NUNAMI

STANTEC LIMITED

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January 27, 2010

License Administrator
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0

Re: Operations & Maintenance Manual for Water, Sewage and Solid Waste Facilities at Coral Harbour, NU

On behalf of the Hamlet of Coral Harbour, please find enclosed an Operations and Maintenance (O&M) Manual for water, sewage and solid waste facilities to satisfy Item 1 Part F of the their Municipal Water License 3BM-COR0813.

One hard copy of these documents is provided in addition a digital copy on the enclosed compact disc.

Should you have any questions or comments, please do not hesitate to contact us. Please address any correspondence related to this application to the undersigned.

Yours truly,

NUNAMI STANTEC LIMITED

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Jeff Hunter, Project Officer, Community and Government Services, Government of Nunavut

Water, Sewage and Solid Waste Operations & Maintenance Manual

CORAL HARBOUR, NU

FINAL

Prepared for:
Government of Nunavut Department of Community and Government Services
Rankin Inlet, NU

Prepared by:
Nunami Jacques Whitford Limited
Rankin Inlet, NU

January 2010

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Executive Summary

This Operation and Maintenance (O&M) manual has been developed for use at the water distribution, sewage disposal, and solid waste facilities in the Hamlet of Coral Harbour, Nunavut. The purpose of the O&M manual is to establish and describe standard operating and maintenance procedures for proper management of resources and equipment used in water distribution, sewage disposal and solid waste management at Coral Harbour. Proper operation and maintenance of these municipal facilities will support:

- effective treatment and management of water, sewage and solid wastes;
- successful implementation of the monitoring and sampling program;
- long-term performance of equipment and engineered structures;
- compliance with the Hamlet of Coral Harbour's Water License; and,
- appropriate emergency response implementation.

The O&M Manual has been separated into two volumes. Volume I provides current operations and maintenance procedures and is divided into four main sections. These include:

1. Water Distribution System Operations & Maintenance;
2. Sewage Disposal Facility Operations & Maintenance;
3. Solid Waste Disposal Facilities Operations & Maintenance; and,
4. Emergency Response (includes a Spill Contingency Plan)

Volume II of the O&M Manual contains all original manufacturer brochures for the pumphouse and standby power facility of the Water Distribution System. These manufacturer brochures may be referred to for specific operations, maintenance or equipment information for the pumphouse and standby power facility only.

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Abbreviations

BTEX ..... Benzene, Toluene, Ethylbenzene, Xylene
GN-CGS .....Government of Nunavut Department of Community & Government Services
GN-ENV.....Government of Nunavut Department of Environment
Hamlet ..... Hamlet of Coral Harbour
HHW .....Household Hazardous Waste
Hz .....Hertz
m^3 ..... cubic metres
MSW .....Municipal Solid Waste
NWB .....Nunavut Water Board
O&M.....Operation and Maintenance
PAH .....Polycyclic Aromatic Hydrocarbons
SAO .....Senior Administrative Officer
TPH.....Total Petroleum Hydrocarbons
TSS..... Total Suspended Solids
V .....Volts

1 Introduction

1.1 Purpose

This Operation and Maintenance (O&M) manual has been developed for use at the water distribution, sewage disposal, and solid waste facilities in the Hamlet of Coral Harbour, Nunavut. The purpose of the O&M manual is to establish and describe standard operating and maintenance procedures for proper management of resources and equipment used in water distribution, sewage disposal and solid waste management in Coral Harbour. Proper operation and maintenance of these municipal facilities will support:

- effective treatment and management of water, sewage and solid wastes;
- successful implementation of the monitoring and sampling program;
- long-term performance of equipment and engineered structures;
- compliance with the Hamlet of Coral Harbour's Water License; and,
- appropriate emergency response implementation.

Preparation and execution of this O&M manual satisfies Item 1 of Part F of the Hamlet of Coral Harbour's Water License (No. 3BM-COR0813), issued by the Nunavut Water Board (NWB) on April 2, 2008. The Water License is included in **Appendix A** of this O&M manual.

This O&M manual has been developed using the following guidelines or regulations:

- *Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories* (Duong and Kent 1996)
- *Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories* (Kent *et. al.* 2003)
- Nunavut guidelines for *Municipal Solid Wastes Suitable for Open Burning* (GN-ENV ____)
- *Environmental Guidelines for General Management of Hazardous Waste in Nunavut* (GN-ENV 2002)
- *Contingency Planning and Spill Reporting in Nunavut: A Guide to the New Regulations* (GN-ENV ____)
- Operations and Maintenance Manual for the Coral Harbour Water Supply: Volume I Pumphouse and Volume II Standby Power Facility (W.L. Wardrop & Associates 1985)
- Additional information on water, sewage and solid waste systems in Coral Harbour has been obtained through the Government of Nunavut Department of Community and Government Services (GN-CGS), Nunami Jacques Whitford Limited Coral Harbour project files, and interviews with key GN-CGS and Hamlet personnel.

1.2 Site Description

The Hamlet of Coral Harbour is situated on the west shore of Coral Harbour, located in South Bay on the southern shores of Southampton Island, Nunavut (approximately 64° 8' 18" N, 83° 9' 56" W). The community is located approximately 466 km northeast of Rankin Inlet, NU (see Figure 1 inset in **Appendix B**).

Coral Harbour is located within the Southern Arctic ecozone on the Southampton Island Plain ecoregion (EC 2005). Average annual air temperature at the Hamlet is approximately -11.6°C (EC 2009). July is the warmest month in Coral Harbour with an average temperature of 9.3°C, while January and February are the coldest months with average temperatures of -30°C (EC 2009). Mean annual precipitation on the Southampton Island Plain ranges between 200 – 300 mm (EC 2005) and Coral Harbour receives the most precipitation during August with an average of 51.3 mm (EC 2009).

The Hamlet is situated within the zone of continuous permafrost in the Canadian Shield. Tundra vegetation overlies bedrock, which is mainly Paleozoic marine limestone. There are gravel and fine deposits in low-lying areas, scattered boulders, muskeg and exposed rocks, often in the form of ridges a few meters to a hundred meters or more in length and usually oriented north-south. The area is characterized by low relief and many shallow surface water bodies.

The Hamlet provides trucked services for water delivery and sewage collection. Drinking water is obtained from the Post River, stored in a reservoir, and distributed to water trucks via the pumphouse truck fill. Sewage and wastewater are treated in a bermed detention cell which discharges into a natural tundra wetland, draining east and southeast eventually reaching the marine environment of Hudson Bay. Domestic waste is collected five days a week (Monday through Friday) by the Hamlet and disposed of at the municipal solid waste facility. Locations of the water distribution, sewage disposal, and solid waste disposal facilities are shown on Figures 2 through 4 in **Appendix B**.

The 2006 Canadian Census estimated the population of Coral Harbour at 769 (Nunavut Bureau of Statistics 2008). Table 1-1 illustrates population projections for the Hamlet of Coral Harbour for a 20 year period, based on an annual increase of 2.45%, as projected by the Nunavut Bureau of Statistics.

Table 1-1 Population Projection at Coral Harbour, Nunavut – 2007 to 2025

Year	Population
2007	808
2012	912
2017	1,030
2022	1,162
2025	1,312

2 Background

2.1 Water Distribution System

The Coral Harbour water distribution system consists of a water intake, overland pipeline, reservoir, and pumphouse with truckfill. Potable water is obtained from the Post River approximately 1.4 km west of the community. The water intake is situated approximately 20 m offshore (FSC 2002). A pump shack is located near the shore of the Post River and houses the water pump and a diesel fuel tank.

Water is piped via an overland pipeline from the Post River into a reservoir. The pipeline was constructed in the late 1970s (Saviakjuk *pers. comm.*), just prior to construction of the reservoir in 1982. Modifications were made to the original 1979 design of the pumphouse and it was not constructed until 1986. The pumphouse has since been used for truck fill and chlorination of potable water. Components of the water distribution facility are illustrated in Figure 2 in **Appendix B**.

The reservoir is located approximately 350 m north of the community and was constructed by blasting bedrock to a depth of approximately 2.7 m. The reservoir was constructed in 1980 and is unlined; it was expanded in the 1990's and now consists of two dependent cells (FSC 2002). Reservoir capacity is approximately 40,000 cubic meters (m^3).

The Hamlet uses trucked services for daily water delivery to all houses and other buildings. Water trucks obtain water from the reservoir via two submersible intake pumps, which pump through the pumphouse. The pumphouse accommodates the water intake system, truck fill system, chlorination system and associated heating, electrical, and alarm systems. Annual water consumption volumes were estimated by Nunami (2007); these are displayed in Table 2-1 in Section 2.2 for the period 2007 to 2027, along with annual wastewater volumes.

2.2 Sewage Disposal Facility

The sewage disposal facility at Coral Harbour consists of a fenced and bermed detention cell and natural tundra wetland. Sewage is collected from the Hamlet's houses and other buildings by vacuum truck and discharged into the detention cell located approximately 3 km north of the community. The detention cell was constructed in 2003 and has an estimated capacity of 41,200 m^3 (170 m by 155 m by 1.7 m depth, allowing for reduced capacity due to inside sloping of berms). The detention cell is equipped with an outflow valve and was originally designed to act as a storage lagoon with an annual discharge however the berms were discovered to not be impervious and allowed effluent to seep through. Effluent leaving the detention cell flows through a natural tundra wetland, consisting of boggy areas and a series of wetland ponds which provide sewage treatment. The tundra wetland eventually flows into a large freshwater lake, approximately 580 m east from the detention cell; see Figure 3 in **Appendix B** for an illustration of the sewage disposal facility.

In 2008, three flow diversion berms were constructed within the tundra wetland to divert flow to the east, away from the community, during periods of high flow (i.e. spring freshet). Construction of these berms was part of a program to enhance the tundra wetland and ensure it met conditions set in the Hamlet's water license. With these enhancements, the sewage disposal facility, comprised of the detention cell and tundra wetland, will effectively treat the community's wastewater for a 20-year period in compliance with applicable legislation. Signs advising the public of the treatment area were also erected.

For information purposes, projected sewage generation rates for the period between 2007 and 2027 are provided in Table 2-1 (Nunami 2007). Sewage volumes are anticipated to be equal to water consumption volumes. The annual sewage generation is projected, based on a per capita water consumption rate of

100 Liters per capita per day (L/c/d.). The volume of sewage produced during a ten-month period each year is also included in the table.

Table 2-1 Sewage Generation Projections at Coral Harbour, Nunavut – 2007 to 2027 (from Nunami 2007)

Year	Population	Annual Water Consumption (m^3)	Annual Sewage Volume (m^3)	10-Month Sewage Volume (m^3)
2007	808	29,492	29,492	24,240
2008	828	30,215	30,215	24,834
2009	848	30,955	30,955	25,442
2010	869	31,713	31,713	26,066
2011	890	32,490	32,490	26,704
2012	912	33,286	33,286	27,359
2013	934	34,102	34,102	28,029
2014	957	34,937	34,937	28,715
2015	981	35,793	35,793	29,419
2016	1,005	36,670	36,670	30,140
2017	1,030	37,568	37,568	30,878
2018	1,054	38,489	38,489	31,635
2019	1,080	39,432	39,432	32,410
2020	1,107	40,398	40,398	33,204
2021	1,134	41,388	41,388	34,017
2022	1,162	42,402	42,402	34,851
2023	1,190	43,441	43,441	35,705
2024	1,219	44,505	44,505	36,579
2025	1,249	45,595	45,595	37,476
2026	1,280	46,712	46,712	38,394
2027	1,312	47,857	47,857	39,334

2.3 Solid Waste Disposal Facilities

Coral Harbour's primary solid waste disposal facility consists of a fenced and bermed disposal area for municipal solid waste (MSW) and a separate bulk metal disposal area immediately south of the bermed area. A second disposal facility is located at the airport and is primarily used to dispose of animal hides and carcasses; Figure 4 in **Appendix B** illustrates components of Coral Harbour's MSW disposal facility.

The Hamlet collects waste from community buildings five times per week with a compactor truck and transports the waste to the MSW disposal facility, located 2.5 km northeast of the community. The MSW disposal facility covers an area approximately 7,300 m^2 and is situated adjacent to (south of) the sewage disposal facility and tundra wetland. Two small ponds are located within the bermed MSW disposal area and several small ponds lie within 100 m of the facility. The MSW disposal facility is unlined and a culvert is located within the east berm of the facility allowing water to drain to the tundra wetland. Monthly open burning of MSW is practiced within the MSW disposal facility. The annual amount of solid waste generated by the community was projected from 2007 to 2027; projected solid waste volumes and total amount of cover material required are provided in Table 2-2.

Table 2-2 Solid Waste Generation Projections at Coral Harbour, Nunavut – 2007 – 2027

Year	Population	Annual Solid Waste Volume (m^3)	Annual Volume of Cover Material Required (m^3)
2007	808	4,129	2,064
2008	828	4,230	2,115
2009	848	4,334	2,167
2010	869	4,440	2,220
2011	890	4,549	2,274
2012	912	4,660	2,330
2013	934	4,774	2,387
2014	957	4,891	2,446
2015	981	5,011	2,506
2016	1,005	5,134	2,567
2017	1,030	5,260	2,630
2018	1,054	5,388	2,694
2019	1,080	5,520	2,760
2020	1,107	5,656	2,828
2021	1,134	5,794	2,897
2022	1,162	5,936	2,968
2023	1,190	6082	3,041
2024	1,219	6,231	3,115
2025	1,249	6,383	3,192
2026	1,280	6,540	3,270
2027	1,312	6,700	3,350
		Sub-Total	55,821
		Total Cover Material Required	11,164
		Total Volume	66,985

Some metal waste is stored within the bermed MSW disposal area however most large metal wastes are disposed of at the bulk metal disposal area, situated approximately 175 m south of the MSW disposal facility. The bulk metal waste disposal area is not fenced or bermed and is used by the community to dispose of items such as automobiles, heavy equipment, appliances, old fuel tanks, and other bulky metal wastes.

Currently the little is done for hazardous waste management at the MSW disposal facility. This needs to be improved upon to ensure risks to human health and the environment are minimised and the terms of the Hamlet's water license are met. Presently, waste oil is stored in drums at the Hamlet Garage; the Hamlet plans to get a waste oil burner installed at the Garage in 2010. Waste batteries, paint, antifreeze and other hazardous wastes are typically stored at the MSW disposal facility, though little segregation from regular MSW occurs.

A second waste disposal area is used by the community to dispose of animal hides and carcasses from commercial hunts. As there is currently a moratorium on commercial hunting, this carcass disposal area has not been used for a few years. It is maintained by the Hamlet who covers it on an annual basis.

3 Water Distribution System Operations & Maintenance

3.1 Equipment

The following equipment is used to operate and maintain the water distribution system at Coral Harbour.

- Post River to Reservoir:
  - Intake pipe with screen submerged in the Post River, located approximately 20 m offshore (FSC 2002)
  - Skid-mounted portable diesel intake pump and diesel fuel tank, located in the pumpshack at the Post River
  - 152 mm (6 inches) diameter overland ABS pipeline, approximately 1500 m (1.5 km) long
- Reservoir to Pumphouse:
  - Two Grundfos® SP 45-2 submersible pumps (P-1 and P-2) with flow range from 39 to 66 m^3 per hour, each enclosed in separate 250 mm diameter series 45 HDPE pump casings
    - Pump casings overlain by 75 mm thick polyurethane insulation and 4.6 mm thick HDPE outer sheath
    - Outer diameter of pump casing assemblies is 403 mm
  - 100 mm series 100 HDPE water discharge pipes (intake pipes) connected to the submersible pumps; intake pipes enclosed within each HDPE pump casing assembly
    - 22 mm diameter CTS series 160 HDPE heat trace carrier pipe encloses two Chemelex self-limiting heat trace cables; heat trace carrier pipe assembly is mounted on the intake pipes, inside each pump casing assembly
    - Pump casing lengths from submerged end to flange face inside pumphouse is 79.5 m
- Pumphouse:
  - 100 mm diameter HDPE pumphouse water line with various Vitaulic® couplings, elbows and valves, and a heat trace system
  - 100 mm diameter Tech-Taylor™ three-way valve (Model No. T2-4), connecting the two 100 mm intake pipes to the 100 mm pumphouse water line
  - Intake pipes heat trace controllers and associated power receptacles (2)
  - 114 L chlorine chemical mixing tank with Wallace and Tiernan® 1/20 hp mixer mounted above mixing tank
  - 114 L chlorine chemical solution feed tank
  - Wallace and Tiernan® hypochlorinator (model series 94), connected to the 100 mm pumphouse water line via a 6 mm ID Tygon® chemical feed line and a Wallace and Tiernan® chlorine solution injection fitting (model U-21846)
  - 100 mm diameter insulated truck fill line, exiting the pumphouse wall

        - 100 mm truck fill line terminates at a 0.7 – 1.4 m long wire reinforced flexible rubber hose
        - Truck fill line is heat traced
- Water trucks:
    - The first with 8172 L capacity, and
    - The second with 5000 L capacity.
- Standby Power Facility:
    - Lima SER 208 volts (V) generator (25 kilowatt, 3 phase) to supply electrical power to the pumphouse in the event of a utility power supply failure or outage
    - Lister HR3 diesel engine to drive the electric generator
        - 946 L (250 gal.) diesel fuel tank and fuel filter provide fuel to the diesel engine
    - Electrical distribution system to monitor power supply and transfer power supply in the event of a utility power failure; components include an electrical meter, main breaker, splitter box, electrical panels (2), and transfer switch, with a relays and several timers
    - Ventilation system to provide appropriate air flow to the standby power facility; components include an exhaust fan, louvers, dampers and damper motor, and a thermostat
    - Heating system to provide heat to the standby power facility; components include a unit heater, thermostat and timer

3.2 Site Personnel

Overall responsibility and management of the water distribution system lies with the Hamlet's Senior Administrative Officer (SAO). The SAO is responsible to ensure proper operation of the system is carried out, sampling and inspections are completed and documented, and annual reporting to the NWB is accomplished.

The Hamlet Maintainer is responsible for the operation and maintenance of the intake and overland pipeline from the Post River, including filling the reservoir.

The Hamlet Foreman is responsible for day-to-day operation and maintenance of the pumphouse, including managing water delivery, sampling drinking water, ensuring chlorine solution is mixed, chlorine levels are tested, and completing monthly and annual inspections.

The Hamlet typically has three individuals hired to operate the two water trucks and distribute water to community buildings on a daily basis. These individuals are also responsible for monitoring volume of water pumped to residences everyday and reporting these volumes daily at the Hamlet Office. The Water Truck Drivers are also responsible for mixing chlorine solution and testing chlorine levels at the pumphouse.

3.3 Post River & Overland Pipeline

3.3.1 Operations

Water is obtained from the Post River once per year. The intake pump at the Post River runs 24 hours per day for approximately one week to fill the reservoir in the fall. Potable water from the Post River is

pumped through the intake pipe, via the intake pump, into the overland pipeline which empties into the reservoir. The following procedures should be carried out to ensure proper operation of the Post River pump station:

1. Ensure the end of the overland pipeline at the reservoir is free and clear of any debris or ice.
2. An intake pump is located in the pumpshack at the Post River (64° 8' 38" N, 83° 11' 58" W). The intake pump is used to obtain water from the Post River via the intake pipe. The intake pump runs off diesel fuel; ensure the fuel tank is full prior to starting pumping.
3. Start the intake pump by pressing the push Start button.
4. To begin pumping water from Post River, turn the pump switch to the opposite side.
5. It takes approximately one week to fill the reservoir. You can leave the pump running all day however it should be checked on a couple times per day to ensure it is still running smoothly and there is enough diesel fuel in the tank.
6. Once sufficient volume has been pumped into the reservoir, turn off the pump switch and turn off the pump.
7. On a monthly and annual basis, the volume of water pumped out of the Post River needs to be recorded. This volume of water obtained from the Post River should be recorded in a log book or other record form every time water is pumped.

