DRAFT - CAPE DORSET GROUNDWATER MONITORING OPERATIONS AND MAINTENANCE MANUAL

Submitted to:

Community Planning Services

Baffin Region, Government of Nunavut

Pond Inlet, Nunavut

Submitted by:

AMEC Earth & Environmental,

a division of AMEC Americas Limited

Yellowknife, Northwest Territories

2010

YX00826.200

31 March 2010
YX00826

Community Planning Services
Baffin Region, Government of Nunavut
P.O. Box 379
Pond Inlet, NU, X0A 0S0

Attention: Mr. Bhabesh Roy, M.A.Sc, P.Eng.

Dear Mr. Roy:

Re: DRAFT - CAPE DORSET GROUNDWATER MONITORING OPERATIONS AND MAINTENANCE MANUAL

As per your request, AMEC Earth & Environmental (AMEC) is pleased to submit this DRAFT to Community Planning Services (CGS) of the Operations and Maintenance Manual (O & M Manual) for Monitoring Wells installed (summer 2010) at the Metal Dump Site, Solid Waste Site and P-Lake Sewage Lagoon, Cape Dorset, Nunavut. Upon installation of the monitoring wells (summer 2010), AMEC will provide CGS with the final and complete O & M Manual, as previously agreed. The final manual will include the as built drawings of each monitoring well (Appendix C), and the Cape Dorset Spill Contingency Plan (Appendix I) when provided by CGS or the Hamlet.

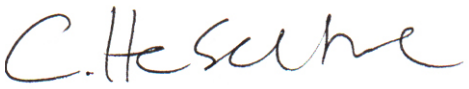
If you have any questions or concerns regarding the above, please contact the undersigned at your convenience.

Yours truly,

AMEC Earth and Environmental

David Wells M.A.Sc

Reviewed by:
Cheryl Heseltine P.Ag.



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1.0 INTRODUCTION

The current water license (Nunavut Water Board License No.: 3BM-CAP0810) held by the Hamlet of Cape Dorset, NU requires the installation of five monitoring wells at the locations specified below:

- One monitoring well up gradient of the 2007 Sewage Disposal Facility at P-Lake (designated CAP-16);
- Two monitoring wells down gradient of the 2007 Sewage Disposal Facility at P-Lake (designated CAP-17 and CAP-18);
- One monitoring well up gradient of the Solid Waste Disposal Facility (designated CAP-19); and,
- One monitoring well down gradient of the Solid Waste Disposal Facility (designated CAP-20).

The Government of Nunavut, Community Planning Services (CGS) has retained AMEC Earth and Environmental (AMEC) to design the required monitoring well installations and produce an Operations and Maintenance (O & M) manual for the collection and analysis of groundwater samples.

1.1 Purpose

This manual has been produced to assist the Hamlet of Cape Dorset personnel in the proper operation and maintenance of the five monitoring wells installed at the sewage disposal facility and the solid waste disposal facility.

1.2 Site Setting

Cape Dorset, Nunavut is located on Dorset Island (southwest of Baffin Island) and occupies two valleys that extend inland and then end abruptly against precipitous bluffs of the Kingnait Hills (AMEC, 2005). Cape Dorset is located geographically at approximately 64°14' N latitude and 76°32' W longitude. The average annual mean temperature is reported to be –8.9 °C. The average thawing and freezing indices for Cape Dorset are calculated to be about 507 °C-days and 3675 °C-days, respectively (AMEC, 2005). Cape Dorset is located in an area of continuous permafrost. The surficial materials include glacial till, talus and marine beach deposits. Isolated deposits of glacial silty sand and gravel (till) overlay bedrock in the uplands. Talus is the most common surficial material in the area (AMEC, 2005).

1.2.1 Sewage Disposal Facility

The P-Lake sewage disposal facility, constructed in 2007, is located approximately 1.9 km south of the airport and 800 m southeast of the community. As of March 2010 the facility has not been commissioned.

1.2.2 Solid Waste Disposal Facility

The solid waste disposal facility is located approximately 1.9 km west of the airport and approximately 400 m northwest of the nearest residence in the community. The facility is adjacent to the shoreline of Tellik Inlet.

1.3 Contact List

The individuals (Table 1) responsible for the monitoring wells at the sewage and solid waste disposal sites in Cape Dorset are the following:

Table 1: Cape Dorset Contact List

Individual	Position	Phone Number	Fax Number
Olayuk Akesuk	Senior Administrative Officer (Acting)	(867) 897 8981	(867) 897-8030
Mike Hayward	Director, Municipal Works	(867) 897- 8834	
Steve Weedark	Mechanic	(867) 897- 8834	

2.0 BACKGROUND

2.1 Sewage Disposal Facility

Sewage waste will be trucked from the community to the sewage disposal facility at P-Lake on a daily or as needed basis once the facility is commissioned.

2.2 Solid Waste Disposal Facility

Solid waste collected from the community is trucked to the solid waste disposal facility on a daily or as needed basis. The current facility will be closed in approximately 2 – 3 years.

3.0 GROUNDWATER MONITORING PLAN

The location of the proposed groundwater monitoring wells are presented in Table 2

Table 2: Groundwater Monitoring Well Locations

Well Identification	Facility	UTM Coordinate (NAD 83, Zone 18)	
		Northing	Easting
CAP-16	Sewage Facility	7122632	424199
CAP-17	Sewage Facility	7122471	423970
CAP-18	Sewage Facility	7122534	423982
CAP-19	Solid Waste Facility	7123785	7123935
CAP-20	Solid Waste Facility	423957	423926

3.1 Standard Operating Procedures for Groundwater Sampling

According to the current water license (3BM-CAP0810) groundwater is to sampled and analyzed on annual basis from the three monitoring wells located at the sewage disposal facility prior to the discharge of effluent from the facility. Groundwater samples are to be analyzed for those parameters listed in Part H, Item 4 of the water license or section 3.1.1.5 of this document.

Similarly, as per the Solid Waste Disposal facility's current water license (3BM-CAP0810), groundwater is also to sampled and analyzed on annual basis from the two monitoring wells.. It is recommended that this sampling program be conducted concurrent with the sampling of the monitoring wells at the sewage disposal facility. Groundwater samples are to be analyzed for those parameters listed in Part H, Item 4 of the water license or section 3.1.1.5 of this document.

3.1.1 Preparation

There are a number of tasks that must be completed in advance of the collection of samples to ensure that quality, representative samples are collected, stored and shipped. The equipment required is listed in Section 3.2 and the meters will require calibration. The laboratory requires some advance notice to ship the sampling containers and the sampler may choose to label the containers in advance of the field program (Section 3.3.2). Arrangement for the transportation of the samples should be coordinated such that the samples can be transported as quickly as possible following collection (Section 3.4).

Finally, the sampler must be aware of the Health and Safety issues associated with the groundwater monitoring program (Section 3.5).

3.1.2 Visual Inspection

The sampler should visually inspect the above-ground surface protector, noting any frost jacking, subsidence of the installation, tampering, etc. The lock should be removed and the above ground protective casing opened.

3.1.3 Well Head Vapour Readings

The following readings are only to be conducted at the monitoring wells located at the solid waste disposal site.

1. The monitoring well head will be field-screened for accumulating volatile hydrocarbon vapours using a portable volatile organic compound (VOC) monitor, capable of detecting landfill gas (methane) and volatile petroleum hydrocarbons, involving:
    a. For monitoring wells with PVC top caps fitted with a vapour sampling port, the VOC monitor sampling hose is attached to the barbed port fitting to make an air-tight seal, the sampling port opened and VOC monitor activated and readings taken; or
    b. For monitoring wells with plain PVC top caps without a vapour sampling port, the plain cap is opened momentarily to allow introduction of the VOC monitor sampling hose into the well head, to the maximum extent possible without contacting well water, the top cap is then closed to the extent possible to minimize ambient air entry and VOC monitor activated and readings taken.
2. VOC monitor reading are recorded in parts per million vapour (ppm_V), typically the maximum value is reported, together with the field instrument used and details of the calibration gas standard, including: calibration gas type, its concentration and calibration readout applicable to gas standard, and the last date calibration was performed.

3.1.4 Pre-Purging Measurements

1. Measure the static water level (SWL) within the well using a combined water level/hydrocarbon dipmeter, e.g., Solinst 122 Interface Meter, or equivalent device;
2. Check for separated-phase hydrocarbon product using the interface probe and record thickness (measured in millimetres) of free product if present, using the Solinst 122 Interface Meter, or equivalent device;
3. Check the depth to well bottom using the water level dipmeter measuring tape. The well bottom is to be recorded in centimetres below top of casing.

3.1.5 Well Purging

1. Measure the height of casing stick-up using a standard measuring tape. The stick-up height is measured in centimetres above ground surface.
2. Calculate the well volume (in litres) as $(2\pi r^2 h) \times 1000$, where:
    a. r = well radius (in centimetres)
    b. h = thickness of water column = well bottom (cm) - water level (cm)

c. 1 cm^3 = 1 mL
d. 1000 mL = 1 L.

3. Purge the well of stagnant well water, to enable sampling of fresh formation water, involving:
    a. Typically three (3) well volumes of water are bailed from each monitoring well prior to sampling. If well water level recovers very slowly, the well is bailed to dryness and allowed to recover for sampling;
    b. Purge water is released to the ground surface, at least two (2) metres down-gradient from the monitoring well casing.
4. If a field multimeter is available, measure and record field values for well water pH, electrical conductivity and temperature, either by:
    a. Collecting a final purge water aliquot in open glassware and testing using hand-held meters, pre-calibrated before use according to manufactures instructions; or
    b. Using an in-well multi-parameter sensor unit, e.g., YSI 556 or equivalent device, pre-calibrated before use according to manufactures instructions. The device must also be de-contaminated before introduction into each monitoring well as per Section 3.1.3.

These measurements are used for field purposes only. pH and Conductivity will be measured at the analytical laboratory for the purposes of the water license.

3.1.6 Groundwater Collection

1. Samples are to be collected during a single sampling event;
2. According to PART H -4 of the current Cape Dorset Water License (3BM-CAP0810), the following parameters are to be analyzed in groundwater collected from both the landfill and lagoon sites:
    a. BOD_5, Fecal Coliforms, pH, Conductivity, Total Suspended Solids, Ammonia Nitrogen, Nitrate-Nitrite, Oil and Grease, Total Phenols, Total Alkalinity, Total Hardness;
    b. Major ions: Ca, Mg, K, Na, and SO_4^{2-};
    c. Total Metals: As, Cd, Cu, Cr, Fe, Pb, Hg, and Ni.
3. Samples are to be collected using a new HDPE bailer attached to new clean string for each well. The sampler is to wear new disposable Nitrile gloves for each well;
4. Samples are to be ONLY placed in laboratory-supplied containers, following specified laboratory container, preservation and shipping instructions
5. Equipment must be decontaminated between well locations (Section3.2.1);
6. Chain of Custody forms are to be completed during sampling and accompany the groundwater samples at all times;
7. Transport Canada TDG documentation is to be completed and accompany the groundwater samples at all times, as required;

8. As requested by the Nunavut Water Board, samples are to be sent to one of the following accredited laboratories:

Table 3: Laboratory Information

Primary Laboratory	Secondary Laboratory
Caduceon Environmental Laboratories 2378 Holly Lane, Ottawa, ON, K1V 7P1 Tel:(613) 526-0123 Fax: (613) 526-1244 Website: www.caduceonlabs.com	**Taiga Environmental Laboratory** 4601 - 52 Avenue, PO Box 1500 Yellowknife, NT, X1A 2R3 Tel:(867) 669-2788 Fax:(867) 669-2718 Website: http://nwt-tno.inac-ainc.gc.ca/taiga/index_e.htm

9. Samples are to be shipped, received and analyzed in compliance with laboratory's maximum sample holding times. The laboratory will send a Confirmation of Assignment upon receipt of the shipment and the sampler is to review and confirm that the laboratory understands the analytical program, including costs. The laboratory will also notify the sampler immediately if the bottles have broken in transit or have exceeded the hold times due to unforeseen delivery delays. Replacement samples should be collected as soon as possible.

10. The Nunavut Water Board should be contacted as soon as possible in the event that monitoring wells cannot be sampled in accordance with the terms and conditions of the Water Licence.

3.1.7 Completion

Following sample collection, the PVC top cap is to be replaced and the protective casing locked.

3.2 Equipment

Equipment and products listed throughout this document are summarized below in Table 4. Product specifications can be found in Appendix D. Table 4 Groundwater Monitoring Required Equipment

Disposable	Non-Disposable
Nitrile Gloves (one for each sample)	Keys to all wells
1 Litre Bailers (one for each well)	Marker to label containers
String (sufficient to allow fresh for each well)	Photo-ionization Detector
Paper Towels	pH/Conductivity/Temperature Meter
Phosphate-free Detergent	Water Level Tape
Distilled Water	Laboratory Supplied Sample Jars
Laboratory Supplied Preservatives	Laboratory Supplied Cooler
	Laboratory Supplied Ice-packs
	Notebook and pencils or pens
	Laboratory Supplied Chain of Custody Forms

	Camera (to record any points of note)

3.2.1 Decontamination

All field equipment directly used to measure in-well groundwater measurements will require decontamination to reduce the possibility of cross-contamination between wells.

The following steps are to be followed to decontaminate field equipment between each monitoring well:

1. Wipe all surfaces with phosphate-free (Alconox, or similar product) detergent and water;
2. Rinse all surfaces with distilled water.

The sampler is to wear fresh disposable Nitrile gloves while decontaminating the field equipment.

3.3 Quality Assurance / Quality Control (QA/QC)

At the request of the Nunavut Water Board, the QA/QC plan for this monitoring program is modelled from DIAND 1996 Document: *Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class B Licensees in Collecting Representative water Samples in the Field and for Submission of a QA/QC Plan.*

3.3.1 Sample Collection

Sample Location

As described above the groundwater samples are to be collected from each of the five monitoring wells. The name of each monitoring well (CAP-16 – CAP-20) will be placed on the outside of the protective casing and on the inside as well. The name of monitoring well be sampled MUST be placed on the each of the sample containers used to store groundwater for analytical analysis.

Sampling Equipment

Only sampling equipment described in Sections 3.1.1.5 and 3.1.2 are to be used for the collection of groundwater. All sampling equipment MUST be decontaminated as described in Section 3.1.3 prior to be used. Only new disposable bailers are to be used at each monitoring well for the collection of groundwater. At the conclusion of sampling activities, the bailer is to be disposed of.

All samples are to be placed ONLY in laboratory supplied containers. It is NOT acceptable to use old or used containers. The laboratory should be contacted one month prior to sampling to provide the required containers. Different analyses require different containers, the laboratory will advise the sampler of the required containers, preservatives, hold times, and sample volumes.

Sampling Methods

Samples are to be collected as described in Section 3.1.1.5. The containers are to be filled directly from the sample end (bottom) of the bailer. Containers are to be 95 – 98% filled unless otherwise directed by the laboratory. The exception is BOD_5 which must be filled to the top (no head space). After each container is filled it should be placed into a cooler with ice packs, both of which will be provided by the laboratory.

