at lunch time.

Stockpiling drums to be crushed.

Discharge site.

Pumping water from Bladder #4 into overpacks for use as wash water.

Full holding tanks.

Drums housing waste oil and sediment from the oil-water separator.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Tuesday, August 16th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	N.Aboriginal
Cook's Assistant	Beatrice Wahne	N.Aboriginal
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	40

Weather

	Morning (0700hrs)	*Afternoon (1700hrs)*
Temperature:	8°C	16°C
Precipitation:	Scattered showers	Intermittent spitting
Condition:	Overcast	Overcast

General

Camp complement today is 15 persons.

Work in Progress

Contract

None.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped to Bladder #5 (5000 L). The field inspection table for the water pumped into Bladder #5 is provided below.

Holding Bladder #5			
	1000 L	**3000L**	**5000L**
Date	16 August 2011	16 August 2011	16 August 2011
Visual and Olfactory Observations	Water is without colour or odour and does not appear to have suspended solids (clear).	Water is without colour or odour and does not appear to have suspended solids (clear).	Water is without colour or odour and does not appear to have suspended solids (clear).
Flow rate	~15L/min	~15L/min	~10L/min

The front end loader was used to move drums closer to the wash area and for repair activities on the waterfront access road.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	45%
Volume of Water Treated (litres)[1]	29000

Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety
Site safety meeting held every day at 0645h. Topics covered today were:

- Safety award was given to Alfred for conscientious work practices
- Crew swap out, remain alert to unsafe practices
- Safety meeting attendance/punctuality

Environmental Issues
Two minor spills of wash water (~30L and ~10L, respectively) were reported this morning. The water and soil in the area of the spill was collected and deposited in empty drums and placed inside the bermed area on the liner. The incident was noted and details were recorded on the INAC Monthly Spill Reporting Form.

Comments, Concerns and Correspondence
Both drum openers are now broken. Drums are currently being washed through the bungholes. After each round of washing, the DR and OCR visually inspected the drums. The DR directed the contractor to ensure that proper draining of the washed drums occur. Every drum but one passed the visual inspection, and only then because it had not been drained properly.

The Kubota generator used to run equipment at the airstrip was malfunctioning this morning. Maintenance was performed but the generator was not used for the rest of the day.

E-mail approval was given for the discharge of Bladder #2.

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Laboratory results are pending.

Wildlife Observations
None.

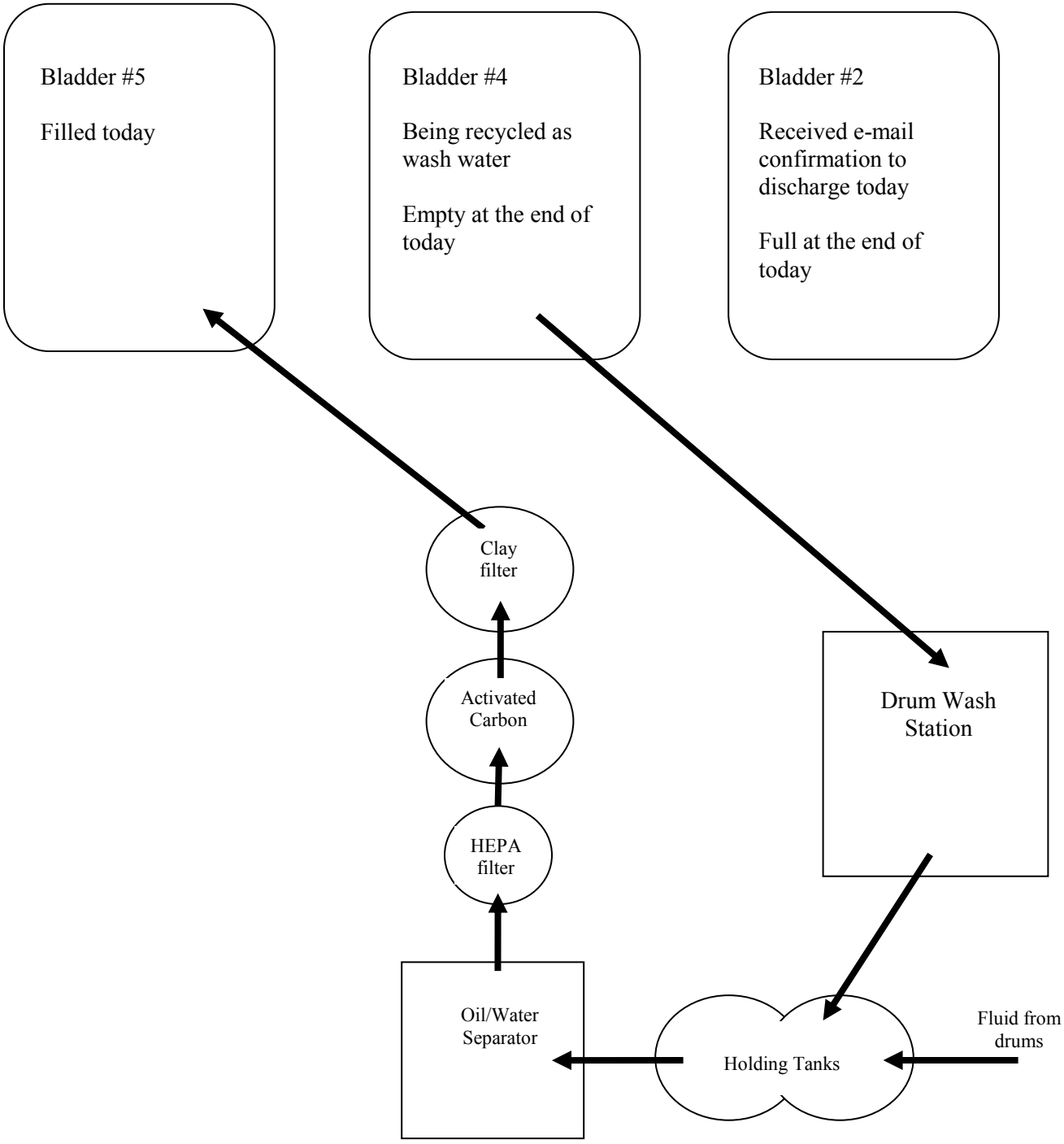
Samples
None.

Results
None.

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
Total		**5600**

Bladder Schematic



Photos

Cleaning up spilled wash water.

The last drum opener broke today.

Water being pumped into the oil/water separator.

The incinerator in use.

Using the front-end loader to move drums to the wash site. Box is lined with spill pads.

Replacing the particulate filter.

Field inspection of water being pumped into Bladder #5 (1000L).

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Wednesday, August 17th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Alfred Betsidea	Sahtu
Hazmat Labourer	Patrick Goulet	N.Aboriginal - Tlicho
Medic	Bianca Spence	Other
Boat Pilot	Hughie Ferdinand	Sahtu
HEO	Roger Football	N.Aboriginal
Cook's Assistant	Beatrice Wahne	N.Aboriginal
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Andrew Beaverho	N.Aboriginal - Tlicho
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Cook	Alice Heron	N.Aboriginal - Tlicho
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	41

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	6°C	10°C
Precipitation:	Light, steady	Light, steady
Condition:	Overcast	Overcast

General

Camp complement today is 15 persons. A personnel rotation took place today; see the table below for the names and positions of individuals.

Position	Leaving	Arriving
Bear Monitor	Alfred Betsidea	Russell Kenny
Camp Attendant	Hughie Ferdinand	George Takazo
Hazmat Worker	Roger Football	Lloyd Baton
Hazmat Worker	Patrick Goulet	Clayton Modeste
Hazmat Worker	Andrew Beaverho	Joseph Kenney
Cook	Alice Heron	Gina Neyelle
Cook Helper	Beatrice Whane	Noreen Takazo

Work in Progress

Contract

None.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped directly to the overpacks for use as wash water. The field inspection table for the treated water is presented in the 'Results' section below.
The front end loader was used to move drums closer to the wash area.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	55%
Volume of Water Treated (litres)[1]	29750
Consolidating drums with Product Main Phase	*0% complete*
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete

Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety
Site safety meeting held every day at 0645h. Topics covered today were:

- Crew swap out, remain alert to unsafe practices
- Help/watch out for untrained people arriving today
- Trip hazards on the job site
- Safety meeting attendance/punctuality

Environmental Issues
None.

Comments, Concerns and Correspondence
None.

Site Visitors
Two pilots made the flight from Yellowknife to Sawmill Bay, to Deline, to Sawmill Bay and return. They did not come down to camp.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Wildlife Observations
None.

Samples
None.

Results
Results for Bladder #4 were received this evening. A table summarizing the results is presented below.

Parameter	SB-W-4	Maximum Allowable Concentration
Volatile Hydrocarbons	< 100	15 mg/L
pH	9.05	6-9
Extractable Hydrocarbons	0.53	5 mg/L
NAPL/free product	Not present	Not present
Phenols	0.023	Not listed (mg/L)
Arsenic (total)	7.3	100 µg/L
Copper (dissolved)	< 0.2	200 µg/L
Cadmium (dissolved)	0.041	10 µg/L
Mercury (total)	< 0.002	0.6 µg/L
Nickel (dissolved)	1	200 µg/L
Lead (dissolved)	7	50 µg/L
Zinc (total)	48	1000 µg/L
Chromium (total)	< 1.0	100 µg/L
Cobalt (dissolved)	< 0.3	50 µg/L
Toxicity (EC50(15))	81.7%	>75%

The water in Bladder #4 has been recycled for use as wash water.

The field inspection table for water pumped directly to the overpacks for use as wash water is presented below.

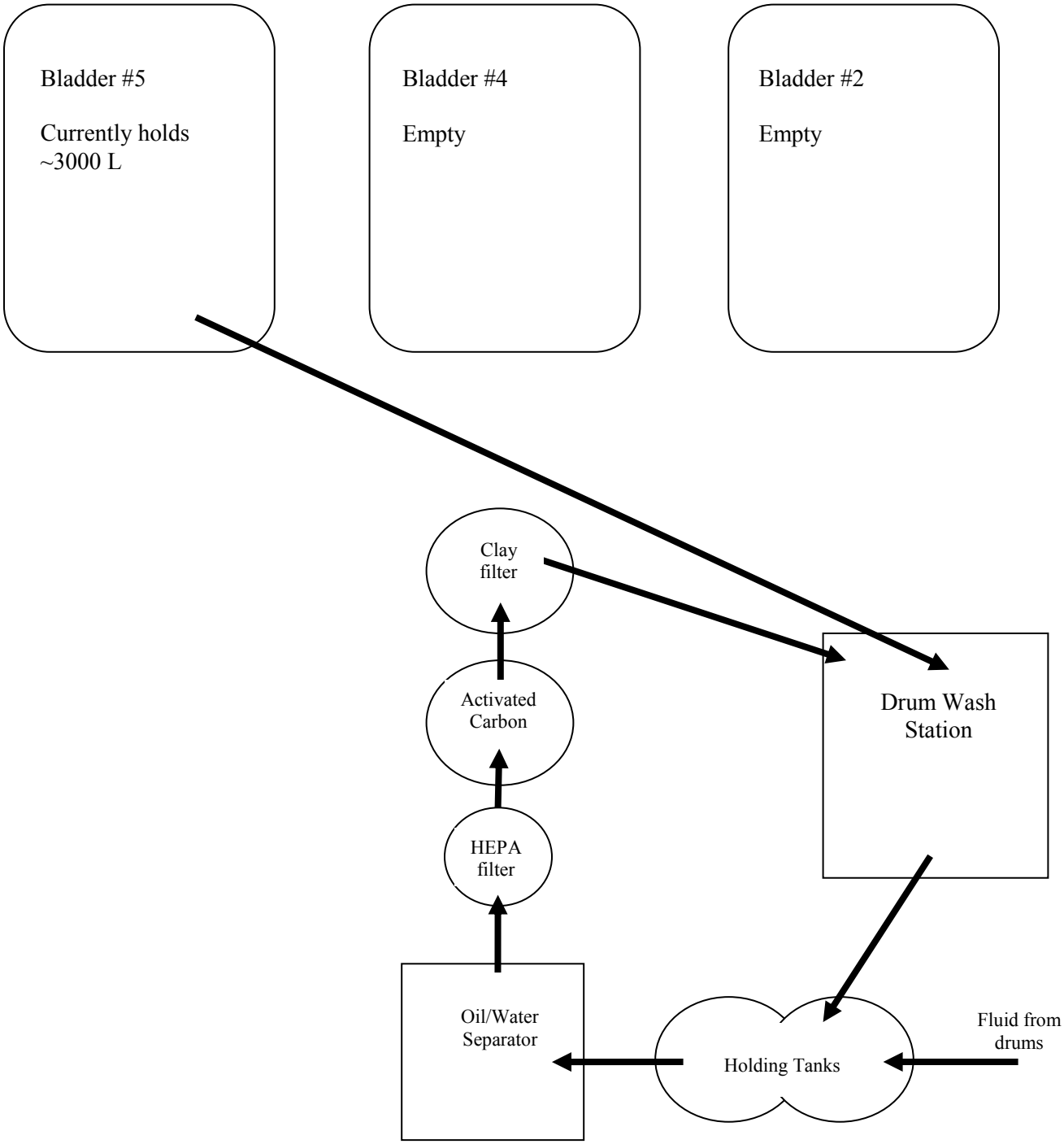
Date	17 August 2011
Visual and Olfactory Observations	Water is without colour or odour and does not appear to have suspended solids (clear).
Flow rate	~15L/min

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic



Photos

Discharging Bladder #2.

Bladder #2, emptied.

Stockpile of opened and washed drums, ready for crushing. Picture taken at 1000 hrs.

Washing drums.

Treatment system in use. System pressure is roughly 3 psi.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Thursday, August 18th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Noreen Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, 2 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	42

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	8ºC	12 ºC
Precipitation:	Intermittent light rain	None
Condition:	Overcast	Mixed sun and cloud

General

Camp complement today is 15 persons.

Work in Progress

Contract

The excavator was used in the afternoon to crush drums. The loader was used to move crushed drums to the stockpile. There was no labourer helping during these activities, thus the steel safety shield was not in use.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped into Bladder #4.
Water from the holding tanks was treated and pumped directly to the overpacks for use as wash water.
The field inspection table for the treated water is presented in the 'Results' section below.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	65%
Volume of Water Treated (litres)[1]	31150
Consolidating drums with Product Main Phase	*0% complete*
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Showing the new crew job hazards
- Addressing/communicating safety concerns
- Asking for help when doing heavy lifting

- Switching jobs to avoid mental fatigue, repetitive motion injuries
- Slipping hazards due to wet conditions

Environmental Issues
A minor spill of wash water (~50 L) was reported this morning due to the pressure washer overflowing. The water and soil in the area of the spill was collected and deposited in empty drums which was then placed inside the bermed area on the liner. The incident was noted and details were recorded on the INAC Monthly Spill Reporting Form. On suggestion from the DR, the pressure washer has been placed on a plastic liner inside a bermed area of its own.

Comments, Concerns and Correspondence
Parts for the Kubota generator were received on last night's flight. It is again in working order.

A manual 'deheader' arrived on last night's flight. Some drums are having their lids cut off.

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Wildlife Observations
None.

Samples
None.

Results
The field inspection table for water pumped directly to the overpacks for use as wash water is presented below.

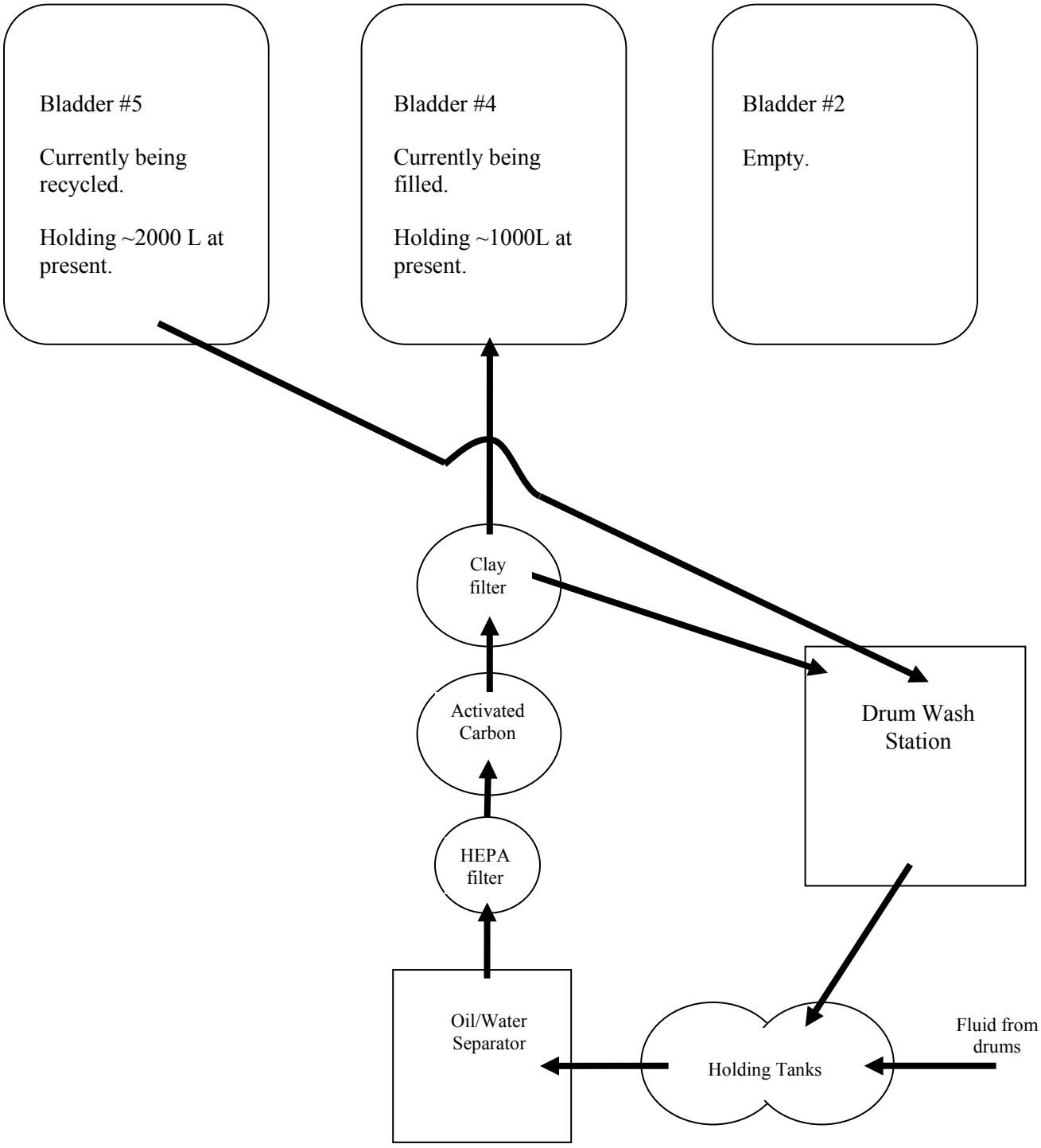
Date	18 August 2011
Visual and Olfactory Observations	Water is without colour or odour and does not appear to have suspended solids (clear).
Flow rate	~10L/min

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic



Photos

Cutting the lid off a drum.

Washing drums.

Treated water being pumped into the overpacks for re-use as wash water.

Cleaning out the oil/water separator.

Using the excavator to crush drums. There was no labourer helping the excavator, thus the steel safety shield is not in use.

Pumping waste oil into marked drums.

Using the front-end loader to move and stockpile crushed drums.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Friday, August 19th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Noreen Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good, 1 trailers require repair
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	43

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	6ºC	13 ºC
Precipitation:	None	None
Condition:	Overcast, windy	Sunny

General

Camp complement today is 15 persons.

Work in Progress

Contract

The drum crushing pad was moved to the airstrip, beside the washed drum stockpile.
The excavator was used in the afternoon to crush drums.
The loader was used to move crushed drums to the stockpile.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped into Bladder #2.
Treated water from Bladders #4 and #5 was recycled as wash water.
The field inspection table for the treated water is presented in the 'Results' section below.
Consolidation of drums with product main phase started today.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	75%
Volume of Water Treated (litres)[1]	35150
Consolidating drums with Product Main Phase	*5% complete*
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	10% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Ways to perform tasks more safely
- Hazards involved with stacking barrels

- Maintain safe work practices (dust masks, half-mask respirators)

Environmental Issues
None.

Comments, Concerns and Correspondence
The third Yamaha 4x4 is again in working condition.

Site Visitors
An Air Tindi Twin Otter on floats brought cargo (diesel fuel, propane, fresh vegetables) to camp today. The pilots did not come up to camp.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Wildlife Observations
None.

Samples
None.

Results
The field inspection table for water pumped directly to the overpacks for use as wash water is presented below.

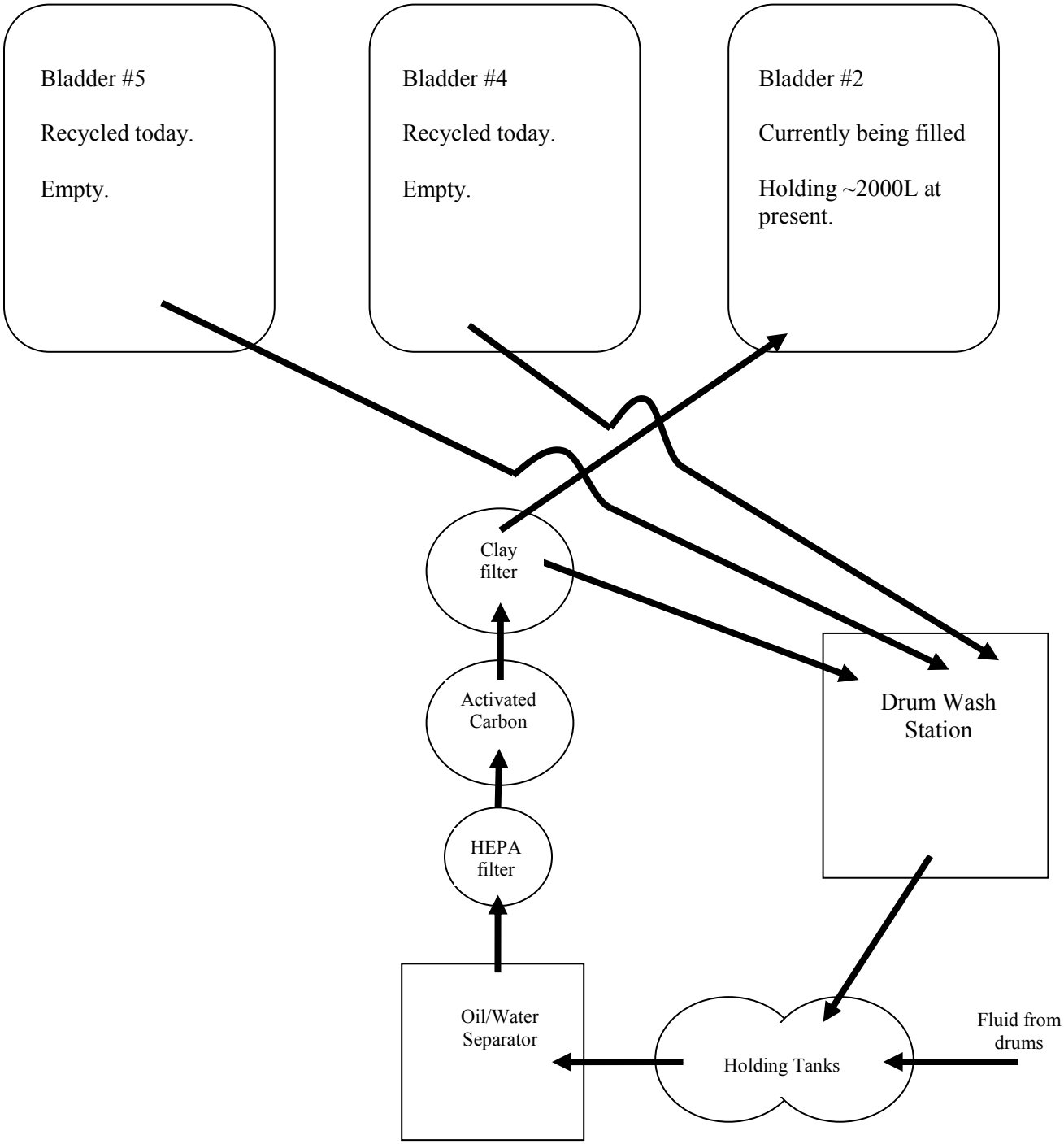
Date	19 August 2011
Visual and Olfactory Observations	Water is without colour or odour and does not appear to have suspended solids (clear).
Flow rate	~10L/min

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic



Photos

Opening drums.

The incinerator in use.

Bladder #5, empty.

Water being pumped into Bladder #2.

Spreading out plastic under the location of the new crushed drum stockpile.

Moving the crushing pad to the airstrip. Note the plastic liner under the pad.

Crushing drums with the excavator. The 6'x6' safety shield is to the left of the frame. There are no labourers aiding the excavator.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Saturday, August 20th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Noreen Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	3 good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	44

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	4ºC	16ºC
Precipitation:	Sunny	Sunny
Condition:	Mixed sun and cloud	Mixed sun and cloud

General

Camp complement today is 15 persons.

Work in Progress

Contract

The excavator was used to crush drums.
The loader was used to move crushed drums to the stockpile.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped direct to the drum washing station.
The field inspection table for the treated water is presented in the 'Results' section below.
Consolidation of drums with product main phase continued today.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	85%
Volume of Water Treated (litres)[1]	39150
Consolidating drums with Product Main Phase	*25% complete*
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	45% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Loader and heavy equipment safety
- Team lifting heavy loads
- Mental fatigue, staying focussed

Environmental Issues
None.

Comments, Concerns and Correspondence
None.

Site Visitors
An Air Tindi Caravan delivered groceries today. The pilot came up to camp for dinner.

Limiting Factors and Potential Pressures
The limiting factor is washing drums. Consolidation of product main phase drums is a potential pressure.

Wildlife Observations
None.

Samples
None.

Results
The field inspection table for water pumped directly to the overpacks for use as wash water is presented below.

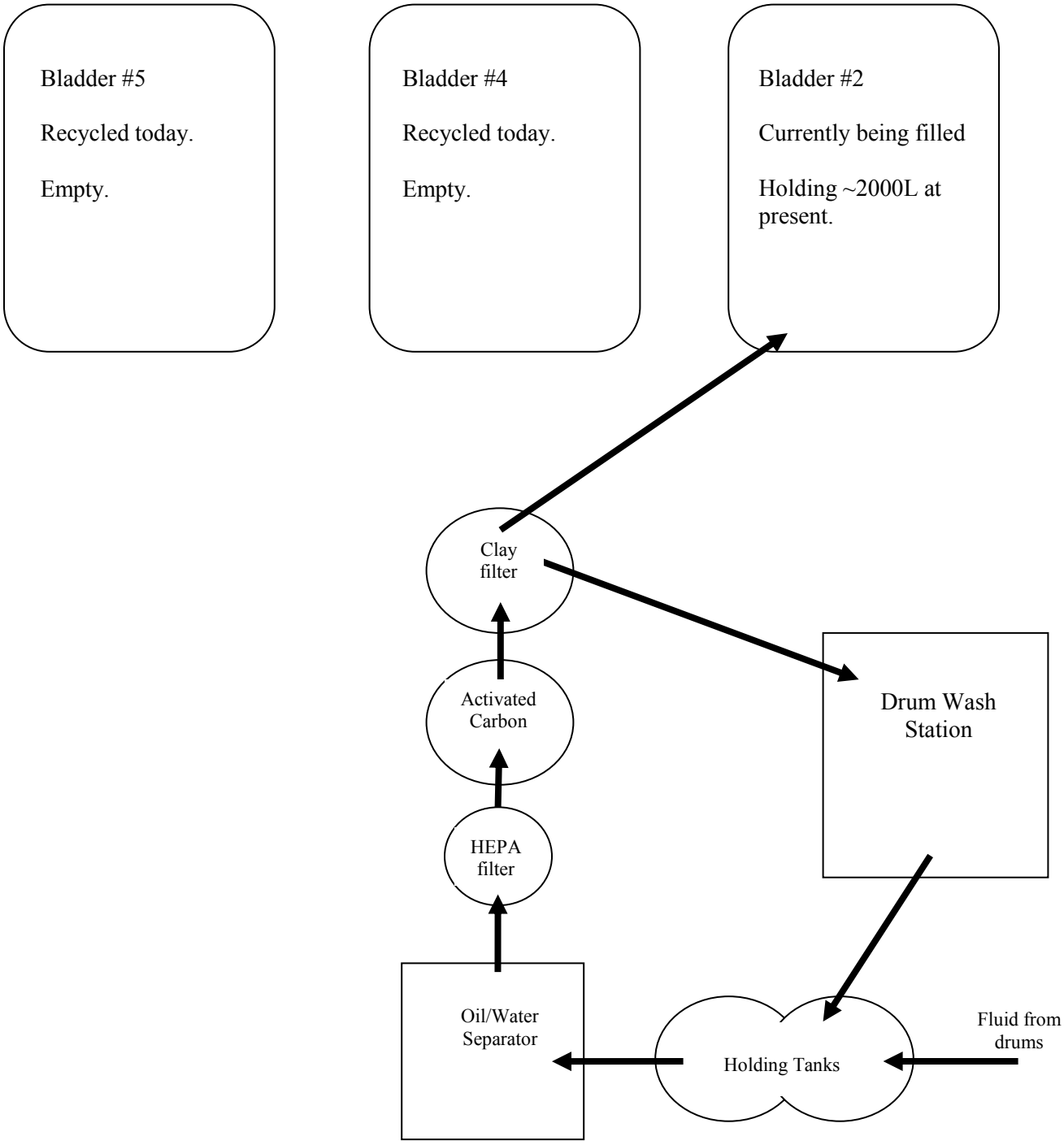
Date	20 August 2011
Visual and Olfactory Observations	Water is without colour or odour and does not appear to have suspended solids (clear).
Flow rate	~20L/min

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic



Photos

Washing drums.

Consolidating drums of like product.

Crushing drums.

The incinerator in use.

Treated water being pumped into overpacks for use as wash water.

The oil/water separator in use.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Sunday, August 21st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Noreen Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	45

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	12ºC	14 ºC
Precipitation:	Steady, light rain	Steady rain
Condition:	Overcast	Overcast

General

Camp complement today is 15 persons.

Work in Progress

Contract

The excavator was in limited use today to crush drums.
The loader was in limited use today to move crushed drums to the stockpile.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped directly to the drum washing station.
Water from the holding tanks was treated and pumped into Bladder #2.
The field inspection table for the treated water is presented in the 'Results' section below.
Consolidation of drums with product main phase continued today.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	90%
Volume of Water Treated (litres)[1]	39150
Number of Drums Crushed	1770
Consolidating drums with Product Main Phase	*70% complete*
Volume of Consolidated Product FP<25°C	0% complete
Volume of Consolidated Product 25°C<FP<60.5°C	0% complete
Volume of Consolidated Waste Oil	90% complete
Volume of Consolidated Waste Gas	90% complete
Volume of Consolidated Waste Jet Fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Loader and heavy equipment safety
- Washing up/changing clothes before eating
- Proper incineration of garbage

Environmental Issues
None.

Comments, Concerns and Correspondence
It rained steadily all day today, which slowed work somewhat. The forecast for tomorrow is more rain.

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is washing drums. Two pumps were used for consolidation yesterday; it is no longer a potential pressure.

Wildlife Observations
Moose tracks were seen this morning at the dock area. A bear was sighted near the incinerator. The bear left without being frightened by the wildlife monitor.

Samples
None.

Results
The field inspection table for water pumped directly to the overpacks for use as wash water is presented below.

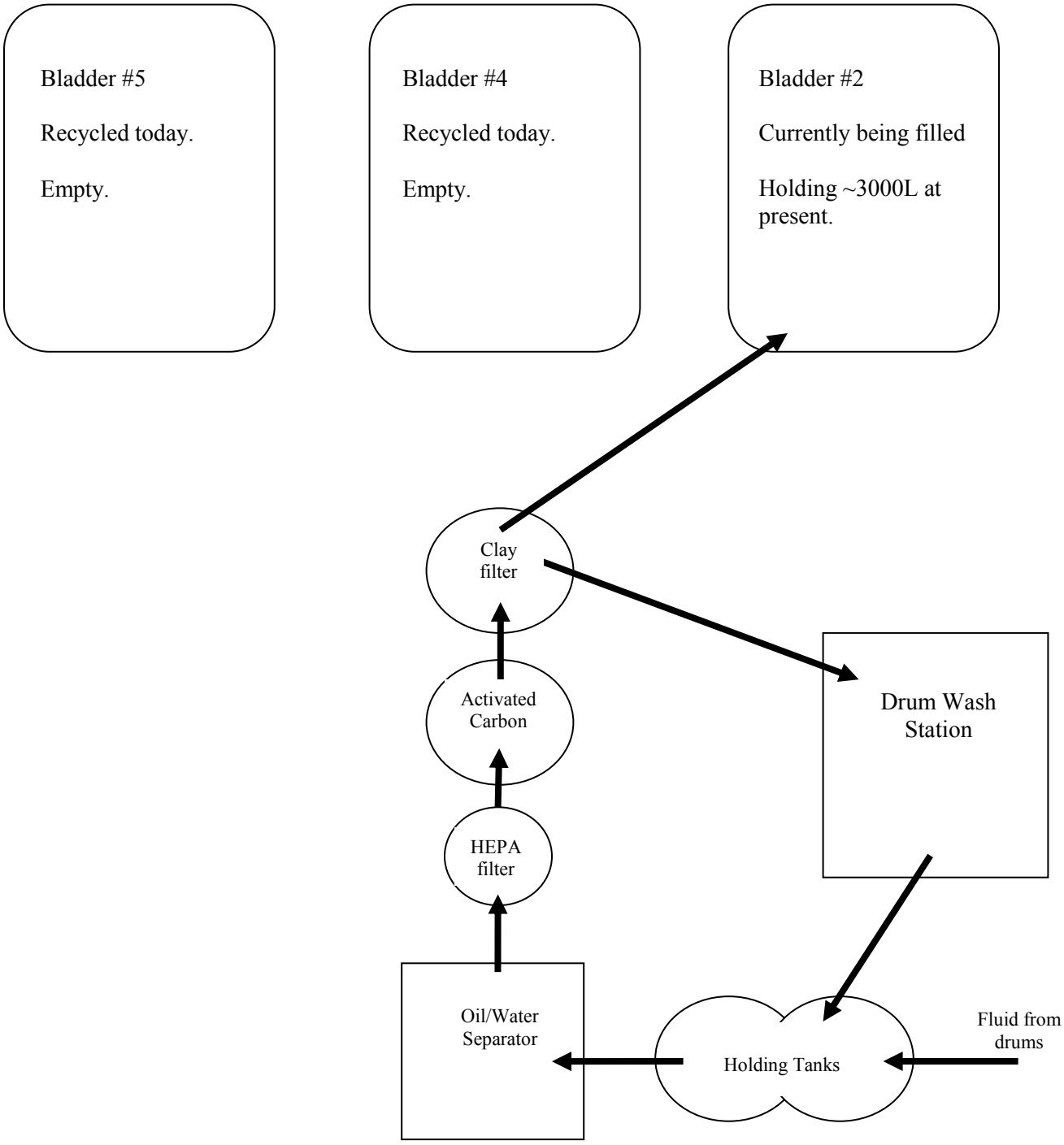
Date	21 August 2011
Visual and Olfactory Observations	Water is without colour or odour and does not appear to have suspended solids (clear).
Flow rate	~15L/min

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic



Photos

The incinerator in use.

Loading crushed drums into the bucket of the front-end loader.

Dumping crushed drums on the stockpile.

Consolidating product main phase drums.

The treatment system in use.

Washing drums.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Monday, August 22st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Noreen Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derek Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, one needing maintenance
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	46

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	10ºC	12 ºC
Precipitation:	Steady rain	None
Condition:	Overcast	Overcast

General

Camp complement today is 15 persons. One of the Yamaha 4x4s is currently unusable.

Work in Progress

Contract

The excavator was in limited use today to crush drums.
The loader was in limited use today to move crushed drums to the stockpile.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped directly to the drum washing station.
Water from the holding tanks was treated and pumped into Bladder #2.
Consolidation of drums with product main phase continued today.
The front-end loader was in limited use today moving drums to the wash station.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	95%
Volume of Water Treated (litres)[1]	44150
Number of Drums Crushed	1890
Consolidating drums with Product Main Phase	*80% complete*
Volume of Consolidated Product FP<25°C	0% complete
Volume of Consolidated Product 25°C<FP<60.5°C	0% complete
Volume of Consolidated Waste Oil	96% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	10% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Loader and heavy equipment safety
- Rain hazards
- Proper incineration of garbage/disposal of foodstuffs

Environmental Issues
None.

Comments, Concerns and Correspondence
It rained steadily today until around 1500, which slowed work somewhat.

Water being pumped into the overpacks this morning (1130 hrs) had a slight brown tinge. The particulate, clay and carbon filters were all switched out and the process water will be inspected tomorrow when treating begins again (the activated carbon must soak for 24 hours before processing can begin).

Site Visitors
None.

Limiting Factors and Potential Pressures
The limiting factor is washing drums.

Wildlife Observations
The wildlife monitor saw a cow and calf moose on the far side of the lake from the beach area today.

Samples
None.

Results
The field inspection table for water pumped directly to the overpacks for use as wash water is presented below.

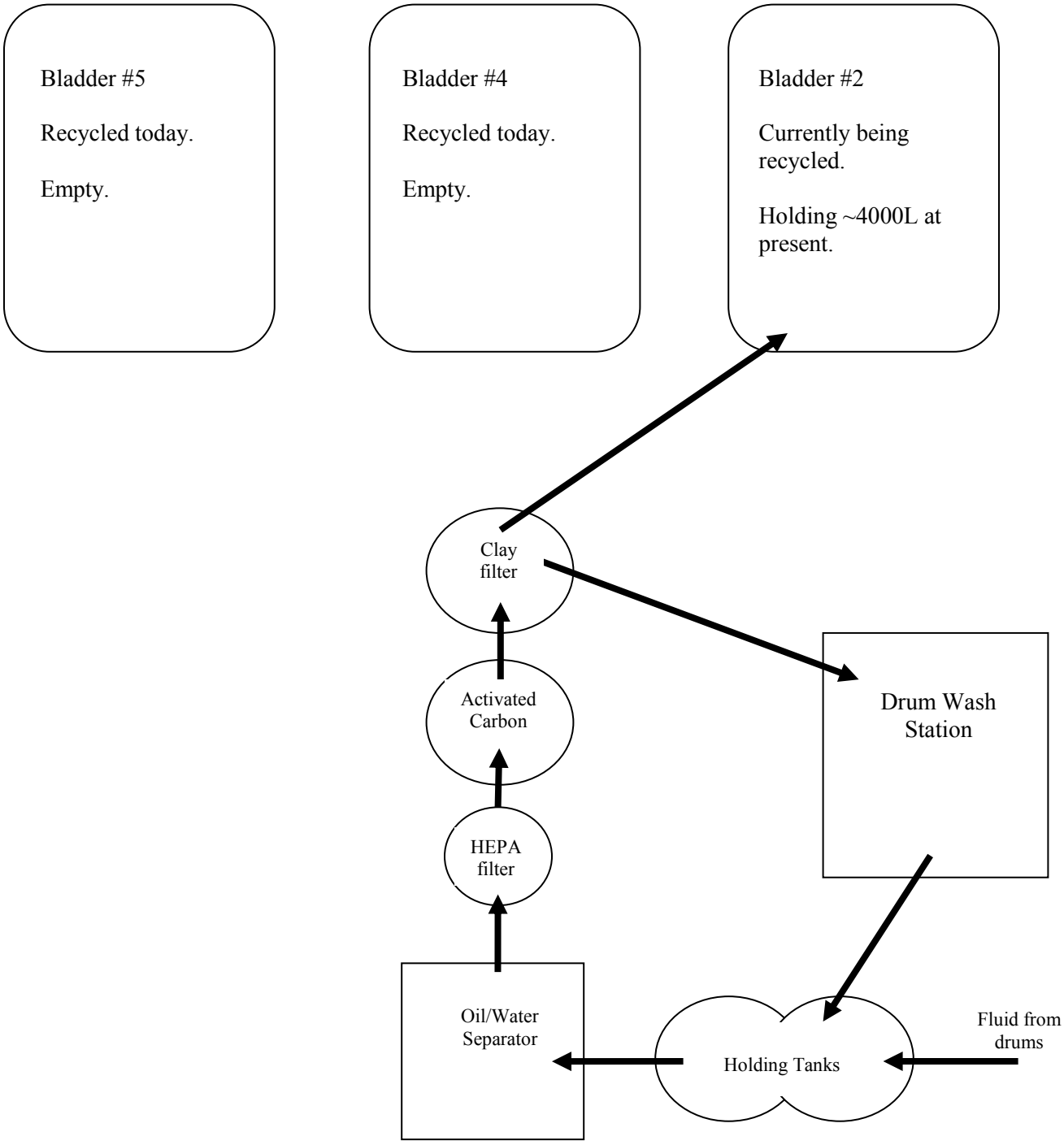
Date	22 August 2011
Visual and Olfactory Observations	Water has a slight brown colour and is not as clear as has been seen previously. There is no odour.
Flow rate	~15L/min

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic



Photos

Consolidation activities.

Bladder #2, full.

Washing drums.

Using the loader to bring empty drums for use in consolidating drums with a product main phase.

The crushed drum stockpile.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Tuesday, August 23st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Merine Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derrick Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, one needing maintenance
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	47

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	8ºC	11ºC
Precipitation:	None	Very light, intermittent
Condition:	Overcast	Overcast

General

Camp complement today is 15 persons.

Work in Progress

Contract

The excavator was in limited use today to crush drums.
The loader was in limited use today to move crushed drums to the stockpile.

TA

Liquid contents were pumped into the white holding tanks.
Drums were opened, washed, and readied for crushing.
The oil/water separator was in use today.
Water from the holding tanks was treated and pumped directly to the drum washing station.
Water from the holding tanks was treated and pumped into Bladder #2 and #4.
Consolidation of drums with product main phase continued today.
The front-end loader was in limited use today moving drums to the wash station.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	100%
Volume of Water Treated (litres)[1]	50300
Number of Drums Crushed	100%
Consolidating drums with Product Main Phase	*100% complete*
Volume of Consolidated Product FP<25°C	100% complete
Volume of Consolidated Product 25°C<FP<60.5°C	100% complete
Volume of Consolidated Waste Oil	100% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	100% complete
Volume of Consolidated Antifreeze	100% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Exercising caution when lifting full drum
- Carbon monoxide alarm went off in someone's tent last night, be careful
- Stay mentally focused, don't get lax near the end of the job

Environmental Issues
None.

Comments, Concerns and Correspondence
Water being pumped into the overpacks yesterday had a slight brown tinge. After switching the filters, the treated water again appears clear, without any suspended solids or odours.

Site Visitors
None.

Limiting Factors and Potential Pressures
Samples will be sent to the lab tormorrow morning for analysis. Until we receive discharge approval, the full bladders, part of the treatment system and sampling equipment must remain onsite.

Wildlife Observations
None.

Samples
None.

Results
The field inspection table for water pumped directly to the overpacks for use as wash water is presented below.

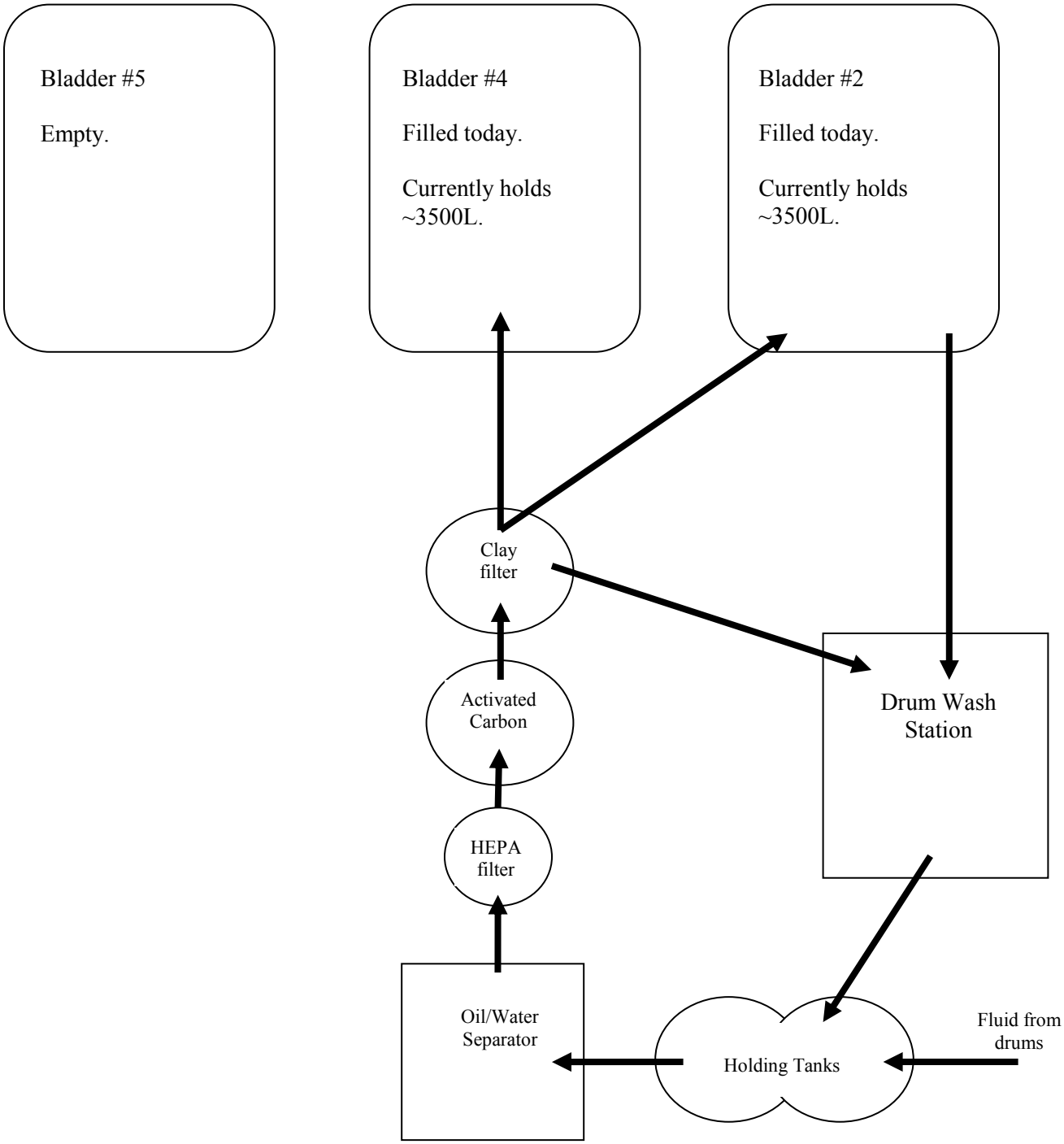
Date	23 August 2011
Visual and Olfactory Observations	Water is without colour or odour and does not appear to have suspended solids (clear).
Flow rate	~15L/min

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic



Photos

Repairing a liquid pump.

Washing drums.

Treated water being pumped into Bladder #4.

Moving crushed drums to the stockpile.

Barrels containing sand. They have been moved to a stockpile on a plastic liner.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Wednesday, August 24st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Field Tech	Clint Baptiste	Sahtu
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Merine Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derrick Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**15**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	3	2 good, one needing maintenance
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good
Oil-Water separator	1	good
Pressure washer	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	1
2011 Total	48

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	4ºC	15ºC
Precipitation:	None	None
Condition:	Mixed sun and cloud	Clear, sunny

General

Camp complement today is 15 persons. Clint Baptiste left this morning at 0900 on an Air Tindi Twin Otter.

Work in Progress

Contract

The excavator was in limited use today to crush drums.
The loader was in limited use today to move crushed drums to the stockpile.
Camp teardown began in earnest today.

TA

Clean-up of equipment, dismantling of washing and treatment systems, general site clean-up.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	100%
Volume of Water Treated (litres)[1]	50300
Number of Drums Crushed	100%
Consolidating drums with Product Main Phase	*100% complete*
Volume of Consolidated Product FP<25°C	100% complete
Volume of Consolidated Product 25°C<FP<60.5°C	100% complete
Volume of Consolidated Waste Oil	100% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	100% complete
Volume of Consolidated Antifreeze	100% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Wear hard hats when tearing down tents, watch joists etc. overhead
- Wear gloves, watch for splinters and nails
- Assess and remove hazards before beginning work

Environmental Issues

None.

Comments, Concerns and Correspondence
Water being pumped into the overpacks yesterday had a slight brown tinge. After switching the filters, the treated water again appears clear, without any suspended solids or odours.

Site Visitors
An Air Tindi Twin Otter arrived at 0900 from Yellowknife. The pilot did not come up to camp. Clint Baptiste left site on the return flight.

Limiting Factors and Potential Pressures
Samples were sent to the lab this morning for analysis. Until we receive discharge approval, the full bladders, part of the treatment system and sampling equipment must remain onsite.

Wildlife Observations
A bear was observed late tonight (2400) in the vestibule between the kitchen and bathroom, eating food from the fridge. It was shot with a rubber bullet and left the camp area. Upon inspection, a board had fallen on the bear fence, causing two wires to touch so that the fence was not carrying a charge. This has since been remedied. No one was injured.

Samples
Samples of treated water in Bladders #2 and #4 were sent to Maxxam by way of the Air Tindi flight this morning. The samples are PW2-2308 and PW4-2308, respectively.

Results
Results for Bladders #2 and #4 are pending.

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Bladder Schematic
The treatment system and bladders are idle and were not used today. Some of the volume in Bladder #2 was used to clean the treatment system components. This water was then pumped into drums as process waste.

Photos

Stockpiling the last of the drums.

Cleaning and disassembling the barrel wash station.

Overpacks filled with sand.

Camp demobilization has begun.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Thursday, August 25st, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other
On-site Community Rep (OCR)	Brian Gaudet	Sahtu

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Wildlife Monitor	Russell Kenney	Sahtu
Cook	Gina Neyelle	Sahtu
Cook's Assistant	Merine Takazo	Sahtu
Medic	Bianca Spence	Other
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Clayton Modeste	Sahtu
Hazmat Labourer	Derrick Neyelle	Sahtu
Hazmat Labourer	Joseph Kenny	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Camp Attendant	George Takazo	Sahtu
TOTAL ON-SITE	**14**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	2	good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	0
2011 Total	48

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	6ºC	14ºC
Precipitation:	None	None
Condition:	Mixed sun and cloud	Mixed sun and cloud

General

Camp complement today is 14 persons. A personnel switch occurred today.

Position	**Leaving**	**Arriving**
OCR	Brian Gaudet	
Mazmat Labourer	Joseph Kenny	
Mazmat Labourer	Clayton Modeste	
Mazmat Labourer	Derrick Neyelle	
Mazmat Labourer	George Takazo	
Cook	Gina Neyelle	
Cook's Assistant	Merine Takazo	
Medic	Bianca Spence	
Boat Pilot		Hughie Ferdinand
Boat Pilot		Eddie Loutit

Work in Progress

Contract

Camp teardown continued today.

TA

Clean-up of equipment, dismantling of washing and treatment systems, general site clean-up.

Consolidation Summary	**Total**
Number of Drums	2149
Number of Drums opened and cleaned	100%
Volume of Water Treated (litres)[1]	50300
Number of Drums Crushed	100%
Consolidating drums with Product Main Phase	*100% complete*
Volume of Consolidated Product FP<25°C	100% complete
Volume of Consolidated Product 25°C<FP<60.5°C	100% complete
Volume of Consolidated Waste Oil	100% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	100% complete
Volume of Consolidated Antifreeze	100% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Bear and wildlife safety
- Wear gloves, watch for splinters and nails
- Assess and remove hazards before beginning work

Environmental Issues
None.

Comments, Concerns and Correspondence
Site visit by Joel Gowman and Michael Bernardin occurred today. During the site tour, remaining remedial actions were outlined.

Site Visitors
An Air Tindi Twin Otter arrived at 0600 from Yellowknife and proceeded to drop off part of the crew in Deline (see table above). On the return flight, the same plane picked up a Yamaha 4x4, the oil/water separator, various other equipment, Bianca Spence and Merine Takazo and returned them to Yellowknife. The pilots did not come up to camp.

A second Air Tindi Twin Otter arrived on floats with the visitors (Joel Gowman, Michael Bernardin and Gardner) for the site visit. The plane held for 3 hours and returned with the same complement. The pilots did not come up to camp.

Limiting Factors and Potential Pressures
Until we receive discharge approval, the full bladders, part of the treatment system and sampling equipment must remain onsite.

Wildlife Observations
The same bear that had entered camp last night returned to the camp area multiple times, despite being shot with bean bag rounds. During the last encounter, the bear was killed.

Samples
None.

Results
Results for Bladders #2 and #4 are pending.

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Photos

Dismantling a canvas tent.

Breaking camp.

The site of the former airstrip drum cache. Barrels to the right of the frame are consolidated product and process waste. To the left of the frame, the bladders will be discharged and removed once results below applicable standards and approval have been received.

Burning scrap lumber.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Friday, August 26th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Wildlife Monitor	Russell Kenney	Sahtu
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Barge Captain	Eddie Loutit	Other
Boat Pilot	Hughie Ferdinan	Sahtu
TOTAL ON-SITE	**8**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	2	good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	0
2011 Total	48

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	5ºC	14ºC
Precipitation:	Light rain	None
Condition:	Overcast	Mixed sun and cloud

General
Camp complement today is 8 persons.

Work in Progress

Contract

Camp teardown continued today.

TA

None.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	100%
Volume of Water Treated (litres)[1]	50300
Number of Drums Crushed	100%
Consolidating drums with Product Main Phase	*100% complete*
Volume of Consolidated Product FP<25°C	100% complete
Volume of Consolidated Product 25°C<FP<60.5°C	100% complete
Volume of Consolidated Waste Oil	100% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	100% complete
Volume of Consolidated Antifreeze	100% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Bear and wildlife safety
- Mental focus
- Barge and heavy equipment operating safety

Environmental Issues

None.

Comments, Concerns and Correspondence

None.

Site Visitors

None.

Limiting Factors and Potential Pressures

Until we receive discharge approval, the full bladders, part of the treatment system and sampling equipment must remain onsite.

Wildlife Observations

Another bear was seen outside the camp area today on two separate occasions. The first time the bear left without being frightened, the second time the bear was hit with a rubber bullet and fled.

Samples

None.

Results
Results for Bladders #2 and #4 are pending.

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Photos

Loading of the barge.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Saturday, August 27th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Wildlife Monitor	Russell Kenney	Sahtu
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Hazmat Labourer	Roddy Modeste	Sahtu
Barge Captain	Eddie Loutit	Other
Boat Pilot	Hughie Ferdinan	Sahtu
TOTAL ON-SITE	**8**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	2	good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	0
2011 Total	48

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	9ºC	15ºC
Precipitation:	None	None
Condition:	Mixed sun and cloud	Mixed sun and cloud

General
Camp complement today is 8 persons.

Work in Progress

Contract

Camp teardown continued today.

TA

None.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	100%
Volume of Water Treated (litres)[1]	50300
Number of Drums Crushed	100%
Consolidating drums with Product Main Phase	*100% complete*
Volume of Consolidated Product FP<25°C	100% complete
Volume of Consolidated Product 25°C<FP<60.5°C	100% complete
Volume of Consolidated Waste Oil	100% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	100% complete
Volume of Consolidated Antifreeze	100% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Sleeping arrangements
- Wear your hard hats when dismantling tents
- Using radios when away from the main camp

Environmental Issues

None.

Comments, Concerns and Correspondence

None.

Site Visitors

An Air Tindi Twin Otter arrived onsite at 1400. Dave Joben (carpenter) arrived with the plane. Roddy Modeste (hazmat labourer) and Russell Kenny (wildlife monitor) left with the plane back to Yellowknife. The pilots did not come up to camp.

Limiting Factors and Potential Pressures

Until we receive discharge approval, the full bladders, part of the treatment system and sampling equipment must remain onsite.

Wildlife Observations

A bear was seen away from the camp area, in the bush off the road.

Samples

None.

Results
Results for Bladders #2 and #4 are pending.

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Photos

Stockpiling and banding lumber for transport.

Disassembled plumbing from the shower stalls.

Picking up nails/screws with the magnetic collector.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Sunday, August 28th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Carpenter	Dave Jobien	Sahtu
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Barge Captain	Eddie Loutit	Other
Boat Pilot	Hughie Ferdinand	Sahtu
TOTAL ON-SITE	**7**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	2	good
Ford F350 Pickup	1	good
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	0
2011 Total	48

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	8ºC	14ºC
Precipitation:	None	None
Condition:	Mixed sun and cloud	Mixed sun and cloud

General
Camp complement today is 7 persons.