3.3.2 Maintenance

Maintenance of the intake pipe, intake pump and overland pipeline are the responsibility of the Hamlet. The Hamlet Maintainer should inspect the intake pipe, intake screen, intake pump, fuel tank, and overland pipeline each time water is pumped from the Post River. The Hamlet Maintainer should also ensure the intake pump remains in good repair by performing oil changes and other mechanical repairs to the pump as needed. If any repairs to the overland pipe are required, the Hamlet Maintainer should ensure those are completed promptly.

Inspection and repair records should be brought to the Hamlet Office for filing at least once per month. If any issues or problems are noted with the intake pipe, intake pump, fuel tank or overland pipeline, these should be communicated to the Hamlet Foreman and/or SAO as soon as possible.

3.4 Reservoir

3.4.1 Operations

The 40,000 m^3 reservoir contains the end of the overland pipeline from the Post River (discharge) and two submersible pumps feeding into the pumphouse (intakes). Water is typically pumped into the reservoir from the Post River once per year while water is removed from the reservoir daily through the pumphouse. Operations of the Post River water discharge pipe are described in Section 3.3.1 above while operations for the reservoir submersible pumps (P-1 and P-2) and intake pipes are described as part of the truck fill system in the Section 3.5.1.4.

3.4.2 Maintenance

The reservoir is unlined and blasted out of bedrock. The Hamlet is responsible to clean the reservoir once every two or three years to remove any accumulated mud, algae or other materials.

The reservoir should be inspected periodically to ensure it is in good condition, no repairs are required and no contaminants are found within 50 m.

3.5 Pumphouse & Truck Fill

3.5.1 Operations

Several different systems are contained within the pumphouse and each has their own operating methods. The following section will describe operational procedures for the electrical, the heating and alarm systems, the water intake and distribution system within the pumphouse (the truck fill system), the chlorination system, and the heat trace system for intake pipes and pumphouse water line. Operational troubleshooting is located in Section 3.8.

Most information on operational procedures for pumphouse systems were derived from the original O&M manual developed for the Coral Harbour Water Supply System by W.L. Wardrop and Associates Ltd. in 1985; a copy of this manual is located in **Appendix C**. Operational information in this 1985 O&M manual has been modified to reflect current conditions and equipment in the community.

3.5.1.1 Electrical System

Electricity for the pumphouse comes from either the normal utility provider (i.e. Quilliq Energy) or from the standby power facility in the event of a failure or outage in the utility power supply. The standby power facility is located in the building next to the pumphouse. See As-Built Drawings #8 and #9 in the 1985 O&M manual in **Appendix C** for a depiction of the pumphouse electrical system. See Section 3.7 for operational procedures for the standby power facility.

Electrical power comes into the pumphouse via two underground electrical cables from the standby power facility to Electrical Panel A, located on the west wall inside the pumphouse. The standby power facility is connected to the normal utility power supply and houses the generator system for standby power.

Electrical Panel A should always have power to it as it is connected to the normal utility provider and the standby power supply. Electrical systems in the pumphouse served by this panel are considered essential systems which need to be supplied with power at all times. These essential systems include:

- The two submersible pumps in the reservoir, allowing you to operate the pumphouse facility and obtain drinking water when there is a power outage
- Indoor and outdoor lights of the pumphouse
- Flow meter readouts and Control Panel #2 lights
- Receptacles for the chemical mixing tank mixer and hypochlorinator

Electrical power to Electrical Panel B is fed from Panel A. Electrical Panel B should normally have power supplied to it EXCEPT when the pumphouse is running on standby power and a pump is started. Panel B receives power from Panel A on standby power until a pump is started; this is to prevent overloading of the generator. Once the pump is shut off, power is returned to Panel B. Electrical Panel B serves power to non-essential systems, or systems which can be shut off for a short period of time. These non-essential systems include:

- The two electrical radiant heaters
- Heat trace controllers of the heat trace system on the intake pipes from the reservoir
- Heat trace system of the truck fill line

The breakers in Electrical Panels A and B are operated in the same way as the breakers in your house. Normally all breakers should be “on”. A “tripped” breaker indicates an overloaded circuit. Tripped breakers or those turned “off” will show an orange color in the breaker window.

3.5.1.2 Heating System

The heating system in the pumphouse consists of two electrical radiant heaters. These heaters are controlled by the room thermostats, located on the east wall inside the pumphouse. Each heater has its own thermostat.

The thermostats should be normally set at 20°C (68°F) in the winter, fall and spring to prevent freezing of the water pipes and other equipment. In the summer, you can turn the thermostats down to the lowest temperature setting.

To increase the temperature in the pumphouse, turn up the thermostats to a higher temperature. To decrease the temperature in the pumphouse, turn the thermostats down to a lower temperature.

The electrical radiant heaters are provided with power from breakers #1-3 and # 5-7 in Electrical Panel B. To shut off power to the heater, switch both breakers to the “off” position. These breakers should normally be in the “on” position however.

3.5.1.3 Alarm System

There are two types of alarms present in the pumphouse: transmitted alarms and non-transmitted alarms.

Transmitted Alarm: The transmitted alarm for the pumphouse indicates low building temperature. This alarm activates red and green alarm lights on the roof of the pumphouse.

A low building temperature alarm thermostat sense building temperature and is located on the east wall inside the pumphouse, to the right of the heater thermostats. If pumphouse temperature is normal, the green light on the roof of the pumphouse is “on”. If pumphouse temperature gets too low, an alarm is signified by the red alarm light on the roof of the pumphouse turning “on” and the green light turns “off”.

The green light should always be “on”. The low building temperature alarm thermostat should normally be set at 7°C (45°F).

Non-transmitted Alarm: The non-transmitted alarm for the pumphouse indicates that the standby submersible pump is being used. This alarm activates a red alarm light on Control Panel #1 inside the pumphouse on the south wall. This alarm does not affect the transmitted alarm described above.

If you find that the red “standby pump alarm” light is “on”, you should check with the last water truck driver to determine why they switched using pumps in the reservoir. They may have switched the pumps because the first one was not working.

If there is no problem with the pump and you wish to continue using the currently selected pump, turn off the standby pump alarm by turning the alarm reset selector switch on Control Panel #1 to the opposite position. This will cause the light to go off and the alarm to reset.

3.5.1.4 Truck Fill System

The truck fill system of the pumphouse consists of the pumphouse water line connected to the intake pipes of the submersible pumps in the reservoir, and the truck fill piping on the outside of the pumphouse building, connected to the pumphouse water line. See As-Built Drawing #6 from the 1985 O&M manual in **Appendix C** for a depiction of the truck fill system. The truck fill rate is approximately 900 L/min.

The operation of the reservoir submersible pumps and truck filling system may be performed from both outside and inside the pumphouse. The following step-by-step procedure outlines operation of the truck fill system.

To operate the truck fill system from <u>inside</u> the pumphouse (manual start):

1. Locate the two butterfly valves below the three-way valve. These two butterfly valves should be in the open position. In the open position, the handles of the valves are parallel to the pipes. Opening the two butterfly valves will allow water from either submersible pump to flow from the reservoir into the pumphouse water line.
2. Each submersible pump (P-1 and P-2) has its own starter. To start a pump, locate the two pump starters below Control Panel #1, situated on the south wall of the pumphouse; each pump starter is labelled P-1 and P-2. To start pump P-1, turn the "hand-off-auto" switch to the "hand" position. A red indicator light on the starter will come on indicating that the pump is running.
    - The two submersible pumps (P-1 and P-2) act as a back-up pump to each other. Only one pump is needed to fill water trucks. Though both pumps can be operated at the same time by turning both "hand-off-auto" switches to the "hand" position, you should **<u>NOT</u>** operate both at the same time due to the operation of the three-way valve.
3. Turning on one pump will automatically begin pumping water into the truck fill system and out of the truck fill line outside the pumphouse building.
4. The pump will run for as long as the "hand-off-auto" switch is in the "hand" position.
5. The pump will automatically run for a preset length of time, based on what the "pump run timer" is set at. To manually turn off the pump, turn the "hand-off-auto" switch to the "off" position.
6. If it is necessary to turn on the second pump (i.e. if your attempts to start the first pump failed), follow the same procedures to start P-2.

NOTE: **<u>NEVER</u>** run both pumps at the same time if the standby generator is being used to supply power to the pumphouse. The generator is sized to only run one pump at a time.

CAUTION: After stopping a pump, **<u>DO NOT</u>** immediately try to re-start it! A "pump wait timer" will prevent re-starting a pump and red "wait" indicator lights on Control Panel #1 and #2 will come on once a pump has stopped. You should wait until these lights have turned off before attempting to re-start a pump.

After a pump is stopped, water drains back down the intake pipes into the reservoir, causing the pump to turn backwards. Re-starting a pump while it is turning backwards may result in damage to the pump. If the pump wait timer is malfunctioning (e.g. red "wait" lights do not turn on), you should wait at least <u>ONE MINUTE</u> before attempting to re-start a pump after stopping it.

To operate the truck fill system from <u>outside</u> the pumphouse (automatic start):

1. In order to operate the truck fill system from outside the pumphouse, the "hand-off-auto" switches of the pump starters in the pumphouse MUST be in the "auto" position. This transfers control of the pumps to Control Panel #2, located on the outside south wall of the pumphouse. Ensure the switches of the pump starters are in the "auto" position. These switches should normally be in the "auto" position as the pumps are typically operated by the water truck drivers from outside the pumphouse.
2. The two butterfly valves below the three-way valve should also be in the open position. Ensure the butterfly valves are open.
3. To begin pumping water into a water truck, turn the "on-off" switch on Control Panel #2 to its other position. For example, if the "on-off" switch is turned to the right, start the pump by turning the "on-off" switch to the left, and vice versa.
4. The pump can also be started by switching the position of the "start-stop" switch mounted on the truck fill line.
5. When the pump starts, a green indicator light on Control Panel #2 will come on indicating the pump is running.
6. The pump will automatically run for a preset length of time, based on what the "pump run timer" is set at. To manually stop the pump, simply change the position of either the "on-off" switch on Control Panel #2 or the "start-stop" switch on the truck fill line.

NOTES: Steps #3 and #4 allow you to start the pump from either the truck fill line or from Control Panel #2 outside the pumphouse building. You may have to change the position of these switches a couple times to start them depending on the status of the pump run timer.

A pump selector switch is also found on Control Panel #2. When this switch points to "Pump #1", it means the submersible pump P-1 will be running. To run P-2, simply change the position of the switch to "Pump #2". Changing the position of the pump selector switch will cause an alarm light to come on on Control Panel #1. This alerts the pumphouse operator (if present) that it has been necessary to use the standby pump. To prevent false alarms, do not switch the position of the pump selector switch unless you have tried to start the initially selected pump and it did not work.

Additional pump operating notes:

1. When you start either of the two submersible pumps following the steps above, the pump will run for a preset length of time, unless you manually stop it. This timed running of the pumps is done to reduce the chance of overfilling a water truck, or for the pump to be left on for a long period of time, causing water spillage.

   The length of time that a pump will run is adjustable. To adjust the pump run time, locate the "pump run timer" inside Control Panel #1 (open Control Panel #1; the pump run timer is situated near the middle of the panel on the left side; see Photograph #12 of the 1985 O&M Manual in **Appendix C**). The timer should be set to run the pump for five minutes. To change the run time, turn the clear plastic knob of the timer until the red line on the knob is at the desired run time.

2. Whenever a pump is started (using any of the methods described above) and then stopped (either manually or by the pump run timer), it cannot be immediately started again. A "pump wait timer" inside Control Panel #1 prevents the pump from turning on until a preset length of time elapses. When the pump is stopped, the pump wait timer is turned on. Red "wait" indicator lights on Control Panel #1 and #2 will also come on at the same time. These indicator lights will stay on until the pump wait timer times out. Once these lights go out, you can start the pump again.

   The pump wait timer prevents damage to the pumps. After a pump is stopped, water drains back down the intake pipes into the reservoir, causing the pump to turn backwards. Re-starting a pump while it is turning backwards may result in damage to the pump. You should wait at least ONE MINUTE before re-starting a pump after stopping it.

   The pump wait timer can be adjusted. The timer should be set at one minute; it is not recommended to set the timer to less than one minute. To adjust the pump wait time, locate the pump wait timer inside Control Panel #1 (open Control Panel #1; the pump wait timer is situated near the middle of the panel on the right side; see Photograph #12 of the 1985 O&M Manual in **Appendix C**). To change the wait time, turn the clear plastic knob of the timer until the red line on the knob is at the desired wait time.

CAUTION: Though the pump wait timer will prevent the pump from starting while the red "wait" lights are on, if you push any pump start switch before the wait lights go out, the pump will automatically turn on once the wait time is over. Therefore if you leave the pumphouse during wait time and have switch a pump on, water spillage may results.

IT IS BEST PRACTICE TO NEVER SWITCH A PUMP ON WHILE THE "WAIT" LIGHTS ARE ON

3.5.1.5 Chlorination System

The addition of chlorine to drinking water is an important component of any water distribution system. Chlorine is added to drinking water to reduce or eliminate microorganisms, such as bacteria and viruses, which can be present in drinking water (Health Canada 2006). This makes the water safer to drink by eliminating those microorganisms which can cause serious and life-threatening diseases. However the correct amount of chlorine needs to be added to ensure there is enough chlorine to kill microorganisms but not too much to affect the aesthetic quality (e.g. taste, smell) of the drinking water.

The chlorination system at Coral Harbour automatically feeds measured chlorine solution into the truck fill system through a hypochlorinator. The chlorination system consists of a chemical mixing tank, a mounted mixer, a chlorine solution tank, feed lines between the mixing tank – solution tank, and solution tank – truck fill system, and the hypochlorinator.

Wall-mounted instructions on how to operate the chlorination system should be present above the chemical mixing tank. If you cannot find them, print these instructions and post on the wall. The following step-by-step procedures outline operation of the chlorination system:

Chemical Mixing Tank

To fill the chemical mixing tank:

1. Close the butterfly valve above the three-way valve. The butterfly valve should be perpendicular to the pipe when closed.
2. Manually start either one of the submersible pumps (see Section 3.5.1.1 for step-by-step instructions).
3. Remove the cover of the chemical mixing tank.
4. Open the filling valve of the waterline, located directly above the chemical mixing tank. This will allow water to fill the chemical mixing tank.
5. Check the volume of water in the chemical mixing tank by checking the markings on the side of the tank. When the tank is filled to the desired level, close the filling valve.
6. Stop the pump manually, unless it has already timed out (see Section 3.5.1.1 for step-by-step instructions).
7. Open the butterfly valve above the three-way valve.

To mix chlorine solution:

1. Ensure you are wearing protective gloves, safety glasses and an apron when handling chlorine powder or chlorine solution!
2. To mix chlorine solution, add 70 grams (approximately ½ cup) of chlorine powder to the mixing tank for every one gallon (or 3.78 L) of water. This will produce a 1% (10,000 mg/L) chlorine solution. The chemical mixing tank holds a volume of 114 L (approximately 30 gallons).

   For example, if the chemical mixing tank is full (114 L), you will add 15 cups (approximately 2,100 grams) of chlorine powder.
3. If you have not already done so, add water to the chemical mixing tank as per the directions above. If there is already water in the chemical mixing tank, make sure you note the volume

before you add more water and the volume once you are done. You will only need to add chlorine powder for the volume of water you added.

For example, if there are two gallons of water in the chemical mixing tank and you fill the tank to five gallons, you have added three gallons of water. You will need to add 1 ½ cups of chlorine powder for the three gallons of water you added. This assumes any water already present in the chemical mixing tank was already chlorinated.

4. After you have added chlorine powder and water to the chemical mixing tank, put the lid back on the mixing tank and use the mixer mounted above the tank to mix the water and chlorine powder together. To turn on the mixer, plug it into the power receptacle labelled "mixer receptacle" on the right side of the mixer.
5. Allow the mixer to run for at least one hour to thoroughly mix the chlorine powder and water.
6. To turn off the mixer, simply unplug it from the mixer receptacle.

Chlorine Solution Tank

Once the chlorine solution has been thoroughly mixed in the chemical mixing tank, it must be transferred into the chlorine solution tank to be automatically fed into the truck fill system.

To transfer the chlorine solution into the chlorine solution tank:

CAUTION: You should **NOT** transfer chlorine solution from the chemical mixing tank to the chlorine solution tank immediately after making a new batch of chlorine solution! The undissolved chlorine powder in the mixing tank needs to settle first or it will plug up the hypochlorinator. You should wait at least one day or until the chlorine solution in the mixing tank is clear (i.e. no longer cloudy) before transferring into the solution tank.

1. Open the chlorine solution transfer valve at the bottom of the chemical mixing tank. This will allow chlorine solution from the chemical mixing tank to flow via the feed line into the chlorine solution tank.
2. When enough chlorine solution has been transferred, close the transfer valve. The chlorine solution tank holds a volume of 114 L (approximately 30 gallons).

Chlorine Testing

Once the chlorine solution has been transferred into the chlorine solution tank, the water should be tested for the amount of chlorine present. Two chlorine tests need to be performed: a total chlorine test and a free chlorine test.

When chlorine is added to water, some of it initially reacts with materials present in the water and becomes unavailable for disinfection. The total chlorine test will determine how much chlorine is present in the water after some of it has become unavailable. Some of the total available chlorine can then further react with other materials in the water and also become unavailable for disinfection. The free chlorine test will verify how much of this total available chlorine is actually able to eliminate disease-causing microorganisms.

To make sure that the chlorine tests are representative of the water going into the community's homes, you must sample to chlorine levels from a filled water truck.

To test the water for the amount of chlorine:

1. Use the chlorine test kit. You will be using a Hach colormetric chlorine test kit which measures the amount of chlorine in a sample by evaluating the change in the color after a specific chemical has been added.
2. Collect a sample of approximately 30 mL (1/8 cup) chlorinated water from the water truck after it has been filled from the truck fill system.
3. Allow the sample to sit for at least 20 minutes before you test it.
4. Once the appropriate time has elapsed, perform the tests for total and free chlorine.
    a. Total Chlorine Test:
        i. From the chlorine test kit obtain a color viewing tube and fill it to the 5 mL mark with your sample water. Place it in the left hand opening of the comparator. This is your sample for comparison.
        ii. Fill the other viewing tube to the 5 mL mark with sample water. This is your test sample.
        iii. Add the contents of one DPD Total Chlorine Reagent Powder Pillow to the test sample. Swirl the tube to mix the reagent and water.
        iv. Let the test sample stand for at least three minutes but NO LONGER than six minutes. This allows for color development.
        v. Place the test sample in the right side opening of the comparator.
        vi. Hold the comparator up to a light source (e.g. window, sky, lamp) and view the samples through the front of the comparator. Turn the color disc until a color match of the test sample is obtained. Read the mg/L of total chlorine through the scale window.
    b. Free Chlorine Test:
        i. From the chlorine test kit obtain a color viewing tube and fill it to the 5 mL mark with your sample water. Place it in the left hand opening of the comparator. This is your sample for comparison.
        ii. Fill the other viewing tube to the 5 mL mark with sample water. This is your test sample.
        iii. Add the contents of one DPD Free Chlorine Reagent Powder Pillow to the test sample. Swirl the tube to mix the reagent and water.
        iv. Place the test sample in the right side opening of the comparator.
        v. Hold the comparator up to a light source (e.g. window, sky, lamp) and view the samples through the front of the comparator. Turn the color disc until a color match of the test sample is obtained. Read the mg/L of free chlorine through the scale window.
5. Results for the chlorine tests should be near 2 mg/L for total chlorine and between 0.1 and 0.3 mg/L for free chlorine.
    - If the results you obtain are higher than these, too much chlorine is being added from the chlorine solution tank into the truck fill system. This can cause problems with the taste and smell of drinking water.