Field duplicate (FD) samples (referred to as replicate samples by DIAND 1996) are to be collected corresponding to 10% of the total number (rounded up) of sampled monitoring wells, for quality assurance/quality control purposes, as a means to detect if field bias is introduced from field sampling methods or field equipment.

Field duplicates are prepared by splitting bailer contents so that a well sample and its field duplicate are as similar as possible, involving filling laboratory sample containers in an alternating manner from the same bailer contents. Note, significant differences between samples and their field duplicates can arise related to water turbidity. Duplicate samples are collected to measure the reproductively of the field sampling procedures. The sample ID on a duplicate sample should be recorded on the field sheet and, often, the Well ID is simply reversed for ease of recall. For example, the duplicate for CAP-16 could be labelled CAP-61 or alternately, the two samples could be labelled CAP-16A and CAP-16B.

Groundwater quality parameters are considered as having passed the QA/QC reproducibility procedure (U.S. EPA, 2004), if the relative percent differences (RPD) between a sample and its field duplicate are within 20%. It should be noted that Relative Percent Differences (RPD) are calculated for the results for which the concentrations of both samples were above 5 times the MDL.

Field blanks (FB) are samples of distilled water supplied by the laboratory that are treated exactly the same manner as all other samples. The FB is opened in the field to expose it to the atmosphere and preserved as per the laboratory instructions. Trip blanks (TB) are samples of distilled water supplied by the laboratory which are analyzed by the laboratory prior to and after going to the field. Blanks are used to indicate when a sample may be contaminated from the shipping or field processes, and are indicative of general sample integrity.

3.3.2 Sample Handling

Preservation

Samples are to be preserved as per the laboratories instructions. Certain samples require the addition of an acid. Before handling any preservatives refer to the product materials safety data sheet (MSDS) to ensure the proper personal protective equipment (PPE) is used. The laboratory will supply all preservatives. All samples are to remain cool (~ 4^{o}C) immediately following collection and during transport to the laboratory. Samples are not to be frozen. Table 5

lists the required containers, preservative and maximum hold times for each of the required parameters.

Table 5: Analytical Laboratory Requirements

Analysis	Container†	Preservative*	Maximum Holding Time
BOD_5	1 L Polyethylene	Maintain at 4°C, no head space	48 hours
Fecal Coliforms	300 mL Sterile Plastic	Sodium thiosulfate (?) and maintain at 4°C	48 hours
pH	1 L Polyethylene	None	24 days
Conductivity	1 L Polyethylene	None	28 days
Total Suspended Solids	1 L Polyethylene	None	7 days
Ammonia Nitrogen	100 mL Glass	Sulphuric acid	28 days
Nitrate-Nitrite	1 L Polyethylene	Maintain at 4°C	48 hours
Oil and Grease	1 L Glass	Hydrochloric acid	28 days
Total Phenols	1 L Glass	Sulphuric Acid	28 days
Total Alkalinity	1 L Polyethylene	Maintain at 4°C	7 days
Total Hardness	1 L Polyethylene	None	28 days
Ca, Mg, K, Na, SO_4^2	125 mL Polyethylene	None	6 months
Total As, Cd, Cu, Cr, Fe, Pb, Hg, Ni	125 mL Polyethylene	None	6 months 28 days for Hg

† **Laboratory Requirements May Vary**
*** Supplied by Laboratory**

Samples to be analyzed for BOD_5 and Fecal Coliforms have very low holding times (time after the sample is collected that it must be analyzed), thus it is recommend to collect the samples as close to the departure time of the cargo aircraft as possible to ensure the samples arrive at the laboratory on time.

Sample Identification

Each sample set is to be given a specific identifier. The following identifier sequence is to be used:

- Monitoring Well – Date (year/month/day)

Thus, the identifier on the sample container for groundwater collected from CAP-16 on August 16, 2010 would be:

- CAP16-10/08/16

All containers filled with groundwater from a specific monitoring well would have the same identifier, no matter the number of containers filled. The identifier is to be affixed to the label using a non-smear felt pen (Sharpie® or similar).

The sample identifier is to be recorded in the field notebook during sampling. Other information to include in the field book includes sampler names, date, weather conditions, issues/problems encountered during sampling, etc. It is also advisable to collect photographs during sample collection.

3.4 Transportation

Samples are to be sent to the laboratory via air cargo. Samples are to be shipped in a laboratory supplied cooler which is to be maintained at approximately 4°C using laboratory supplied ice packs. The laboratory will also supply packing materials (bubble wrap), if requested. It is important to ensure that all glass containers are properly wrapped and placed in the cooler to avoid movement which may lead to breakage. The cooler is to be sealed with tape to ensure it is not tampered with during transport. The Chain of Custody form, fully completed and signed by the sampler, is to be sealed inside the cooler.

If the cooler is to be held at an intermediate location (Iqaluit) during transport, the sampler request that it is kept refrigerated, if possible. If transportation of dangerous goods (TDG) documentation is required, this must be completed and accompany the shipment.

Waybill information and tracking numbers should be faxed to the laboratory along with the Chain of Custody forms.

3.5 Health and Safety

Due to the potential hazards associated with groundwater monitoring activities, the following safety precautions should be taken:

- Suitable footwear;
- Safety glasses;
- Disposable Nitrile gloves;
- Material Data Safety Sheets for all chemicals used during the monitoring program; and,
- Manufactures instructions for all equipment used during the monitoring program.

3.5.1 Bear Safety

Polar bears are known to frequent the area and precautions should be taken. Bear safety information can be found on the Nunavut Government Department of Environment Parks website:

http://www.nunavutparks.com/english/visitor-information/polar-bear-safety.html

3.6 Record Keeping

Records should be kept to assist in planning for yearly operations and to assist in the evaluation of the effectiveness of the sewage disposal and solid waste disposal facilities. The records should be stored at the Hamlet office and be maintained by the Hamlet Foreman. As a minimum, the following information should be recorded:

- The dates when groundwater monitoring is conducted;
- All field notes and a tabulated record of field measurements (all measurements as per Sections 3.1.3 to 3.1.5)
- Any maintenance activities carried out at either facility; and
- Any maintenance activities carried out at the groundwater monitoring network.

As wells, copies of the Chain of Custody forms, any transportation documents and copies of the analytical reports should be maintained in a binder.

3.7 Maintenance Procedures

The following maintenance procedures should be carried out to ensure the groundwater monitoring program operates efficiently:

- Maintain soil mound around perimeter of protective casing to promote drainage away form the monitoring wells;
- Visually inspect the above ground casing and markers;
- If marker is damaged or missing, replace as per original specifications;
- If monitoring well is damaged, photograph and report to CGS as soon as possible.

3.8 Operation and Maintenance Summary

Quarterly

- Visually inspect monitoring wells and conduct required maintenance.

Yearly

- Conduct the annual groundwater monitoring program as specified in the water license.

4.0 REFERENCES

AMEC Earth and Environmental. 2005. Geotechnical Investigation for P-Lake Sewage Lagoon, Cape Dorset, NU. Completed for Dillion Consulting. AMEC Project Number YX00748.

Department of Indian and Northern Affairs Canada (DIAND) Water Resources Division and the Northwest Territories Water Board. 1996. Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class B Licensees in Collecting Representative water Samples in the Field and for Submission of a QA/QC Plan.

FIGURES

Legend

- Open Water
- Watercourse
- Roads

Source: GeoBase®

100 50 0 100 200

Kilometres

1:9,000,000

Government of Nunavut

Groundwater Monitoring
Cape Dorset Lagoon and Landfill

Proposed Monitoring Wells Overview

DATE: February 2010	**Figure 1**
PROJECT: YX00826.200	Fig 1 Prop Mntr Wells 10-03-30
ANALYST: CF / QA/QC: TR DW	
PROJECTION/DATUM: Lambert Conformal Conic	

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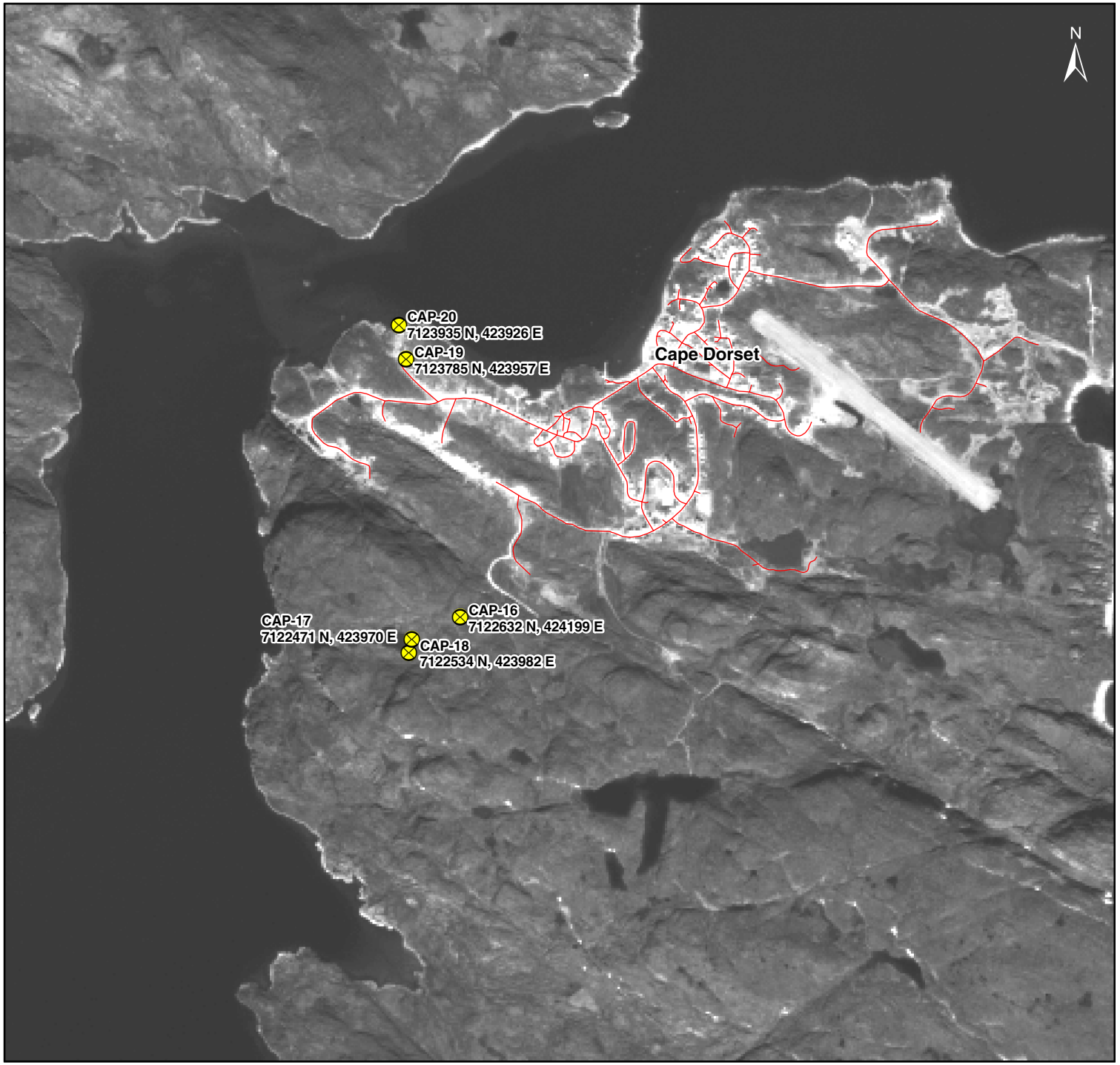

Legend

- Monitoring Well

Source: GeoBase®

400 200 0 400 800

Metres

1:25,000

Government of Nunavut

Groundwater Monitoring
Cape Dorset Lagoon and Landfill

Proposed Monitoring Wells Overview

DATE: February 2010	**Figure 2**
PROJECT: YX00826.200	Fig 2 Prop Mntr Wells 10-03-31
ANALYST: TR / QA/QC: CP DW	
PROJECTION/DATUM: UTM Zone 18 WGS84	amec

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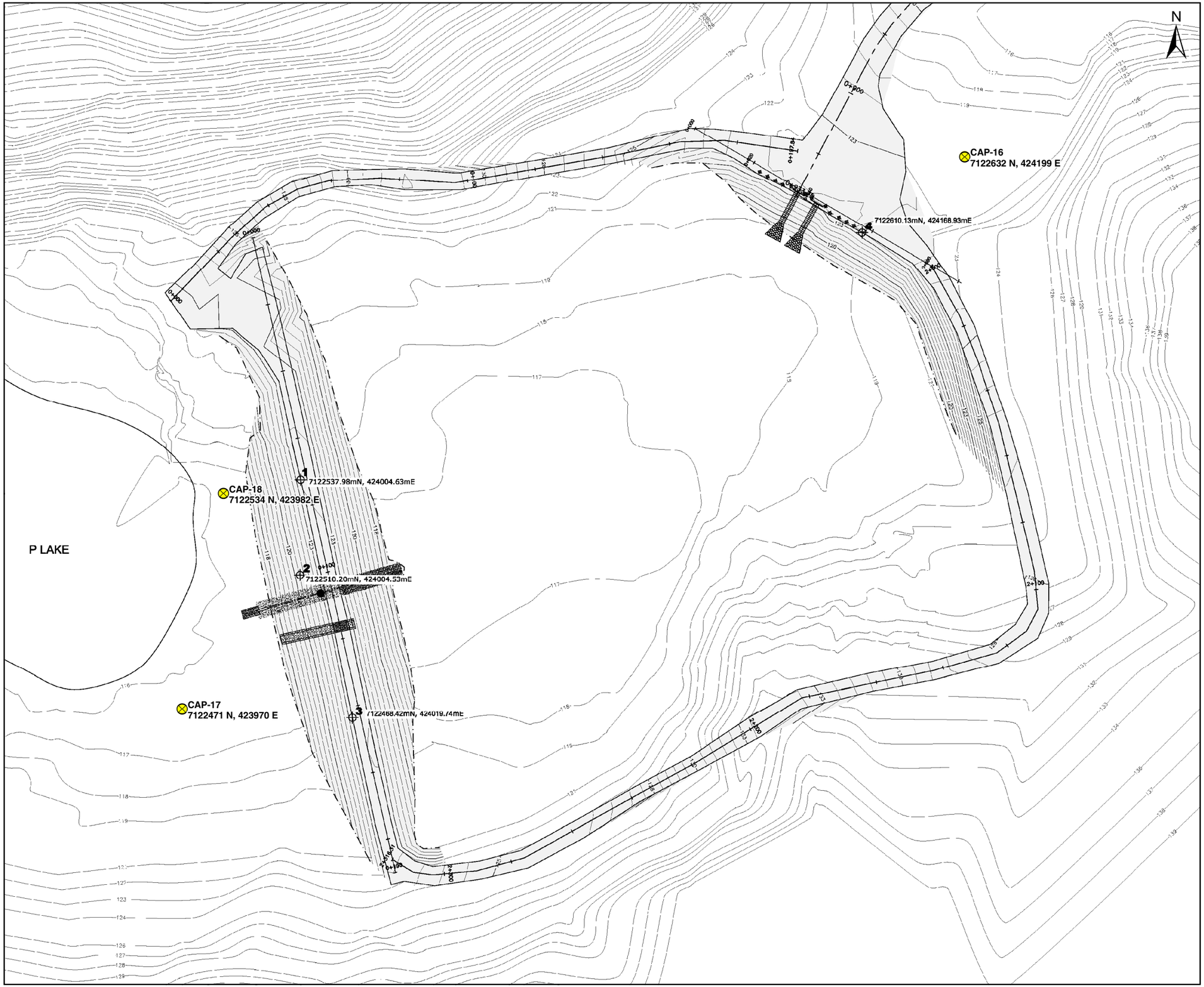

Legend

- Monitoring Well

Note: Base map modified from Dillon Consulting drawing 114 "Thermister Locations" from May 2009.