Work in Progress

Contract

Camp teardown continued today.

TA

None.

Consolidation Summary	Total
Number of Drums	2149 (approximate)
Number of Drums opened and cleaned	100%
Volume of Water Treated (litres)[1]	50300
Number of Drums Crushed	100%
Consolidating drums with Product Main Phase	*100% complete*
Volume of Consolidated Product FP<25°C	100% complete
Volume of Consolidated Product 25°C<FP<60.5°C	100% complete
Volume of Consolidated Waste Oil	100% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	100% complete
Volume of Consolidated Antifreeze	100% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Mental fatigue
- Tool (hammer, drill) safety/proper care
- Proper communication with the loader operator
- Barge loading safety

Environmental Issues

None.

Comments, Concerns and Correspondence

Camp breakdown is taking longer than expected. We now expect to be set to leave Monday evening.

Site Visitors

None.

Limiting Factors and Potential Pressures

Until we receive discharge approval, the full bladders, part of the treatment system and sampling equipment must remain onsite.

Wildlife Observations

A bear was seen at the camp area today. He was frightened with a bear banger and hit with a bean bag round.

Samples

None.

Results
Results for Bladders #2 and #4 are pending.

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Photos

Taking down the kitchen/bunkhouse.

Moving the fridges and other kitchen gear.

A weather haven packed into its crate.

SENES Consultants Limited
Specialists in Energy, Nuclear and Environmental Sciences

GBL –Phase I
SAWMILL BAY REMEDIATION
DAILY REPORT

Date Monday, August 29th, 2011
Project ID PWGSC: R.015211.027
SENES/DCS: 340962-000

Site Personnel
DRAP: SENES

Position	Name	from
Department Rep (DR)	Ryan Janzen	Other

Remediation Contractor: Aboriginal Engineering Limited (AEL)

Position	Name	from
Site Superintendent	Brad Landry	N.Aboriginal Fort Res
Carpenter	Dave Jobien	Sahtu
Hazmat Labourer	Lloyd Baton	Sahtu
Hazmat Labourer	Cameron Yukon	Sahtu
Barge Captain	Eddie Loutit	Other
Boat Pilot	Hughie Ferdinand	Sahtu
TOTAL ON-SITE	**7**	

Site Equipment

Equipment	Number of	Condition
Yamaha Grizzly 4x4 with trailer	2	good
Ford F350 Pickup	1	Poor condition, not being used
Cat 250E Loader/Forklift	1	good
Cat 320C Excavator	1	good
Ingersoll Rand portable light tower	1	good

Daily and Yearly Water Use

Timeframe	Volume (m^3)
Today	0
2011 Total	48

Weather

	Morning (0700hrs)	*Afternoon (1800hrs)*
Temperature:	8ºC	15ºC
Precipitation:	None	None
Condition:	Mixed sun and cloud	Mixed sun and cloud

General
Camp complement today is 7 persons.

Work in Progress

Contract

Camp teardown continued today. DR performed confirmation soil sampling at the Dock Cache, the Airstrip Cache, the Wash Station and underneath the former Ash Pile (behind the main lodge).

TA

None.

Consolidation Summary	Total
Number of Drums	2149
Number of Drums opened and cleaned	100%
Volume of Water Treated (litres)[1]	50300
Number of Drums Crushed	100%
Consolidating drums with Product Main Phase	*100% complete*
Volume of Consolidated Product FP<25°C	100% complete
Volume of Consolidated Product 25°C<FP<60.5°C	100% complete
Volume of Consolidated Waste Oil	100% complete
Volume of Consolidated Waste Gas	100% complete
Volume of Consolidated Waste Jet Fuel	100% complete
Volume of Consolidated Antifreeze	100% complete
Volume of Consolidated Transmission Fluid	100% complete

1. First bladder retreated

Health & Safety

Site safety meeting held every day at 0645h. Topics covered today were:

- Barge loading safety
- Building dismantling safety
- Proper communication with the loader operator

Environmental Issues

None.

Comments, Concerns and Correspondence

Camp breakdown is taking longer than expected. We expect to be able to leave tonight.

Site Visitors

None.

Limiting Factors and Potential Pressures

Until we receive discharge approval, the full bladders, part of the treatment system and sampling equipment must remain onsite.

Wildlife Observations

A bear was seen away from the camp area, on the dock access road. He left without being frightened.

Samples

The confirmatory samples mentioned above will be sent on the offsite flight tonight.

Results
Results for Bladders #2 and #4 are pending.

Discharge Totals

Date	Bladder	Volume (litres)
August 13th	Bladder #3	5600
August 17th	Bladder #2	5600
Total		**11200**

Note: 'Discharge' is specified as a release to the environment. Water that is recycled as wash water is not included in this tally.

Photos

The airstrip after drum removal/crushing. Flags in the picture denote the location of confirmatory soil samples taken at the Wash Station.

Environmental supplies to be stored onsite (inside the Quonset hut also in photo).

The final stages of camp teardown.

Collecting sand from minor spills into overpacks for offsite transportation.

MINUTES OF MEETING - DRAFT
Weekly Construction Meeting

Project Name: Sawmill Bay, Great Bear Lake. Environmental Site Remediation – Phase 1
Project No.: R.015211.027 and R.015211.038

Date: Thursday August 4th, 2011
Location: Sawmill Bay

Purpose: Weekly Construction Meeting and Schedule Review

Attendance and Distribution

Person	Initials	Company	Role	Email	Attended	Distributed
Brad Landry	BL	AEL	Superintendent	blandry@aboriginaleng.com	√	√
Giselle Cotta	GC	PWGSC	PWGSC	Giselle.Cotta@pwgsc-tpsgc.gc.ca		√
Jason Mauchan	JDM	SENES/DCS	DR	jmauchan@dcsltd.ca	√	√
Michael Bernardin	MB	PWGSC	PWGSC PM	Michael.Bernardin@pwgsc-tpsgc.gc.ca		√
Charles Gravelle	CG	SENES/DCS	DR PM	cgravelle@dcsltd.ca		√
Joel Gowman	JG	AANDC	AANDC CARD PM	Joel.Gowman@inac-ainc.gc.ca		√
Mellissa Munger	MM	AANDC	AANDC CARD	Melissa.Munger@aandc-aadnc.gc.ca		√
Clint Baptiste	CB	AEL	Field Tech	gbladmin@aboriginaleng.com		√
Robert Johnson	RJ	AEL	AEL PM	rjohnson@aboriginaleng.com		√
Bianca Spence	BS	AEL	Medic	siebrand6@msn.com	√	
Kurri Mackeinzo	KM	DFN	OCR	c_mack21@hotmail.com		√

i) Introduction

Agenda:

1. Review and approve minutes of previous meetings;
2. Review of Work progress since previous meeting;
3. Field observations, problems, conflict;
4. Problems which impede construction Schedule;
5. Review of off-site fabrication delivery Schedules;
6. Project Schedule review, identifying activities that are behind Schedule and providing measures to regain slippage;
7. Corrective measures and procedures to regain Projected Schedule;
8. Revisions to construction Schedule;
9. Progress Schedule, during succeeding Work period;
10. Review submittal Schedules and expedite as required;
11. Maintenance of quality standards;
12. Review proposed changes for affect on construction Schedule and on completion date;

13. Health, Safety and Security issues;
14. Correspondence from Authorities Having Jurisdiction (AHJ) or expected visits from AHJ;
15. Camp requirements; and
16. Regulatory compliance
17. Other business.

1 Review and approve minutes of previous meetings.

- Review of previous weekly report. JM to distribute.

2 Review of Work progress

Progress as of midnight August 3rd

	Airstrip Cache To Do (A)	Completion	Bay Cache To Do (B)	Completion
Number of Drums	1093		1056	
Transporting drums with Water Main Phase	232	100%	219	20%
Pumping drums with Water Main Phase	232	100%	219	18%
Treating of Water (litres)	7680	100%	7700	18%
Transporting drums with Product Main Phase	121	90%	38	0%
Consolidating drums with Product Main Phase	121	0%	38	0%
Consolidating of Product (litres)	12867	0%	822	0%
Drums with Sludge	655		768	
Treating/Consolidating Sludge (litres)	2781	23%	2000	0%
Deheading drums	1093	14%	1056	0%

1. Totals do not add up due to the table not including drums which are empty, contain sand, or contain antifreeze.

3 Field observations, problems, conflicts

- Field crew are wearing the appropriate PPE
- Positive atmosphere at camp
- The water coming through the treatment system is clear, colourless, and odourless

4 Problems which may impede construction Schedule.

- Deheading the drums is impeding the construction schedule
- Transporting drums from Bay Cache to Airstrip Cache is impeding schedule
- If analytical results are pending, this may impede the schedule
- If analytical results above criteria, this may impede the schedule

5 Review of off-site delivery schedule

- Partial analytical results due Aug 4th evening

6 Project Schedule review, identifying activities that are behind Schedule

Overall project is moving forward. The drum deheading and drum transport are the limiting factors.

Drum Deheading

There are 1850 remaining drums to dehead.

If one drum takes 3 minutes to dehead → 92 hours
If one drum takes 5 minutes to dehead → 154 hours
If one drum takes 8 minutes to dehead → 246 hours

Currently, one drum takes 8 minutes to dehead.

Transporting Drums

There are 875 drums remaining to transport to the Airstrip Cache.
Available vehicles are 3 ATVs with trailers, truck, and loader.

7 Corrective measures and procedures to regain and determine Projected Schedule.

- Drum deheading - options explored by AEL
  - Additional drum deheader
  - Additional drum deheader part to handle old style drums
  - Use hand tool, a large can opener
  - Wash the drums without deheading
    - On August 4th, BL submitted to JM a proposal to:
      1. Pump out the contents of each drum into the appropriate stream,
      2. Pressure wash the drums through the opening,
      3. Drain the contents of the wash water into the treatment system,
      4. Visually inspect the drum, and
      5. Crush the drum.
    - JM to discuss their proposal with CG, MB, and GC

- Transporting drums
  - Two trailers have been repaired.
  - Use 3 ATVs with 3 repaired trailers
  - Use the loader with a box capable of transporting 10 drums
  - Use the truck to transport 6 drums.
  - Allocate all labour crew to transporting drums

- 3 ATVS with trailers (4-5 drums each) + the truck (6) + loader (10) = 28 to 31 drums

- 30 trips using all the vehicles will transport all the drums to the airstrip

- Average round trip is 40 minutes → 20 hours to transport all the drums to the airstrip

8 Revisions to construction Schedule

- BL submitted an amended construction schedule on August 4th

SUN	MON	TUE	WED	THUR	FRI	SAT
				4	5 TRANSPORT	6 TRANSPORT
7 TREAT & WASH	8 TREAT & WASH	9 TREAT & WASH	10 TREAT & WASH & CONSOL	11 TREAT & WASH & CONSOL	12 ASH & CONTIGENCY	13 CRUSH & STOCKPILE
14 CRUSH & STOCKPILE	15 CRUSH & STOCKPILE	16 DEMOB	17 DEMOB	18 DEMOB	19 DEMOB	20 DEMOB - BARGE DEPARTURE
21	22	23	24	25	26	27
28	29	30	31			

9 Progress Schedule, during succeeding Work period.

- See calendar

10 Review submittal Schedules and expedite as required.

- Project schedule submitted by BL to JM on August 4th

11 Maintenance of quality standards

- Quality standards being maintained through daily record keeping and monitoring
- Water samples sent to an accredited laboratory

12 Review proposed changes for effect on Construction Schedule.

- Completion date for TA work is projected to be August 12th
- Completion date for the project is projected to be August 20th

13 Health, Safety and Security issues.

- Bear sightings.
    - The bear fence is in operation during the evenings
    - All vehicles equipped with bear spray
    - Radio communication in operation
    - The bear has been seen at the airstrip crossroads and the daily burn area
    - One member of camp is dedicated as wildlife monitor
- PPE in use by all crew
- Three individuals were sent home on two spate medevac planes.
    - First person was sent home due to an ear infection
    - The second person was sent home due to a combination of shortness of breath,

a dry cough, a skin rash, and age. He is 67 years old.
    - The third person suffered from dehydration and pains
- In each case the medic advised the individual to seek further medical attention at the Health Clinic in Deline.
- A few members of the crew have had coughs and colds. The medic is in daily communication with these crew members and has advised them to drink more water, and get more sleep. The medic, an EMT, has 'over the counter' medicine.
- A protective shield was constructed for drum crushing activities
    - The protective shield is 6' x 6'
    - The DR will document the use when crushing activities commence

14 Correspondence from AHJ or expected visits from AHJ.

- An on-site inspection was completed Wednesday July 27th, 2011
- Bruce Graney, CRSP submitted a written inspection report. AEL received his report on Wednesday August 3rd, 2011
- There are 6 compliance orders
    - First Aid room to be a separate tent
    - Widen door on First Aid tent
    - Increase the amount of on-site oxygen
    - Provide suitable transportation for injured worker
    - Provide stretchers for injured workers
    - Provide stretchers suitable for aircraft
- Required compliance date is Wednesday August 10th, 2011
- BL and BS began dealing with compliance requirements immediately
    - Oxygen and a stretcher have been ordered
- JM will document the compliance requirements

- The Land Inspector verbally approved the discharge location at the airstrip during the July 27th site visit. Written approval is pending. He stated that a diffuser is required.
- The land inspector verbally disapproved of the discharge location proposed at the Bay Cache.
    - The inspector stated "At the Bay cache, at minimum further actions would be required, including silt fences, diffuser, and increased distance. The airstrip discharge location is preferred."
- The land inspector written requirements for a possible Bay Cache discharge location is pending.
- The transport of all drums to the airstrip satisfies the land inspector.
    - AEL proposing to transport all Bay Cache drums to the airstrip

15 Camp requirements

- See compliance requirements

16 Regulatory compliances issues and other business

- Tracking daily Water Use. Water inspector requires daily and cumulative totals.
- Monitor grey water lagoon levels, sample will be obtained from end-of-pipe
- Average of 1 m^3 per day being used as camp water

17 Any Other Business

- None

Action *JM to distribute analytical data upon receipt*

Action *JM to submit the AEL project schedule to MB, CG, GC*

Action *BL and BS to address compliance requirements*

Action *Along with daily record keeping, JM to document: the compliance requirement actions, the use of the shield, treated water airstrip discharge using a diffuser*

Action *BL and RJ to discuss the proposed schedule with MB*

Action *BL to discuss with MB the proposed cleaning of drums without deheading*

Action *BL to direct the transport of all drums to the airstrip cache*

Action *JM to discuss with CG, MB and GC, the AEL proposal to wash drums without deheading*

Please advise the writer, in writing, if these minutes contain any errors or omissions, otherwise they will become part of the project documentation as presented.

END OF MINUTES

Minutes prepared by:

Jason Mauchan
Sawmill Bay Great Bear Lake Environmental Site Remediation Phase I – Department Representative
Decommissioning Consulting Services Limited

4 August 2011

MINUTES OF MEETING - DRAFT
Weekly Construction Meeting

Project Name: Sawmill Bay, Great Bear Lake. Environmental Site Remediation – Phase 1
Project No.: R.015211.027 and R.015211.038

Date: Thursday August 11th, 2011
Location: Sawmill Bay

Purpose: Weekly Construction Meeting and Schedule Review

Attendance and Distribution

Person	Initials	Company	Role	Email	Attended	Distributed
Brad Landry	BL	AEL	Superintendent	blandry@aboriginaleng.com	√	√
Giselle Cotta	GC	PWGSC	PWGSC	Giselle.Cotta@pwgsc-tpsgc.gc.ca		√
Jason Mauchan	JDM	SENES/DCS	DR	jmauchan@dcsltd.ca	√	√
Michael Bernardin	MB	PWGSC	PWGSC PM	Michael.Bernardin@pwgsc-tpsgc.gc.ca		√
Charles Gravelle	CG	SENES/DCS	DR PM	cgravelle@dcsltd.ca		√
Joel Gowman	JG	AANDC	AANDC CARD PM	Joel.Gowman@inac-ainc.gc.ca		√
Mellissa Munger	MM	AANDC	AANDC CARD	Melissa.Munger@aandc-aadnc.gc.ca		√
Clint Baptiste	CB	AEL	Field Tech	gbladmin@aboriginaleng.com		√
Robert Johnson	RJ	AEL	AEL PM	rjohnson@aboriginaleng.com		√
Bianca Spence	BS	AEL	Medic	siebrand6@msn.com		√
Kurri Mackeinzo	KM	DFN	OCR	c_mack21@hotmail.com		√
Ryan Janzen	RJZ	SENES/DCS	DR	rjanzen@dcsltd.ca		√

i) Introduction

Agenda:

1. Review and approve minutes of previous meetings;
2. Review of Work progress since previous meeting;
3. Field observations, problems, conflict;
4. Problems which impede construction Schedule;
5. Review of off-site fabrication delivery Schedules;
6. Project Schedule review, identifying activities that are behind Schedule and providing measures to regain slippage;
7. Corrective measures and procedures to regain Projected Schedule;
8. Revisions to construction Schedule;
9. Progress Schedule, during succeeding Work period;
10. Review submittal Schedules and expedite as required;
11. Maintenance of quality standards;

12. Review proposed changes for affect on construction Schedule and on completion date;
13. Health, Safety and Security issues;
14. Correspondence from Authorities Having Jurisdiction (AHJ) or expected visits from AHJ;
15. Camp requirements; and
16. Regulatory compliance
17. Other business.

1 Review and approve minutes of previous meetings.

- Review of previous weekly report.
- Review of previous schedule

2 Review of Work progress. As of 9pm August 10th

All the old drums were transported to the Airstrip Cache. Note that the remaining drums at the Bay, are the contractor's drums from both the Port Radium project and GBL 1 - El Bonanza/Contact Lake aspects. Note that all historic drums are now at the Airstrip.

	Total
Number of Drums	2149
Number of Drums deheaded and cleaned	12% complete
Volume of Water Treated (litres)[1]	16000 litres
Consolidating drums with Product Main Phase	0% complete
Volume of Consolidated product FP<25°C	0% complete
Volume of Consolidated product 25°C<FP<60.5°C	0% complete
Volume of Consolidated waste oil	0% complete
Volume of Consolidated waste gas	0% complete
Volume of Consolidated waste jet fuel	0% complete
Volume of Consolidated Antifreeze	0% complete
Volume of Consolidated Transmission Fluid	0% complete

1.Bladder 1 was retreated, wash water being treated

The barge departed for Deline on August 4th and returned August 8th. Four crew on board

3 Field observations, problems, conflicts

- Field crew are wearing the appropriate PPE
- The water coming through the treatment system is clear, colourless, and odourless
- Washing drums without deheading has been field trialed successfully.
    - DR and OCR inspecting wash water
- Bears have been seen at each work area
- Heavy rain has added to the volume of water to treat, along with recycling the drum wash water through the system. Limiting factor is still washing drums.

4 Problems which may impede construction Schedule.

- Deheading the drums is impeding the construction schedule
- Deheading and washing the drums are the limiting factors
- If analytical results are pending, this may impede the schedule
- If analytical results above criteria, this may impede the schedule
- Waiting for discharge approval may impede the schedule

5 Review of off-site delivery schedule

- Analytical results expected today.
- Analytical results due Aug 12th evening and August 15th afternoon
- Delivery of new stretcher is expected on the next twin otter

6 Project Schedule review, identifying activities that are behind Schedule

Overall project is moving forward. The drum deheading limits the rate of drum washing

Drum Deheading

12% of drums have been deheaded. The limiting factor of deheading causes a delay in the rate of washing drums. An additional part for the barrel wash was projected be able to cut the older style drums, however, the time taken to dehead the drums is expected to remain the same.

Drum Washing
The drum washing station has consistently been waiting for drums from the deheading station.

7 Corrective measures and procedures to regain and determine Projected Schedule.

- Drum deheading
  Drums with liquid contents emptied will be sent to the drum wash station
  AEL proposes to wash the drums without deheading through the use of the 'hotsie' and the existing bung hole. Drums will be washed on the drum rack which allows for the rinsate to drain. A visual inspection by the DR and OCR will confirm the cleanliness of the drum. The wash water draining from the drum will also be field inspected using absorbent diapers. Water beads on the absorbent material, product soaks into the diaper. The wash water will be sent to the treatment process through pumping the lined drum wash liquid to the white holding tanks.
- Drum washing
  Drum washing without deheading will be the corrective measure. The procedure is for the DR and OCR to visually inspect the drums being washed and to ensure that wash water is fully drained from the drums.

8 Revisions to construction Schedule

- BL submitted an amended construction schedule. See below.

SUN	MON	TUE	WED	THUR	FRI	SAT
	1	2	3 (2 wks)	4	5	6
7	8	9	10 (3 wks)	11 WASH	12 TREAT &WASH	13 TREAT &WASH
14 TREAT & WASH	15 WASH	16 TREAT & WASH	17 (4 wks) WASH	18 CONSOL & WASH	19 CONSOL & WASH	20 TREAT &WASH DEMOB
21 CRUSH & STOCKPILE DEMOB	22 CRUSH & STOCKPILE DEMOB	23 CRUSH & STOCKPILE DEMOB	24 (5 wks) BARGE	25	26	27
28	29	30	31 (6 wks)			

9 Progress Schedule, during succeeding Work period.

- See calendar

10 Review submittal Schedules and expedite as required.

- Project schedule submitted by BL to JM on August 11th

11 Maintenance of quality standards

- Quality standards being maintained through daily record keeping and monitoring
- Water samples sent to an accredited laboratory

12 Review proposed changes for effect on Construction Schedule.

- Completion date for TA work is projected to be August 20th
- Completion date for the project is projected to be August 24th

13 Health, Safety and Security issues.

- Bear sightings.
    - The bear fence is in operation during the evenings
    - All vehicles equipped with bear spray
    - Radio communication in operation
    - The bear has been seen at all work areas
        - Daily housekeeping is part of the routine
    - One member of camp is dedicated as wildlife monitor
- PPE in use by all crew
- A protective shield was constructed for drum crushing activities
    - The protective shield is 6’ x 6’

- The DR to document the use of the barrier shield when crushing activities commence

14 Correspondence from AHJ or expected visits from AHJ.

- An on-site inspection was completed Wednesday July 27th, 2011
- There were 6 compliance orders
  - First Aid room to be a separate tent
  - Widen door on First Aid tent
  - Increase the amount of on-site oxygen
  - Provide suitable transportation for injured worker
  - Provide stretchers for injured workers
  - Provide stretchers suitable for aircraft
- Compliance actions were dealt with by AEL on August 5th.
- The DR documented the compliance actions in the August 5th daily report
- Stretcher is expected on the next twin otter. BL to expedite stretcher to site, RJZ to document the new stretcher on-site
- The Land Inspector verbally approved the discharge location at the airstrip during the July 27th site visit. Written approval is pending.
- The DR will document the use of the diffuser when discharge occurs.

15 Camp requirements

- Corrective actions were taken to meet compliance requirements

16 Regulatory compliances issues and other business

- Tracking daily Water Use. Water inspector requires daily and cumulative totals.
- Monitor grey water lagoon levels, sample obtained from end-of-pipe. Results expected August 15th
- Average of 1 m^3 per day being used as camp water.
- Awaiting approval for discharge
- Corrective actions taken by AEL to meet compliance

17 Any Other Business

- None

Action *JM and RJZ to distribute analytical data upon receipt*

Action *BL to submit proposed schedule changes to MB*

Action *JM and RJZ to track progress*

Action *BL to amend construction schedule as necessary*

Action *BL to submit construction schedule amendments to JM, RJZ, and MB*

Action *BL to expedite stretcher to site*

Action *RJZ to document the stretcher for compliance requirement corrective action*

Please advise the writer, in writing, if these minutes contain any errors or omissions, otherwise they will become part of the project documentation as presented.

END OF MINUTES

Minutes prepared by:

Jason Mauchan
Sawmill Bay Great Bear Lake Environmental Site Remediation Phase I – Department Representative
Decommissioning Consulting Services Limited

11 August 2011

APPENDIX I

LABORATORY DATA

Your P.O. #: 340982
Your Project #: GBL1
Site Location: SAWMILL
Your C.O.C. #: A057634

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/13

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B174363
Received: 2011/08/11, 9:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS	2	N/A	2011/08/13	CAL SOP-00190	CCME CWS, EPA 8260C
pH @25C	2	N/A	2011/08/13	AB SOP-00005	SM 4500-H B
Total Extractable Hydrocarbon C11-C30	2	2011/08/13	2011/08/13	AB SOP-00040 SOP-00037	AB EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B174363
Report Date: 2011/08/13

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

AT1 BTEX AND F1 (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Volatiles					
Benzene	ug/L	17	3.0	0.4	5085507
Toluene	ug/L	10	1.8	0.4	5085507
Ethylbenzene	ug/L	2.2	<0.4	0.4	5085507
o-Xylene	ug/L	3.1	0.4	0.4	5085507
m & p-Xylene	ug/L	3.0	<0.8	0.8	5085507
Xylenes (Total)	ug/L	6.1	<0.8	0.8	5085507
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	5085507
(C6-C10)	ug/L	<100	<100	100	5085507
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	99	99		5085507
4-BROMOFLUOROBENZENE (sur.)	%	102	101		5085507
D4-1,2-DICHLOROETHANE (sur.)	%	101	100		5085507

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/13

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BG0301	BG0364	
Sampling Date				
COC Number		A057634	A057634	
	Units	**SB-W-1B**	**SB-W-2B**	**QC Batch**

Misc. Inorganics				
pH	N/A	7.58	7.78	5089689

Maxxam Job #: B174363
Report Date: 2011/08/13

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Extractable Hydrocarbons					
Undecanes (C11)	mg/L	<0.02	<0.02	0.02	5089820
Dodecanes (C12)	mg/L	0.04	<0.02	0.02	5089820
Triadecanes (C13)	mg/L	0.10	<0.02	0.02	5089820
Tetradecanes (C14)	mg/L	0.18	<0.02	0.02	5089820
Pentadecanes (C15)	mg/L	0.24	<0.02	0.02	5089820
Hexadecanes (C16)	mg/L	0.17	<0.02	0.02	5089820
Heptadecanes (C17)	mg/L	0.15	<0.02	0.02	5089820
Octadecanes (C18)	mg/L	0.11	<0.02	0.02	5089820
Nonadecanes (C19)	mg/L	0.05	<0.02	0.02	5089820
Eicosanes (C20)	mg/L	0.06	<0.02	0.02	5089820
Heneicosanes (C21)	mg/L	<0.02	<0.02	0.02	5089820
Docosanes (C22)	mg/L	<0.02	<0.02	0.02	5089820
Triacosanes (C23)	mg/L	<0.02	<0.02	0.02	5089820
Tetracosanes (C24)	mg/L	<0.02	<0.02	0.02	5089820
Pentacosanes (C25)	mg/L	<0.03	<0.03	0.03	5089820
Hexacosanes (C26)	mg/L	<0.03	<0.03	0.03	5089820
Heptacosanes (C27)	mg/L	<0.03	<0.03	0.03	5089820
Octacosanes (C28)	mg/L	<0.03	<0.03	0.03	5089820
Nonacosanes (C29)	mg/L	<0.03	<0.03	0.03	5089820
Triacontanes (C30)	mg/L	<0.03	<0.03	0.03	5089820
Total Extractables C11 to C30	mg/L	1.1	<0.03	0.03	5089820
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	109	100		5089820

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/13

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

General Comments

Results relate only to the items tested.

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report

Maxxam Job Number: CB174363

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5085507	PX	Matrix Spike	1,4-Difluorobenzene (sur.)	2011/08/13		375 (1)	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/13		20 (2)	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/13		423 (1)	%	70 - 130
			Benzene	2011/08/13		NC	%	70 - 130
			Toluene	2011/08/13		NC	%	70 - 130
			Ethylbenzene	2011/08/13		NC	%	70 - 130
			o-Xylene	2011/08/13		NC	%	70 - 130
			m & p-Xylene	2011/08/13		NC	%	70 - 130
		Spiked Blank	1,4-Difluorobenzene (sur.)	2011/08/12		99	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/12		98	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/12		108	%	70 - 130
			Benzene	2011/08/12		86	%	70 - 130
			Toluene	2011/08/12		84	%	70 - 130
			Ethylbenzene	2011/08/12		88	%	70 - 130
			o-Xylene	2011/08/12		90	%	70 - 130
			m & p-Xylene	2011/08/12		89	%	70 - 130
			(C6-C10)	2011/08/12		77	%	70 - 130
		Method Blank	1,4-Difluorobenzene (sur.)	2011/08/13		96	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/13		100	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/13		107	%	70 - 130
			Benzene	2011/08/13	<0.4		ug/L	
			Toluene	2011/08/13	<0.4		ug/L	
			Ethylbenzene	2011/08/13	<0.4		ug/L	
			o-Xylene	2011/08/13	<0.4		ug/L	
			m & p-Xylene	2011/08/13	<0.8		ug/L	
			Xylenes (Total)	2011/08/13	<0.8		ug/L	
			F1 (C6-C10) - BTEX	2011/08/13	<100		ug/L	
			(C6-C10)	2011/08/13	<100		ug/L	
		RPD	Benzene	2011/08/13	NC		%	40
			Toluene	2011/08/13	25.7		%	40
			Ethylbenzene	2011/08/13	NC		%	40
			o-Xylene	2011/08/13	NC		%	40
			m & p-Xylene	2011/08/13	NC		%	40
			Xylenes (Total)	2011/08/13	NC		%	40
			F1 (C6-C10) - BTEX	2011/08/13	NC		%	40
			(C6-C10)	2011/08/13	NC		%	40
5089689	RP0	Spiked Blank	pH	2011/08/13		100	%	97 - 102
		RPD [BG0301-01]	pH	2011/08/13	0.4		%	5
5089820	JW0	Matrix Spike [BG0301-02]	O-TERPHENYL (sur.)	2011/08/13		111	%	70 - 130
			Total Extractables C11 to C30	2011/08/13		123	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2011/08/13		110	%	70 - 130
			Total Extractables C11 to C30	2011/08/13		129	%	70 - 130
		Method Blank	O-TERPHENYL (sur.)	2011/08/13		110	%	70 - 130
			Undecanes (C11)	2011/08/13	<0.02		mg/L	
			Dodecanes (C12)	2011/08/13	<0.02		mg/L	
			Triadecanes (C13)	2011/08/13	<0.02		mg/L	
			Tetradecanes (C14)	2011/08/13	<0.02		mg/L	
			Pentadecanes (C15)	2011/08/13	<0.02		mg/L	
			Hexadecanes (C16)	2011/08/13	<0.02		mg/L	
			Heptadecanes (C17)	2011/08/13	<0.02		mg/L	
			Octadecanes (C18)	2011/08/13	<0.02		mg/L	
			Nonadecanes (C19)	2011/08/13	<0.02		mg/L	
			Eicosanes (C20)	2011/08/13	<0.02		mg/L	
			Heneicosanes (C21)	2011/08/13	<0.02		mg/L	

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report (Continued)

Maxxam Job Number: CB174363

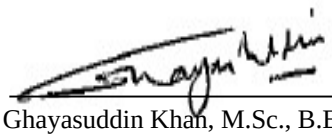
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5089820	JW0	Method Blank	Docosanes (C22)	2011/08/13	<0.02		mg/L	
			Triacosanes (C23)	2011/08/13	<0.02		mg/L	
			Tetracosanes (C24)	2011/08/13	<0.02		mg/L	
			Pentacosanes (C25)	2011/08/13	<0.03		mg/L	
			Hexacosanes (C26)	2011/08/13	<0.03		mg/L	
			Heptacosanes (C27)	2011/08/13	<0.03		mg/L	
			Octacosanes (C28)	2011/08/13	<0.03		mg/L	
			Nonacosanes (C29)	2011/08/13	<0.03		mg/L	
			Triacontanes (C30)	2011/08/13	<0.03		mg/L	
			Total Extractables C11 to C30	2011/08/13	<0.6		mg/L	
		RPD [BG0364-02]	Undecanes (C11)	2011/08/13	NC		%	40
			Dodecanes (C12)	2011/08/13	NC		%	40
			Triadecanes (C13)	2011/08/13	NC		%	40
			Tetradecanes (C14)	2011/08/13	NC		%	40
			Pentadecanes (C15)	2011/08/13	NC		%	40
			Hexadecanes (C16)	2011/08/13	NC		%	40
			Heptadecanes (C17)	2011/08/13	NC		%	40
			Octadecanes (C18)	2011/08/13	NC		%	40
			Nonadecanes (C19)	2011/08/13	NC		%	40
			Eicosanes (C20)	2011/08/13	NC		%	40
			Heneicosanes (C21)	2011/08/13	NC		%	40
			Docosanes (C22)	2011/08/13	NC		%	40
			Triacosanes (C23)	2011/08/13	NC		%	40
			Tetracosanes (C24)	2011/08/13	NC		%	40
			Pentacosanes (C25)	2011/08/13	NC		%	40
			Hexacosanes (C26)	2011/08/13	NC		%	40
			Heptacosanes (C27)	2011/08/13	NC		%	40
			Octacosanes (C28)	2011/08/13	NC		%	40
			Nonacosanes (C29)	2011/08/13	NC		%	40
			Triacontanes (C30)	2011/08/13	NC		%	40
			Total Extractables C11 to C30	2011/08/13	NC		%	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) Surrogate recovery exceeds acceptance criteria due to matrix interference.
(2) Surrogate recovery below acceptance criteria due to matrix interference. Reanalysis yields similar results.

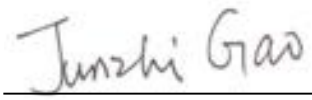
Validation Signature Page

Maxxam Job #: B174363

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab



Janet Gao, Senior Analyst, Organics Department

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your P.O. #: 340962-000
Your Project #: GBL 1
Site Location: SAW MILL BAY

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B169704
Received: 2011/08/02, 8:45

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS	1	N/A	2011/08/04	CAL SOP-00190	CCME CWS, EPA 8260C
Mercury - Low Level (Total)	1	2011/08/03	2011/08/03	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved	1	N/A	2011/08/04	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	1	2011/08/04	2011/08/04	AB SOP-00043	EPA 200.8
Oil & Grease (sheen)	1	N/A	2011/08/03		N/A
pH @25C	1	N/A	2011/08/03	AB SOP-00005	SM 4500-H B
Phenols (4-AAP)	1	N/A	2011/08/03	CAL SOP-00067	EPA 420.2
Hydrocarbon by IR (Mineral oil & grease)	1	2011/08/03	2011/08/04	CAL SOP-00096	SM 5520C, F

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B169704
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAW MILL BAY
Your P.O. #: 340962-000

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BD4980		
Sampling Date		2011/08/01 17:00		
	Units	**SB-W-2**	**RDL**	**QC Batch**
Misc. Inorganics				
pH	N/A	7.71	N/A	5060980
Misc. Organics				
Phenols	mg/L	0.046	0.002	5058054
Total Petroleum Hydrocarbon	mg/L	<2	2	5057409
Physical Properties				
Visible Sheen	N/A	NO SHEEN	N/A	ONSITE

RDL = Reportable Detection Limit

Maxxam Job #: B169704
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAW MILL BAY
Your P.O. #: 340962-000

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		BD4980		
Sampling Date		2011/08/01 17:00		
	Units	**SB-W-2**	**RDL**	**QC Batch**
Elements				
Total Arsenic (As)	mg/L	0.026	0.0002	5063247
Dissolved Cadmium (Cd)	mg/L	0.00011	0.000005	5061041
Total Chromium (Cr)	mg/L	<0.001	0.001	5063247
Dissolved Cobalt (Co)	mg/L	0.0003	0.0003	5061041
Dissolved Copper (Cu)	mg/L	0.0003	0.0002	5061041
Dissolved Lead (Pb)	mg/L	0.0056	0.0002	5061041
Dissolved Nickel (Ni)	mg/L	0.0028	0.0005	5061041
Total Zinc (Zn)	mg/L	0.11	0.003	5063247
Low Level Elements				
Total Mercury (Hg)	ug/L	0.008	0.002	5058357

RDL = Reportable Detection Limit

Maxxam Job #: B169704
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAW MILL BAY
Your P.O. #: 340962-000

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		BD4980		
Sampling Date		2011/08/01 17:00		
	Units	**SB-W-2**	**RDL**	**QC Batch**
Volatiles				
Benzene	ug/L	0.6	0.4	5055695
Toluene	ug/L	1.7	0.4	5055695
Ethylbenzene	ug/L	0.6	0.4	5055695
o-Xylene	ug/L	2.0	0.4	5055695
m & p-Xylene	ug/L	1.4	0.8	5055695
Xylenes (Total)	ug/L	3.4	0.8	5055695
LH (C5-C10)	ug/L	110	100	5055695
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	99		5055695
4-BROMOFLUOROBENZENE (sur.)	%	85		5055695
D4-1,2-DICHLOROETHANE (sur.)	%	87		5055695

RDL = Reportable Detection Limit

Maxxam Job #: B169704
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAW MILL BAY
Your P.O. #: 340962-000

General Comments

Results relate only to the items tested.

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL 1
P.O. #: 340962-000
Site Location: SAW MILL BAY

Quality Assurance Report

Maxxam Job Number: CB169704

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5055695	RSA	Matrix Spike	1,4-Difluorobenzene (sur.)	2011/08/03		92	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/03		105	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/03		102	%	70 - 130
			Benzene	2011/08/03		91	%	70 - 130
			Toluene	2011/08/03		88	%	70 - 130
			Ethylbenzene	2011/08/03		88	%	70 - 130
			o-Xylene	2011/08/03		94	%	70 - 130
			m & p-Xylene	2011/08/03		96	%	70 - 130
		Spiked Blank	1,4-Difluorobenzene (sur.)	2011/08/02		87	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/02		97	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/02		96	%	70 - 130
			Benzene	2011/08/02		115	%	70 - 130
			Toluene	2011/08/02		107	%	70 - 130
			Ethylbenzene	2011/08/02		110	%	70 - 130
			o-Xylene	2011/08/02		117	%	70 - 130
			m & p-Xylene	2011/08/02		115	%	70 - 130
		Method Blank	1,4-Difluorobenzene (sur.)	2011/08/02		98	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/02		98	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/02		106	%	70 - 130
			Benzene	2011/08/02	<0.4		ug/L	
			Toluene	2011/08/02	<0.4		ug/L	
			Ethylbenzene	2011/08/02	<0.4		ug/L	
			o-Xylene	2011/08/02	<0.4		ug/L	
			m & p-Xylene	2011/08/02	<0.8		ug/L	
			Xylenes (Total)	2011/08/02	<0.8		ug/L	
		RPD	Benzene	2011/08/02	NC		%	40
			Toluene	2011/08/02	NC		%	40
			Ethylbenzene	2011/08/02	NC		%	40
			o-Xylene	2011/08/02	NC		%	40
			m & p-Xylene	2011/08/02	NC		%	40
			Xylenes (Total)	2011/08/02	NC		%	40
5057409	RC8	Spiked Blank	Total Petroleum Hydrocarbon	2011/08/04		101	%	70 - 130
		Method Blank	Total Petroleum Hydrocarbon	2011/08/04	<2		mg/L	
5058054	AP1	Matrix Spike	Phenols	2011/08/03		100	%	80 - 120
		Spiked Blank	Phenols	2011/08/03		98	%	89 - 106
		Method Blank	Phenols	2011/08/03	<0.002		mg/L	
		RPD	Phenols	2011/08/03	NC		%	20
5058357	VGG	Matrix Spike	Total Mercury (Hg)	2011/08/03		111	%	80 - 120
		Spiked Blank	Total Mercury (Hg)	2011/08/03		117	%	80 - 120
		Method Blank	Total Mercury (Hg)	2011/08/03	<0.002		ug/L	
		RPD	Total Mercury (Hg)	2011/08/03	NC		%	20
5060980	RP0	Spiked Blank	pH	2011/08/03		99	%	97 - 102
		RPD [BD4980-01]	pH	2011/08/03	0.8		%	5
5061041	TDB	Matrix Spike	Dissolved Cadmium (Cd)	2011/08/03		100	%	80 - 120
			Dissolved Cobalt (Co)	2011/08/03		104	%	80 - 120
			Dissolved Copper (Cu)	2011/08/03		NC	%	80 - 120
			Dissolved Lead (Pb)	2011/08/03		97	%	80 - 120
			Dissolved Nickel (Ni)	2011/08/03		97	%	80 - 120
		Spiked Blank	Dissolved Cadmium (Cd)	2011/08/03		102	%	80 - 114
			Dissolved Cobalt (Co)	2011/08/03		99	%	80 - 120
			Dissolved Copper (Cu)	2011/08/03		97	%	80 - 116
			Dissolved Lead (Pb)	2011/08/03		103	%	80 - 116
			Dissolved Nickel (Ni)	2011/08/03		98	%	80 - 116
		Method Blank	Dissolved Cadmium (Cd)	2011/08/04	<0.000005		mg/L	
			Dissolved Cobalt (Co)	2011/08/04	<0.0003		mg/L	

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL 1
P.O. #: 340962-000
Site Location: SAW MILL BAY

Quality Assurance Report (Continued)

Maxxam Job Number: CB169704

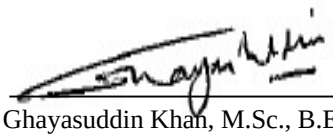
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5061041	TDB	Method Blank	Dissolved Copper (Cu)	2011/08/04	<0.0002		mg/L	
			Dissolved Lead (Pb)	2011/08/04	<0.0002		mg/L	
			Dissolved Nickel (Ni)	2011/08/04	<0.0005		mg/L	
		RPD	Dissolved Cobalt (Co)	2011/08/04	NC		%	20
			Dissolved Copper (Cu)	2011/08/04	0.2		%	20
			Dissolved Lead (Pb)	2011/08/04	NC		%	20
			Dissolved Nickel (Ni)	2011/08/04	2.1		%	20
5063247	TDB	Matrix Spike	Total Arsenic (As)	2011/08/04		94	%	80 - 120
			Total Chromium (Cr)	2011/08/04		100	%	80 - 120
			Total Zinc (Zn)	2011/08/04		90	%	80 - 120
		Spiked Blank	Total Arsenic (As)	2011/08/04		92	%	80 - 120
			Total Chromium (Cr)	2011/08/04		97	%	80 - 120
			Total Zinc (Zn)	2011/08/04		90	%	80 - 120
		Method Blank	Total Arsenic (As)	2011/08/04	0.0003, RDL=0.0002		mg/L	
			Total Chromium (Cr)	2011/08/04	<0.001		mg/L	
			Total Zinc (Zn)	2011/08/04	<0.003		mg/L	
		RPD	Total Arsenic (As)	2011/08/04	9.5		%	20
			Total Chromium (Cr)	2011/08/04	NC		%	20
			Total Zinc (Zn)	2011/08/04	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

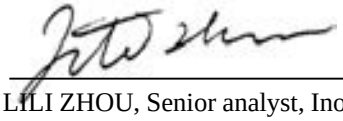
Validation Signature Page

Maxxam Job #: B169704

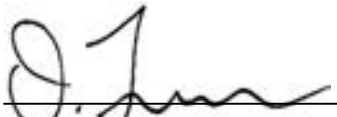
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab



LILI ZHOU, Senior analyst, Inorganic department.



Orla Jorgensen, Organics Supervisor

Smitha Rajesh, Analyst II

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Rainbow Trout Bioassay - Daily Update Sheet

File #: B169704-BD4980

Company Name: SENES Consultants Limited
Attention:
Analyst: MM

Sample Description: **SB-W-2**
Date Sampled: **11 08 01**
Time: **1400**
Date Received: **11 08 02**
Time: **0925**
Bioassay Date: **11 08 03**
Time: **1430**

Concentration (% by Volume)		0	20	40	60	80	100	Analyst
Start	pH							MM
	NH3-N							
1 hour	# Dead							
2 hours	# Dead							
3 hours	# Dead							
24 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	BH
48 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	MM
72 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	HW
96 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	HW

Stress Codes: P: dark pigmentation U: light pigmentation L: lethargic H: hyperactive
M: inhibited movement G: pronounced opercular movement S: extreme toxic shock

Note: # Dead or Stress Behaviour is out of 10 fish total in each concentration.

Comments:

9331-48 St, Edmonton, Alberta, Canada T6B 2R4
Tel: (780) 577-7100 Fax: (780) 450-4187 Website: www.maxxam.ca

Maxxam

Success Through Science®

Your P.O. #: 340982
Your Project #: GBL1
Site Location: SAWMILL
Your C.O.C. #: A057634

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/15

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B174363
Received: 2011/08/11, 9:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
See Attached Results (1)	2	2011/08/15	2011/08/15		
BTEX/F1 in Water by HS GC/MS	2	N/A	2011/08/13	CAL SOP-00190	CCME CWS, EPA 8260C
Cadmium - low level CCME - Dissolved	2	N/A	2011/08/15	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	2	2011/08/12	2011/08/15	AB SOP-00043	EPA 200.8
Mercury - Low Level (Total)	2	2011/08/15	2011/08/15	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved	2	N/A	2011/08/13	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	2	2011/08/12	2011/08/13	AB SOP-00043	EPA 200.8
pH @25C	2	N/A	2011/08/13	AB SOP-00005	SM 4500-H B
Phenols (4-AAP)	2	N/A	2011/08/15	CAL SOP-00067	EPA 420.2
Total Extractable Hydrocarbon C11-C30	2	2011/08/13	2011/08/13	AB SOP-00040 SOP-00037	AB EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Edmonton Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Industrial					
Remark	N/A	SEE ATTACH	SEE ATTACH	N/A	5090824
Misc. Inorganics					
pH	N/A	7.58	7.78	N/A	5089689
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.018	0.016	0.005	5089396
Total Cadmium (Cd)	ug/L	0.022	0.017	0.005	5089348
Misc. Organics					
Phenols	mg/L	0.030	0.008	0.002	5091374

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Elements					
Total Arsenic (As)	mg/L	0.026	0.049	0.0002	5089798
Dissolved Cadmium (Cd)	mg/L	0.000018	0.000016	0.000005	5089800
Total Chromium (Cr)	mg/L	<0.001	<0.001	0.001	5089798
Dissolved Cobalt (Co)	mg/L	<0.0003	<0.0003	0.0003	5089800
Dissolved Copper (Cu)	mg/L	0.0003	<0.0002	0.0002	5089800
Dissolved Lead (Pb)	mg/L	0.0032	0.0017	0.0002	5089800
Dissolved Nickel (Ni)	mg/L	0.0007	<0.0005	0.0005	5089800
Total Zinc (Zn)	mg/L	0.036	0.038	0.003	5089798
Low Level Elements					
Total Mercury (Hg)	ug/L	0.003	0.003	0.002	5090841

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Extractable Hydrocarbons					
Undecanes (C11)	mg/L	<0.02	<0.02	0.02	5089820
Dodecanes (C12)	mg/L	0.04	<0.02	0.02	5089820
Triadecanes (C13)	mg/L	0.10	<0.02	0.02	5089820
Tetradecanes (C14)	mg/L	0.18	<0.02	0.02	5089820
Pentadecanes (C15)	mg/L	0.24	<0.02	0.02	5089820
Hexadecanes (C16)	mg/L	0.17	<0.02	0.02	5089820
Heptadecanes (C17)	mg/L	0.15	<0.02	0.02	5089820
Octadecanes (C18)	mg/L	0.11	<0.02	0.02	5089820
Nonadecanes (C19)	mg/L	0.05	<0.02	0.02	5089820
Eicosanes (C20)	mg/L	0.06	<0.02	0.02	5089820
Heneicosanes (C21)	mg/L	<0.02	<0.02	0.02	5089820
Docosanes (C22)	mg/L	<0.02	<0.02	0.02	5089820
Triacosanes (C23)	mg/L	<0.02	<0.02	0.02	5089820
Tetracosanes (C24)	mg/L	<0.02	<0.02	0.02	5089820
Pentacosanes (C25)	mg/L	<0.03	<0.03	0.03	5089820
Hexacosanes (C26)	mg/L	<0.03	<0.03	0.03	5089820
Heptacosanes (C27)	mg/L	<0.03	<0.03	0.03	5089820
Octacosanes (C28)	mg/L	<0.03	<0.03	0.03	5089820
Nonacosanes (C29)	mg/L	<0.03	<0.03	0.03	5089820
Triacontanes (C30)	mg/L	<0.03	<0.03	0.03	5089820
Total Extractables C11 to C30	mg/L	1.1	<0.03	0.03	5089820
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	109	100		5089820

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Volatiles					
Benzene	ug/L	17	3.0	0.4	5085507
Toluene	ug/L	10	1.8	0.4	5085507
Ethylbenzene	ug/L	2.2	<0.4	0.4	5085507
o-Xylene	ug/L	3.1	0.4	0.4	5085507
m & p-Xylene	ug/L	3.0	<0.8	0.8	5085507
Xylenes (Total)	ug/L	6.1	<0.8	0.8	5085507
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	5085507
(C6-C10)	ug/L	<100	<100	100	5085507
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	99	99		5085507
4-BROMOFLUOROBENZENE (sur.)	%	102	101		5085507
D4-1,2-DICHLOROETHANE (sur.)	%	101	100		5085507

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

General Comments

Results relate only to the items tested.

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report

Maxxam Job Number: CB174363

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5085507	PX	Matrix Spike	1,4-Difluorobenzene (sur.)	2011/08/13		375 (1)	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/13		20 (2)	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/13		423 (1)	%	70 - 130
			Benzene	2011/08/13		NC	%	70 - 130
			Toluene	2011/08/13		NC	%	70 - 130
			Ethylbenzene	2011/08/13		NC	%	70 - 130
			o-Xylene	2011/08/13		NC	%	70 - 130
			m & p-Xylene	2011/08/13		NC	%	70 - 130
		Spiked Blank	1,4-Difluorobenzene (sur.)	2011/08/12		99	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/12		98	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/12		108	%	70 - 130
			Benzene	2011/08/12		86	%	70 - 130
			Toluene	2011/08/12		84	%	70 - 130
			Ethylbenzene	2011/08/12		88	%	70 - 130
			o-Xylene	2011/08/12		90	%	70 - 130
			m & p-Xylene	2011/08/12		89	%	70 - 130
			(C6-C10)	2011/08/12		77	%	70 - 130
		Method Blank	1,4-Difluorobenzene (sur.)	2011/08/13		96	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/13		100	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/13		107	%	70 - 130
			Benzene	2011/08/13	<0.4		ug/L	
			Toluene	2011/08/13	<0.4		ug/L	
			Ethylbenzene	2011/08/13	<0.4		ug/L	
			o-Xylene	2011/08/13	<0.4		ug/L	
			m & p-Xylene	2011/08/13	<0.8		ug/L	
			Xylenes (Total)	2011/08/13	<0.8		ug/L	
			F1 (C6-C10) - BTEX	2011/08/13	<100		ug/L	
			(C6-C10)	2011/08/13	<100		ug/L	
		RPD	Benzene	2011/08/13	NC		%	40
			Toluene	2011/08/13	25.7		%	40
			Ethylbenzene	2011/08/13	NC		%	40
			o-Xylene	2011/08/13	NC		%	40
			m & p-Xylene	2011/08/13	NC		%	40
			Xylenes (Total)	2011/08/13	NC		%	40
			F1 (C6-C10) - BTEX	2011/08/13	NC		%	40
			(C6-C10)	2011/08/13	NC		%	40
5089689	RP0	Spiked Blank	pH	2011/08/13		100	%	97 - 102
		RPD [BG0301-01]	pH	2011/08/13	0.4		%	5
5089798	RW0	Matrix Spike	Total Arsenic (As)	2011/08/13		94	%	80 - 120
			Total Chromium (Cr)	2011/08/13		108	%	80 - 120
			Total Zinc (Zn)	2011/08/13		NC	%	80 - 120
		Spiked Blank	Total Arsenic (As)	2011/08/13		101	%	80 - 107
			Total Chromium (Cr)	2011/08/13		116	%	80 - 120
			Total Zinc (Zn)	2011/08/13		103	%	80 - 120
		Method Blank	Total Arsenic (As)	2011/08/13	0.0003, RDL=0.0002		mg/L	
			Total Chromium (Cr)	2011/08/13	<0.001		mg/L	
			Total Zinc (Zn)	2011/08/13	<0.003		mg/L	
		RPD	Total Arsenic (As)	2011/08/13	2.2		%	20
			Total Chromium (Cr)	2011/08/13	NC		%	20
			Total Zinc (Zn)	2011/08/13	0.2		%	20
5089800	RW0	Matrix Spike [BG0301-01]	Dissolved Cadmium (Cd)	2011/08/13		109	%	80 - 120
			Dissolved Cobalt (Co)	2011/08/13		101	%	80 - 120
			Dissolved Copper (Cu)	2011/08/13		112	%	80 - 120
			Dissolved Lead (Pb)	2011/08/13		102	%	80 - 120

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report (Continued)

Maxxam Job Number: CB174363

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5089800	RW0	Matrix Spike						
		[BG0301-01]	Dissolved Nickel (Ni)	2011/08/13		118	%	80 - 120
		Spiked Blank	Dissolved Cadmium (Cd)	2011/08/13		99	%	80 - 114
			Dissolved Cobalt (Co)	2011/08/13		101	%	80 - 120
			Dissolved Copper (Cu)	2011/08/13		97	%	80 - 116
			Dissolved Lead (Pb)	2011/08/13		97	%	80 - 116
			Dissolved Nickel (Ni)	2011/08/13		99	%	80 - 116
		Method Blank	Dissolved Cadmium (Cd)	2011/08/13	<0.000005		mg/L	
			Dissolved Cobalt (Co)	2011/08/13	<0.0003		mg/L	
			Dissolved Copper (Cu)	2011/08/13	<0.0002		mg/L	
			Dissolved Lead (Pb)	2011/08/13	<0.0002		mg/L	
			Dissolved Nickel (Ni)	2011/08/13	<0.0005		mg/L	
		RPD [BG0301-01]	Dissolved Cadmium (Cd)	2011/08/13	NC		%	20
			Dissolved Cobalt (Co)	2011/08/13	NC		%	20
			Dissolved Copper (Cu)	2011/08/13	NC		%	20
			Dissolved Lead (Pb)	2011/08/13	1.6		%	20
			Dissolved Nickel (Ni)	2011/08/13	NC		%	20
5089820	JW0	Matrix Spike						
		[BG0301-02]	O-TERPHENYL (sur.)	2011/08/13		111	%	70 - 130
			Total Extractables C11 to C30	2011/08/13		123	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2011/08/13		110	%	70 - 130
			Total Extractables C11 to C30	2011/08/13		129	%	70 - 130
		Method Blank	O-TERPHENYL (sur.)	2011/08/13		110	%	70 - 130
			Undecanes (C11)	2011/08/13	<0.02		mg/L	
			Dodecanes (C12)	2011/08/13	<0.02		mg/L	
			Triadecanes (C13)	2011/08/13	<0.02		mg/L	
			Tetradecanes (C14)	2011/08/13	<0.02		mg/L	
			Pentadecanes (C15)	2011/08/13	<0.02		mg/L	
			Hexadecanes (C16)	2011/08/13	<0.02		mg/L	
			Heptadecanes (C17)	2011/08/13	<0.02		mg/L	
			Octadecanes (C18)	2011/08/13	<0.02		mg/L	
			Nonadecanes (C19)	2011/08/13	<0.02		mg/L	
			Eicosanes (C20)	2011/08/13	<0.02		mg/L	
			Heneicosanes (C21)	2011/08/13	<0.02		mg/L	
			Docosanes (C22)	2011/08/13	<0.02		mg/L	
			Triacosanes (C23)	2011/08/13	<0.02		mg/L	
			Tetracosanes (C24)	2011/08/13	<0.02		mg/L	
			Pentacosanes (C25)	2011/08/13	<0.03		mg/L	
			Hexacosanes (C26)	2011/08/13	<0.03		mg/L	
			Heptacosanes (C27)	2011/08/13	<0.03		mg/L	
			Octacosanes (C28)	2011/08/13	<0.03		mg/L	
			Nonacosanes (C29)	2011/08/13	<0.03		mg/L	
			Triacontanes (C30)	2011/08/13	<0.03		mg/L	
			Total Extractables C11 to C30	2011/08/13	<0.6		mg/L	
		RPD [BG0364-02]	Undecanes (C11)	2011/08/13	NC		%	40
			Dodecanes (C12)	2011/08/13	NC		%	40
			Triadecanes (C13)	2011/08/13	NC		%	40
			Tetradecanes (C14)	2011/08/13	NC		%	40
			Pentadecanes (C15)	2011/08/13	NC		%	40
			Hexadecanes (C16)	2011/08/13	NC		%	40
			Heptadecanes (C17)	2011/08/13	NC		%	40
			Octadecanes (C18)	2011/08/13	NC		%	40
			Nonadecanes (C19)	2011/08/13	NC		%	40
			Eicosanes (C20)	2011/08/13	NC		%	40
			Heneicosanes (C21)	2011/08/13	NC		%	40

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report (Continued)

Maxxam Job Number: CB174363

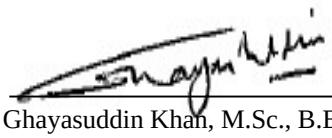
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5089820	JW0	RPD [BG0364-02]	Docosanes (C22)	2011/08/13	NC		%	40
			Triacosanes (C23)	2011/08/13	NC		%	40
			Tetracosanes (C24)	2011/08/13	NC		%	40
			Pentacosanes (C25)	2011/08/13	NC		%	40
			Hexacosanes (C26)	2011/08/13	NC		%	40
			Heptacosanes (C27)	2011/08/13	NC		%	40
			Octacosanes (C28)	2011/08/13	NC		%	40
			Nonacosanes (C29)	2011/08/13	NC		%	40
			Triacontanes (C30)	2011/08/13	NC		%	40
			Total Extractables C11 to C30	2011/08/13	NC		%	40
5090841	JMS	Matrix Spike	Total Mercury (Hg)	2011/08/15		103	%	80 - 120
		Spiked Blank	Total Mercury (Hg)	2011/08/15		111	%	80 - 120
		Method Blank	Total Mercury (Hg)	2011/08/15	0.002, RDL=0.002		ug/L	
		RPD	Total Mercury (Hg)	2011/08/15	NC		%	20
5091374	AP1	Matrix Spike [BG0301-01]	Phenols	2011/08/15		NC	%	80 - 120
		Spiked Blank	Phenols	2011/08/15		95	%	89 - 106
		Method Blank	Phenols	2011/08/15	<0.002		mg/L	
		RPD [BG0301-01]	Phenols	2011/08/15	0.3		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) Surrogate recovery exceeds acceptance criteria due to matrix interference.
(2) Surrogate recovery below acceptance criteria due to matrix interference. Reanalysis yields similar results.