- If results you obtain are lower than these, too little chlorine is being added from the chlorine solution tank into the truck fill system. This can cause health problems for those who drink the water as it may mean not all disease-causing microorganisms are being killed.
- You can adjust the amount of chlorine being automatically added to the truck fill system by adjusting the hypochlorinator.

Hypochlorinator

The hypochlorinator is a device which automatically feeds a measured amount of chlorine solution from the chlorine solution tank into the truck fill system. The hypochlorinator is mounted above the chlorine solution tank. The hypochlorinator can be adjusted to add more or less chlorine solution depending on the results of the chlorine tests.

How the hypochlorinator works:

1. When water flows down the pumphouse water line, it passes by a flow switch (mounted on the water pipe above the chemical mixing tank on the left) and initiates an electrical contact, which starts a flow switch delay timer.
2. When the flow switch delay timer times out (approximately three to five seconds) power is supplied to the “switched” side of the hypochlorinator receptacle. The hypochlorinator should always be plugged into the switched side (top plug) of the hypochlorinator receptacle, located on the wall above the chlorine solution tank.
3. With power supplied to the hypochlorinator, it begins pumping chlorine solution into the pumphouse water line through an injection fitting. Pumping occurs by piston action, moving back and forth at a set rate. This rate can be adjusted to speed up (add more chlorine solution) or slow down (add less chlorine solution).
4. When water stops flowing past the flow switch, this opens the electrical circuit and power to the hypochlorinator receptacle is stopped. The hypochlorinator then stops.

To adjust the hypochlorinator pumping rate:

1. Turn the adjustment knob on the top of the hypochlorinator.
   - To increase the amount of chlorine, turn the knob to a higher number (i.e. from five to six)
   - To decrease the amount of chlorine, turn the knob to a lower number (i.e. from five to four)

3.5.1.6 Heat Trace Systems

Two heat trace systems are present in the pumphouse. The first heat trace system is associated with the intake pipes from the reservoir, and the second system is associated with the truck fill line.

Intake Pipe Heat Trace System

This heat trace system is comprised of two self-limiting heat trace cables mounted on each intake pipe. On each intake pipe, one cable is a “duty” cable and should always be plugged into its appropriate power receptacle. The second cable is a spare cable and should only be used if the duty cable fails.

The “self-limiting” nature of these cables means they are manufactured of materials which automatically adjust the amount of heat generated by the cable in relation to the ambient temperature surrounding the cable. For example, the colder it is around the cable, the more heat they will generate and vice versa.

In addition to the self-limiting feature of the cables, the heat trace cables are also controlled by separate heat trace controllers, mounted above the intake pipes on the north wall inside the pumphouse. These two controllers each have two thermostats (or thermistors) which are mounted on the surface of each intake pipe, inside the pump casing assemblies. The thermistors are located 3.5 m and 35.5 m down the intake pipes from the pumphouse (see As-Built Drawing #9 in the 1985 O&M Manual in **Appendix C**). The thermistor located 35.5 m from the pumphouse is a control thermistor and controls the on/off function of the heat trace cables. The second thermistor (at 3.5 m) is a high limit thermistor and acts as a safety device which turns off the heat trace cable if the temperature gets too high. This protects the HDPE plastic pipes from getting too hot and possibly melting.

The cables from each thermistor are plugged into the heat controller through their own power receptacles, which receive power from the heat trace controllers. The power receptacles are located above the intake pipes, underneath the heat trace controllers. Three sockets are present in this location, above each intake pipe. The middle receptacle serves the duty cable of the heat trace cables; the inside receptacle, nearest the submersible pump power receptacles, serves the control thermistor cable; and, the outside receptacle serves the high limit thermistor cable (see As-Built Drawing #8 in the 1985 O&M Manual in **Appendix C**). All of these cables should always be plugged in.

Heat trace operation is normally controlled automatically through the controllers and the self-limiting feature of the cables. Heat trace cables are properly working when the duty cable and control thermistor lights of the heat trace controllers are “on”. If the high limit thermistor light is “on”, this implies the high limit thermistor has turned the heat trace cables off. Power to the heat trace controllers is provided by two 30 amp two-pole breakers located in Electrical Panel B, on the west wall inside the pumphouse. Breakers #2 and #4 server the heat trace on intake P-1 while breakers #9 and #11 serve the heat trace on intake P-2. The breakers should always be in the “on” position unless you need them turned off for some reason (e.g. maintenance).

Truck Fill Line Heat Trace System

The truck fill line (exiting the pumphouse) is insulated and heat traced, which prevents the truck fill line from freezing during the winter months. This insulation and heat tracing was added following initial construction of the pumphouse.

The truck fill heat trace is supplied with power from breaker #6 in Electrical Panel B. This heat trace should be turned “on” in the late fall and left on all winter. The heat trace can be turned off in the spring and left off all summer.

3.5.2 Maintenance

Maintenance of the pumphouse and truck fill system should be done on a monthly or annual basis, depending on the system. General inspections of the pumphouse systems should be completed monthly, while inspections by qualified individuals (i.e. electricians, mechanics) should be completed annually. The following section outlines general procedures for maintenance and inspection of the electrical, heating and alarm systems, truck fill system, chlorination system and heat trace systems. For specific equipment maintenance procedures, the original manufacturer brochures have been included in Volume II of this O&M Manual.

All inspections should be completed by the Hamlet Foreman, Water Truck Driver (where appropriate), or another qualified individual. All inspection records should be filed at the Hamlet office. A Pumphouse Inspection Form is included in **Appendix F**. Any problems or issues noted during the inspections should be communicated to the Hamlet Foreman and/or SAO as soon as possible and corrected promptly.

3.5.2.1 Electrical System

The pumphouse electrical system should be inspected by a qualified electrician on an annual basis. Any issues or concerns noted with the electrical system should be repaired by a qualified electrician. All inspections should be documented and copies of the inspections kept in the Hamlet Office.

3.5.2.2 Heating System

The heating system of the pumphouse is connected to the electrical system. This should be inspected along with the electrical system on an annual basis.

3.5.2.3 Alarm System

The low temperature alarm (transmitted) should be checked at least once per month to ensure the system and lights are functioning correctly. To check this alarm:

1. Make sure the green light (on the roof of the pumphouse) is “on”
2. Locate the low temperature alarm thermostat (to the right of the building thermostats on the east wall inside the pumphouse) and turn the thermostat up until the set temperature is above the pumphouse room temperature. This will simulate an alarm condition.
3. Check outside to make sure the red alarm like has turned on and the green light has turned off.
    a. If the red alarm light has <u>not</u> turned on, check the bulb. If the bulb has burned out, replace it.
    b. If the red alarm light has turned on, return to the low temperature alarm thermostat and reduce the set temperature to the original set point (7°C). This should turn the red alarm light off and the green light back on.

3.5.2.4 Truck Fill System

The pumphouse components of the truck fill system should be inspected on a monthly basis, at a minimum, to ascertain all equipment is in sound condition and all components are functioning correctly. On an annual basis, the submersible pumps, intake pipes and heat trace cables should be removed and inspected.

Monthly

Every month, the pumphouse water line, truck fill line and chlorination system should be inspected. Inspection of the pumphouse water line and truck fill line should focus on condition of the piping and pipe connections, condition of the valves, flow switches, meter readouts and control panels, and identifying any issues (e.g. water leaks, unreadable labels, etc).

Inspection of the chlorination system should look for dirty or clogged pieces, quantity of chlorine powder remaining, and functioning of the mixer, hypochlorinator, valves and receptacles. If pieces of the system are found to be dirty or clogged (i.e. chemical mixing tank, chlorine solution tank, feed line from mixing tank – solution tank and solution tank – truck fill system), these should be cleaned or replaced.

Annual

To complete an inspection of the intake system or replacement of any equipment within the intake system, you must first remove all components from the pump casing assembly.

To remove components of the intake system:

1. Unplug the following at the wall receptacles:
    a. Pump power cable
    b. Heat trace cable
    c. Heat trace control cables (i.e. thermistor cables)
2. In the pumphouse, locate the winch stand for pump removal . Place the winch stand in front of the intake systems to be removed and fasten it in place by using the threaded inserts in the floor.
3. Turn off the pump in the intake by turning the “hand-off-auto” switch on Control Panel #1 to the “off” position. In addition, turn “off” the local disconnect switch, located below the pump starter (for the pump to be removed).
4. Turn off the breaker in Electrical Panel A that serves the pump being removed. In addition, turn off the breaker serving the heat trace system in this intake (in Electrical Panel B).
5. Close the butterfly valve, situated below the three-way valve,that serves this intake system. The butterfly valve should be perpendicular to the pipes in the closed position.
6. Disconnect the Victaulic pipe coupling situated above the 45° elbow (see As-Built Drawing #6 in the 1985 O&M Manual in **Appendix C**).
7. Thread the pump removal cable (located near the floor towards the outside of the intake) through the winch and hook the winch onto the winch stand.
8. Remove the split flange assembly at the top of the intake casing.
9. Once you have disconnected all piping and electrical equipment, remove the entire intake system by winching it out with the winch. Guide the end of the system out the open door way.
    a. It is suggested that as the removal of the intake system takes place, the free end of the system is carefully guided over the ground outside the pumphouse to prevent damage.
10. Continue to winch out the intake system out until the pump is removed.

Re-installation of the intake system is completed in the reverse order of the removal.

3.6 Water Trucks

3.6.1 Operations

Every day, water is delivered to houses and buildings in the community by water trucks. Only trained drivers should operate these trucks, including driving and water delivery.

See Section 3.5.1.4 for operational procedures to fill water trucks.

3.6.2 Maintenance

Water delivery to residences and buildings in the community is the key component of the water distribution system. It is very important that the water trucks are kept in good condition and any repairs are given top priority and completed immediately.

The water trucks and tanks should be inspected on a daily basis for leaks (water and fuel or oil), proper lighting and hose operation, and basic condition (e.g. rust). The trucks should receive a mechanical inspection at least once per year. Additionally, the water trucks should be parked in a heated garage in winter to prevent the tanks from freezing and full tanks should not be allowed to rest for long periods of time, especially in winter.

The tanks of the water trucks need to be cleaned on a regular basis to maintain the water quality of the drinking water being transported and delivered. The tanks should be thoroughly cleaned at least once every month, or more often if conditions warrant (e.g. algae in the reservoir).

3.7 Standby Power Facility

The pumphouse is generally powered from the normal utility provider (i.e. Quilliq Energy) however in the event of a power failure or outage, pumphouse essential components will be powered from the standby power facility.

3.7.1 Operations

Several different systems are contained within the standby power facility and each has their own operating methods. The following section will describe operational procedures for the electrical, ventilation, heating, alarm and fuel systems, and standby power generator and diesel engine. Operational troubleshooting is located in Section 3.8.

Most information on operational procedures for the standby power facility were derived from the original O&M manual developed for the Coral Harbour Water Supply System by W.L. Wardrop and Associates Ltd. in 1985; a copy of this manual is located in **Appendix C**. Operational information in this 1985 O&M manual has been modified to reflect current conditions and equipment in the community.

3.7.1.1 Electrical System

Operation of the electrical system in the standby power facility is described as follows:

1. Normal utility power enters the standby power facility through electrical service mast from the power pole outside the building. The normal utility power passes through an electrical meter to meter the amount of utility power used by the pumphouse. Inside the standby power facility, the power is then fed to a 100 amp main breaker.
2. As the main breaker is used to isolate the entire system from the normal utility provider, the main breaker should always be “on” unless you want to shut off all normal power to the pumphouse.

- Turning “off” the main breaker will simulate a power failure and should automatically start the standby generator. This can be used to test the system. See Section 3.7.2.4 for more information.

3. At the splitter box the electrical supply is split to serve the Heating Electrical Panel and the transfer switch.
    a. The Heating Electrical Panel serves the heating loads inside the standby power facility, including the battery blanket, oil heater and building heater
    b. The Heating Electrical Panel is served with normal utility power only and all loads served by this panel will not be operational during a normal utility power failure.
    c. Breakers in the Heating Electrical Panel should always be “on”.
4. As mentioned in Step 3 above, the splitter box is also connected to the transfer switch. During normal utility power operation, the electrical supply passes through the transfer switch to serve the Subfeed Electrical Panel.
    a. The Subfeed Electrical Panel serves the lighting circuits in the standby power facility and Electrical Panel A in the pumphouse.
    b. All breakers in the Subfeed Electrical Panel should always be “on”.

3.7.1.2 Ventilation System

The ventilation system in the standby power facility allows proper ventilation and cooling of the building. Operation of the ventilation system is described as follows:

1. When the ventilation thermostat senses a rise in building temperature (e.g. heat from running the standby power generator, etc), this will cause the air intake and exhaust dampers to open and the exhaust fan to start. This allows outside air to be drawn into and through the standby power facility, cooling the building.
2. When the ventilation thermostat senses the temperature in the building has been reduced to the thermostat setpoint, the exhaust fan will stop and intake and dampers will close.
3. The ventilation thermostat should be set between 24°C and 29°C.

The ventilation system is provided with power from the Subfeed Electrical Panel and will therefore be provided with power at all times.

3.7.1.3 Heating System

The heating system in the standby power facility allows heating of the building. Heating the standby power facility is not necessary at all times since the engine and other essential equipment are provided with their own heat sources (i.e. oil immersion heater for the engine, battery blanket on the battery). Essential components are then protected for cold weather operation.

The heating system should only be used to heat the standby power facility when maintenance or repair inside the building is required. To start the heater, set the heating thermostat to the desired temperature and set the heat timer for the length of time you want the heater to run.

The heater will run until the heat timer times out, or until the building is warm and the heating thermostat shuts the heater off. The use of the heat timer will prevent the heater from being used continuously.

3.7.1.4 Standby Generator and Diesel Engine

The standby power generator and diesel engine are designed to automatically start and stop when a utility power failure occurs. The standby generator and diesel engine may also be operated manually.

To operate the standby generator and diesel engine automatically:

1. The breaker switch on the right side of the standby generator control panel should be in the "on" position. This breaker switch isolates and protects the standby generator from all power loads and should always be "on" unless you are servicing it.
2. The "auto-off-manual" switch on the standby generator control panel must be in the "auto" position for automatic operation. This is the normal operation position and should always be in this position (e.g. so the generator is always ready to start automatically).
3. The four position selector switch ("test-off-auto-engine test"), located on the face of the standby generator transfer panel, controls the automatic operation of the electrical transfer switch. This four position selector switch should be in the "auto" position for automatic operation.
4. During a normal utility power failure, the three voltage sensing relays in the electrical transfer switch will sense a drop in voltage, signalling a power failure. Two voltage adjustment knobs are located on each of these three relays, labelled "drop-out" and pick-up".
    a. The "drop-out" voltage adjustment knob on each relay is used adjust the voltage at which the standby generator will start.
        i. For example, normal utility power is typically 208 V, three phase. The voltage between phase to neutral is normally 120 V. If the "drop-out" voltage knobs are set to 110 V, then the standby generator will start when the phase to neutral voltage drops below this. Since the three phases are monitored by the three relays; a drop in any one of the three phase to neutral voltages will cause the standby generator to start.
        ii. The "drop-out" adjustment knobs can be set between 90 V and 138 V, however should be set at the highest voltage below 120 V which does not cause false generator starts due to normal utility voltage fluctuations.
        iii. The drop-out voltage of all three sensing relays should be set at slightly below the midpoint of the full adjustment range (114 V) and above the quarter point (102 V). Normally drop-out voltages are set between 108 V and 110 V.
    b. The "pick-up" voltage adjustment knob on each relay is used to adjust the voltage at which the standby generator will stop (when normal utility power is restored). Further discussion of this occurs at Step 9.
5. When the voltage sensing relays sense a drop in voltage, a generator start delay timer will begin timing. This timer is used to prevent the generator from starting during a momentary drop in voltage. If the generator start delay timer times out and the voltage is still low, the standby generator will start.
    a. The generator start delay timer has a range between one second and 300 seconds. The timer should normally be set for 10 seconds. Therefore a normal utility power failure must last for at least 10 seconds before the standby generator will start.
6. When the standby generator starts, the engine speed pick-up timer begins time. This timer allows the generator to come up to full speed before the pumphouse electrical load is transferred.

a. The engine speed pick-up timer has a range between one and 30 seconds. The timer should normally be set for 5 seconds.

7. When the pick-up timer times out, the pumphouse electrical load is transferred to the generator by switching two breaker handles to the opposite position. This is performed automatically by a steel transfer level, which is operated by a nylon cam in the transfer motor.
8. Once the standby generator automatically starts, it will continue to run until the normal utility power is restored. An alarm can also shut down the generator; see Section 3.7.1.5 for information on generator alarms and shutdowns.
9. Normal utility power restoration is sensed by the voltage sensing relays ("pick-up"), causing the transfer switch to switch back to normal utility power.
    a. The "pick-up" voltage adjustment knob can be set between 92 V and 150 V. The voltage should be set at least two volts higher than the drop-out voltage and no higher than 118 V to 120 V.
    b. The pick-up voltage of all three sensing relays should be set at slightly below the midpoint of the full adjustment range (121 V).
10. When the voltage sensing relays sense a pick up in voltage, the time delay for retransfer back to normal utility power begins timing. This timer ensures that utility power has truly been restored (i.e. has been back on for a specified amount of time) before the pumphouse is taken off standby power.
    a. The retransfer delay timer has a range between 20 seconds and 10 minutes. The timer should normally be set at one minute.
11. Once the retransfer delay timer times out, the steel transfer lever (operated by the nylon cam in the transfer motor) switches the two breaker handles back. This switches the electrical load from the standby generator back to the normal utility.
12. Following retransfer back to normal utility power, the generator will begin a cool down cycle, timed by an engine cool down timer. This timer allows the diesel engine to continue running so it has time to cool down before it shuts down.
    a. The engine cool down timer has a range between 20 second and 10 minutes. The timer should normally be set at three minutes.

CAUTION: The drop-out voltage should not be set too low as this can cause damage to electrical equipment in the pumphouse. The standby generator should start when the voltage drops too low.

3.7.1.5 Alarm System

Several alarms are associated with the standby generator and engine. The generator control panel has several small indicator lights on its front face.

When the generator is in the "auto" mode and is ready to start automatically, a green light will be "on" on the generator control panel. This light should normally always be "on".

Red lights on the front face of the generator control panel indicate an alarm and/or a shutdown condition The following is a description of possible alarms:

- Engine Overspeed – the rpm of the diesel engine is too high; this will cause the generator to shut down. The alarm light will come on to indicate this is the reason for the shut down. This condition may be caused by an incorrect adjustment of the engine speed control.
- Engine Overcrank – if the generator and engine are called to start but do not start after a three minute cranking cycle, they will cease to start and the overcrank alarm will come on. The generator will not attempt another start until the problem has been corrected. See the manufacturer brochure in Volume II of this O&M Manual to determine the reason for engine overcranking.
- Low Oil Pressure – when the engine oil pressure is too low this alarm will come on and shut down the generator and engine. The alarm light will come on indicating this condition. See the manufacturer brochure in Volume II of this O&M Manual to determine the reason for low engine oil pressure.
- High Temperature – when the engine temperature gets too hot this alarm will come on and shut down the generator and engine. The alarm light will come on indicating this condition. One reason for high engine temperature may be improper operation of the building ventilation system; check the ventilation system. See the manufacturer brochure in Volume II of this O&M Manual to determine the other reasons for engine overheating.
- No Speed Signal – this alarm light will come on if the engine starts but does not reach the prescribed speed. See the manufacturer brochure in Volume II of this O&M Manual to determine the reason for the no speed signal.

When any alarm light comes on, the cause for the alarm should be investigated and corrected promptly. The alarm can be reset by turning the “auto-off-manual” switch on the generator control panel to the “off” position and then back to the “auto” position. This will cause the alarm light to turn off and the generator to start. The generator and engine cannot be started when one of the safety alarm shutdowns has been activated.