20 10 0 20 40

Meters

1:1,100

Government of Nunavut

Groundwater Monitoring
Cape Dorset Lagoon and Landfill

Proposed Monitoring Wells
Sewage Lagoon

DATE: February 2010	**Figure 3**
PROJECT: YX00826.200	Fig 3 Prop Mntr Wells Lagoon 10-03-31
ANALYST: TR / QA/QC: CP DW	
PROJECTION/DATUM: UTM Zone 18 WGS84	amec

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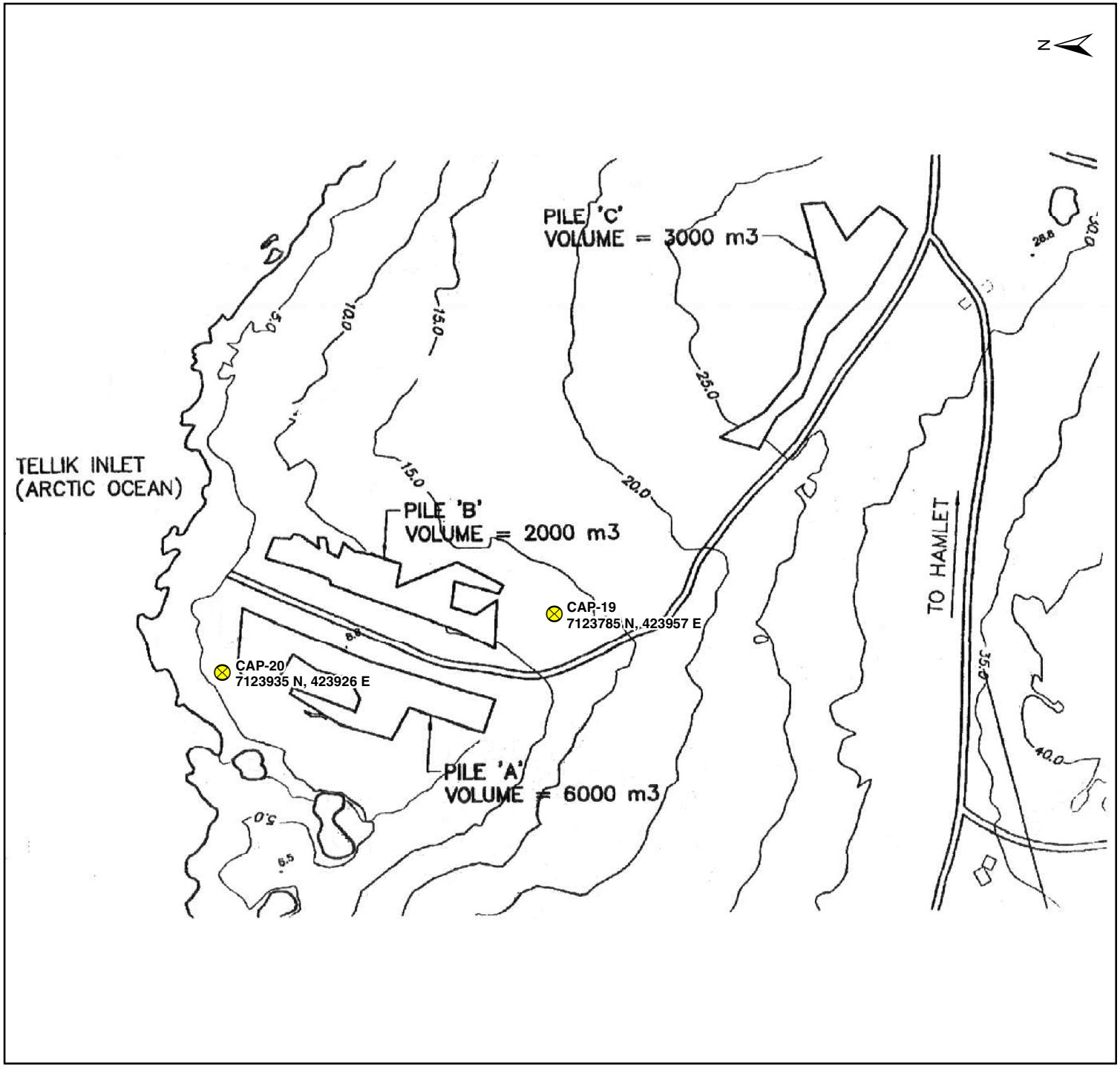

Legend

⊗ Monitoring Well

Note: Base map modified from Dillon Consulting Figure 4 "Existing Bulk Waste Piles" from September 23, 2003.

40 20 0 40 80

Meters

1:2,400

Scale bar and written scale are approximate.

Government of Nunavut

Groundwater Monitoring
Cape Dorset Lagoon and Landfill

Proposed Monitoring Wells Landfill

DATE: February 2010	**Figure 4**
PROJECT: YX00826.200	Fig 4 Prop Mntr Wells Landfill 10-03-31
ANALYST: TR / QA/QC: CP DW	
PROJECTION/DATUM: UTM Zone 18 WGS84	amec

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APPENDIX A

Cape Dorset Water License

P.O. BOX 119
GJOA HAVEN, NU X0B 1J0
TEL: (867) 360-6338
FAX: (867) 360-6369

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NUNAVUT IMALIRIYIN KATIMAYINGI
NUNAVUT WATER BOARD
OFFICE DES EAUX DU NUNAVUT

File No: 3BM-CAP0810

March 7, 2008

Honorable Chuck Strahl, P.C., M.P.
Minister of Indian Affairs & Northern Development
and Federal Interlocutor for Metis and Non-Status Indians
21st Floor, 10 Wellington
Gatineau, Quebec K1A 0H4

By Courier, Email and Regular Mail

Subject: Licence 3BM-CAP0810 – Cape Dorset, Nunavut

Dear Minister:

Please find enclosed an amended Licence 3BM-CAP0810 duly issued by the Nunavut Water Board (NWB).

The amendment to this Licence authorizes the Hamlet of Cape Dorset, to dispose of waste in relation the disposal, treatment and discharge of sewage effluent for municipal operations at Cape Dorset. This Type B Licence is being sent to you for your approval in accordance with Section 56(1) of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (Act) as the Board determined pursuant to subsection 51(2) of the Act that it is in the public interest to hold a public hearing on the amendment application.

As set out in the Board's Reasons for Decision, attached for your information, this decision was particularly difficult for the Board. The Board has concluded that the current sewage lagoon system has failed. At the same time, construction of the new sewage lagoon was completed prior to the Public Hearing. The new sewage lagoon appears to have been built without environmental assessment, and certainly without this Board's regulatory review and approval.

Without the benefit of environmental assessment or regulatory direction, the evidence supports that the new sewage lagoon, has been built in a location with unfavourable geological characteristics; the integrity of the design is seriously questioned by technical reviewers; and the facility has not been constructed in accordance with construction drawings, omitting design elements essential to mitigating the design risks (i.e. thermistors installations). Furthermore, the new lagoon is accessible only by

a road that the Board believes is likely to prove unusable during winter months, forcing continued reliance on the existing lagoon.

While the new lagoon system poses serious risks, the Board is satisfied that with appropriate conditions these risks can be mitigated. Moreover, this is likely the only mechanism for the Hamlet to come into compliance with the Act and the terms of the Licence. Accordingly, the Board has decided that the optimum benefit for the residents of Nunavut is derived from a decision to issue the amendment to the Licence.

The Board's decision relies heavily on the need for mitigating risks posed by the new lagoon system and has set out corresponding conditions in the amended Licence, including specified responsibilities of the Her Majesty in right of Canada pursuant to 70(2) of the Act. The Board believes these conditions are essential to achieving optimum benefit for the residents of Nunavut and asks that the Minister approve this Licence only if INAC inspectors are committed to comply with the responsibilities specified in the Licence and pursuant to the Act.

Through the conditions set out in the Licence, the Board will carefully monitor the Hamlet's efforts to come into compliance with the Licence. If at any point the Board determines that future failure to comply with key conditions set out in the Licence such that the balance of the benefit to the residents of Nunavut changes, the Board is prepared to exercise its authority pursuant to clause 43(1)(c)(iii) of the Act to recommend cancellation of the licence if the Board determines it is in the public interest to do so.

If your office wishes to receive a full Records of Proceedings please contact our head office. The Licence is in your hands to be considered in accordance with section 56 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*.

Please contact the undersigned in writing should you have any questions regarding this matter.

Sincerely,

Thomas Kabloona
A/Chair

Attachment: Licence No: 3BM-CAP0810 and Decision

c.c. Cape Dorset Distribution List
NWB Public Registry

WATER LICENCE NO: 3BM-CAP0810

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LICENCE 3BM-CAP0810

Pursuant to the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

HAMLET OF CAPE DORSET
(Licensee)

of **P.O. BOX 30, CAPE DORSET, NUNAVUT X0A 0C0**
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water for a period subject to restrictions and conditions contained within this licence:

Licence Number **3BM-CAP0810**

Water Management Area **NUNAVUT 05**

Location **CAPE DORSET, NUNAVUT**
Latitude 64°14'N and Longitude 76°32'W

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to Exceed **70,000 CUBIC METRES ANNUALLY**

Date of Licence **MARCH 7, 2008**

Expiry Date of Licence **MARCH 1, 2010**

Thomas Kabloona,
Nunavut Water Board
A/Chair

APPROVED BY:

Minister of Indian and Northern Affairs Canada

DATE LICENCE APPROVED:

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Cape Dorset, Nunavut (Latitude 64°14'N and Longitude 76°32'W);

b. 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 *Nunavut Waters and Nunavut Surface Rights Tribunal 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 subject to such requirements; and

c. 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

"Act" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"Amendment" means a change to original terms and conditions of this licence requiring correction, addition or deletion of specific terms and conditions of the licence; modifications inconsistent with the terms of the set terms and conditions of the Licence;

"Analyst" means an Analyst designated by the Minister under Section 85 (1) of the *Act*;

''Appurtenant undertaking'' means an undertaking in relation to which a use of waters or a deposit of waste is permitted by a licence issued by the Board;

"Average Concentration" means the arithmetic mean of the last four consecutive analytical results for contained in composite or grab samples collected from the Waste Disposal Facility's final discharge point;

"Average Concentration For Faecal Coliforms" means the geometric mean of the last four consecutive analytical results for faecal coliforms contained in composite or grab samples collected from the Waste Disposal Facility's final discharge point;

"Board" means the Nunavut Water Board established under the *Nunavut Land Claims Agreement*;

"Chief Administrative Officer" means the Executive Director of the Nunavut Water Board;

"Composite Sample" means a water or wastewater sample made up of four (4) samples taken at regular periods over a 24 hour period;

"Effluent" means treated or untreated liquid waste material that is discharged into the environment from a structure such as a settling pond or a treatment plant;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Engineering, Geological and Geophysical Act (Nunavut)* S.N.W.T. 1998, c.38, s.5;

"Final Discharge Point" means the discharge location point where the effluent from the 2007 Sewage Disposal Facilities enters fish habitat or fish bearing waters;

"Final Point of Control" means the discharge location at the 2007 Sewage Disposal Facilities August 27, 2007 submission prepared by Dillon Consulting including ten appendices, to be confirmed by an Inspector;

"Freeboard" means the vertical distance between water line and crest on a dam or dyke's upstream slope;

"Geotechnical Engineer" means a professional engineer registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

"Grab Sample" means a single water or wastewater sample taken at a time and place representative of the total discharge;

"Greywater" means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes;

"Inspector" means an Inspector designated by the Minister under Section 85 (1) of the

Act;

"Licensee" means the holder of this Licence;

"Modification" means an alteration to a physical work that introduces new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion, and changes to the operating system that are consistent with the terms of this Licence and do not require amendment;

"Monitoring Program" means a monitoring program established to collect data on surface water and groundwater quality to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

"Nunavut Land Claims Agreement" (NLCA) means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"**Sewage**" means all toilet wastes and greywater;

"**Sewage Disposal Facilities**" includes the facilities licensed in 2001, 2004 and 2007;

"**Emergency Sewage Disposal Facility**" comprises the area designed to contain and treat sewage as described in the Water License Amendment Application filed by the Applicant on August 16, 2004, and illustrated on the "Cape Dorset Sewage Lagoon Rehabilitation Site Plan (August 2004)"

"2001 Sewage Disposal Facilities" comprises the Three Tier Lagoon which comprises the area and engineered lagoon and decant structures designed to contain sewage as described in the Application for Water Licence filed by the Applicant on April 19, 2001;

"2007 Sewage Disposal Facilities" comprises the engineered lagoon and decant structures constructed in 2007 and illustrated in the Record Drawings No.'s 100 and 101 of Project N-05-4319-3000 prepared by Dillon Consulting and submitted November 13, 2007;

"Solid Waste Disposal Facilities" comprises the area and associated structures designed to contain solid waste (landfill site) as described in the Application for Water Licence filed by the Applicant on April 19, 2001;

"Toilet Wastes" means all human excreta and associated products, but does not include greywater;

"Waste" means, as defined in S.4 of the *Act*, any substance that, by itself or in combination with other substances found in water, would have the effect of altering the quality of any water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

"Waste Disposal Facilities" means all facilities designated for the disposal of waste, and includes the 2001, 2004 and 2007 Sewage Disposal Facilities, Solid Waste Disposal Facilities, and Bagged Toilet Waste Disposal Facilities, as described in the Application for Water Licence filed by the Applicant on April 19, 2001 and subsequently in the application dated July 7, 2005;

"Water Supply Facilities" comprises the area and associated intake infrastructure at Tee Lake, as described in the Application for Water Licence filed by the Applicant on April 19, 2001;

3. Enforcement

i. Failure to comply with this Licence will be a violation of the *Act*, subjecting the Licensee to the enforcement measures and the penalties provided for in the *Act*;

ii. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the *Act*; and

iii. For the purpose of enforcing this Licence and with respect to the use of water and deposit or discharge of waste by the Licensee, Inspectors appointed under the *Act*, hold all powers, privileges and protections that are conferred upon them by the *Act* or by other applicable law.

iv. The Licensee shall, in relation to any application to renew or amend the Licence, have in place a Plan for Compliance approved by the Board in writing, to achieve full compliance with the conditions of this Licence, or a Plan for Compliance must be submitted at the time of Application, in order for the Application to be deemed complete.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

i. tabular summaries of all data generated under the Monitoring Program;
ii. the monthly and annual quantities in cubic metres of fresh water obtained from all sources;
iii. the monthly and annual quantities in cubic metres of each and all waste discharged;
iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;
v. a list of unauthorized discharges and summary of follow-up action taken;
vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the following year;
vii. a summary of any studies, reports and plans (i.e. Operations and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to water use and waste disposal or reclamation, and a brief description of any future studies planned; and
viii. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.