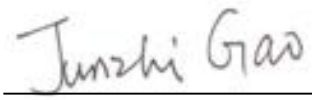
Validation Signature Page

Maxxam Job #: B174363

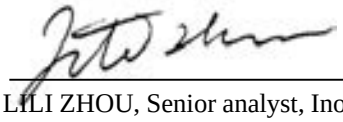
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab



Janet Gao, Senior Analyst, Organics Department



LILI ZHOU, Senior analyst, Inorganic department.

Robert Vivian, Senior Analyst

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Microtox Report

Project : B174363-BG0364
Tech: RL

Sample Data :

Company Name :	Senes Consultants Limited		
City :	Richmond Hill, ON		
Sample Description :	SB-W-2B		
Sample Location :	Sawmill		
Sampling Method :	Grab		
Volume Obtained :	125 mL		
Sampled By :	JM-KM		
	YY MM DD		
Sample Date :	n/g	Time:	n/g
Date Received :	11 08 11	Time:	9:00
Date of Assay :	11 08 12	Time:	12:30
Report Date :	11 08 15		
Storage Temp :	4 ± 2 °C		
Sample Prep:	none		

Test Data:

Appearance, Visual :	clear		
Turbidity, Visual :	none		
Initial pH :	7.2		
Sample Dilution :	neat		
IC50 (5min, 15°C) :	>100%	95% Confidence Interval :	n/a
IC20 (5min, 15°C) :	57.6%	95% Confidence Interval :	38.9<57.6<85.2%
IC50 (15min, 15°C) :	>100%	95% Confidence Interval :	n/a
IC20 (15min, 15°C) :	70.3%	95% Confidence Interval :	40.9<70.3<81.8%

Note: The results relate only to the item tested.

Results of Phenol Reference Test :

Current	IC50 @ 5 min. :	17.7 mg/L
	95 % Confidence Interval :	14.7<17.7<21.4
	Date of Reference Bioassay :	11 08 12
Historical	Geometric Mean IC50 @ 5min.:	18.8 mg/L
	Mean ± 2SD:	15.1<18.8<24.2
	Method:	Shewhart

The reference toxicant is conducted under the same conditions as the definitive testing.

Data & QA/QC Reviewed By :  Robert Vivian, Bioassay Senior Analyst

Maxxam Analytics

Microtox Report

Project : B174363-BG0364

Test Information :

Sample Description : SB-W-2B

Type of Test :	15 min. Static Bioassay
Test Species :	Vibrio fischeri (Bioluminescent bacteria)
Source of Test Species :	STRATEGIC DIAGNOSTICS Inc.
Reagent Lot # :	10L1004
Date Obtained :	2011/05/03
Expiry Date :	2012/11/30
Reagent Holding Temp :	< - 20°C
Test Protocol :	Environment Canada EPS 1/RM/24
Salinity Adjustment :	Osmotic Adjusting Solution (200 uL)
Analyzer Used :	MICROBICS Analyzer Model 500
Calculation Method :	MICROTOX OMNI Version 1.18

Data Table: Sample vs Light Emission at Time T

Time (min.)	Sample Concentration [% v/v] Control	10.2	20.5	40.9	81.8
T0	96	98	95	96	97
T5	99	97	92	86	71
T15	92	95	88	84	70
T30*					
T60*					

* If applicable

General Comments:

Maxxam

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757

Client Name:	***Senes Consultants Limited***
Location:	***Richmond Hill, ON***

Sample Data :

Sample Description :	**SB-W-1**		
Sampling Location :	**Sawmill Bay**		
Sampling Method :	**Grab**		
Volume obtained :	**60 L**		
Sampled By :	**JM/KM**		
	YY MM DD		
Sample Date :	**11 07 29**	*Time :*	**n/g**
Date Received :	**11 08 02**	*Time :*	**0940**
Bioassay Date :	**11 08 03**	*Time :*	**1430**
Report Date :	**11 08 09**		
Deviations from method :	**None**		

Bioassay Results :

CETIS Statistical Program

LC50 @ 96 Hours :	**>100%**
Method :	**n/a**
95 % Confidence Interval :	**n/a**
EC50 @ 96 Hours :	**>100%**
Method :	**n/a**
95 % Confidence Interval :	**n/a**

Legend:
LC50 (EC50) indicates concentration of sample, in percent, which kills (or affects) 50% of test organisms.

Note: The results relate only to the item tested.

General Comments:

Data & QA/QC Reviewed By : Robert Vivian, Bioassay Senior Analyst

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757

Sample Description : SB-W-1

Test Information :

Type of Bioassay :	**96 Hour Multiple Dilution Static Bioassay**			
Test Species :	***Oncorhynchus mykiss*** **(Rainbow Trout)**			
Test Protocols :	**Environment Canada EPS 1/RM/13 (Dec.2000 ed. with May 2007 amendments) and EPS1/RM/50 March 2008**			
Source of Test Species :	**Lyndon Trout Hatcheries, New Dundee, ON**			
Culture Lot # :	**LF0713-3**			
Mean (±1 SD) & Range Fork Length of Fish :	**3.5 ± 0.1 cm**	*Pop.Range*	**3.3 - 3.8 cm**	**n=10**
Mean (±1 SD) & Range Weight of Fish :	**0.55 ± 0.04 g**	*Pop.Range*	**0.5 - 0.6 g**	
Cumulative Mortality of Fish Lot in the 7 Days Prior to Test :	**<0.2%**			
Source of Holding Water :	**Ammonia Free, Dechlorinated City of Edmonton Tap Water**			
Size of Test Container :	**38 L**			
Material of Test Container :	**Disposable Plastic Liner in Glass Tank**			
Volume of Test Solution in Each Test Vessel :	**20 L**			
Depth of Test Material in Each Test Vessel :	**≥ 15 cm**			
Concentrations of Test Material :	**0, 20, 40, 60, 80, 100%**			
Number of Fish per Test Vessel :	**10**			
Loading Density :	**0.28 g/L**			
Method of Aeration :	**Carbon Filtered, Compressed Air Through Air-stone**			
Aeration Rate during test :	**6.5 ± 1.0 mL/min./L**			
pH adjustment:	**No pH adjustment of sample was made during testing.**			

Maxxam

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757

Data Table :

Sample Description : SB-W-1

Setup		Temperature °C	pH @ 20°C	EC µS cm-1	Dissolved Oxygen mg/L
	Sample Properties Prior To Initial Setup:	9.1	8.0	229	11.0
Analyst: MM	Preaeration Time (at rate of 6.5 ± 1.0 mL / min / L) :	90 min			

Time	Description	Concentration (% by Volume)					
		0	20	40	60	80	100
Start	Temperature (°C)	15.6	15.0	15.2	14.7	14.7	14.7
	pH	8.0	8.0	7.9	7.8	7.8	7.8
	EC (µS cm-1)	352	333	321	299	282	264
Analyst: MM	Dissolved Oxygen (mg/L)	9.7	9.6	9.3	9.2	9.0	8.8
1/4 Hour	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
1/2 Hour	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
1 Hour	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
2 Hours	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
4 Hours	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
24 Hours	Temperature (°C)	14.9	14.2	14.2	14.2	14.3	14.5
	pH	8.2	8.1	8.1	8.1	8.2	8.1
	EC (µS cm-1)	340	315	310	290	280	264
	Dissolved Oxygen (mg/L)	9.7	9.8	9.8	9.8	9.7	9.4
	Number Dead	0	0	0	0	0	0
Analyst: BH	Atypical/Stressed Behaviour	0	0	0	0	0	0
48 Hours	Temperature (°C)	14.7	14.2	14.2	14.2	14.3	14.5
	pH	8.3	8.1	8.1	8.1	8.2	8.1
	EC (µS cm-1)	336	317	315	299	281	266
	Dissolved Oxygen (mg/L)	9.6	9.5	9.7	9.7	9.6	9.4
	Number Dead	0	0	0	0	0	0
Analyst: MM	Atypical/Stressed Behaviour	0	0	0	0	0	0
72 Hours	Temperature (°C)	14.7	14.2	14.2	14.2	14.3	14.5
	pH	8.3	8.2	8.2	8.2	8.2	8.2
	EC (µS cm-1)	348	324	316	300	285	266
	Dissolved Oxygen (mg/L)	9.6	9.6	9.6	9.7	9.7	9.5
	Number Dead	0	0	0	0	0	0
Analyst: HW	Atypical/Stressed Behaviour	0	0	0	0	0	0
96 Hours	Temperature (°C)	14.8	14.2	14.3	14.2	14.3	14.5
	pH	8.3	8.2	8.2	8.2	8.2	8.2
	EC (µS cm-1)	351	320	312	300	277	261
	Dissolved Oxygen (mg/L)	9.6	9.7	9.7	9.8	9.7	9.6
	Number Dead	0	0	0	0	0	0
Analyst: HW	Atypical/Stressed Behaviour	0	0	0	0	0	0

Stress Codes: P:dark pigmentation U:light pigmentation L:lethargic H:hyperactive M:inhibited movement G:pronounced opercular movement S:extreme toxic shock D:disorientated

Note:Number Dead or Atypical/Stress Behaviour is out of 10 fish total in each concentration.

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757
Sample Description : SB-W-1

Results of Phenol Reference Bioassay :

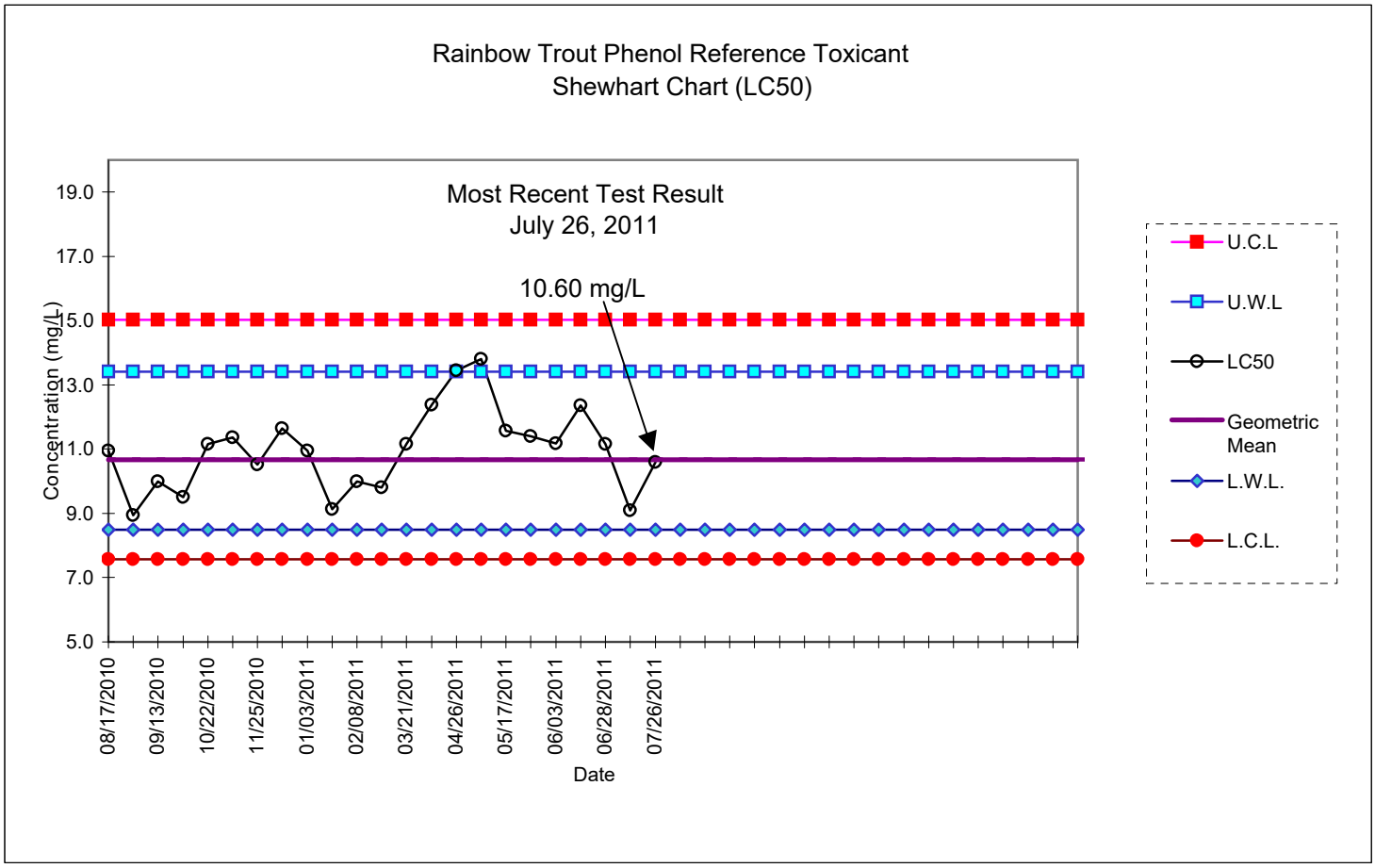
Current

LC50 @ 96 Hours :	**10.60 mg/L**
95 % Confidence Interval :	**9.68<10.6<11.4**
Method :	**Probit**
Date Initiated	**11 07 26**

Historical

Geometric Mean :	**10.65 mg/L**
Warning Limits :	**8.48<10.67<13.41**
Method :	**Shewhart**

The reference toxicant is conducted under the same conditions as the definitive testing.



Success Through Science®

Your P.O. #: 340962
Your Project #: GBL-1, SAWMILL
Your C.O.C. #: 153453

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/11

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B172814
Received: 2011/08/09, 9:25

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method		Analytical Method
Total Extractable Hydrocarbon C11-C60	1	2011/08/10	2011/08/11	AB SOP-00040 SOP-00037	AB	EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BF2318		
Sampling Date		2011/08/08 17:00		
COC#		153453		
	Units	**SB-W-1A**	**RDL**	**QC Batch**
Extractable Hydrocarbons				
Undecanes (C11)	mg/L	0.06	0.02	5078777
Dodecanes (C12)	mg/L	0.14	0.02	5078777
Triadecanes (C13)	mg/L	0.19	0.02	5078777
Tetradecanes (C14)	mg/L	0.23	0.02	5078777
Pentadecanes (C15)	mg/L	0.33	0.02	5078777
Hexadecanes (C16)	mg/L	0.32	0.02	5078777
Heptadecanes (C17)	mg/L	0.26	0.02	5078777
Octadecanes (C18)	mg/L	0.14	0.02	5078777
Nonadecanes (C19)	mg/L	0.08	0.02	5078777
Eicosanes (C20)	mg/L	0.08	0.02	5078777
Heneicosanes (C21)	mg/L	0.07	0.02	5078777
Docosanes (C22)	mg/L	0.03	0.02	5078777
Triacosanes (C23)	mg/L	0.03	0.02	5078777
Tetracosanes (C24)	mg/L	<0.02	0.02	5078777
Pentacosanes (C25)	mg/L	<0.03	0.03	5078777
Hexacosanes (C26)	mg/L	<0.03	0.03	5078777
Heptacosanes (C27)	mg/L	<0.03	0.03	5078777
Octacosanes (C28)	mg/L	<0.03	0.03	5078777
Nonacosanes (C29)	mg/L	0.06	0.03	5078777
Triacontanes (C30)	mg/L	<0.03	0.03	5078777
C 31	mg/L	<0.03	0.03	5078777
Dotriacontanes (C32)	mg/L	<0.04	0.04	5078777
C 33	mg/L	<0.04	0.04	5078777
Tetratriacontanes (C34)	mg/L	<0.04	0.04	5078777
C 35	mg/L	<0.04	0.04	5078777
Hexatriacontanes (C36)	mg/L	<0.04	0.04	5078777
C 37	mg/L	<0.04	0.04	5078777
Octatriacontanes (C38)	mg/L	<0.04	0.04	5078777
C 39	mg/L	<0.04	0.04	5078777
Tetracontanes (C40)	mg/L	<0.05	0.05	5078777
C 41	mg/L	<0.05	0.05	5078777
Dotetracontanes (C42)	mg/L	<0.05	0.05	5078777
C 43	mg/L	<0.05	0.05	5078777
Tetratetracontanes (C44)	mg/L	<0.05	0.05	5078777

RDL = Reportable Detection Limit

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BF2318		
Sampling Date		2011/08/08 17:00		
COC#		153453		
	Units	**SB-W-1A**	**RDL**	**QC Batch**
C 45	mg/L	<0.05	0.05	5078777
Hexatetracontanes (C46)	mg/L	<0.05	0.05	5078777
C 47	mg/L	<0.05	0.05	5078777
Octatetracontanes (C48)	mg/L	<0.05	0.05	5078777
C 49	mg/L	<0.05	0.05	5078777
Pentacontanes (C50)	mg/L	<0.05	0.05	5078777
C 51	mg/L	<0.05	0.05	5078777
Dopentacontanes (C52)	mg/L	<0.05	0.05	5078777
C 53	mg/L	<0.05	0.05	5078777
Tetrapentacontanes (C54)	mg/L	<0.05	0.05	5078777
C 55	mg/L	<0.05	0.05	5078777
Hexapentacontanes (C56)	mg/L	<0.05	0.05	5078777
C 57	mg/L	<0.05	0.05	5078777
Octapentacontanes (C58)	mg/L	<0.05	0.05	5078777
C 59	mg/L	<0.05	0.05	5078777
Hexacontanes (C60)	mg/L	<0.05	0.05	5078777
Total Extractables C11 to C60	mg/L	2.0	0.05	5078777
Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	108		5078777

RDL = Reportable Detection Limit

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

Package 1	4.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units
5078777	O-TERPHENYL (sur.)	2011/08/11	108	70 - 130	107	70 - 130	107	%
5078777	Total Extractables C11 to C60	2011/08/11	118	50 - 130	111	70 - 130	<0.6	mg/L
5078777	Undecanes (C11)	2011/08/11					<0.02	mg/L
5078777	Dodecanes (C12)	2011/08/11					<0.02	mg/L
5078777	Triadecanes (C13)	2011/08/11					<0.02	mg/L
5078777	Tetradecanes (C14)	2011/08/11					<0.02	mg/L
5078777	Pentadecanes (C15)	2011/08/11					<0.02	mg/L
5078777	Hexadecanes (C16)	2011/08/11					<0.02	mg/L
5078777	Heptadecanes (C17)	2011/08/11					<0.02	mg/L
5078777	Octadecanes (C18)	2011/08/11					<0.02	mg/L
5078777	Nonadecanes (C19)	2011/08/11					<0.02	mg/L
5078777	Eicosanes (C20)	2011/08/11					<0.02	mg/L
5078777	Heneicosanes (C21)	2011/08/11					<0.02	mg/L
5078777	Docosanes (C22)	2011/08/11					<0.02	mg/L
5078777	Triacosanes (C23)	2011/08/11					<0.02	mg/L
5078777	Tetracosanes (C24)	2011/08/11					<0.02	mg/L
5078777	Pentacosanes (C25)	2011/08/11					<0.03	mg/L
5078777	Hexacosanes (C26)	2011/08/11					<0.03	mg/L
5078777	Heptacosanes (C27)	2011/08/11					<0.03	mg/L
5078777	Octacosanes (C28)	2011/08/11					<0.03	mg/L
5078777	Nonacosanes (C29)	2011/08/11					<0.03	mg/L
5078777	Triacontanes (C30)	2011/08/11					<0.03	mg/L
5078777	C 31	2011/08/11					<0.03	mg/L
5078777	Dotriacontanes (C32)	2011/08/11					<0.04	mg/L
5078777	C 33	2011/08/11					<0.04	mg/L
5078777	Tetratriacontanes (C34)	2011/08/11					<0.04	mg/L
5078777	C 35	2011/08/11					<0.04	mg/L
5078777	Hexatriacontanes (C36)	2011/08/11					<0.04	mg/L
5078777	C 37	2011/08/11					<0.04	mg/L
5078777	Octatriacontanes (C38)	2011/08/11					<0.04	mg/L
5078777	C 39	2011/08/11					<0.04	mg/L
5078777	Tetracontanes (C40)	2011/08/11					<0.05	mg/L
5078777	C 41	2011/08/11					<0.05	mg/L
5078777	Dotetracontanes (C42)	2011/08/11					<0.05	mg/L
5078777	C 43	2011/08/11					<0.05	mg/L
5078777	Tetratetracontanes (C44)	2011/08/11					<0.05	mg/L
5078777	C 45	2011/08/11					<0.05	mg/L
5078777	Hexatetracontanes (C46)	2011/08/11					<0.05	mg/L
5078777	C 47	2011/08/11					<0.05	mg/L

Maxxam Job #: B172814
Report Date: 2011/08/11

SENES CONSULTANTS LIMITED
Client Project #: GBL-1, SAWMILL

Your P.O. #: 340962
Sampler Initials: JM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units
5078777	Octatetracontanes (C48)	2011/08/11					<0.05	mg/L
5078777	C 49	2011/08/11					<0.05	mg/L
5078777	Pentacontanes (C50)	2011/08/11					<0.05	mg/L
5078777	C 51	2011/08/11					<0.05	mg/L
5078777	Dopentacontanes (C52)	2011/08/11					<0.05	mg/L
5078777	C 53	2011/08/11					<0.05	mg/L
5078777	Tetrapentacontanes (C54)	2011/08/11					<0.05	mg/L
5078777	C 55	2011/08/11					<0.05	mg/L
5078777	Hexapentacontanes (C56)	2011/08/11					<0.05	mg/L
5078777	C 57	2011/08/11					<0.05	mg/L
5078777	Octapentacontanes (C58)	2011/08/11					<0.05	mg/L
5078777	C 59	2011/08/11					<0.05	mg/L
5078777	Hexacontanes (C60)	2011/08/11					<0.05	mg/L

N/A = Not Applicable
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

Validation Signature Page

Maxxam Job #: B172814

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Janet Gao, Senior Analyst, Organics Department

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
4000 19st N.E. Calgary, Alberta Canada T2E 6P8 Tel (403) 291-3077 Toll-free 800-386-7247 Fax (403) 735-2240 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#4598 SENES CONSULTANTS LIMITED	Company Name:	#11077 SENES CONSULTANTS LIMITED	Quotation #:		MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	CHARLES F. GRAVELLE	Contact Name:	JASON MAUCHAN	P.O. #:	340962 GBL-1	B172GH	153453
Address:	121 GRANTON DRIVE, UNIT 12 RICHMOND HILL ON L4B 3N4	Address:	121 GRANTON DRIVE, UNIT 12 RICHMOND HILL AB L4B 3N4	Project #:		CHAIN OF CUSTODY #:	PROJECT MANAGER:
Phone:	(905)882-5984 Fax: (905)882-8962	Phone:	(905)882-5984 Fax: (905)882-8962	Project Name:	SAWMILL	C#153453-01-01	Ioana Stoica
Email:	cgravelle@dcsltd.ca	Email:	jmauchan@dcsltd.ca	Site #:			
				Sampled By:	JM Km		

REGULATORY CRITERIA:

SPECIAL INSTRUCTIONS

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: Time Required:
Rush Confirmation Number: (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	~~pH and T69~~ TEH60	Residual Chlorine	Biochemical Oxygen Demand	Fecal Coliforms	Oil & Grease (sheen)	ICPMS - Dissolved Cd, Co, Cu, Pb, Ni	ICPMS - Total As, Cr, Zn	Mercury - Low Level (Total)	BTEX C5-C10 and TEH30	Hydrocarbon by IR (Mineral oil & grease)	# of Bottles	Comments
1		SB-W-1A	Aug 8	1700	W			✓										2	
2					W														
3					W														
4					W														
5					W														
6					W														
7					W														
8					W														
9					W														
10																			

ARRIVED AT DEPOT:
AUG 0 9 2011
TEMP: 3 / 4 / 5

RECEIVED
AUG 10 2011

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler? Yes No
J. Mauchan	2011/Aug/8	1930							

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Success Through Science®

Your P.O. #: 340962-000
Your Project #: SAWMILL BAY GBL1
Your C.O.C. #: A057630

Attention: CHARLES F. GRAVELLE
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/17

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B175008
Received: 2011/08/14, 9:40

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
See Attached Results (1)	1	2011/08/16	2011/08/17		
BTEX/F1 in Water by HS GC/MS	1	N/A	2011/08/16	CAL SOP-00190	CCME CWS, EPA 8260C
Mercury - Low Level (Total)	1	2011/08/16	2011/08/16	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved	2	N/A	2011/08/16	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	1	2011/08/16	2011/08/17	AB SOP-00043	EPA 200.8
pH @25C	1	N/A	2011/08/17	AB SOP-00005	SM 4500-H B
Phenols (4-AAP)	1	N/A	2011/08/16	CAL SOP-00067	EPA 420.2
Total Extractable Hydrocarbon C11-C30	1	2011/08/16	2011/08/16	AB SOP-00040 SOP-00037	AB EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Maxxam Edmonton Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

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Total cover pages: 1

Maxxam Job #: B175008
Report Date: 2011/08/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY GBL1

Your P.O. #: 340962-000
Sampler Initials: JM

AT1 BTEX AND F1 (WATER)

Maxxam ID		BG4757		
Sampling Date		2011/08/13 16:00		
COC#		A057630		
	Units	**SB-W-4**	**RDL**	**QC Batch**
Volatiles				
Benzene	ug/L	<0.4	0.4	5093642
Toluene	ug/L	<0.4	0.4	5093642
Ethylbenzene	ug/L	<0.4	0.4	5093642
o-Xylene	ug/L	<0.4	0.4	5093642
m & p-Xylene	ug/L	<0.8	0.8	5093642
Xylenes (Total)	ug/L	<0.8	0.8	5093642
F1 (C6-C10) - BTEX	ug/L	<100	100	5093642
(C6-C10)	ug/L	<100	100	5093642
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	96		5093642
4-BROMOFLUOROBENZENE (sur.)	%	103		5093642
D4-1,2-DICHLOROETHANE (sur.)	%	96		5093642

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BG4757	BG4757	BG4758		
Sampling Date		2011/08/13 16:00	2011/08/13 16:00	2011/08/13 16:00		
COC#		A057630	A057630	A057630		
	Units	**SB-W-4**	**SB-W-4 Lab-Dup**	**SB-W-4A**	**RDL**	**QC Batch**
Industrial						
Remark	N/A			SEE ATTACH	N/A	5094300
Misc. Inorganics						
pH	N/A	9.05	9.14		N/A	5097820
Misc. Organics						
Phenols	mg/L	0.023	0.022		0.002	5094707

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B175008
Report Date: 2011/08/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY GBL1

Your P.O. #: 340962-000
Sampler Initials: JM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		BG4757	BG4758		
Sampling Date		2011/08/13 16:00	2011/08/13 16:00		
COC#		A057630	A057630		
	Units	**SB-W-4**	**SB-W-4A**	**RDL**	**QC Batch**
Elements					
Total Arsenic (As)	mg/L	0.0073		0.0002	5095487
Dissolved Cadmium (Cd)	mg/L	0.000041	0.000042	0.000005	5095495
Total Chromium (Cr)	mg/L	<0.001		0.001	5095487
Dissolved Cobalt (Co)	mg/L	<0.0003	<0.0003	0.0003	5095495
Dissolved Copper (Cu)	mg/L	0.0002	0.0003	0.0002	5095495
Dissolved Lead (Pb)	mg/L	0.0070	0.0070	0.0002	5095495
Dissolved Nickel (Ni)	mg/L	0.0010	0.0009	0.0005	5095495
Total Zinc (Zn)	mg/L	0.048		0.003	5095487
Low Level Elements					
Total Mercury (Hg)	ug/L	<0.002		0.002	5092758

RDL = Reportable Detection Limit

Maxxam Job #: B175008
Report Date: 2011/08/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY GBL1

Your P.O. #: 340962-000
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BG4757		
Sampling Date		2011/08/13 16:00		
COC#		A057630		
	Units	**SB-W-4**	**RDL**	**QC Batch**
Extractable Hydrocarbons				
Undecanes (C11)	mg/L	<0.02	0.02	5094316
Dodecanes (C12)	mg/L	<0.02	0.02	5094316
Triadecanes (C13)	mg/L	0.05	0.02	5094316
Tetradecanes (C14)	mg/L	0.12	0.02	5094316
Pentadecanes (C15)	mg/L	0.13	0.02	5094316
Hexadecanes (C16)	mg/L	0.07	0.02	5094316
Heptadecanes (C17)	mg/L	0.06	0.02	5094316
Octadecanes (C18)	mg/L	0.05	0.02	5094316
Nonadecanes (C19)	mg/L	0.04	0.02	5094316
Eicosanes (C20)	mg/L	<0.02	0.02	5094316
Heneicosanes (C21)	mg/L	<0.02	0.02	5094316
Docosanes (C22)	mg/L	<0.02	0.02	5094316
Triacosanes (C23)	mg/L	<0.02	0.02	5094316
Tetracosanes (C24)	mg/L	<0.02	0.02	5094316
Pentacosanes (C25)	mg/L	<0.03	0.03	5094316
Hexacosanes (C26)	mg/L	<0.03	0.03	5094316
Heptacosanes (C27)	mg/L	<0.03	0.03	5094316
Octacosanes (C28)	mg/L	<0.03	0.03	5094316
Nonacosanes (C29)	mg/L	<0.03	0.03	5094316
Triacontanes (C30)	mg/L	<0.03	0.03	5094316
Total Extractables C11 to C30	mg/L	0.53	0.03	5094316
Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	87		5094316

RDL = Reportable Detection Limit

Maxxam Job #: B175008
Report Date: 2011/08/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY GBL1

Your P.O. #: 340962-000
Sampler Initials: JM

Package 1	7.0°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B175008
Report Date: 2011/08/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY GBL1

Your P.O. #: 340962-000
Sampler Initials: JM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5092758	Total Mercury (Hg)	2011/08/15	111	80 - 120	112	80 - 120	0.004, RDL=0.002	ug/L	NC	20
5093642	1,4-Difluorobenzene (sur.)	2011/08/16	99	70 - 130	77	70 - 130	95	%		
5093642	4-BROMOFLUOROBENZENE (sur.)	2011/08/16	96	70 - 130	81	70 - 130	99	%		
5093642	D4-1,2-DICHLOROETHANE (sur.)	2011/08/16	102	70 - 130	82	70 - 130	98	%		
5093642	Benzene	2011/08/16	81	70 - 130	90	70 - 130	<0.4	ug/L	NC	40
5093642	Toluene	2011/08/16	87	70 - 130	97	70 - 130	<0.4	ug/L	NC	40
5093642	Ethylbenzene	2011/08/16	83	70 - 130	90	70 - 130	<0.4	ug/L	NC	40
5093642	o-Xylene	2011/08/16	82	70 - 130	92	70 - 130	<0.4	ug/L	NC	40
5093642	m & p-Xylene	2011/08/16	82	70 - 130	94	70 - 130	<0.8	ug/L	NC	40
5093642	(C6-C10)	2011/08/16			82	70 - 130	<100	ug/L	NC	40
5093642	Xylenes (Total)	2011/08/16					<0.8	ug/L	NC	40
5093642	F1 (C6-C10) - BTEX	2011/08/16					<100	ug/L	NC	40
5094316	O-TERPHENYL (sur.)	2011/08/16	82	70 - 130	89	70 - 130	87	%		
5094316	Total Extractables C11 to C30	2011/08/16	53	50 - 130	109	70 - 130	<0.6	mg/L		
5094316	Undecanes (C11)	2011/08/16					<0.02	mg/L		
5094316	Dodecanes (C12)	2011/08/16					<0.02	mg/L		
5094316	Triadecanes (C13)	2011/08/16					<0.02	mg/L		
5094316	Tetradecanes (C14)	2011/08/16					<0.02	mg/L		
5094316	Pentadecanes (C15)	2011/08/16					<0.02	mg/L		
5094316	Hexadecanes (C16)	2011/08/16					<0.02	mg/L		
5094316	Heptadecanes (C17)	2011/08/16					<0.02	mg/L		
5094316	Octadecanes (C18)	2011/08/16					<0.02	mg/L		
5094316	Nonadecanes (C19)	2011/08/16					<0.02	mg/L		
5094316	Eicosanes (C20)	2011/08/16					<0.02	mg/L		
5094316	Heneicosanes (C21)	2011/08/16					<0.02	mg/L		
5094316	Docosanes (C22)	2011/08/16					<0.02	mg/L		
5094316	Triacosanes (C23)	2011/08/16					<0.02	mg/L		
5094316	Tetracosanes (C24)	2011/08/16					<0.02	mg/L		
5094316	Pentacosanes (C25)	2011/08/16					<0.03	mg/L		
5094316	Hexacosanes (C26)	2011/08/16					<0.03	mg/L		
5094316	Heptacosanes (C27)	2011/08/16					<0.03	mg/L		
5094316	Octacosanes (C28)	2011/08/16					<0.03	mg/L		
5094316	Nonacosanes (C29)	2011/08/16					<0.03	mg/L		
5094316	Triacontanes (C30)	2011/08/16					<0.03	mg/L		
5094707	Phenols	2011/08/16	97	80 - 120	93	89 - 106	<0.002	mg/L	2.2	20
5095487	Total Arsenic (As)	2011/08/17	95	80 - 120	92	80 - 120	<0.0002	mg/L	2.4	20
5095487	Total Chromium (Cr)	2011/08/17	98	80 - 120	95	80 - 120	<0.001	mg/L	NC	20
5095487	Total Zinc (Zn)	2011/08/17	NC	80 - 120	93	80 - 120	<0.003	mg/L	4.1	20
5095495	Dissolved Cadmium (Cd)	2011/08/16	100	80 - 120	99	80 - 120	<0.000005	mg/L		

Maxxam Job #: B175008
Report Date: 2011/08/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY GBL1

Your P.O. #: 340962-000
Sampler Initials: JM

QUALITY ASSURANCE REPORT

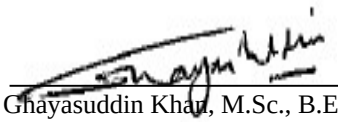
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5095495	Dissolved Cobalt (Co)	2011/08/16	96	80 - 120	98	80 - 120	<0.0003	mg/L		
5095495	Dissolved Copper (Cu)	2011/08/16	96	80 - 120	97	80 - 120	<0.0002	mg/L		
5095495	Dissolved Lead (Pb)	2011/08/16	95	80 - 120	98	85 - 113	<0.0002	mg/L		
5095495	Dissolved Nickel (Ni)	2011/08/16	97	80 - 120	99	82 - 120	<0.0005	mg/L		
5097820	pH	2011/08/17			100	97 - 102			1	5

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

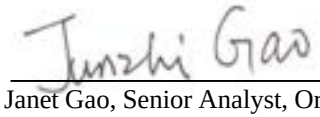
Validation Signature Page

Maxxam Job #: B175008

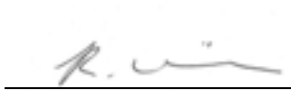
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab



Janet Gao, Senior Analyst, Organics Department



Robert Vivian, Senior Analyst

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Maxxam

www.maxxamanalytics.com

Chain of Custody A057630

Page: 1 of 1

Invoice To:	C/O Report Address ☐
Company:	Senes
Contact:	C. Granville J. Mauchan
Address:	Senes Richmond Hill
Prov:	PC:
Contact #s: Ph:	Cell:

Report To:	Same as Invoice ☐
	jmauchan
	JASON MAUCHAN
Prov:	PC: QC
Ph: 819 923 6832	Cell:

Report Distribution (E-Mail):
jmauchan@dcsltd.ca
rjanzen "

REGULATORY GUIDELINES:
- ☐ AT1
- ☑ CCME
- ☐ Regulated Drinking Water
- ☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:	340962-000
Project # / Name:	SAWMILL BAY GBL1
Site Location:	
Quote #:	
Sampled By:	JM KM

SERVICE REQUESTED:
- ☑ RUSH (Contact lab to reserve) Date Required: WED
- ☐ REGULAR (5 to 7 Days)

See reverse for package specifics

#	Sample ID	Depth (unit)	Matrix GW/SW/Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill				WATER: ☐BTEX F1 / ☐VOCs	☐BTEX F1-F2 / ☐BTEX F1-F4	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐ Total ☐ Dissolved	pH	phenols	microtox EC50(15)	BTEX C5-C10	TEH30	ICPMS Dissolved Cd Co	" Dissolved Cu Pb Ni	ICPMS Total As Cr Zn	Hg	NAPL/Product present?	HOLD - Do not Analyze	# of Containers Submitted
1	SB-W-4		W	2011/Aug 13 16:00																	✓	✓	■	✓	✓	✓	✓	✓	✓			
2	SB-W-4A		W	2011/Aug 13 16:00																			✓			✓	✓					
3																																
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

Please Indicate Filtered, Preserved or Both (F, P, F/P) → F/P

ARRIVED AT DEPOT: 940
AUG 14 2011
TEMP:

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
J. Mauchan	2011/Aug/13	1800
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:
microtox sample 4A from 'Routine' bottle
Please contact Ryan Janzen for expected result date

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B175008
AMANDA LAROUNDELLE	2011-08-15	10:09	

Custody Seal: Present Intact | Temperature: 8,7,6 | Ice: Present

Lab Comments:

RECEIVED AUG 15 2011 1540

Microtox Report

Project : B175008-BG4758
Tech: ND

Sample Data :

Company Name :	Senes Consultants Limited		
City :	Richond Hill, ON		
Sample Description :	SB-W-4A		
Sample Location :	Sawmill Bay		
Sampling Method :	Grab		
Volume Obtained :	125 mL		
Sampled By :	JM/KM		
	YY MM DD		
Sample Date :	11 08 13	Time:	16:00
Date Received :	11 08 15	Time:	10:09
Date of Assay :	11 08 16	Time:	14:00
Report Date :	11 08 17		
Storage Temp :	4 ± 2 °C		
Sample Prep:	pH adjusted from 9.3 to 7.9 with H2SO4		

Test Data:

Appearance, Visual :	clear	
Turbidity, Visual :	none	
Initial pH :	7.9	
Sample Dilution :	neat	
IC50 (5min, 15°C) :	81.7%	95% Confidence Interval : 61.7<81.7<108%
IC20 (5min, 15°C) :	21.6%	95% Confidence Interval : 18.1<21.6<26.9%
IC50 (15min, 15°C) :	86.8%	95% Confidence Interval : 49.1<86.8<153%
IC20 (15min, 15°C) :	21.2%	95% Confidence Interval : 14.9<21.2<30.1%

Note: The results relate only to the item tested.

Results of Phenol Reference Test :

Current	IC50 @ 5 min. :	17.5 mg/L
	95 % Confidence Interval :	13.6<17.5<22.6
	Date of Reference Bioassay :	11 08 16
Historical	Geometric Mean IC50 @ 5min.:	18.8 mg/L
	Mean ± 2SD:	15.1<18.8<24.2
	Method:	Shewhart

The reference toxicant is conducted under the same conditions as the definitive testing.

Data & QA/QC Reviewed By :  Robert Vivian, Bioassay Senior Analyst

Maxxam Analytics

Microtox Report

Project : B175008-BG4758

Test Information :

Sample Description : SB-W-4A

Type of Test :	15 min. Static Bioassay
Test Species :	Vibrio fischeri (Bioluminescent bacteria)
Source of Test Species :	STRATEGIC DIAGNOSTICS Inc.
Reagent Lot # :	10L1004
Date Obtained :	2011/05/03
Expiry Date :	2012/11/30
Reagent Holding Temp :	< - 20°C
Test Protocol :	Environment Canada EPS 1/RM/24
Salinity Adjustment :	Osmotic Adjusting Solution (200 uL)
Analyzer Used :	MICROBICS Analyzer Model 500
Calculation Method :	MICROTOX OMNI Version 1.18

Data Table: Sample vs Light Emission at Time T

Time (min.)	Sample Concentration [% v/v] Control	10.2	20.5	40.9	81.8
T0	102	103	101	98	101
T5	112	102	88	73	56
T15	114	101	93	76	56
T30*					
T60*					

* If applicable

General Comments:

Success Through Science®

Your P.O. #: 340962-000
Your Project #: SAWMILL BAY
Site: GREAT BEAR LAKE
Your C.O.C. #: A019557

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/06/17

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B149946
Received: 2011/06/10, 13:20

Sample Matrix: Soil
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Boron (Hot Water Soluble)	10	2011/06/15	2011/06/16	AB SOP-00042	EPA 200.7
BTEX/F1 by HS GC/MS (MeOH extract)	10	2011/06/11	2011/06/17	CAL SOP-00190	CCME CWS, EPA 8260C
Hexavalent Chromium	10	2011/06/12	2011/06/12	CAL SOP-00056	SM 3500-Cr B
CCME Hydrocarbons (F2-F4 in soil)	6	2011/06/11	2011/06/16	CAL SOP-00086 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil)	4	2011/06/11	2011/06/17	CAL SOP-00086 AB SOP-00036	CCME PHC-CWS
Elements by ICPMS - Soils	10	2011/06/15	2011/06/15	AB SOP-00043	EPA 200.8
Moisture	10	N/A	2011/06/12	CAL SOP-00023	McKeague MSSMA 2.411
Benzo[a]pyrene Equivalency	10	N/A	2011/06/17	AB SOP-00003	EPA 8270D
Polycyclic Aromatic Hydrocarbons in soil	10	2011/06/15	2011/06/16	AB SOP-00003 AB SOP-00036	EPA 3540C/8270D
Polychlorinated Biphenyls	10	2011/06/12	2011/06/15	CAL SOP-00149	EPA 3550B, EPA 8082A

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Sylvianne Sanders, Environmental Project Manager
Email: SSanders@maxxam.ca
Phone# (403) 291-3077

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		AS8351	AS8351	AS8352	AS8352	AS8353	AS8354	AS8354		
Sampling Date		2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09		
COC#		A019557	A019557	A019557	A019557	A019557	A019557	A019557		
	Units	**A - SS 1 @ 1-6 "**	**A - SS 1 @ 1-6 " Lab-Dup**	**A - SS 2 @ 1-6 "**	**A - SS 2 @ 1-6 " Lab-Dup**	**A - SS 3 @ 1-6 "**	**A - SS 4 @ 1-6 "**	**A - SS 4 @ 1-6 " Lab-Dup**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	1.8		2.8		1.9	2.1	2.2	0.3	4923327
Ext. Pet. Hydrocarbon										
F2 (C10-C16 Hydrocarbons)	mg/kg	<10		<10	<10	<10	<10		10	4932822
F3 (C16-C34 Hydrocarbons)	mg/kg	<10		<10	<10	<10	<10		10	4932822
F4 (C34-C50 Hydrocarbons)	mg/kg	<10		<10	<10	<10	<10		10	4932822
Reached Baseline at C50	mg/kg	YES		YES	YES	YES	YES			4932822
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	100		102	101	100	99			4932822
Volatiles										
Benzene	mg/kg	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050		0.0050	4923557
Toluene	mg/kg	<0.020	<0.020	<0.020		<0.020	<0.020		0.020	4923557
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010		<0.010	<0.010		0.010	4923557
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040		<0.040	<0.040		0.040	4923557
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040		<0.040	<0.040		0.040	4923557
o-Xylene	mg/kg	<0.020	<0.020	<0.020		<0.020	<0.020		0.020	4923557
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12		<12	<12		12	4923557
(C6-C10)	mg/kg	<12	<12	<12		<12	<12		12	4923557
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	103	98	100		98	99			4923557
4-BROMOFLUOROBENZENE (sur.)	%	101	102	102		103	103			4923557
D10-ETHYLBENZENE (sur.)	%	109	109	101		117	108			4923557
D4-1,2-DICHLOROETHANE (sur.)	%	105	103	102		106	102			4923557

RDL = Reportable Detection Limit

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		AS8355	AS8356	AS8357	AS8358	AS8359	AS8360		
Sampling Date		2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09		
COC#		A019557	A019557	A019557	A019557	A019557	A019557		
	Units	**A - SS 5 @ 1-6 "**	**B - SS 1 @ 1-6 "**	**B - SS 2 @ 1-6 "**	**B - SS 3 @ 1-6 "**	**B - SS 4 @ 1-6 "**	**B - SS 5 @ 1-6 "**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	2.6	3.0	3.2	3.7	3.2	3.5	0.3	4923327
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	10	4932822
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	10	4932822
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	10	4932822
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES		4932822
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	98	98	95	98	95	97		4932822
Volatiles									
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4923557
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	4923557
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923557
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	4923557
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	4923557
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	4923557
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	<12	<12	12	4923557
(C6-C10)	mg/kg	<12	<12	<12	<12	<12	<12	12	4923557
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	101	96	98	98	100	97		4923557
4-BROMOFLUOROBENZENE (sur.)	%	100	102	103	102	98	104		4923557
D10-ETHYLBENZENE (sur.)	%	109	106	113	104	104	116		4923557
D4-1,2-DICHLOROETHANE (sur.)	%	103	100	103	106	106	104		4923557

RDL = Reportable Detection Limit

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

REGULATED METALS (CCME/AT1) - SOILS

Maxxam ID		AS8351	AS8352	AS8353	AS8354	AS8355		
Sampling Date		2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09		
COC#		A019557	A019557	A019557	A019557	A019557		
	Units	**A - SS 1 @ 1-6 "**	**A - SS 2 @ 1-6 "**	**A - SS 3 @ 1-6 "**	**A - SS 4 @ 1-6 "**	**A - SS 5 @ 1-6 "**	**RDL**	**QC Batch**
Elements								
Soluble (Hot water) Boron (B)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4936373
Hex. Chromium (Cr 6+)	mg/kg	<0.15	0.31	<0.15	<0.15	<0.15	0.15	4923354
Total Antimony (Sb)	mg/kg	<1	<1	<1	<1	<1	1	4931304
Total Arsenic (As)	mg/kg	3	3	2	2	2	1	4931304
Total Barium (Ba)	mg/kg	18	29	20	23	23	10	4931304
Total Beryllium (Be)	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	4931304
Total Cadmium (Cd)	mg/kg	0.2	0.1	0.1	0.2	0.1	0.1	4931304
Total Chromium (Cr)	mg/kg	7	6	6	8	6	1	4931304
Total Cobalt (Co)	mg/kg	3	3	3	4	3	1	4931304
Total Copper (Cu)	mg/kg	<5	<5	<5	<5	<5	5	4931304
Total Lead (Pb)	mg/kg	3	3	3	3	3	1	4931304
Total Mercury (Hg)	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	4931304
Total Molybdenum (Mo)	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	4931304
Total Nickel (Ni)	mg/kg	6	5	5	6	6	1	4931304
Total Selenium (Se)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	4931304
Total Silver (Ag)	mg/kg	<1	<1	<1	<1	<1	1	4931304
Total Thallium (Tl)	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	4931304
Total Tin (Sn)	mg/kg	<1	<1	<1	<1	<1	1	4931304
Total Uranium (U)	mg/kg	<1	<1	<1	<1	<1	1	4931304
Total Vanadium (V)	mg/kg	20	16	12	24	13	1	4931304
Total Zinc (Zn)	mg/kg	32	29	27	33	27	10	4931304

RDL = Reportable Detection Limit

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

REGULATED METALS (CCME/AT1) - SOILS

Maxxam ID		AS8356		AS8357		AS8358	AS8359	AS8360		
Sampling Date		2011/06/09		2011/06/09		2011/06/09	2011/06/09	2011/06/09		
COC#		A019557		A019557		A019557	A019557	A019557		
	Units	**B - SS 1 @ 1-6 "**	**RDL**	**B - SS 2 @ 1-6 "**	**RDL**	**B - SS 3 @ 1-6 "**	**B - SS 4 @ 1-6 "**	**B - SS 5 @ 1-6 "**	**RDL**	**QC Batch**
Elements										
Soluble (Hot water) Boron (B)	mg/kg	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	4936373
Hex. Chromium (Cr 6+)	mg/kg	<0.15	0.15	<0.30 (1)	0.30	<0.15	<0.15	<0.15	0.15	4923354
Total Antimony (Sb)	mg/kg	<1	1	<1	1	<1	<1	<1	1	4931304
Total Arsenic (As)	mg/kg	2	1	2	1	1	2	2	1	4931304
Total Barium (Ba)	mg/kg	11	10	13	10	17	17	11	10	4931304
Total Beryllium (Be)	mg/kg	<0.4	0.4	<0.4	0.4	<0.4	<0.4	<0.4	0.4	4931304
Total Cadmium (Cd)	mg/kg	<0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	4931304
Total Chromium (Cr)	mg/kg	8	1	8	1	7	6	9	1	4931304
Total Cobalt (Co)	mg/kg	4	1	4	1	4	4	4	1	4931304
Total Copper (Cu)	mg/kg	6	5	6	5	<5	6	6	5	4931304
Total Lead (Pb)	mg/kg	5	1	4	1	4	5	5	1	4931304
Total Mercury (Hg)	mg/kg	<0.05	0.05	<0.05	0.05	<0.05	<0.05	<0.05	0.05	4931304
Total Molybdenum (Mo)	mg/kg	<0.4	0.4	<0.4	0.4	<0.4	<0.4	<0.4	0.4	4931304
Total Nickel (Ni)	mg/kg	6	1	5	1	5	5	6	1	4931304
Total Selenium (Se)	mg/kg	<0.5	0.5	<0.5	0.5	<0.5	<0.5	<0.5	0.5	4931304
Total Silver (Ag)	mg/kg	<1	1	<1	1	<1	<1	<1	1	4931304
Total Thallium (Tl)	mg/kg	<0.3	0.3	<0.3	0.3	<0.3	<0.3	<0.3	0.3	4931304
Total Tin (Sn)	mg/kg	<1	1	<1	1	<1	<1	<1	1	4931304
Total Uranium (U)	mg/kg	<1	1	<1	1	<1	<1	<1	1	4931304
Total Vanadium (V)	mg/kg	19	1	18	1	19	15	22	1	4931304
Total Zinc (Zn)	mg/kg	41	10	40	10	39	39	44	10	4931304

RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		AS8351	AS8352	AS8353	AS8353	AS8354		
Sampling Date		2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09		
COC#		A019557	A019557	A019557	A019557	A019557		
	Units	**A - SS 1 @ 1-6 "**	**A - SS 2 @ 1-6 "**	**A - SS 3 @ 1-6 "**	**A - SS 3 @ 1-6 " Lab-Dup**	**A - SS 4 @ 1-6 "**	**RDL**	**QC Batch**
Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1260	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Total Aroclors	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	93	98	101	97	96		4923338

Maxxam ID		AS8355	AS8356	AS8357	AS8358	AS8359	AS8360		
Sampling Date		2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09		
COC#		A019557	A019557	A019557	A019557	A019557	A019557		
	Units	**A - SS 5 @ 1-6 "**	**B - SS 1 @ 1-6 "**	**B - SS 2 @ 1-6 "**	**B - SS 3 @ 1-6 "**	**B - SS 4 @ 1-6 "**	**B - SS 5 @ 1-6 "**	**RDL**	**QC Batch**
Polychlorinated Biphenyls									
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1260	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Total Aroclors	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4923338
Surrogate Recovery (%)									
NONACHLOROBIPHENYL (sur.)	%	92	91	89	99	96	94		4923338

RDL = Reportable Detection Limit

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		AS8351	AS8352	AS8353	AS8354		
Sampling Date		2011/06/09	2011/06/09	2011/06/09	2011/06/09		
COC#		A019557	A019557	A019557	A019557		
	Units	**A - SS 1 @ 1-6 "**	**A - SS 2 @ 1-6 "**	**A - SS 3 @ 1-6 "**	**A - SS 4 @ 1-6 "**	**RDL**	**QC Batch**
Polycyclic Aromatics							
Acenaphthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo[a]pyrene equivalency	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1	4923081
Acenaphthylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Acridine	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	4930818
Anthracene	mg/kg	<0.0040	<0.0040	<0.0040	<0.0040	0.0040	4930818
Benzo(a)anthracene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(b&j)fluoranthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(k)fluoranthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(g,h,i)perylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(c)phenanthrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(a)pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo[e]pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Chrysene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Dibenz(a,h)anthracene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Fluoranthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Fluorene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
2-Methylnaphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Naphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Phenanthrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Perylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Quinoline	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	4930818
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	116	112	112	115		4930818
D12-BENZO(A)PYRENE (sur.)	%	96	93	91	93		4930818
D8-ACENAPHTHYLENE (sur.)	%	104	99	100	102		4930818
TERPHENYL-D14 (sur.)	%	106	103	103	118		4930818

RDL = Reportable Detection Limit

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		AS8355	AS8356	AS8357	AS8358	AS8359	AS8360		
Sampling Date		2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09	2011/06/09		
COC#		A019557	A019557	A019557	A019557	A019557	A019557		
	Units	**A - SS 5 @ 1-6 "**	**B - SS 1 @ 1-6 "**	**B - SS 2 @ 1-6 "**	**B - SS 3 @ 1-6 "**	**B - SS 4 @ 1-6 "**	**B - SS 5 @ 1-6 "**	**RDL**	**QC Batch**
Polycyclic Aromatics									
Acenaphthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo[a]pyrene equivalency	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4923081
Acenaphthylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Acridine	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4930818
Anthracene	mg/kg	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0040	4930818
Benzo(a)anthracene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(b&j)fluoranthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(k)fluoranthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(g,h,i)perylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(c)phenanthrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo(a)pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Benzo[e]pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Chrysene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Dibenz(a,h)anthracene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Fluoranthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Fluorene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
2-Methylnaphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Naphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Phenanthrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Perylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4930818
Quinoline	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4930818
Surrogate Recovery (%)									
D10-ANTHRACENE (sur.)	%	112	108	108	110	107	107		4930818
D12-BENZO(A)PYRENE (sur.)	%	90	89	89	89	86	84		4930818
D8-ACENAPHTHYLENE (sur.)	%	102	99	97	100	99	96		4930818
TERPHENYL-D14 (sur.)	%	112	100	100	102	99	113		4930818

RDL = Reportable Detection Limit

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

Package 1	17.7°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
4923327	Moisture	2011/06/12							4.7	20		
4923338	NONACHLOROBIPHENYL (sur.)	2011/06/15	92	30 - 130	118	30 - 130	100	%				
4923338	Aroclor 1260	2011/06/15	79	30 - 130	100	30 - 130	<0.010	mg/kg	NC	50		
4923338	Aroclor 1016	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Aroclor 1221	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Aroclor 1232	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Aroclor 1242	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Aroclor 1248	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Aroclor 1254	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Aroclor 1262	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Aroclor 1268	2011/06/15					<0.010	mg/kg	NC	50		
4923338	Total Aroclors	2011/06/15					<0.010	mg/kg	NC	50		
4923354	Hex. Chromium (Cr 6+)	2011/06/12	103	75 - 125	101	90 - 110	<0.15	mg/kg	NC	35		
4923557	1,4-Difluorobenzene (sur.)	2011/06/17	103	60 - 140	103	60 - 140	97	%				
4923557	4-BROMOFLUOROBENZENE (sur.)	2011/06/17	101	60 - 140	104	60 - 140	102	%				
4923557	D10-ETHYLBENZENE (sur.)	2011/06/17	101	30 - 130	96	30 - 130	115	%				
4923557	D4-1,2-DICHLOROETHANE (sur.)	2011/06/17	108	60 - 140	106	60 - 140	108	%				
4923557	Benzene	2011/06/17	113	60 - 140	109	60 - 140	<0.0050	mg/kg	NC	50		
4923557	Toluene	2011/06/17	116	60 - 140	111	60 - 140	<0.020	mg/kg	NC	50		
4923557	Ethylbenzene	2011/06/17	116	60 - 140	114	60 - 140	<0.010	mg/kg	NC	50		
4923557	m & p-Xylene	2011/06/17	119	60 - 140	115	60 - 140	<0.040	mg/kg	NC	50		
4923557	o-Xylene	2011/06/17	118	60 - 140	114	60 - 140	<0.020	mg/kg	NC	50		
4923557	(C6-C10)	2011/06/17	95	60 - 140	101	60 - 140	<12	mg/kg	NC	50		
4923557	Xylenes (Total)	2011/06/17					<0.040	mg/kg	NC	50		
4923557	F1 (C6-C10) - BTEX	2011/06/17					<12	mg/kg	NC	50		
4930818	D10-ANTHRACENE (sur.)	2011/06/16	109	30 - 130	110	30 - 130	113	%				
4930818	D12-BENZO(A)PYRENE (sur.)	2011/06/16	104	30 - 130	90	30 - 130	85	%				
4930818	D8-ACENAPHTHYLENE (sur.)	2011/06/16	100	30 - 130	96	30 - 130	97	%				
4930818	TERPHENYL-D14 (sur.)	2011/06/16	102	30 - 130	98	30 - 130	101	%				
4930818	Acenaphthene	2011/06/16	97	30 - 130	96	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Acenaphthylene	2011/06/16	102	30 - 130	97	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Acridine	2011/06/16	70	30 - 130	69	30 - 130	<0.010	mg/kg				
4930818	Anthracene	2011/06/16	90	30 - 130	91	30 - 130	<0.0040	mg/kg	NC	50		
4930818	Benzo(a)anthracene	2011/06/16	103	30 - 130	89	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Benzo(b&j)fluoranthene	2011/06/16	101	30 - 130	90	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Benzo(k)fluoranthene	2011/06/16	103	30 - 130	100	30 - 130	<0.0050	mg/kg	NC(1)	50		
4930818	Benzo(g,h,i)perylene	2011/06/16	101	30 - 130	92	30 - 130	<0.0050	mg/kg	74.0(2)	50		
4930818	Benzo(c)phenanthrene	2011/06/16	97	30 - 130	100	30 - 130	<0.0050	mg/kg				
4930818	Benzo(a)pyrene	2011/06/16	100	30 - 130	84	30 - 130	<0.0050	mg/kg	NC	50		

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
4930818	Benzo[e]pyrene	2011/06/16	97	30 - 130	90	30 - 130	<0.0050	mg/kg				
4930818	Chrysene	2011/06/16	110	30 - 130	112	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Dibenz(a,h)anthracene	2011/06/16	98	30 - 130	81	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Fluoranthene	2011/06/16	104	30 - 130	102	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Fluorene	2011/06/16	97	30 - 130	90	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Indeno(1,2,3-cd)pyrene	2011/06/16	101	30 - 130	87	30 - 130	<0.0050	mg/kg	NC	50		
4930818	2-Methylnaphthalene	2011/06/16	95	30 - 130	91	30 - 130	<0.0050	mg/kg				
4930818	Naphthalene	2011/06/16	99	30 - 130	97	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Phenanthrene	2011/06/16	99	30 - 130	101	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Perylene	2011/06/16	97	30 - 130	112	30 - 130	<0.0050	mg/kg				
4930818	Pyrene	2011/06/16	128	30 - 130	104	30 - 130	<0.0050	mg/kg	NC	50		
4930818	Quinoline	2011/06/16	94	30 - 130	97	30 - 130	<0.010	mg/kg				
4931304	Total Antimony (Sb)	2011/06/15	89	75 - 125	99	75 - 125	<1	mg/kg				
4931304	Total Arsenic (As)	2011/06/15	86	75 - 125	89	81 - 103	<1	mg/kg	3.6	35	100	50 - 150
4931304	Total Barium (Ba)	2011/06/15	NC	75 - 125	89	75 - 125	<10	mg/kg	2.6	35	107	69 - 131
4931304	Total Beryllium (Be)	2011/06/15	99	75 - 125	100	75 - 116	<0.4	mg/kg				
4931304	Total Cadmium (Cd)	2011/06/15	96	75 - 125	96	75 - 125	<0.1	mg/kg				
4931304	Total Chromium (Cr)	2011/06/15	87	75 - 125	92	75 - 125	<1	mg/kg	3.4	35	96	41 - 159
4931304	Total Cobalt (Co)	2011/06/15	90	75 - 125	92	75 - 125	<1	mg/kg			98	75 - 125
4931304	Total Copper (Cu)	2011/06/15	83	75 - 125	88	75 - 125	<5	mg/kg	NC	35	93	72 - 127
4931304	Total Lead (Pb)	2011/06/15	91	75 - 125	97	85 - 112	<1	mg/kg	4.0	35	98	54 - 146
4931304	Total Mercury (Hg)	2011/06/15	99	75 - 125	99	75 - 125	<0.05	mg/kg				
4931304	Total Molybdenum (Mo)	2011/06/15	99	75 - 125	98	75 - 125	<0.4	mg/kg				
4931304	Total Nickel (Ni)	2011/06/15	85	75 - 125	92	75 - 125	<1	mg/kg			101	61 - 139
4931304	Total Selenium (Se)	2011/06/15	92	75 - 125	92	75 - 125	<0.5	mg/kg				
4931304	Total Silver (Ag)	2011/06/15	100	75 - 125	100	75 - 125	<1	mg/kg				
4931304	Total Thallium (Tl)	2011/06/15	91	75 - 125	95	75 - 125	<0.3	mg/kg				
4931304	Total Tin (Sn)	2011/06/15	99	75 - 125	97	75 - 125	<1	mg/kg				
4931304	Total Uranium (U)	2011/06/15	92	75 - 125	92	75 - 125	<1	mg/kg				
4931304	Total Vanadium (V)	2011/06/15	86	75 - 125	97	75 - 125	<1	mg/kg			111	50 - 150
4931304	Total Zinc (Zn)	2011/06/15	NC	75 - 125	91	75 - 125	<10	mg/kg	2.9	35	102	72 - 128
4932822	O-TERPHENYL (sur.)	2011/06/16	106	50 - 130	105	50 - 130	102	%				
4932822	F2 (C10-C16 Hydrocarbons)	2011/06/16	120	50 - 130	95	70 - 130	<10	mg/kg	NC	50		
4932822	F3 (C16-C34 Hydrocarbons)	2011/06/16	114	50 - 130	99	70 - 130	<10	mg/kg	NC	50		

Maxxam Job #: B149946
Report Date: 2011/06/17

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY
Site Reference: GREAT BEAR LAKE
Your P.O. #: 340962-000
Sampler Initials: PH

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
4932822	F4 (C34-C50 Hydrocarbons)	2011/06/16	124	50 - 130	117	70 - 130	<10	mg/kg	NC	50		
4936373	Soluble (Hot water) Boron (B)	2011/06/16	106	75 - 125	99	75 - 125	<0.1	mg/kg	NC	35		

N/A = Not Applicable
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Detection limits raised due to matrix interference.
(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Validation Signature Page

Maxxam Job #: B149946

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Janet Gao, Senior Analyst, Organics Department

LILI ZHOU, Senior analyst, Inorganic department.