An additional alarm in the transfer switch can shut down the generator and engine if the electrical power produced by the generator is outside the recommended range. If the standby generator starts but the electrical power generator is outside the frequency range of 57 Hz to 63 Hz, the frequency shutdown of the transfer switch will shut down the generator and engine. See the manufacturer brochure in Volume II of this O&M Manual to determine the reason for the out of range electrical power.

3.7.1.6 Fuel System

The diesel fuel tank for the standby generator is mounted outside the standby power facility. The tank is situated in a welded secondary containment to contain any spill or leak and prevent it from entering the reservoir.

From the fuel tank, diesel fuel flows through a supply line into the standby power facility. The valve on this supply line should always be open to provide fuel to the diesel engine. Inside the building, the diesel fuel passes through a fuel filter before entering the engine. A return line from the engine to the fuel tank returns any unused fuel.

3.7.2 Maintenance

Maintenance of the standby power facility should be done on a monthly or annual basis, depending on the system. General inspections of the standby power facility systems should be completed monthly, while inspections by qualified individuals (i.e. electricians, mechanics) should be completed annually. The following section outlines general procedures for maintenance and inspection of the electrical, ventilation,

and heating systems, and the standby generator and diesel engine. For specific equipment maintenance procedures, the original manufacturer brochures have been included in Volume II of this O&M Manual.

All inspections should be completed by the Hamlet Foreman, Water Truck Driver (where appropriate) or another qualified individual. Records of all inspections should be filed at the Hamlet office. A Standby Power Facility Inspection Form is included in **Appendix F**. Any problems or issues noted during the monthly inspections should be communicated to the Hamlet Foreman and/or SAO as soon as possible and corrected promptly.

3.7.2.1 Electrical System

The standby power facility electrical system should be inspected by a qualified electrician on an annual basis. Any issues or concerns noted with the electrical system should be repaired by a qualified electrician. All inspections should be documented and copies of the inspections kept in the Hamlet Office.

3.7.2.2 Ventilation System

The ventilation system should be inspected annually by a certified technician or other qualified individual. Any issues of concerns should be repaired by the certified technician or qualified individual.

To test the operation of the ventilation system, turn the ventilation thermostat down until you reach the temperature of the building. This should automatically start the ventilation system.

3.7.2.3 Heating System

The heating system of the standby power facility should be used infrequently. The heating system should be inspected along with the electrical and ventilation systems on an annual basis.

3.7.2.4 Standby Generator and Diesel Engine

Maintenance procedures that should be completed monthly on the standby generator and diesel engine include inspections and operational testing. See the attached Standby Power Facility Inspection Form in **Appendix F** for inspection information. The standby generator performance should also be inspected during a real or simulated power failure to ensure optimal operation of the generator.

The standby generator and diesel engine should also be inspected annually by a qualified mechanic or other qualified individual.

Operational Testing

Four methods are available to test the operation of the standby generator; one of these methods should be performed at least monthly. The first two methods simulate a normal utility power failure and transfer the electrical load to standby power; these methods test the operation of the entire standby power facility. The final two methods enable you to test run the standby generator without transferring the electrical load; this will not test the operation of the timers and relays as the electrical load is not being transferred.

Power Failure Simulation – Method # 1:

1. Turn the 100 amp main breaker to the “off” position. This shuts off all utility power to the facility, simulating a power failure.
2. The standby generator should go through Steps 4 to 8 outlined in Section 3.7.1.4 to start up and run.
3. If you are satisfied with generator starting operations, turn the main breaker back to “on” to simulate normal utility power restoration.

4. The standby generator should go through its routine retransfer and cool down procedures.

Power Failure Simulation – Method # 2:

1. On the front of the transfer switch, turn the four position switch ("test-off-auto-engine test") to the "test" position.
2. The standby power facility should go through its routine start-up procedures and transfer the power load from normal utility power to standby power.
3. The standby generator will continue to run until you switch the four position switch back to the "auto" position. Once this is done, the electrical load will be retransferred back to normal utility power and the generator will go through its routine cool down procedures.

Generator Test Run – Method # 1:

1. On the generator control panel, turn the "auto-off-manual" switch to the "manual" position. This will start the generator.
2. The standby generator and engine will continue to run as long as the switch is in the "manual" position (unless an alarm causes the generator or engine to stop, see Section 3.7.1.5 or Section 3.8 Troubleshooting for more information).
3. Turn the switch to the "auto" or "off" position to stop the generator and engine.

NOTE: If the "auto-off-manual" switch is in the "off" position, the generator will not run in either manual or automatic mode. This switch should always be left in the "auto" position to allow the unit to automatically start during power failures.

Generator Test Run – Method # 2:

1. At the generator control panel, ensure the "auto-off-manual" switch is in the "auto" position.
2. On the front face of the transfer switch, turn the four position switch ("test-off-auto-engine test") to the "engine test" position. This should start the engine and the generator.
3. The standby generator and engine will continue to run as long as the switch is in the "engine test" position (unless an alarm causes the generator or engine to stop).
4. Turn the switch to the "auto" or "off" position to stop the generator and engine.

NOTE: Turning the four position switch to the "off" position will take the transfer switch out of service. Unless maintenance is being performed, the four position switch should always be in the "auto" position to allow the standby power facility to automatically start during power failures.

Generator Performance

Monitoring the standby generator performance needs to be completed during a real or simulated normal utility power failure. Generator performance or electrical power supplied by the generator is checked based on the voltage, frequency and amperage draw on each of the three phases of electrical power generated by the unit. To check generator performance:

1. During a real or simulated normal utility power failure, locate the three gauges on the front face of the generator control panel. Each of these three gauges measure the voltage, frequency and amperage draw on each of the three phases of electrical power produced by the generator.
2. Use the phase selector switch on the generator control panel to measure the voltage, frequency and amperage of each of the three phases. On any of the three phases:

a. The voltage should be 120 V ± (plus or minus) 4 V.

b. The frequency should be 60 Hz (hertz).

c. The amperage draw will vary between zero (0, indicates no load) and a maximum of 70 amps (full load).

Generator Battery System

The generator battery is automatically charged by the wall mounted electrical battery charger. The charger monitors battery voltage and only provides charge when needed, not continuously. This should always be connected.

The generator battery also has a battery blanket around it to keep it warm for cold weather operation of the standby power facility. The battery blanket is plugged into the power receptacle on the side of the generator. This power receptacle is controlled by an internal thermostat and has no power when the standby power facility is warm. The battery blanket can be unplugged during summer, however for simplicity it should always be plugged into this receptacle.

Engine Oil Heater

The diesel engine driving the generator is air-cooled but has an immersion-type oil heater installed in the oil pan to keep the engine warm during winter when the building is not heated. This engine oil heater is plugged into the thermostatically-controlled receptacle on the generator, along with the battery blanket. Similar to the battery blanket, the engine oil heater can be unplugged during summer, however for simplicity it should always be plugged into this receptacle.

3.7.2.5 Fuel System

The fuel tank, secondary containment, supply and return lines should be checked during the monthly inspection of the standby power facility. The fuel level in the tank should be checked at least twice a month and refilled if necessary. The fuel level should be checked more frequently if power failures are occurring often, or if the facility has been running for an extended length of time. The standby power facility will not operate if the engine runs out of diesel fuel.

3.8 Troubleshooting

Problem	Solution
Pumphouse	
Red low temperature alarm light (on roof of pumphouse) is “on” and green light is “off”	1. This indicates that the low building temperature alarm has been activated. 2. Check the setting on the low temperature alarm thermostat – it should be set at 7°C (45°F). 3. Check the breakers for the radiant heaters in Electrical Panel B – they should both be on. 4. Check the thermostats controlling the radiant heaters. These should be set at 20°C (68°F). Turn up the thermostats; the heaters should come on. 5. Check the heaters for proper operation. If they appear to be malfunctioning, contact a local electrical or mechanical service to come and service the heaters.
Green light (on roof of pumphouse) indicating normal pumphouse temperature is “off” and red low temperature alarm light is also “off”	1. There is no power at the pumphouse. If the power is out in the community (i.e. power outage), this may indicate that the standby generator has not started. Check the pumphouse and standby generator. 2. If there is power at the pumphouse, the bulbs have likely burnt out. Replace the bulbs.
Pump does not start (i.e. no water comes into the truck fill system)	1. Check to make sure the pump power cables are securely plugged in. 2. Go through the procedures in this section step-by-step to ensure everything is done correctly. 3. Try running the pump manually from inside the pumphouse using the “hand-off-auto” switch on the appropriate pump starter. 4. If the pump does not start on either automatic or manual, check the pump breakers in Electrical Panel A. The pump breakers should be “on”. 5. Try running the other pump. If the other pump works, there is likely a problem with the first pump. Attempt plugging the power cables for the first pump into the second pump receptacle. If the first pump still does not work, contact the manufacturer for specific information (see Volume II of the O&M Manual).

Problem	Solution
Hypochlorinator is not working properly	1. Test the hypochlorinator by plugging it into the "un-switched" side (bottom plug) of the hypochlorinator receptacle. When you plug it in, it should automatically begin pumping. 2. If the hypochlorinator does not begin pumping and the receptacle has power, the hypochlorinator needs to be replaced. A spare hypochlorinator should be kept in the pumphouse. 3. If a new hypochlorinator needs to be ordered, contact the manufacturer (see Volume II of the O&M Manual).
Intake pipe is frozen	Indicates a problem with the heat trace cables: 1. Check to make sure that the breakers in Electrical Panel B for the heat trace are "on". 2. Try plugging the spare heat trace cable into the duty heat trace cable receptacle. If the standby cable works (i.e. the light on the heat trace control box turns "on"), then the duty cable has failed. Use the standby cable to thaw the intake pipe. Once the intake pipe thaws, pull out the pump and intake pipe (see Section 3.5.2.4) and replace the heat trace cable. 3. If in Step 2 above the spare cable does not work, then the heat trace controller or control thermistor are the problem. 4. To check the control thermistor, unplug the thermistors of the frozen intake and plug them into the other (not frozen) heat trace controller. If the heat trace on the other controller works (i.e. lights on the other controller come on), the thermistors are working. If the heat trace does not work, you must thaw out the frozen intake, remove the pump and intake pipe and replace the control thermistor. 5. To check the heat trace controller, unplug the control thermistor from the other (not frozen) intake and plug it into the controller for the frozen intake. If the heat trace does not work (i.e. lights on the frozen controller do not come on), the controller is defective and needs to be replaced. Contact the manufacturer (see Volume II of the O&M Manual).

Problem	Solution
Standby Power Facility	
Red alarm lights have turned on at the standby generator control panel.	Indicates an alarm and/or shut down condition: 1. Engine Overspeed – the rpm of the diesel engine is too high; this will cause the generator to shut down. The alarm light will come on to indicate this is the reason for the shut down. This condition may be caused by an incorrect adjustment of the engine speed control. 2. Engine Overcrank – if the generator and engine are called to start but do not start after a three minute cranking cycle, they will cease to start and the overcrank alarm will come on. The generator will not attempt another start until the problem has been corrected. See the manufacturer brochure in Volume II of this O&M Manual to determine the reason for engine overcranking. 3. Low Oil Pressure – when the engine oil pressure is too low this alarm will come on and shut down the generator and engine. The alarm light will come on indicating this condition. See the manufacturer brochure in Volume II of this O&M Manual to determine the reason for low engine oil pressure. 4. High Temperature – when the engine temperature gets too hot this alarm will come on and shut down the generator and engine. The alarm light will come on indicating this condition. One reason for high engine temperature may be improper operation of the building ventilation system; check the ventilation system. See the manufacturer brochure in Volume II of this O&M Manual to determine the other reasons for engine overheating. 5. No Speed Signal – this alarm light will come on if the engine starts but does not reach the prescribed speed. See the manufacturer brochure in Volume II of this O&M Manual to determine the reason for the no speed signal.
The generator does not start during a real or simulated power failure.	1. Check the “auto-off-manual” switch on the generator control panel; make sure it is in the “auto” position. 2. Check that the four position switch (“test-off-auto-engine test”) on the face of the transfer switch is in the “auto” position. 3. Ensure there are no alarms indicated on the generator control panel. If so, see Troubleshooting for generator alarms (above).

Problem	Solution
The generator does not start during a real or simulated power failure (continued).	4. Check the generator start delay timer and its timer setting. It may be set for too much time. It should be set for 10 seconds. 5. If all controls are in "auto" but the unit is not cranking, try to start the generator manually by turning the four position switch on the transfer switch to the "test" position. If the generator starts manually, there may be a problem in the automatic control circuits. If the generator has started, check the frequency of power being generated to ensure it is within the recommended range (57 – 63 Hz). 6. If the generator does not start manually as in Step 5, try starting the generator by turning the four position selector switch to the "engine test" position. This should start the generator but will not transfer the electrical load. 7. If Step 6 fails to start the generator, try starting the generator by turning the "auto-off-manual" switch on the generator control panel to the "manual" position. 8. If Step 7 fails to start the generator, check for mechanical issues, such as a dead battery (e.g. the engine won't crank over). 9. If the engine cranks but does not run, check for the reason for not starting (i.e. no fuel). Also see the manufacturer brochure in Volume II of this O&M Manual.
The generator starts during a real or simulated power failure but the pumphouse electrical load is not transferred to the generator.	1. Check the breaker on the right side of the generator control panel. It must be "on". 2. Check the engine speed pick-up timer in the transfer switch and its timer setting. This timer must time out before the electrical load is transferred. The timer may be set too high (should be set for 5 seconds) or may be malfunctioning. 3. Check the steel transfer level. The transfer level should be in the opposite position from when the facility is being served by normal utility power.

3.9 Monitoring & Sampling

3.9.1 Monitoring

Monitoring programs are carried out to help ensure all systems are functioning correctly as they provide important feedback to the operators, helping them track progress of the system and providing warning or notice when issues arise. Monitoring programs also ensure any requirements or guidelines for water quantity and/or quality are being met; these requirements are typically provided in the community's water license. Monitoring programs form an integral part of the O&M for all facilities and it is important to ensure they are being completed successfully. It is important that the Hamlet carry out a monitoring program as part of the daily, monthly and annual operations of the water distribution system.

The water license for the Hamlet of Coral Harbour outlines the Monitoring Program for the community and requires only one monitoring station for the water distribution system. This station, COR-1, is located at the Post River water intake and will be used to measure and record the volume of water removed from the river.

A second monitoring station is required under the *Public Health Act* Consolidation of *Public Water Supply Regulations* (R.R.N.W.T. 1990,c.P-23), enforced by the GN Department of Health and Social Services (GN-HSS). This station is actually sampled at more than one location, including the raw water (either from the reservoir or from the pumphouse before chlorination), the water trucks, and a few taps within the community. The COR-7 station is used to collect samples of drinking water for bacterial characteristics.

Table 3-1 Monitoring stations for the water distribution system

Monitoring Program Station Number	Description	Monitoring Requirement	Location
COR-1	Potable water supply at Post River	Volume (m^3)	64° 8' 38" N 83° 11' 58" W
COR-7 (not included in Water License)	Raw water, water trucks, and a few taps within the community	Water Quality	-

COR-1

At COR-1 the volume (cubic metres, m^3) of water being removed from the Post River should be recorded on a monthly basis. Volume of water being removed can be obtained from an intake pump flow meter, located in the pump shack. A logbook or record form should be used to record volumes and should be located in an area near the intake pump flow meter or easily accessible to those who will be recording volumes. If water is being pumped from the Post River for more than one day, the volume should be recorded in the logbook every day. At the end of the month, the Hamlet Maintainer will use the logbook to tally the monthly volume of water pumped from the Post River.

If an intake pump flow meter is not present on the system, the total volume of water removed from the Post River can be estimated from the total volume of water removed from the reservoir in the previous year. Volume of water removed from the reservoir can be obtained from the flow meters at the pumphouse or from the tallied volumes of water delivered.

In the pumphouse a water meter and read-out system records how much water is being pumped when the truck fill system is used. A sensor in the pumphouse water line detects the amount of water flowing past it from the reservoir and sends a signal to two read-outs:

- The first read-out is a non-resettable totalizer and flow rate indicator and is located on Control Panel #1. This read-out shows the total amount of water that has been pumped through the pumphouse since the facility was put into operation. It also has a needle meter which indicates the current pump flow rate in litres per minute (L/min).
- The second read-out is a resettable totalizer and is mounted on Control Panel #2. You can re-set this meter before pumping to measure how much water is being pumped into a water truck or re-set this meter each year to record how much water is being pumped out of the reservoir. A non-resettable totalizer is also present in this read-out; it should read approximately the same as the read-out on Control Panel #1. The volume of water on this re-settable totalizer should be recorded around every month and at the end of every year, prior to reservoir re-filling, to obtain the total amount of water removed from the reservoir. Once the volume is recorded, the re-settable totalizer should be re-set. The annual volume of water removed from the reservoir can be used to estimate next year's volume of water pumped out of the Post River (e.g. the volume of water pumped out of the reservoir in 2007 provides an estimate of the volume of water pumped out of the Post River in 2008).

To obtain water volume pumped out of the Post River in the current year using delivered water volumes, tally the total volume of water delivered by the trucks in the previous year. Within the water trucks, a microchip system records how much water is distributed to residences and other buildings every day. Water Truck Drivers upload these numbers into a computer program at the Hamlet Office following each day water is delivered.

At the end of the year, all monthly volumes will be tallied to obtain the annual volume of water removed from the Post River. The monthly and annual volumes of water will be reported to the NWB in the Hamlet's Annual Water License Report.

COR-7

At COR-7, a water sample for *E. coli* and other bacteria should be taken once per month at a minimum. Water samples should be taken from the reservoir (raw water), water trucks, and from two to three buildings in the community (tap water).

Indian and Northern Affairs Canada (INAC) Water Resource Officers (Inspectors) will also take drinking water samples for chemical characteristics; these samples are taken at least once every two years. INAC Inspectors report the results to the Hamlet and GN Environmental Health Office.

3.9.2 Sampling Procedures

Bacterial water samples will be taken by the Hamlet Foreman and sent to the GN Environmental Health Laboratory in Rankin Inlet to be analysed.

A water sampling procedure for bacteria is found in **Appendix D**. These procedures are consistent with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater*. The sampling procedure should be carried out for all bacterial sampling of the water distribution system to ensure the correct sample bottles are obtained, proper sampling procedures are completed and contamination of samples is minimized.

3.10 Record Keeping

Records of activities, inspections and sampling for the water distribution system should be kept. These records should be stored at the Hamlet Office and kept by the SAO. These records will assist with the planning of annual operations and maintenance of the system, as well as assess how well system components are functioning.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The SAO is responsible to ensure the Annual Report is submitted annually. The Annual Report provides the NWB with information pertaining to the results of the Monitoring Program, volumes of water consumed, volumes of wastewater discharged, and summaries of any modifications, major maintenance work, and spills.

Therefore, at a minimum, the following records should be kept:

- Number of trips water trucks make per day;
- Volume of water pumped from the Post River monthly and annually;
- Volume of water consumed by the community monthly and annually;
- Dates any sampling has been completed;
- Results from any sampling;
- Dates and description of any maintenance activities (including inspections) carried out on the system by Hamlet personnel or other Inspectors;
- Dates and description of any modifications and/or major maintenance work, and abandonment and restoration work carried out on the system, including on associated equipment (e.g. water trucks, etc); and,
- Dates, description and clean-up activities of any spills (fuel, oil, etc) related to the water distribution system.