2. The Licensee shall comply with the Monitoring Program described in this Licence, and any amendments to the Monitoring Program as may be made from time to time, pursuant to the conditions of this Licence.

3. The Monitoring Program and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. Meters, devices or other such methods used for measuring the volumes of water used and waste discharged shall be installed, operated and maintained by the Licensee.

5. The Licensee shall, within ninety (90) days after the first visit by the Inspector following issuance of this Licence, post the necessary signs, to identify the stations of the Monitoring Program. All signage postings shall be in the Official Languages of Nunavut.

6. The Licensee shall submit to the Board, for approval in writing, within the lesser of ninety (90) days or the filing of any application in relation to the Licence, a Plan for Compliance that clearly demonstrates the ways and means the Licensee will undertake to achieve full compliance with the conditions of this Licence.

7. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted, cannot be undertaken without subsequent written Board approval and direction. The Board may alter or modify a Plan if necessary to achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the Plan.

8. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and condition imposed upon approval of a Plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

9. The Licensee shall immediately report to the 24-Hour Spill Report Line (867-920-8130) any spills of Waste, which are reported to, or observed by the Licensee, within the municipal boundaries or in the areas of the Water Supply or Waste Disposal Facilities.

10. The Licensee shall ensure a copy of this Licence is maintained at the municipal office at all times. Any communication with respect to this Licence shall be made in writing to the attention of:

Manager of Licensing:
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nunavutwaterboard.org

Inspector Contact:
Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

Analyst Contact:
Taiga Laboratories
Department of Indian and Northern Affairs
4601 – 52 Avenue, P.O. Box 1500
Yellowknife, NT X1A 2R3
Telephone: (867) 669-2781
Fax: (867) 669-2718

11. The Licensee shall submit one paper copy and one electronic copy of all reports, studies, and plans to the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in Inuktitut.

12. The Licensee shall ensure that any document(s) or correspondence submitted by the

Licensee to the Board, is received by the Board and maintain on file a copy of the acknowledgment of receipt issued by the Manager of Licensing.

13. This Licence is not assignable except as provided in Section 44 of the Act.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all fresh water from the Tee Lake using the Water Supply Facilities or as otherwise approved by the Board in writing.

2. The annual quantity of water used for all purposes shall not exceed 70,000 cubic metres.

3. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

4. The Licensee shall not remove any material from below the ordinary high water mark of any water body unless otherwise approved by the Board in writing.

5. The Licensee shall not cause erosion to the banks of any body of water and shall provide necessary controls to prevent such erosion.

6. Sediment and erosion control measures shall be implemented prior to and maintained during the operation to prevent entry of sediment into water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. Licensee shall locate areas designated for waste disposal at a minimum distance of thirty (30) metres from the ordinary high water mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.

2. Subject to the conditions in the Licence regarding commissioning, the Licensee shall direct all Sewage to the 2007 Sewage Disposal Facilities or as otherwise approved by the Board in writing.

3. The Licensee shall provide notice to an Inspector at least ten (10) days prior to initiating any decant of the 2001 and 2007 Sewage Disposal Facilities.

4. All Effluent discharge from the 2001 Sewage Disposal Facility at Monitoring Program Station CAP-3 and the Emergency Sewage Disposal Facility at Monitoring Program

Station CAP-4, shall meet the following effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1 x 10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

5. All Effluent discharged from the 2007 Sewage Disposal Facilities at Monitoring Program Station CAP-5 shall meet the following effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	80 mg/L
Total Suspended Solids	100 mg/L
Faecal Coliforms	1 x 10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

6. The Licensee shall maintain at all times, a freeboard of at least 1.0 metre, or as recommended by a qualified Geotechnical Engineer with notice in writing provided to the Board, for all dams, dykes or other structures intended to contain, withhold, divert or retain water or wastes.

7. The Sewage Disposal Facilities shall be maintained and operated in such a manner as to prevent structural failure.

8. All Effluent discharged from the 2007 Sewage Disposal Facility at the Final Discharge Point at Monitoring Station CAP-14 and effluent discharge from Monitoring Stations CAP-3 and CAP-4 prior to the point of entry at the ocean, , shall be demonstrated to be non-acutely toxic under the following tests to be conducted once annually, approximately mid-way through the discharge period:

   i. Acute lethality to Rainbow Trout, Oncorhynchus mykiss (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); or

ii. Acute lethality to the crustacean, Daphnia magna (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).

9. The Licensee shall dispose of and contain all solid wastes at the Solid Waste Disposal Facilities or as otherwise approved by the Board in writing.

10. The Licensee shall implement appropriate erosion and diversion control methods, to minimize surface water intrusion and leachate generation at the Solid Waste Storage Facility.

11. The Licensee shall segregate and securely store all hazardous materials and/or hazardous waste within the Solid Waste Disposal Facility in a manner as to prevent the deposit of deleterious substances into any water.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board, for approval in writing, design drawings stamped by a qualified engineer registered in Nunavut prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

2. The Licensee may, without written approval from the Board, carry out modifications to the Water Supply and Waste Disposal Facilities provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

   i. the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to beginning the modifications;

   ii. these modifications do not place the Licensee in contravention of the Licence or the Act;

   iii. the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and

   iv. the Board has not rejected the proposed modifications.

3. Modifications for which all of the conditions referred to in Part E, Item 2, have not been met may be carried out only with written approval from the Board.

4. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Part within ninety (90) days of completion of the Modification. These plans and

drawings shall be stamped by an Engineer.

5. The Licensee shall, within sixty (60) days of issuance of this Licence, provide a summary report along with revised stamped as-built plans and record drawings of the 2007 Sewage Disposal Facility, to reflect the clarifications and omissions identified through the Licence application review and detailed in the attached Schedule 1.

6. All activities shall be conducted in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake corrective measures to restore natural surface drainage in the event of any impacts on surface drainage

7. The Licensee shall ensure that sediment and erosion control measures are implemented prior to and maintained during the operation to prevent the release of sediment and minimize erosion during construction activities.

8. The Licensee shall designate an area for the deposition of excavated and stockpiled materials that is at least thirty (30) metres above the ordinary high water mark of any water body and in such a manner as to prevent sediment from entering any surrounding water body.

9. The Licensee shall ensure that both (a) fill material used in construction, and (b) that the ground to be constructed upon, are free of contaminants. If contaminated soils are identified, notification shall be made in the Licensee's annual report. All contaminated soils shall be treated and disposed of in accordance with Part F, Item 2, or as otherwise approved by the Board in writing.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence and prior to commissioning of the 2007 Sewage Disposal Facilities, a revised *Operation and Maintenance Manual, Sewage Treatment System, Hamlet of Cape Dorset, November 7, 2007.* The revision shall include the requirements of Schedule 2.

2. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence, an Operation and Maintenance Manual for the Water Supply Facilities and the Solid Waste Disposal Facilities prepared in accordance with the *"Guidelines for Preparing an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities", October 1996.* The Plan shall include a specific section addressing waste management and the proper diversion and segregation of wastes, the storage, transport and disposal of hazardous wastes materials.

3. The Licensee shall implement the Manuals specified in Part F, Items 1 and 2, following approval in writing by the Board.

4. The Licensee shall provide notification in writing to the Board, in accordance with Part E, Item 2, of changes to the approved Operation and Maintenance Plan under Part F, Item 1, with respect to the wastewater storage and decanting operations and procedures. For any potential significant impact of such change to the geothermal regime within and under the berms or lagoon floor, notice shall be accompanied by the Geotechnical Engineer's supporting documentation and further geotechnical analysis.

5. An inspection of all engineered facilities related to the management of water and waste shall be carried out annually in July, by a Geotechnical Engineer in accordance with the Canadian Dam Association, Dam Safety Guidelines, November 2007, where applicable. This inspection shall include the access road alignment with respect to water resources and the diversion and passage of water through culverts. The engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a covering letter from the Licensee outlining an implementation plan addressing each of the Engineer's recommendations.

6. The Licensee shall perform a visual operations inspection of all engineered facilities related to the management of water and waste on a weekly basis or more frequently as requested by an Inspector, to assess the general operating conditions and integrity of the containment structures. The records of these inspections are to be maintained and made available to an Inspector upon request during the Licence term.

7. The Licensee shall review the Manual(s) referred to in this Part if there are changes in operation and/or technology and modify the Manual(s) accordingly. Revisions to the Board approved Manual(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

8. If, during the period of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

   i. employ the appropriate contingency plan as provided for in the Operation and Maintenance Manual;
   ii. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
   iii. submit to the Inspector, a detailed report on each occurrence, no later than thirty (30) days after initially reporting the event, that provides the necessary information on the location (including the GPS coordinates), initial response action, remediation/clean-up, status of response (ongoing, complete), proposed disposal options for dealing with contaminated materials and preventative measures to be implemented.

PART G: CONDITIONS APPLYING TO ABANDONMENT, RESTORATION AND CLOSURE

1. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence, a detailed Final Abandonment and Restoration Plan for the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility. The Plan should incorporate, where applicable, the appropriate sections as described in Part G, Item 2.

2. The Licensee shall submit to the Board, for approval in writing, within six (6) months of issuance of this Licence, a preliminary or conceptual Abandonment and Restoration Plan for the Hamlet of Cape Dorset, Water and Waste Disposal Facilities and all associated structures not covered under Part G, Item 1, with end objectives to return the site to pre-use conditions. The Plan shall include the following (where applicable):

   i. water intake facilities;
   ii. the water treatment and waste disposal sites and facilities;
   iii. petroleum and chemical storage areas;
   iv. any site affected by waste spills;
   v. leachate prevention;
   vi. an implementation and completion schedule;
   vii. maps delineating all disturbed areas, and site facilities;
   viii. consideration of altered drainage patterns;
   ix. type and source of cover materials;
   x. future area use;
   xi. hazardous wastes; and
   xii. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

3. The Licensee shall submit to the Board, for approval in writing, six (6) months prior to the planned decommissioning of any licensed facility and the construction of new facilities to replace existing ones, a Final Abandonment and Restoration Plan for the facilities being decommissioned.

4. The Licensee shall implement the Plan(s) specified in Part G, Item 1 and 3, following approval in writing by the Board.

5. The Licensee shall review the Plan(s) referred to in this Part if there are changes in operation and/or technology and modify the Plan accordingly. Revisions to the Board approved Plan(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

6. The Licensee shall carry out progressive reclamation of any components of the project no longer required for the Licensee's operations.

7. The Licensee shall complete the restoration work within the time schedule specified in the Plan, or as subsequently revised and approved by the Board.

8. The Licensee shall complete all restoration work prior to the expiry of this Licence.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Monitoring Program Stations at the following locations:

Monitoring Program Station Number	Description	Status
CAP-1	Raw Water supply prior to treatment	Active (Volume)
CAP-2	Runoff from the Solid Waste Disposal Facilities	Active
CAP-3	Influent of Wastewater to Wastewater Facilities (active at the time of sampling)	New
CAP-4	Effluent Discharge from the 2001 Sewage Disposal Facilities	Active (including volume)
CAP-5	Effluent discharge from the Emergency Sewage Disposal Facilities	Active (including volume)
CAP-6	Effluent discharge from the 2007 Sewage Disposal Facilities – Final Point of Control	Active (including volume)
CAP-7	Point of influent of wastewater to P-Lake	New
CAP-8	Centre of P-Lake	New
CAP-9	Location midway between the Centre of P-Lake (Station 8) and the effluent discharge of P-Lake	New

Monitoring Program Station Number	Description	Status
CAP-10	Effluent discharge from P-Lake; note, if flow is negligible a sample from the immediate upstream area within P-Lake shall be obtained	New
CAP-11	Effluent discharge from Wetland area	New
CAP-12	Wetland Pathway at the top of the waterfall	New
CAP-13	Wetland Pathway at mid-way down waterfall	New
CAP-14	Wetland Pathway at bottom of cliff – Final Discharge Point	
CAP-15	Control point using a small lake located between the Lagoon and Tee Lake	New
CAP-16	Monitoring well located up gradient of the 2007 Sewage Disposal Facility	New
CAP-17	Monitoring Well No.1 located down gradient of the 2007 Sewage Disposal Facility	New
CAP-18	Monitoring Well No.2 located down gradient of the 2007 Sewage Disposal Facility	New
CAP 19	Monitoring well located up gradient of the Solid Waste Disposal Facilities	New
CAP-20	Monitoring well located down gradient of the Solid Waste Disposal Facilities	New
CAP-21	Thermistor stations	Proposed with final description to be provided
CAP-22	As above	
CAP-23	As above	
CAP-24	As above	

2. The Licensee shall sample at Monitoring Program Stations CAP-3 through CAP-15 inclusive, one week prior to the proposed discharge date, once at the beginning of discharge and weekly thereafter until cessation of discharge. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand (BOD_5)

Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)
Total Suspended Solids
pH
Conductivity
Oil and Grease (visual)

Fecal Coliforms
Nitrate-Nitrite
Ammonia Nitrogen
Total Phosphorus
Total Phenols
Magnesium
Calcium
Sodium
Potassium
Chloride
Sulphate
Total Hardness
Total Alkalinity

Total Trace Metals as determined by a standard ICP Scan (to include at a minimum, the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn),

Total Arsenic
Total Mercury
Total Organic Carbon (TOC)

3. If the discharge at Station CAP-4, CAP-5 or CAP-6 has been suspended for more than 48 hours and subsequently restarted, the sampling sequence described in Part H, Item 2 of the Monitoring Program shall be repeated for these Stations.

4. The Licensee shall sample monthly at Monitoring Program Station CAP-2 during periods of observed flow. Samples shall be analyzed for the following parameters:

BOD_5	Fecal Coliforms
pH	Conductivity
Total	Suspended Solids Ammonia Nitrogen
Nitrate-Nitrite	Oil and Grease
Total Phenols	Total Alkalinity
Total Hardness	Calcium
Magnesium	Potassium
Sodium	Sulphate
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel

5. The Licensee shall report all results of non-acute toxicity testing as required under Part D, Item 8 within the Annual Report as per Part B, Item 1.

6. The Licensee shall install thermistors for the purpose of validating assumptions made in the geothermal analyses for the 2007 Sewage Disposal Facilities as recommended by the Geotechnical Engineer of record and agreed upon by the Licensee, subject to a minimum of three 20 to 25 metre deep thermistors installed in crest of the west berm and at least one thermistor of that depth in the east berm.

7. The results of thermistor monitoring required under Part H, Item 6, shall be submitted to the Board for approval in writing, prior to commissioning of the 2007 Sewage Disposal Facility. The results shall include an Engineer's Report, validating the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations

8. The Licensee shall not commission the 2007 Sewage Disposal Facility until the requirements of Part H, Item 6 and Item 7 have been completed and approved.