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Calgary: 4000 19st St. NE, T2E 6P8 · Edmonton: 9331 - 48 Street, T6B 2R4 · www.maxxamanalytics.com

Chain of Custody A019557

Page: 1 of 1

Invoice To:	C/O Report Address ☐
Company:	SENES / DCS
Contact:	J. Mauchan / C. Gravelle
Address:	121 Granton Drive Unit 11, Richmond Hill, Ontario, L4B 3N4
Contact #:	Ph: 905 882 5984 Cell:

Report To: Same as Invoice ☐

Report Distribution (E-Mail): jmauchan@dcsltd.ca, Cgravelle@dcsltd.ca

REGULATORY GUIDELINES:
- ☐ AT1
- ☒ CCME
- ☐ Regulated Drinking Water
- ☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise

PO #:	340962-000
Project # / Name:	Sawmill Bay
Site Location:	Great Bear Lake
Quote #:	
Sampled By:	P. Harrison

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☒ REGULAR (5 to 7 Days)

See reverse for package specifics

#	Sample ID	Depth (unit)	Matrix GW/SW/Soil	Date/Time Sampled YY/MM/DD 24:00	BTEX F1-F4 (PHC)	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	PCB	PAH	HOLD - Do not Analyze	# of Containers Submitted
1	A-SS1	1-6"	Soil	June 9, 2011	X		X				X	X		3
2	A-SS2	↓	↓	↓	X	~~X~~	X				X	X		3
3	A-SS3	↓	↓	↓	X	~~X~~	X				X	X		3
4	A-SS4	↓	↓	↓	X	~~X~~	X				X	X		3
5	A-SS5	↓	↓	↓	X	~~X~~	X				X	X		3
6														
7	B-SS1	1-6"	Soil	June 9, 2011	X		X				X	X		3
8	B-SS2	↓	↓	↓	X		X				X	X		3
9	B-SS3	↓	↓	↓	X		X				X	X		3
10	B-SS4	↓	↓	↓	X		X				X	X		3
11	B-SS5	↓	↓	↓	X		X				X	X		3
12					~~X~~		~~X~~							

WATER: ☐BTEX F1, ☐BTEX F1-F2, ☐BTEX F1-F4, ☐VOCs, ☐ Routine Water ☐ Turb ☐ F, ☐ TOC ☐ DOC, Regulated Metals (CCME / AT1) Total / Dissolved, Mercury ☐ Total ☐ Dissolved

Other Analysis

Please indicate Filtered, Preserved or Both (F, P, F/P)

	Date (YY/MM/DD):	Time (24:00):
Relinquished By (Signature/Print): Patrick Harrison	June 9 2011	1600 h
Relinquished By (Signature/Print):		

Special Instructions:

# of Jars Used & Not Submitted

LAB USE ONLY

Received By: | Date: | Time: | Maxxam Job #:

RECEIVED JUN 11 2011 [illegible]

ARRIVED AT DEPOT: JUN 10 2011 TEMP: [illegible]

Lab Comments: | Custody Seal | Temperature | Ice

All FCD-00331 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam

Success Through Science®

Your P.O. #: 340962
Your Project #: SAWMILL BAY

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/09/07

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B181843
Received: 2011/08/30, 10:40

Sample Matrix: Soil
Samples Received: 19

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Boron (Hot Water Soluble)	2	2011/09/06	2011/09/06	AB SOP-00042	EPA 200.7
BTEX/F1 by HS GC/MS (MeOH extract)	17	2011/09/01	2011/09/05	CAL SOP-00190	CCME CWS, EPA 8260C
Hexavalent Chromium	2	2011/09/02	2011/09/02	CAL SOP-00056	SM 3500-Cr B
CCME Hydrocarbons (F2-F4 in soil)	5	2011/09/01	2011/09/04	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil)	12	2011/09/01	2011/09/05	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
Elements by ICPMS - Soils	2	2011/09/06	2011/09/06	AB SOP-00043	EPA 200.8
Moisture	19	N/A	2011/09/01	CAL SOP-00023	McKeague MSSMA 2.411

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B181843
Report Date: 2011/09/07

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

Your P.O. #: 340962
Sampler Initials: RV

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		BK4010	BK4010	BK4012	BK4013	BK4013	BK4014	BK4015		
Sampling Date		2011/08/29 13:30	2011/08/29 13:30	2011/08/29 17:10	2011/08/29 13:05	2011/08/29 13:05	2011/08/29 13:10	2011/08/29 13:15		
	Units	**DUP-1**	**DUP-1 Lab-Dup**	**DUP-2**	**SBDC-1**	**SBDC-1 Lab-Dup**	**SBDC-2**	**SBDC-3**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	4.0		6.0	3.8	3.7	5.8	2.8	0.3	5144354
Ext. Pet. Hydrocarbon										
F2 (C10-C16 Hydrocarbons)	mg/kg	22		<10	18		<10	<10	10	5149210
F3 (C16-C34 Hydrocarbons)	mg/kg	22		<10	20		<10	<10	10	5149210
F4 (C34-C50 Hydrocarbons)	mg/kg	<10		<10	<10		<10	<10	10	5149210
Reached Baseline at C50	mg/kg	YES		YES	YES		YES	YES		5149210
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	85		88	82		85	87		5149210
Volatiles										
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	0.0050	5145371
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020		<0.020	<0.020	0.020	5145371
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	0.010	5145371
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040		<0.040	<0.040	0.040	5145371
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040		<0.040	<0.040	0.040	5145371
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020		<0.020	<0.020	0.020	5145371
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12		<12	<12	12	5145371
(C6-C10)	mg/kg	<12	<12	<12	<12		<12	<12	12	5145371
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	105	123	98	102		125	99		5145371
4-BROMOFLUOROBENZENE (sur.)	%	79	99	74	85		99	81		5145371
D10-ETHYLBENZENE (sur.)	%	107	114	103	111		115	120		5145371
D4-1,2-DICHLOROETHANE (sur.)	%	92	117	91	95		116	99		5145371

RDL = Reportable Detection Limit

Maxxam Job #: B181843
Report Date: 2011/09/07

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

Your P.O. #: 340962
Sampler Initials: RV

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		BK4016	BK4017	BK4062	BK4063	BK4064	BK4065		
Sampling Date		2011/08/29 13:20	2011/08/29 13:25	2011/08/29 16:25	2011/08/29 16:30	2011/08/29 16:35	2011/08/29 16:45		
	Units	**SBDC-4**	**SBDC-5**	**SBWS-1**	**SBWS-2**	**SBWS-3**	**SBWS-4**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	4.2	6.6	4.6	3.5	3.9	4.6	0.3	5144354
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	190	<10	<10	<10	130	<10	10	5149210
F3 (C16-C34 Hydrocarbons)	mg/kg	500	<10	<10	<10	140	<10	10	5149210
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	10	5149210
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES		5149210
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	88	86	88	88	85	86		5149210
Volatiles									
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	5145371
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	5145371
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5145371
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	5145371
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	5145371
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	5145371
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	<12	<12	12	5145371
(C6-C10)	mg/kg	<12	<12	<12	<12	<12	<12	12	5145371
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	100	99	96	95	126	122		5145371
4-BROMOFLUOROBENZENE (sur.)	%	89	78	99	92	103	106		5145371
D10-ETHYLBENZENE (sur.)	%	97	107	106	120	114	118		5145371
D4-1,2-DICHLOROETHANE (sur.)	%	86	85	85	88	110	112		5145371

RDL = Reportable Detection Limit

Maxxam Job #: B181843
Report Date: 2011/09/07

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

Your P.O. #: 340962
Sampler Initials: RV

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		BK4066	BK4067	BK4068	BK4069	BK4070	BK4071		
Sampling Date		2011/08/29 16:40	2011/08/29 16:45	2011/08/29 16:50	2011/08/29 16:55	2011/08/29 17:00	2011/08/29 17:05		
	Units	**SBWS-5**	**SBAC-1**	**SBAC-2**	**SBAC-3**	**SBAC-4**	**SBAC-5**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	3.9	5.1	4.0	4.8	5.4	7.1	0.3	5144354
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	10	5149210
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	10	5149210
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	10	5149210
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES		5149210
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	86	88	88	87	84	84		5149210
Volatiles									
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	5145371
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	5145371
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5145371
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	5145371
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	5145371
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	5145371
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	<12	<12	12	5145371
(C6-C10)	mg/kg	<12	<12	<12	<12	<12	<12	12	5145371
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	123	94	102	126	126	94		5145371
4-BROMOFLUOROBENZENE (sur.)	%	103	95	95	97	101	74		5145371
D10-ETHYLBENZENE (sur.)	%	112	117	103	123	128	108		5145371
D4-1,2-DICHLOROETHANE (sur.)	%	116	89	85	115	119	91		5145371

RDL = Reportable Detection Limit

Maxxam Job #: B181843
Report Date: 2011/09/07

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

Your P.O. #: 340962
Sampler Initials: RV

REGULATED METALS (CCME/AT1) - SOILS

Maxxam ID		BK4018		BK4019		
Sampling Date		2011/08/29 18:40		2011/08/29 18:45		
	Units	**SBAP-1**	**RDL**	**SBAP-2**	**RDL**	**QC Batch**
Elements						
Soluble (Hot water) Boron (B)	mg/kg	<0.1	0.1	<0.1	0.1	5152030
Hex. Chromium (Cr 6+)	mg/kg	<0.15	0.15	<0.30(1)	0.30	5145718
Total Antimony (Sb)	mg/kg	<1	1	<1	1	5152025
Total Arsenic (As)	mg/kg	2	1	3	1	5152025
Total Barium (Ba)	mg/kg	30	10	20	10	5152025
Total Beryllium (Be)	mg/kg	<0.4	0.4	<0.4	0.4	5152025
Total Cadmium (Cd)	mg/kg	0.1	0.1	<0.1	0.1	5152025
Total Chromium (Cr)	mg/kg	8	1	9	1	5152025
Total Cobalt (Co)	mg/kg	4	1	6	1	5152025
Total Copper (Cu)	mg/kg	6	5	7	5	5152025
Total Lead (Pb)	mg/kg	5	1	5	1	5152025
Total Mercury (Hg)	mg/kg	<0.05	0.05	<0.05	0.05	5152025
Total Molybdenum (Mo)	mg/kg	<0.4	0.4	<0.4	0.4	5152025
Total Nickel (Ni)	mg/kg	5	1	7	1	5152025
Total Selenium (Se)	mg/kg	<0.5	0.5	<0.5	0.5	5152025
Total Silver (Ag)	mg/kg	<1	1	<1	1	5152025
Total Thallium (Tl)	mg/kg	<0.3	0.3	<0.3	0.3	5152025
Total Tin (Sn)	mg/kg	<1	1	<1	1	5152025
Total Uranium (U)	mg/kg	<1	1	<1	1	5152025
Total Vanadium (V)	mg/kg	17	1	18	1	5152025
Total Zinc (Zn)	mg/kg	32	10	33	10	5152025

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		BK4018	BK4019		
Sampling Date		2011/08/29 18:40	2011/08/29 18:45		
	Units	**SBAP-1**	**SBAP-2**	**RDL**	**QC Batch**
Physical Properties					
Moisture	%	13	8.9	0.3	5144354

RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference

Maxxam Job #: B181843
Report Date: 2011/09/07

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

Your P.O. #: 340962
Sampler Initials: RV

Package 1	2.7°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B181843
Report Date: 2011/09/07

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

Your P.O. #: 340962
Sampler Initials: RV

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5144354	Moisture	2011/09/01							2.7	20		
5145371	1,4-Difluorobenzene (sur.)	2011/09/04	119	60 - 140	118	60 - 140	94	%				
5145371	4-BROMOFLUOROBENZENE (sur.)	2011/09/04	110	60 - 140	111	60 - 140	77	%				
5145371	D10-ETHYLBENZENE (sur.)	2011/09/04	110	60 - 130	111	60 - 130	96	%				
5145371	D4-1,2-DICHLOROETHANE (sur.)	2011/09/04	82	60 - 140	82	60 - 140	84	%				
5145371	Benzene	2011/09/05	138	60 - 140	92	60 - 140	<0.0050	mg/kg	NC	50		
5145371	Toluene	2011/09/05	139	60 - 140	111	60 - 140	<0.020	mg/kg	NC	50		
5145371	Ethylbenzene	2011/09/05	138	60 - 140	115	60 - 140	<0.010	mg/kg	NC	50		
5145371	m & p-Xylene	2011/09/05	126	60 - 140	102	60 - 140	<0.040	mg/kg	NC	50		
5145371	o-Xylene	2011/09/05	117	60 - 140	101	60 - 140	<0.020	mg/kg	NC	50		
5145371	(C6-C10)	2011/09/05	92	60 - 140	84	60 - 140	<12	mg/kg	NC	50		
5145371	Xylenes (Total)	2011/09/05					<0.040	mg/kg	NC	50		
5145371	F1 (C6-C10) - BTEX	2011/09/05					<12	mg/kg	NC	50		
5145718	Hex. Chromium (Cr 6+)	2011/09/02	NC	75 - 125	96	90 - 110	<0.15	mg/kg	NC	35		
5149210	O-TERPHENYL (sur.)	2011/09/04	86	50 - 130	71	50 - 130	84	%				
5149210	F2 (C10-C16 Hydrocarbons)	2011/09/04	90	50 - 130	89	70 - 130	<10	mg/kg	NC	50		
5149210	F3 (C16-C34 Hydrocarbons)	2011/09/04	90	50 - 130	76	70 - 130	<10	mg/kg	NC	50		
5149210	F4 (C34-C50 Hydrocarbons)	2011/09/04	84	50 - 130	76	70 - 130	<10	mg/kg	NC	50		
5152025	Total Antimony (Sb)	2011/09/06	87	75 - 125	104	75 - 125	<1	mg/kg	NC	35		
5152025	Total Arsenic (As)	2011/09/06	78	75 - 125	86	75 - 125	<1	mg/kg	NC	35	87	50 - 150
5152025	Total Barium (Ba)	2011/09/06	NC	75 - 125	89	75 - 125	<10	mg/kg	25.7	35	88	69 - 131
5152025	Total Beryllium (Be)	2011/09/06	76	75 - 125	90	75 - 125	<0.4	mg/kg	NC	35		
5152025	Total Cadmium (Cd)	2011/09/06	81	75 - 125	90	75 - 125	<0.1	mg/kg	NC	35		
5152025	Total Chromium (Cr)	2011/09/06	80	75 - 125	89	75 - 125	<1	mg/kg	1.1	35	84	41 - 159
5152025	Total Cobalt (Co)	2011/09/06	81	75 - 125	91	75 - 125	<1	mg/kg	0.2	35	82	75 - 125
5152025	Total Copper (Cu)	2011/09/06	79	75 - 125	89	75 - 125	<5	mg/kg	NC	35	77	72 - 127
5152025	Total Lead (Pb)	2011/09/06	NC	75 - 125	92	75 - 125	1, RDL=1	mg/kg	14.2	35	81	54 - 146
5152025	Total Mercury (Hg)	2011/09/06	85	75 - 125	93	75 - 125	<0.05	mg/kg	NC	35		
5152025	Total Molybdenum (Mo)	2011/09/06	85	75 - 125	92	75 - 125	<0.4	mg/kg	NC	35		
5152025	Total Nickel (Ni)	2011/09/06	80	75 - 125	91	75 - 125	<1	mg/kg	0.9	35	85	61 - 139
5152025	Total Selenium (Se)	2011/09/06	78	75 - 125	87	75 - 125	<0.5	mg/kg	NC	35		
5152025	Total Silver (Ag)	2011/09/06	80	75 - 125	90	75 - 125	<1	mg/kg	NC	35		
5152025	Total Tin (Sn)	2011/09/06	82	75 - 125	90	75 - 125	<1	mg/kg	NC	35		
5152025	Total Uranium (U)	2011/09/06	79	75 - 125	91	75 - 125	<1	mg/kg	NC	35		
5152025	Total Vanadium (V)	2011/09/06	88	75 - 125	92	75 - 125	<1	mg/kg	5.9	35	97	50 - 150
5152025	Total Zinc (Zn)	2011/09/06	NC	75 - 125	89	75 - 125	<10	mg/kg	1	35	82	72 - 128

Maxxam Job #: B181843
Report Date: 2011/09/07

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

Your P.O. #: 340962
Sampler Initials: RV

QUALITY ASSURANCE REPORT

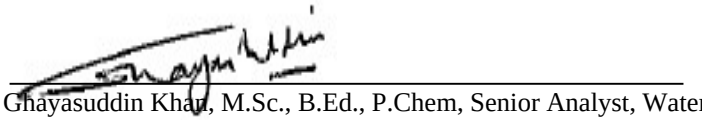
			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5152025	Total Thallium (Tl)	2011/09/06			87	75 - 125	<0.3	mg/kg	NC	35		
5152030	Soluble (Hot water) Boron (B)	2011/09/06	103	75 - 125	88	75 - 125	<0.1	mg/kg	NC	35		

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B181843

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab

Janet Gao, Senior Analyst, Organics Department

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
4000 19st N.E. Calgary, Alberta Canada T2E 6P8 Tel:(403) 291-3077 Toll-free:800-386-7247 Fax:(403) 735-2240 www.maxxam.ca

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#4598 SENES CONSULTANTS LIMITED	Company Name:	#11077 SENES CONSULTANTS LIMITED	Quotation #:		MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	CHARLES F. GRAVELLE	Contact Name:	JASON MAUCHAN	P.O. #:	340962	B181843	152612
Address:	121 GRANTON DRIVE, UNIT 12 RICHMOND HILL ON L4B 3N4	Address:	121 GRANTON DRIVE, UNIT 12 RICHMOND HILL AB L4B 3N4	Project #:		CHAIN OF CUSTODY #:	PROJECT MANAGER:
Phone:	(905)882-5984 Fax: (905)882-8962	Phone:	(905)882-5984 Fax: (905)882-8962	Project Name:	Sawmill Bay	C#153442-01-01	Ioana Stoica
Email:	cgravelle@dcsltd.ca	Email:	jmauchan@dcsltd.ca, rjanzen@dcsltd.ca	Site #:			
				Sampled By:	RVJ		

REGULATORY CRITERIA:

SPECIAL INSTRUCTIONS

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (Please be specific):

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details

Job Specific Rush TAT (if applies to entire submission) ☐
Date Required: _____ Time Required: _____
Rush Confirmation Number: _____ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	AT1 BTEX and F1-F4 in Soil	Regulated Metals (CCME/AT1) - Soils	# of Bottles	Comments
1		DUP-1	2008-11	1330	SOIL			X		1	
2		DUP-2		1710	SOIL			X		1	
3		SBDC-1		1305	SOIL			X		1	10:40 mg
4		SBDC-2		1310	SOIL			X		1	
5		SBDC-3		1315	SOIL			X		1	
6		SBDC-4		1320	SOIL			X		1	
7		SBDC-5		1325	SOIL			X		1	
8		SBAP-1		1840	SOIL				X	1	
9		SBAP-2		1845	SOIL				X	1	
10					SOIL						

ARRIVED AT DEPOT:
AUG 30 2011
TEMP: 31.2 3

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
Ryan Janzen	11/08/29		Josh Kinassuy	2011/09/01	0700		☐		☐ Yes ☐ No

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
4000 19st N.E. Calgary, Alberta Canada T2E 6P8 Tel:(403) 291-3077 Toll-free:800-386-7247 Fax:(403) 735-2240 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 2 of 2

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:	
Company Name:	#4598 SENES CONSULTANTS LIMITED	Company Name:	#11077 SENES CONSULTANTS LIMITED	Quotation #:	
Contact Name:	CHARLES F. GRAVELLE	Contact Name:	JASON MAUCHAN	P.O. #:	
Address:	121 GRANTON DRIVE, UNIT 12	Address:	121 GRANTON DRIVE, UNIT 12	Project #:	340962
	RICHMOND HILL ON L4B 3N4		RICHMOND HILL AB L4B 3N4	Project Name:	Sawmill Bay
Phone:	(905)882-5984 Fax: (905)882-8962	Phone:	(905)882-5984 Fax: (905)882-8962	Site #:	
Email:	cgravelle@dcsltd.ca	Email:	jmauchan@dcsltd.ca rjanzen@dcsltd.ca	Sampled By:	RVJ

Laboratory Use Only:

MAXXAM JOB #:	BOTTLE ORDER #:
B181843	153442
CHAIN OF CUSTODY #:	PROJECT MANAGER:
C#153442-01-01	Ioana Stoica

REGULATORY CRITERIA:

SPECIAL INSTRUCTIONS:

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (Please be specific):

#	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	AT1 BTEX and F1-F4 in Soil	Regulated Metals (CCME/AT1) - Soils	# of Bottles	Comments
1		SBWS-1	August 29 2011	1625	SOIL			X		1	
2		SBWS-2	↓	1630	SOIL			X		1	
3		SBWS-3	↓	1635	SOIL			X		1	
4		SBWS-4	↓	1645	SOIL			X		1	
5		SBWS-5	↓	1640	SOIL			X		1	
6		SBAC-1	↓	1645	SOIL			X		1	
7		SBAC-2	↓	1650	SOIL			X		1	
8		SBAC-3	↓	1655	SOIL			X		1	
9		SBAC-4	↓	1700	SOIL			X		1	
10		SBAC-5	↓	1705	SOIL			X		1	

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission) ☐
Date Required: ______ Time Required: ______
Rush Confirmation Number: ______ (call lab for #)

ARRIVED AT DEPOT: 10:40
AUG 3 0 2011
TEMP: 3/2/1

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Ryan Janzen	11/08/29		Josh Kinnsbury	2011/09/01	0700	

Laboratory Use Only: Time Sensitive ☐ | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? ☐ Yes ☐ No

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

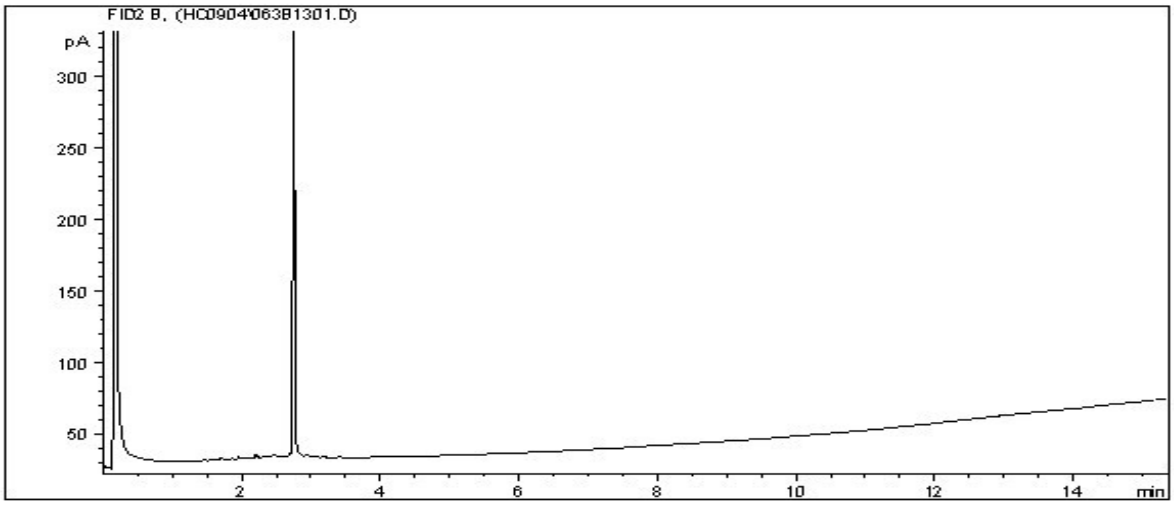
Maxxam Analytics International Corporation o/a Maxxam Analytics

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

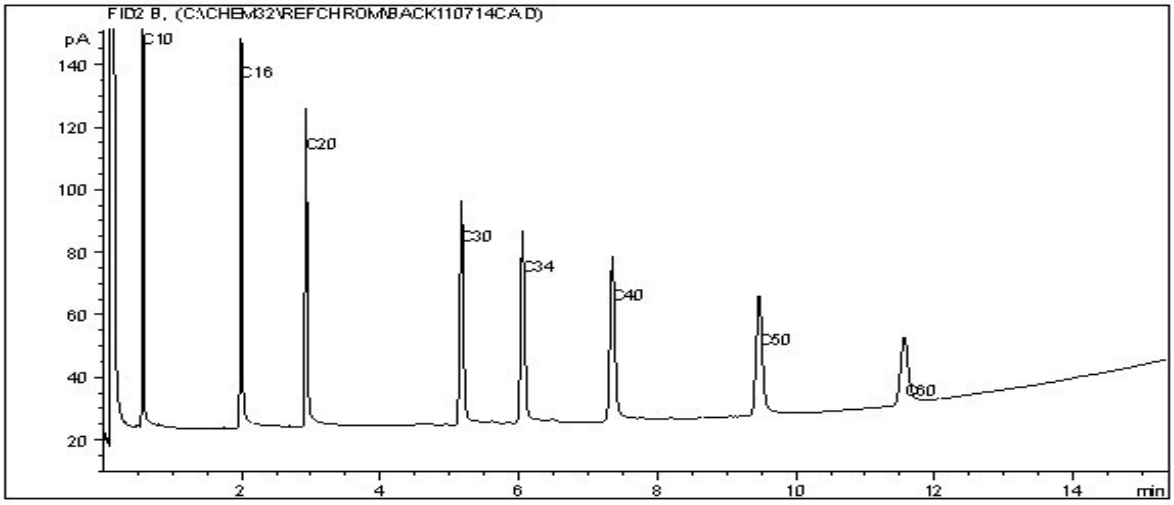
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4010

Client ID: DUP-1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

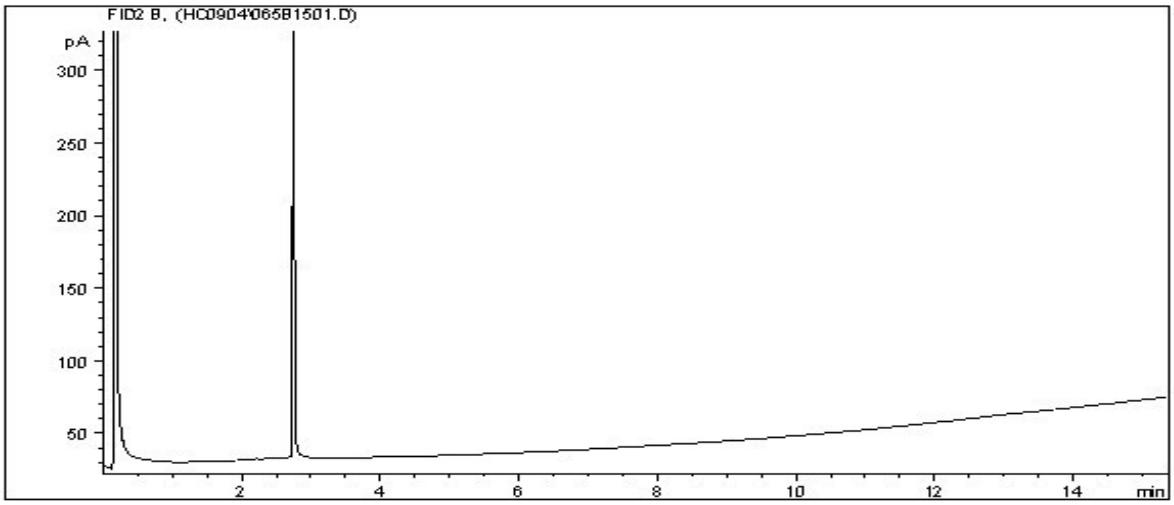
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

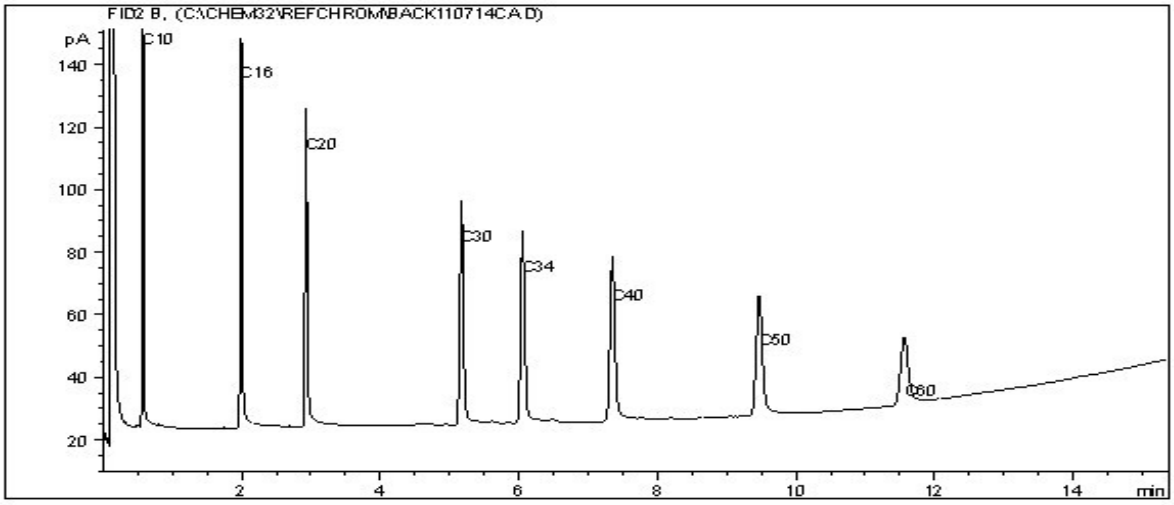
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4012

Client ID: DUP-2

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

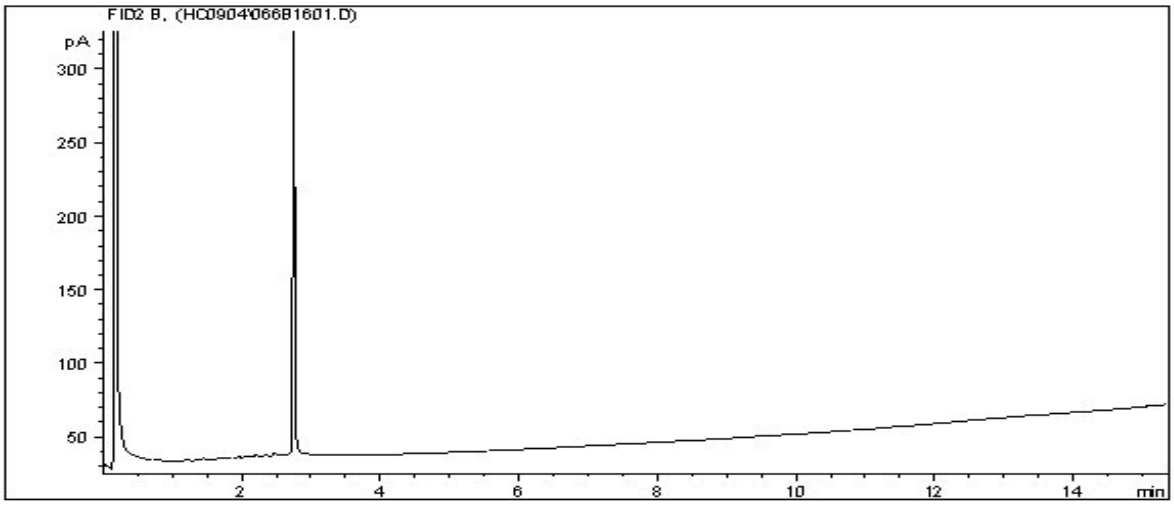
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

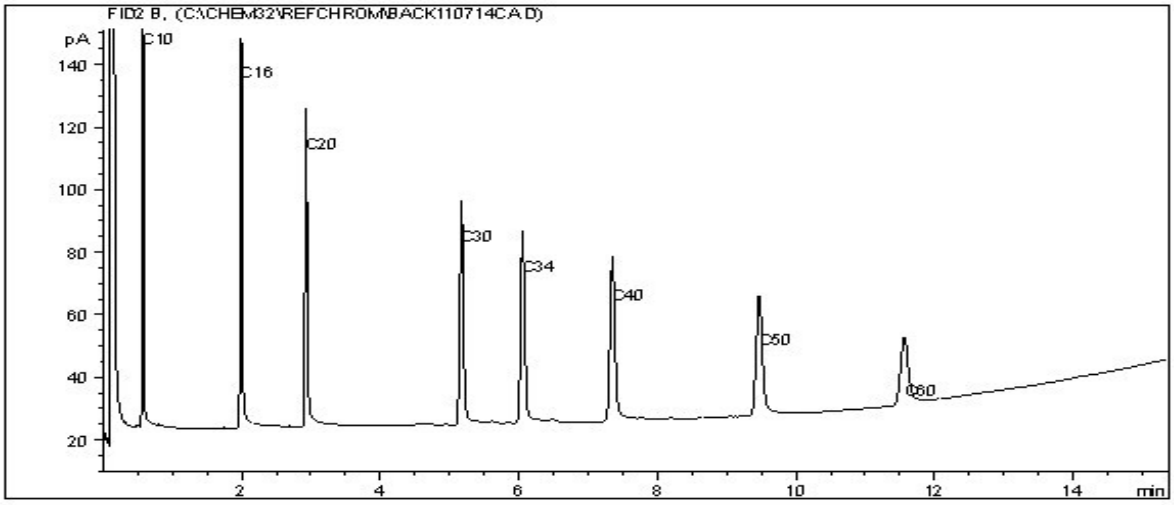
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4013

Client ID: SBDC-1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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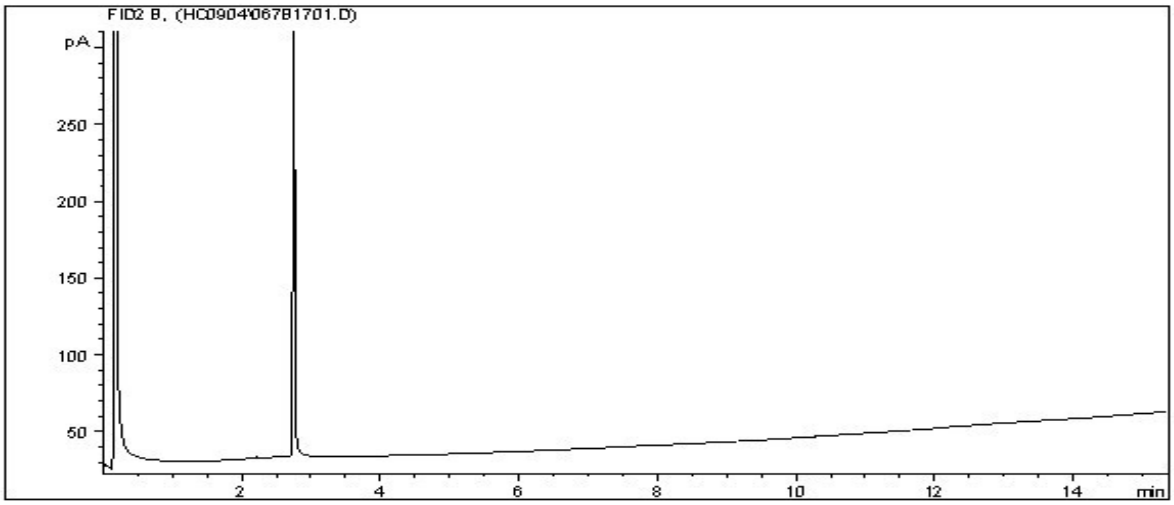
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

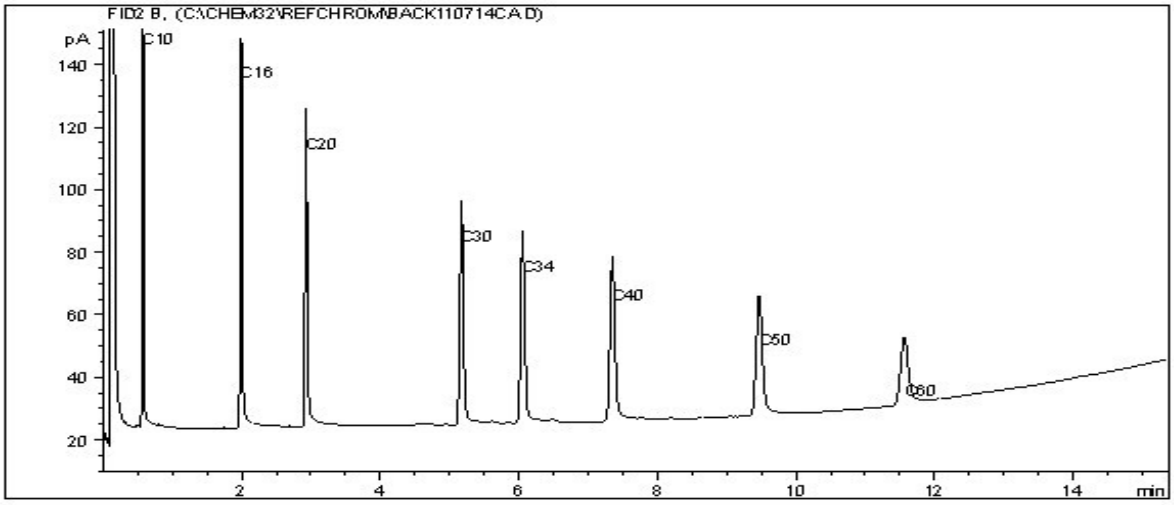
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4014

Client ID: SBDC-2

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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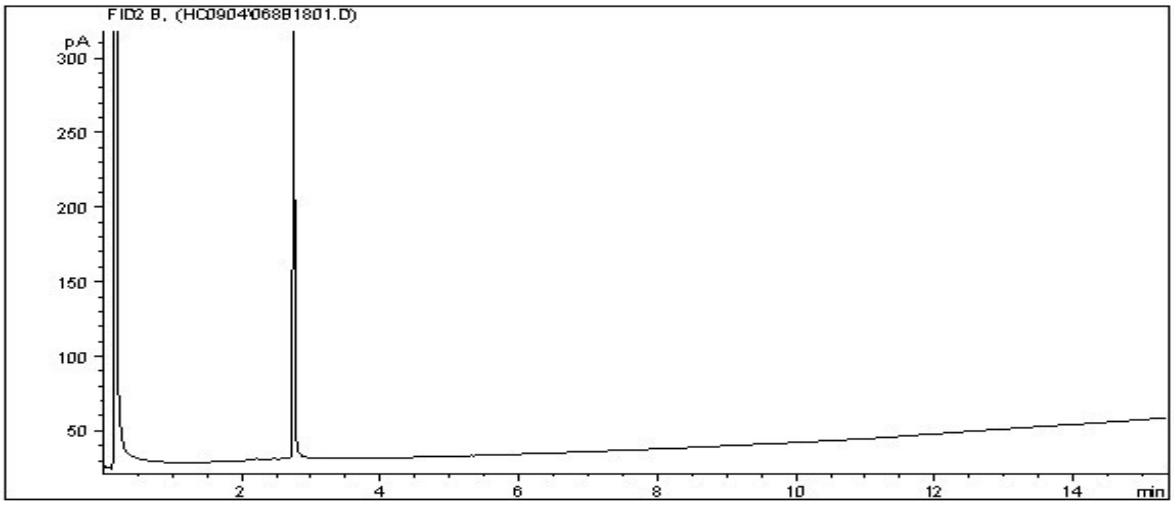
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

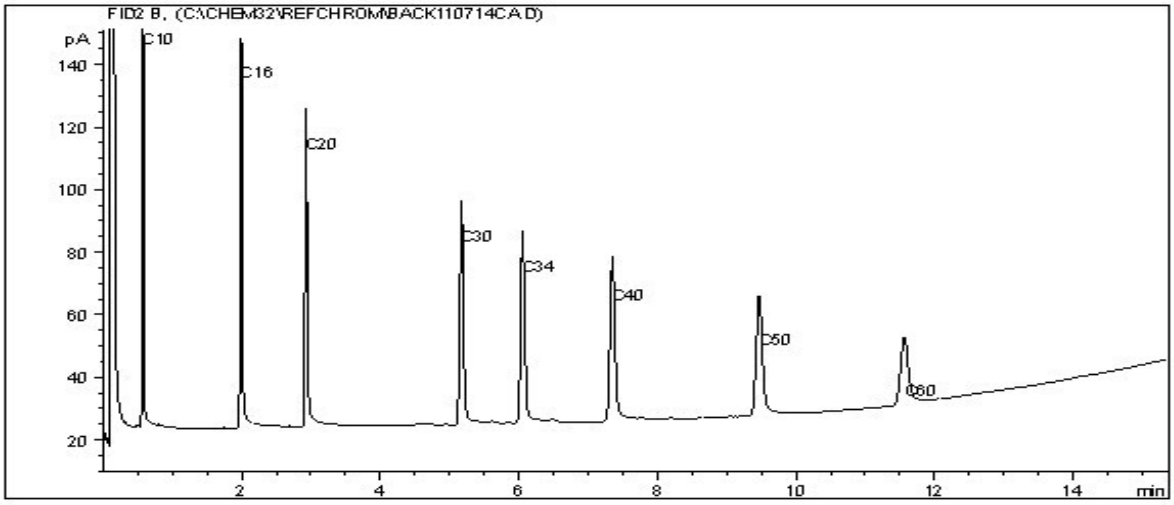
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4015

Client ID: SBDC-3

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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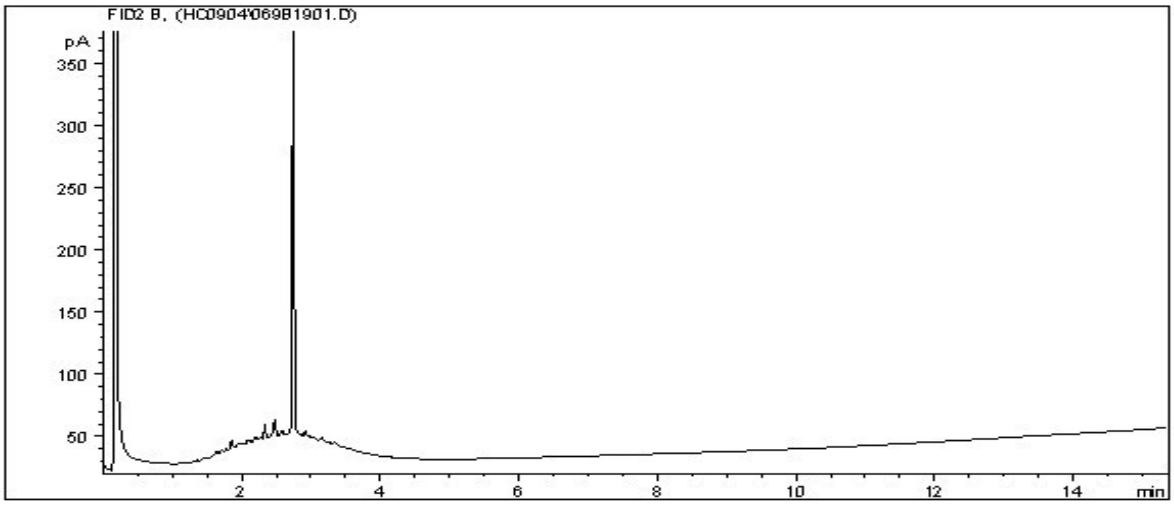
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

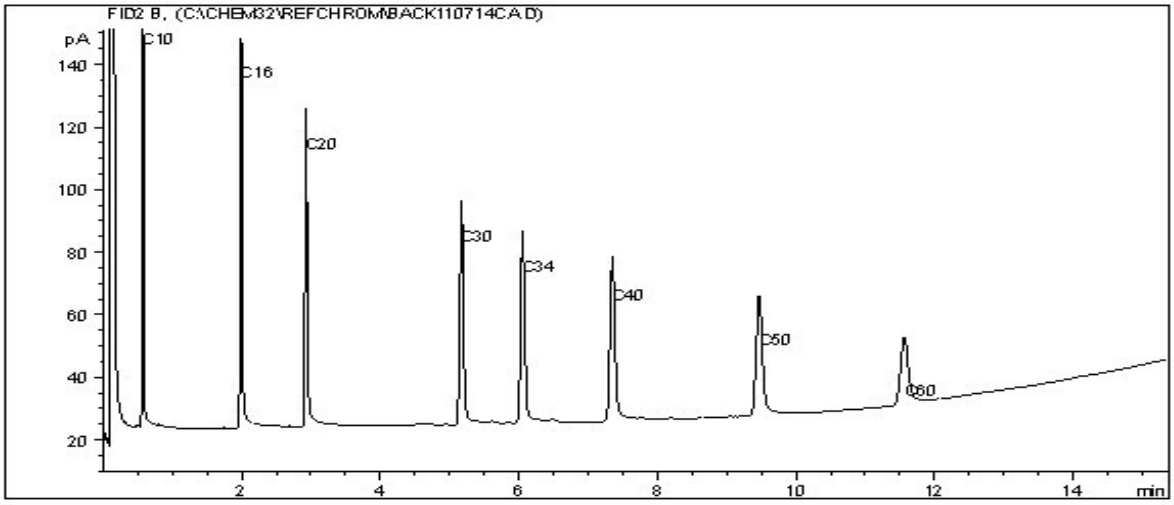
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4016

Client ID: SBDC-4

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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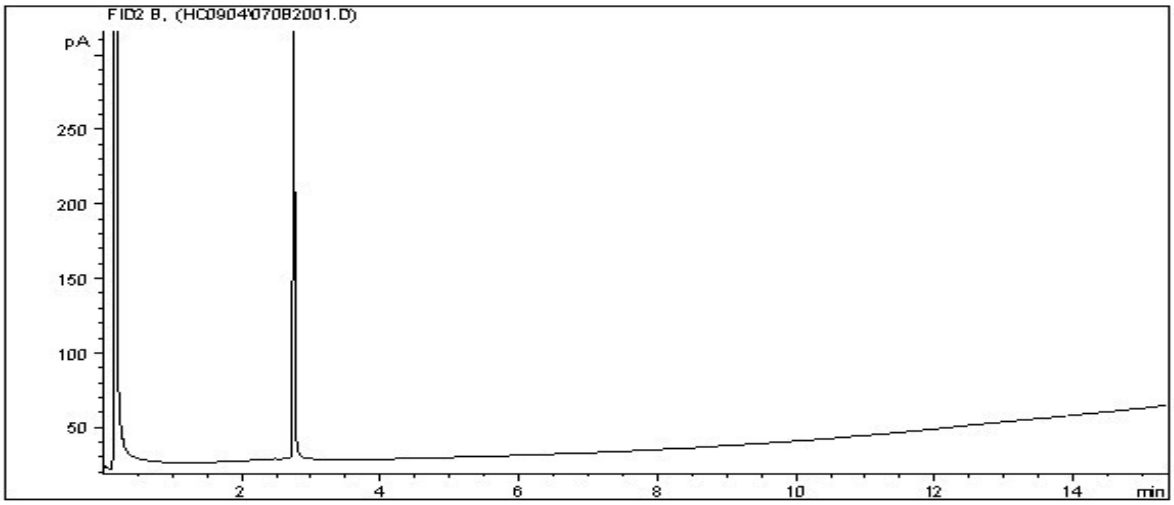
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

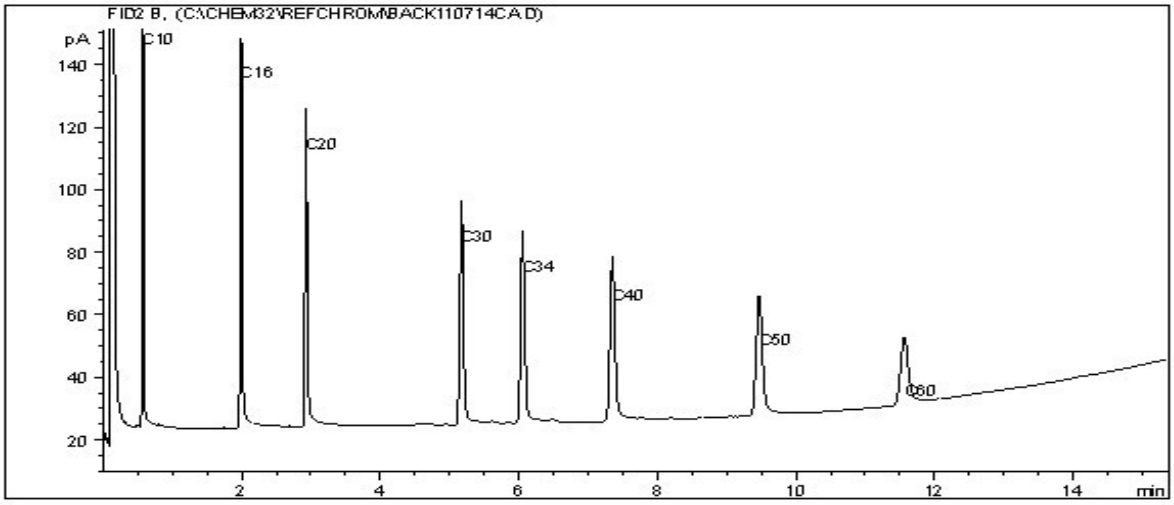
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4017