4 Sewage Disposal Facility Operations & Maintenance

4.1 Equipment

The two main components of the sewage disposal facility at Coral Harbour are the detention cell (with an area of 25,300 m^2) and the tundra wetland (with an area of approximately 200,000 m^2). Two sewage vacuum trucks are required to operate the sewage disposal facility; one sewage truck is a back-up and is used infrequently. The volumes of the three trucks are:

- 6000 L
- 6000 L
- 4800 L (back-up truck)

4.2 Site Personnel

The SAO has overall responsibility for the operation and maintenance of the sewage disposal system. The SAO is responsible to ensure proper operation and maintenance of the system is carried out, including sampling, inspections, and annual reporting to the NWB.

The Hamlet Foreman is responsible for day-to-day operation and maintenance of the sewage facility, including managing daily sewage collection, ensuring sewage volumes are recorded, sampling wastewater, and completing inspections and other maintenance activities.

The Hamlet typically has three (3) individuals hired to operate the sewage vacuum trucks and collect sewage from community buildings on a daily basis. These individuals also operate the Hamlet's water trucks. The Sewage Truck Drivers are responsible for recording and reporting the volume of sewage released to the detention cell daily, and inspecting the sewage trucks.

4.3 Health & Safety

All personnel working within the sewage disposal facility should be made aware of potential health hazards associated with working around sewage and wastewater. This is imperative so individuals make a conscious effort to perform all necessary safety procedures to protect themselves, their co-workers and family members at home. Safety precautions include:

- Ensure all equipment is kept as clean as possible;
- Assume anything touched by sewage is contaminated;
- Protective clothing such as coveralls, gloves, boots and safety glasses are to be provided to personnel and worn at all times when working around sewage;
- Workers must always wear protective gloves when hands are chapped, burn, or have a rash or a cut;
- Workers work clothing is not worn home, work clothing must be left at work;
- Workers wash their hands with soap and water on a regular basis, especially before delivering drinking water, eating and before going home;

- Workers are prohibited from eating or drinking in and around the sewage vacuum trunks; and
- Workers keep their vaccinations up to date.

See Section 6 of this O&M Manual for emergency response procedures in the event of a sewage spill at the sewage disposal facility or elsewhere within the community.

4.4 Operations

In Coral Harbour, sewage is collected Monday to Friday every week of the year and is released into the detention cell, located approximately 3 km north of the community. Sewage effluent from the detention cell seeps continuously through its permeable berms and enters the tundra wetland where it receives treatment. As little is required in the way of operational procedures for the detention cell or tundra wetland, basic operational procedures for the sewage disposal facility have been developed. Components of the sewage disposal facility are illustrated in Figure 3 in **Appendix B**.

The following procedures should be carried out daily when sewage collection and release to the detention cell occurs.

1. Sewage is collected Monday through Friday from holding tanks in residences and other buildings in the community. Sewage is collected through the use of sewage vacuum trucks.
2. The vacuum trucks pump out sewage from the building holding tanks and transport it to the detention cell.
3. Sewage is deposited into the detention cell from the vacuum trucks using one of three offload chutes and concrete splash pads, located on the east side of the offload truck pad. The sewage truck backs up to one of the offload chutes and the release valve of the truck is opened. Bollards with railings have been placed in front of each offload chute for safety precautions.
4. The sewage truck driver should record the daily wastewater volumes discharged to the detention cell and the number of trips they make there per day. A logbook or other record form should be kept in each truck for this purpose. An example Sewage Volume Record form located in **Appendix F** can be used for this purpose.
5. The detention cell provides some primary treatment of sewage though mainly functions to hold back solids. Sewage effluent seeps through the permeable east and southeast berms of the detention cell into the tundra wetland.
6. Once in the tundra wetland, the effluent flows in an east direction, receiving treatment from native vegetation, soil bacteria, and the chain of small ponds and boggy areas. The tundra wetland discharges to a freshwater lake.

Sewage is discharged into the detention cell year round. In the winter, the sewage freezes in the fenced detention cell and discharges upon melt in the spring.

4.5 Maintenance

Maintenance activities for the sewage disposal facility should be performed by the Hamlet on a monthly and/or annual basis, depending on the facility component. The following sections outline procedures for proper maintenance of the detention cell, tundra wetland, flow diversion berms, sewage trucks, access road and truck pad.

Inspections are an integral part of the maintenance procedures of the sewage disposal facility as they identify concerns and deficiencies, and recognize areas or components which need improvement, correction, repair, and/or replacement. All maintenance inspections should be completed by the Hamlet

Foreman or a licensed engineer, where required, and all inspection records should be filed at the Hamlet Office. Any problems or issues noted during the inspections should be communicated to the Hamlet Foreman and/or SAO as soon as possible. Sewage Disposal Facility Inspection Forms have been included in **Appendix F**.

Detention Cell

The following maintenance activities should be carried out to ensure the detention cell remains in sound condition:

- Monthly inspection of the offload chutes and safety railings for condition and stability;
- Monthly inspection of the detention cell berms for stability;
- Monthly inspection of the detention cell outlet structure;
- Monthly inspection of the fence around the detention cell and prompt repairs when required; and,
- Annual geotechnical inspection of the detention cell berms by a qualified engineer.

Tundra Wetland

Maintenance activities within the tundra wetland should be performed to ensure the wetland effectively treats wastewater and

- Monthly inspection of the flow diversion berms for condition and stability.
- Monthly inspection of signage throughout the tundra wetland to ensure it is still present and readable.
- During early spring and late fall, daily inspections of the drainage courses should be conducted to determine when flow is present. Inspections should take place at each monitoring station. Presence of flow within the tundra wetland in early spring will initiate the Monitoring Program while lack of flow in late fall with terminate the Monitoring Program (see Section 4.5).
- Sampling at tundra wetland monitoring stations when required (see Section 4.5).

Sewage Trucks

Sewage collection from residences and buildings in the community is a key component of the sewage disposal facility. It is very important that the sewage trucks are kept in good condition and any repairs are given top priority and completed immediately to ensure continued collection service.

Sewage trucks and tanks should be inspected on a daily basis for leaks (sewage and fuel or oil), proper lighting, hose and valve operation, and basic condition (e.g. rust). Sewage trucks should be parked in a heated garage in the winter to prevent the tanks from freezing and full tanks should not be allowed to rest for long periods of time, especially in winter.

The trucks should also receive a mechanical inspection by a certified mechanic at least once per year.

Access Road & Offload Truck Pad

To ensure continued access to the sewage disposal facility, the Hamlet should regularly perform basic road maintenance activities on the access road and offload truck pad. The following should be carried out:

- Weekly inspection of the truck pad offload areas should be conducted by the vacuum truck drivers to examine for signs of erosion or other issues;

- The access road and offload truck pad should be graded and re-shaped at least once per year, or more often as required;
- The access road and truck pad should be cleared of snow regularly in the winter, taking care to not damage berms, offload chutes, detention cell fence and other areas;
- Any repairs or erosion issues related to the access road or truck pad should be repaired promptly; and,
- Any spilled and/or frozen wastewater should be removed and deposited in the detention cell. See Section 6 for sewage spill contingency plans.

4.6 Monitoring & Sampling Procedures

4.6.1 Monitoring Requirement

Monitoring programs are carried out to help ensure all systems are functioning correctly as they provide important feedback to the operators, helping them track progress of the system and providing warning or notice when issues arise. Monitoring programs also ensure any requirements or guidelines for water quantity and/or quality are being met; these requirements are typically provided in the community's water license. Monitoring programs form an integral part of the O&M for all facilities and it is important to ensure they are being completed successfully.

The Monitoring Program outlined in the Hamlet's water license requires that six stations are monitored within the sewage disposal facility. These stations will provide water quality or quantity information to operators and regulators and help assess the sewage treatment performance of the tundra wetland. These stations and their locations are provided in Table 4-1 below; monitoring stations are also depicted in Figure 3 in **Appendix B**.

Table 4-1 Monitoring stations for the sewage disposal facility

Monitoring Program Station Number	Description	Monitoring Requirement	Location
COR-2	Sewage truck release point (into the detention cell)	Volume (m^3)	64° 9' 49" N 83° 11' 47" W
COR-3	Effluent from within the detention cell	Water Quality	64° 9' 47" N 83° 11' 41" W
COR-4a	Station within the tundra wetland, 113 m southeast of the detention cell	Water Quality	64° 9' 45" N 83° 11' 27" W
COR-4b	Station within the tundra wetland, 143 m east of the detention cell	Water Quality	64° 9' 47" N 83° 11' 19" W
COR-4c	Station within the tundra wetland, 337 m southeast of the detention cell	Water Quality	64° 9' 42" N 83° 11' 8" W
COR-5	Final discharge point of the tundra wetland, 578 m east of the detention cell	Water Quality	64° 9' 48" N 83° 10' 50" W

COR-2

At station COR-2, the monthly volume (cubic metres, m^3) of effluent released from each sewage truck should be monitored. A logbook or record form should be kept within each sewage truck. Every time a truck releases effluent into the detention cell, the volume released should be recorded in the logbook or record form, as well as the total number of trips to the detention cell per day. Logbooks/record forms should be filed at the Hamlet Office each week.

At the end of each month, the SAO will tally the volumes to obtain the monthly volume released. Similarly, at the end of each year, the monthly volumes will be tallied to obtain the volume of effluent released throughout the year (annually). The monthly and annual volumes of effluent released will be reported to the NWB in the Hamlet's Annual Report.

COR-3, COR-4a, COR-4b, COR-4c & COR-5

The effluent at COR-3, COR-4a, COR-4b, COR-4c and COR-5 stations should be sampled at the beginning, the middle and near the end of the open water season at Coral Harbour, when water flow is present. The presence of water flow will be determined in the early spring and late fall by daily inspections of the tundra wetland drainage courses.

All effluent samples taken from the monitoring stations will be analysed for:

- Biochemical Oxygen Demand (BOD_5)
- Faecal Coliforms
- Total Suspended Solids (TSS)
- pH
- Conductivity
- Oil & Grease (visual)
- Total Phenols
- Ammonia Nitrogen
- Nitrate & Nitrite
- Anions and Cations (includes magnesium, calcium, sodium, potassium, chloride and sulphate)
- Total Hardness
- Total Alkalinity
- Total metals (including aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel and zinc)
- Total Organic Carbon

Additionally, at the middle of the open water season, toxicity samples need to be taken COR-5, the final discharge point of the sewage disposal facility. These toxicity samples will be tested to determine if the effluent leaving the tundra wetland is toxic to fish and zooplankton; rainbow trout (*Oncorhynchus mykiss*) and water fleas (*Daphnia magna*) will be tested as per Environment Canada's Environmental Protection Series Biological Test Methods (EPS/1/RM/13 and EPS/1/RM/14).

4.6.2 Water Sample Procedures

As mentioned above, the effluent at stations COR-3, COR-4a, COR-4b, COR-4c and COR-5 should be sampled at least three times a year when water flow is present within the tundra wetland (beginning, middle and near the end of the open water season). Effluent samples will be taken by the Hamlet Foreman, or other trained personnel appointed by the Hamlet Foreman, and sent to Taiga Laboratory in Yellowknife to be analysed. The parameters listed above will be examined in effluent samples from all tundra wetland monitoring stations.

A water sampling procedure for the tundra wetland is found in **Appendix E**; a procedure for collecting toxicity samples is also included. These procedures are consistent with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater*. The water sampling procedure should be carried out for all sampling in sewage and solid waste facilities to ensure the correct

sample bottles are obtained, proper sampling procedures are completed and contamination of samples is minimized.

4.7 Sewage Sludge Management

Sewage sludge is generated by the settling of wastewater solids during primary treatment. Sludge produced in Coral Harbour would be considered 'lagoon sludge' (FSC 2001) and will be contained within the detention cell. The amount of sludge accumulation in the detention cell needs to be monitored to ensure the accumulation does not exceed a certain percent volume of the cell.

The quality of the effluent will determine when a sludge management program is initiated. Sludge is typically monitored annually to determine its volume and physical and chemical characteristics. The monitoring indicates when the performance of the detention cell starts to degrade. Sludge may need to be removed from the detention cell and disposed of if too much begins to accumulate and/or it becomes contaminated. Sludge contains a great deal of high-value organic matter and nutrients and is used in a lot of places around the world as fertilizer for crops. However sludge contamination can result from mixing of domestic wastes with industrial and household hazardous wastes (e.g. cleaning chemicals, prescriptions, solvents, etc dumped down the drain), which are then concentrated into the sludge during primary treatment.

Sludge must be sampled and tested to ensure the disposal method selected is appropriate, safe and environmentally responsible. The sludge may be of a quality suitable for land disposal. If the sludge is not suitable for land disposal, it may be disposed of at the MSW disposal facility if it meets the facility's requirements. The sludge may require additional treatment before disposal (FSC 2001).

The sewage sludge has not been sampled in Coral Harbour. Before an appropriate sludge management plan can be developed, the sludge should be sampled to obtain its chemical and physical characteristics. Additionally, the volume of sludge in the detention cell should be measured. Once the chemical composition of the sludge is understood, a sludge management plan can be developed to explore the best options for removal and disposal.

4.8 Record Keeping

Records of activities, inspections and sampling for the sewage disposal system should be kept. These records should be stored at the Hamlet office and kept by the SAO. These records will assist with the planning of annual operations and maintenance of the system, as well as assess how effective the system is operating.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The Annual Report provides the NWB with information pertaining to the results of the Monitoring Program, volumes of water consumed, volumes of wastewater discharged, and summaries of any modifications, major maintenance work, and spills.

Therefore, at a minimum, the following records should be kept:

- Number of trips sewage trucks make per day;
- Volume of wastewater released into the detention cell daily (tallied for monthly and annual volumes);
- Dates any sampling has been completed;
- Results from any sampling;
- Dates and description of any maintenance activities (including inspections) carried out on the system by Hamlet personnel or other Inspectors;

- Dates and description of any modifications and/or major maintenance work, and abandonment and restoration work carried out on the system, including on associated structures, facilities and equipment (e.g. old sewage disposal facility, sewage trucks, etc); and,
- Dates, description and clean-up activities of any spills (sewage, fuel, oil, etc) related to the sewage disposal system.

5 Solid Waste Disposal Facilities Operations & Maintenance

5.1 Equipment

The Hamlet uses the following equipment to operate the two solid waste facilities at Coral Harbour:

- Modified Ford truck with compactor, estimated weight capacity is 2300 kg
- CAT loader
- CAT bulldozer

The primary solid waste facility is used to dispose of MSW collected from community residences and other buildings (MSW disposal facility). This site is inclusive of the fenced and bermed MSW disposal facility, as well as the bulk metal waste disposal area, located 175 m south.

The second solid waste facility is only used to dispose of animal hides and carcasses from commercial hunts (carcass disposal facility). This site is maintained by the Hamlet and covered annually, though it has not been used for a few years.

The following sections primarily relate to operation and maintenance of the MSW disposal facility.

5.2 Site Personnel

The SAO has overall responsible of the solid waste disposal facilities to ensure proper operation and maintenance is carried out, including compacting, burning, covering, inspections, sampling, and annual reporting to the NWB.

The Hamlet Foreman is responsible for day-to-day operation and maintenance of the solid waste facilities. All day-to-day activities take place at the MSW disposal facility, including managing waste collection, proper segregation of waste, compacting and burning of waste, sampling leachate from the facility, completing inspections and other maintenance activities. The Hamlet Foreman is also responsible to ensure the carcass disposal facility is properly covered when required.

The Hamlet typically has one individual hired to operate the waste compactor truck and collect waste from community buildings five days a week. This Waste Truck Driver is also responsible for ensuring collected waste is properly segregated, and refusing the collection of hazardous waste if present. If properly trained, this individual may also be required to operate heavy equipment at the MSW disposal facility.

5.3 Health & Safety

The public and all personnel working within the MSW disposal facility should be made aware of potential health and safety hazards associated with working around municipal solid wastes and hazardous wastes. This is imperative so individuals make a conscious effort to perform all necessary safety procedures to protect themselves, their co-workers and family members at home. The requirements of the Nunavut *Safety Act* will be followed at all times. A site-specific safety plan should be developed by the Hamlet for the MSW disposal facility. The site-specific safety plan should outline all potential hazards, safe work practices, training requirements, equipment requirements (e.g. fire extinguishers, spill response kits), and emergency procedures.

Public access to the MSW disposal facility should be restricted to specific areas to minimize potential hazards to the public. Additional health and safety precautions for the public and site personnel will be taken during burning of MSW, accidental spills.

See **Section 6** of this O&M Manual for emergency response procedures in the event of a fire or spill at the MSW disposal facility.

5.4 Municipal Solid Waste Disposal Facility

5.4.1 Operations

5.4.1.1 Waste Segregation

The MSW disposal area is fenced however the Hamlet does not typically control who disposes of waste, where, when, what or how much is disposed. Proper waste segregation is imperative to the long-term operation of the facility as it helps ensure potential human health and environmental hazards are minimized, un-compactable wastes (e.g. bulky metal wastes) are kept out of the landfill, hazardous wastes are properly managed, and waste re-use and recycling can occur.

The MSW disposal facility at Coral Harbour was likely designed as a natural attenuation landfill. This means that the landfill is not lined and small amounts of contaminants can enter the surrounding environment to be naturally broken down. In this type of landfill, the rate that contaminants enter the environment is expected to occur at a rate such that contaminants can easily be broken down and the surrounding environment is not overwhelmed. Natural attenuation landfills also rely on permafrost aggrading into the covered waste cells of the landfill and eventually freezing them. However, as contaminants are able to freely enter the environment in this type of landfill, proper waste segregation is important to ensure harmful contaminants are kept out of the landfill.

Initial waste segregation should begin at the community's residences and other buildings, ensuring residents and business are familiar with acceptable wastes for the MSW facility. Household hazardous or bulky wastes need to be kept out of the landfill and Burn Area and need to be transported to the appropriate disposal/storage locations.

The Waste Truck Driver should be familiar with operational procedures for the MSW disposal facility, acceptable wastes for burning and landfilling (see Section 5.3.1.2 for appropriate burnable waste), and proper waste segregation practices. Ultimately the Hamlet Foreman (site operator) is responsible to ensure proper waste segregation occurs.

The Waste Truck Driver should monitor the waste they collect from community buildings every day, collecting only that which is acceptable for disposal at the MSW disposal facility. The Hamlet does provide a 'grace' day once per year to collect residents' household hazardous and/or bulk metal waste. The Hamlet will also provide help to residents who have larger items to dispose of and have no means of transporting them to the correct disposal area.

The MSW disposal facility needs to be properly signed to inform operators and residents of the correct location to dispose of or store certain wastes. At a minimum, the MSW disposal facility should have disposal/storage areas for:

- Domestic burnable waste (for burning and landfilling) – a selected Burn Area
- Domestic non-burnable waste (for landfilling)
- Treated wood and wood products
- Building/construction materials

- Bulk metal waste – the separate bulk metal waste disposal area
- Re-usable/recyclable material (i.e. salvage area)
- Household hazardous wastes (i.e. Hazardous Waste Storage Area)

Seacans or constructed drum shelters can be used to store specific household hazardous wastes before being shipped out of the community. Hazardous waste management is described in Section 5.5 below.

5.4.1.2 Burning

Once waste has been properly segregated, burnable waste should be burned at least once per week to keep the volume of waste manageable. Burning should only occur when winds are light and blowing away from the community. Table 5-1 outlines wastes acceptable for burning.