9. The Licensee shall, within ninety (90) days of issuance of this Licence, provide a Temperature Monitoring Program and Implementation Plan for ongoing collection of ground temperatures within each berm structure and foundation of the 2007 Sewage Disposal Facility through the installation of thermistors. This Plan shall take into consideration the following:

    i. Locations of thermistors, to be incorporated into the Monitoring Station Table under Part H, Item 1;
    ii. Appropriate thermistor configuration, overall depth and spacing of bead locations to provide the level of data collection that will capture any extreme variations in temperature and provide the information needed to validate the assumptions made in the geothermal analysis.
    iii. The frequency of temperature readings shall be such to allow the determination of the maximum freeze and thaw of the berm and underlying native materials and provide adequate data for thermal modeling of the berms.
    iv. This frequency may be reviewed and adjusted upon collection of adequate data and as recommended by the Geotechnical Engineer in order to assess the berms through thermal modeling and provide an assessment with respect to berm stability and potential seepage.
    v. This information is to be reported along with the results of the annual geotechnical inspection as required under Part F, Item 6.
    vi. An implementation schedule that will allow collection of data for confirmation of core-trench freeze-back.

10. The Licensee shall implement the Plan specified in Part H, Item 9 following approval by the Board in writing.

11. The Licensee shall review the Plan(s) referred to in this Part if there are changes in operation and/or technology and modify the Plan accordingly. Revisions to the Board approved Plan(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

12. The Licensee shall install groundwater monitoring wells at the 2007 Sewage Disposal Facility to obtain at least one monitoring season of data prior to the expiry of the Licence. At least one groundwater monitoring well shall be located upstream of the 2007 Sewage Disposal Facility for background data collection, at least one groundwater monitoring well shall be located downstream of the landfill and at least one groundwater monitoring well shall be located downstream of the metals dump.

13. The Licensee shall sample at Monitoring Program Stations CAP-16, CAP-17 and CAP-18 once annually in the summer, prior to commencing discharge from the 2007 Sewage Disposal Facility, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. Samples shall be analyzed for parameters identified in Part H, Item 4.

14. The Licensee shall install groundwater monitoring at the Solid Waste Disposal Facilities wells to obtain at least one monitoring season of data prior to the expiry of the Licence, At lease one groundwater monitoring well shall be located upstream of the Solid Waste Disposal Facilities for background data collection and at least one groundwater monitoring well shall be located downstream of the Solid Waste Disposal Facilities .

15. The Licensee shall sample at Monitoring Program Stations CAP-19 and CAP-20 once annually in the summer season, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. Samples shall be analyzed for parameters identified in Part H, Item 4.

16. The Licensee shall measure and record in cubic metres, the monthly and annual quantities of water pumped for all purposes at Monitoring Program Station CAP-1.

17. The Licensee shall measure and record in cubic metres (a) the monthly and annual quantities of raw sewage offloaded from trucks and the number of days of use for the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility, and (b) the monthly and annual quantities of raw sewage offloaded from trucks at the 2007 Sewage Disposal Facility.

18. The Licensee shall measure and record the annual quantities of sewage solids removed from the Sewage Disposal Facilities.

19. The Licensee shall conduct additional sampling and analysis as may be requested by an Inspector.

20. The Licensee shall revise the "Guidelines for Wastewater Sampling, October 27, 2007" and submit to the Board for approval by an Analyst in writing a Quality Assurance/Quality Control (QA/QC) Plan for the Hamlet of Cape Dorset, within ninety (90) days of issuance of this Licence. The Plan shall use as a guide the document *"Quality Assurance and Quality Control Guidelines for use by Class "B" Licensees in Collection of Representative Water Samples in the Field, and for Submission of a QA/QC Plan, July 1996"*. The Plan shall address the use of field blanks, replicate sampling and certified reference material in order to assess accuracy, precision and field contamination.

21. The Licensee shall implement the Plan referred to in Part H, Item 20 following approval in writing by the Analyst.

22. All sampling, sample preservation and analyses 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 approved by the Board.

23. All analyses shall be performed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Certified Laboratory, or as otherwise approved by an Analyst.

24. The Licensee shall include all of the data and information required by the "Monitoring Program" in the Licensee's Annual Report, as required *per* Part B, Item 1 or as otherwise requested by an Inspector.

25. Her Majesty in the right of Canada shall:
    i. Monitor the Licensee's installation of thermistors and notify the Board when the installation of thermistors is complete and in compliance with Part H, Item 6;
    ii. Monitor the Licensee's validation of the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations under Part H, Item 7, and notify the Board when satisfied the assumptions of the geothermal analysis have been validated; and
    iii. Monitor the 2007 Waste Disposal Facility and notify the Board immediately if the Project is commissioned prior to the completion of i. and ii., or in contravention of any other condition of the Licence.

SCHEDULE 1 CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION

List of drawing deficiencies identified by BGC for revision and submission.
Please refer to Technical Memorandum "Cape Dorset Sewage lagoon-Review of Final Submissions, January 8, 2008", or the final intervention memo dated January 8, 2008 for further clarification.

The record set of drawings fails to include a signature block for AMEC. It was noted that the original design drawings issued by Dillon in the December 21, 2006 design report, revision 5, marked "Issued for Construction" included a signature block "Reviewed by AMEC" on Drawing 111, which is the equivalent of Drawing 112 of the Record Drawings

1. At a minimum, AMEC is to provide a signature block for the following drawings:

- Drawing 101- shows location of test pits carried out for geotechnical investigations.
- Drawing 109- shows longitudinal geological sections along cut-off trench.
- Drawing 110- shows typical earthworks sections for the access road and berm.
- Drawing 112- shows lagoon berm sections

2. The as-built drawings must identify the areas where field changes were made from the original design drawings, preferably in the form of a revision bubble and a brief note in the revisions section of the title block.

List of Drawing alterations and request for rationale for the change.

Record drawing 100 – the alignment of the access roads between the East and West Berms, on the north and south sides of the lagoon was changed from the original design. The road berms were originally designed to deflect runoff from entering the lagoon.

3. Explanation is required as to the rationale for changing the alignment of the road berms and how the as-built berm details in the drawing prevents runoff from entering the lagoon.

Record Drawing 109 – there is up to 1m of unfrozen fill used to level the ground surface under both the East and West berms. This leveling course of material has not been shown as a separate zone in the berm sections presented in Record Drawing 112.

4. A description for record drawing 112 is required of the material used including grain size gradation curve.

Record Drawing 109 – shows that the berm contours at the north end of the West Berm have been modified from the original design drawings. Crest widened from 4m to 25m to accommodate what appears to be a vehicle turnaround on the downstream side of the berm.

5. Additional as-built cross-sections of this area are to be provided along with geothermal analysis that there is sufficient fill thickness over the abutment to ensure that the GCL tie-in to the cut-off trench remains frozen.

Record Drawing 110 shows typical road sections. On July 30, 2007, the GN CGS provided a revised ditch detail for the road

6. This revised ditch detail is requested as part of the as-built drawing details for Drawing 110

7. Additional information is requested providing further details as to how seepage through the active zone under the berm will be prevented.

The Hamlet of Cape Dorset noted a problem during the October 1, 2007 Technical Meeting/Pre-Hearing, with seepage into the lagoon through the active zone with the as-constructed detail. Record Drawing 112 indicates that the material used to backfill the cut-off trench is a "Sand", the same material as used for the berm.

8. Further clarification is requested on how the issue of seepage is being resolved.

In the original Design Drawing 111, Detail 4 showed the liner embedment longitudinal section in the abutments. This Detail was absent from Record Drawing 112. The cut-off trench must extend sufficient distance into the abutment so that any "end-run" seepage through the active zone is prevented. It is not clear from the as-built information if the extent of the cut-off trench satisfies this criterion.

9. Therefore the as-built liner embedment details for the abutment areas of the East and West Berms are therefore requested to be included for Record Drawing 112.

In Record Drawing 112, the crest detail of the emergency overflow weir section was changed. This change notice was transmitted to the contractor by Dillon on July 21, 2007. The as-built detail shows the geo-web and the GCL in one layer, with no granular or other material between the two. Dillon initiated this modification to address a previous concern raised by BGC that water could seep under the GCL in the emergency spillway and potentially lift the liner. It is still not clear how the above modification prevents this problem from occurring.

10. Design change rationale is requested that provides an explanation as to the change from the original drawing, change to meet BGC's concern and then further change to what appears to be potentially inadequate construction.

SCHEDULE 2 CONDITIONS APPLYING TO MONITORING AND MAINTENANCE

A revised *Operation and Maintenance Manual, Sewage Treatment System, Hamlet of Cape Dorset, November 7, 2007* shall include the following requirements:

i. Expansion of Section 3.4.5 to include terms and conditions for the disposal of sludge as provided for in the Draft Guidelines for Discharge of Domestic Wastewater in Nunavut, 2000;
ii. Section 3.4.6 should include a description of the installation of thermistors required under Part H, Item 6, including the number, locations and depths of thermistor beads used to monitor the berms, and a description of the method and frequency of monitoring requirements;
iii. Section 3.4.6 should include a description of the installation of monitoring wells required under Part H, Item 7, including the number, locations and depths of thermistor beads used to monitor the berms, and a description of the method and frequency of monitoring requirements
iv. Description of the details of any repairs, upgrades and maintenance required for the use of part or all of the 2001 Sewage Disposal Facility or Emergency Sewage Disposal Facility;
v. Include a contingency plan for the operation of the 2007 Sewage Disposal Facility during periods where accessibility to the facility is limited and alternative measures are required for the handling of sewage. This may include operation and maintenance of any older facility or portion of, that would be retained as the contingency;
vi. Provision for the monitoring of effluent discharges from the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility;
vii. Inspection program for the 2001 Sewage Disposal Facility, the Emergency Sewage Disposal Facility and 2007 Sewage Disposal Facility, detailing the frequency and inspection requirements by the operator(s) of the facility;
viii. Appendix C of the O&M Manual to include forms to document the recommendations and follow up work required as a result of the annual geotechnical inspection.
ix. Section 4 – Spill Contingency Plan be revised to comprehensively address specific recommendations provided during the review process by GN DoE as follows:

    a. The date the contingency plan was prepared.
    b. The name and address of the person in charge, management or control. This is an on-site person responsible for managing the facility. This person would be initially responsible for clean-up activities.
    c. The name and address of the owner if different from the person in charge. This is the person ultimately responsible for the facility, usually the owner.
    d. The name, job title and 24 hour telephone number for the persons responsible for activating the contingency plan. This ensures the employee discovering the spill can activate a response and provides a 24 hour point of contact for the authority

investigating the spill.

e. A description of the facility including the location, size and storage capacity. This is important if persons are unfamiliar with the facility or area. The description could include a map and/or diagrams.

f. A site map that is intended to illustrate the facilities relationship to other areas that may be affected by the spill. The map should be to scale and be large enough to include the location of your facility, nearby buildings or facilities, roads, culverts, drainage patters, and any nearby bodies of water.

g. The steps to be taken to report, contain, and clean up and dispose of a contaminant in the case of a spill.
    1. Reporting: Notification of all parties involved. This can include internal and external reporting procedures as well as a copy of the spill report;
    2. Clean up: Removal of the contaminant from the environment, a detailed of actual containment and clean up techniques. (2 steps: contain and remediate; be aware of fire);
    3. Disposal: Is the treatment of the contaminant such that it is no longer a threat to the environment. Plans may include location of disposal sites approved to accept wastes, means of storage prior to disposal and other approvals required. (Waste Manifest document).

h. The means by which the contingency plan is activated. This should outline internal company procedures to activate appropriate response equipment and personnel.

i. A description of the training provided to employees to respond to a spill. A sound training program is necessary when dealing with an emergency situation.

j. An inventory and the location of response and clean up equipment available to implement the plan. This includes your equipment as well as any to be used by another person responding to the spill on your behalf.

k. SPILL KIT (FUEL)The kit can include but not limited to the following: shovel, pick-axe, drums, booms, absorbent pad/sheet, disposable protective gloves/coveralls, sorbent and containment materials, and disposal bags.

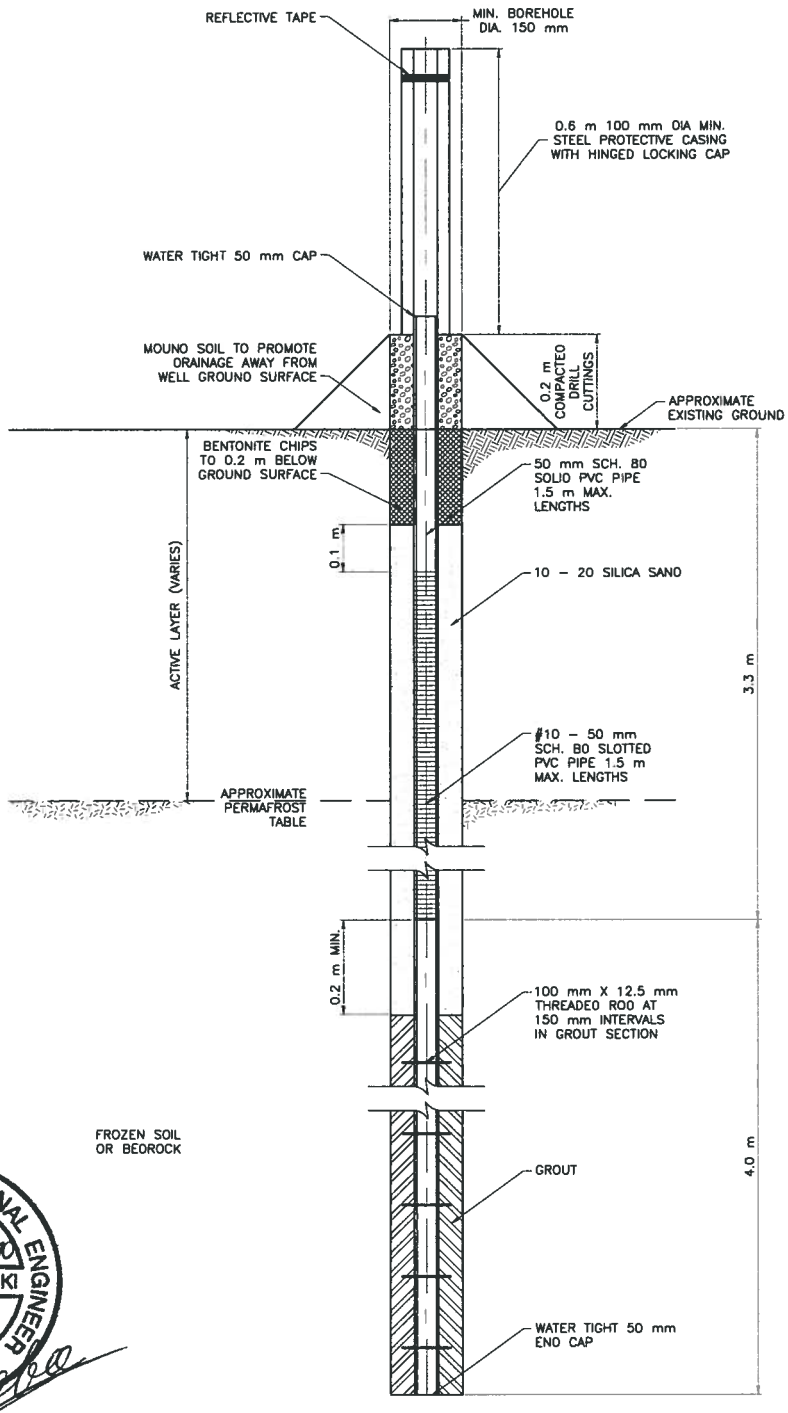
l. A list of local contractors or clean up specialists who may be called upon to assist in responding to spills. A list of emergency numbers such as fire, ambulance and police.

x. Section 4 – describe the measures to be implemented for a spill during the collection and transportation of wastewater. This spill response is to be expanded to include spill scenarios resulting from the leakage or failure of a containment structure for the Sewage Disposal Facilities; and

xi. Appendix B to include specific reference to monitoring stations and required frequency of sampling and the analyses required by the Licence.