Client ID: SBDC-5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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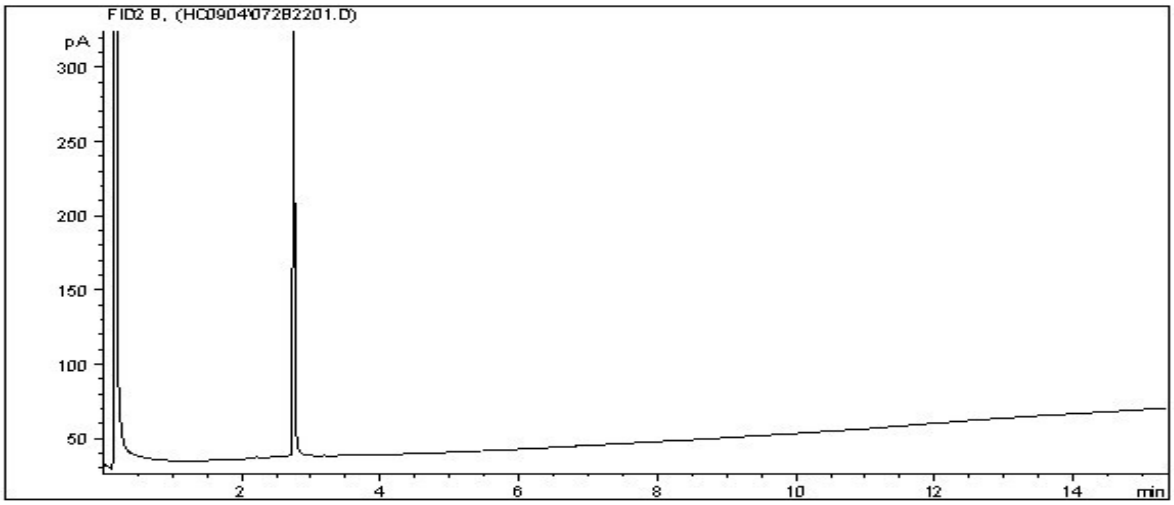
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

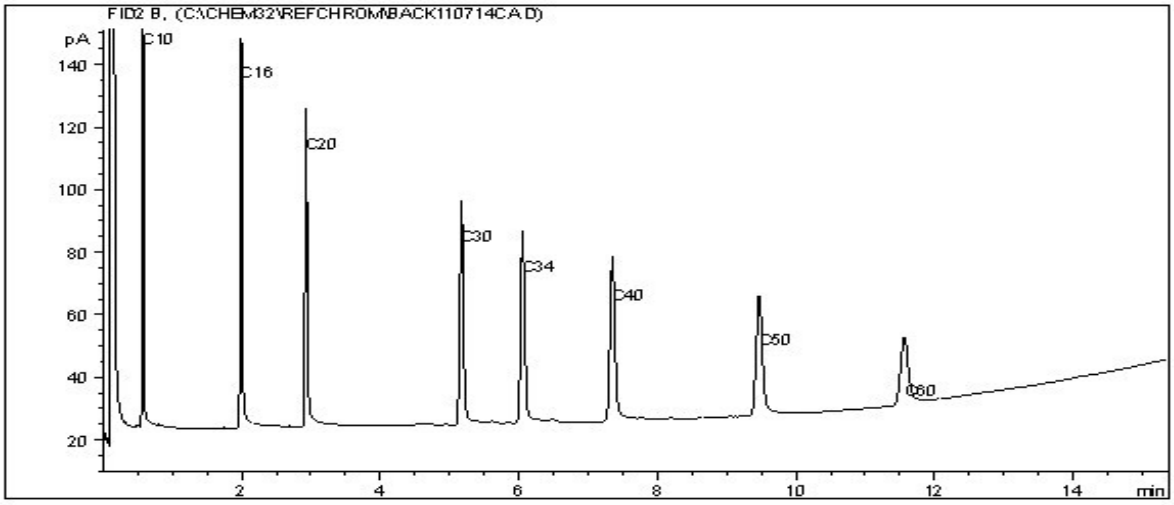
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4062

Client ID: SBWS-1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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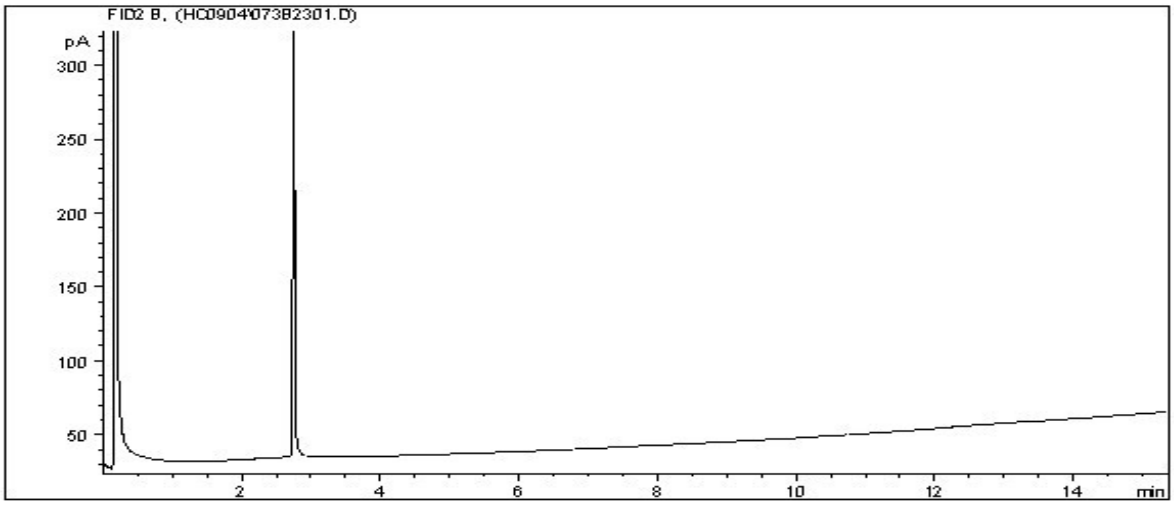
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

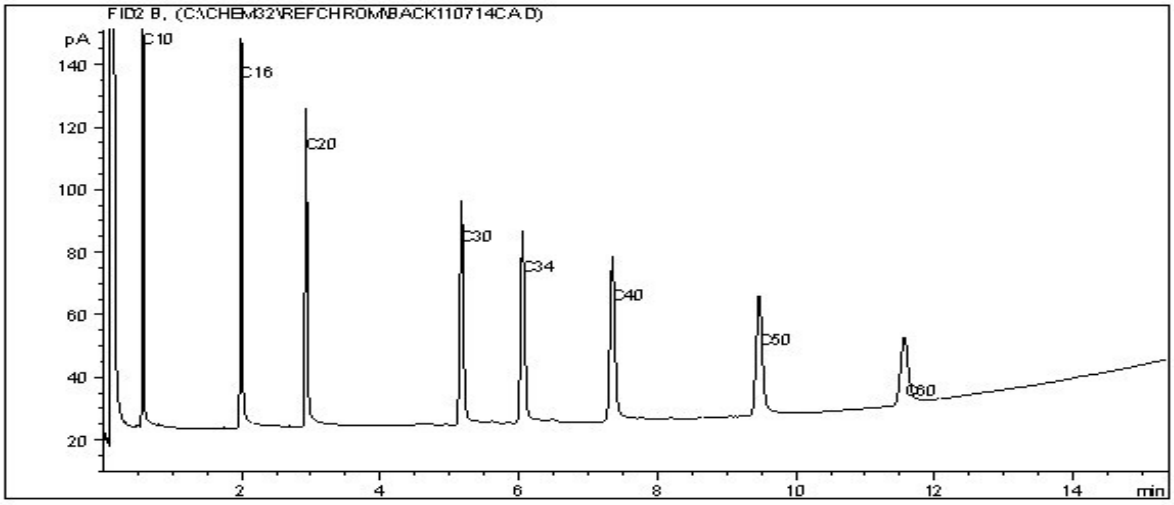
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4063

Client ID: SBWS-2

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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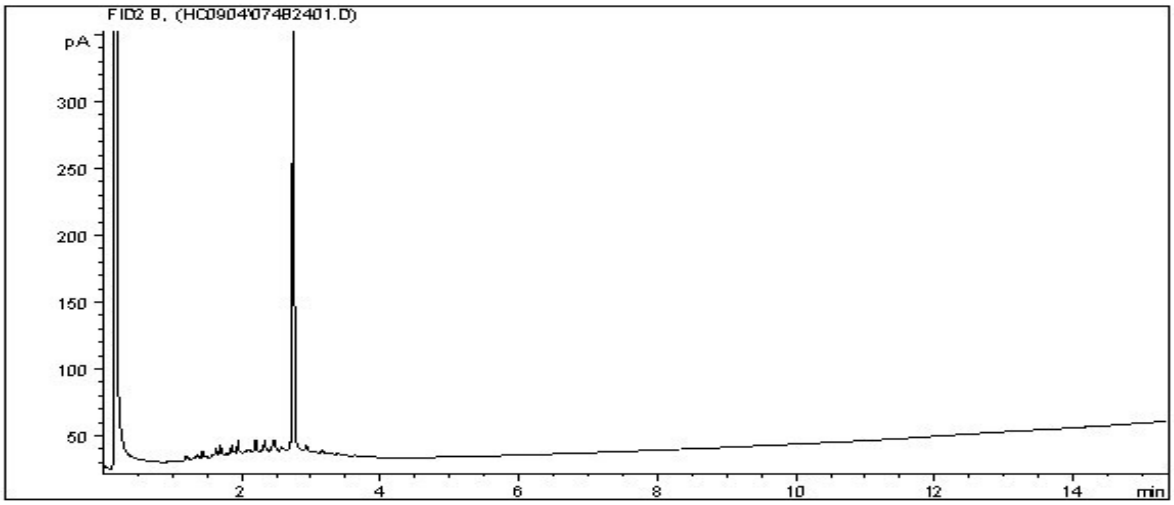
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

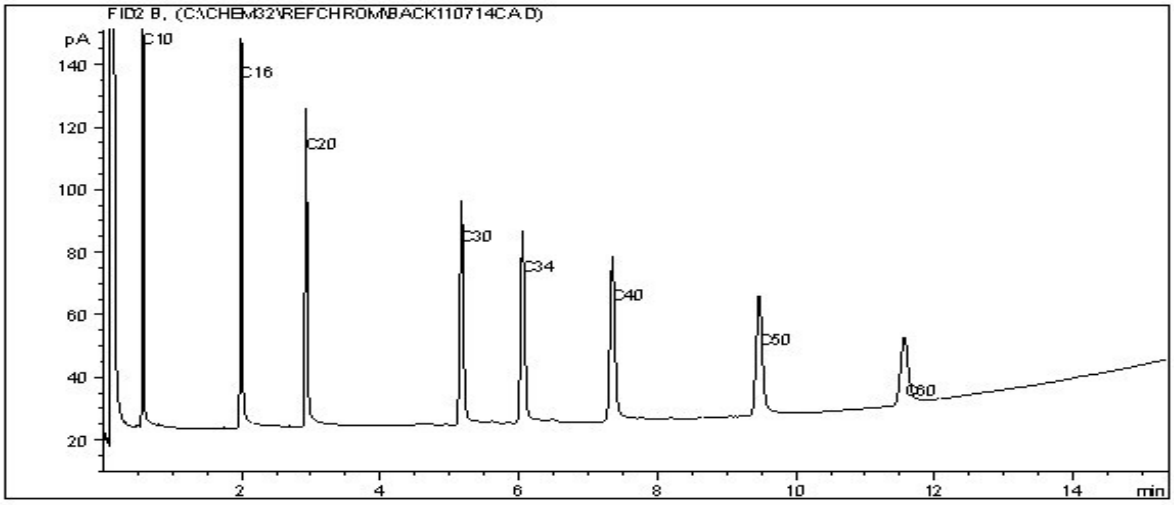
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4064

Client ID: SBWS-3

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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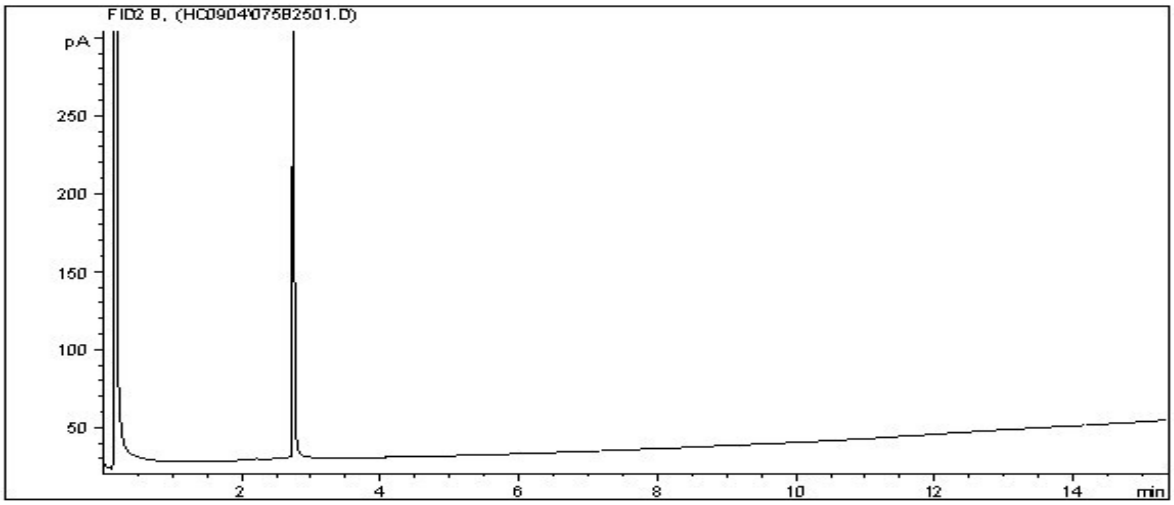
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

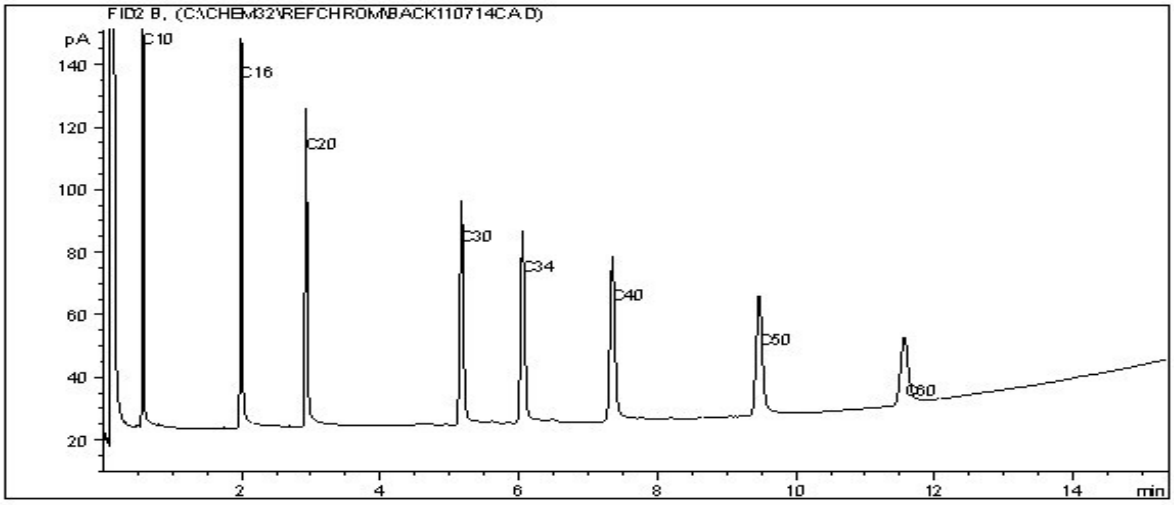
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4065

Client ID: SBWS-4

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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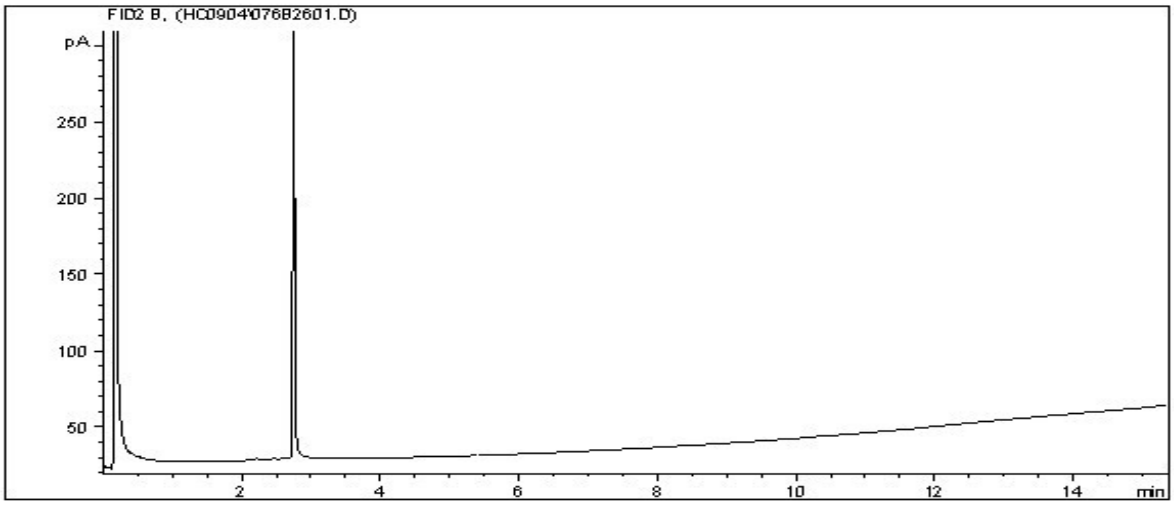
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

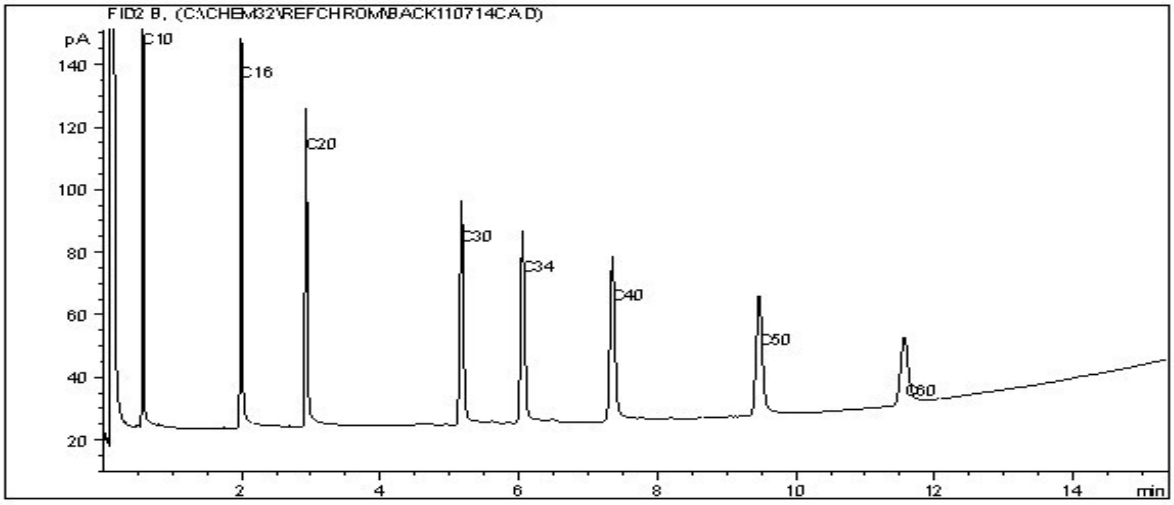
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4066

Client ID: SBWS-5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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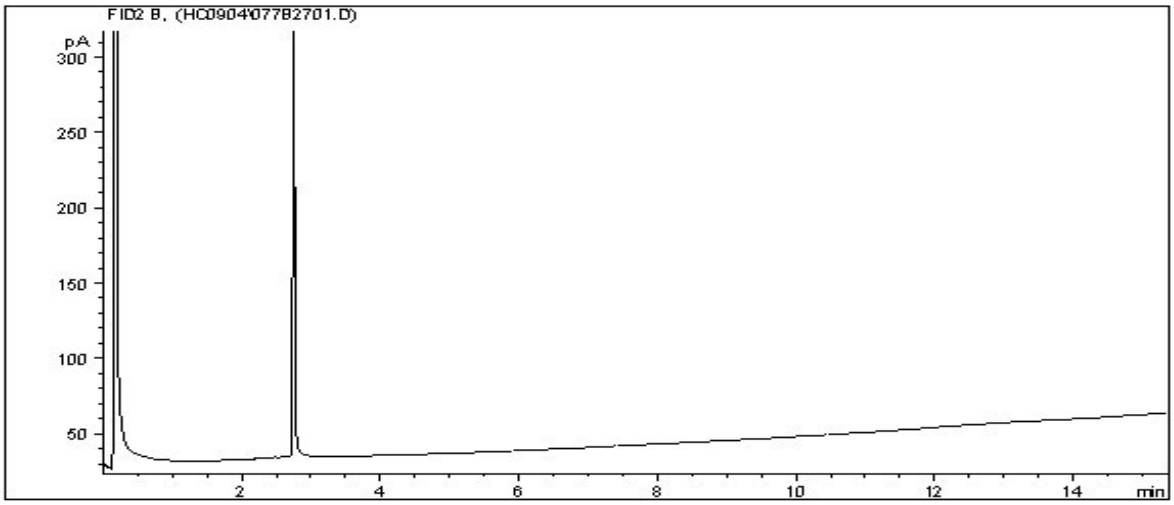
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

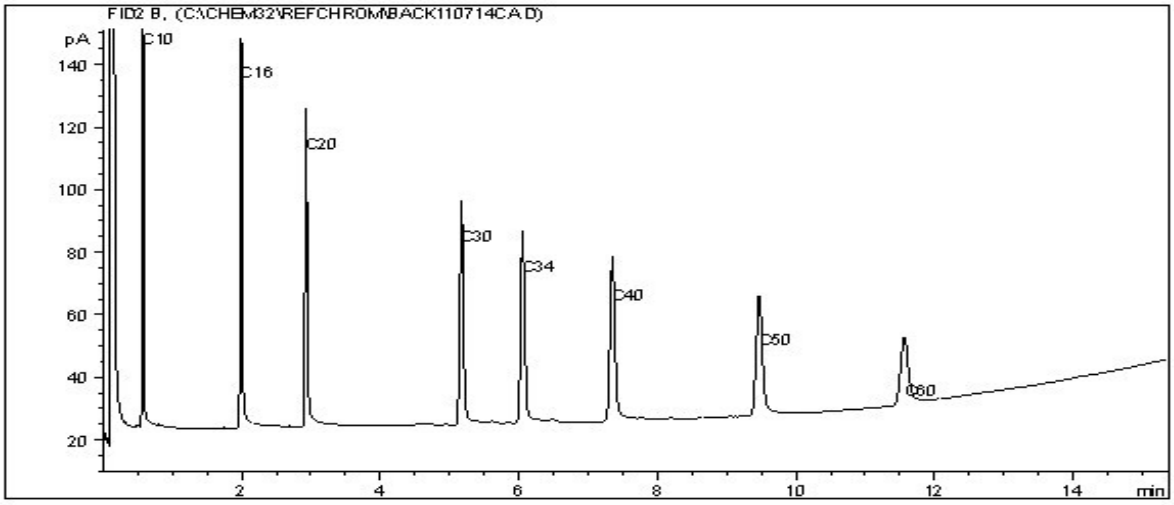
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4067

Client ID: SBAC-1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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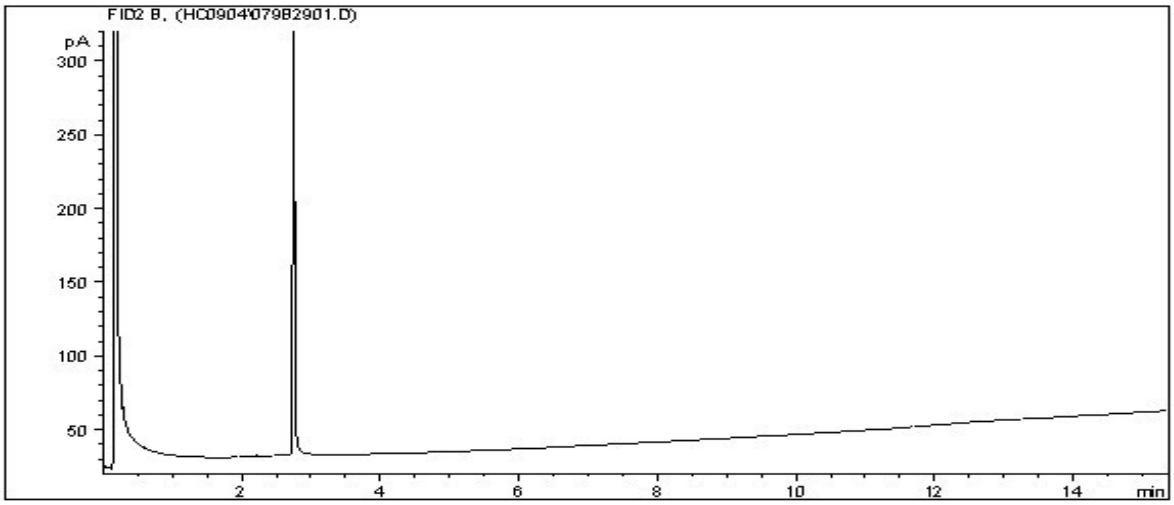
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

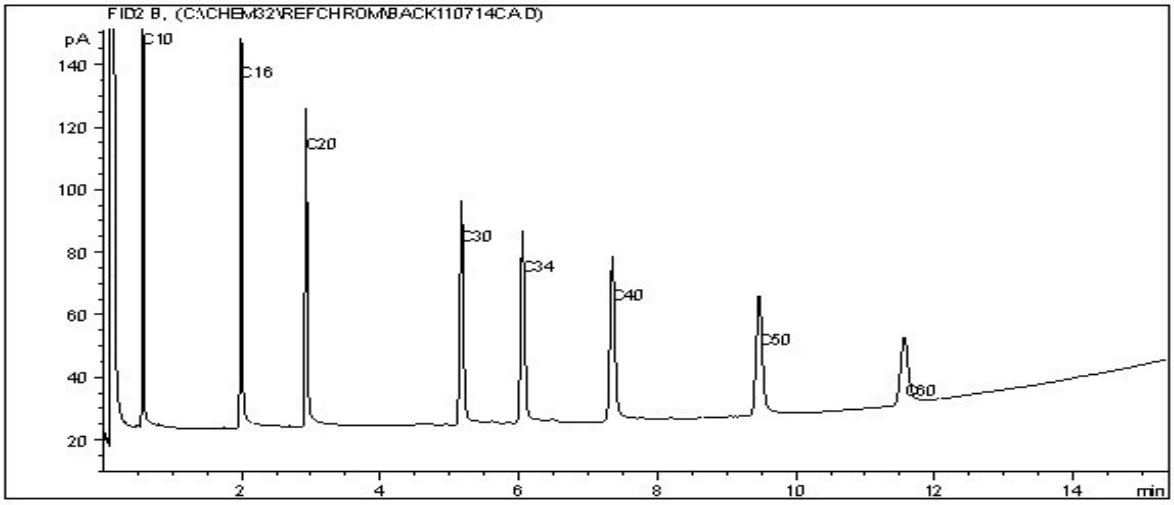
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4068

Client ID: SBAC-2

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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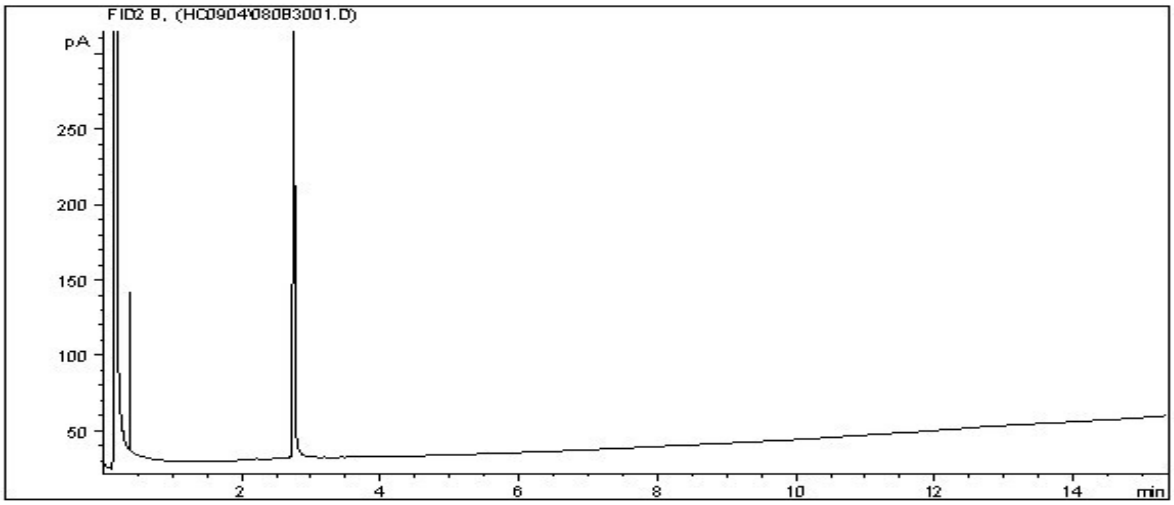
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

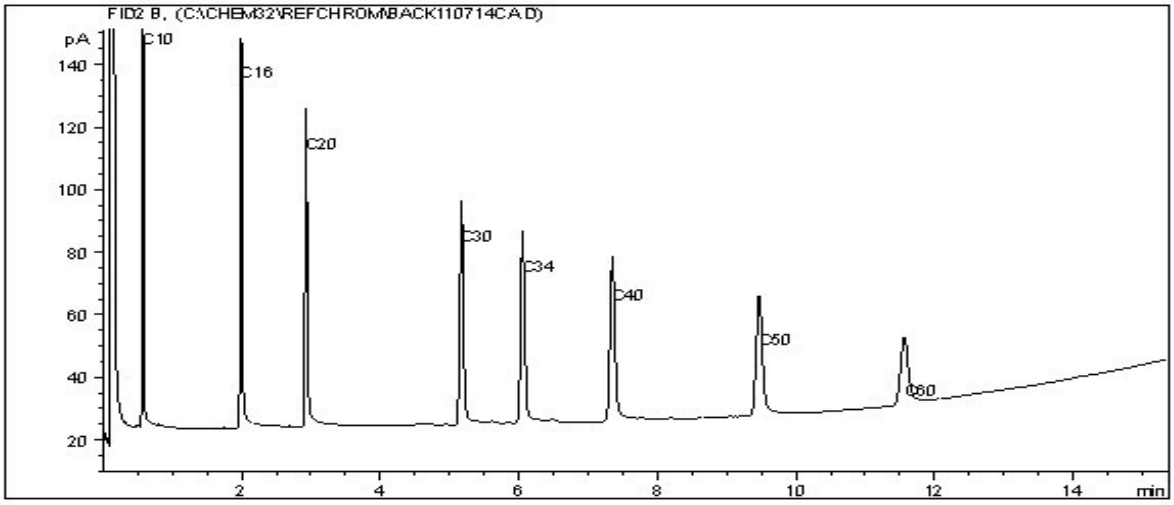
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4069

Client ID: SBAC-3

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

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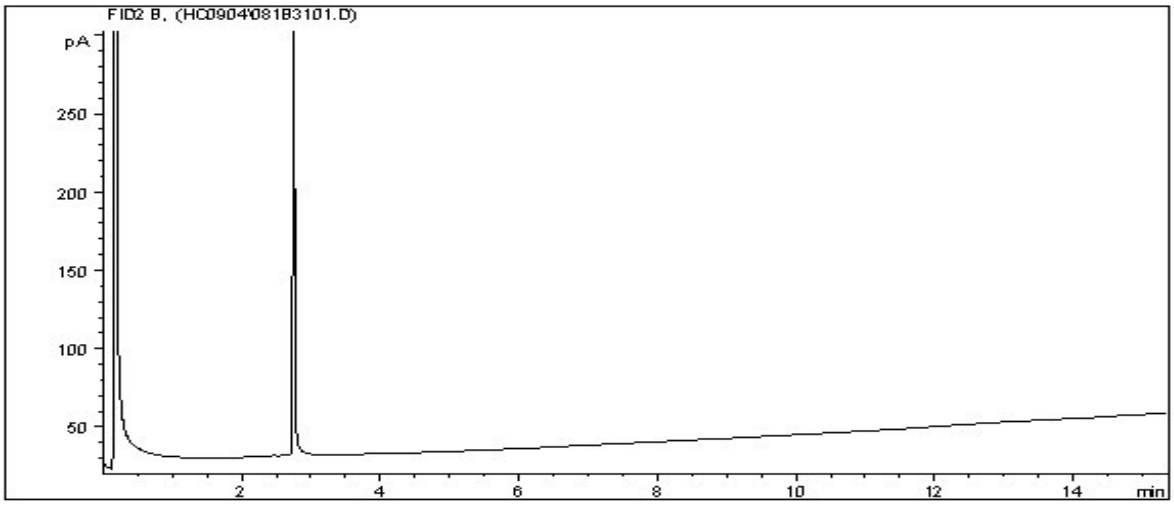
SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

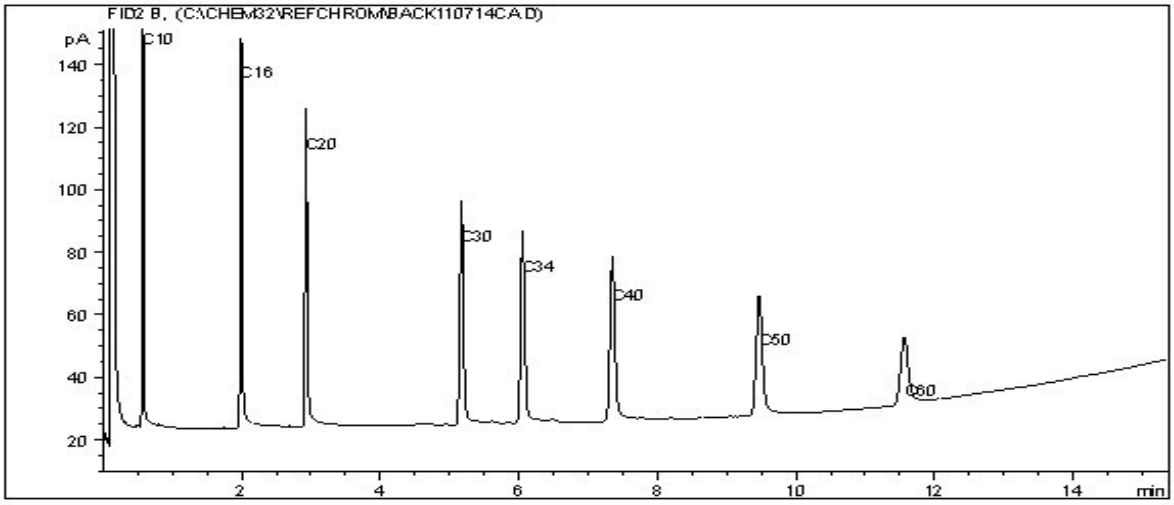
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4070

Client ID: SBAC-4

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

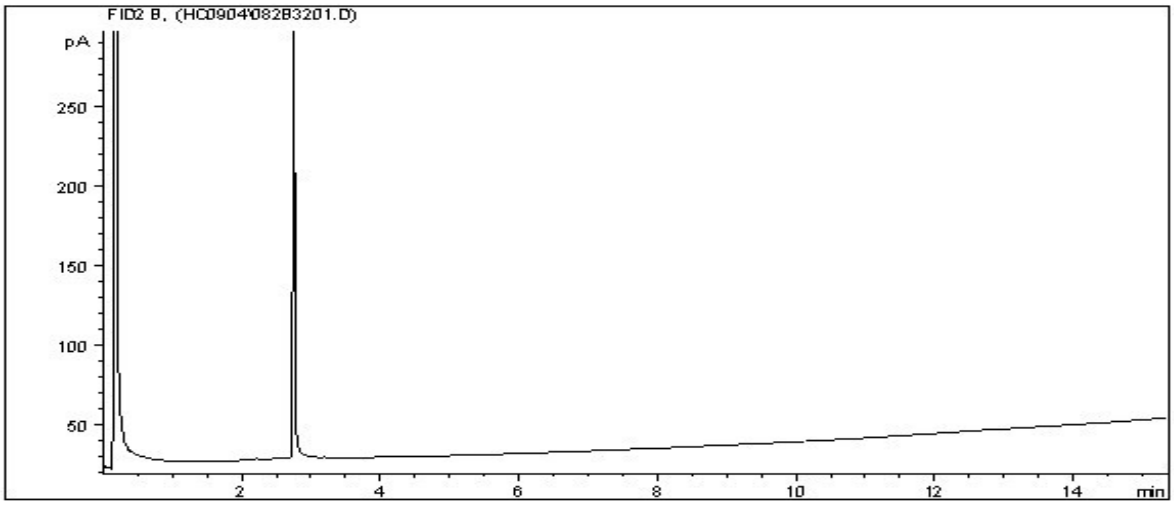
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

SENES CONSULTANTS LIMITED
Client Project #: SAWMILL BAY

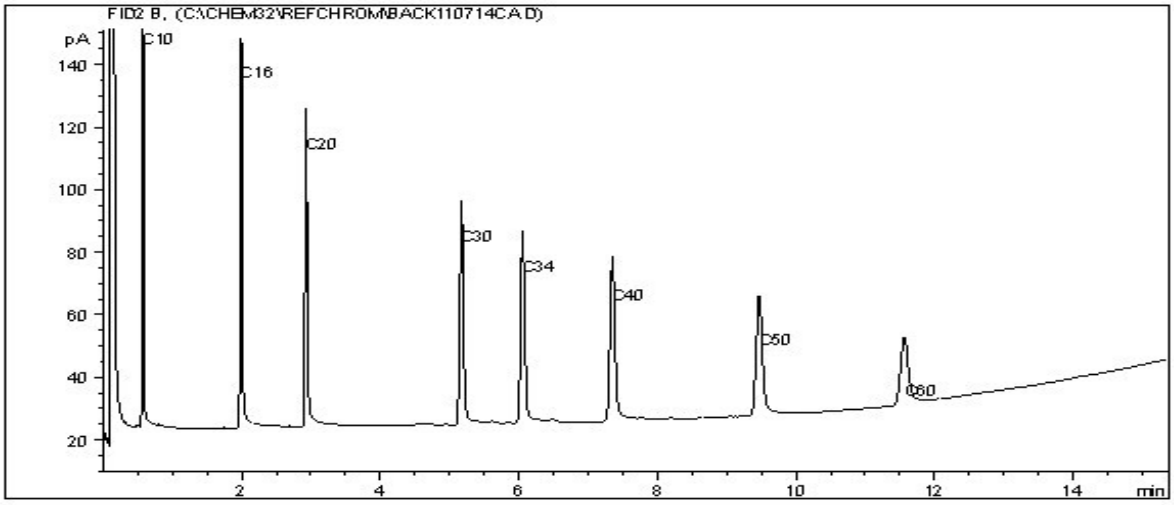
Report Date: 2011/09/07
Maxxam Job #: B181843
Maxxam Sample: BK4071

Client ID: SBAC-5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam

Success Through Science®

Your Project #: 340962-000, GBL1
Site Location: SAWMILL BAY
Your C.O.C. #: A057857

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B179238
Received: 2011/08/24, 13:00

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
See Attached Results (1)	2	2011/08/29	2011/08/29		
BTEX/F1 in Water by HS GC/MS	2	N/A	2011/08/27	CAL SOP-00190	CCME CWS, EPA 8260C
BTEX/F1 in Water by HS GC/MS	1	N/A	2011/08/29	CAL SOP-00190	CCME CWS, EPA 8260C
Cadmium - low level CCME - Dissolved	3	N/A	2011/08/29	AB SOP-00043	EPA 200.8
Mercury - Low Level (Total)	3	2011/08/29	2011/08/29	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved	2	N/A	2011/08/28	AB SOP-00043	EPA 200.8
Elements by ICPMS - Dissolved	1	N/A	2011/08/29	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	1	2011/08/27	2011/08/29	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	2	2011/08/28	2011/08/29	AB SOP-00043	EPA 200.8
pH @25C	2	N/A	2011/08/26	AB SOP-00005	SM 4500-H B
pH @25C	1	N/A	2011/08/27	AB SOP-00005	SM 4500-H B
Phenols (4-AAP)	3	N/A	2011/08/26	CAL SOP-00067	EPA 420.2
Total Extractable Hydrocarbon C11-C30	3	2011/08/26	2011/08/27	AB SOP-00040 SOP-00037	AB EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Maxxam Edmonton Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		BI7969		
Sampling Date		2011/08/23 22:15		
COC#		A057857		
	Units	**PW2-2308A**	**RDL**	**QC Batch**
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	0.55	0.005	5122455
Elements				
Dissolved Cobalt (Co)	mg/L	0.0009	0.0003	5132277
Dissolved Copper (Cu)	mg/L	0.0009	0.0002	5132277
Dissolved Lead (Pb)	mg/L	0.0040	0.0002	5132277
Dissolved Nickel (Ni)	mg/L	0.0023	0.0005	5132277

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		BI7969		
Sampling Date		2011/08/23 22:15		
COC#		A057857		
	Units	**PW2-2308A**	**RDL**	**QC Batch**
Elements				
Total Arsenic (As)	mg/L	0.0006	0.0002	5132174
Total Chromium (Cr)	mg/L	<0.001	0.001	5132174
Total Zinc (Zn)	mg/L	0.084	0.003	5132174

RDL = Reportable Detection Limit

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BI7969	BI8137		BI8201	BI8201	BI8219	BI8221		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30							
COC#		A057857	A057857		A057857	A057857	A057857	A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**QC Batch**	**TRIP BLANK**	**TRIP BLANK Lab-Dup**	**TB MICROTOX 1**	**TB MICROTOX 2**	**RDL**	**QC Batch**
Industrial										
Remark	N/A						SEE ATTACH(1)	SEE ATTACH(1)	N/A	5130659
Misc. Inorganics										
pH	N/A	7.37	7.80	5126211	6.33	6.38			N/A	5129880
Low Level Elements										
Dissolved Cadmium (Cd)	ug/L		0.11	5122455	<0.005				0.005	5127220
Misc. Organics										
Phenols	mg/L	0.006	0.003	5127309	<0.002				0.002	5127309

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		BI7969	BI8137	BI8201		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30			
COC#		A057857	A057857	A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**TRIP BLANK**	**RDL**	**QC Batch**
Elements						
Total Arsenic (As)	mg/L		0.0013	<0.0002	0.0002	5130312
Dissolved Cadmium (Cd)	mg/L		0.00011	<0.000005	0.000005	5130316
Total Chromium (Cr)	mg/L		<0.001	<0.001	0.001	5130312
Dissolved Cobalt (Co)	mg/L		<0.0003	<0.0003	0.0003	5130316
Dissolved Copper (Cu)	mg/L		0.0004(2)	0.0003(2)	0.0002	5130316
Dissolved Lead (Pb)	mg/L		0.0004(2)	<0.0002	0.0002	5130316
Dissolved Nickel (Ni)	mg/L		0.0006(2)	<0.0005	0.0005	5130316
Total Zinc (Zn)	mg/L		0.039	<0.003	0.003	5130312
Low Level Elements						
Total Mercury (Hg)	ug/L	0.011	0.005	0.004	0.002	5132523

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Sample was analyzed after holding time expired.
(2) - Dissolved greater than total. Results are within limits of uncertainty(MU).

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BI7969	BI8137	BI8137	BI8201		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30	2011/08/23 22:30			
COC#		A057857	A057857	A057857	A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**PW4-2308A Lab-Dup**	**TRIP BLANK**	**RDL**	**QC Batch**
Extractable Hydrocarbons							
Undecanes (C11)	mg/L	<0.02	<0.02	<0.02	<0.02	0.02	5127232
Dodecanes (C12)	mg/L	0.07	<0.02	<0.02	<0.02	0.02	5127232
Triadecanes (C13)	mg/L	0.15	0.09	0.08	<0.02	0.02	5127232
Tetradecanes (C14)	mg/L	0.19	0.14	0.13	<0.02	0.02	5127232
Pentadecanes (C15)	mg/L	0.20	0.15	0.13	<0.02	0.02	5127232
Hexadecanes (C16)	mg/L	0.16	0.12	0.10	<0.02	0.02	5127232
Heptadecanes (C17)	mg/L	0.08	0.05	0.05	<0.02	0.02	5127232
Octadecanes (C18)	mg/L	0.10	0.06	0.05	<0.02	0.02	5127232
Nonadecanes (C19)	mg/L	<0.02	<0.02	<0.02	<0.02	0.02	5127232
Eicosanes (C20)	mg/L	0.08	0.04	0.03	<0.02	0.02	5127232
Heneicosanes (C21)	mg/L	0.02	<0.02	<0.02	<0.02	0.02	5127232
Docosanes (C22)	mg/L	0.04	<0.02	<0.02	<0.02	0.02	5127232
Triacosanes (C23)	mg/L	0.03	<0.02	<0.02	<0.02	0.02	5127232
Tetracosanes (C24)	mg/L	0.03	<0.02	<0.02	<0.02	0.02	5127232
Pentacosanes (C25)	mg/L	0.04	<0.03	<0.03	<0.03	0.03	5127232
Hexacosanes (C26)	mg/L	0.04	<0.03	<0.03	<0.03	0.03	5127232
Heptacosanes (C27)	mg/L	0.06	<0.03	<0.03	<0.03	0.03	5127232
Octacosanes (C28)	mg/L	0.06	<0.03	<0.03	<0.03	0.03	5127232
Nonacosanes (C29)	mg/L	0.04	<0.03	<0.03	<0.03	0.03	5127232
Triacontanes (C30)	mg/L	0.06	<0.03	<0.03	<0.03	0.03	5127232
Total Extractables C11 to C30	mg/L	1.5	0.65	0.57	<0.03	0.03	5127232
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	101	104	102	102		5127232

RDL = Reportable Detection Limit

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		BI7969	BI8137		BI8201		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30				
COC#		A057857	A057857		A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**QC Batch**	**TRIP BLANK**	**RDL**	**QC Batch**
Volatiles							
Benzene	ug/L	<0.4	1.2	5124961	<0.4	0.4	5129846
Toluene	ug/L	<0.4	7.8	5124961	<0.4	0.4	5129846
Ethylbenzene	ug/L	<0.4	0.5	5124961	<0.4	0.4	5129846
o-Xylene	ug/L	<0.4	2.1	5124961	<0.4	0.4	5129846
m & p-Xylene	ug/L	<0.8	2.1	5124961	<0.8	0.8	5129846
Xylenes (Total)	ug/L	<0.8	4.2	5124961	<0.8	0.8	5129846
F1 (C6-C10) - BTEX	ug/L	<100	110	5124961	<100	100	5129846
LH (C5-C10)	ug/L	<100	130	5124961	<100	100	5129846
(C6-C10)	ug/L	<100	120	5124961	<100	100	5129846
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	81	91	5124961	95		5129846
4-BROMOFLUOROBENZENE (sur.)	%	112	0.00	5124961	100		5129846
D4-1,2-DICHLOROETHANE (sur.)	%	130	0.00	5124961	108		5129846
D8-TOLUENE (sur.)	%		0.00	5124961			

RDL = Reportable Detection Limit

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

Package 1	5.3°C
Package 2	5.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Sample BI8137-01: Dissolved greater than total for Cd. Results within acceptable limits of precision.

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5124961	1,4-Difluorobenzene (sur.)	2011/08/27	93	70 - 130	97	70 - 130	97	%		
5124961	4-BROMOFLUOROBENZENE (sur.)	2011/08/27	113	70 - 130	102	70 - 130	96	%		
5124961	D4-1,2-DICHLOROETHANE (sur.)	2011/08/27	115	70 - 130	117	70 - 130	113	%		
5124961	Benzene	2011/08/27	99	70 - 130	92	70 - 130	<0.4	ug/L	NC	40
5124961	Toluene	2011/08/27	99	70 - 130	87	70 - 130	<0.4	ug/L	NC	40
5124961	Ethylbenzene	2011/08/27	99	70 - 130	88	70 - 130	<0.4	ug/L	NC	40
5124961	o-Xylene	2011/08/27	90	70 - 130	81	70 - 130	<0.4	ug/L	NC	40
5124961	m & p-Xylene	2011/08/27	87	70 - 130	79	70 - 130	<0.8	ug/L	NC	40
5124961	(C6-C10)	2011/08/27	71	70 - 130	72	70 - 130	<100	ug/L	NC	40
5124961	Xylenes (Total)	2011/08/27					<0.8	ug/L	NC	40
5124961	F1 (C6-C10) - BTEX	2011/08/27					<100	ug/L	NC	40
5126211	pH	2011/08/26			100	97 - 102			0.2	5
5127232	O-TERPHENYL (sur.)	2011/08/27	102	70 - 130	101	70 - 130	102	%		
5127232	Total Extractables C11 to C30	2011/08/27	NC	50 - 130	100	70 - 130	<0.6	mg/L	12.8	40
5127232	Undecanes (C11)	2011/08/27					<0.02	mg/L	NC	40
5127232	Dodecanes (C12)	2011/08/27					<0.02	mg/L	NC	40
5127232	Triadecanes (C13)	2011/08/27					<0.02	mg/L	NC	40
5127232	Tetradecanes (C14)	2011/08/27					<0.02	mg/L	9.3	40
5127232	Pentadecanes (C15)	2011/08/27					<0.02	mg/L	10.5	40
5127232	Hexadecanes (C16)	2011/08/27					<0.02	mg/L	12.3	40
5127232	Heptadecanes (C17)	2011/08/27					<0.02	mg/L	NC	40
5127232	Octadecanes (C18)	2011/08/27					<0.02	mg/L	NC	40
5127232	Nonadecanes (C19)	2011/08/27					<0.02	mg/L	NC	40
5127232	Eicosanes (C20)	2011/08/27					<0.02	mg/L	NC	40
5127232	Heneicosanes (C21)	2011/08/27					<0.02	mg/L	NC	40
5127232	Docosanes (C22)	2011/08/27					<0.02	mg/L	NC	40
5127232	Triacosanes (C23)	2011/08/27					<0.02	mg/L	NC	40
5127232	Tetracosanes (C24)	2011/08/27					<0.02	mg/L	NC	40
5127232	Pentacosanes (C25)	2011/08/27					<0.03	mg/L	NC	40
5127232	Hexacosanes (C26)	2011/08/27					<0.03	mg/L	NC	40
5127232	Heptacosanes (C27)	2011/08/27					<0.03	mg/L	NC	40
5127232	Octacosanes (C28)	2011/08/27					<0.03	mg/L	NC	40
5127232	Nonacosanes (C29)	2011/08/27					<0.03	mg/L	NC	40
5127232	Triacontanes (C30)	2011/08/27					<0.03	mg/L	NC	40
5127309	Phenols	2011/08/26	98	80 - 120	98	89 - 106	<0.002	mg/L	0.6	20
5129846	1,4-Difluorobenzene (sur.)	2011/08/28	97	70 - 130	92	70 - 130	96	%		
5129846	4-BROMOFLUOROBENZENE (sur.)	2011/08/28	103	70 - 130	102	70 - 130	100	%		
5129846	D4-1,2-DICHLOROETHANE (sur.)	2011/08/28	109	70 - 130	114	70 - 130	119	%		
5129846	Benzene	2011/08/29	97	70 - 130	101	70 - 130	<0.4	ug/L	2.1	40
5129846	Toluene	2011/08/29	97	70 - 130	101	70 - 130	<0.4	ug/L	5.7	40

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

QUALITY ASSURANCE REPORT

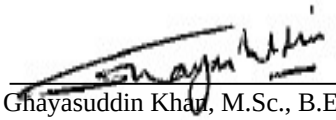
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5129846	Ethylbenzene	2011/08/29	95	70 - 130	98	70 - 130	<0.4	ug/L	10.6	40
5129846	o-Xylene	2011/08/29	86	70 - 130	89	70 - 130	<0.4	ug/L	13.3	40
5129846	m & p-Xylene	2011/08/29	87	70 - 130	88	70 - 130	<0.8	ug/L	11.7	40
5129846	(C6-C10)	2011/08/29	89	70 - 130	75	70 - 130	<100	ug/L	NC	40
5129846	Xylenes (Total)	2011/08/29					<0.8	ug/L	12.1	40
5129846	F1 (C6-C10) - BTEX	2011/08/29					<100	ug/L	NC	40
5129880	pH	2011/08/27			100	97 - 102			0.7	5
5130312	Total Arsenic (As)	2011/08/28	105	80 - 120	99	80 - 120	<0.0002	mg/L	0.6	20
5130312	Total Chromium (Cr)	2011/08/28	104	80 - 120	101	80 - 120	<0.001	mg/L	NC	20
5130312	Total Zinc (Zn)	2011/08/28	NC	80 - 120	102	80 - 120	<0.003	mg/L	0.8	20
5130316	Dissolved Cadmium (Cd)	2011/08/28	113	80 - 120	99	80 - 120	<0.000005	mg/L		
5130316	Dissolved Cobalt (Co)	2011/08/28	108	80 - 120	97	80 - 120	<0.0003	mg/L	NC	20
5130316	Dissolved Copper (Cu)	2011/08/28	101	80 - 120	97	80 - 120	<0.0002	mg/L	18.3	20
5130316	Dissolved Lead (Pb)	2011/08/28	106	80 - 120	98	80 - 120	<0.0002	mg/L	NC	20
5130316	Dissolved Nickel (Ni)	2011/08/28	103	80 - 120	97	80 - 120	<0.0005	mg/L	NC	20
5132174	Total Arsenic (As)	2011/08/29	100	80 - 120	100	80 - 120	<0.0002	mg/L	NC	20
5132174	Total Chromium (Cr)	2011/08/29	102	80 - 120	103	80 - 120	<0.001	mg/L	NC	20
5132174	Total Zinc (Zn)	2011/08/29	99	80 - 120	101	80 - 120	<0.003	mg/L	NC	20
5132277	Dissolved Cobalt (Co)	2011/08/29	117	80 - 120	99	80 - 120	<0.0003	mg/L	NC	20
5132277	Dissolved Copper (Cu)	2011/08/29	115	80 - 120	97	80 - 120	0.0003, RDL=0.0002	mg/L	19.7	20
5132277	Dissolved Lead (Pb)	2011/08/29	108	80 - 120	98	80 - 120	<0.0002	mg/L	NC	20
5132277	Dissolved Nickel (Ni)	2011/08/29	115	80 - 120	99	80 - 120	<0.0005	mg/L	NC	20
5132523	Total Mercury (Hg)	2011/08/29	118	80 - 120	106	80 - 120	0.003, RDL=0.002	ug/L	NC	20

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

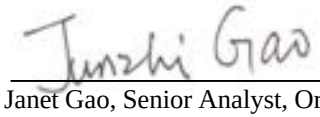
Validation Signature Page

Maxxam Job #: B179238

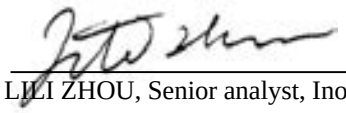
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



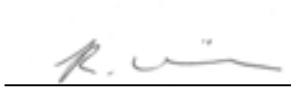
Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab



Janet Gao, Senior Analyst, Organics Department



LILI ZHOU, Senior analyst, Inorganic department.



Robert Vivian, Senior Analyst

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Calgary 4000 19st St. NE, T2E 6P8, Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton 9331 - 48 Street, T6B 2R4, Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 485-8569
www.maxxamanalytics.com

Chain of Custody

A057857

Page: 1 of 1

	Invoice To:	C/O Report Address ☐	Report To:	Same as Invoice ☐	Report Distribution (E-Mail):
Company:	SENES		J. Mauchan		jmauchan@desltd.ca
Contact:	J. Mauchan C. Gravelle				rjanzen@desltd.ca
Address:	Richmond Hill				
	Prov:	PC:	Prov:	PC:	
Contact #s:	Ph:	Cell:	Ph:	Cell:	

REGULATORY GUIDELINES:
☐ AT1
☑ CCME
☐ Regulated Drinking Water
☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #: 340962-000
Project # / Name: GBL 1
Site Location: SAWMILL BAY
Quote #:
Sampled By:

SERVICE REQUESTED:
☑ RUSH (Contact lab to reserve) Date Required: see note
☐ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix (Soil)	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐BTEX F1 ☐VOCs	☐BTEX F1-F2 ☐BTEX F1-F4	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury	☐ Total ☐ Dissolved	Other Analysis: BTEX C6-C10	pH	TEH30	Phenols	Dissolved Cu Cd Ni Pb Co	Total As Hg Zn Cr	Toxicity Microtox EC50(15)			HOLD - Do not Analyze	# of Containers Submitted
1	PW2-2308A	NA	Sw	11/08/23 2215															✓	✓	✓	✓	✓	✓	✓				
2	PW2-2308B	↓	↓	"																							✓	
3	PW4-2308A			11/08/23 2230															✓	✓	✓	✓	✓	✓	✓				
4	PW4-2308B			"																					1,30		✓	
5																									2Hg			
6																												
7																												
8																												
9																												
10																												
11																												
12																												

ARRIVED AT DEPOT:
AUG 25 2011
TEMP: 5 | 6 | 5

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Ryan Janzen Ryan Janzen	11/08/23	2345
Received By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:
Report results when microtox expected

# of Jars Used & Not Submitted:

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B179238		
			Custody Seal	Temperature	Ice
Lab Comments:					

RECEIVED AUG 25 2011 0800

AB FCD-02321 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

Joyce Kimani

From: Ryan Janzen [rjanzen@dcsltd.ca]
Sent: Friday, August 26, 2011 12:21 PM
To: Joyce Kimani
Subject: RE: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Location: SAWMILL BAY

Hi Joyce,

Yes, please do an analysis for phenols as well.