Table 5-1 Examples of burnable and non-burnable waste

Burnable	Non-Burnable
Domestic waste (e.g. food waste, paper products, paperboard/cardboard packaging, etc) Non-treated wood (this can also be recyclable/salvageable)	Non-wood building / construction materials (e.g. roofing materials, electrical wire, insulation, plastics, asbestos, etc) Treated wood (e.g. telephone poles, pilings, cribbing, foundation wood) Asphalt & asphalt products Tires Hazardous wastes Waste paint Fuel & lubricant containers Aerosol cans & other compressed gas containers (e.g. propane tanks)

In Coral Harbour, the Hamlet personnel typically control burning at the MSW disposal facility. The Hamlet applies for a permit to burn through the Fire Department and then carry-out burning of MSW. The Fire Department will occasionally manage the open burning at the MSW disposal facility. Regardless, controlling the open burn is extremely important to reduce the risk of uncontrolled fire and hazards to the public, employees and the surrounding environment. Burning practices at the MSW disposal facility should include:

- Confirmation of weather forecasts prior to any burning. If heavy rain is or will be present, burning should be postponed (burning during heavy rain events may result in poor or incomplete combustion and the potential to generate harmful contaminants).
- Confirmation of wind speed and direction prior to any burning. If loose debris can be carried by the wind, burning should be postponed.
- Burning in a selected Burn Area only and ensuring burning does not occur in landfill piles
- Presence of an attendant during initial stages of the burn and periodic inspection of the burn once it has been established.
- Maintaining a minimum of 5 m buffer zone around the burning area and all ensuring attendants or personnel remain upwind of the burn area.
- Closing the MSW disposal facility to the public during burn events.

- Confirmation the MSW is no longer hot or burning prior to the addition of more waste, or covering with granular material. This can be accomplished by moving around the ash and remaining materials to ensure the fire is out and material can cool.

5.4.1.3 Municipal Solid Waste Facility Operational Procedure

The MSW disposal facility requires daily, weekly and monthly operations to ensure it continues to optimally function as the Hamlet's primary MSW disposal site, and potential public health and environmental hazards are minimized.

Specific information regarding waste segregation and burning were provided in the preceding section. Further information on hazardous waste management at the MSW disposal facility is provided in Section 5.5 below. The following general procedure should be followed to ensure proper operation of the MSW disposal facility:

1. The Waste Truck Driver collects MSW from community buildings five times per week. The modified compactor truck has estimated weight capacity of 2300 kg and is used to collect and transport MSW to the MSW disposal facility.
2. The number of trips and estimated weight of every load transported to the facility should be recorded in a log book or record form kept in the compactor truck (a Solid Waste Quantity Form is included in **Appendix F**). If waste is present at the MSW facility that has been brought by others, the Waste Truck Driver should make an estimate of the quantity and record this as well. Trip records should be filed at the Hamlet Office once per week. The SAO will include results in the Hamlet's Annual Report to the NWB.
3. At the MSW disposal facility, waste from the compactor truck will be tipped into the Burn Area. The Waste Truck Driver should then complete an initial inspection of the waste pile to ensure it does not contain any non-burnable wastes. If so, waste should be diverted to the appropriate disposal areas:
    - Household waste is dumped out of the compactor truck in the selected Burn Area of the MSW disposal facility. Waste is properly segregated into burnable and non-burnable waste;
    - Any non-burnable, non-hazardous waste should be moved to the edge of the covered portion of the MSW disposal facility landfill (tipping face);
    - Any materials requiring disposal in the bulk metal waste facility should be transported there;
    - Hazardous waste materials need to be transported to their appropriate storage areas; and,
    - Reusable/recyclable materials (e.g. wood) should be transported to the Salvage Area of the MSW disposal facility. Salvaging of materials will only be supported in the designated Salvage Area due to public health and safety concerns.
4. Burning of combustible waste should only occur in the designated Burn Area. Burning should occur at least weekly to ensure materials are burned in manageable volumes. However conditions for open burning depends on weather and burning should only occur when winds are light and blowing away from the community. A permit to burn MUST be obtained from the Coral Harbour Fire Department before any burning occurs. The guideline for *Municipal Solid Wastes Suitable for Open Burning* from the GN Department of Environment (GN-ENV) can be found at their website ((http://www.gov.nu.ca/env/environment.shtml).

5. After every burn, once the MSW is confirmed to be cold and not burning, the CAT bulldozer should push the ash and remaining material to the landfill tipping face.
6. At least twice per month, the CAT bulldozer should be used to push the collected MSW pile over the edge of the landfill tipping face and spread out the MSW. The waste should be worked upslope gradually, to a maximum 3:1 grade. The CAT loader should drive over the waste pile at least three to five times to ensure it is packed down and the 3:1 grade is achieved.
7. The act of burning (waste reduction) and compaction should result in a manageable waste mound on the landfill tipping face that can be covered annually. The waste mound should only be allowed to reach two metres high. Annually, or once the waste mound is approximately three metres wide, the waste mound should be covered with 0.3 m of granular material and packed down to form a covered waste cell.

5.4.1.4 Bulk Metal Waste Disposal Area Operational Procedure

The bulk metal waste disposal area requires less operational activity than the MSW disposal area (e.g. does not need to be burned or covered) however proper waste segregation is required and only specific materials should be disposed of here. The following is a list of materials acceptable for disposal in the bulk metal waste disposal facility:

- Large metal wastes (i.e. clean and decommissioned fuel tanks and drums, towers, poles/posts, culverts, etc);
- Tires;
- Appliances; and,
- Properly abandoned vehicles, snowmobiles, and all-terrain vehicles;
    - *Properly abandoned* implies all vehicles have had their batteries removed and have been drained of fuel, oil, antifreeze, transmission fluid, and other fluids; these wastes should be properly stored in the hazardous waste stream.
    - Vehicles can also contain ozone-depleting substances (ODS') in their air conditioning systems. These systems should be properly decommissioned by a qualified technician.
    - Once vehicles have been properly abandoned, they should be tagged to indicate they have been inspected and meet these criteria.

All waste within the bulk metal waste disposal area should eventually be removed from the community through a back haul program and properly disposed of at appropriate receivers. The Hamlet is working with other communities and the Northern Transportation Company Ltd (NTCL) to establish a backhaul program to remove and dispose of materials at the bulk metal waste disposal area (Hedley, *pers. comm.*).

5.4.2 Maintenance

5.4.2.1 Inspections & Audits

Regular inspections of the MSW disposal facility will provide the Hamlet Foreman, SAO and other personnel with information on the effectiveness of waste segregation, burning, landfilling, signage, and any remedial activities. Inspections are an integral part of the maintenance procedures of the MSW disposal facility as they identify any concerns and deficiencies, and recognize areas or items which need improvement, correction, repair, and/or replacement.

The Hamlet Foreman, or trained personnel appointed by the Hamlet Foreman, should complete weekly inspections of the entire MSW disposal facility, including the bulk metal waste disposal area and

hazardous waste storage area. Site Inspection Forms will be used to document the findings of the inspections and ensure basic items requiring weekly inspection and/or maintenance are examined. Site Inspection Forms will also document other relevant information, such as weather conditions, health and safety concerns, and follow-up on any incidents which may have occurred (e.g. accident, fires, flooding, spills, etc) or deficiencies noted in previous inspections. The following factors will be inspected:

- Site equipment (including heavy equipment, signage, and any storage containers)
- Site infrastructure (including access road, truck pads, drainage systems, fencing, berms, landfill cover and erosion)
- Waste segregation
- Burn completion and proper practices
- Health and safety concerns (public and personnel)
- Hazardous waste storage area

The Site Inspection Forms should be filed at the Hamlet Office and results reported to the SAO monthly. The SAO is required to include inspection results and maintenance activities in the Hamlet's Annual Report to the NWB. MSW Disposal Facility Inspection Forms have been included in **Appendix F**.

Following year end, the Hamlet will undertake a review of the past year's inspection results and follow-ups to determine where improvements to the MSW disposal facility are required. These improvements should be documented and the O&M Manual updated.

5.4.2.2 Maintenance Activities

Specific maintenance activities may need to be completed on components of the MSW disposal facility. This will help ensure the facility remains in good condition, appropriate practices are followed, and human health and safety, and environmental hazards are minimized. The following maintenance activities may be periodically required:

- Grading (in summer) or clearing snow (in winter) of all access roads and truck pads used for the MSW disposal facility;
- Repair of drainage ditches from erosion;
- Fence repair;
- Repair or replacement of signage;
- Litter which has been wind carried to the surrounding area outside the MSW disposal facility fence should be removed and deposited in the facility;
- Litter which has accumulated against the fence of the MSW disposal facility should be removed and deposited in the facility; and
- Repair of the MSW disposal facility berm, culvert or landfill cover from erosion or settling.

5.5 Hazardous Waste Management

Hazardous wastes are those that are known to be dangerous due to their chemical, physical or biological properties, are no longer used for their original purpose, and are intended for recycling, treatment, disposal or storage (GNWT 1998, GN-ENV 2002). All hazardous wastes require special handling, storage and disposal methods to prevent human health and environmental exposure.

The *Environmental Guideline for the General Management of Hazardous Waste* (GN-ENV 2002) provides information regarding the proper management of hazardous waste in Nunavut, and has the intent to establish a monitoring system for hazardous wastes, from generation to final disposal. From the *Guide*, the generator of any hazardous waste is ultimately responsible for ensuring it will be properly managed from is creation to its disposal (GN-ENV 2002). Generators typically use carriers to transport the hazardous waste to appropriate receivers for disposal. Both carriers and receivers need to be registered with GN Environmental Protection Service and follow specific regulations and training.

Coral Harbour's MSW disposal facility is only licensed to accept municipal wastes for disposal and shall only accept household hazardous wastes for storage. Industrial hazardous wastes shall not be accepted for storage or disposal at the Coral Harbour MSW disposal facility. Industrial sources (generators) are responsible to manage their own hazardous wastes.

The following hazardous waste operations and maintenance procedures deal with household hazardous wastes (HHW) only. Typical HHW which may be found in Coral Harbour include:

- Pesticides and herbicides
- Paint
- Solvents (e.g. paint cleaners)
- Flammable liquids
- Corrosive cleaners
- Batteries (wet and dry cell)
- Used fuel and oil
- Oil filters
- Antifreeze
- Propane tanks and cylinders
- Aerosol cans (not empty)
- Fluorescent light tubes and compact fluorescent light bulbs
- Fire extinguishers

Generally, any household items which have the following symbols are considered household hazardous wastes.

Corrosive Explosive Flammable Poison

Certain items considered HHW cannot be stored at the MSW disposal facility however. These include:

- Ammunition, flares and explosives (including fireworks) – contact the Coral Harbour RCMP for proper disposal
- Prescriptions, medications and bio-hazardous wastes (includes syringes) – dispose of these at the Nursing Station and/or Health Care Centre
- Reactive chemicals – contact the Hamlet office for disposal options
- Waste fuel – stored in 205 L steel drums at the Hamlet Garage; a waste oil heater will be installed at the Hamlet Garage in 2010 and will be used to heat the Hamlet Garage by burning waste fuel

Contaminated soil from spill clean-up is the only non-HHW that should be accepted by the Hamlet for storage at the MSW disposal facility. Contaminated soil is typically stored in 205 L steel drums and is shipped out of the community every year. Businesses or individuals wishing to store contaminated soil at the MSW disposal facility must contact the Hamlet Foreman or SAO to discuss storage options and fees. The decision to accept contaminated soil from industrial sources rests with the Hamlet.

5.5.1 Operations

The MSW disposal facility in Coral Harbour needs to have an area set aside as a Hazardous Waste Storage Area. This area also needs to be properly signed as the "Hazardous Waste Storage Area" and should have appropriate storage options for expected HHW. Proper signage helps operators of the MSW disposal facility, as well as the general public when residents arrive to dispose of their wastes.

The Hazardous Waste Storage Area is intended for storage only, not disposal. It is expected that hazardous wastes will be stored for up to five years. This should be sufficient time for the community to build up enough waste to make it economical for a back haul out of the community to a licensed waste receiver.

Once the Hazardous Waste Storage Area has been developed, the Hamlet should create a site map of the MSW disposal facility, detailing disposal and storage locations for various wastes. This site map should be posted at the MSW disposal facility, the Hamlet Garage and contained within the Spill Contingency Plan. All site personnel should be familiar with the MSW disposal facility layout and disposal/storage areas.

5.5.1.1 Collection

Since the MSW disposal facility is generally accessible to the public, residents can come and drop off HHW throughout the year. However the general public should not have direct access to the Hazardous Waste Storage Area for health and safety reasons. If the Hamlet does not restrict access to the MSW disposal facility, a designated public drop-off area for HHW should be used. The public drop-off area should be tended to on a daily basis by the Hamlet Foreman, Waste Truck Driver, or other designated and trained site personnel, to remove and properly store any deposited HHW.

The Hamlet also holds a 'grace' day for residents, helping residents collect and drop off their HHW or bulky metal wastes. This 'grace' day can be held once or twice per year (e.g. in spring and/or fall) and will be advertised in the community up to 30 days before the event. This grace day will encourage residents to drop off their HHW and bulky metals wastes, and provide information pamphlets on HHW, waste disposal, segregation, and recycling. Like many community-based management programs, successful implementation comes from informed and concerned residents. Providing facts and figures supporting proper disposal, segregation and minimization of hazardous wastes will help sustain hazardous waste management in the community.

5.5.1.2 Storage

All HHW collected need to be properly stored in the MSW disposal facility to ensure any environmental and human health hazards are minimized. The GN-ENV provides information on proper storage of specific HHW; these include

- Antifreeze – use original containers where possible, or bulk waste antifreeze into good condition 16 gauge or lower gauge steel or plastic 205 L drums
- Batteries – bulk waste batteries into good condition 16 gauge or lower gauge steel or plastic 205 L drums, or other form of containment away from weather; wooden pallets should be used to keep batteries and containers off the ground during storage and transport

- Fluorescent light tubes/compact fluorescent light bulbs – use original containers where possible and prevent breakage of light tubes/bulbs; keep away from weather.
- Ozone Depleting Substances (ODS') – do not landfill; wastes with ODS' (i.e. refrigerators and refrigeration equipment, vehicle air conditioners, ODS-containing fire extinguishers [typically purchased before 1997]) should be diverted to the bulk metal waste disposal area. The Hamlet can hire technicians to remove ODS' from stored equipment.
- Paint – use original containers where possible, or bulk compatible paints into good condition 16 gauge or lower gauge steel or plastic 205 L drums; do not mix different types of paint (i.e. alkyd and latex)
- Solvent – use original containers where possible, or bulk waste compatible waste solvents into good condition 16 gauge or lower gauge steel or plastic 205 L drums

See the GN-ENV website (http://www.gov.nu.ca/env/environment.shtml) for further information on guidelines for storage and disposal of HHW.

As the Hamlet currently stores waste oil in drums at the Hamlet Garage, it is recommended they register the site as a hazardous waste storage facility with the GN-ENV Environmental Protection Services (R. Eno, *pers. comm.*). Further, once the Hazardous Waste Storage Area is developed, the MSW disposal facility should also be registered. To register a facility, contact:

Robert Eno
Manager, Pollution Control
Environmental Protection Services
Government of Nunavut
P.O. Box 1000, Stn 1195
Iqaluit, NU X0A 0H0
Phone: (867) 975 – 7729
Email: reno@gov.nu.ca

When developing the Hazardous Waste Storage Area at the MSW disposal facility in Coral Harbour, several factors also need to be considered. From Phifer and McTigue Jr. (1988) and GN-ENV (2002), these are:

- Compatibility – compatibility of wastes and their storage containers, and wastes and nearby materials should be considered. For example, some wastes need to be stored in specific containers to minimize the potential for corrosion and leaks (e.g. acids cannot be stored in steel drums due to corrosion, waste fuel should not be stored long-term in plastic drums). Additionally not all wastes can be stored in the same area (e.g. flammable wastes near ignition sources).
- Packaging – storage of HHW in original containers is acceptable. Bulk storage of compatible HHW in 205 L 16 gauge or lower gauge steel or plastic drums is generally acceptable though may depend on the type of waste. All containers need to be in good condition and sealable. Contact the GN-ENV or a licensed waste carrier or receiver for advice on specific wastes. All storage containers also need to be properly labelled, following requirements of WHMIS or *Transportation of Dangerous Goods* regulations, if transport is planned.
- Regulatory Compliance – the GN-ENV *Environmental Guideline for the General Management of Hazardous Waste* and hazardous waste minimum storage volumes should be considered when planning the Hazardous Waste Storage Area.
- Segregation – if some HHW can be recovered or recycled at a later time, the HHW should be segregated and stored in a manner to allow this. Final destination of the HHW should be considered during storage.

- Ventilation – all HHW should be properly ventilated to reduce build up of potentially poisonous or noxious fumes. Most wastes should be stored outside in sheds or under roofs providing free air movement.
- Climate – not all HHW can be stored directly outside. Waste containers should be stored with some overhead cover (e.g. roof or tarp) and on an impermeable base to prevent contact with rain, snow and direct sunlight. This also makes clean up of spills and leaks easier and cheaper. Some communities utilise old seacans for storage of some HHW.
- Handling – all handlers of HHW will have proper training. At a minimum, all handlers should have WHMIS (Workplace Hazardous Materials Information System) training.
- Security – certain security precautions may need to be taken to prevent theft, accidental discharge or harm to the public from collected HHW. Only persons authorised and trained to handle HHW should have access to the Hazardous Waste Storage Area.

5.5.2 Maintenance

Inspection of the Hazardous Waste Storage Area should occur during the weekly inspections of the MSW disposal facility by the Hamlet Foreman or other trained personnel. Inspections of the Hazardous Waste Storage Area will be documented on Site Inspection Forms and will look for proper segregation and storage containers, container condition, spills and leaks, and follow-up on any incidents (e.g. spill) or deficiencies noted in the previous inspection.

As the Hazardous Waste Storage Area will be inspected with the MSW disposal facility, the Site Inspection Forms will be filed at the Hamlet Office and results reported to the SAO monthly. The SAO will include inspection results and maintenance activities in the Hamlet's Annual Report to the NWB. MSW Disposal Facility Inspection Forms have been included in **Appendix F**.

5.6 Carcass Disposal Facility

5.6.1 Operations

The carcass disposal facility, located near the Airport, is only used following commercial caribou harvests for animal hide and carcass disposal. Currently, the commercial harvest has been reduced so it is unknown when this disposal facility will be used again.

The following general operational procedures should be followed when the carcass disposal facility is in use:

1. All carcasses and animal wastes from commercial harvests shall be transported to the carcass disposal facility.
2. All carcasses and animal wastes will be placed in one small area of the disposal facility to minimize areal extent of the disposal and required cover material.
3. At the end of the commercial harvest season, the carcasses will be covered with granular material to a depth of 0.3 m. The covered carcasses should be driven over with the CAT bulldozer three to five times to pack the waste down.
4. Should the carcass disposal facility require closing out, a separate abandonment and restoration plan should be developed.

5.6.2 Maintenance

When the carcass disposal facility is in use during the commercial harvest season, the carcass disposal facility should be inspected by the Hamlet Foreman, or other trained personnel appointed by the Hamlet Foreman, following each carcass deposition. The inspection will examine contents deposited into the facility, ensuring only carcasses and animal wastes are disposed of. If additional wastes are disposed of in the carcass disposal facility, these must be removed and properly disposed of at the MSW disposal facility. Previously covered disposal areas will also be inspected for any erosion.

Inspection records should be filed at the Hamlet Office and inspection results communicated to the SAO on a monthly basis during use of the carcass disposal facility. The SAO is required to include inspection results and maintenance activities in the Hamlet's Annual Report to the NWB

5.7 Monitoring & Sampling Procedures

5.7.1 Monitoring Requirement

Monitoring programs are carried out to help ensure all systems are functioning correctly as they provide important feedback to the operators, helping them track progress of the system and providing warning or notice when issues arise. Monitoring programs also ensure any requirements or guidelines for water quantity and/or quality are being met; these requirements are typically provided in the community's water license. Monitoring programs form an integral part of the O&M for all facilities and it is important to ensure they are being completed successfully.

The Monitoring Program outlined in the Hamlet's water license requires that one station is monitored within the MSW disposal facility. This station will provide water quality information to operators and regulators and help assess the leachate quality leaving the MSW disposal facility and entering the sewage treatment tundra wetland. Leachate quality data will also help assess leachate treatment performance of the tundra wetland and provide an indication of waste segregation success. A description and the location of this station is provided in Table 5-2 below; at this time, a monitoring station is not required for the carcass disposal facility. The COR-6 monitoring station is depicted in Figure 4 in **Appendix B**.