APPENDIX B

Typical Monitoring Well Design – Cape Dorset



REGISTERED PROFESSIONAL ENGINEER
April 6, 2010
A. TCHEKHOVSKI
LICENSEE

DISCLAIMER:
AMEC CANNOT GUARANTEE THE INTEGRITY OF PVC PIPE DUE TO POTENTIAL FOR CONSIDERABLE FROST JACKING FORCES WHEN ACTIVE LAYER FREEZES. AMEC CANNOT GUARANTEE THE PRODUCTION OF GROUNDWATER

SCALE
1:10
0 100 200 mm

amec

CLIENT: COMMUNITY AND GOVERNMENT SERVICES, GOVERNMENT OF NUNAVUT

PROJECT: CAPE DORSET GROUNDWATER MONITORING PROGRAM

TITLE: TYPICAL MONITORING WELL INSTALLATION - CAPE DORSET

DATE:	JOB No.:	CAD FILE:	FIGURE No.:	REV.
MARCH 2010	YX00826	00826N02.dwg	FIGURE 3	A

APPENDIX C

Borehole Logs and "As Built" Monitoring Well Logs

(TO BE ADDED FOLLOWING WELL INSTALATION – SUMMER 2010)

APPENDIX D

Equipment Calibration Sheets

FINAL YSI Daily Calibrations

DATE mm/dd/yy	TIME 24hrs	TEMP. (°C)	Barometric Pressure (mmHg)	pH 7 Final	pH 4 Final	pH 10 Final	SpCond (mS/cm) Final	ORP (mV) Final	DO (% Sat.) Final
Field Rep:			Comments:						
DATE mm/dd/yy	TIME 24hrs	TEMP. (°C)	Barometric Pressure (mmHg)	pH 7 Final	pH 4 Final	pH 10 Final	SpCond (mS/cm) Final	ORP (mV) Final	DO (% Sat.) Final
Field Rep:			Comments:						
DATE mm/dd/yy	TIME 24hrs	TEMP. (°C)	Barometric Pressure (mmHg)	pH 7 Final	pH 4 Final	pH 10 Final	SpCond (mS/cm) Final	ORP (mV) Final	DO (% Sat.) Final
Field Rep:			Comments:						
DATE mm/dd/yy	TIME 24hrs	TEMP. (°C)	Barometric Pressure (mmHg)	pH 7 Final	pH 4 Final	pH 10 Final	SpCond (mS/cm) Final	ORP (mV) Final	DO (% Sat.) Final
Field Rep:			Comments:						
DATE mm/dd/yy	TIME 24hrs	TEMP. (°C)	Barometric Pressure (mmHg)	pH 7 Final	pH 4 Final	pH 10 Final	SpCond (mS/cm) Final	ORP (mV) Final	DO (% Sat.) Final
Field Rep:			Comments:						
DATE mm/dd/yy	TIME 24hrs	TEMP. (°C)	Barometric Pressure (mmHg)	pH 7 Final	pH 4 Final	pH 10 Final	SpCond (mS/cm) Final	ORP (mV) Final	DO (% Sat.) Final
Field Rep:			Comments:						
DATE mm/dd/yy	TIME 24hrs	TEMP. (°C)	Barometric Pressure (mmHg)	pH 7 Final	pH 4 Final	pH 10 Final	SpCond (mS/cm) Final	ORP (mV) Final	DO (% Sat.) Final
Field Rep:			Comments:						

NOTE: FINAL READINGS ARE TAKEN WITH SOLUTION

Figure 4. Calibration Data

Water Level Tape Calibration Tape Description ☐ ft ☐ m

Before Use		Date:	Initials:	After Use		Date:	Initials:
Water Level Tape Reading		Measured Distance	Correction Factor	Water Level Tape Reading		Measured Distance	Correction Factor
5 ft	1 m	-	=	5 ft	1 m	-	=
10	3	-	=	10	3	-	=
20	5	-	=	20	5	-	=
50	10	-	=	50	10	-	=
100	30	-	=	100	30	-	=
150	45	-	=	150	45	-	=
200	60	-	=	200	60	-	=
250	75	-	=	250	75	-	=
300	100	-	=	300	100	-	=

To Calibrate the Water Level Tape:

1. Determine the point on the water level tape probe where electric circuit is closed when the probe is submerged in water. This point equals 0 feet (or meters) on the water level tape.
2. Measure the distance from 0 on the water level tape to the feet or meter markers on the water level tape.
3. The correction factor equals the distance marked on the water level tape minus the measured distance. The correction factor will be a negative number if the water level tape has stretched.
4. Subtract the correction factor from the depth to water measurement to get the water level in the well.

pH Meter Calibration pH Meter Type Serial No. Date Initials

Marked Buffer pH (on bottle)	Buffer Temperature ☐ °C ☐ °F	Buffer pH at Measured Temperature	pH Meter Reading

Meter Calibration ☐ Automatic Calibration ☐ Temperature Compensated

1. Automatic Calibration Use manufacturer's instructions and check the box above.
2. Two-Buffer Calibration: Determine field pH of the pH 7 buffer solution at the buffer's field temperature (from the table on the bottle), set meter to pH at the buffer temperature. Rinse electrode with deionized water, measure pH of second buffer solution, adjust slope of meter to read the pH of the second buffer at the field temperature. Recheck the pH 7 buffer's field pH and repeat procedure if necessary. If possible, have the buffers at the groundwater temperature.
3. Single-Buffer Calibration: Determine field pH of buffer solution, set meter to read the pH at the buffer temperature.]

Conductivity Meter Calibration Type Serial No. Date Initials

Conductivity Standard	Temperature (°C)	Meter Reading	Remarks

Meter Calibration ☐ Internal Standard ☐ Temperature Compensated

1. Internal Standard: Use manufacturer's instructions and check box above.
2. Wet Standardization: Measure conductivity of a standard solution that is within the range of the field groundwater sample conductivity. Adjust meter to read standard's conductivity.

Thermometer Calibration Type Date Initials

Lab Thermometer Reading to 0.1°C	Field Thermometer Reading to 0.1°C	Correction Factor: Lab - Field Temperature	Remarks

FIELD REPORT

Client:	Project No.	Well/Site ID
	Facility	Date (d.m.y)

Site Description

☐ Monitoring Well, ☐ Spring, ☐ Other:

Air Temp:	☐ °C ☐ °F	Weather:
Well Locked? ☐ Yes ☐ No	Damaged/Repairs Needed:	
☐ TOC ☐ MP	Description:	
TOC/MP Stickup: ☐ m ☐ ft above/below ground	Well Inside Diameter (ID): ☐ 2 inch ☐ 4 inch ☐ Other:	
Site Remarks (nearby wells pumping, tide, stream stage, etc.)		

Water Level Data Measurement Units: ☐ m, ☐ ft Previously recorded Well or Borehole Total Depth (mbtoc):

Stick-up height: Depth to Product (mbtoc):

☐ E-Tape, # ☐ Steel Tape ☐ Other	Water Level (mbtoc)	Total Depth (mbtoc)	HA (Available head) (TD – WL)	HA*6 (for 2 inch casing) Volume in Litres to purge	Well goes dry while purging?	Actual Volume purged?	Remarks
Time (hh:mm)							
Value in meters or Litres							

Measure water level from fixed measuring point (MP) or top of well casing (TOC). Record depth to the nearest 0.002 m or 0.01 ft, with minus (-) sign if level is above MP or TOC. If no mark on MP or TOC, measure depth highest point on casing. MP/TOC stickup measurement is from ground surface to nearest 0.01 m or 0.1 ft. Depth to water codes: N-not measured, D-dry, O-obstructed, P-pumping, F-flowing (artesian condition), R-recently pumped, C-cascading. Record free product presence at time of water level measurement, use: S-product sheen observed. If free product is removed from the well, record the volume removed in litres or gallons, list product type in Remarks@ column.

Field WQ Data

Purged and sampled well with: ☐ Grab, ☐ Waterra, ☐ Bailer, ☐ Pump Description:

pH/EC meter used:	Time Measured (hh:mm)	pH	Temp (°C)	EC (µS/cm)	DO (mg/L)	Redox Potential/Eh	Turbidity (NTU)	Colour/Tint and Odour	Remarks

Record equipment details and calibration methods, decontamination procedures, equipment failures, purge water disposal method, etc. in daily field notes. SC: Specific conductance corrected for temperature (µS/cm=µmho). 3.785 L = 0.833 Imp.gall. = 1 US gall.

Sample Data

Sample Depth: ☐ Grab, ☐ Waterra, ☐ Bailer, ☐ Pump Description:

Field Sample ID (unique ID on bottles)	Result Code	Date (d.m.y)	Time (hh:mm)	Bottles (total to lab)	Filtered (0.45µm)	Lab ID	Case ID	SDG ID	Remarks

Sample ID may be up to 15 characters. Sample Result Code, Date and Time must be entered. Result Codes: PO-Primary Sample, D#-Duplicate Sample, S#-Split sample (sent to second lab), FB#-Field Blank, EB#-Equipment Rinsate, TB#-Travel Blank, FS#-Field Spike. Lab ID is name of laboratory that will analyse the sample. Case ID and SDG ID (sample delivery group) are required for blanks. Case ID may be the lab service request number or yy-mm. SDG may be lab's SDG, a cooler ID number, or mmddyy. Enter sample preservation and handling data on chain-of-custody form. Also record detailed information about duplicate, split, rinsate, spike and/or blank sample collection/handling in daily field notes.

Sampled By (print)	Signature	Entered into Database __/__ /__ by___	Page __of __

APPENDIX E

Equipment Specifications

MiniRAE 2000

Portable Handheld VOC Monitor

The rugged **MiniRAE 2000** is the smallest pumped handheld volatile organic compound (VOC) monitor on the market. Its Photoionization Detector's (PID) extended range of 0-10,000 ppm makes it an ideal instrument for applications from environmental site surveying to HazMat/Homeland Security.

Key Features

Proven PID technology The patented 3D sensor provides a 3-second response up to 10,000 ppm and sets a new standard for resistance to moisture and dirt.

Self-cleaning lamp and sensor Our patented self-cleaning lamp and sensor minimize the need for maintenance and calibration.

The MiniRAE 2000 lamp and sensor can be taken apart in seconds for easy maintenance without any tools!

Measure more chemicals than with any other PID With over 100 Correction Factors built into the **MiniRAE 2000** memory and the largest printed list of Correction
Factors in the world (300+), RAE Systems offers the ability to accurately measure more ionizable chemicals than any other
PID. When a gas is selected from the MiniRAE 2000's library, the alarm points are automatically loaded into the meter.

User friendly screens make it easy to use for simple applications and flexible enough for sophisticated operations.

Drop-in battery When work schedules require putting in more than the 10 hours supplied by the standard NiMH battery, the drop-in alkaline pack supplied with every MiniRAE 2000 lets you finish the job.

Rugged Rubber Boot The standard rubber boot helps assure that the MiniRAE 2000 survives the bumps and knocks of tough field use.

Strong, built-in sample pump draws up to 100 feet (30m) horizontally or vertically.

Tough flexible inlet probe

Large keys operable with 3 layers of gloves.

Easy-to-read display with backlight.

Stores up to 267 hours of data at one minute intervals for downloading to PC (with the datalogging option).

3-year 10.6 eV lamp warranty

Applications

HazMat/Homeland Security

- Initial PPE (personal protective equipment) assessment
- Leak detection
- Perimeter establishment and maintenance
- Spill delineation
- Decontamination
- Remediation

Industrial Hygiene/Safety

- Confined Space Entry (CSE)
- Indoor Air Quality (IAQ)
- Worker exposure studies

Environmental

- Soil and water headspace analysis
- Leaking underground storage tanks
- Perimeter fenceline monitoring
- Fugitive emissions (EPA Method 21)
- Vapor recovery breakthrough
- Landfill monitoring

ATEX

ISO 9001 CERTIFIED

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Specifications*

Default Sensor Settings**

Gas Monitor (ppm)	Range (ppm)	Resolution Time (T_{90})	Response
VOCs	0 - 999 ppm	0.1 ppm	< 3 sec
	100 - 10,000 ppm	1 ppm	< 3 sec

Detector Specifications

Size	8.2"L x 3.0"W x 2.0"H (21.8 x 7.62 x 5.0 cm)
Weight	20 oz with battery pack (553g) w/o rubber boot
Sensor	Photoionization sensor with standard 10.6 eV or optional 9.8eV or 11.7 eV UV lamp
Battery	• Rechargeable, external, field replaceable Nickel-Metal-Hydride (NiMH) battery pack • Alkaline battery holder (for 4 AA batteries)
Operating Period	10 hours continuous operation
Display	Large LCD, backlight activated manually, with alarms or darkness
Keypad	1 operation and 2 programming keys
Direct Readout	• VOCs as ppm by volume • High and low values • STEL and TWA (in hygiene mode) • Battery and shut down voltage
Alarms	90 dB buzzer and flashing red LED to indicate exceeded preset limits • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Alarms automatic reset or latching with manual override • Optional plug-in pen size vibration alarm • User adjustable alarm limits
Calibration	Two point field calibration of zero and standard reference gas. Calibration memory of 8 calibration gases, alarm limits, span values and calibration date
Datalogging	Optional 267 hours (at one minute intervals) with date/time. Header information includes monitor serial number, user ID, site ID, date and time
Sampling Pump	• Internal, integrated flow rate 400 cc/min • Sample from 100' (30m) horizontally or vertically
Low Flow Alarm	Auto shut-off pump at low flow condition
Communication	Download data and upload instrument set-up from PC through RS-232 link to serial port
Temperature	14° to 104°F (-10° to 40°C)
Humidity	0% to 95% relative humidity (non-condensing)
EM/RFI	Highly resistant to EMI /RFI. Compliant with EMC Directive 89/336/EEC
IP-rating	IP-55: protected against dust, protected against low pressure jets of water from all directions
Hazardous Area Approval	• US and Canada: UL and cUL, Classified for use in Class I, Division 1, Groups A, B, C and D hazardous locations • Europe: ATEX II IG EEx ia IIC T4
Attachment	Durable bright yellow rubber boot w/belt clip & wrist strap
Warranty	Lifetime on non-consumable components (per RAE Systems Standard Warranty), 3 years for 10.6.V PID lamp, 1 year for pump and battery

* On going projects to enhance our products means that these specifications are subject to change

** Performance based on isobutylene calibration

MiniRAE 2000

MiniRAE 2000 and Accessories

Monitor only includes:

- 10.6eV, 9.8eV or 11.7eV as specified
- RAE Systems UV lamp: 10.6eV, 9.8eV or 11.7eV as specified
- 5-inch Flex-I-Probe
- External filter
- Rubber boot with belt clip
- Alkaline battery adapter
- Tool kit
- Lamp cleaning kit
- Nickel-Metal-Hydride battery
- 120/230 V AC/DC wall adapter (if specified)
- Operation and maintenance manual

Monitor with accessories kit adds:

- Hard transport case with pre-cut foam
- 5 porous metal filters and O-rings
- Organic vapor zeroing adapter
- Gas outlet port and tubing

Optional calibration kit adds:

- 10 ppm isobutylene calibration gas, 34L
- Calibration regulator and flow controller

Datalogging monitor adds:

- ProRAE Suite software package for Windows 98, NT, 2000 and XP
- Computer interface cable

Optional Guaranteed Cost of Ownership Program:

- 4-year repair and replacement guarantee
- Annual maintenance service

DISTRIBUTED BY:

Equipco
2100 Meridian Park Boulevard
Concord, CA 94520
Tel: 1-888-234-5678

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Tel: 852.2669.0828

rev12_ 04.05

YSI Environmental

New Features - Multiple language capabilities and graphing!