Thanks,

Ryan

From: Joyce Kimani [mailto:JKimani@maxxam.ca]
Sent: August-26-11 1:16 PM
To: Ryan Janzen
Cc: cgravelle@dcsltd.ca
Subject: RE: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Location: SAWMILL BAY

Hi Ryan,

We will go ahead with the analysis however, a phenol bottle was not provided for the Trip Blank. If you want we can pour off one from one of the unpreserved 250mL ambers that were provided. Please confirm.

JOYCE KIMANI
Project Manager Assistant
jkimani@maxxam.ca
Direct Line 403 219 3683
Main Office 403 291 3077
4000 19th Street NE / Calgary, AB Canada T2E 6P8

From: Ryan Janzen [mailto:rjanzen@dcsltd.ca]
Sent: Friday, August 26, 2011 10:58 AM
To: Calgary Customer Service
Cc: cgravelle@dcsltd.ca
Subject: RE: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Location: SAWMILL BAY

Hi Joyce,

Here is the table that details what the samples are being analyzed for. I suppose the trip blanks should get the same analysis.

Here is the re-created COC, as best I can do it.

Sample ID	Matrix	Date/Time	BTEX/C6-C10	pH	TEH 30	Phenols	Dissolved Metals (Cu, Cd,	Total Metals (As,	Toxici EC50 (15)

2011/08/26

							Ni, Pb, Co)	Hg, Zn, Cr)		
PW2-2308A	Water	23/08/2011 – 2215	X	X	X	X	X	X	X	
PW2-2308B	Water	23/08/2011 – 2215								X
PW4-2308A	Water	23/08/2011 – 2230	X	X	X	X	X	X	X	
PW4-2308B	Water	23/08/2011 – 2230								X

Thanks,

Ryan

-----Original Message-----
From: customerservicecalgary@maxxam.ca [mailto:customerservicecalgary@maxxam.ca]
Sent: August-26-11 12:47 PM
To: jmauchan@desltd.ca; rjanzen@desltd.ca
Subject: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Locatiog: SAWMILL BAY
Importance: High

CONFIRMATION-RECEPTION OF SAMPLES FOR ANALYSIS

Hello,

Attached is the job confirmation for your sample submission. I just wanted to confirm what analysis you need for the trip blank sample. Please let us know as soon as possible so that we can start with the analysis.

Thank you

Joyce Kimani

MAXXAM ANALYTICS
4000 19st N.E
Calgary, Alberta T2E 6P8
http://www.maxxam.ca

2011/08/26

Microtox Report

Project : B179238-BI8219
Tech: RL

Sample Data :

Company Name :	Senes Consultants Limited		
City :	Richmond, ON		
Sample Description :	TB Microtox 1		
Sample Location :	Sawmill Bay		
Sampling Method :	Grab		
Volume Obtained :	250 mL		
Sampled By :	n/g		
	YY MM DD		
Sample Date :	11 08 23	Time:	n/g
Date Received :	11 08 27	Time:	8:32
Date of Assay :	11 08 27	Time:	10:45
Report Date :	11 07 29		
Storage Temp :	4 ± 2 °C		
Sample Prep:	pH adjusted from 8.9 to 8.5 with HCl		

Test Data:

Appearance, Visual :	clear	
Turbidity, Visual :	none	
Initial pH :	8.5	
Sample Dilution :	neat	
IC50 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC50 (15min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (15min, 15°C) :	>100%	95% Confidence Interval : n/a

Note: The results relate only to the item tested.

Results of Phenol Reference Test :

Current	IC50 @ 5 min. :	19.1 mg/L
	95 % Confidence Interval :	13.6<19.1<26.6
	Date of Reference Bioassay :	11 08 27
Historical	Geometric Mean IC50 @ 5min.:	18.8 mg/L
	Mean ± 2SD:	15.1<18.8<24.2
	Method:	Shewhart

The reference toxicant is conducted under the same conditions as the definitive testing.

Data & QA/QC Reviewed By : _____ Robert Vivian, Bioassay Senior Analyst

Microtox Report

Project : B179238-BI8219

Test Information : Sample Description : TB Microtox 1

Type of Test :	15 min. Static Bioassay
Test Species :	Vibrio fischeri (Bioluminescent bacteria)
Source of Test Species :	STRATEGIC DIAGNOSTICS Inc.
Reagent Lot # :	10L1004
Date Obtained :	2011/05/03
Expiry Date :	2012/11/30
Reagent Holding Temp :	< - 20°C
Test Protocol :	Environment Canada EPS 1/RM/24
Salinity Adjustment :	Osmotic Adjusting Solution (200 uL)
Analyzer Used :	MICROBICS Analyzer Model 500
Calculation Method :	MICROTOX OMNI Version 1.18

Data Table: Sample vs Light Emission at Time T

Time (min.)	Sample Concentration [% v/v] Control	10.2	20.5	40.9	81.8
T0	95	92	93	93	92
T5	97	92	94	94	90
T15	91	88	90	91	87
T30*					
T60*					

* If applicable

General Comments: _____

Microtox Report

Project : B179238-BI8221
Tech: RL

Sample Data :

Company Name :	Senes Consultants Limited		
City :	Richmond, ON		
Sample Description :	TB Microtox 2		
Sample Location :	Sawmill Bay		
Sampling Method :	Grab		
Volume Obtained :	250 mL		
Sampled By :	n/g		
	YY MM DD		
Sample Date :	11 08 23	Time:	n/g
Date Received :	11 08 27	Time:	8:32
Date of Assay :	11 08 27	Time:	10:45
Report Date :	11 07 29		
Storage Temp :	4 ± 2 °C		
Sample Prep:	pH adjusted from 8.7 to 8.1 with HCl		

Test Data:

Appearance, Visual :	clear	
Turbidity, Visual :	none	
Initial pH :	8.1	
Sample Dilution :	neat	
IC50 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC50 (15min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (15min, 15°C) :	>100%	95% Confidence Interval : n/a

Note: The results relate only to the item tested.

Results of Phenol Reference Test :

Current	IC50 @ 5 min. :	19.1 mg/L
	95 % Confidence Interval :	13.6<19.1<26.6
	Date of Reference Bioassay :	11 08 27
Historical	Geometric Mean IC50 @ 5min.:	18.8 mg/L
	Mean ± 2SD:	15.1<18.8<24.2
	Method:	Shewhart

The reference toxicant is conducted under the same conditions as the definitive testing.

Data & QA/QC Reviewed By : _____ Robert Vivian, Bioassay Senior Analyst

Maxxam Analytics

Microtox Report

Project : B179238-BI8221

Test Information :

Sample Description : TB Microtox 2

Type of Test :	15 min. Static Bioassay
Test Species :	Vibrio fischeri (Bioluminescent bacteria)
Source of Test Species :	STRATEGIC DIAGNOSTICS Inc.
Reagent Lot # :	10L1004
Date Obtained :	2011/05/03
Expiry Date :	2012/11/30
Reagent Holding Temp :	< - 20°C
Test Protocol :	Environment Canada EPS 1/RM/24
Salinity Adjustment :	Osmotic Adjusting Solution (200 uL)
Analyzer Used :	MICROBICS Analyzer Model 500
Calculation Method :	MICROTOX OMNI Version 1.18

Data Table: Sample vs Light Emission at Time T

Time (min.)	Sample Concentration [% v/v] Control	10.2	20.5	40.9	81.8
T0	93	91	92	93	91
T5	97	93	94	94	88
T15	92	89	92	93	87
T30*					
T60*					

* If applicable

General Comments:

Your P.O. #: 340962-000
Your Project #: GBL 1
Site Location: SAWMILL BAY
Your C.O.C. #: 153453-1

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B169677
Received: 2011/08/02, 9:40

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS (1)	1	N/A	2011/08/03	EENVSOP-00004 EENVSOP-00002	EPA 8260C/5021A/CCME
Mercury - Low Level (Total)	1	2011/08/03	2011/08/03	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved (1)	1	N/A	2011/08/04	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total (1)	1	2011/08/04	2011/08/04	AB SOP-00043	EPA 200.8
Oil and Grease by IR	1	2011/08/03	2011/08/04	CAL SOP-00096	SM 5520C
Oil & Grease (sheen) (1)	1	N/A	2011/08/03	EENV WI-00061	N/A
Phenols (4-AAP) (1)	1	N/A	2011/08/03	EENVSOP-00061	EPA 420.2

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Edmonton Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

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Total cover pages: 1

Maxxam Job #: B169677
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAWMILL BAY
Your P.O. #: 340962-000
Sampler Initials: JM/

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BD4757		
Sampling Date		2011/07/29 16:00		
COC Number		153453-1		
	Units	**SB-W-1**	**RDL**	**QC Batch**
Misc. Organics				
Oil and grease	mg/L	6	2	5057407
Phenols	mg/L	0.028	0.002	5061049
Physical Properties				
Visible Sheen	N/A	No	N/A	5057875

RDL = Reportable Detection Limit

Maxxam Job #: B169677
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAWMILL BAY
Your P.O. #: 340962-000
Sampler Initials: JM/

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		BD4757		
Sampling Date		2011/07/29 16:00		
COC Number		153453-1		
	Units	**SB-W-1**	**RDL**	**QC Batch**
Elements				
Total Arsenic (As)	mg/L	0.019	0.0002	5061483
Dissolved Cadmium (Cd)	mg/L	0.000013	0.000005	5061384
Total Chromium (Cr)	mg/L	<0.001	0.001	5061483
Dissolved Cobalt (Co)	mg/L	<0.0003	0.0003	5061384
Dissolved Copper (Cu)	mg/L	0.0003	0.0002	5061384
Dissolved Lead (Pb)	mg/L	0.039	0.0002	5061384
Dissolved Nickel (Ni)	mg/L	<0.0005	0.0005	5061384
Total Zinc (Zn)	mg/L	0.007	0.003	5061483
Low Level Elements				
Total Mercury (Hg)	ug/L	0.010	0.002	5058357

RDL = Reportable Detection Limit

Maxxam Job #: B169677
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAWMILL BAY
Your P.O. #: 340962-000
Sampler Initials: JM/

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		BD4757		
Sampling Date		2011/07/29 16:00		
COC Number		153453-1		
	Units	**SB-W-1**	**RDL**	**QC Batch**
Volatiles				
Benzene	ug/L	<0.4	0.4	5058128
Toluene	ug/L	1.0	0.4	5058128
Ethylbenzene	ug/L	<0.4	0.4	5058128
o-Xylene	ug/L	2.5	0.4	5058128
m & p-Xylene	ug/L	2.1	0.8	5058128
Xylenes (Total)	ug/L	4.6	0.8	5058128
F1 (C6-C10) - BTEX	ug/L	340	100	5058128
(C6-C10)	ug/L	340	100	5058128
Surrogate Recovery (%)				
4-BROMOFLUOROBENZENE (sur.)	%	96		5058128
D4-1,2-DICHLOROETHANE (sur.)	%	95		5058128
D8-TOLUENE (sur.)	%	98		5058128

RDL = Reportable Detection Limit

Maxxam Job #: B169677
Report Date: 2011/08/04

SENES CONSULTANTS LIMITED
Client Project #: GBL 1
Site Location: SAWMILL BAY
Your P.O. #: 340962-000
Sampler Initials: JM/

General Comments

Results relate only to the items tested.

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL 1
P.O. #: 340962-000
Site Location: SAWMILL BAY

Quality Assurance Report

Maxxam Job Number: CB169677

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5057407	RC8	Spiked Blank	Oil and grease	2011/08/04		100	%	70 - 130
		Method Blank	Oil and grease	2011/08/04	<2		mg/L	
5058128	PS7	Matrix Spike	4-BROMOFLUOROBENZENE (sur.)	2011/08/03		98	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/03		85	%	70 - 130
			D8-TOLUENE (sur.)	2011/08/03		97	%	70 - 130
			Benzene	2011/08/03		101	%	70 - 130
			Toluene	2011/08/03		98	%	70 - 130
			Ethylbenzene	2011/08/03		105	%	70 - 130
			o-Xylene	2011/08/03		105	%	70 - 130
			m & p-Xylene	2011/08/03		107	%	70 - 130
			(C6-C10)	2011/08/03		101	%	70 - 130
		Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2011/08/03		97	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/03		86	%	70 - 130
			D8-TOLUENE (sur.)	2011/08/03		99	%	70 - 130
			Benzene	2011/08/03		99	%	70 - 130
			Toluene	2011/08/03		98	%	70 - 130
			Ethylbenzene	2011/08/03		102	%	70 - 130
			o-Xylene	2011/08/03		103	%	70 - 130
			m & p-Xylene	2011/08/03		104	%	70 - 130
			(C6-C10)	2011/08/03		110	%	70 - 130
		Method Blank	4-BROMOFLUOROBENZENE (sur.)	2011/08/03		96	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/03		86	%	70 - 130
			D8-TOLUENE (sur.)	2011/08/03		95	%	70 - 130
			Benzene	2011/08/03	<0.4		ug/L	
			Toluene	2011/08/03	<0.4		ug/L	
			Ethylbenzene	2011/08/03	<0.4		ug/L	
			o-Xylene	2011/08/03	<0.4		ug/L	
			m & p-Xylene	2011/08/03	<0.8		ug/L	
			Xylenes (Total)	2011/08/03	<0.8		ug/L	
			F1 (C6-C10) - BTEX	2011/08/03	<100		ug/L	
			(C6-C10)	2011/08/03	<100		ug/L	
		RPD	Benzene	2011/08/03	NC		%	40
			Toluene	2011/08/03	NC		%	40
			Ethylbenzene	2011/08/03	NC		%	40
			o-Xylene	2011/08/03	NC		%	40
			m & p-Xylene	2011/08/03	NC		%	40
			Xylenes (Total)	2011/08/03	NC		%	40
			F1 (C6-C10) - BTEX	2011/08/03	NC		%	40
			(C6-C10)	2011/08/03	NC		%	40
5058357	VGG	Matrix Spike	Total Mercury (Hg)	2011/08/03		111	%	80 - 120
		Spiked Blank	Total Mercury (Hg)	2011/08/03		117	%	80 - 120
		Method Blank	Total Mercury (Hg)	2011/08/03	<0.002		ug/L	
		RPD	Total Mercury (Hg)	2011/08/03	NC		%	20
5061049	LP5	Matrix Spike	Phenols	2011/08/03		95	%	80 - 120
		Spiked Blank	Phenols	2011/08/03		81	%	80 - 120
		Method Blank	Phenols	2011/08/03	<0.002		mg/L	
		RPD	Phenols	2011/08/03	NC		%	20
5061384	EO1	Matrix Spike						
		[BD4757-01]	Dissolved Cadmium (Cd)	2011/08/04		104	%	80 - 120
			Dissolved Cobalt (Co)	2011/08/04		104	%	80 - 120
			Dissolved Copper (Cu)	2011/08/04		103	%	80 - 120
			Dissolved Lead (Pb)	2011/08/04		NC	%	80 - 120
			Dissolved Nickel (Ni)	2011/08/04		104	%	80 - 120
		Spiked Blank	Dissolved Cadmium (Cd)	2011/08/04		100	%	80 - 120
			Dissolved Cobalt (Co)	2011/08/04		101	%	80 - 120

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL 1
P.O. #: 340962-000
Site Location: SAWMILL BAY

Quality Assurance Report (Continued)

Maxxam Job Number: CB169677

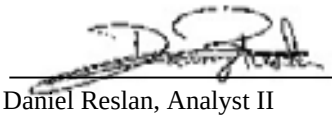
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5061384	EO1	Spiked Blank	Dissolved Copper (Cu)	2011/08/04		100	%	80 - 120
			Dissolved Lead (Pb)	2011/08/04		103	%	80 - 120
			Dissolved Nickel (Ni)	2011/08/04		101	%	80 - 120
		Method Blank	Dissolved Cadmium (Cd)	2011/08/04	<0.000005		mg/L	
			Dissolved Cobalt (Co)	2011/08/04	<0.0003		mg/L	
			Dissolved Copper (Cu)	2011/08/04	<0.0002		mg/L	
			Dissolved Lead (Pb)	2011/08/04	<0.0002		mg/L	
			Dissolved Nickel (Ni)	2011/08/04	<0.0005		mg/L	
		RPD [BD4757-01]	Dissolved Cadmium (Cd)	2011/08/04	NC		%	20
			Dissolved Cobalt (Co)	2011/08/04	NC		%	20
			Dissolved Copper (Cu)	2011/08/04	NC		%	20
			Dissolved Lead (Pb)	2011/08/04	0.8		%	20
			Dissolved Nickel (Ni)	2011/08/04	NC		%	20
5061483	EO1	Matrix Spike	Total Arsenic (As)	2011/08/04		92	%	80 - 120
			Total Chromium (Cr)	2011/08/04		102	%	80 - 120
			Total Zinc (Zn)	2011/08/04		94	%	80 - 120
		Spiked Blank	Total Arsenic (As)	2011/08/04		94	%	80 - 120
			Total Chromium (Cr)	2011/08/04		96	%	80 - 120
			Total Zinc (Zn)	2011/08/04		96	%	80 - 120
		Method Blank	Total Arsenic (As)	2011/08/04	<0.0002		mg/L	
			Total Chromium (Cr)	2011/08/04	<0.001		mg/L	
			Total Zinc (Zn)	2011/08/04	<0.003		mg/L	
		RPD	Total Arsenic (As)	2011/08/04	NC		%	20
			Total Chromium (Cr)	2011/08/04	NC		%	20
			Total Zinc (Zn)	2011/08/04	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

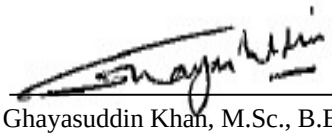
Maxxam Job #: B169677

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Daniel Reslan, Analyst II

Dina Tleugabulova, Ph.D., Scientific Specialist



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab

Smitha Rajesh, Analyst II

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

APPENDIX J

WATER LICENSE AND 2011 WATER LICENSE REPORT (CD ROM ONLY)

SAHTU Land and Water Board
Water Licence

Pursuant to the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations, the SAHTU Land and Water Board, hereinafter referred to as the Board, hereby grants to

Indian and Northern Affairs Canada – NT Region
Contaminant and Remediation Directorate
(licencee)

of **Box 1500, Yellowknife, NT X1A 1N5**
(Mailing Address)

hereinafter called the Licencee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence.

Licence Number	S09L8-001
Licence Type	"B"
Location	Great Bear Lake Mine Sites: Sawmill Bay, Silver Bear Mines, El Bonanza/Bonanza Mines and Contact Lake Mine
Purpose	Water use and Waste disposal reclamation and remediation of mining sites
Effective Date of Licence	July 26, 2010
Expiry Date of Licence	July 25, 2015

This Licence issued and recorded at Fort Good Hope includes and is subject to the annexed conditions.

SAHTU Land and Water Board

Witness

Chairman

This Licence and conditions shall be kept on site.
If you have any questions please call the SAHTU Land & Water Board at (867) 598-2413

SAHTU LAND AND WATER BOARD

LICENSEE: Indian and Northern Affairs Canada - CARD

LICENCE NUMBER: S09L8-001

EFFECTIVE DATE OF LICENCE ISSUANCE: July 26, 2010

TERMS AND CONDITIONS

PART A: SCOPE AND DEFINITIONS

1. **Scope**

a) This Licence entitles the Indian and Northern Affairs Canada - CARD to use water and deposit waste for miscellaneous undertakings in remediation and restoration of the Great Bear Lake Mine Sites and associated uses in the Northwest Territories:

Site	Latitude (°N)	Longitude (°W)	Area (ha)
Silver Bear Mines			4165
- Terra Mine	65.6042	118.1153	
- Northrim Mine	65.6011	117.9669	
- Smallwood Mine	65.5667	117.9333	
- Norex & Graham Vein	65.5833	117.8932	
Contact Lake Mine	65.9833	117.8000	1480
El Bonanza/Bonanza	66.0078	118.1306	875
Sawmill Bay	65.7206	118.9206	2322

b) This Licence entitles the Indian and Northern Affairs Canada - to use water for miscellaneous undertakings, in remediation and reclamation and associated uses, for camp use, decontamination, dust suppression, concrete mixing and for construction and maintenance of a maximum of 24 kilometers of existing overland Winter Road access beginning at a point at or near the Charter Community of Deline on Great Bear Lake and ending at the Silver Bear Mines – Terra Mine site. The water sources are as follows:

Water Source	Volume (m^3)	Latitude (°N)	Longitude (°W)
Great Bear Lake (WR)		65 00 47.798	121 48 42.580
Great Bear Lake (WR)		64 57 57.171	121 27 54.138
Great Bear Lake (WR)	22500	65 42 55.100	119 36 53.870
Great Bear Lake (WR)	22500	65 43 19.440	118 54 37.520
Camsell River (PII)	101577		
Great Bear Lake (PI)	11650		
Great Bear Lake (PIII)	11650		

(WR) – Winter Road, (PI) – Phase I, (PII) – Phase II, (PIII) – Phase III

c) This Licence is issued, subject to the conditions contained herein, with respect to the taking of water and the depositing of Waste of any type in any Waters or in any place under any conditions where such waste or any other Waste that

results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Governor-in-Council under the *Northwest Territories Waters Act*, or other statutes imposing more stringent conditions relating to the quantity or type of Waste that may be so deposited or under which any such Waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations; and

d) Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

In this Licence: S09L8-001

"**Act**" means the *Mackenzie Valley Resource Management Act* and/or the *Northwest Territories Waters Act*.

"**Analyst**" means an Analyst designated by the Minister under Section 35(1) of the *Northwest Territories Water Act*.

"**Board**" means the Sahtu Land and Water Board established under Section 60(1) of the *Mackenzie Valley Resource Management Act*.

"**Contingency Planning**" means a plan to establish a state of readiness that will enable prompt and effective response to possible spill or system failure.

"**Licensee**" means the holder of this Licence.

"**LC50(96)**" means in a bioassay test, that effluent is deemed acutely lethal if the undiluted (100%) effluent kills 50% or more of the fish in the test after 96 hours.

"**EC50(15)**" means in a bioassay test, the effluent is deemed excessively toxic if the light emission of a marine bioluminescent bacterium colony is reduced by more than 50% over 15 minutes when challenged by a sample containing a toxic substance. A test result of greater than or equal to 75 is considered a pass.

"**Freeboard**" means the vertical distance between the water line and the crest on a dam or dyke's upstream slope.

"**Greywater**" means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes.

"**Low Permeability**" a rate of hydraulic conductivity of less than $10^{-6} m^3/s$.

"**Microtox Test**" means a bioassay test, that monitors changes in the level of light emission from a marine luminescent bacteria when challenged with a toxic substance or sample containing toxic materials, and is used to provide a more rapid, real-time measurement of acute toxicity. Microtox Test is measured as EC50 (15) or LC50 (15).

"**Minister**" means the Minister of Indian Affairs and Northern Development.

"**Modification**" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion.

"**Process Water**" means water used for, but not limited to, washing drums, barrels, equipment, soil and buildings and the decontamination of items and objects related to remediation and reclamation.

"**Regulations**" means Regulations proclaimed pursuant to Section 33 of the *Northwest Territories Waters Act.*

"**Sewage**" means all toilet wastes (blackwater) and greywater.

"**Surveillance Network Program**" means a series or network of devices or sampling points designed to test environmental conditions for comparison against baseline data obtained from a point or area designated as a control. This is a method of tracking and identifying the spread of deleterious substances in the environment.

"**Toilet Wastes**" means all human excreta and associated products, but does not include greywater.

"**Toxicity Bioassays**" means tests used to determine if components that might be harmful to vegetation, microorganisms, aquatic species, as well as animals or humans are present, but are not normally detected in routine chemical analysis.

"**Waste**" means waste as defined by Section 2 of the *Northwest Territories Waters Act.*

"**Waste Disposal Facilities**" mean all facilities designated for the disposal of Waste.

"**Watercourse**" means a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches, as defined in the Northwest Territories Waters Regulations.

"**Water Licence Inspector**" means an Inspector designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act.*

"**Waters**" means any inland water, whether in a liquid or frozen state, on or below the surface of the land in the Northwest Territories;

PART B: GENERAL CONDITIONS

1. The Licencee shall file an Annual Report with the Board not later than December 1st, 2010 and each year thereafter for the life of the Water Licence which shall contain the following information:

DAY 1 = AUG 12
1000 L/ day
until Sep 8
Sep 9 - 2000L
LAST DAY=OCT 1

a) the monthly and annual quantities in cubic metres of fresh water obtained from all sources;

b) the monthly and annual quantities in cubic metres of each and all Waste(s) discharged;

c) an itemized list indicating the names, uses and quantities of all substances which were used during the remediation and reclamation operation;

d) a summary of all remediation and reclamation activities as they relate to Water use and Waste disposal;

e) tabular summaries of all data generated under the "Surveillance Network Program";

f) a list of unauthorized discharges;

g) the details and results of the required Annual Summer Site Inspection;

h) a camp set-up schematic for each phase;

i) details of all abandonment and restoration activities carried out in each phase; and

j) any other details on water use or Waste disposal requested by the Board by May 31st of the year being reported.

2. The Licencee shall submit all reports in the units of measurement as outlined in Part B: General Conditions.

3. All laboratory test results shall be submitted to the Board and the Water Licence Inspector, concurrently, within forty-eight (48) hours of the Licencee receiving such results. The laboratory tests include, but are not limited to: total Waste samples, Microtox Test samples, LC(50)96 samples on test populations, other Toxicity Bioassays, unauthorized Waste samples, dissolved oxygen/temperature profiles and water quality sample results.

4. Meters, devices or other such methods used for measuring the volumes of water used shall be installed, operated and maintained by the Licensee to the satisfaction of the Board and the Water Licence Inspector.

5. The Licencee shall maintain a copy of the Water Licence on-site at all times.

6. The Licencee shall comply with the "Surveillance Network Program" annexed to this Licence, and any amendment to the said "Surveillance Network Program" as may be made from time to time, pursuant to the conditions of this Licence.

7. The "Surveillance Network Program" and compliance dates specified in this Licence may be modified at the discretion of the Board.

8. The Licencee shall within thirty (30) days of the issuance of this Licence, post the necessary signs, where applicable, to identify the stations of the "Surveillance Network Program". All postings shall be located and maintained to the satisfaction of the Water Licence Inspector.

9. The Licencee shall submit the results of the Annual Summer Site Inspection to the Board in the Annual Report as set out in Part B: General Conditions, Sub-part (1), Item (g), which shall contain the details and results of the inspection as set out in Part E, Conditions Applying to Abandonment and Restoration, sub-part (1) to (5) inclusive.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all water for miscellaneous undertakings, in remediation and reclamation and associated uses, for camp use, decontamination, dust suppression, concrete mixing and for construction and maintenance of a maximum of 24 kilometers of existing overland Winter Road access beginning at a point near or at the Charter Community of Deline on Great Bear Lake and ending at the Silver Bear Mines – Terra Mine site from water sources identified in the application and listed above in Part A, or as otherwise approved by the Inspector.

2. Water obtained for miscellaneous undertakings, in remediation and reclamation and associated uses, includes water taken for camp use, decontamination, dust suppression, concrete mixing and for construction and maintenance of a maximum of 24 kilometers of existing overland Winter Road access across the Leith Peninsula to the Silver Bear Mines – Terra Mine site.

3. Total quantities of water involved are approximately as follows:

ACTIVITY	WATER USAGE (m^3)
Camp Use	8100 m^3 at 10 m^3/day
Dust Suppression	40500 m^3 at 50 m^3/day
Cleaning	81000 m^3 at 100 m^3/day
Concrete Mixing	20250 m^3 at 25 m^3/day
Winter Road Construction and Maintenance	48,000 m^3 at 24,000 m^3 per winter season for 2 years

4. The Licencee shall erect and maintain permanent conspicuous signage at all approved water sources. The signage shall be erected at or near the point where land and water interface nearest to the water intake location.

5. Signage erected at all approved water sources shall include the following information: the words "Water Intake Site", the Water Licence file designation "S09L8-001", the approved nomenclature for the water source as indicated in Part A: Scope, Item (1), (b).

6. The Licencee shall maintain water uptake logs for all utilized sources. The water uptake logs shall include the following information: identification of water source, volume of water withdrawn per trip in cubic meters, cumulative uptake per source, time of uptake, date of uptake, and contractor and employee identification.

7. The water intake hose used on the water pumps shall be equipped with a screen of a mesh size of 2.54 mm sufficient to ensure no entrainment of fish, as per DFO requirements.

8. The Licencee shall comply with the most recent version of the Department of Fisheries and Oceans "*Freshwater Intake End-of-Pipe Fish Screen Guidelines, 1995,*"

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. All Hazardous Wastes must be handled according to the *Transportation of Dangerous Goods Act* and removed for disposal to an approved waste disposal facility outside of the Northwest Territories.

2. The Licencee shall notify the Board and the Water Licence Inspector, in writing, forty-eight (48) hours prior to the shipping of any Hazardous Wastes.

3. The Licencee shall not at any time deposit Hazardous Wastes into a Solid Waste Facility in the Northwest Territories.

4. All sampling, sample preservation and analysis shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater", or by such other methods as approved by the Analyst.

5. The Licencee shall provide to the Board, in the required Annual Report as set out in Part B: General Conditions, Sub-part (1), item (h), and after completion of the remediation and reclamation, an as-built drawing showing the location of all activities including the placement of the proposed Terra Mine site landfill and other remediation and reclamation activities.

6. All test results must be reported in the units of measurement as indicated in the Terms and Conditions applying to water usage and Waste disposal.

7. The Licencee shall ensure that qualified personnel are retained to ensure the success of the sampling regime and sampling results in keeping with Part D, Sub-part (6) of the Water Licence Terms and Conditions.

8. The Licencee shall treat all sewage in a treatment plant capable of extracting eighty-five to ninety (85-90%) per cent of the biodegradable solids.

9. Solid Waste(s) removed from the camp sewage effluent by the portable sewage treatment plant shall be deposited at a waste disposal facility approved by the Water Licence Inspector.

10. All liquid Waste(s) generated by the camp, specifically grey water, sewage effluent and process water, will be processed on-site by a portable waste treatment plant prior to being spread on the surface of the land.

11. The Licencee shall endeavor to spread treated camp effluent to known or identified wetlands.

12. Non-hazardous solid Waste generated by the camp(s) and project activities shall be deposited in the proposed Solid Waste Facility at the Terra Mine site.

13. All sewage effluent discharged from the portable sewage treatment plant at the "Surveillance Network Program" Stations shall meet the following effluent quality standards:

PARAMETER	MAX. CONCENTRATION
Suspended Solids	100 mg/L
Oil and Grease	5 mg/L
BOD_5	100 mg/L
Fecal Coliforms	1×10^4 CFU/100mL

14. All Process water effluent discharged from the process water treatment plant will meet the appropriate criteria for the following:

Parameter	Concentration Limit
Volatile Hydrocarbons	15 mg/L
pH	6 - 9
Extractable Hydrocarbons	5 mg/L
Non-aqueous phase liquid/free product	Not present
Phenols	µg/L
Arsenic (total)	100 µg/L
Copper (dissolved)	200 µg/L
Cadmium (dissolved)	10 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
Lead (dissolved)	50 µg/L
Zinc (total)	1000 µg/L
Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Toxicity (Microtox EC50(15)*	Pass=EC50(15)>/=75%
LC50(96) Toxicity Testing*	Test sample is of acutely lethal toxicity if test population mortality equals or exceeds 50% of the test population in 96 hour time period
Microtox EC50(15) With Charcoal Filtration**	Pass with Charcoal Filtration=EC50(15)>/=75%

*Applicant must complete either a Microtox EC50 (15) toxicity test, a LC50 (96) toxicity test or both.
** If original microtox tests fail the applicant may perform the microtox test with charcoal filtration.
***All results must be reported in indicated units of measurement.

15. The waste discharged shall have a pH between 6 and 9, and no visible sheen of oil and grease.

16. Within thirty (30) days, the Licensee shall design and submit to the SLWB a Domestic Waste Management Plan which contains the following:

    a) A detailed list of waste treatment and disposal plans
    b) A listing of expected waste types and quantities to be shipped off-site.
    c) Treatment, testing and disposal methods for all waste products to be transported off-site.

17. Within thirty (30) days, the Licencee shall design and submit to the SLWB a Domestic Waste Management Plan which contains the following:

    a) A detailed list of waste treatment and disposal plans.
    b) A listing of expected waste types and quantities to be shipped off-site.
    c) Treatment, testing and disposal methods for all waste products to be transported off-site.

18. The Licencee shall not deposit raw, untreated sewage on the land surface.

PART E: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licencee shall monitor the project area affected by activities relating to the issued Water Licence for a minimum of five (5) years to ensure that mitigation, reseeding, erosion control and restoration efforts have been successful. These efforts shall be performed to the satisfaction of the Board and the Water Licence Inspector,

2. The Licencee shall, within nine (9) months submit to the Board for approval a Remedial Action Plan for Sawmill Bay. The plan shall include, but not be limited to:

    a) Outline of community consultation;

    b) Details of any excavation of contaminated soils and methods of disposal;

    c) Details of safety precautions taken for workers regarding exposure to radionuclide contaminated soils;

    d) Details of any removal of heritage mining equipment and its destination;

    e) or any other changes that may be required by the Board or the Water Licence Inspector.

3. The Licencee shall inspect the project location for the parameters set out in Part E: Conditions (1) of this document once in the summer months to ensure that efforts to fulfill the conditions are successful. The inspection results shall be to the satisfaction of the Board and the Water Licence Inspector.

4. During the 5-year monitoring period, any failure of the measures as set out in Conditions (1) and (2) of Part E: shall be reported to the Board and the Water Licence Inspector within seven (7) days of the discovery of said failure or failures.

5. The Licencee shall submit a written report documenting the Annual Summer Site Inspection as set out in Part B, General Conditions, sub-part (10). - subpart 1 ? not 10

6. All disturbed areas relating to Water Licence activities shall be restored, fertilized and reseeded with an approved natural or native seed mixture.

PART F: CONDITIONS APPLYING TO STREAM CROSSINGS

1. The Licencee shall ensure that only clean snow is used on all stream crossings and that no debris is left on the surfaces of the crossings.

2. Stream crossings shall be v-notched or completely removed before spring break-up to facilitate natural flow.

3. The removal of naturally occurring material from the bed or banks of any stream below the ordinary high water mark is not permitted other than what has been outlined in the submitted Remedial Action Plans.

5. The Licencee shall not cut or modify any stream banks during the building and maintenance of the proposed Winter Road.

6. The Licencee shall not cut or modify any stream banks unless previously identified in the remediation and reclamation plans, Phases I-III.

7. The Licencee shall not ford wet watercourses or areas of overflow unless previously identified in the remediation and reclamation plans, Phases I-III, or authorized in writing by the Water Licence Inspector.

8. The Licencee shall not destroy or damage beaver dams or lodges, and minimize disturbance to beaver activities.

9. The Licencee shall comply with the most recent version of the *"Department of Fisheries and Oceans Protocol for Temporary Winter Access Water Crossings for Oil and Gas Activities in the Northwest Territories"*.

10. The Licencee shall comply with the most recent version of the *"Department of Fisheries and Oceans Ice Bridges Operational Statement"*.

11. The Licencee shall ensure that stream crossings occur at a 90-degree angle to the channel.

12. The Licencee shall ensure that stream crossings have the proper ice thickness to carry the anticipated loads and that no debris is left of the surface of the crossings.

PART G: CONDITIONS APPLYING TO MODIFICATIONS

1. The Licencee may, without written approval from the Board, carry out Modification(s) to the planned undertakings provided that such Modification(s) are consistent with the terms of this Licence and the following requirements are met:

   a) the Licencee has notified the Board in writing of such proposed Modification(s) at least thirty (30) days prior to beginning the Modification(s);

   b) such Modification(s) do not place the Licensee in contravention of either the Licence or the Act;

   c) the Board has not, during the thirty (30) days following notification of the proposed Modification(s), informed the Licensee that review of the proposal will require more than thirty (30) days; and

d) the Board has not rejected the proposed Modification(s).

2. Modification(s) for which all of the conditions referred to in Part G, Item (1), have not been met may be carried out only with written approval from the Board.

3. The Licencee shall provide to the Board as-built plans and drawings of the Modification(s) referred to in this Licence within ninety (90) days of completion of the Modification(s).

PART H: CONDITIONS APPLYING TO CONTINGENCY PLANNING

1. The Licencee shall maintain a copy of the Emergency Response Plan on-site in a readily available location to the satisfaction of the Water Licence Inspector.

2. The Licencee shall ensure that petroleum products, hazardous material and other Waste(s) associated with the project do not enter any Waters.

3. The Licencee shall review the Spill Contingency Plan annually and modify the plan as necessary to reflect changes in Regulations, operations and technology. Any proposed Modification(s) shall be submitted to the Board for approval.

4. Site-specific Spill Contingency Plans shall be developed for all locations where refined petroleum products will be stored and used for refueling with copies being distributed to operators in the field. These Plans should include, but not be limited to:

   a) An inventory of response and clean-up equipment,

   b) A site map with location of storage facilities, and the location of emergency equipment with spill response and clean-up equipment; and

   c) A cover page that clearly identifies: The NWT 24-hour Spill Report Line and the name, job title and 24-hr telephone number for the person(s) responsible for activating the Spill Contingency Plan.

5. If, during the period of this Licence, an unauthorized discharge of Waste occurs, or if such a discharge is foreseeable, the Licensee shall:

   a.) employ the appropriate Spill Contingency Plan;

   b.) report the incident immediately via the (24) Hour NWT Spill Report Line. Currently the number is (867) 920-8130;

   c.) report the unauthorized discharge of Waste to the Board within (24) hours; and

   d.) submit to a Water Licence Inspector, a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

5. The Licencee shall report spills to the NT-NU 24-hour Spill Report Line (867) 920-8130, fax (867) 873-6924, and/or e-mail spills@gov.nt.ca in accordance with the *NT-NU Spill Reporting Protocol*, the *NT-NU Spill Report Form*, and the *Instructions for Completing the NT-NU Spill Report Form*.

PART I: CONDITIONS APPLYING TO THE UNDERTAKING

1. The Licencee shall ensure all refueling and storage of fuels, chemicals or deleterious substances are located a minimum of 100 metres from the Ordinary High Water Mark of any Watercourse.

2. The Licencee shall ensure that all fuels in excess of 4000 litres stored on-site are contained in an approved double-walled or self-berming storage tank(s), and located within a bermed area incorporating a synthetic liner that is considered to be impermeable to leakage and is capable of containing 110% of the total volume of largest fuel tank(s) employed within the bermed area.

3. The Licencee shall ensure that all project activities are confined to locations as described in the Water Licence application.

4. The Licencee shall ensure that the undertaking conforms to a Letter of Advice as may be issued to the Licensee by the Department of Fisheries and Oceans.

5. Materials cleared from the project site shall not be placed within one hundred (100) metres of the Ordinary High Water Mark of any watercourse or in such as a manner as to enter any watercourse.

6. All sites affected by project and camp activities shall be stabilized, groomed, reseeded and landscaped as necessary and suitable erosion control measures implemented to minimize sediment deposition into Watercourse(s).

7. The Licensee shall not operate any machinery within 150 m of any known historical or archaeological site or burial ground.

8. The Licencee shall make every effort to ensure that no historical or archaeological site will be affected by this operation.

9. The Licencee shall make every effort to retain riparian vegetation.

SAHTU LAND AND WATER BOARD

Witness

Larry Wallace
Chairman

LICENCEE: **Contaminants and Remediation Directorate - INAC**

LICENCE NUMBER: **S09L8-001**

EFFECTIVE DATE OF LICENCE: **July 26, 2010**

EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM: **July 26, 2010**

SURVEILLANCE NETWORK PROGRAM

1. Location of Surveillance Stations

Station Number	Description
S09L8-001(1)	Treated sewage effluent prior to disposal
S09L8-001(2)	Treated greywater prior to disposal
S09L8-001(3)	Treated Process water prior to disposal

2. Sampling and Analysis Requirements

Any effluent discharged at SNP Stations S09L8-001(1) and S09L8-001(2) shall be sampled prior to disposal and analyzed for the following parameters and shall not exceed criteria as per Part D (14) of the Licence:

Total Suspended Solids
Oil and Grease
BOD_5
Fecal Coliforms
pH

Any effluent discharged from SNP Station S09L8-001(3) shall be sampled prior to disposal and analyzed for the following parameters and shall not exceed criteria as per Part D (15) of the Licence.

Parameter	Concentration Limit
Volatile Hydrocarbons	15 mg/L
pH	6 - 9
Extractable Hydrocarbons	5 mg/L
Non-aqueous phase liquid/free product	Not present
Phenols	µg/L
Arsenic (total)	100 µg/L
Copper (dissolved)	200 µg/L
Cadmium (dissolved)	10 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
Lead (dissolved)	50 µg/L
Zinc (total)	1000 µg/L

Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Toxicity (Microtox EC50(15)*	Pass=EC50(15)>/=75%
LC50(96) Toxicity Testing*	Test sample is of acutely lethal toxicity if test population mortality equals or exceeds 50% of the test population in 96 hour time period
Microtox EC50(15) With Charcoal Filtration**	Pass with Charcoal Filtration=EC50(15)>/=75%

*Applicant must complete either a Microtox EC50 (15) toxicity test, a LC50 (96) toxicity test or both.
** If original microtox tests fail the applicant may perform the microtox test with charcoal filtration.
***All results must be reported in indicated units of measurement.

Sample frequency may be altered at the request/approval of the Water Licence Inspector.

All analyses shall be performed in a laboratory approved by the Analyst

3. **Reports**

The Licencee shall, unless otherwise requested by the Water Licence Inspector, include all of the data and information required by the "Surveillance Network Program" in the Licencee's Annual Report, which shall be submitted to the Board by December 1st of the year following the calendar year being reported.

SAHTU LAND AND WATER BOARD

Witness **Chairman**

SAHTU Land & Water Board
REASONS FOR DECISION
Issued Pursuant to Section 121 of
The Mackenzie Valley Resource Management Act
and Section 26 of the Northwest Territories Waters Act

Water Licence Number: S09L8-001 (Type "B")

This is the decision of the SAHTU Land & Water Board with respect to an application for a Water Licence dated February 2, 2009 made by:

Indian and Northern Affairs Canada – NT Region
Contaminates and Remediation Directorate
P.O Box 1500
Yellowknife, NT
X1A 2R3

For: Water use and Waste disposal for a mining remediation program at Great Bear Lake Mine Sites Remediation Program on the east side of Great Bear Lake, NT.

With respect to this application, written notice was given to 10 organizations within the Sahtu and 13 outside of the settlement area in accordance with Sections 63 & 64 of the Mackenzie Valley Resource Management Act. There was no Public Hearing held in association with this application.

DECISION

The Board is satisfied that the project has had a Preliminary Screening pursuant to the Mackenzie Valley Resource Management Act; that the proposed project is not likely to cause any significant adverse environmental impact or be the source of any public concern. The Board, having due regard to the facts and circumstances, the merits of the submissions made to it, and to the purpose, scope and intent of the Mackenzie Valley Resource Management Act and Regulations made there under has determined that:
Land Use Permit S09L8-001 be issued subject to the Terms and Conditions contained therein.
The Board's reasons for this decision are as follows:

1. Information contained in Staff Report S09L8-001 (1), (2) and (3) relative to environmental impacts and/or public concerns.
2. Any public concerns previously made known to the Board have been mitigated through community and leadership consultation and engagement.
3. The Board received a request dated July 2, 2010 from the Dolino Land Corporation, Deline First Nations and Deline Renewable Resources Board requesting a 45 day review extension. After carefully considering the request and a written response from INAC-CARD dated July 8, 2010, the Board does not deem the extension necessary as there were not sufficient reasons to grant the extension within the mandate of the Board.
4. Any disturbance to the natural conditions of the land in the area of the Mining Remediation Project will be temporary and can be minimized by conducting the undertaking in compliance with the Terms and Conditions imposed by the Permit and will improve the environment of the nine abandoned mine sites.
5. The Sahtu Land and Water Board has met its referral obligations to the Sahtu Land Use Planning Board as outlined in the Mackenzie Valley Resource Management Act. There has been no indication that the project does not conform to an approved Land Use Plan, as one does not exist.
6. The use of the land proposed by the Permittee is of a nature consistent with the Mackenzie Valley Resource Management Act.
7. The undertaking will support the socio-economic well-being and economic development of the region.

Water Licence S09L8-001 contains provisions, which the Board feels necessary to ensure and monitor compliance with the Mackenzie Valley Resource Management Act and the Regulations made there under and to provide appropriate safeguards in respect of the applicant's use of the land affected by the Permit. The Board will provide any referenced material or documents and/or reasons for decision for any specific clause or clauses contained within the application if requested to do so in writing.

The Board will provide any referenced material or documents and/or reasons for decision for any specific clause or clauses contained within the application if requested to do so in writing.

SIGNED this 21st day of July, 2010 on behalf of the SAHTU Land & Water Board.

Larry Wallace (Chairman)
SAHTU Land & Water Board

SENES Consultants Limited
121 Granton Drive, Unit 12
Richmond Hill, Ontario
Canada L4B 3N4
Tel: (905) 764-9380
Fax: (905) 764-9386
E-mail: info@senes.ca
Web Site: http://www.senes.ca

340962-000

18 January 2012

Contaminants and Remediation Directorate, AANDC
3rd Floor Waldron Building
5103-48th St.
Yellowknife, NT, X1A 2R3

Attention: Mr. Joel Gowman

Re: **Great Bear Lake Sites Remediation Phase I**
Water License S09L8-001 Annual Report 2011

Dear Mr. Gowman:

We are pleased to submit our report entitled *Great Bear Lake Sites Remediation Phase I – Water License S09L8-001 Annual Report 2011*. We trust that the enclosed report is suitable for your current purposes. We wish to thank you for the opportunity to be of assistance to you on this project. Please call if you have any questions.

Yours very truly,

SENES CONSULTANTS LIMITED

Jason Mauchan, M.Eng.

Great Bear Lake Sites Remediation Phase I Water Licence S09L8-001 Annual Report 2011

Prepared for:

Aboriginal Affairs and Northern Development Canada (AANDC)

Prepared by:

SENES Consultants Limited

January 2012

340962-000

Table of Contents

Executive Summary

The purpose of the 2011 Sawmill Bay site work was to complete the Phase I of the Great Bear Lake Sites Remediation program. Prior to the commencement of the remediation program a water licence S09L8-001 was granted on July 26, 2010. The licence is effective from July 26th, 2010 until July 25th, 2015.

This document was prepared to fulfill the reporting requirements stated within the licence.

Water use during the remediation program was metered using 1 m^3 vessels. In total, 48 m^3 of water was collected from Great Bear Lake. The water was used for washing, laundry, housekeeping, showering, and cleaning old drums.

Latrines were constructed at the temporary camp for disposing of black water. Potable drinking water was shipped to site via Yellowknife.

Grey water was collected in the grey water lagoon, located in the main camp area. The grey water was left in this soak away pit.

Process water was used to clean the old drums. In total, 2190 old drums were cleaned and crushed during the 2011 field season. Process water was discharged at the location approved by the Land Use Inspector (LUI) adjacent to the former old airstrip. In total, 15.7 m^3 of process water was discharged at this location. In accordance with the Surveillance Network Program, station S09L8-001(3) was located at the process water end-of-pipe. The analytical results of process water discharged were below the maximum allowable concentrations for discharge as stipulated in the licence.

As of the end of the 2011 field season, the Phase I portion of the Great Bear Lake Sites Remediation program has now been completed.

Project Summary

Phase I of the Great Bear Lake Sites Remediation project began during the summer of 2010. The purpose of the project is to remediate abandoned facilities, including mine sites, at Sawmill Bay, Contact Lake, Bonanza, and El Bonanza. The 2010 remediation activities at Sawmill Bay, Contact Lake, Bonanza, and El Bonanza included: gathering, consolidating, and stockpiling surface debris including drums; building closure and demolition; burning of unpainted, untreated wood; and shipping hazardous material off-site.

The 2010 summer construction work for all four sites was based from a temporary camp built at Sawmill Bay. The camp at Sawmill Bay housed the labour crew responsible for the remediation work. The on-site remediation work occurred from August 12th, 2010 until October 1st, 2010. During 2010, 74 m^3 of fresh water was withdrawn from Great Bear Lake. Water collected from Great Bear Lake was used for general camp activities.

For further information regarding the 2010 work, see the document entitled *Great Bear Lake Sites Remediation Phase I - Water Licence S09L8-001 Annual Report 2010.*

The 2011 program focussed on the remaining drums, and their contents, at Sawmill Bay. The 2,190 drums which were remaining at Sawmill Bay contained various petroleum based products, water, a mix of both or sand. During the summer program the liquid contents were tested, classified, consolidated, and treated. The remaining old drums were washed and crushed. The process water used to clean the old drums was treated, temporarily stored in bladders and tested to confirm that the water met the effluent quality criteria, and the bladder contents subsequently discharged in accordance with the provisions outlined by the Land Use Inspector during their site visit.

Site activities at Sawmill Bay during 2011 occurred from June 5th to June 10th and July 20th to August 30th. At the end of the construction season, the temporary camp was dismantled. The construction activities of the Phase I Great Bear Lake Sites Remediation project are now complete.

The text henceforth details the work activities for the 2011 program as it pertains to the requirements outlined in the water licence.

Part A: Licence Information

Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada) – North West Territories Region – Contaminant and Remediation Directorate received a Water Licence from the Sahtu Land and Water Board effective July 26th, 2010. The Water Licence entitles the use of water in remediation and restoration activities of the Great Bear Lake Mine Sites. Table 1 outlines the Licence information.

Table 1: Licence Information

Licensee	Aboriginal Affairs & Northern Development Canada (AANDC) – NT Region Contaminant and Remediation Directorate
Licensee Mailing Address	Box 1500, Yellowknife, NT X1A 1N5
Licence Number	S09L8-001
Licence Type	B
Location	Great Bear Lake Mine Sites: Sawmill Bay, Silver Bear Mines, El Bonanza/Bonanza Mines and Contact Lake Mine
Purpose	Water use during reclamation and remediation activities of old mining sites
Effective Date of Licence	July 26, 2010
Expiry Date of Licence	July 25, 2015

The on-site work took place from June 5th until June 10th and July 20th until August 30th, 2011.

Water collected from Great Bear Lake was used for washing, laundry, housekeeping, showering, and cleaning old drums. The quantity of fresh water was metered using 1 m^3 (1000 litre) vessels. The grey water produced from camp activities was collected in a grey water lagoon. Process water was used to clean old drums. Potable drinking water was shipped to Site from Yellowknife. Black water was deposited in pit toilets at the Site.

The number of people on-site during the 2011 field season ranged from 8 to 19. The key plan for the Sawmill Bay site is presented in Figure 1, Appendix A.

Part B: Reporting Requirements

a) The Monthly and Annual Quantities of Fresh Water Obtained

The monthly quantities of fresh water obtained from Great Bear Lake for the month of June, July, and August, were 5 m^3, 16 m^3, and 27 m^3, respectively. Water was collected using a screened hose to fill four (4) 1000 litre vessels. The vessels were hauled to camp using a front-end loader and pick-up truck. All personnel on-site were informed that water from Great Bear

Lake was used as camp water. A sign with the words 'Water Supply Lake' was posted at the barge area. The monthly quantities and annual quantity with regards to licence S09L8-001 are presented in Table 2 below.

Table 2: Licence S09L8-001 Quantity of Fresh Water obtained from Great Bear Lake, 2011

Month	Quantity of fresh water obtained (m^3)
June	5
July	16
August	27
Total	**48**

b) The Monthly and Annual Quantities of Discharges

The grey water lagoon (see Photo 1, Appendix B) at the Sawmill Bay camp was constructed in August 2010, at the beginning of the Phase I remediation project. The lagoon was built to contain grey water produced from camp activities such as washing, laundry, cleaning, and showering.

The lagoon was 1.5 m long by 1.5 m wide and 1 m deep and was located at the east side of camp with approximate co-ordinates of 7 290 150 N, 411 750 E (See Figure 2, Appendix A). The same grey water lagoon was used during the 2011 construction season (see Photo 2, Appendix B). During 2011, no grey water was discharged from the lagoon.

Process water was used to clean old drums prior to crushing. The drum cleaning occurred within a lined and bermed area at the former old airstrip (See Figure 3, Appendix A). Water was cycled through an oil-water separator and an activated carbon system. Prior to discharge, the water was stored in holding bladders, each with a capacity of 5600 litres (5.6 m^3). The process water was sampled and tested to meet discharge criteria as stated within the water licence. The drum washing station area and discharge location were reviewed and approved by the Land Use Inspector during the July 27th, 2011 visit to the SIte. The discharge location is shown in Photo 3, Appendix B. The discharge location and use of diffuser was done in accordance with the Land Use Inspector's recommendations and approval.

In total, 15.7 m^3 of process water was discharged to the ground adjacent the former airstrip. The end-of-pipe was a diffuser on a sheet of plywood as stipulated by the Land Use Inspector (see Photo 4, Appendix B). The quantity of process water discharged per month is presented in Table 3. The discharge location is shown in Figure 3 of Appendix A.

Table 3: Quantity of Process Water Discharge at Sawmill Bay, 2011

Month	Quantity of process water discharged (m^3)
June	0
July	0
August	15.7
Total	**15.7**

c) Itemized List of Substances used during Remediation

An itemized list of substances used during the remediation program is presented in Table 4.

Table 4: List of Substances used at Sawmill Bay, 2011

Substance	Use
Engine oil[1]	Heavy equipment, ATVs, pick-up truck
Diesel[1]	Camp generator, heavy equipment
Oxygen	Welding
Acetylene	Welding
Propane	Hot water tank
A-1 jet fuel[1]	Charter flights to site
Drinking water	Cooking, drinking
Grease	Vehicle maintenance
Gasoline[1]	Light vehicles
Activated charcoal	Treating process water
Detergent and soaps	Camp housekeeping
Absorbent diapers	Process water treatment area and spill kits

[1]See Figure 1, Appendix A for temporary fuel storage locations (airstrip, near camp)

d) Remediation Activity Summary

Remediation activities at Sawmill Bay during the 2011 construction season included:

- Liquid contents of old drums tested during June;
- 2190 drums cleaned and crushed during July and August;
- Consolidation of old gasoline into 32 newer drums;
- Consolidation of old oil into 51 newer drums;
- Consolidation of old jet fuel into 7 newer drums;
- Consolidation of old antifreeze into 1 newer drum;
- Consolidation of old transmission fluid into 3 newer drums;
- 15.7 m^3 of treated process water discharged at the former old airstrip; and

- Camp tear down and demobilization.

e) Surveillance Network Program

The Surveillance Network Programs (SNP) at Sawmill Bay consists of a specific sampling location within the site at which water quality and quantity are measured. The SNP program is a requirement of the water license. The document entitled '*Water and Effluent Quality Management Policy – Draft*' prepared by the Sahtu Land and Water Board, dated April 29th, 2010, states that the SNP program is designed to ensure that the effluent quality criteria (EQC) are being and will continue to be consistently met. Typically, one of the SNP stations is assigned to the end-of-pipe and is the point at which the licensee must comply with the EQC. At Sawmill Bay, S09L8-001(3) was located at the end-of-pipe (discharge location) at the former old airstrip (See Figure 2, Appendix A).

Table 5 presents the station summary for the Sawmill Bay SNP. At Sawmill Bay, there is no station S09L8-001(1) because latrines (pit toilets) were dug for black water due to the short duration of the project and the small number of people at camp. Station S09L8-001(2) at the grey water lagoon was located in the vicinity of the camp. Note however that during 2011, no grey water was discharged from the grey water lagoon. Station S09L8-001(3) was the discharge location for process water at the former old airstrip. Process water was used to clean the old drums. The process water was tested and temporarily stored in bladders prior to discharge.

Table 5: Surveillance Network Program Station Summary for Sawmill Bay 2011

Station Number	Description	Location at Sawmill Bay
S09L8-001(1)	Treated sewage effluent prior to disposal	Not applicable
S09L8-001(2)	Grey water end-of-pipe, prior to disposal	Camp area (see Figure 2, Appendix A)
S09L8-001(3)	Treated process water prior to disposal	Former old airstrip (See Figure 3, Appendix A)

The location of the latrines and grey water lagoon are presented in Figure 2, Appendix A. The location of the process water discharge end-of-pipe is presented in Figure 3, Appendix A. Test results from S09L8-001(3) were compared to the EQC stated in the water licence. The analytical results for station S09L8-001(3) and the EQC are presented in Table 6, which clearly indicate process water did not exceed the EQCs. Maxxam Analytics Inc. of Edmonton conducted the analyses. The analytical reports are attached as Appendix B. For reference, Table 6 also summarizes the sample number and discharge dates of the respective bladders.