Table 5-2 Monitoring station for the MSW disposal facility

Monitoring Program Station Number	Description	Monitoring Requirement	Location
COR-6	Run-off from the MSW disposal facility	Water Quality	64° 9' 40" N 83° 11' 29" W

The water at the COR-6 monitoring station should be sampled once per year during periods of run-off or seepage from the MSW disposal facility. The presence of water flow out of the MSW disposal facility will be determined by weekly inspections of the MSW disposal facility drainage systems, particularly between June and October.

All water samples taken from COR-6 will be analysed for:

- Total Petroleum Hydrocarbons (TPHs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Benzene, Toluene, Ethylbenzene, Xylene (BTEX)
- Biochemical Oxygen Demand (BOD_5)
- Faecal Coliforms
- Total Suspended Solids (TSS)
- pH
- Conductivity
- Oil & Grease
- Total Phenols
- Ammonia Nitrogen
- Nitrate & Nitrite
- Anions and Cations (includes magnesium, calcium, sodium, potassium, and sulphate)
- Total Hardness
- Total Alkalinity
- Total metals (including arsenic, cadmium, chromium, copper, iron, lead, mercury and nickel)

5.7.2 Sample Procedures

As mentioned above, water at station COR-6 should be sampled once a year when run-off or seepage from the MSW disposal facility is present. Water samples will be taken by the Hamlet Foreman, or other trained personnel appointed by the Hamlet Foreman, and sent to Taiga Laboratory in Yellowknife to be analysed. The parameters listed above will be examined in water samples of seepage from the MSW disposal facility.

A water sampling procedure is found in **Appendix E**. This procedure is consistent with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater*. The water sampling procedure should be carried out for all sampling in sewage and solid waste facilities to ensure the correct sample bottles are obtained, proper sampling procedures are completed and contamination of samples is minimized.

5.8 Record Keeping

Records of activities, inspections and sampling for the MSW and carcass disposal facilities should be kept. These records should be stored at the Hamlet office and kept by the Hamlet Foreman or SAO. These records will assist with the planning of annual operations and maintenance of the disposal facilities, as well as assess how successful facility practices (e.g. waste segregation, HHW storage, etc) are operating.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The Annual Report provides the NWB with information pertaining to the results of the Monitoring Program, volumes of water consumed, volumes of wastewater discharged, quantities of solid waste disposed, and summaries of any modifications, major maintenance work, and spills.

Therefore, at a minimum, the following records should be kept:

- Number of trips the compactor trucks make per day;
- Quantity (weight) of MSW disposed of per day (tallied for monthly and annual quantities);
- Quantity (weight and/or volume) and types of HHW stored at the Hazardous Waste Storage Area;
- Dates any water sampling has been completed;
- Results from any sampling;

- Dates and description of any maintenance activities (including inspections) carried out on the disposal facilities by Hamlet personnel or other Inspectors;
- Dates and descriptions of any modifications and/or major maintenance work, and abandonment and restoration work carried out on the disposal facilities, including on associated structures, facilities and equipment (e.g. old landfill, compactor truck, CAT bulldozer, etc); and,
- Dates, description and clean-up activities of any spills (fuel, oil, hazardous waste, etc) related to the MSW disposal facility or carcass disposal facility.

6 Emergency Response

6.1 Fire

Surface Fires

If site personnel discover a surface fire in the MSW disposal facility, the Coral Harbour Fire Department will be called immediately and informed of the situation.

Coral Harbour Fire Department (867) 925 – 4422

In the event of an uncontrolled fire during routine burning of MSW, the Fire Department will be contacted and should assess the danger of the burn. Depending on the burn severity, the Fire Department may assume control of the MSW disposal facility. The MSW disposal facility is normally closed to the public during any controlled open burn of MSW and will remain closed if a burn becomes uncontrolled, and until the Fire Department has deemed the site safe.

If site personnel discover a small surface fire, fire extinguishers should be located on the MSW disposal facility to be used safely to manage small fires. Covering a fire with soil by hand or using the CAT bulldozer may also be used. However, site personnel should not attempt to fight a fire if it cannot be done safely.

The cause of any surface fires will be investigated and necessary steps taken to prevent an uncontrolled surface fire from recurring. The fire incident and all response measures should be documented on the weekly MSW Disposal Facility Inspection Form (**Appendix F**), and reported to the SAO.

Subsurface Fires

If a subsurface fire is suspected at the landfill of the MSW disposal facility, the Coral Harbour Fire Department will be called and informed of the situation. The MSW disposal facility should be closed to the public whenever a subsurface fire is suspected.

The Fire Department should be called to site to determine if a subsurface fire is present and to assess the danger of the fire. The Fire Department may assume control of the MSW disposal facility if the subsurface fire is deemed an emergency. Hamlet personnel should not excavate a suspected subsurface as the fire may quickly get worse when exposed to more oxygen, may release toxic or poisonous fumes, or may have caused underground voids causing an unstable surface prone to collapse. The Fire Department should manage the suppression of any subsurface fires.

The cause of any subsurface fires will be investigated and necessary steps taken to prevent a subsurface fire from recurring. The fire incident and all response measures should be documented on the weekly MSW Disposal Facility Inspection Form (**Appendix F**), and reported to the SAO.

6.2 Spill Contingency Plan

The intent of this Spill Contingency Plan is to provide a guide to operators and other Hamlet personnel in the event of an accidental release of fuel, sewage, or other waste at the water, sewage, and MSW facilities in Coral Harbour. The Spill Contingency Plan is planned to be protective of the local environment and public and personnel health and safety.

This Spill Contingency Plan (SCP) has been developed for implementation at the water distribution system, sewage disposal facility, and MSW disposal facility in Coral Harbour. At these sites, there may be situations that arise that are beyond the scope of this SCP. In these situations, all activities at the site should stop until a revised procedure or SCP is prepared, reflecting the changing conditions at the site.

All persons involved with operations at the water, sewage and MSW facilities should read and be familiar with this SCP. To be effective, it is important that all personnel are familiar with their responsibilities and steps to take in the event of a spill. Personnel should not be reading the SCP for the first time during an emergency.

6.2.1 Site Descriptions

The water, sewage and MSW facilities have been described in the preceding sections of this O&M Manual. The sites are shown in Figures 2, 3 and 4 in **Appendix B**.

6.2.2 Regulations

Under Section 34 of the *Environmental Protection Act*, the Nunavut *Consolidation of Spill Contingency Planning and Reporting Regulations* was enabled by the Commissioner in 1998. In the *Spill Contingency Planning and Reporting Regulations*, a SCP is required to include the following:

- The name and address of the owner or person in charge, management or control of the site(s);
- The name, job title and 24-hour telephone number for the person(s) responsible for activating the contingency plan;
- A description of the facility(ies) including location, size, type and amount of contaminants normally stored on the site(s), and site map(s);
- The steps to be taken to report, contain, clean up and dispose of a contaminant in the case of a spill;
- The means by which the contingency plan is activated;
- An inventory and location of the response and clean-up equipment available to implement the plan;
- A description of the training required and provided to employees who respond to a spill; and,
- The date the plan was prepared.

6.2.3 Contacts & Regulatory Authorities

The SAO has overall responsibility of Hamlet sites, including the water, sewage and MSW facilities. The Hamlet Maintainer and Hamlet Foreman manages the facilities and are to be responsible for initiating the Spill Contingency Plan; the Hamlet Foreman should be contacted when a spill occurs at the water, sewage or MSW facilities. Contact information for the SAO, Hamlet Maintainer and Hamlet Foreman are in Table 6-1 below.

Table 6-1 Hamlet Contact Information for Spill Contingency Planning

Senior Administrative Officer	Hamlet Maintainer	Hamlet Foreman
Rob Hedley Hamlet of Coral Harbour Office Phone: (867) 925 – 8867 Fax: (867) 925 – 8233 Email: munch@qiniq.com	Douglas Pameolik Hamlet of Coral Harbour Office Phone: (867) 925 – 8867 Fax: (867) 925 – 8233	Charlie Saviakjuk Hamlet of Coral Harbour Garage Phone: (867) 925 – 8970 (Garage) Phone: (867) 925- 8284 (Home) Fax: (867) 925 – 8233

Every time a spill is identified, the Hamlet Maintainer and/or Hamlet Foreman should be contacted as soon as possible. The 24-hour Emergency Spills Report Line should also be contacted in the event the quantity of contaminant spilled exceeds the reportable amount. Generally this is 100 L or greater of fuel, oil or other flammable liquid, and any amount of sewage. See Section 6.2.5 for specific information on reportable quantities of contaminants.

24-HOUR EMERGENCY SPILL REPORT LINE (867) 920 – 8130

Any person reporting a spill is required to give as much information as possible, however reporting of a spill should not be delayed if all of the necessary information is not known. Additional information can be provided later. From the *Consolidation of Spill Contingency Planning and Reporting Regulations* (1998) As much of the following information should be reported during the initial spill report:

- Date and time of spill;
- Location of spill;
- Direction spill is moving;
- Name and phone number of a contact person close to the location of the spill;
- Type of contaminant spilled and quantity;
- Cause of spill;
- Whether spill is continuing or has stopped;
- Description of existing contaminant;
- Action taken to contain, recover, clean up, and dispose of spilled contaminant;
- Name, address and phone number of person reporting the spill; and,
- Name of owner or person in charge, management or control of contaminants at the time of the spill.

Other regulatory agencies which have a legislated (vested) interest in the event of a spill are summarised in Table 6-2 below. These authorities do not need to be immediately contact if a spill occurs, however may be involved in follow-up or additional clean-up activities.

Table 6-2 Regulatory Agency Contact Information

Agency	Legislation	Contact Information
Nunavut Water Board	*Nunavut Waters and Surface Right Tribunal Act*	Phone: (867) 360 – 6338 Fax: (867) 360 – 6369
Nunavut Impact Review Board	*Nunavut Land Claims Agreement Act*	Phone: (867) 983 – 2593 Fax: (867)
Government of Nunavut Department of Environment	*Nunavut Environmental Protection Act*	Phone: (867) 975 – 7700 Fax: (867) 975 – 7740
Environment Canada	*Canadian Environmental Protection Act, 1999*	Phone: (867) 975 – 4464 Fax: (867) 975 – 4645
Department of Fisheries and Oceans Canada	*Fisheries Act*	Phone: (867) 979 – 8000 Fax: (867) 979 – 8039
Transport Canada (Coast Guard)	*Transportation of Dangerous Goods Act*	Phone: (867) 979 – 5269 Fax: (867) 979 – 4260

6.2.4 Potential Contaminants

At the date of this SCP, the Hamlet of Coral Harbour had not completed a waste inventory and exact types and quantities of contaminants are unknown. However the following contaminants are anticipated to be used at the facilities, and may be involved in a spill:

- Gasoline
- Diesel
- Hydraulic oil
- Motor oil
- Other lubricating oil
- Antifreeze and other coolants
- Sewage
- Chlorine powder

At the water, sewage and MSW facilities, spills may results from any of the following occurrences:

- Leaks or ruptures of fuel storage tanks;
- Valve or line failure in systems, vehicles or heavy equipment;
- Heat expansion due to overfilling or improper storage;
- Improper storage of contaminants;
- Vehicular accidents;
- Spill during transfer of contaminant;
- Vandalism; and
- Accidental release of sewage during collection, transport or offload to the detention cell.

6.2.5 Reportable Spill Quantities

Under the Nunavut *Spill Planning and Reporting Regulations*, all spills which are of a quantity greater than or equal to the amount set out for that contaminant type must be immediately reported to the 24-hour Emergency Spill Report Line; this is called a 'reportable spill'. Reportable spill quantities are located in Table 6-3 below.

Table 6-3 Reportable Spill Quantities[1]

Item No.	TDGA Class[2]	Contaminant	Reportable Spill Quantity
1	1	Explosives	Any amount
2	2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity greater than 100 L
3	2.2	Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 L
4	2.3	Compressed gas (toxic)	Any amount
5	2.4	Compressed gas (corrosive)	Any amount
6	3.1, 3.2, 3.3	Flammable liquid	100 L
7	4.1	Flammable solid	25 kg
8	4.2	Spontaneously combustible solids	25 kg
9	4.3	Water reactant solids	25 kg
10	5.1	Oxidizing substances	50 L or 50 kg
11	5.2	Organic Peroxides	1 L or 1 kg
12	6.1	Poisonous substances	5 L or 5 kg
13	6.1	Infectious substances	Any amount
14	7	Radioactive	Any amount
15	8	Corrosive substances	5 L or 5 kg
16	9.1 (in part)	Miscellaneous products or substances, excluding PCB mixtures	50 L or 50 kg
17	9.2	Environmentally hazardous	1 L or 1 kg
18	9.3	Dangerous wastes	5 L or 5 kg
19	9.1 (in part)	PSCB mixtures of 5 or more parts per million	0.5 L or 0.5 kg
20	None	Other contaminants	100 L or 100 kg

[1] *Environmental Protection Act, Consolidation of Spill Contingency Planning and Reporting Regulations*
[2] TDGA Class – Transportation of Dangerous Goods Class under the *Transportation of Dangerous Goods Act*

6.2.6 Spill Response Procedure

The following steps outline the general spill response procedures for reporting, containing, cleaning up and disposing of materials in the event of hydrocarbon (e.g. fuel, oil, etc) and other waste spill, or sewage spill.

6.2.6.1 Hydrocarbon Spills

Three procedures for hydrocarbon spills have been developed depending on the media the spill has occurred. The following sections outline procedures for hydrocarbon or other waste spills occurring on land (soil, gravel, sand, rock and vegetation), water, or snow/ice.

Spills on Land

1. Once a spill is identified, all sources of ignition turned off (e.g. no smoking, shut off engines).
2. The spilled material should be identified, if possible.

3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
4. If possible, identify the source of the spill. Determine if the spill is still occurring (i.e. still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g. plug hole, close valve, upright container), or contain the spill (e.g. place a container or tarp with built up edges under the spill source to contain the spill).
5. If the spill is too large to be controlled with the spill materials at hand, contact the facility(ies) manager and report the spill immediately (see Section 6.2.3 for contact information).
6. If the spill is small enough to be controlled with the materials at hand, prevent spilled contaminants from spreading or entering waterways by using sorbent (oil-absorbing) materials or a soil dyke down slope from the spill. This is especially the case with liquid contaminants (e.g. gasoline, diesel).

   If some contaminant has entered a waterway, follow procedures in the next section (***Spills on Water***) to contain and clean-up the contaminant in the water.
7. Once the spill has been controlled and further spreading prevented, contact the facility(ies) manager and report the spill (see Section 6.2.3 for contact information).
8. If possible with materials at hand, clean up the remaining spilled contaminant and store contaminated materials in a secure container for disposal. Do not flush the affected area with water.
9. If possible, remove any contained liquid by pumping into secure drums.
10. Complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
11. Contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** to report the spill as soon as possible and obtain additional advice.
12. Fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax 867 – 873 – 6924)**.

Spills on Water

1. Once a spill is identified, all sources of ignition turned off (e.g. no smoking, shut off engines).
2. The spilled material should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
4. If possible, identify the source of the spill. Determine if the spill is still occurring (i.e. still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g. plug hole, close valve, upright container).
5. If the spill is too large to be controlled with the spill materials at hand, contact the facility(ies) manager and report the spill immediately (see Section 6.2.3 for contact information).
6. If the spill is small enough to be controlled with the materials at hand, use sorbent booms to contain the spill for recovery. Place sorbent sheets on the water within the boomed area to help contain the contaminant. For narrow waterways, place one or more sorbent booms across the waterway, downstream of the spill location, and anchor the booms on the each bank.

7. Once the spill has been controlled and further spreading prevented, contact the facility(ies) manager and report the spill (see Section 6.2.3 for contact information).
8. If possible with materials at hand, clean up the remaining spilled contaminant within the boomed area. Store contaminated materials in a secure container for disposal.
9. Complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
10. Contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** to report the spill as soon as possible and obtain additional advice.
11. Fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax 867 – 873 – 6924)**.

Spills on Snow/Ice

1. Once a spill is identified, all sources of ignition turned off (e.g. no smoking, shut off engines).
2. The spilled material should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
4. If possible, identify the source of the spill.
5. Since a spill occurring on snow or ice presents the potential for immediate access of contaminants into waterways, contact the facility(ies) manager and report the spill immediately (see Section 6.2.3 for contact information) if the spill is too large to be controlled with the spill materials at hand.
6. Determine if the spill is still occurring (i.e. still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g. plug hole, close valve, upright container), or contain the spill (e.g. place a container or tarp with built up edges under the spill source to contain the spill).
7. If the spill is small enough to be controlled with the materials at hand, prevent spilled contaminants from spreading or entering waterways by using sorbent materials or a snow/soil dyke down slope from the spill. This is especially the case with liquid contaminants (e.g. gasoline, diesel).
8. Once the spill has been controlled and further spreading prevented, contact the facility(ies) manager and report the spill (see Section 6.2.3 for contact information).
9. If possible with materials at hand, clean up the remaining spilled contaminant and store contaminated materials in a secure container for disposal. Impacted snow should also be stored in drums for disposal.
10. Complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
11. Contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** to report the spill as soon as possible and obtain additional advice.
12. Fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax 867 – 873 – 6924)**.

Additional Spill Delineation or Monitoring

In the event of a large spill in which not all of the spilled contaminant can be readily cleaned up with materials at hand (as described above), delineation of the affected area may be required. This would include subsurface investigation of the area (i.e. digging of test pits, soil sampling, installation of monitoring wells) to determine how large and how deep the contaminant affected the subsurface soil and/or groundwater (lateral and vertical extent of the spill). The delineation would result in the development of an appropriate remediation plan for the affected area. In this case, a qualified environmental consultant should be retained to provide advice on how to proceed with delineation and remediation of a large spill.

6.2.6.2 Sewage Spills

Raw sewage can contain infectious bacteria, viruses, fungi and parasites that can cause serious human illnesses and even death. A risk of environmental contamination also exists from sewage spills as raw sewage can also contain unknown chemicals from improper chemical disposal. It is imperative to safely and properly clean up all sewage spills to reduce the chance of human infection and environmental contamination.

Spills on Land

1. Once a spill is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the spill responders. Public access of the area should be restricted.
2. If possible, identify the source of the spill. Determine if the spill is still occurring (i.e. still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g. plug hole, close valve, upright container), or contain the spill (e.g. place a container or tarp with built up edges under the spill source to contain the spill).
3. Ensure all spill responders wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
4. If the spill is too large to be controlled with the spill materials at hand, contact the facility(ies) manager and report the spill immediately (see Section 6.2.3 for contact information).
5. If the spill is small enough to be controlled with the materials at hand, prevent spilled sewage from spreading or entering waterways by constructing an impervious soil dyke, or other impervious barrier.
6. Once the spill has been controlled and further spreading prevented, contact the facility(ies) manager and report the spill (see Section 6.2.3 for contact information).
7. If possible, remove any contained liquids using the sewage vacuum truck(s). Transport and dispose of this in the detention cell of the sewage disposal facility.
8. If possible with materials and equipment at hand, clean up the remaining spilled sewage and dispose of contaminated soil in the detention cell of the sewage disposal facility. Do not flush the affected area with water. Other materials used for clean-up of the sewage spill should be burned in the Burn Area of the MSW disposal facility.
9. Any hard surfaces (e.g. paving, concrete, equipment, rubber boots, etc) that having come into contact with spilled sewage should be cleaned with a detergent solution and then disinfected. Use only approved disinfectants.