Pure Data for a Healthy Planet.™

A rugged, cost-effective Multiprobe System — designed for the field!

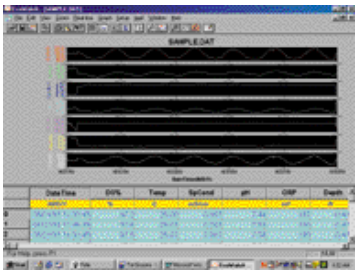
YSI 556 Multiprobe System

Versatile, multiparameter handheld instrument

Rugged and reliable, the YSI 556 MPS (Multiprobe System) combines the versatility of an easy-to-use, easy-to-read handheld unit with all the functionality of a multiparameter system.

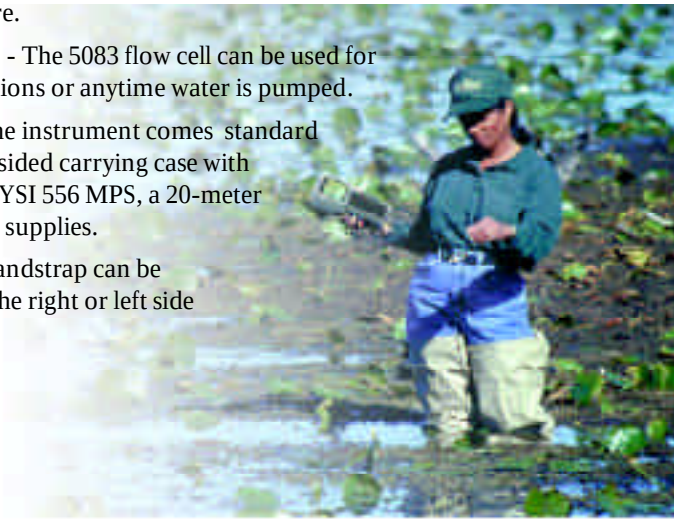
- Simultaneously measures dissolved oxygen, pH, conductivity, temperature, and ORP
- Field-replaceable electrodes
- Compatible with EcoWatch ® for Windows ® data analysis software
- Stores over 49,000 data sets, time and date stamped, interval or manual logging
- Three-year warranty on the instrument; one-year on the probes
- GLP assisting, records calibration data in memory
- Available with 4, 10, and 20 m cable lengths
- IP-67, impact-resistant, waterproof case
- Easy-to-use, screw-on cap DO membranes
- RS-232 interface for PC connection

Packed With Features!



EcoWatch® software screen shot

- Battery Options – The unit is powered by alkaline batteries or an optional rechargeable battery pack with quick-charge feature.
- Optional Barometer – Internal barometer can be user-calibrated and displayed along with other data, used in dissolved oxygen calibrations, and logged to memory for tracking changes in barometric pressure.
- Optional Flow Cell - The 5083 flow cell can be used for groundwater applications or anytime water is pumped.
- Carrying Case – The instrument comes standard with YSI 5061, a soft-sided carrying case with enough space for the YSI 556 MPS, a 20-meter cable, and calibrating supplies.
- Handstrap - The handstrap can be connected on either the right or left side of the instrument.



www.YSI.com

Pure Data for a Healthy Planet.™

To order or for more information, contact YSI Environmental.

800 897-4151

www.YSI.com

YSI Environmental
937 767 7241
Fax 937 767 9353
environmental@YSI.com

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508 748 0366
Fax 508 748 2543
environmental@YSI.com

YSI Environmental
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Fax 81 44 222 1102
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Fax 86 532 389 6647
china@YSI.com

ISO **9001**
ISO **14001**

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CE

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Who's Minding the Planet?™

YSI 5563 MPS Sensor Specifications

Dissolved Oxygen (% saturation)	Sensor Type	Steady state polarographic
	Range	0 to 500% air saturation
	Accuracy	0 to 200% air saturation, ± 2% of the reading or ±2% air saturation, whichever is greater; 200 to 500% air saturation, ± 6% of the reading
	Resolution	0.1% air saturation
Dissolved Oxygen (mg/L)	Sensor Type	Steady state polarographic
	Range	0 to 50 mg/L
	Accuracy	0 to 20 mg/L, ± 2% of the reading or ±0.2 mg/L, whichever is greater; 20 to 50 mg/L, ± 6% of the reading
	Resolution	0.01 mg/L
Temperature	Sensor Type	YSI Temperature Precision™ thermistor
	Range	-5 to 45°C
	Accuracy	± 0.15°C
	Resolution	0.1°C
Conductivity	Sensor Type	4-electrode cell with autoranging
	Range	0 to 200 mS/cm
	Accuracy	± 0.5% of reading or ± 0.001 mS/cm; whichever is greater (4 meter cable) ± 1.0% of reading or ± 0.001 mS/cm; whichever is greater (20 meter cable)
	Resolution	0.001 mS/cm to 0.1 mS/cm (range-dependent)
Salinity	Sensor Type	Calculated from conductivity and temperature
	Range	0 to 70 ppt
	Accuracy	± 1.0% of reading or ±0.1 ppt, whichever is greater
	Resolution	0.01 ppt
pH (optional)	Sensor Type	Glass combination electrode
	Range	0 to 14 units
	Accuracy	±0.2 units
	Resolution	0.01 units
ORP (optional)	Sensor Type	Platinum button
	Range	-999 to +999 mV
	Accuracy	± 20 mV
	Resolution	0.1 mV
Total Dissolved Solids (TDS)	Sensor Type	Calculated from conductivity (variable constant, default 0.65)
	Range	0 to 100 g/L
	Resolution	4 digits
Barometer (optional)	Range	500 to 800 mm Hg
	Accuracy	± 3 mm Hg within ± 15°C temperature range from calibration point
	Resolution	0.1 mm Hg

YSI 556 Instrument Specifications

Size	11.9 cm width x 22.9 cm lenth (4.7 in. x 9 in.)
Weight with batteries	2.1 lbs. (916 grams)
Power	4 alkaline C-cells; optional rechargeable pack
Cables	4, 10, and 20 m (13.1, 32.8, 65.6 ft.) lengths
Warranty	3-year for the instrument; 1-year for the probes and cable
Communication Port	RS-232 Serial
Data Logger	49,000 Data sets with date and time stamp, manual or logging, with user-selectable save rate

Order instrument, cable, and accessories separately.

556-01	Instrument (with 5061 large, soft-sided carrying case)
556-02	Instrument with barometer option
5563-4	4 m cable and DO/temp/conductivity
5563-10	10 m cable and DO/temp/conductivity
5563-20	20 m cable and DO/temp/conductivity
5564	pH Probe
5565	pH/ORP Probe
6118	Rechargeable battery pack kit (includes battery, adapter, charger)
614	Ultra clamp, C-clamp mount
616	Charger, cigarette lighter
4654	Tripod
5060	Small carrying case, soft-sided (fits instrument and 4 m cable)
5061	Large carrying case, soft-sided (comes with 556 standard)
5065	Form-fitted carrrier with shoulder strap
5080	Small carrying case, hard-sided (fits instrument and 4 m cable)
5083	Flow cell
5085	Hands-free harness
5094	Rechargeable battery pack kit, Europe
5095	Rechargeable battery pack kit, Australia
6081	Large carrying case, hard-sided (fits instrument and 20 m cable)
6075	EcoWatch® for Windows®

For more information on YSI's full line of products and services, as well as application notes, FAQs, troubleshooting, and more, check our information-packed website. Be sure to see the YSI 556 MPS feature page which outlines the advantages and benefits of this new technology at www.YSI.com/556MPS

Model 122

Interface Meter

Solinst Oil/Water Interface Meters give accurate measurements of product level and thickness in wells and tanks.

Determination of both floating non-aqueous liquids (LNAPL) and sinking non-aqueous liquids (DNAPL) is quick and easy. The factory-sealed probes are pressure proof and tapes are available in a range of lengths up to 1,500 ft. (450 m).

The 5/8" (16 mm) diameter P1 probe allows easy access through tight spaces and into narrow wells, making this the Interface Probe of choice for most applications. The 1.5" (38.1 mm) P2 probe has a glass cylinder covering the optics which is resistant to all chemicals. The extra weight of the P2 probe is useful on longer tape lengths and when DNAPL is being measured.

Hazardous Locations Use

The Model 122 Interface Meter has been approved by the Canadian Standards Association (CSA) for use in explosive environments. It is suitable for use in hazardous locations Class I, Groups C&D.

The grounding clip is a safety essential when the meter is used in potentially explosive environments. It also helps ensure that the electronics work properly.

Sturdy

- Designed for rugged field use
- Tape uses stranded stainless steel conductors:
  - non-stretch; does not corrode
  - resists kinking and breaks
  - easy to repair and splice
- Rugged free-standing reel with carrying handle

Model 122M

Mini Interface Meter

The Mini 122 is a convenient small version of the Solinst Interface Meter, small enough to fit in a backpack. A custom carrying bag is also available. The Mini is available in 65 ft. or 20 m length. The narrow 1/4" tape (6 mm) is accurately marked each 1/100 ft. or millimeter. Enhanced electronics allow operation for up to 300 hours of on-time, using one 9V battery.

High Quality Design

The state-of-the-art electronics includes automatic circuitry testing when the 'On' button is used; extended battery life; clear signals; and high accuracy.

Infra-red refraction is used to detect liquids and conductivity to distinguish water. Both optical and electronic sensors are precisely at the zero point.

A steady light and tone indicate product. Water is indicated by intermittent signals. The factory sealed probes do not need to be accessed by the user.

The sensors of the P1 probe are protected by an integral stainless steel shield, which allows easy cleaning.

The P2 probe has the infra-red emitter and detector protected behind a chemically resistant glass cylinder. Power is supplied by 2 standard 9V batteries, located in easy access drawers in the reel.

Advantages

- 5/8" (16 mm) diameter 122/P1 probe
- Easy access batteries: minimum 120 hours of life
- Sensor accuracy to 1/200 ft. or 1.0 mm.
- Clear signals
- Automatic shut off after 10 minutes
- Inexpensive, simple repairs
- Lengths from 65 - 1500 ft. (20 - 450 m)
- Carrying Bag and Tape Guide included

Model 122 & 122M are CSA approved for use in hazardous locations Class I, Groups C&D

CE

Operating Principles

To detect liquids, Solinst Interface Meters use an infra-red beam and detector. When the probe enters a liquid the beam is refracted away from the detector which activates an audible tone and light. If the liquid is a non-conductive oil/product the signals are steady. If the liquid is water, the conductivity of the water completes a conductivity circuit. This overrides the infra-red circuit, and the tone and light are intermittent.

Both sensors use exactly the same zero point, giving accuracy as good as 1/200 ft. or 1.0 mm. The circuits are powered by 2 standard 9V batteries which are housed in easy-access drawers on the faceplate of the reel.

Obtaining Product Measurements

To measure the thickness of a product layer, lower the probe into the well till the signals activate. If there is an oil/product layer on the top of the water, the light and tone will be steady, indicating an air/product interface.

Read the depth off the permanently marked tape. Then lower the probe further into the water, where the signals become intermittent, then pull back up and take a reading at the product/water interface.

The thickness of the product layer is then determined by subtracting the first reading from the second.

If there is only water in the well and no product, there will only be intermittent (water) signals.

The presence or absence of dense (sinking) non-aqueous layers (DNAPL) is determined by continuing to lower the probe to the bottom of the well.

If the steady tone and light return, this indicates a non-conductive liquid. Measure the depth and continue lowering the probe till the probe touches bottom and the tape goes slack. Record that depth. The thickness of the DNAPL layer is determined by subtracting the first reading from the second.

Probes

P1 & P2 probes are interchangeable when necessary.

122/P1 Narrow Diameter: 5/8" diameter (16 mm) stainless steel. The beam is emitted from within a cone-shaped tip made from rigid polyurethane. The tip is protected by an integral stainless steel shield. This probe is excellent for the vast majority of product monitoring situations.

122/P2 Probe: 1.5" diameter (38.1 mm) stainless steel with Teflon® filled Delrin® tip. The infra-red emitter and detector are protected by glass, which is resistant to all chemicals. Consider this probe for deep applications and in the occasional situation where there is difficulty reading product with the P1 probe.

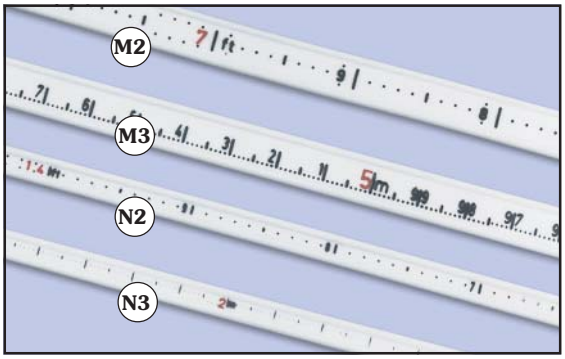
122M Probe: 5/8" diameter (16 mm) stainless steel. Similar to the P1 but shorter.

Tape

The easy-to-read markings on the tape are permanently heat-stamped into the tape. The dog bone shaped tape avoids adherance to wet surfaces in wells. It is resistant to most chemicals, and the smooth surface of the tape is easy to decontaminate.

The following marking options are available:

M2 & N2 Each 1/100 ft. in black; feet in red.
M3 & N3 Each mm in black; metres in red.



Standard Equipment

Each meter has a grounding clip, a convenient carrying bag with shoulder strap, and a tape guide/datum.

The tape guide may be used to provide support for the reel on the well casing. It acts as a datum allowing repeatably accurate measurements; ensures that the probe hangs in the centre of the well; and protects the tape from damage.