Table 6: Process Water Analytical Results for Station S09L8-001(3)

Sample Number / Parameter	SB-W-1B	SB-W-2B	PW2-2308A	PW4-2308A	Maximum Allowable Concentration
Volatile Hydrocarbons (BTEX C5-C10)	<0.2 mg/L	<0.2 mg/ L	<0.2 mg/ L	<0.2 mg/ L	15 mg/ L
pH	7.58	7.78	7.37	7.80	6-9
Extractable Hydrocarbons (TEH30)	1.1 mg/ L	<0.03 mg/L	1.5 mg/L	0.65 mg/L	5 mg/L
NAPL/free product	Not present	Not present	Not present	Not present	Not present
Phenols	30 ug/L	8 ug/L	6 ug/L	3 ug/L	Not listed
Arsenic (total)	26 ug/L	49 ug/L	0.6 ug/L	1.3 ug/L	100 ug/L
Copper (dissolved)	0.3 ug/L	<0.2 ug/L	0.9 ug/L	0.4 ug/L	200 ug/L
Cadmium (dissolved)	0.018 ug/L	0.016 ug/L	0.55 ug/L	0.11 ug/L	10 ug/L
Mercury (total)	0.003 ug/L	0.003 ug/L	0.011 ug/L	0.005 ug/L	0.6 ug/L
Nickel (dissolved)	0.7 ug/L	<0.05 ug/L	2.3 ug/L	0.6 ug/L	200 ug/L
Lead (dissolved)	3.2 ug/L	1.7 ug/L	4 ug/ L	0.4 ug/L	50 ug/L
Zinc (total)	36 ug/L	38 ug/L	84 ug/L	39 ug/L	1000 ug/L
Chromium (total)	<1 ug/L	<1 ug/L	<1 ug/L	<1 ug/L	100 ug/L
Cobalt (dissolved)	<0.3 ug/L	<0.3 ug/L	0.9 ug/L	<0.3 ug/L	50 ug/L
LC50(96) Trout or EC50(15) Microtox	0 % Dead trout	0 % Dead trout	EC50(15) = >100%	EC50(15) = >100%	Pass = <50% dead trout or EC50(15) = >75%
Discharge Date	August 13th	August 17th	August 30th	August 30th	

f) Unauthorized discharges

During the June drum sampling program, black oil was observed adjacent to an overturned drum. The overturned drum was first noticed on June 9th, 2011. The drum, located within an old drum cache beyond the north end of the former old airstrip at approximate co-ordinates 7 291 250 N, 410 100 E (see Figure 1) was subsequently put upright and stabilized. The NWT Spill Report Line was contacted and a spill report was filed. The spill report number is 2011251. Based on visual observations and 210 litre capacity for a standard drum, it was estimated that between 100 and 200 litres of oil were spilled.

g) Annual Summer Site Inspection

Déline on-site community representatives (OCR) were on-site during the Phase 1 remediation activities. Mr. Kuri Mackeinzo was on-site at Sawmill Bay from July 23rd until August 13th, 2011. Mr. Bryan Gaudet was on-site at Sawmill Bay from August 13th until August 25th, 2011. An inspection of the site by the AANDC Water Licence Inspector, Mr. Tom Bradbury of Norman Wells occurred on July 27th, 2011. Mr. Bradbury's inspection of the site occurred in the presence of the OCR.

h) Camp Schematic

The camp set-up schematic for the Phase I remediation activities is presented in plan on Figure 2, Appendix A.

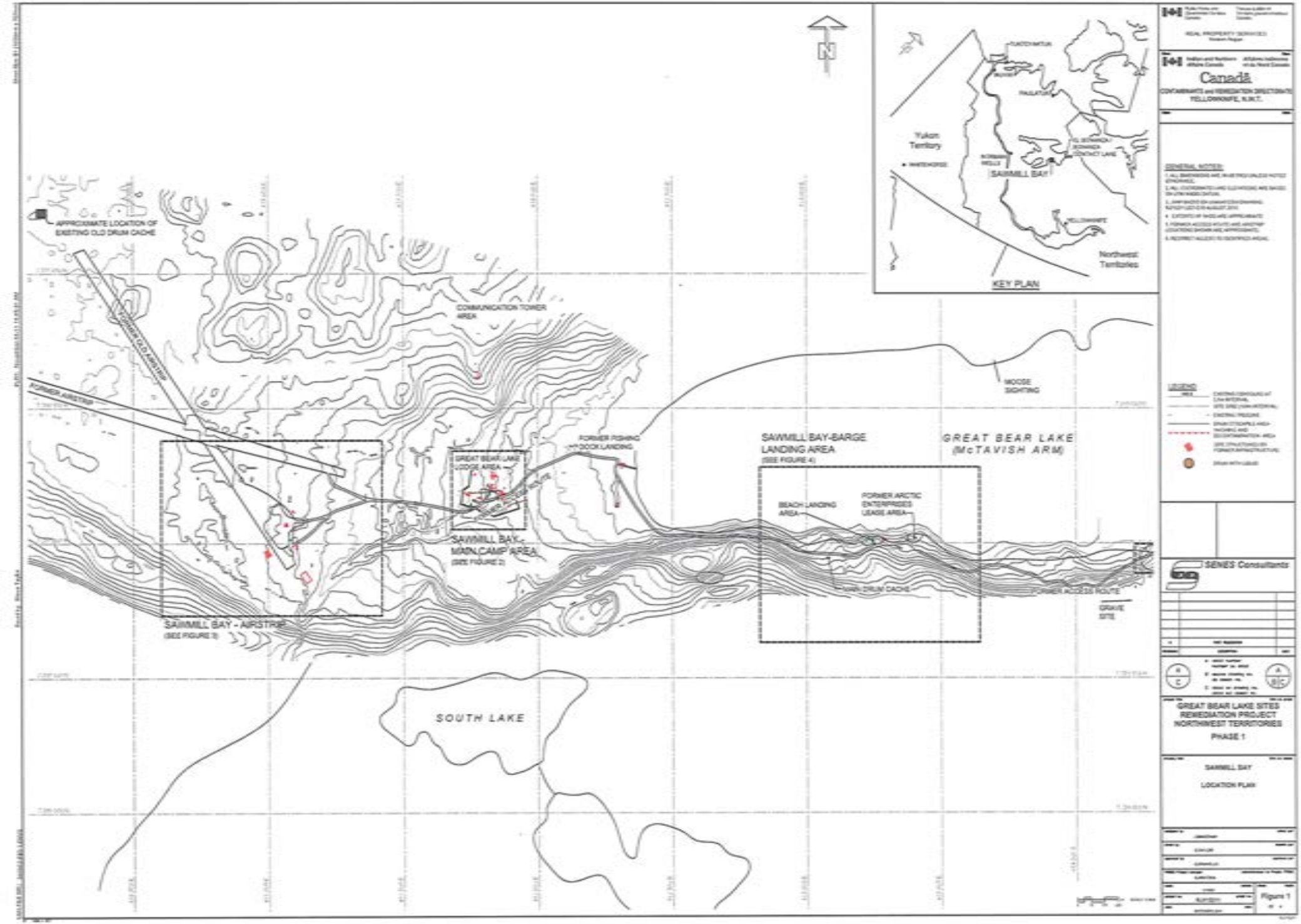
i) Remediation Activities

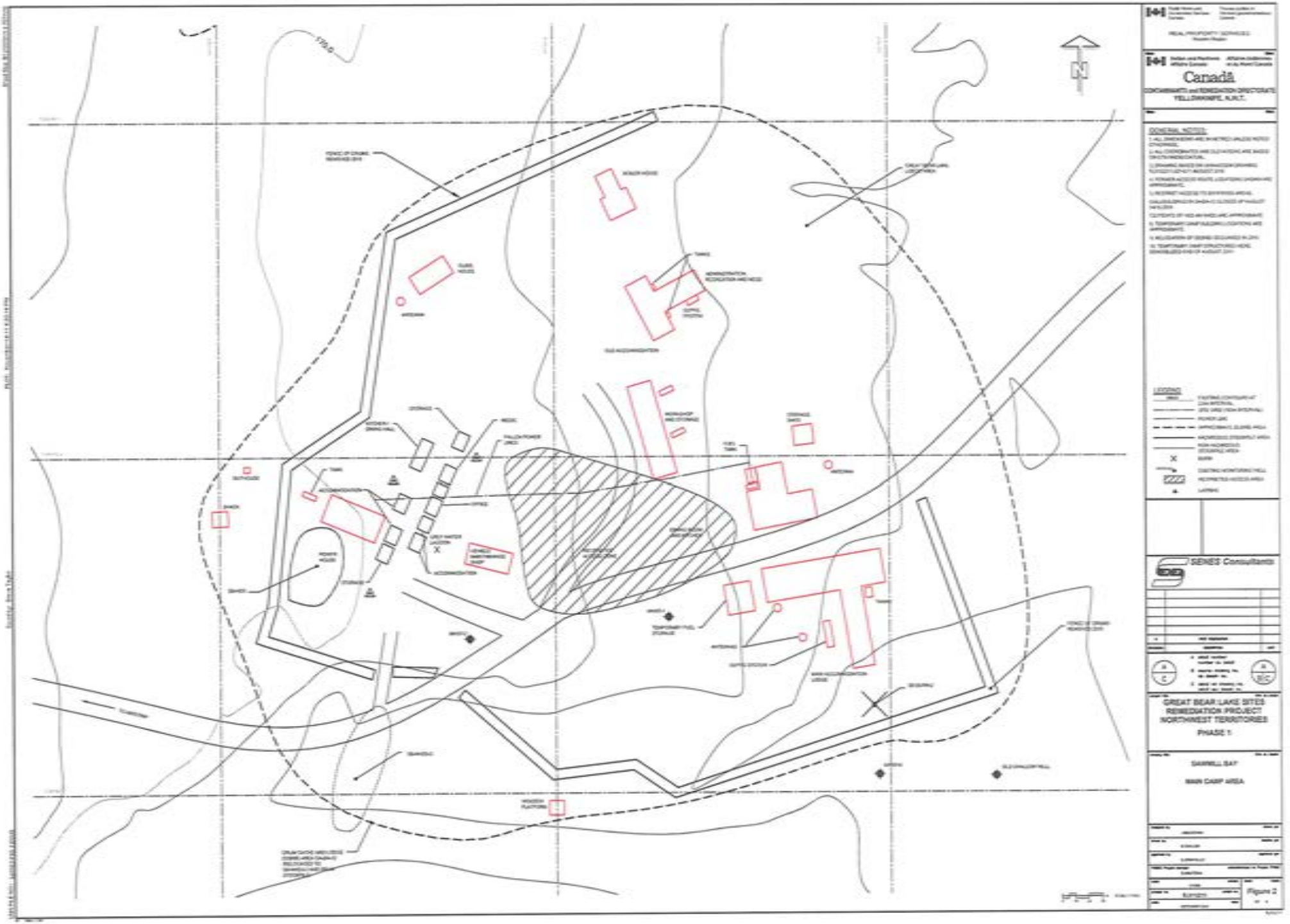
A summarized list of activities conducted during the summer 2011 component of the Great Bear Lake Sites Phase I project is presented above in Part B, section d).

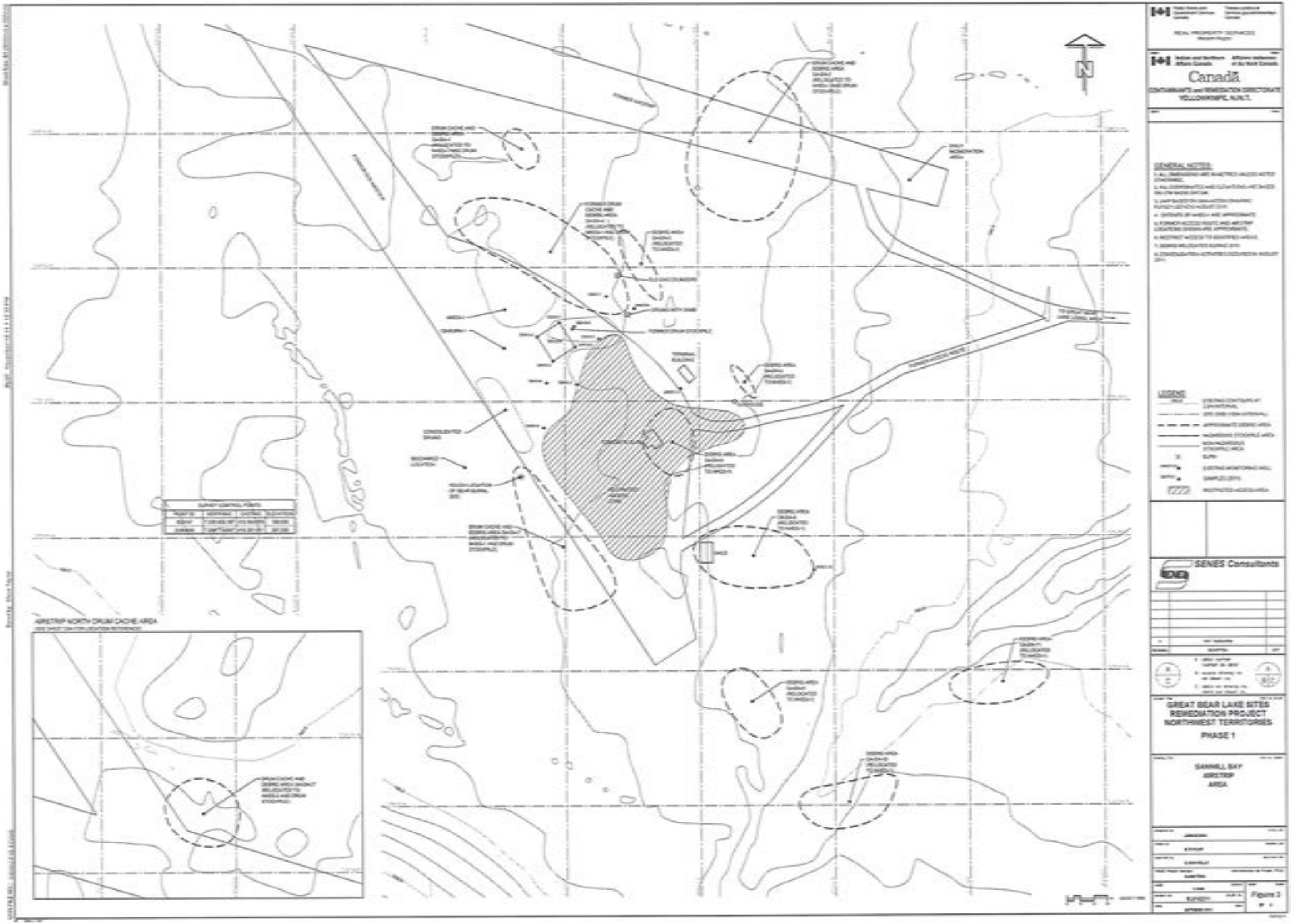
j) Other Details Requested by Board

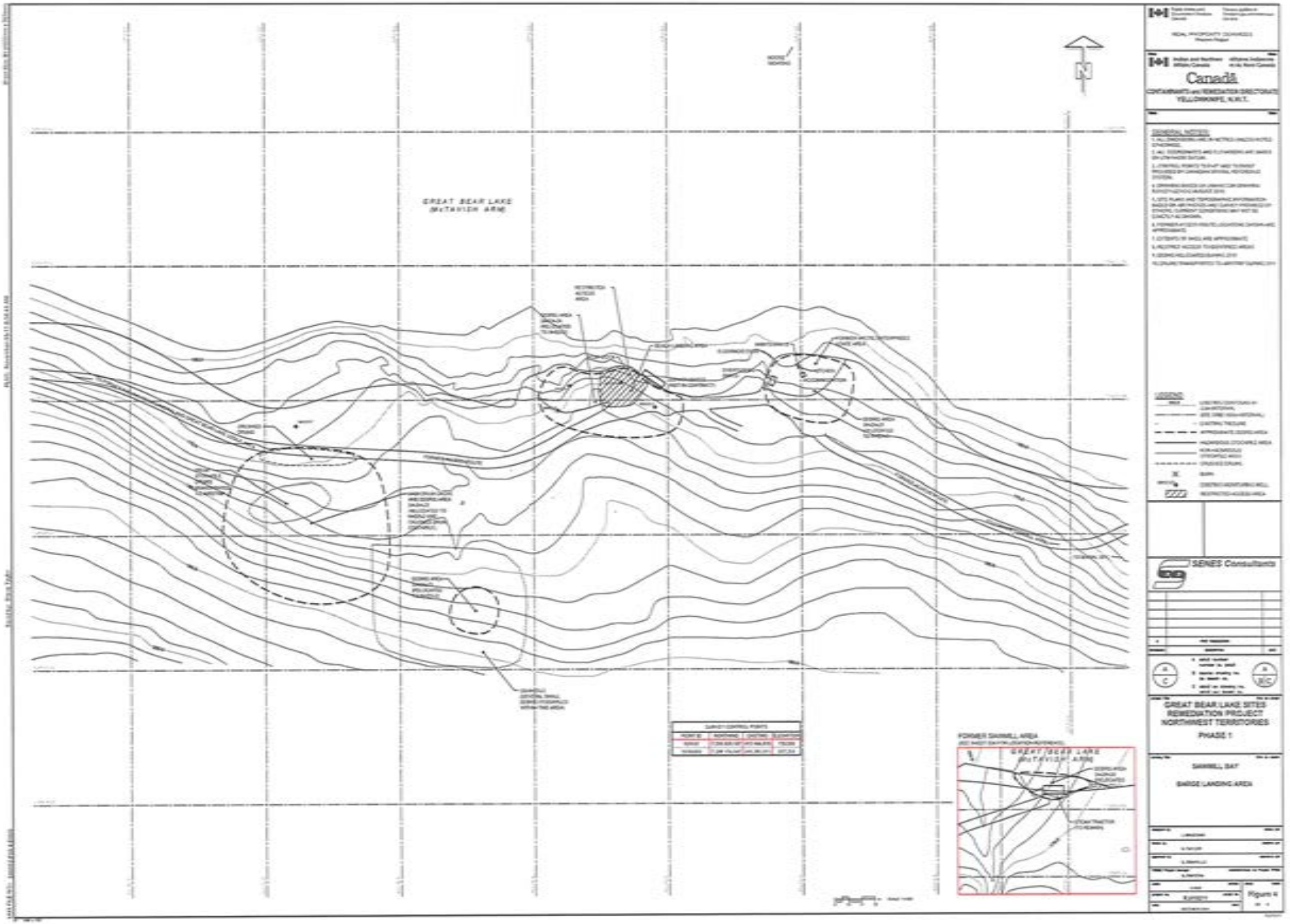
As of December 2011, no other details on water use or waste disposal are known to have been requested by the board.

Appendix A: Figures


APPROXIMATE LOCATION OF EXISTING OLD DRUM CACHE
FORMER OLD AIRSTRIP
FORMER AIRSTRIP
COMMUNICATION TOWER AREA
FORMER FISHING HOOK LANDING
GREAT BEAR LAKE LODGE AREA
SAWMILL BAY - MAIN CAMP AREA
(SEE FIGURE 2)
SAWMILL BAY - AIRSTRIP
(SEE FIGURE 3)
SAWMILL BAY-BARGE LANDING AREA
(SEE FIGURE 4)
GREAT BEAR LAKE
(McTAVISH ARM)
BEACH LANDING AREA
FORMER ARCTIC ENTERPRISES LEASE AREA
MAIN DRUM CACHE
FORMER ACCESS ROUTE
GRAVE SITE
MOOSE SIGHTING
SOUTH LAKE
N
KEY PLAN
Yukon Territory
WHITEHORSE
NORMAN WELLS
SAWMILL BAY
YELLOWKNIFE
Northwest Territories
Canada
CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.
GENERAL NOTES:
LEGEND
SENES Consultants
GREAT BEAR LAKE SITES
REMEDIATION PROJECT
NORTHWEST TERRITORIES
PHASE 1
SAWMILL BAY
LOCATION PLAN
Figure 1


Canada
CONTAMINATED and REMEDIATION DRAWING
YELLOWKNIFE, N.W.T.
GENERAL NOTES:
SENES Consultants
GREAT BEAR LAKE SITES
REMEDIATION PROJECT
NORTHWEST TERRITORIES
PHASE 1
DARRELL BAY
MAIN CAMP AREA
Figure 2


N
AIRSTRIP NORTH DRUM CACHE AREA
SURVEY CONTROL POINTS
GENERAL NOTES:
LEGEND:
Canada
CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.
SENES Consultants
GREAT BEAR LAKE SITES
REMEDIATION PROJECT
NORTHWEST TERRITORIES
PHASE 1
SANNAIL BAY
AIRSTRIP
AREA
Figure 3



Canada

CONTAMINANTS and REMEDIATION DIRECTORATE
YELLOWKNIFE, N.W.T.

GENERAL NOTES:

LEGEND

SENES Consultants

GREAT BEAR LAKE SITES
REMEDIATION PROJECT
NORTHWEST TERRITORIES

PHASE 1

SAWMILL BAY

BARGE LANDING AREA

Figure 4

Appendix B: Photographs

Great Bear Lake Sites
Phase I
APPENDIX B - PHOTOGRAPHS

Photograph 1: Grey Water Lagoon during 2010 activities. ↑

Photograph 2: Grey water lagoon during 2011 activities. ↑

Photograph 3: Process water discharge location. ↑

Photograph 4: Process water end-of-pipe, diffuser on plywood sheet. ↑

Appendix C: Process water analytical results

Maxxam

Success Through Science®

Your P.O. #: 340982
Your Project #: GBL1
Site Location: SAWMILL
Your C.O.C. #: A057634

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/15

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B174363
Received: 2011/08/11, 9:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
See Attached Results (1)	2	2011/08/15	2011/08/15		
BTEX/F1 in Water by HS GC/MS	2	N/A	2011/08/13	CAL SOP-00190	CCME CWS, EPA 8260C
Cadmium - low level CCME - Dissolved	2	N/A	2011/08/15	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	2	2011/08/12	2011/08/15	AB SOP-00043	EPA 200.8
Mercury - Low Level (Total)	2	2011/08/15	2011/08/15	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved	2	N/A	2011/08/13	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	2	2011/08/12	2011/08/13	AB SOP-00043	EPA 200.8
pH @25C	2	N/A	2011/08/13	AB SOP-00005	SM 4500-H B
Phenols (4-AAP)	2	N/A	2011/08/15	CAL SOP-00067	EPA 420.2
Total Extractable Hydrocarbon C11-C30	2	2011/08/13	2011/08/13	AB SOP-00040 SOP-00037	AB EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Edmonton Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Industrial					
Remark	N/A	SEE ATTACH	SEE ATTACH	N/A	5090824
Misc. Inorganics					
pH	N/A	7.58	7.78	N/A	5089689
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.018	0.016	0.005	5089396
Total Cadmium (Cd)	ug/L	0.022	0.017	0.005	5089348
Misc. Organics					
Phenols	mg/L	0.030	0.008	0.002	5091374

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Elements					
Total Arsenic (As)	mg/L	0.026	0.049	0.0002	5089798
Dissolved Cadmium (Cd)	mg/L	0.000018	0.000016	0.000005	5089800
Total Chromium (Cr)	mg/L	<0.001	<0.001	0.001	5089798
Dissolved Cobalt (Co)	mg/L	<0.0003	<0.0003	0.0003	5089800
Dissolved Copper (Cu)	mg/L	0.0003	<0.0002	0.0002	5089800
Dissolved Lead (Pb)	mg/L	0.0032	0.0017	0.0002	5089800
Dissolved Nickel (Ni)	mg/L	0.0007	<0.0005	0.0005	5089800
Total Zinc (Zn)	mg/L	0.036	0.038	0.003	5089798
Low Level Elements					
Total Mercury (Hg)	ug/L	0.003	0.003	0.002	5090841

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Extractable Hydrocarbons					
Undecanes (C11)	mg/L	<0.02	<0.02	0.02	5089820
Dodecanes (C12)	mg/L	0.04	<0.02	0.02	5089820
Triadecanes (C13)	mg/L	0.10	<0.02	0.02	5089820
Tetradecanes (C14)	mg/L	0.18	<0.02	0.02	5089820
Pentadecanes (C15)	mg/L	0.24	<0.02	0.02	5089820
Hexadecanes (C16)	mg/L	0.17	<0.02	0.02	5089820
Heptadecanes (C17)	mg/L	0.15	<0.02	0.02	5089820
Octadecanes (C18)	mg/L	0.11	<0.02	0.02	5089820
Nonadecanes (C19)	mg/L	0.05	<0.02	0.02	5089820
Eicosanes (C20)	mg/L	0.06	<0.02	0.02	5089820
Heneicosanes (C21)	mg/L	<0.02	<0.02	0.02	5089820
Docosanes (C22)	mg/L	<0.02	<0.02	0.02	5089820
Triacosanes (C23)	mg/L	<0.02	<0.02	0.02	5089820
Tetracosanes (C24)	mg/L	<0.02	<0.02	0.02	5089820
Pentacosanes (C25)	mg/L	<0.03	<0.03	0.03	5089820
Hexacosanes (C26)	mg/L	<0.03	<0.03	0.03	5089820
Heptacosanes (C27)	mg/L	<0.03	<0.03	0.03	5089820
Octacosanes (C28)	mg/L	<0.03	<0.03	0.03	5089820
Nonacosanes (C29)	mg/L	<0.03	<0.03	0.03	5089820
Triacontanes (C30)	mg/L	<0.03	<0.03	0.03	5089820
Total Extractables C11 to C30	mg/L	1.1	<0.03	0.03	5089820
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	109	100		5089820

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		BG0301	BG0364		
Sampling Date					
COC Number		A057634	A057634		
	Units	**SB-W-1B**	**SB-W-2B**	**RDL**	**QC Batch**
Volatiles					
Benzene	ug/L	17	3.0	0.4	5085507
Toluene	ug/L	10	1.8	0.4	5085507
Ethylbenzene	ug/L	2.2	<0.4	0.4	5085507
o-Xylene	ug/L	3.1	0.4	0.4	5085507
m & p-Xylene	ug/L	3.0	<0.8	0.8	5085507
Xylenes (Total)	ug/L	6.1	<0.8	0.8	5085507
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	5085507
(C6-C10)	ug/L	<100	<100	100	5085507
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	99	99		5085507
4-BROMOFLUOROBENZENE (sur.)	%	102	101		5085507
D4-1,2-DICHLOROETHANE (sur.)	%	101	100		5085507

RDL = Reportable Detection Limit

Maxxam Job #: B174363
Report Date: 2011/08/15

SENES CONSULTANTS LIMITED
Client Project #: GBL1
Site Location: SAWMILL
Your P.O. #: 340982
Sampler Initials: JM

General Comments

Results relate only to the items tested.

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report

Maxxam Job Number: CB174363

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5085507	PX	Matrix Spike	1,4-Difluorobenzene (sur.)	2011/08/13		375 (1)	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/13		20 (2)	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/13		423 (1)	%	70 - 130
			Benzene	2011/08/13		NC	%	70 - 130
			Toluene	2011/08/13		NC	%	70 - 130
			Ethylbenzene	2011/08/13		NC	%	70 - 130
			o-Xylene	2011/08/13		NC	%	70 - 130
			m & p-Xylene	2011/08/13		NC	%	70 - 130
		Spiked Blank	1,4-Difluorobenzene (sur.)	2011/08/12		99	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/12		98	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/12		108	%	70 - 130
			Benzene	2011/08/12		86	%	70 - 130
			Toluene	2011/08/12		84	%	70 - 130
			Ethylbenzene	2011/08/12		88	%	70 - 130
			o-Xylene	2011/08/12		90	%	70 - 130
			m & p-Xylene	2011/08/12		89	%	70 - 130
			(C6-C10)	2011/08/12		77	%	70 - 130
		Method Blank	1,4-Difluorobenzene (sur.)	2011/08/13		96	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/08/13		100	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/08/13		107	%	70 - 130
			Benzene	2011/08/13	<0.4		ug/L	
			Toluene	2011/08/13	<0.4		ug/L	
			Ethylbenzene	2011/08/13	<0.4		ug/L	
			o-Xylene	2011/08/13	<0.4		ug/L	
			m & p-Xylene	2011/08/13	<0.8		ug/L	
			Xylenes (Total)	2011/08/13	<0.8		ug/L	
			F1 (C6-C10) - BTEX	2011/08/13	<100		ug/L	
			(C6-C10)	2011/08/13	<100		ug/L	
		RPD	Benzene	2011/08/13	NC		%	40
			Toluene	2011/08/13	25.7		%	40
			Ethylbenzene	2011/08/13	NC		%	40
			o-Xylene	2011/08/13	NC		%	40
			m & p-Xylene	2011/08/13	NC		%	40
			Xylenes (Total)	2011/08/13	NC		%	40
			F1 (C6-C10) - BTEX	2011/08/13	NC		%	40
			(C6-C10)	2011/08/13	NC		%	40
5089689	RP0	Spiked Blank	pH	2011/08/13		100	%	97 - 102
		RPD [BG0301-01]	pH	2011/08/13	0.4		%	5
5089798	RW0	Matrix Spike	Total Arsenic (As)	2011/08/13		94	%	80 - 120
			Total Chromium (Cr)	2011/08/13		108	%	80 - 120
			Total Zinc (Zn)	2011/08/13		NC	%	80 - 120
		Spiked Blank	Total Arsenic (As)	2011/08/13		101	%	80 - 107
			Total Chromium (Cr)	2011/08/13		116	%	80 - 120
			Total Zinc (Zn)	2011/08/13		103	%	80 - 120
		Method Blank	Total Arsenic (As)	2011/08/13	0.0003, RDL=0.0002		mg/L	
			Total Chromium (Cr)	2011/08/13	<0.001		mg/L	
			Total Zinc (Zn)	2011/08/13	<0.003		mg/L	
		RPD	Total Arsenic (As)	2011/08/13	2.2		%	20
			Total Chromium (Cr)	2011/08/13	NC		%	20
			Total Zinc (Zn)	2011/08/13	0.2		%	20
5089800	RW0	Matrix Spike [BG0301-01]	Dissolved Cadmium (Cd)	2011/08/13		109	%	80 - 120
			Dissolved Cobalt (Co)	2011/08/13		101	%	80 - 120
			Dissolved Copper (Cu)	2011/08/13		112	%	80 - 120
			Dissolved Lead (Pb)	2011/08/13		102	%	80 - 120

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report (Continued)

Maxxam Job Number: CB174363

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5089800	RW0	Matrix Spike						
		[BG0301-01]	Dissolved Nickel (Ni)	2011/08/13		118	%	80 - 120
		Spiked Blank	Dissolved Cadmium (Cd)	2011/08/13		99	%	80 - 114
			Dissolved Cobalt (Co)	2011/08/13		101	%	80 - 120
			Dissolved Copper (Cu)	2011/08/13		97	%	80 - 116
			Dissolved Lead (Pb)	2011/08/13		97	%	80 - 116
			Dissolved Nickel (Ni)	2011/08/13		99	%	80 - 116
		Method Blank	Dissolved Cadmium (Cd)	2011/08/13	<0.000005		mg/L	
			Dissolved Cobalt (Co)	2011/08/13	<0.0003		mg/L	
			Dissolved Copper (Cu)	2011/08/13	<0.0002		mg/L	
			Dissolved Lead (Pb)	2011/08/13	<0.0002		mg/L	
			Dissolved Nickel (Ni)	2011/08/13	<0.0005		mg/L	
		RPD [BG0301-01]	Dissolved Cadmium (Cd)	2011/08/13	NC		%	20
			Dissolved Cobalt (Co)	2011/08/13	NC		%	20
			Dissolved Copper (Cu)	2011/08/13	NC		%	20
			Dissolved Lead (Pb)	2011/08/13	1.6		%	20
			Dissolved Nickel (Ni)	2011/08/13	NC		%	20
5089820	JW0	Matrix Spike						
		[BG0301-02]	O-TERPHENYL (sur.)	2011/08/13		111	%	70 - 130
			Total Extractables C11 to C30	2011/08/13		123	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2011/08/13		110	%	70 - 130
			Total Extractables C11 to C30	2011/08/13		129	%	70 - 130
		Method Blank	O-TERPHENYL (sur.)	2011/08/13		110	%	70 - 130
			Undecanes (C11)	2011/08/13	<0.02		mg/L	
			Dodecanes (C12)	2011/08/13	<0.02		mg/L	
			Triadecanes (C13)	2011/08/13	<0.02		mg/L	
			Tetradecanes (C14)	2011/08/13	<0.02		mg/L	
			Pentadecanes (C15)	2011/08/13	<0.02		mg/L	
			Hexadecanes (C16)	2011/08/13	<0.02		mg/L	
			Heptadecanes (C17)	2011/08/13	<0.02		mg/L	
			Octadecanes (C18)	2011/08/13	<0.02		mg/L	
			Nonadecanes (C19)	2011/08/13	<0.02		mg/L	
			Eicosanes (C20)	2011/08/13	<0.02		mg/L	
			Heneicosanes (C21)	2011/08/13	<0.02		mg/L	
			Docosanes (C22)	2011/08/13	<0.02		mg/L	
			Triacosanes (C23)	2011/08/13	<0.02		mg/L	
			Tetracosanes (C24)	2011/08/13	<0.02		mg/L	
			Pentacosanes (C25)	2011/08/13	<0.03		mg/L	
			Hexacosanes (C26)	2011/08/13	<0.03		mg/L	
			Heptacosanes (C27)	2011/08/13	<0.03		mg/L	
			Octacosanes (C28)	2011/08/13	<0.03		mg/L	
			Nonacosanes (C29)	2011/08/13	<0.03		mg/L	
			Triacontanes (C30)	2011/08/13	<0.03		mg/L	
			Total Extractables C11 to C30	2011/08/13	<0.6		mg/L	
		RPD [BG0364-02]	Undecanes (C11)	2011/08/13	NC		%	40
			Dodecanes (C12)	2011/08/13	NC		%	40
			Triadecanes (C13)	2011/08/13	NC		%	40
			Tetradecanes (C14)	2011/08/13	NC		%	40
			Pentadecanes (C15)	2011/08/13	NC		%	40
			Hexadecanes (C16)	2011/08/13	NC		%	40
			Heptadecanes (C17)	2011/08/13	NC		%	40
			Octadecanes (C18)	2011/08/13	NC		%	40
			Nonadecanes (C19)	2011/08/13	NC		%	40
			Eicosanes (C20)	2011/08/13	NC		%	40
			Heneicosanes (C21)	2011/08/13	NC		%	40

SENES CONSULTANTS LIMITED
Attention: JASON MAUCHAN
Client Project #: GBL1
P.O. #: 340982
Site Location: SAWMILL

Quality Assurance Report (Continued)

Maxxam Job Number: CB174363

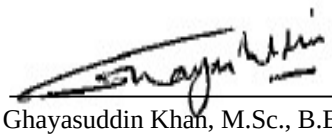
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5089820	JW0	RPD [BG0364-02]	Docosanes (C22)	2011/08/13	NC		%	40
			Triacosanes (C23)	2011/08/13	NC		%	40
			Tetracosanes (C24)	2011/08/13	NC		%	40
			Pentacosanes (C25)	2011/08/13	NC		%	40
			Hexacosanes (C26)	2011/08/13	NC		%	40
			Heptacosanes (C27)	2011/08/13	NC		%	40
			Octacosanes (C28)	2011/08/13	NC		%	40
			Nonacosanes (C29)	2011/08/13	NC		%	40
			Triacontanes (C30)	2011/08/13	NC		%	40
			Total Extractables C11 to C30	2011/08/13	NC		%	40
5090841	JMS	Matrix Spike	Total Mercury (Hg)	2011/08/15		103	%	80 - 120
		Spiked Blank	Total Mercury (Hg)	2011/08/15		111	%	80 - 120
		Method Blank	Total Mercury (Hg)	2011/08/15	0.002, RDL=0.002		ug/L	
		RPD	Total Mercury (Hg)	2011/08/15	NC		%	20
5091374	AP1	Matrix Spike [BG0301-01]	Phenols	2011/08/15		NC	%	80 - 120
		Spiked Blank	Phenols	2011/08/15		95	%	89 - 106
		Method Blank	Phenols	2011/08/15	<0.002		mg/L	
		RPD [BG0301-01]	Phenols	2011/08/15	0.3		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) Surrogate recovery exceeds acceptance criteria due to matrix interference.
(2) Surrogate recovery below acceptance criteria due to matrix interference. Reanalysis yields similar results.

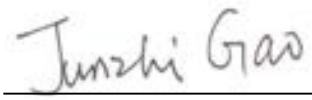
Validation Signature Page

Maxxam Job #: B174363

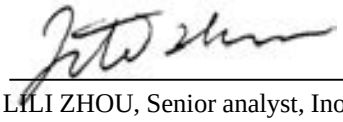
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab



Janet Gao, Senior Analyst, Organics Department



LILI ZHOU, Senior analyst, Inorganic department.

Robert Vivian, Senior Analyst

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757

Client Name:	***Senes Consultants Limited***
Location:	***Richmond Hill, ON***

Sample Data :

Sample Description :	**SB-W-1**		
Sampling Location :	**Sawmill Bay**		
Sampling Method :	**Grab**		
Volume obtained :	**60 L**		
Sampled By :	**JM/KM**		
	YY MM DD		
Sample Date :	**11 07 29**	*Time :*	**n/g**
Date Received :	**11 08 02**	*Time :*	**0940**
Bioassay Date :	**11 08 03**	*Time :*	**1430**
Report Date :	**11 08 09**		
Deviations from method :	**None**		

Bioassay Results :

CETIS Statistical Program

LC50 @ 96 Hours :	**>100%**
Method :	**n/a**
95 % Confidence Interval :	**n/a**
EC50 @ 96 Hours :	**>100%**
Method :	**n/a**
95 % Confidence Interval :	**n/a**

Legend:
LC50 (EC50) indicates concentration of sample, in percent, which kills (or affects) 50% of test organisms.

Note: The results relate only to the item tested.

General Comments:

Data & QA/QC Reviewed By : Robert Vivian, Bioassay Senior Analyst

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757

Sample Description : SB-W-1

Test Information :

Type of Bioassay :	**96 Hour Multiple Dilution Static Bioassay**			
Test Species :	***Oncorhynchus mykiss*** **(Rainbow Trout)**			
Test Protocols :	**Environment Canada EPS 1/RM/13 (Dec.2000 ed. with May 2007 amendments) and EPS1/RM/50 March 2008**			
Source of Test Species :	**Lyndon Trout Hatcheries, New Dundee, ON**			
Culture Lot # :	**LF0713-3**			
Mean (±1 SD) & Range Fork Length of Fish :	**3.5 ± 0.1 cm**	*Pop.Range*	**3.3 - 3.8 cm**	**n=10**
Mean (±1 SD) & Range Weight of Fish :	**0.55 ± 0.04 g**	*Pop.Range*	**0.5 - 0.6 g**	
Cumulative Mortality of Fish Lot in the 7 Days Prior to Test :	**<0.2%**			
Source of Holding Water :	**Ammonia Free, Dechlorinated City of Edmonton Tap Water**			
Size of Test Container :	**38 L**			
Material of Test Container :	**Disposable Plastic Liner in Glass Tank**			
Volume of Test Solution in Each Test Vessel :	**20 L**			
Depth of Test Material in Each Test Vessel :	**≥ 15 cm**			
Concentrations of Test Material :	**0, 20, 40, 60, 80, 100%**			
Number of Fish per Test Vessel :	**10**			
Loading Density :	**0.28 g/L**			
Method of Aeration :	**Carbon Filtered, Compressed Air Through Air-stone**			
Aeration Rate during test :	**6.5 ± 1.0 mL/min./L**			
pH adjustment:	**No pH adjustment of sample was made during testing.**			

Maxxam

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757

Data Table :

Sample Description : SB-W-1

Setup		Temperature °C	pH @ 20°C	EC µS cm-1	Dissolved Oxygen mg/L
	Sample Properties Prior To Initial Setup:	9.1	8.0	229	11.0
Analyst: MM	Preaeration Time (at rate of 6.5 ± 1.0 mL / min / L) :	90 min			

Time	Description	Concentration (% by Volume)					
		0	20	40	60	80	100
Start	Temperature (°C)	15.6	15.0	15.2	14.7	14.7	14.7
	pH	8.0	8.0	7.9	7.8	7.8	7.8
	EC (µS cm-1)	352	333	321	299	282	264
Analyst: MM	Dissolved Oxygen (mg/L)	9.7	9.6	9.3	9.2	9.0	8.8
1/4 Hour	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
1/2 Hour	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
1 Hour	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
2 Hours	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
4 Hours	Number Dead						
Analyst:	Atypical/Stressed Behaviour						
24 Hours	Temperature (°C)	14.9	14.2	14.2	14.2	14.3	14.5
	pH	8.2	8.1	8.1	8.1	8.2	8.1
	EC (µS cm-1)	340	315	310	290	280	264
	Dissolved Oxygen (mg/L)	9.7	9.8	9.8	9.8	9.7	9.4
	Number Dead	0	0	0	0	0	0
Analyst: BH	Atypical/Stressed Behaviour	0	0	0	0	0	0
48 Hours	Temperature (°C)	14.7	14.2	14.2	14.2	14.3	14.5
	pH	8.3	8.1	8.1	8.1	8.2	8.1
	EC (µS cm-1)	336	317	315	299	281	266
	Dissolved Oxygen (mg/L)	9.6	9.5	9.7	9.7	9.6	9.4
	Number Dead	0	0	0	0	0	0
Analyst: MM	Atypical/Stressed Behaviour	0	0	0	0	0	0
72 Hours	Temperature (°C)	14.7	14.2	14.2	14.2	14.3	14.5
	pH	8.3	8.2	8.2	8.2	8.2	8.2
	EC (µS cm-1)	348	324	316	300	285	266
	Dissolved Oxygen (mg/L)	9.6	9.6	9.6	9.7	9.7	9.5
	Number Dead	0	0	0	0	0	0
Analyst: HW	Atypical/Stressed Behaviour	0	0	0	0	0	0
96 Hours	Temperature (°C)	14.8	14.2	14.3	14.2	14.3	14.5
	pH	8.3	8.2	8.2	8.2	8.2	8.2
	EC (µS cm-1)	351	320	312	300	277	261
	Dissolved Oxygen (mg/L)	9.6	9.7	9.7	9.8	9.7	9.6
	Number Dead	0	0	0	0	0	0
Analyst: HW	Atypical/Stressed Behaviour	0	0	0	0	0	0

Stress Codes: P:dark pigmentation U:light pigmentation L:lethargic H:hyperactive M:inhibited movement G:pronounced opercular movement S:extreme toxic shock D:disorientated

Note:Number Dead or Atypical/Stress Behaviour is out of 10 fish total in each concentration.

96hr *Rainbow Trout* Bioassay Report

Project : B169677-BD4757
Sample Description : SB-W-1

Results of Phenol Reference Bioassay :

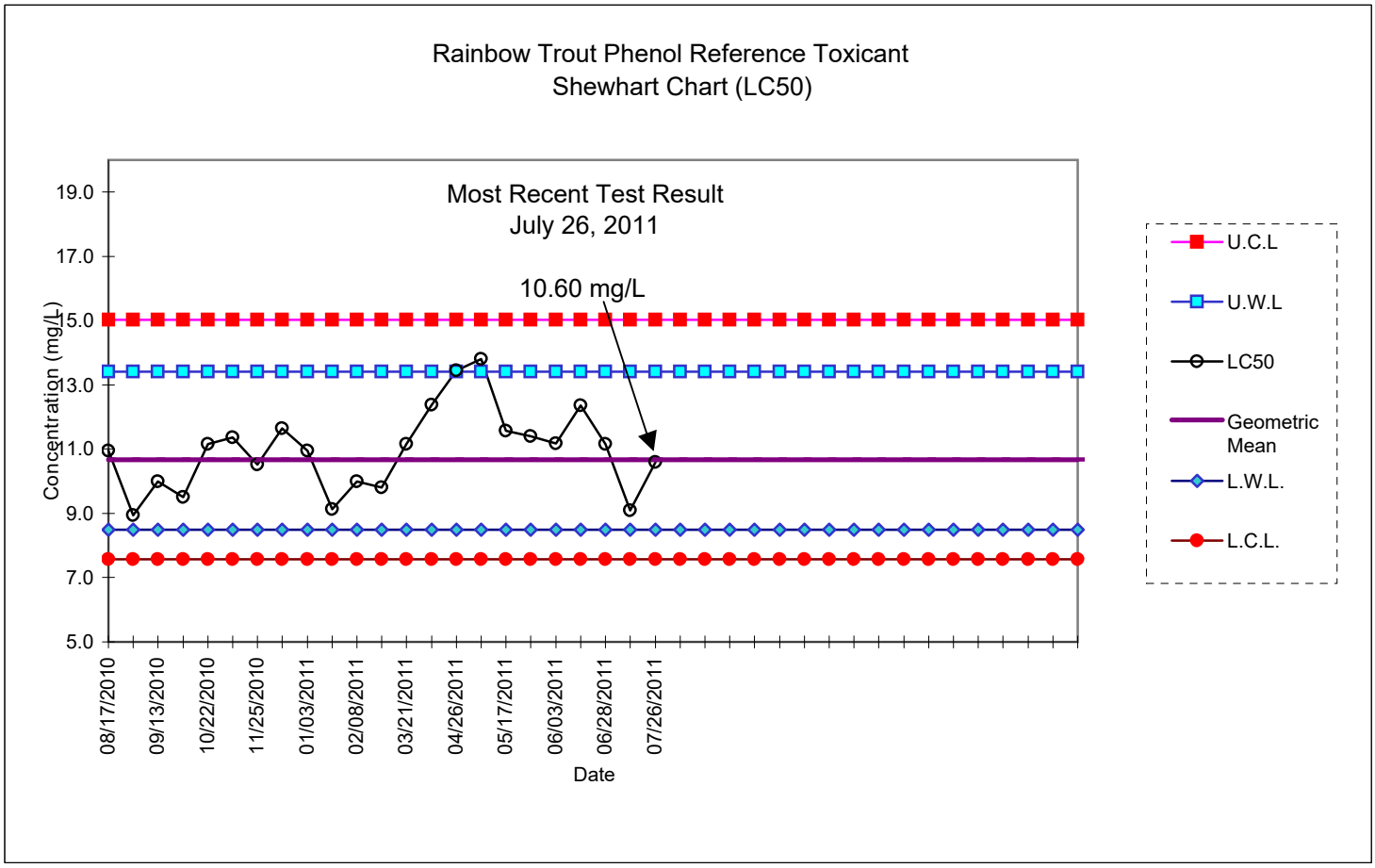
Current

LC50 @ 96 Hours :	**10.60 mg/L**
95 % Confidence Interval :	**9.68<10.6<11.4**
Method :	**Probit**
Date Initiated	**11 07 26**

Historical

Geometric Mean :	**10.65 mg/L**
Warning Limits :	**8.48<10.67<13.41**
Method :	**Shewhart**

The reference toxicant is conducted under the same conditions as the definitive testing.



Microtox Report

Project : B174363-BG0364
Tech: RL

Sample Data :

Company Name :	Senes Consultants Limited		
City :	Richmond Hill, ON		
Sample Description :	SB-W-2B		
Sample Location :	Sawmill		
Sampling Method :	Grab		
Volume Obtained :	125 mL		
Sampled By :	JM-KM		
	YY MM DD		
Sample Date :	n/g	Time:	n/g
Date Received :	11 08 11	Time:	9:00
Date of Assay :	11 08 12	Time:	12:30
Report Date :	11 08 15		
Storage Temp :	4 ± 2 °C		
Sample Prep:	none		

Test Data:

Appearance, Visual :	clear		
Turbidity, Visual :	none		
Initial pH :	7.2		
Sample Dilution :	neat		
IC50 (5min, 15°C) :	>100%	95% Confidence Interval :	n/a
IC20 (5min, 15°C) :	57.6%	95% Confidence Interval :	38.9<57.6<85.2%
IC50 (15min, 15°C) :	>100%	95% Confidence Interval :	n/a
IC20 (15min, 15°C) :	70.3%	95% Confidence Interval :	40.9<70.3<81.8%

Note: The results relate only to the item tested.

Results of Phenol Reference Test :

Current	IC50 @ 5 min. :	17.7 mg/L
	95 % Confidence Interval :	14.7<17.7<21.4
	Date of Reference Bioassay :	11 08 12
Historical	Geometric Mean IC50 @ 5min.:	18.8 mg/L
	Mean ± 2SD:	15.1<18.8<24.2
	Method:	Shewhart

The reference toxicant is conducted under the same conditions as the definitive testing.

Data & QA/QC Reviewed By :  Robert Vivian, Bioassay Senior Analyst

Maxxam Analytics

Microtox Report

Project : B174363-BG0364

Test Information :

Sample Description : SB-W-2B

Type of Test :	15 min. Static Bioassay
Test Species :	Vibrio fischeri (Bioluminescent bacteria)
Source of Test Species :	STRATEGIC DIAGNOSTICS Inc.
Reagent Lot # :	10L1004
Date Obtained :	2011/05/03
Expiry Date :	2012/11/30
Reagent Holding Temp :	< - 20°C
Test Protocol :	Environment Canada EPS 1/RM/24
Salinity Adjustment :	Osmotic Adjusting Solution (200 uL)
Analyzer Used :	MICROBICS Analyzer Model 500
Calculation Method :	MICROTOX OMNI Version 1.18

Data Table: Sample vs Light Emission at Time T

Time (min.)	Sample Concentration [% v/v] Control	10.2	20.5	40.9	81.8
T0	96	98	95	96	97
T5	99	97	92	86	71
T15	92	95	88	84	70
T30*					
T60*					

* If applicable

General Comments:

Maxxam

Rainbow Trout Bioassay - Daily Update Sheet

File #: B169704-BD4980

Company Name: SENES Consultants Limited
Attention:
Analyst: MM

Sample Description: **SB-W-2**
Date Sampled: **11 08 01**
Time: **1400**
Date Received: **11 08 02**
Time: **0925**
Bioassay Date: **11 08 03**
Time: **1430**

Concentration (% by Volume)		0	20	40	60	80	100	Analyst
Start	pH							MM
	NH3-N							
1 hour	# Dead							
2 hours	# Dead							
3 hours	# Dead							
24 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	BH
48 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	MM
72 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	HW
96 hours	pH							
	NH3-N							
	# Dead	0	0	0	0	0	0	
	# Stress Behavior	0	0	0	0	0	0	HW

Stress Codes: P: dark pigmentation U: light pigmentation L: lethargic H: hyperactive
M: inhibited movement G: pronounced opercular movement S: extreme toxic shock

Note: # Dead or Stress Behaviour is out of 10 fish total in each concentration.

Comments:

9331-48 St, Edmonton, Alberta, Canada T6B 2R4
Tel: (780) 577-7100 Fax: (780) 450-4187 Website: www.maxxam.ca

Maxxam

Success Through Science®

Your Project #: 340962-000, GBL1
Site Location: SAWMILL BAY
Your C.O.C. #: A057857

Attention: JASON MAUCHAN
SENES CONSULTANTS LIMITED
121 GRANTON DRIVE, UNIT 12
RICHMOND HILL, ON
CANADA L4B 3N4

Report Date: 2011/08/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B179238
Received: 2011/08/24, 13:00

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
See Attached Results (1)	2	2011/08/29	2011/08/29		
BTEX/F1 in Water by HS GC/MS	2	N/A	2011/08/27	CAL SOP-00190	CCME CWS, EPA 8260C
BTEX/F1 in Water by HS GC/MS	1	N/A	2011/08/29	CAL SOP-00190	CCME CWS, EPA 8260C
Cadmium - low level CCME - Dissolved	3	N/A	2011/08/29	AB SOP-00043	EPA 200.8
Mercury - Low Level (Total)	3	2011/08/29	2011/08/29	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved	2	N/A	2011/08/28	AB SOP-00043	EPA 200.8
Elements by ICPMS - Dissolved	1	N/A	2011/08/29	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	1	2011/08/27	2011/08/29	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	2	2011/08/28	2011/08/29	AB SOP-00043	EPA 200.8
pH @25C	2	N/A	2011/08/26	AB SOP-00005	SM 4500-H B
pH @25C	1	N/A	2011/08/27	AB SOP-00005	SM 4500-H B
Phenols (4-AAP)	3	N/A	2011/08/26	CAL SOP-00067	EPA 420.2
Total Extractable Hydrocarbon C11-C30	3	2011/08/26	2011/08/27	AB SOP-00040 SOP-00037	AB EPA3510C/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Maxxam Edmonton Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		BI7969		
Sampling Date		2011/08/23 22:15		
COC#		A057857		
	Units	**PW2-2308A**	**RDL**	**QC Batch**
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	0.55	0.005	5122455
Elements				
Dissolved Cobalt (Co)	mg/L	0.0009	0.0003	5132277
Dissolved Copper (Cu)	mg/L	0.0009	0.0002	5132277
Dissolved Lead (Pb)	mg/L	0.0040	0.0002	5132277
Dissolved Nickel (Ni)	mg/L	0.0023	0.0005	5132277

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		BI7969		
Sampling Date		2011/08/23 22:15		
COC#		A057857		
	Units	**PW2-2308A**	**RDL**	**QC Batch**
Elements				
Total Arsenic (As)	mg/L	0.0006	0.0002	5132174
Total Chromium (Cr)	mg/L	<0.001	0.001	5132174
Total Zinc (Zn)	mg/L	0.084	0.003	5132174

RDL = Reportable Detection Limit

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BI7969	BI8137		BI8201	BI8201	BI8219	BI8221		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30							
COC#		A057857	A057857		A057857	A057857	A057857	A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**QC Batch**	**TRIP BLANK**	**TRIP BLANK Lab-Dup**	**TB MICROTOX 1**	**TB MICROTOX 2**	**RDL**	**QC Batch**
Industrial										
Remark	N/A						SEE ATTACH(1)	SEE ATTACH(1)	N/A	5130659
Misc. Inorganics										
pH	N/A	7.37	7.80	5126211	6.33	6.38			N/A	5129880
Low Level Elements										
Dissolved Cadmium (Cd)	ug/L		0.11	5122455	<0.005				0.005	5127220
Misc. Organics										
Phenols	mg/L	0.006	0.003	5127309	<0.002				0.002	5127309

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		BI7969	BI8137	BI8201		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30			
COC#		A057857	A057857	A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**TRIP BLANK**	**RDL**	**QC Batch**
Elements						
Total Arsenic (As)	mg/L		0.0013	<0.0002	0.0002	5130312
Dissolved Cadmium (Cd)	mg/L		0.00011	<0.000005	0.000005	5130316
Total Chromium (Cr)	mg/L		<0.001	<0.001	0.001	5130312
Dissolved Cobalt (Co)	mg/L		<0.0003	<0.0003	0.0003	5130316
Dissolved Copper (Cu)	mg/L		0.0004(2)	0.0003(2)	0.0002	5130316
Dissolved Lead (Pb)	mg/L		0.0004(2)	<0.0002	0.0002	5130316
Dissolved Nickel (Ni)	mg/L		0.0006(2)	<0.0005	0.0005	5130316
Total Zinc (Zn)	mg/L		0.039	<0.003	0.003	5130312
Low Level Elements						
Total Mercury (Hg)	ug/L	0.011	0.005	0.004	0.002	5132523

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Sample was analyzed after holding time expired.
(2) - Dissolved greater than total. Results are within limits of uncertainty(MU).

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

EXTRACTABLE HYDROCARBONS BY GC-FID (WATER)

Maxxam ID		BI7969	BI8137	BI8137	BI8201		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30	2011/08/23 22:30			
COC#		A057857	A057857	A057857	A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**PW4-2308A Lab-Dup**	**TRIP BLANK**	**RDL**	**QC Batch**
Extractable Hydrocarbons							
Undecanes (C11)	mg/L	<0.02	<0.02	<0.02	<0.02	0.02	5127232
Dodecanes (C12)	mg/L	0.07	<0.02	<0.02	<0.02	0.02	5127232
Triadecanes (C13)	mg/L	0.15	0.09	0.08	<0.02	0.02	5127232
Tetradecanes (C14)	mg/L	0.19	0.14	0.13	<0.02	0.02	5127232
Pentadecanes (C15)	mg/L	0.20	0.15	0.13	<0.02	0.02	5127232
Hexadecanes (C16)	mg/L	0.16	0.12	0.10	<0.02	0.02	5127232
Heptadecanes (C17)	mg/L	0.08	0.05	0.05	<0.02	0.02	5127232
Octadecanes (C18)	mg/L	0.10	0.06	0.05	<0.02	0.02	5127232
Nonadecanes (C19)	mg/L	<0.02	<0.02	<0.02	<0.02	0.02	5127232
Eicosanes (C20)	mg/L	0.08	0.04	0.03	<0.02	0.02	5127232
Heneicosanes (C21)	mg/L	0.02	<0.02	<0.02	<0.02	0.02	5127232
Docosanes (C22)	mg/L	0.04	<0.02	<0.02	<0.02	0.02	5127232
Triacosanes (C23)	mg/L	0.03	<0.02	<0.02	<0.02	0.02	5127232
Tetracosanes (C24)	mg/L	0.03	<0.02	<0.02	<0.02	0.02	5127232
Pentacosanes (C25)	mg/L	0.04	<0.03	<0.03	<0.03	0.03	5127232
Hexacosanes (C26)	mg/L	0.04	<0.03	<0.03	<0.03	0.03	5127232
Heptacosanes (C27)	mg/L	0.06	<0.03	<0.03	<0.03	0.03	5127232
Octacosanes (C28)	mg/L	0.06	<0.03	<0.03	<0.03	0.03	5127232
Nonacosanes (C29)	mg/L	0.04	<0.03	<0.03	<0.03	0.03	5127232
Triacontanes (C30)	mg/L	0.06	<0.03	<0.03	<0.03	0.03	5127232
Total Extractables C11 to C30	mg/L	1.5	0.65	0.57	<0.03	0.03	5127232
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	101	104	102	102		5127232

RDL = Reportable Detection Limit

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		BI7969	BI8137		BI8201		
Sampling Date		2011/08/23 22:15	2011/08/23 22:30				
COC#		A057857	A057857		A057857		
	Units	**PW2-2308A**	**PW4-2308A**	**QC Batch**	**TRIP BLANK**	**RDL**	**QC Batch**
Volatiles							
Benzene	ug/L	<0.4	1.2	5124961	<0.4	0.4	5129846
Toluene	ug/L	<0.4	7.8	5124961	<0.4	0.4	5129846
Ethylbenzene	ug/L	<0.4	0.5	5124961	<0.4	0.4	5129846
o-Xylene	ug/L	<0.4	2.1	5124961	<0.4	0.4	5129846
m & p-Xylene	ug/L	<0.8	2.1	5124961	<0.8	0.8	5129846
Xylenes (Total)	ug/L	<0.8	4.2	5124961	<0.8	0.8	5129846
F1 (C6-C10) - BTEX	ug/L	<100	110	5124961	<100	100	5129846
LH (C5-C10)	ug/L	<100	130	5124961	<100	100	5129846
(C6-C10)	ug/L	<100	120	5124961	<100	100	5129846
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	81	91	5124961	95		5129846
4-BROMOFLUOROBENZENE (sur.)	%	112	0.00	5124961	100		5129846
D4-1,2-DICHLOROETHANE (sur.)	%	130	0.00	5124961	108		5129846
D8-TOLUENE (sur.)	%		0.00	5124961			

RDL = Reportable Detection Limit

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

Package 1	5.3°C
Package 2	5.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Sample BI8137-01: Dissolved greater than total for Cd. Results within acceptable limits of precision.

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5124961	1,4-Difluorobenzene (sur.)	2011/08/27	93	70 - 130	97	70 - 130	97	%		
5124961	4-BROMOFLUOROBENZENE (sur.)	2011/08/27	113	70 - 130	102	70 - 130	96	%		
5124961	D4-1,2-DICHLOROETHANE (sur.)	2011/08/27	115	70 - 130	117	70 - 130	113	%		
5124961	Benzene	2011/08/27	99	70 - 130	92	70 - 130	<0.4	ug/L	NC	40
5124961	Toluene	2011/08/27	99	70 - 130	87	70 - 130	<0.4	ug/L	NC	40
5124961	Ethylbenzene	2011/08/27	99	70 - 130	88	70 - 130	<0.4	ug/L	NC	40
5124961	o-Xylene	2011/08/27	90	70 - 130	81	70 - 130	<0.4	ug/L	NC	40
5124961	m & p-Xylene	2011/08/27	87	70 - 130	79	70 - 130	<0.8	ug/L	NC	40
5124961	(C6-C10)	2011/08/27	71	70 - 130	72	70 - 130	<100	ug/L	NC	40
5124961	Xylenes (Total)	2011/08/27					<0.8	ug/L	NC	40
5124961	F1 (C6-C10) - BTEX	2011/08/27					<100	ug/L	NC	40
5126211	pH	2011/08/26			100	97 - 102			0.2	5
5127232	O-TERPHENYL (sur.)	2011/08/27	102	70 - 130	101	70 - 130	102	%		
5127232	Total Extractables C11 to C30	2011/08/27	NC	50 - 130	100	70 - 130	<0.6	mg/L	12.8	40
5127232	Undecanes (C11)	2011/08/27					<0.02	mg/L	NC	40
5127232	Dodecanes (C12)	2011/08/27					<0.02	mg/L	NC	40
5127232	Triadecanes (C13)	2011/08/27					<0.02	mg/L	NC	40
5127232	Tetradecanes (C14)	2011/08/27					<0.02	mg/L	9.3	40
5127232	Pentadecanes (C15)	2011/08/27					<0.02	mg/L	10.5	40
5127232	Hexadecanes (C16)	2011/08/27					<0.02	mg/L	12.3	40
5127232	Heptadecanes (C17)	2011/08/27					<0.02	mg/L	NC	40
5127232	Octadecanes (C18)	2011/08/27					<0.02	mg/L	NC	40
5127232	Nonadecanes (C19)	2011/08/27					<0.02	mg/L	NC	40
5127232	Eicosanes (C20)	2011/08/27					<0.02	mg/L	NC	40
5127232	Heneicosanes (C21)	2011/08/27					<0.02	mg/L	NC	40
5127232	Docosanes (C22)	2011/08/27					<0.02	mg/L	NC	40
5127232	Triacosanes (C23)	2011/08/27					<0.02	mg/L	NC	40
5127232	Tetracosanes (C24)	2011/08/27					<0.02	mg/L	NC	40
5127232	Pentacosanes (C25)	2011/08/27					<0.03	mg/L	NC	40
5127232	Hexacosanes (C26)	2011/08/27					<0.03	mg/L	NC	40
5127232	Heptacosanes (C27)	2011/08/27					<0.03	mg/L	NC	40
5127232	Octacosanes (C28)	2011/08/27					<0.03	mg/L	NC	40
5127232	Nonacosanes (C29)	2011/08/27					<0.03	mg/L	NC	40
5127232	Triacontanes (C30)	2011/08/27					<0.03	mg/L	NC	40
5127309	Phenols	2011/08/26	98	80 - 120	98	89 - 106	<0.002	mg/L	0.6	20
5129846	1,4-Difluorobenzene (sur.)	2011/08/28	97	70 - 130	92	70 - 130	96	%		
5129846	4-BROMOFLUOROBENZENE (sur.)	2011/08/28	103	70 - 130	102	70 - 130	100	%		
5129846	D4-1,2-DICHLOROETHANE (sur.)	2011/08/28	109	70 - 130	114	70 - 130	119	%		
5129846	Benzene	2011/08/29	97	70 - 130	101	70 - 130	<0.4	ug/L	2.1	40
5129846	Toluene	2011/08/29	97	70 - 130	101	70 - 130	<0.4	ug/L	5.7	40

Maxxam Job #: B179238
Report Date: 2011/08/30

SENES CONSULTANTS LIMITED
Client Project #: 340962-000, GBL1
Site Location: SAWMILL BAY

QUALITY ASSURANCE REPORT

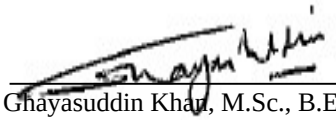
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5129846	Ethylbenzene	2011/08/29	95	70 - 130	98	70 - 130	<0.4	ug/L	10.6	40
5129846	o-Xylene	2011/08/29	86	70 - 130	89	70 - 130	<0.4	ug/L	13.3	40
5129846	m & p-Xylene	2011/08/29	87	70 - 130	88	70 - 130	<0.8	ug/L	11.7	40
5129846	(C6-C10)	2011/08/29	89	70 - 130	75	70 - 130	<100	ug/L	NC	40
5129846	Xylenes (Total)	2011/08/29					<0.8	ug/L	12.1	40
5129846	F1 (C6-C10) - BTEX	2011/08/29					<100	ug/L	NC	40
5129880	pH	2011/08/27			100	97 - 102			0.7	5
5130312	Total Arsenic (As)	2011/08/28	105	80 - 120	99	80 - 120	<0.0002	mg/L	0.6	20
5130312	Total Chromium (Cr)	2011/08/28	104	80 - 120	101	80 - 120	<0.001	mg/L	NC	20
5130312	Total Zinc (Zn)	2011/08/28	NC	80 - 120	102	80 - 120	<0.003	mg/L	0.8	20
5130316	Dissolved Cadmium (Cd)	2011/08/28	113	80 - 120	99	80 - 120	<0.000005	mg/L		
5130316	Dissolved Cobalt (Co)	2011/08/28	108	80 - 120	97	80 - 120	<0.0003	mg/L	NC	20
5130316	Dissolved Copper (Cu)	2011/08/28	101	80 - 120	97	80 - 120	<0.0002	mg/L	18.3	20
5130316	Dissolved Lead (Pb)	2011/08/28	106	80 - 120	98	80 - 120	<0.0002	mg/L	NC	20
5130316	Dissolved Nickel (Ni)	2011/08/28	103	80 - 120	97	80 - 120	<0.0005	mg/L	NC	20
5132174	Total Arsenic (As)	2011/08/29	100	80 - 120	100	80 - 120	<0.0002	mg/L	NC	20
5132174	Total Chromium (Cr)	2011/08/29	102	80 - 120	103	80 - 120	<0.001	mg/L	NC	20
5132174	Total Zinc (Zn)	2011/08/29	99	80 - 120	101	80 - 120	<0.003	mg/L	NC	20
5132277	Dissolved Cobalt (Co)	2011/08/29	117	80 - 120	99	80 - 120	<0.0003	mg/L	NC	20
5132277	Dissolved Copper (Cu)	2011/08/29	115	80 - 120	97	80 - 120	0.0003, RDL=0.0002	mg/L	19.7	20
5132277	Dissolved Lead (Pb)	2011/08/29	108	80 - 120	98	80 - 120	<0.0002	mg/L	NC	20
5132277	Dissolved Nickel (Ni)	2011/08/29	115	80 - 120	99	80 - 120	<0.0005	mg/L	NC	20
5132523	Total Mercury (Hg)	2011/08/29	118	80 - 120	106	80 - 120	0.003, RDL=0.002	ug/L	NC	20

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

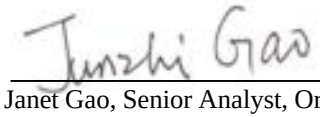
Validation Signature Page

Maxxam Job #: B179238

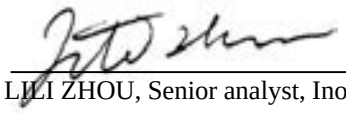
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



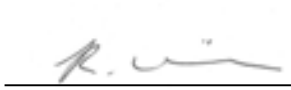
Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Senior Analyst, Water Lab



Janet Gao, Senior Analyst, Organics Department



LILI ZHOU, Senior analyst, Inorganic department.



Robert Vivian, Senior Analyst

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Calgary 4000 19st St. NE, T2E 6P8, Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton 9331 - 48 Street, T6B 2R4, Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 485-8569
www.maxxamanalytics.com

Chain of Custody

A057857

Page: 1 of 1

	Invoice To:	C/O Report Address ☐	Report To:	Same as Invoice ☐	Report Distribution (E-Mail):
Company:	SENES		J. Mauchan		jmauchan@desltd.ca
Contact:	J. Mauchan C. Gravelle				rjanzen@desltd.ca
Address:	Richmond Hill				
	Prov:	PC:	Prov:	PC:	
Contact #s:	Ph:	Cell:	Ph:	Cell:	

REGULATORY GUIDELINES:
☐ AT1
☑ CCME
☐ Regulated Drinking Water
☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #: 340962-000
Project # / Name: GBL 1
Site Location: SAWMILL BAY
Quote #:
Sampled By:

SERVICE REQUESTED:
☑ RUSH (Contact lab to reserve) Date Required: see note
☐ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix (Soil)	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐BTEX F1 ☐VOCs	☐BTEX F1-F2 ☐BTEX F1-F4	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury	☐ Total ☐ Dissolved	Other Analysis: BTEX C6-C10	pH	TEH30	Phenols	Dissolved Cu Cd Ni Pb Co	Total As Hg Zn Cr	Toxicity Microtox EC50(15)			HOLD - Do not Analyze	# of Containers Submitted
1	PW2-2308A	NA	Sw	11/08/23 2215															✓	✓	✓	✓	✓	✓	✓				
2	PW2-2308B	↓	↓	"																							✓	
3	PW4-2308A			11/08/23 2230															✓	✓	✓	✓	✓	✓	✓				
4	PW4-2308B			"																					1,30		✓	
5																									2Hg			
6																												
7																												
8																												
9																												
10																												
11																												
12																												

ARRIVED AT DEPOT:
AUG 25 2011
TEMP: 5 | 6 | 5

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Ryan Janzen Ryan Janzen	11/08/23	2345
Received By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:
Report results when microtox expected

# of Jars Used & Not Submitted:

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B179238		
			Custody Seal	Temperature	Ice
Lab Comments:					

RECEIVED AUG 25 2011 0800

AB FCD-02321 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

Joyce Kimani

From: Ryan Janzen [rjanzen@dcsltd.ca]
Sent: Friday, August 26, 2011 12:21 PM
To: Joyce Kimani
Subject: RE: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Location: SAWMILL BAY

Hi Joyce,

Yes, please do an analysis for phenols as well.

Thanks,

Ryan

From: Joyce Kimani [mailto:JKimani@maxxam.ca]
Sent: August-26-11 1:16 PM
To: Ryan Janzen
Cc: cgravelle@dcsltd.ca
Subject: RE: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Location: SAWMILL BAY

Hi Ryan,

We will go ahead with the analysis however, a phenol bottle was not provided for the Trip Blank. If you want we can pour off one from one of the unpreserved 250mL ambers that were provided. Please confirm.

JOYCE KIMANI
Project Manager Assistant
jkimani@maxxam.ca
Direct Line 403 219 3683
Main Office 403 291 3077
4000 19th Street NE / Calgary, AB Canada T2E 6P8

From: Ryan Janzen [mailto:rjanzen@dcsltd.ca]
Sent: Friday, August 26, 2011 10:58 AM
To: Calgary Customer Service
Cc: cgravelle@dcsltd.ca
Subject: RE: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Location: SAWMILL BAY

Hi Joyce,

Here is the table that details what the samples are being analyzed for. I suppose the trip blanks should get the same analysis.

Here is the re-created COC, as best I can do it.

Sample ID	Matrix	Date/Time	BTEX/C6-C10	pH	TEH 30	Phenols	Dissolved Metals (Cu, Cd,	Total Metals (As,	Toxici EC50 (15)

2011/08/26

							Ni, Pb, Co)	Hg, Zn, Cr)		
PW2-2308A	Water	23/08/2011 – 2215	X	X	X	X	X	X	X	
PW2-2308B	Water	23/08/2011 – 2215								X
PW4-2308A	Water	23/08/2011 – 2230	X	X	X	X	X	X	X	
PW4-2308B	Water	23/08/2011 – 2230								X

Thanks,

Ryan

-----Original Message-----
From: customerservicecalgary@maxxam.ca [mailto:customerservicecalgary@maxxam.ca]
Sent: August-26-11 12:47 PM
To: jmauchan@desltd.ca; rjanzen@desltd.ca
Subject: Job Confirmation Report [B179238] - Project 340962-000, GBL1 , Site Locatiog: SAWMILL BAY
Importance: High

CONFIRMATION-RECEPTION OF SAMPLES FOR ANALYSIS

Hello,

Attached is the job confirmation for your sample submission. I just wanted to confirm what analysis you need for the trip blank sample. Please let us know as soon as possible so that we can start with the analysis.

Thank you

Joyce Kimani

MAXXAM ANALYTICS
4000 19st N.E
Calgary, Alberta T2E 6P8
http://www.maxxam.ca

2011/08/26

Microtox Report

Project : B179238-BI8219
Tech: RL

Sample Data :

Company Name :	Senes Consultants Limited		
City :	Richmond, ON		
Sample Description :	TB Microtox 1		
Sample Location :	Sawmill Bay		
Sampling Method :	Grab		
Volume Obtained :	250 mL		
Sampled By :	n/g		
	YY MM DD		
Sample Date :	11 08 23	Time:	n/g
Date Received :	11 08 27	Time:	8:32
Date of Assay :	11 08 27	Time:	10:45
Report Date :	11 07 29		
Storage Temp :	4 ± 2 °C		
Sample Prep:	pH adjusted from 8.9 to 8.5 with HCl		

Test Data:

Appearance, Visual :	clear	
Turbidity, Visual :	none	
Initial pH :	8.5	
Sample Dilution :	neat	
IC50 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC50 (15min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (15min, 15°C) :	>100%	95% Confidence Interval : n/a

Note: The results relate only to the item tested.

Results of Phenol Reference Test :

Current	IC50 @ 5 min. :	19.1 mg/L
	95 % Confidence Interval :	13.6<19.1<26.6
	Date of Reference Bioassay :	11 08 27
Historical	Geometric Mean IC50 @ 5min.:	18.8 mg/L
	Mean ± 2SD:	15.1<18.8<24.2
	Method:	Shewhart

The reference toxicant is conducted under the same conditions as the definitive testing.

Data & QA/QC Reviewed By : _____ Robert Vivian, Bioassay Senior Analyst

Microtox Report

Project : B179238-BI8219

Test Information : Sample Description : TB Microtox 1

Type of Test :	15 min. Static Bioassay
Test Species :	Vibrio fischeri (Bioluminescent bacteria)
Source of Test Species :	STRATEGIC DIAGNOSTICS Inc.
Reagent Lot # :	10L1004
Date Obtained :	2011/05/03
Expiry Date :	2012/11/30
Reagent Holding Temp :	< - 20°C
Test Protocol :	Environment Canada EPS 1/RM/24
Salinity Adjustment :	Osmotic Adjusting Solution (200 uL)
Analyzer Used :	MICROBICS Analyzer Model 500
Calculation Method :	MICROTOX OMNI Version 1.18

Data Table: Sample vs Light Emission at Time T

Time (min.)	Sample Concentration [% v/v] Control	10.2	20.5	40.9	81.8
T0	95	92	93	93	92
T5	97	92	94	94	90
T15	91	88	90	91	87
T30*					
T60*					

* If applicable

General Comments: _____

Microtox Report

Project : B179238-BI8221
Tech: RL

Sample Data :

Company Name :	Senes Consultants Limited		
City :	Richmond, ON		
Sample Description :	TB Microtox 2		
Sample Location :	Sawmill Bay		
Sampling Method :	Grab		
Volume Obtained :	250 mL		
Sampled By :	n/g		
	YY MM DD		
Sample Date :	11 08 23	Time:	n/g
Date Received :	11 08 27	Time:	8:32
Date of Assay :	11 08 27	Time:	10:45
Report Date :	11 07 29		
Storage Temp :	4 ± 2 °C		
Sample Prep:	pH adjusted from 8.7 to 8.1 with HCl		

Test Data:

Appearance, Visual :	clear	
Turbidity, Visual :	none	
Initial pH :	8.1	
Sample Dilution :	neat	
IC50 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (5min, 15°C) :	>100%	95% Confidence Interval : n/a
IC50 (15min, 15°C) :	>100%	95% Confidence Interval : n/a
IC20 (15min, 15°C) :	>100%	95% Confidence Interval : n/a

Note: The results relate only to the item tested.

Results of Phenol Reference Test :

Current	IC50 @ 5 min. :	19.1 mg/L
	95 % Confidence Interval :	13.6<19.1<26.6
	Date of Reference Bioassay :	11 08 27
Historical	Geometric Mean IC50 @ 5min.:	18.8 mg/L
	Mean ± 2SD:	15.1<18.8<24.2
	Method:	Shewhart

The reference toxicant is conducted under the same conditions as the definitive testing.

Data & QA/QC Reviewed By : _____ Robert Vivian, Bioassay Senior Analyst

Maxxam Analytics

Microtox Report

Project : B179238-BI8221

Test Information :

Sample Description : TB Microtox 2

Type of Test :	15 min. Static Bioassay
Test Species :	Vibrio fischeri (Bioluminescent bacteria)
Source of Test Species :	STRATEGIC DIAGNOSTICS Inc.
Reagent Lot # :	10L1004
Date Obtained :	2011/05/03
Expiry Date :	2012/11/30
Reagent Holding Temp :	< - 20°C
Test Protocol :	Environment Canada EPS 1/RM/24
Salinity Adjustment :	Osmotic Adjusting Solution (200 uL)
Analyzer Used :	MICROBICS Analyzer Model 500
Calculation Method :	MICROTOX OMNI Version 1.18

Data Table: Sample vs Light Emission at Time T

Time (min.)	Sample Concentration [% v/v] Control	10.2	20.5	40.9	81.8
T0	93	91	92	93	91
T5	97	93	94	94	88
T15	92	89	92	93	87
T30*					
T60*					

* If applicable

General Comments:

APPENDIX K

LAND USE PERMIT
(CD ROM ONLY)

SAHTU Land & Water Board
Land Use Permit

Permit Class: Class A Land Use Permit	Permit No.: S09D-001

Subject to the Mackenzie Valley Land Use Regulations and the terms and conditions in this permit, authority is hereby granted to:

Indian and Northern Affairs Canada - NT Region
Contaminants and Remediation Directorate

Permittee

To proceed with the land use operation described in the application of:

Signature: Jessica Mace	Date: February 24, 2009
Type of Land Use Operations: Mining Remediation	
Location: Great Bear Lake Mine Sites on the east side of Great Bear Lake, NT	

This permit may be assigned, extended, discontinued, suspended or cancelled pursuant to the Mackenzie Valley Land Use Regulations.

Dated at: Fort Good Hope, NT This 21st Day of July Year: 2010

Witness Joan Hardy

Larry Wallace (Chairman)
SAHTU Land & Water Board

Commencement Date: July 26, 2010 Expiry Date: July 25, 2015

NOTE

IT IS A CONDITION OF THIS PERMIT THAT THE PERMITTEE COMPLY WITH THE PROVISIONS OF THE MACKENZIE VALLEY RESOURCE MANAGEMENT ACT AND REGULATIONS AND THE TERMS AND CONDITIONS SET OUT HEREIN. A FAILURE TO COMPLY MAY RESULT IN SUSPENSION OR CANCELLATION OF THIS PERMIT BY THE BOARD.

THIS PERMIT SHALL BE POSTED OR BE AVAILABLE ON SITE.

If you have any questions please call the SAHTU Land & Water Board at (867) 598-2413

CONDITIONS ANNEXED TO AND FORMING PART OF LAND USE PERMIT S09D-001

26 (1) (A) - LOCATION AND AREA

1.1	The Permittee shall not conduct this land use operation on any lands not designated in the accepted application, unless otherwise authorized in writing by a Land Use Inspector or the S.L.W.B.	**PLANS**
1.2	The Permittee shall not conduct any part of the land use operation within three hundred (300) metres of any privately held land or structure, unless otherwise authorized in writing by the S.L.W.B.	**PRIVATE PROPERTY**
1.5	The Permittee shall use existing campsite.	**CAMP LOCATION**
1.6	The Permittee shall only excavate and stockpile in areas designated by the Land Use Inspector.	**DESIGNATED AREAS**
1.7	The Permittee shall remove from project area; all scrap metal, discarded machinery and parts, barrels and kegs, buildings and building material.	**REMOVAL WASTE MATERIAL**
1.10	The Permittee shall use existing campsites where they exist, all campsites shall be located a minimum of 100 metres from the high water mark of any water body.	**CAMP LOCATION**

26 (1) (B) - TIME

2.1	The Permittee's Field Supervisor shall contact or meet with the Land Use Inspector at the Norman Wells office of the Department of Indian Affairs and Northern Development, telephone number (867) 587-2911, at least 48 hours prior to the commencement of this land use operation.	**CONTACT INSPECTOR**
2.2	The Permittee shall advise the Land Use Inspector at least ten (10) days prior to the completion of the land use operation of (a) his plan for removal or storage of equipment and materials, and (b) when final clean-up and restoration of the lands used will be completed.	**REPORTS BEFORE REMOVAL**
2.3	The Permittee shall submit a progress report to the Land Use Inspector every 14 days during this land use operation.	**PROGRESS REPORT**

2.11	The Permittee shall remove all snow fills from winter access road stream crossings prior to spring break-up or completion of the land use operation, unless otherwise approved in writing by a Land Use Inspector	**REMOVE SNOW FILLS**
2.12	The Permittee shall restore all sumps prior to spring break-up, unless otherwise authorized in writing by the Land Use Inspector.	**SUMPS/SPRING BREAK-UP**
2.13	The Inspector reserves the right to impose closure of any area to the Permittee in periods when dangers to natural resources are severe.	**CLOSURE**
2.14	The Permittee shall complete all clean-up and restoration of the lands used prior to the expiry date of this permit.	**CLEAN-UP**

26 (1) (C) EQUIPMENT

3.1	The Permittee shall not use any equipment except of the type, size, and number that is listed in the accepted application, unless otherwise authorized in writing by the Land Use Inspector.	**ONLY APPROVED EQUIPMENT**
3.3	The Permittee shall use a forced-air, fuel-fired incinerator to incinerate all combustible garbage and debris.	**INCINERATORS**
3.5	The Permittee shall use portable ramps during loading or unloading of ships or barges.	**PORTABLE RAMPS**
3.8	The Permittee shall, in camps of more that five (5) personnel, maintain the following fire fighting equipment in the base camp and in active readiness: (a) four (4) backpack bags or cans complete with hand pumps. (b) a minimum of two (2) pieces of each of the following: pulaskis, axes, shovels	**FIRE FIGHTING EQUIPMENT**
3.9	The Permittee shall have any helicopter based at the camp equipped with a water dropping bucket in operating condition	**WATER BUCKET**
3.10	The Permittee shall ensure a garbage container is on site.	**GARBAGE CONTAINER**

26 (1) (D) - METHODS AND TECHNIQUES

4.1	The Permittee shall scout proposed lines and routes to select the best location for crossing streams and avoiding terrain obstacles prior to the movement of any vehicle that exerts pressure on the ground in excess of 35 K pa.	**DETOURS & CROSSINGS**
4.2	The Permittee shall construct and maintain winter roads with a minimum of 15 centimetres packed snow at all times during this land use operation. If this cannot be done, then the Permittee shall construct Ice Roads in a manner approved by a Land Use Inspector.	**SNOW ROADS/ ICE ROADS**
4.3	The Permittee shall dogleg lines, trails and rights-of-way that approach lakes, streams or public roads, as specified in writing by the Land Use Inspector.	**DOGLEG APPROACHES**
4.9	The Permittee shall slope the side of excavations and embankments except in solid rock or two (2) horizontal to one (1) vertical, unless otherwise authorized in writing by the Land Use Inspector	**EXCAVATIONS AND EMBANKMENTS**
4.10	The Permittee shall slope the sides of waste material piles to a gradient specified in writing by the Land Use Inspector.	**WASTE MATERIAL PILES**
4.13	The Permittee shall not erect camps or store material on the surface ice of streams.	**STORAGE ON ICE**
NEW	The Permittee shall use only clean snow in the construction of winter access crossings.	**CLEAN SNOW**

26 (1) (E) - TYPE, LOCATION, CAPACITY AND OPERATION OF FACILITIES

5.7	The Permittee shall ensure that the land use area is kept clean and tidy at all times.	**CLEAN WORK AREA**

26 (1) (F) - CONTROL OR PREVENTION FLOODING, EROSION AND SUBSIDENCE OF LAND

6.2	The Permittee shall remove any obstruction to natural drainage caused by any part of this land use operation.	**NATURAL DRAINAGE**
6.4	The Permittee shall not use any material other than water in the construction of ice bridges.	**CE BRIDGE MATERIAL**
6.5	The Permittee shall not allow any ice or snow bridge to hinder the flow of water in any stream.	**ICE BRIDGE**

6.7	The Permittee shall not use the bed of streams for access routes except for the purpose of crossing the streams, unless otherwise authorized by the Land Use Inspector.	**STREAM BEDS - ACCESS**
6.8	The Permittee shall locate all lines, trails and rights-of-way to be constructed parallel to streams a minimum of thirty (30) metres from any stream except at crossings, unless otherwise authorized in writing by the Land Use Inspector.	**PARALLELLING STREAMS**
6.15	The Permittee shall install erosion control structures as the land use operation progresses, unless otherwise authorized by the Land Use Inspector.	**EROSION CONTROL**
6.17	The Permittee shall prepare the site in such a manner as to prevent rutting of the ground surface.	**PREVENTION OF RUTTING**
6.20	The Permittee shall not move any equipment or vehicles unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging.	**VEHICLE MOVEMENT FREEZE-UP**
6.21	The Permittee shall suspend overland travel of equipment or vehicles if rutting occurs.	**SUSPEND OVERLAND TRAVEL**
6.25	The Permittee shall mark all culvert location in such a way that their location is visible for demobilization, unless otherwise authorized by the Land Use Inspector.	**MARK CULVERT LOCATIONS**
NEW	All culverts must be removed prior to the demobilization of men and equipment from the permitted area.	
NEW	The Permittee shall maintain a snow cover of no less than 15 cm on all winter access roads. If this cannot be done roads will have to be watered.	**PROTECTION OF VEGETATIVE MAT**

26 (1) (G) - USE, STORAGE, HANDLING AND DISPOSAL OF CHEMICAL OR TOXIC MATERIAL

7.1	The Permittee shall not use chemicals in connection with the land use operation without the prior approval of the S.L.W.B.	**APPROVAL OF CHEMICALS**
7.3	The Permittee shall submit to the S.L.W.B. a contingency plan, for chemical spills, for use during the construction and operation of the winter road and associated facilities.	**CONTINGENCY PLAN**

7.9	The Permittee shall report all spills immediately in accordance with instructions contained in "Spill Report" form N.W.T. 1086(10/79). 24 hour spill report line (867) 920-8130.	**REPORT CHEMICAL AND PETROLEUM SPILLS**
NEW	All contaminated material must be removed from the permitted area or deposited in accordance with an approved Remedial Action Plan	**REMOVE CONTAMINATED MATERIAL**

26 (1) (H) - WILDLIFE AND FISHERIES HABITAT

8.1	The Permittee shall not unnecessarily damage wildlife habitat in conducting this land use operation.	**HABITAT DAMAGE**
8.2	The Permittee shall construct and maintain all structures placed in streams frequented by fish, in such a manner that will not obstruct passage of fish.	**FREE FISH MOVEMENT**
8.3	The Permittee shall not obstruct the movement of fish while conducting this land use operation.	**FREE FISH MOVEMENT**
8.6	The Permittee shall not destroy or damage beaver dams.	**BEAVER DAMS**
8.7	The Permittee shall not destroy or damage muskrat lodges	**MUSKRAT LODGES**
8.9	Your operation is in an area where bears may be encountered. Proper food handling and garbage disposal procedures will lessen the likelihood of bears being attracted to your operation. Information about the latest bear detection and deterrent techniques can be obtained from the Department of Environment and Natural Resources at (867) 587-2130.	**BEAR/MAN CONFLICT**
8.11	The Permittee shall not quarry to a depth below that of the water table. Do not quarry below existing pit floor.	**QUARRY DEPTH**
NEW	If Caribou, Moose, Grizzly Bear or Muskoxen are spotted within five hundred (500) metres of any work/camp site immediate notification shall be made to the environmental monitor and/ or the Sahtu Renewable Resources Board.	**NOTIFICATION LARGE GAME**
NEW	There shall be no hunting by project staff at any time, within the project area.	**NO HUNTING**
NEW	A minimum vertical distance of three hundred (300) metres and a minimum horizontal distance of five hundred (500) metres will be maintained from all sensitive species.	**AIRCRAFT/ SENSITIVE SPECIES**

NEW	Aircraft will maintain a vertical distance of 1 km and a horizontal distance of 1.5 km from large concentrations of birds.	**AIRCRAFT/ BIRDS**

26 (1) (I) THE STORAGE, HANDLING, AND DISPOSAL OF REFUSE OR SEWAGE

9.4	The Permittee shall keep all garbage and debris in a covered container until disposed of. This container shall be marked with the Permittee's name.	**GARBAGE CONTAINERS**
9.5	The Permittee shall burn all garbage and debris at least daily.	**GARBAGE DISPOSAL**
9.6	The Permittee shall dispose of all non-combustible garbage and debris by burial beneath no less than one (1) metre of compacted soil in an area pre approved by the Land Use Inspector.	**BURY WASTE MATERIAL**
9.12	The Permittee shall dispose of all combustible waste petroleum products by incineration or removal.	**WASTE PETROLEUM DISPOSAL**
NEW	(a) The Permittee shall treat all sewage in a treatment plant capable of extracting eighty-five to ninety (85-90%) per cent of the biodegradable solids.	**SEWAGE DISPOSAL**
	(b) Solid waste(s) removed from the camp sewage effluent by the portable waste treatment plant shall be deposited at an approved waste disposal facility.	
	(c) All liquid Waste(s) and sewage generated by a camp, specifically grey water and black waters, will be processed on-site by a portable waste treatment plant prior to being spread on the surface of the land.	
	(d) The Permittee shall endeavour to spread treated camp effluent to known or identified wetlands.	

26 (I) (J) - HISTORICAL AND ARCHAEOLOGICAL SITES AND BURIAL GROUNDS

10.1	The permittee shall not operate any machinery or equipment within (150) metres of any known Historical or Archaeological Site or Burial Ground.	**NO ACTIVITY**
10.2	The permittee shall make every effort to ensure that no Historical or Archaeological Site or Burial Ground will be affected by this operation	**SITES PROTECTION**

where is K?)

26 (1) (L) - SECURITY DEPOSIT

12.1	The operator shall deposit with the S.L.W.B. a security deposit in the amount of nil pursuant to Section 26 (1) (L) of the Mackenzie Valley Land Use Regulations.	**SECURITY DEPOSIT**
12.2	The Permittee shall be liable for any cost of damages over and above the amount of the security deposit.	**LIABILITY FOR DAMAGES**

26 (1) (M) - PETROLEUM FUEL STORAGE

13.1	The Permittee shall report in writing to the Land Use Inspector the location and quantity of all petroleum fuel caches within ten (10)days after the establishment.	**REPORT FUEL LOCATION**
13.2	The Permittee shall not place any petroleum fuel storage containers within one hundred (100) metres of the normal high water mark of any stream.	**FUEL BY STREAM**
13.3	The Permittee shall locate mobile fuel facilities on land when stationary for any period of time exceeding twelve (12) hours.	**FUEL ON LAND**
13.4	The Permittee shall not allow petroleum products to spread to surrounding lands or into water bodies.	**FUEL CONTAINMENT**
13.6	The Permittee shall construct a dyke around each stationary fuel container or group of stationary fuel containers where any one container has a capacity exceeding 4 000 litres.	**DYKE/FUEL CONTAINERS**
13.7	The Permittee shall line the dyke and area enclosed by the dyke with a type of plastic film liner approved by the S.L.W.B.	**LINE DYKE**
13.8	The volume of the dyked area shall be 10% greater than the capacity of the largest fuel container placed therein.	**CAPACITY**
13.9	The Permittee shall ensure that the dyke and the area enclosed by the dyke shall be impermeable to petroleum products at all times.	**IMPERMEABLE DYKE**
13.10	The Permittee shall:	**CHECK FOR LEAKS**
	(a) examine all fuel storage containers for leaks a minimum of once every day.	
	(b) repair all leaks immediately.	
13.12	The Permittee shall submit to the S.L.W.B. a contingency plan, for petroleum spills, for use during the construction and operation of the winter road and associated facilities.	**CONTINGENCY PLAN**

13.13	The Permittee shall not use bladders for storing petroleum products.	**BLADDERS PROHIBITED**
13.14	The Permittee shall not use bladders for transporting petroleum.	**BLADDERS PROHIBITED**
13.15	The Permittee shall mark all stationary petroleum products storage facilities with flags, posts or similar devices so that they are at all time plainly visible to local vehicle travel.	**MARK FUEL LOCATION**
13.16	The Permittee shall seal all container outlets except the outlet currently in use.	**SEAL OUTLET**
13.17	The Permittee shall mark all fuel containers with the Permittee's name. This includes 45 gallon drums.	**MARK CONTAINERS**

26 (1) (N) - DEBRIS AND BRUSH DISPOSAL

14.2	The Permittee shall make the windrow of brush and debris lie flat and compact by: (a) bucking the material into suitable lengths and lopping the branches from the stem, and/or (b) crushing with heavy machinery in order to compact the material.	**BRUSH DISPOSAL**
14.3	The Permittee shall ensure that windrows are separated from standing timber.	**WINDROWS LOCATION**
14.16	The Permittee shall not use any self-propelled machinery for clearing the brush.	**HAND CREWS ONLY**
14.17	The Permittee shall not leave tree stumps exceeding twenty (20) centimetres above the ground surface.	**TREE STUMPS**

26 (1) (O) - RESTORATION OF THE LANDS

15.1	The Permittee shall establish vegetation on all areas stripped of vegetation during this land use operation to a minimum of seventy (70%) per cent ground cover, unless otherwise authorized in writing by the Land Use Inspector or the S.L.W.B.	**REVEGETATE STRIPPED AREA**
15.3	The Permittee shall commence and foster re-vegetation on all parts of the land used, as may be directed by a Land Use Inspector, within one year of the completion of the land use operation.	**RE-ESTABLISH VEGETATION**

15.5	The Permittee shall save the organic soil stripped from the excavation area.	**SAVE ORGANIC SOIL**

26 (1) (P) - DISPLAY OF PERMITS AND PERMIT NUMBERS

16.1	The Permittee shall display a copy of this Permit in a conspicuous place in each campsite established to carry out this land use operation.	**DISPLAY PERMIT**
16.2	The Permittee shall keep on hand, at all times during this land use operation, a copy of the Land Use Permit.	**COPY OF PERMIT**

26 (1) (Q) - MATTERS NOT INCONSISTENT WITH THE REGULATIONS

17.5	The Permittee shall provide in writing to the Land Use Inspector at least forty-eight (48) hours prior to commencement of this land use operation, the following information: (a) person, or persons, in charge of the field operation to whom notices, orders, and reports may be served; (b) alternates; (c) all the indirect methods for contacting the above person(s).	**IDENTIFY AGENT**
17.6	The Permittee shall, while conducting the operation, make every effort to avoid covering or destroying traps or snares that may be found in the area.	**TRAPS PROTECTION**
17.7	The Permittee shall restore any trails used by trappers or hunters by slashing any and all trees that may fall across these paths or trails and by removing any other obstructions such as snow piles or debris that may be pushed across the trails.	**TRAILS RESTORATION**
17.8	The Permittee shall not feed wildlife	**NO FEEDING WILDLIFE**
NEW	The Permittee shall submit a Final Plan in Digital Format compatible with ARC GIS software for the footprint used and a map at a scale of 1:250,000 for the operations.	**FINAL PLANS**
17.12	The Permittee shall adhere to all comments and procedures stated in the Land Use Permit application unless otherwise stated in the Terms and Conditions of this Land Use Permit authorized by the Land Use Inspector.	**OTHER COMMITMENTS**

SAHTU Land and Water Board

Witness

Larry Wallace (Chairman)

SAHTU Land & Water Board
REASONS FOR DECISION
Issued Pursuant to Section 121 of
The Mackenzie Valley Resource Management Act

Land Use Permit Number: S09D-001 (Type "A")

This is the decision of the SAHTU Land & Water Board with respect to an application for a Land Use Permit dated, February 2, 2009 made by:

Indian and Northern Affairs Canada – NT Region
Contaminates and Remediation Directorate
P.O Box 1500
Yellowknife, NT
X1A 2R3

for a mining remediation program at Great Bear Lake Mine Sites Remediation Program on the east side of Great Bear Lake, NT. With respect to this application, written notice was given to 10 organizations within the Sahtu and 13 outside of the settlement area in accordance with Sections 63 & 64 of the *Mackenzie Valley Resource Management Act*. There was no Public Hearing held in association with this application.

DECISION

The Board is satisfied that the project has had a Preliminary Screening pursuant to the Mackenzie Valley Resource Management Act; that the proposed project is not likely to cause any significant adverse environmental impact or be the source of any public concern. The Board, having due regard to the facts and circumstances, the merits of the submissions made to it, and to the purpose, scope and intent of the Mackenzie Valley Resource Management Act and Regulations made there under has determined that:
Land Use Permit S09D-001 be issued subject to the Terms and Conditions contained therein,
The Board's reasons for this decision are as follows:

1. Information contained in Staff Report S09L8-001 (1), (2) and (3) relative to environmental impacts and/or public concerns.
2. Any public concerns previously made known to the Board have been mitigated through community and leadership consultation and engagement.
3. The Board received a request dated July 2, 2010 from the Deline Land Corporation, Deline First Nations and Deline Renewable Resources Board requesting a 45 day review extension. After carefully considering the request and a written response from INAC-CARD dated July 8, 2010, the Board does not deem the extension necessary as there were not sufficient reasons to grant the extension within the mandate of the Board.
4. Any disturbance to the natural conditions of the land in the area of the Mining Remediation Project will be temporary and can be minimized by conducting the undertaking in compliance with the Terms and Conditions imposed by the Permit and will improve the environment of the nine abandoned mine sites.
5. The Sahtu Land and Water Board has met its referral obligations to the Sahtu Land Use Planning Board as outlined in the Mackenzie Valley Resource Management Act. There has been no indication that the project does not conform to an approved Land Use Plan, as one does not exist.
6. The use of the land proposed by the Permittee is of a nature consistent with the Mackenzie Valley Resource Management Act.
7. The undertaking will support the socio-economic well-being and economic development of the region.

Land Use Permit S09D-001 contains provisions, which the Board feels necessary to ensure and monitor compliance with the Mackenzie Valley Resource Management Act and the Regulations made there under and to provide appropriate safeguards in respect of the applicant's use of the land affected by the Permit. The Board will provide any referenced material or documents and/or reasons for decision for any specific clause or clauses contained within the application if requested to do so in writing.

The Board will provide any referenced material or documents and/or reasons for decision for any specific clause or clauses contained within the application if requested to do so in writing.

SIGNED this 21st day of July, 2010 on behalf of the SAHTU Land & Water Board.

Larry Wallace (Chairman)
SAHTU Land & Water Board

APPENDIX L

MANIFEST DOCUMENT

MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

Movement Document / Manifest Reference No. / N° de référence du document de mouvement/manifeste: NT02177-3

A — Generator / consignor / Producteur / expéditeur

Registration No. / Provincial ID No. / N° d'immatriculation - d'id. provincial (1): NTG000051

Company name / Nom de l'entreprise: PUBLIC WORKS & SERVICES C/O AEL

Mailing address / Adresse postale: BOX 1500 | City / Ville: YELLOWKNIFE | Province: NT | Postal code / Code postal: X1A 2L5

E-mail / Courrier électronique: | Tel. No. / N° de tél.: ( )

Shipping site address / Adresse du lieu de l'expédition: SAWMILL BAY GREAT BEAR LAKE

City / Ville: | Province: | Postal code / Code postal:

Intended Receiver / consignee / Réceptionnaire / destinataire prévu: KBL ENVIRONMENTAL | Registration No. / Provincial ID No. (2): NTR000123

Mailing address / Adresse postale: BOX 1108 | City / Ville: YELLOWKNIFE | Province: NT | Postal code / Code postal: X1A 2N8

E-mail / Courrier électronique: | Tel. No.: 867873-2063

Receiving site address / Adresse du lieu de réception: 17 CAMERON RD

City / Ville: YELLOWKNIFE | Province: NT | Postal code / Code postal:

B — Carrier / Transporteur

Registration No. / Provincial ID No. / N° d'immatriculation - d'id. provincial (23): NTC000134

Company name / Nom de l'entreprise: BUFFALO AIRWAYS / KBL ENVIRONMENTAL

Mailing address / Adresse postale: BOX 1108 | City / Ville: YELLOWKNIFE | Province: NT | Postal code / Code postal:

E-mail / Courrier électronique: | Tel. No. / N° de tél.: 8678735263

Vehicle / Véhicule; Trailer - Rail car No. 1 / 1ᵉʳ remorque - wagon; Trailer - Rail car No. 2 / 2ᵉ remorque - wagon | Registration No. / N° d'immatriculation: C | Prov.:

Port of entry / Point d'entrée: International use only | Port of exit / Point de sortie: International use only (25)

Carrier Certification: I certify that I have received waste or recyclable material from the generator / consignor for delivery to the receiver / consignee as set out in Part A and that the information contained in Part B is complete and correct. Attestation du transporteur: J'atteste avoir reçu les déchets ou matières recyclables du producteur / expéditeur en vue de leur livraison au réceptionnaire / destinataire, tels qu'ils figurent à la partie A et que les renseignements inscrits à la partie B sont exacts et complets. (26)

Name of authorized person (print) / Nom de l'agent autorisé (caractères d'imprimerie): JOEL LEMALAD | Tel. No. / N° de tél.: 8678735263

Year / Année: 11 | Month / Mois: 10 | Day / Jour: 25 | Signature:

C — Receiver / consignee / Réceptionnaire / destinataire

Reference Nos. of other movement document(s)/manifest(s) used / N° de référence des autres documents de mouvement/manifestes utilisés (27):

Registration No. / Provincial ID No. (28): NTR000123

Receiver / consignee information same as in Part A / Les renseignements du réceptionnaire / destinataire est la même qu'à la Partie A: [X] Yes / Oui [ ] No, complete the box below / Non, remplir la case ci-dessous

Company name / Nom de l'entreprise:
Mailing address / Adresse postale:
City / Ville: | Province: | Postal code / Code postal:
E-mail / Courrier électronique: | Tel. No. / N° de tél.: ( )
Receiving site address / Adresse du lieu de destination:

Date received / Date de réception (29): Year / Année: 11 | Month / Mois: 10 | Day / Jour: 25 | Time / Heure: 1:00 [ ] A.M. [X] P.M.

If waste or recyclable material to be transferred, specify intended company name / Si les déchets ou matières recyclables doivent être transférés, préciser le nom du destinataire: | Registration No./Provincial ID No. / N° d'immatriculation/d'id provincial:

	Prov. code / Code prov. (3)	Shipping name / Appellation réglementaire (4)	Class / Classe Sub. class(es) (5)	UN No. / N° NU (6)	Packing / risk gr. (7)	Quantity shipped / Quantité expédiée	Units L or / ou Kg (8)	Packaging/Container No. / N°	Codes (9)	Phys. state / État phys. (10)	Quantity received / Quantité reçue	Units L or / ou Kg (31)	Comments / Commentaires (32)	Handling Code / Code de manutention (33)	Shipment Accepted / Accepté	Shipment Refused / Refusé (34)	Discrepancy (35)
a	SOILS	CONTAMINATED WITH HYDROCARBONS	N/R	N/A	N/R	5550	Kg	10	07	S	5550	Kg		07			
b																	
c																	
d																	

	Notice No. / N° de notification	Notice Line No / N° de ligne de la notification	Shipment / Envoi (12)	Of / De	D or R code / Code É ou R (13)	C code / Code C (14)	Basel Annex VIII or OECD Code / Annexe VIII de Bâle ou Code OCDE (15)	H code / Code H (16)	Y code / Code Y (17)	Export / Exportation	Import / Importation (18)	Customs code(s) / Code(s) de douanes (19)
(i)												
(ii)												
(iii)	International use only											
(iv)												

If handling code "Other" (specify) / Si code de manutention « autre » (spécifier) (36):

Receiver / consignee certification: I certify that the information contained in Part C is correct and complete / Attestation du réceptionnaire / destinataire : J'atteste que tous les renseignements à la partie C sont exacts et complets. (37)

Name of authorized person (print) / Nom de l'agent autorisé (caractères d'imprimerie): Jeffrey Bembridge

Signature: [signature] | Tel. No. / N° de tél.: 867873-5263

Special handling / Manutention spéciale (22): [ ] Attached / Ci-joint [ ] As follows / Comme suit:

Generator / consignor certification: I certify that the information contained in Part A is correct and complete. Attestation du producteur / expéditeur: J'atteste que tous les renseignements à la partie A sont exacts et complets. (20)

Name of authorized person (print) / Nom de l'agent autorisé (caractères d'imprimerie): BEAD LANDRY | Signature: [signature] | Tel. No. / N° de tél.: ( )

Date shipped / Date d'expédition (21): Year / Année | Month / Mois | Day / Jour | Time / Heure [ ] A.M. [ ] P.M.

Scheduled arrival date / Date d'arrivée prévue: Year / Année | Month / Mois | Day / Jour

MOE 04-1917 (07/07)

Mailed by Consignee to Consignor - Postée par le destinataire à l'expéditeur

Copy / Copie 6 (brown / brun)

APPENDIX M

KBL CORPORATE INFORMATION

KBL Environmental LTD.

#17 Cameron Road
P.O. Box 1108
Yellowknife, NT X1A 2N8

P 867.873.5263
F 867.669.5555
kblenvironmental.com

Organizational Profile

I. About KBL

i. Introduction

KBL Environmental Ltd. (KBL) is a privately owned, operated and *Northern Business* providing customers across Northern Canada with waste management services and systems. The organization has proudly developed a reputation for innovation, best in class service with unsurpassed safety of operations. Our goal is to assist forward-thinking companies in developing and maintaining successful environmental management programs. KBL confidently provides waste management support to Mining, Exploration, Government, Oil & Gas, Industrial and Commercial sectors throughout Northern Canada.

KBL's core business is the provision of services promoting liability management associated to contaminated hazardous and non-hazardous waste. This includes classification, packaging, labeling, manifesting, transportation, recycle and/or disposal of waste streams. Complimentary services include staffing placement, emergency response and environmental products supply. We are an organization formed by a team of professionals with a range of junior to senior level experience.

ii. Health, Safety & Environmental Commitment

KBL has developed a safety program that serves to provide safe work environments in accordance with industry standards and considering compliance with occupational health and safety legislation. This comprehensive program institutes business practices that are oriented towards prevention and management of events having potential harm to employees, the general public, property or the environment. We routinely review our operations to identify preferred management practices' ensuring the company adheres to principles of continuous improvement and prevention of worker risk or environmental impact.

iii. Training

Our training programs ensure that each KBL employee has the skills and knowledge to ensure that health, safety and environmental protection standards are observed and enforced. Staff is exposed to basic principles of hazard recognition to identify appropriate and effective controls for operational activities, systems and products through systematic analysis. Personnel orientation training has been designed to meet key legislative and Certificate of Recognition (COR) program requirements.

iv. Employment Equity

KBL is committed to offering fair and equitable opportunities to all qualified employees and job applicants. Experience, education, training, job skills, competencies, and the personal skills required for each position will be considered whenever there a job opening is available within the company. KBL management will not condone any discriminatory practice or action, either within the company or in contacts with other business relations, which would go against this commitment. Our program objective is to fairly and equitably compensate all employees for the work they do. Salaries are primarily established based on: (1) qualifications, (2) effort required (3) responsibilities inherent in the job and (4) working conditions

v. Compliance

KBL's risk management approach emphasizes a synergy between regulatory compliance and successful work implementation. Working closely with regulatory agencies and industry associations promotes compliance and influence of environmental protection policies, procedures and legislation. KBL holds operational hazardous waste related approval permits and licenses as follows:

Certificate of Recognition (C.O.R.)	20101110-SE7814	AB Partnerships for Safety
Receiver Approval	NTR000123	NT Department of Environment
Generator Approval	NTG000412	NT Department of Environment
Carrier License	NTC000124	NT Department of Environment Carrier

II. Description of Services

i. On-site Services

KBL provides professional services including full time or event based staff placement for environmental program management as well as environmental project management. Professionals have education, training and experience to develop or audit environmental policies and procedures as well as supervise crews supporting liability management and compliance. Technicians are competent in waste characterization, profiling, packaging selection, labeling, manifest preparation and transportation coordination. These individuals have chemical packaging capability consisting of smaller container consolidation into a larger container ensuring materials are compatible and will not break or commingle. KBL staff has training to manage Transportation of Dangerous Goods (TDG) requirements by Land, Marine and Air.

ii. Transportation

Transportation is a major component of waste management; product must reach its destination safely, cost-effectively, and in a timely manner. Choosing the proper transporter to manage the risk involved with waste is an integral part of the management process. All KBL transportation units or approved sub-contractors are specially approved for the transport of hazardous waste. Each unit is equipped with secondary containment and spill response kits in the case of product release. KBL has access to transportation units strategically located throughout Northern and Western Canada.

Transportation drivers are trained in TDG, waste management, waste verification and safe driving practices. Comprehensive insurance coverage protects KBL and waste generators for services or projects that we manage. KBL assumes responsibility and liability for the waste at the time of loading into transportation vehicles. This responsibility and liability is then transferred to licensed and approved receiving facilities when waste is offloaded.

iii. Emergency Response

KBL provides emergency response services for hazardous materials transportation, mining and expediting clients in the Northwest Territories. From spilled product identification to materials handling and disposal the organization provides effective emergency response to industry. 24/7 Emergency Response is critical and promotes immediate response to minimizing risk associated with environmental release. KBL's team will mobilize to site and assess and contain the situation then develop an action plan to safely manage products released. Planning involves addressing potential danger to human life and health, reducing risk to the environment and minimizing loss and liability.

KBL specialists are certified to respond to seven classes of dangerous goods and associated wastes. Staff has appropriate training to manage the health and safety issues with special attention relating to the equipment often utilized without an understanding of limitations (respiratory/chemical protective clothing, gas detection, spill containment, fire protection).

iv. Environmental Products

KBL provides industry with environmental products utilized for leak or spill containment at operational facilities or at sites with significant release requiring environmental response. Products are selected based on the environmental application taking into consideration product quality, cost and availability specific to customer needs. A list of products offered to clientele is as follows:

- UN Approved Containers (drums, bins, bags, etc.)
- Absorbent Pads and Rolls
- Absorbent Socks and Booms
- Absorbent Particulate

- Spill Kits

Specific and commonly used spill clean-up and prevention products are stocked at KBL's facility and sold to customers or utilized for emergency response services.

III. Industrial Waste Transfer Facility

i. Facility Operations

KBL has developed Northern Canada's first approved and licensed Industrial Waste Transfer Facility regulated by the Government of Northwest Territories Department of Natural Resources to receive hazardous waste. The facility is located in Yellowknife's Kam Lake Industrial Park at #17 Cameron Road with an operating approval and waste receiver number NT00123. The operations are situated on 3.0 acres of Medium Industrial zoned land. The Kam Lake Industrial Area is physically located Southwest of the Yellowknife International Airport and Southeast of the City of Yellowknife.

The transfer station is utilized for storage, segregation and consolidation of approved waste streams for bulk transportation to approved waste receivers. The facility has been designed, engineered, constructed and is maintained preventing environmental impact to the environment with management of industrial waste. Hazardous and non-hazardous wastes can be received from waste generators, classes accepted for sorting, repacking and storage include:

- Non-Regulated
- Class 2 Gases
- Class 3 Flammable liquids
- Class 4 Flammable solids
- Class 5 Oxidizers
- Class 6 Poisonous substances
- Class 8 Corrosives
- Class 9 Miscellaneous

ii. Waste Recycle & Disposal

KBL is committed to the Principle of the "4Rs", reduce, recycle, reuse and recover. Waste is managed towards promotion of waste segregation, recycling and minimization based on handling strategies. Minimization and recycling is a priority in developing environmentally sound ways to handle waste and at the same time realizing cost savings for clientele. Through volume agreements and consolidation the company manages waste efficiently and cost-effectively. KBL is constantly searching for new options to handle waste and is working with a number of companies to develop options that reduce liability and costs.

KBL has developed a facility/contractor auditing policy and procedure as part of our HSE program for all disposal facilities and contractors used. The protocol includes review of facilities/contractor license, risk management plan, insurance, safety record, Workers' Compensation history, groundwater, air and soil monitoring plans, emergency response plan, environmental impact studies, regulatory records, etc. Additionally a site visit by KBL personnel and optionally accompanied by our customers' representatives, is conducted at facilities. The purpose of which is to inspect the general state of upkeep and repair, the condition of equipment, the location and terrain, the precise methods of storage, handling and transportation of waste and others aspects of the facility/contractor. The auditing team makes a recommendation based upon the facility's/contractor's documentation and its inspection. Any concerns are noted and the documentation and recommendation is forwarded to our management for comment and approval or decline, all documentation is kept on file.

iii. Waste Documentation & Tracking

Waste transported to KBL's Industrial Waste Transfer Facility is accompanied by completed (movement documents) Bill of Lading or TDG Waste Manifests. Waste is received utilizing an internal quality assurance and quality protocol. Respective copies of manifests are distributed to the generator, transporter and government authority.

KBL tracks waste received at the transfer station which serves as a tool for providing detailed, accurate and current reporting of stored, in transportation and disposed wastes. Tracking includes details including the point of generation to the end receiving facility "cradle to grave". KBL staff can assist generators efforts to demonstrate due diligence and regulatory compliance by providing well-documented waste tracking information. Some benefits of information available from document management include:

- Reduced workload for field personnel and environmental support staff
- Customized reporting suitable for auditing purposes or management reports
- Reports provide information for risk assessment, monitoring and communication
- Cost analysis data useful for environmental waste management
- Assists in minimizing corporate liability through demonstration of due diligence
- Promotes best practices through education and support services
- Resolves document deficiencies prior to regulatory authorities submission