For further information, please contact: Solinst Canada Ltd.
35 Todd Road, Georgetown, ON, Canada L7G 4R8 *E-mail: instruments@solinst.com*
TEL: +1 (905) 873-2255 or (800) 661-2023 FAX: +1 (905) 873-1992 or (800) 516-9081 Web: www.solinst.com

STAINLESS STEEL BAILERS & EXTENSION CLASS (05)

Part Number	Description
BSS.50X12	Stainless steel threaded bailer, .500 O.D. x 12" long
BSS.50X24	Stainless steel threaded bailer, .500 O.D. x 24" long
BSS.50X36	Stainless steel threaded bailer, .500 O.D. x 36" long
BSS1.05X12	Stainless steel threaded bailer, 1.050 O.D. x 12" long
BSS1.05X24	Stainless steel threaded bailer, 1.050 O.D. x 24" long
BSS1.05X36	Stainless steel threaded bailer, 1.050 O.D. x 36" long
BSS1.66X12	Stainless steel threaded bailer, 1.660 O.D. x 12" long
BSS1.66X24	Stainless steel threaded bailer, 1.660 O.D. x 24" long
BSS1.66X36	Stainless steel threaded bailer, 1.660 O.D. x 36" long
BSS3.50X12	Stainless steel threaded bailer, 3.500 O.D. x 12" long
BSS3.50X24	Stainless steel threaded bailer, 3.500 O.D. x 24" long
BSS3.50X36	Stainless steel threaded bailer, 3.500 O.D. x 36" long
BXSS1.66X _ _	Stainless steel threaded bailer extension 1.660 O.D. x 12", 24" or 36" long.

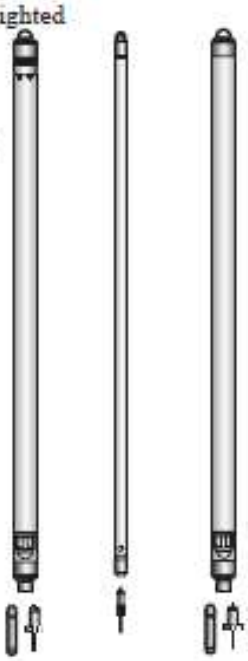
All stainless steel bailers have PTFE (Polytetrafluoroethylene) seats, Viton O-rings and stainless steel check balls and bodies; except, .50 bailers have stainless steel seats.

Note: Call for price and availability for bailer extensions. Other sizes available.

POLYETHYLENE DISPOSABLE BAILERS CLASS (05)

Part Number	Description
BPES1.5X36	HDPE disposable bailer, 1.500 O.D. x 36" long, non-weighted
BPEDW1.5X36	HDPE disposable bailer, 1.500 O.D. x 36" long, weighted
BPES.75X36	HDPE disposable bailer, .750 O.D. x 36" long, non-weighted

Note: 25 pieces per box on all sizes. 20 boxes per pallet on 1.5" sizes.
These bailers are assembled by sonic welding.
Other lengths are available, call for availability and pricing.



Monoflex high density polyethylene disposable bailers for all your sampling needs. Fully assembled and ready for use. So unique that these bailers are patented. (Patent #5,597,966)

1.5" X 36" Bailers

- Weighted bailers contain stainless steel washers
- Unique flexible PVC torpedo ball provides excellent seal
- Heavy duty bailer hook facilitates rope attachment
- 1/2" I.D. Quick empting device provided with each bailer
- VOC Slow emptying device provided with each bailer
- Individually hermetically sealed in polyethylene bags
- 1000 ml Capacity

.75" X 36" Bailers

- Heavy duty bailer hook facilitates rope attachment
- VOC Slow emptying device provided with each bailer
- Individually hermetically sealed in polyethylene bags
- 220 ml Capacity

PRINT THIS PAGE

TOUCH N TUFF® - NITRILE

SMOOTH FINGERTIPS

- Contains absolutely no fillers, silicones or plasticizers
- Provide three times the puncture resistance of competitive latex or vinyl gloves
- Smooth fingertips for exceptional grip
- Durable yet soft for improved comfort

APPLICATIONS

- Manufacturing
- Maintenance and cleanup
- Intricate parts handling
- Laboratory analysis/technical work
- HazMat

Style	Description	Size	CFIA*
92-500	Powdered, 5 mils, rolled cuff, teal, 100 gloves/dispenser box	7, 8, 9, 10	X
92-600	Powder-free, 5 mils, rolled cuff, teal, 100 gloves/dispenser box	7, 8, 9, 10	X

**CFIA : Canadian Food Inspection Agency*

<< BACK

ALCONOX

Critical-cleaning detergents for laboratory, healthcare and industrial applications

30 Glenn Street
White Plains NY 10603 USA
Tel.914.948.4040
Fax.914.948.4088

24 Hour Emergency Number (CHEM-TEL) (800) 255-3924 in U.S.

(e-mail) cleaning@alconox.com

(URL) http://www.alconox.com
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- **free samples**
- **new developments**

Alconox®

Powdered Precision Cleaner

- Concentrated to save you money
- Biodegradable and readily disposable
- Penetrating wetting power to save you time
- Replaces corrosive acids and hazardous solvents
- Free rinsing to give you reliable results and no interfering residues
- Use to pass your cleaning validation tests for lab accreditation and plant inspection approval

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-in-place. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Convenient Sizes:	Alconox Cat. #
Case 9 x 4 lb. Boxes	1104
25 lb. Carton	1125
50 lb. Carton	1150
100 lb. Drum	1101
300 lb. Drum	1103
Case 12 Box 50 x 1/2 oz.	1112
1 lb. makes 13 gal. cleaning solution	

Alconox is available from leading laboratory, hospital, clinical and industrial suppliers. To find a distributor for Alconox, Inc. detergents, visit “Find Dealer” at the website. To request FREE samples visit our Sample Request at www.alcnox.com, write or call Alconox, Inc. today.

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ALCONOX

Critical-cleaning detergents for laboratory, healthcare and industrial applications

30 Glenn Street
White Plains NY 10603 USA
Tel.914.948.4040
Fax.914.948.4088

24 Hour Emergency Number (CHEM-TEL) (800) 255-3924 in U.S.

(e-mail) cleaning@alconox.com

(URL) http://www.alconox.com
- **distributors**
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- **free samples**
- **new developments**

PHYSICAL DATA	TYPICAL VALUE
pH of 1% solution	9.5
Flash Point (degrees F)	None
Phosphate Content (as Phosphorus)	7.3%
Organic Carbon (% calculated w/w)	11%
Fragrance Content	0%
Surface Tension 1% Sol'n (Dyne/cm)	32
Percent active ingredients	100%

Color: White and cream colored flakes
Form: Powder
Solubility in Water: To 10% (w/w) at ambient temperature
Hard Water Effectiveness: Highly Effective
Biodegradability: Biodegradable
Foam Tendency: High Foaming
Shelf Life: Two years from the date of manufacture

Chemical Description

Alconox consists primarily of a homogeneous blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, carbonates. Alconox is anionic in nature.

Cleaning Validation Methods:

Test a parameter of rinse water before and after rinsing the cleaned surface. No significant change in the parameter indicates no detectable residue. Parameters measured include: pH, conductivity, UV, TOC, HPLC, sodium concentration, phosphorus concentration, anionic surfactant concentration using inexpensive detergent water testing kits, surface tension, and surface analysis. Pharmaceutical Cleaning Validation references are available in the tech info section of www.alconox.com.

Health Safety Information:

OSHA Hazardous Ingredients: None
RCRA Hazard Class: Non-hazardous
Flammability: Non-flammable
Latex Content: None in detergent, packaging materials or adhesives.
Oral Toxicity: LD_{50} > 5000 mg/kg oral rat
No ingredient defined as an oral toxicant by OSHA
Eye Irritation: Mild to Moderate eye irritant if not rinsed
Inhalation Toxicity: Non-irritating solution, powder a potential irritant
VOC Content: 0%
Carcinogenicity:
NTP = No **IARC** = No **OSHA** = No
All ingredients in Alconox are listed in TSCA inventory.USDA NSF cat A1

Precautions:

No special precautions other than good industrial hygiene and safety practices employed with any industrial chemical (see Directions). A Material Safety Data Sheet is available at www.alconox.com or by calling fax-on-demand at 914-948-4040 and following the prompts. Use fax document # 0311.

Contact Alconox, Inc. for purchase specifications. Typical data is not a specification.

APPENDIX F

Laboratory Sample Preservation Requirements and Sample Hold Times

Analysis	Container†	Preservative*	Maximum Holding Time
BOD_5	1 L Polyethylene	Maintain at 4°C, no head space	48 hours
Fecal Coliforms	300 mL Sterile Plastic	Sodium thiosulfate (?) and maintain at 4°C	48 hours
pH	1 L Polyethylene	None	24 days
Conductivity	1 L Polyethylene	None	28 days
Total Suspended Solids	1 L Polyethylene	None	7 days
Ammonia Nitrogen	100 mL Glass	Sulphuric acid	28 days
Nitrate-Nitrite	1 L Polyethylene	Maintain at 4°C	48 hours
Oil and Grease	1 L Glass	Hydrochloric acid	28 days
Total Phenols	1 L Glass	Sulphuric Acid	28 days
Total Alkalinity	1 L Polyethylene	Maintain at 4°C	7 days
Total Hardness	1 L Polyethylene	None	28 days
Ca, Mg, K, Na, SO_4^2	125 mL Polyethylene	None	6 months
Total As, Cd, Cu, Cr, Fe, Pb, Hg, Ni	125 mL Polyethylene	None	6 months 28 days for Hg

† **Laboratory Requirements May Vary**

*** Supplied by Laboratory**

APPENDIX G

Laboratory Chain of Custody Forms

CADUCEON™
ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

TESTING REQUIREMENTS

- ☐ O.Reg 153/04 (1___ 2___ 3___ 4___ 5___ 6___)
- ☐ MISA Guidelines
- ☐ Provincial Water Quality Objectives
- ☐ Sewer Use By-Law: _____
- ☐ Other: _____
- ☐ ODWS (Non Regulatory)
- ☐ O.Reg 558 Leachate Analysis
- Disposal Site: _____
- ☐ Landfill Monitoring

REPORT NUMBER (Lab Use)

Organization:	Address and Invoicing Address (if different)	
Contact:		
Tel:		
Fax:	Quote No.:	Project Name:
Email:	P.O. No.:	Additional Info:

ANALYSES REQUESTED (Print Test in Boxes)

TURNAROUND TIME REQUESTED

- ☐ Rush 24 Hr 100% Surcharge
- ☐ Rush 48 Hr 50 % Surcharge
- ☐ Rush 72 Hr 25% Surcharge
- ☐ 5-7 Day Standard
- ☐ Specific Date: _____

* Sample Matrix Legend: WW=Waste Water SW=Surface Water GW=Groundwater LS=Liquid Sludge SS=Solid Sludge S=Soil Sed=Sediment PC=Paint Chips F=Filter

Lab No:	Sample Identification	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Indicate Test For Each Sample By Using A Check Mark In The Box Provided	Field pH	Field Temp.	# Bottles/ Sample	Field Filtered(Y/N)

Are any samples listed above intended for Human Consumption? ☐ Yes ☐ No (If yes, submit all drinking water samples on a drinking water Chain of Custody)

SAMPLE SUBMISSION INFORMATION	SHIPPING INFORMATION		REPORTING / INVOICING	SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)
Sampled By (print):	☐ Courier (Client account)	Invoice for Shipping ☐	☐ Report by Fax	Received By (print): Signature:
Submitted By (print):	☐ Courier (Caduceon account)		☐ Report by Email	Date Received (yy-mm-dd): Time Received:
Signature:	☐ Drop Off	# of Pieces	☐ Invoice by Email	Laboratory Prepared Bottles: ☐ Yes ☐ No
Date(yy-mm-dd): Time:	☐ Caduceon (Pick-up)		☐ Invoice by Mail	Sample Temperature °C: Labeled by:

Laboratory Locations/Shipping Addresses
Kingston Lab - 285 Dalton Ave., Kingston, ON K7K 6Z1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs.com
Ottawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.com
Peterborough Lab - #206-160 Charlotte St., Peterborough, ON K9J 2T8, Tel: (705) 748-1506 Fax: (705) 748-6514 Email: contactpeterborough@caduceonlabs.com
Windsor Lab - #5-3201 Marentette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-9541 Fax: (519) 966-9567 Email: contactwindsor@caduceonlabs.com
Moncton Lab - 150 Lutz St., Moncton, NB E1C 5E9, Tel: (506) 855-6472 Fax: (506) 855-8294 Email: contactmoncton@caduceonlabs.com

Comments:

White: Lab Copy / Yellow: Invoicing Copy / Pink: Client Copy

CofC., Sep 2009, Revision No: 11

APPENDIX H

MSDS Sheets

ALCONOX MSDS

Section 1: PRODUCT INFORMATION

Chemical family: Detergent.

Product name: Alconox

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Supplier: Same as manufacturer.

TDG classification: Not regulated.

WHMIS classification: D2B

DSL status: The supplier has certified that all substances in this product appear on the domestic substances list.

Supplier MSDS date: 2009/04/20

Section 2: HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE

7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A: ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).
CAS# 497-19-8: LD50 4020 mg/kg - rat oral.
CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3: PHYSICAL DATA

Physical state: Solid

Appearance & odor: Almost odourless.
White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): Not applicable.

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).
9.5

Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil dist.: Not available.

VOC: None

Section 4: FIRE & EXPLOSION DATA

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.

Auto-ignition temperature:	Not available.
Flash point (°C), method:	None
Lower flammability limit (% vol):	Not applicable.
Upper flammability limit (% vol):	Not applicable.
Explosion Data	
Sensitivity to static discharge:	Not available.
Sensitivity to mechanical impact:	Not applicable.
Hazardous combustion products:	Oxides of carbon (COx). Hydrocarbons.
Explosive power:	None

Section 5: REACTIVITY DATA

Chemical stability:	Stable under normal conditions.
Conditions of instability:	None known.
Hazardous polymerization:	Will not occur.
Incompatible substances:	Strong acids. Strong oxidizers.
Hazardous decomposition products:	See hazardous combustion products.

Section 6: TOXICOLOGICAL PROPERTIES

Route of entry:	Skin contact, eye contact, inhalation and ingestion.
Effects of acute exposure	
Eye contact:	May cause irritation.
Skin contact:	Prolonged contact may cause irritation.
Inhalation:	Airborne particles may cause irritation.
Ingestion:	May cause vomiting and diarrhea. May cause abdominal pain. May cause gastric distress.
Effects of chronic exposure:	Contains an ingredient which may be corrosive.
LD50 of product, species & route:	> 5000 mg/kg rat oral.
LC50 of product, species & route:	Not available for mixture, see the ingredients section.
Exposure limit of material:	Not available for mixture, see the ingredients section.
Sensitization to product:	Not available.
Carcinogenic effects:	Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

Section 7: PREVENTATIVE MEASURES

Precautionary Measures

Gloves / Type:

Neoprene or rubber gloves.

Respiratory / Type:

If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye / Type:

Safety glasses with side-shields.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash capability should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Leak / Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

TDG classification: Not regulated.

Special shipping information: Not regulated.

Section 8: FIRST AID MEASURES

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.
Do not induce vomiting, seek immediate medical attention.

Additional information: The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. This company shall not be held liable for any inaccuracies.

Section 9: ADDITIONAL INFORMATION

General note: This material safety data sheet was prepared from information obtained from various sources, including product suppliers and the Canadian Center for Occupational Health and Safety.

APPENDIX I

Cape Dorset Spill Contingency Plan

(TO BE SUPPLIED and ADDED)