10. Once the sewage spill has been cleaned up, dispose of disposable PPE (i.e. coveralls, gloves, safety glasses/goggles) in Burn Area of MSW disposal facility. Ensure other PPE (i.e. rubber boots) is properly cleaned and disinfected prior to re-use.
11. Complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
12. Contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** to report the spill as soon as possible and obtain additional advice.
13. Fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax 867 – 873 – 6924)**.

Spills in Water

1. Once a spill is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the spill responders. Public access of the area should be restricted.
2. If possible, identify the source of the spill. Determine if the spill is still occurring (i.e. still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g. plug hole, close valve, upright container), or contain the spill (e.g. place a container or tarp with built up edges under the spill source to contain the spill).
3. A sewage spill into a waterway should be immediately reported to the facility(ies) manager (see Section 6.2.3 for contact information).
4. Ensure all spill responders wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
5. If the spill is small enough to be controlled with the materials at hand, prevent spilled sewage from further spreading or entering waterways by constructing an impervious soil dyke, or other impervious barrier.
6. If the sewage has entered a waterway which could directly impact human health (e.g. Post River, reservoir, etc), water removal (if any) from that source will be immediately stopped. Immediately contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** and GN departments (see table below) to report the sewage spill and obtain additional advice on how to proceed further. The water should be sampled as soon as possible to determine if and how the sewage spill has impacted the waterway.

GN-CGS **24-Hour Emergency Management**	**Government of Nunavut** **Department of Health & Social Services** **Environmental Health Officers**
867 – 645 – 3625	Kivalliq: 867 – 645 – 2171 Qikiqtaaluk: 867 975 – 4817

7. If the sewage has entered a waterway which poses little risk to human health (e.g. into the sewage treatment tundra wetland, non-potable source), the public should be notified and the access to the area restricted. Further action may be required once the spill is reported to the 24-Hour Emergency Spill Report Line.
8. Once the sewage spill has been controlled and further spreading prevented, if possible remove any other contained liquids using the sewage vacuum truck(s). Transport and dispose of this in the detention cell of the sewage disposal facility.

9. If possible with materials and equipment at hand, clean up the any remaining spilled sewage on the land and dispose of contaminated soil in the detention cell of the sewage disposal facility. Do not flush the affected area with water. Other materials used for clean-up of the sewage spill should be burned in the Burn Area of the MSW disposal facility.
10. Any hard surfaces (e.g. paving, concrete, equipment, rubber boots, etc) that having come into contact with spilled sewage should be cleaned with a detergent solution and then disinfected. Use only approved disinfectants.
11. Once the sewage spill has been cleaned up, dispose of disposable PPE (i.e. coveralls, gloves, safety glasses/goggles) in Burn Area of MSW disposal facility. Ensure other PPE (i.e. rubber boots) is properly cleaned and disinfected prior to re-use.
12. Complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
13. Contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** to report the spill as soon as possible and obtain additional advice. Sewage spills must always be reported to the Emergency Spill Report Line.
14. Fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax 867 – 873 – 6924)**.

Spills on Snow/Ice

1. Once a spill is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the spill responders. Public access of the area should be restricted.
2. If possible, identify the source of the spill. Determine if the spill is still occurring (i.e. still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g. plug hole, close valve, upright container), or contain the spill (e.g. place a container or tarp with built up edges under the spill source to contain the spill).
3. Since a spill occurring on snow or ice presents the potential for immediate access of contaminants into waterways, contact the facility(ies) manager and report the spill immediately (see Section 6.2.3 for contact information).
4. Ensure all spill responders wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
5. If the spill is small enough to be controlled with the materials at hand, prevent spilled sewage from further spreading or entering waterways by constructing an impervious soil/snow dyke, or other impervious barrier.

   If the sewage spill has entered a waterway, follow the procedure in the preceding section (***Spills in Water***).
6. Once the spill has been controlled and further spreading prevented, if any liquid remains (e.g. is not frozen), remove contained liquids using the sewage vacuum truck(s). Transport and dispose of this in the detention cell of the sewage disposal facility.
7. If possible with materials and equipment at hand, clean up the any remaining spilled sewage on the snow/ice and dispose of contaminated snow/ice/soil in the detention cell of the sewage disposal facility. Other materials used for clean-up of the sewage spill should be burned in the Burn Area of the MSW disposal facility.

8. Any hard surfaces (e.g. paving, concrete, equipment, rubber boots, etc) that having come into contact with spilled sewage should be cleaned with a detergent solution and then disinfected. Use only approved disinfectants.
9. Once the sewage spill has been cleaned up, dispose of disposable PPE (i.e. coveralls, gloves, safety glasses/goggles) in Burn Area of MSW disposal facility. Ensure other PPE (i.e. rubber boots) is properly cleaned and disinfected prior to re-use.
10. Complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
11. Contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** to report the spill as soon as possible and obtain additional advice. Sewage spills must always be reported to the Emergency Spill Report Line.
12. Fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax 867 – 873 – 6924)**.

6.2.7 Spill Kit and Training Requirements

The following sections outline the recommended minimum requirements for contents and number of spill kits that should be present at the water, sewage and MSW facilities. Personnel training requirements are also provided.

Spill Kit Contents

Each spill kit should be regularly inspection to ensure it always contains the following, at a minimum (in part from INAC [2007]):

- 1 – 205 L open top steel drum with lid, bolting ring and gasket (spill kit container)
- 10 disposable large 5 mil polyethylene bags (dimensions 65 cm x 100 cm) with ties
- 4 – 12.5 cm (5 in.) x 3 m (10 ft.) sorbent booms
- 10 kg bag of sorbent particulate
- 100 sheets (1 bail) of 50 cm x 50 cm sorbent sheets
- 2 large (5 m x 5 m) plastic tarps
- 1 roll duct tape
- 1 utility knife
- 1 field notebook and pencil
- 1 rake
- 1 pick axe
- 3 spark-proof shovels
- 4 tyvek splash suits
- 4 pairs of chemical resistant gloves
- 4 pairs of splash protective goggles
- Instruction binder, including Spill Contingency Plan

The entire spill kit contents, with the exception of the spark-proof shovels, can be stored within the 205 L steel drum. The drum should be sealed securely to protect the spill kit contents though should always be accessible without the use of tools (i.e. finger tight bolt ring). The drum's bolt ring should be inspected regularly during facility inspections to ensure it turns freely and is lubricated.

Extra spill response materials should also be available for use, in addition to the spill kit contents. These include:

- 10 – 205 L open top steel drum with lid, bolting ring and gasket
- 2 spark-proof shovels
- 50 disposable large 5 mil polyethylene bags (dimensions 65 cm x 100 cm)
- 10 – 12.5 cm (5 in.) x 3 m (10 ft.) sorbent booms
- 5 – 10 kg bags of sorbent particulate
- 500 sheets (5 bails) of 50 cm x 50 cm sorbent sheets
- 2 tyvex splash suits
- 2 pairs of oil-resistant gloves
- 2 pairs of splash protective goggles

Spill Kit Locations

At least one spill kit should be clearly marked and present at the sewage disposal and MSW disposal facilities. Two spill kits should be present for amenities within the water distribution facility; one should be located at the pumphouse and the second at the Post River pumpshack.

Required Training

To ensure the SCP is carried out effectively, the following actions should occur:

- The SCP should be reviewed annually to ensure it is still up-to-date for current conditions.
- When required, the SCP should be revised to reflect current conditions.
- The SCP should be distributed to and read by all personnel who work at the Hamlet's water, sewage and MSW facilities.
- Personnel at these facilities should be familiar with the location of all HHW and other potentially hazardous materials, and their associated Material Safety Data Sheets (MSDS).
- Personnel at these facilities should be trained to read and use MSDS.
- Personnel should receive proper spill response training to learn and understand the techniques and materials used to contain, clean up and remediate spills. Trained personnel will be aware of the importance of first response in reducing the impact of spills with respect to protecting human health and safety, the environment, and property.

6.3 Detention Cell Berm Failure

1. Once a berm failure occurs and is identified, the affected area should be vacated and secured, ensuring the area is safe for entry and does not represent an immediate threat to human health and safety of the workers. Public access of the area should be restricted. Sewage discharge to the detention cell has to cease.
2. Determine if the failure has stabilized/equalized or is failure is still occurring (i.e. still eroding) or if the berm degradation has stopped. If the degradation has not stopped, determine if it is safe to stop or control the berm failure (e.g. fill in failure area),
3. Ensure all workers wear the appropriate personal protective equipment, including waterproof gloves, safety glasses/goggles, rubber boots and disposable protective coveralls.
4. Contact the facility(ies) manager and report the berm failure immediately (see Section 6.2.3 for contact information).
5. If the berm failure is small enough and can be controlled with materials at hand that will prevent sewage from spreading or entering waterways, that work should be initiated by reconstructing the berm, or other impervious barrier. On a temporary basis, sand bags, a sand source and a synthetic liner can be utilitised.
6. If possible, remove any downstream liquids using the sewage vacuum truck(s). Transport and dispose of this upstream in the detention cell of the sewage disposal facility.
7. If possible, increase the downstream flow pathway to the discharge location by berming, damming and restricting flow through the downstream tundra wetland as much as possible.
8. If possible with materials and equipment at hand, clean up the sewage and dispose of contaminated soil in the detention cell of the sewage disposal facility.
9. Once the berm has been reconstructed, dispose of disposable PPE (i.e. coveralls, gloves, safety glasses/goggles) in Burn Area of MSW disposal facility. Ensure other PPE (i.e. rubber boots) is properly cleaned and disinfected prior to re-use.
10. Complete the Nunavut Spill Report Form with as much information as possible. This form is included in **Appendix G** of this O&M Manual.
11. Contact the **24-Hour Emergency Spill Report Line (Phone 867 – 920 – 8130)** to report the berm failure and spill as soon as possible and obtain additional advice.
12. Fax the completed Nunavut Spill Report Form to the **24-Hour Emergency Spill Report Line (Fax 867 – 873 – 6924)**.

In the event of a detention cell berm failure, further investigation of the area may be required. The investigation would result in the development of an appropriate remediation plan for the affected area. In this case, a qualified environmental engineer should be retained to provide advice on how to proceed with the investigation of a detention cell berm failure.

6.4 Record Keeping

Records of any spills, spill response activities, follow-up inspections, monitoring, and any additional remedial work must be kept. These records should be stored at the Hamlet office and kept by the SAO. These records will assist with the annual review of the SCP, operations and maintenance practices at all facilities, and spill response requirements.

Every year by March 31st, the Hamlet is required to submit an Annual Report to the NWB. The Hamlet is required to provide a list of all spills and a summary of follow-up action taken for each spill. Therefore, at a minimum, the following records should be kept:

- Reports of all spills and spill reports submitted to the 24-Hour Emergency Spill Report Line;
- Types and quantities of spill contaminants;
- All spill follow-up activities;
- Inspections of spill kit contents and replacement records for any items; and,
- Records of spill response training for all Hamlet personnel.

7 References

7.1 Literature Cited

Duong, D., and R. Kent. 1996. Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories. Government of the Northwest Territories Department of Municipal and Community Affairs, Yellowknife, NT.

Environment Canada (EC). 2005. "Southampton Island Plain". Narrative Descriptions of Terrestrial Ecozones and Ecoregions of Canada. State of the Environment Infobase. 25 August 2009. Available at <http://www.ec.gc.ca/soer-ree/English/Framework/NarDesc/arcsou_e.cfm>.

Environment Canada (EC). 2009. "Coral Harbour A". Canadian Climate Normals 1971 – 2000. 25 August 2009. Available at <http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html>.

Ferguson Simek Clark (FSC). Sewage Treatment Best Available Technology. Prepared for Indian and Northern Affairs Canada, Water Resource Division. Yellowknife, NT: FSC, 2001.

Ferguson Simek Clark (FSC). Coral Harbour Sewage Treatment and Solid Waste Site Improvements. Prepared for Government of Nunavut Department of Community and Government Services. Yellowknife, NT: FSC, 2002.

Government of Nunavut Department of Environment (GN-ENV). Contingency Planning and Spill Reporting in Nunavut: A Guide to the New Regulations. Iqaluit, NU: GN-ENV, ____.

Government of Nunavut Department of Environment (GN-ENV). Municipal Solid Wastes Suitable for Open Burning. Iqaluit, NU: GN-ENV, ____.

Government of Nunavut Department of Environment (GN-ENV). Guideline for the General Management of Hazardous Waste. Iqaluit, NU: GN-ENV, 2002.

Government of the Northwest Territories (GNWT). 1998. Guideline for the General Management of Hazardous Waste in the NWT. GNWT Department of Resources, Wildlife and Economic Development, Yellowknife, NT.

Health Canada. 2006. "It's Your Health: Drinking Water Chlorination". 5 November 2009. Available at <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/chlor-eng.php>.

Indian and Northern Affairs Canada (INAC). Guidelines for Spill Contingency Planning. Yellowknife, NT: INAC, 2007.

Kent, R., P. Marshall, and L. Hawke. 2003. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT. Ferguson Simek Clark, Yellowknife, NT.

Nunami Jacques Whitford Limited (Nunami). Schematic Design Report: Natural Tundra Wetland Sewage Treatment Area Design, Coral Harbour, NU. Prepared for Government of Nunavut Department of Community and Government Services. Rankin Inlet, NU: Nunami, 2007.

Nunavut Bureau of Statistics. 2008. "Nunavut population counts by region and community, 1981 Census to 2006 Census". 21 August 2009. Available at <http://www.gov.nu.ca/eia/stats/community.html>.

Phifer, R.W., and W.R. McTigue Jr. Handbook of Hazardous Waste Management for Small Quantity Generators. Chelsea, MI: Lewis Publishers Inc, 1988.

W.L. Wardrop and Associates Limited (Wardrop). Operations and Maintenance Manual: Coral Harbour Water Supply System. Volume I: Pumphouse. Volume II: Standby Power Facility. Edmonton, AB: Wardrop, 1985.

7.2 Personal Communications

Eno, R. Manager, Pollution Control. Government of Nunavut Department of Environment. November 19, 2009

Hedley, R. Senior Administrative Officer. Hamlet of Coral Harbour. Conversation. November 3, 2009.

Kaludjak, N. GN-CGS Maintainer. Government of Nunavut Department of Community and Government Services. Conversation. November 4, 2009.

Pameolik, D. Hamlet Maintainer. Hamlet of Coral Harbour. Conversation. November 5, 2009.

Wilson, A. Water Pollution Specialist. Environment Canada. Email conversation. January 27, 2010.

Saviakjuk, C. Hamlet Foreman. Hamlet of Coral Harbour. Conversation. November 17, 2009.

Appendix A Hamlet of Coral Harbour Water License (3BM-COR0813)

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

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-COR0813

April 8, 2008

Ron Ladd
Senior Administrative Officer
Hamlet of Coral Harbour
P.O. Box 30
Coral Harbour, Nunavut
X0C 0C0

Email: munch@qiniq.com

RE: NWB Licence No. 3BM-COR0813

Dear Mr. Ladd,

Please find attached Licence No. 3BM-COR0813 issued to the Hamlet of Coral Harbour by the Nunavut Water Board (NWB) pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*. The terms and conditions of the attached Licence related to water use and waste disposal are an integral part of this approval.

If the Licensee contemplates the renewal of this Licence, it is the responsibility of the Licensee to apply to the NWB for its renewal. The past performance of the Licensee, new documentation and information, and issues raised during a public hearing, if the NWB is required to hold one, will be used to determine the terms and conditions of the Licence renewal. Note that if the Licence expires before the NWB issues a new one, then water use and waste disposal must cease, or the Licensee will be in contravention of the *Nunavut Land Claims Agreement* (NLCA) and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA). However, the expiry or cancellation of a licence does not relieve the holder from any obligations imposed by the licence. The NWB recommends that an application for the renewal of this Licence be filed at least three months prior to the Licence expiry date.

If the Licensee contemplates or requires an amendment to this licence, the NWB may decide, in the public interest, to hold a public hearing. The Licensee should submit applications for amendment as soon as possible to give the NWB sufficient time to go through the amendment process. The process and timing may vary depending on the scope of the amendment, however a minimum of thirty (30) days is required from the time of acceptance by

the NWB. It is the responsibility of the Licensee to ensure that all application materials have been received and acknowledged by the Manager of Licensing.

The NWB strongly recommends that the Licensee consult the comments received by interested persons on issues identified. This information is attached for your consideration.

Sincerely,

Thomas Kabloona
A/Chief Executive Officer

TK/tla/dh

Enclosure: Licence No. 3BM-COR0813
Comments GN DoE, INAC and EC

cc: Kivalliq Distribution List

P.O. Box 119
Gjoa Haven, NU X0B 1J0
Tel: (867) 360-6338
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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

DECISION

LICENCE NUMBER: 3BM-COR0813

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence renewal originally received October 11, 2007, made by:

Hamlet of Coral Harbour

to allow for the use of water and disposal of waste for the Hamlet of Coral Harbour, located within the Kivalliq region of Nunavut. With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence renewal.

DECISION

After having been satisfied that the application was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the *Nunavut Land Claims Agreement* (NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the full submission of the Applicant and written comments expressed by interested parties, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *NLCA* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and determined that:

Licence Number 3BM-COR0813 be issued subject to the terms and conditions contained therein. (Motion #: 2008-01-06)

SIGNED this 2nd day of April, 2008 at Gjoa Haven, NU.

Thomas Kabloona
Acting Chief Executive Officer

Table of Contents

I. BACKGROUND

The Hamlet of Coral Harbour has a population of 789 (2006) and is located at the coordinates of 64°08' north latitude and 83°10' west longitude on south shore of Southampton Island within the Keewatin planning region of Nunavut. The surrounding landscape is characterized generally by low relief and many shallow surface water bodies. Existing water use and waste disposal facilities include a freshwater intake and pump and reservoir, exfiltration sewage lagoon, wetland treatment area, solid waste and bulky items disposal areas and hazardous waste storage.

II. PROCEDURAL HISTORY

The NWB issued a municipal water licence to the Hamlet of Coral Harbour on November 1, 2002, to allow for the use of water and disposal of waste. Following an application by the Hamlet, the NWB issued an amendment to the Licence on February 17, 2005 to allow for the construction of additional infrastructure including perimeter containment berms and chain link fencing at the Hamlet's Sewage Disposal Facility.

The municipal water licence expired on October 31, 2007. Nunami Jacques Whitford Limited (NJWL), on behalf of the Hamlet, submitted an application for water licence renewal to the NWB on October 11, 2007. Following a preliminary review of the application, the NWB concluded that it met the requirements of section 48(1) of the *Nunavut Waters and Surface Rights Tribunal Act* (the Act) and advised the Applicant and distribution list accordingly on November 27, 2007.

Information contained in the October 11, 2007 submission and distributed for review was as follows:

- Application cover letter
- Application summary;
- NWB Licence renewal application;
- NWB Municipal licence questionnaire;
- Report of the Natural Tundra Wetland Sewage Treatment Facility (NJWL October 2007)
- Schematic Design Report: Natural Tundra Wetland Sewage Treatment Area Design (NJWL August 29, 2007);
- Appendix B: Wetland photos; and
- Figure 1: Hamlet of Coral Harbour Water and Waste Facility Locations (NJWL).

The scope of the renewal application included ongoing operation of the existing Sewage Disposal Facility, Wetland Treatment Area, and Solid Waste Disposal Facility. In its application, the Licensee also advised the NWB of plans to construct diversion berms to redirect wetland treatment flow away from the community and requested that the Wetland Treatment Area be included as part of the overall sewage treatment system.

The Nunavut Water Board publicly posted notice of this application, in accordance with Section 55.1 of the Act and Article 13 of the *Nunavut Land Claims Agreement* (NLCA), on November 27, 2007. This assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment.

As no public concern was expressed, the NWB waived the requirement to hold a public hearing and proceeded with the application process.

The NWB received comments on the application from interested parties including Indian and Northern Affairs Canada (INAC), Environment Canada (EC), and the Government of Nunavut Department of Environment (GN-DOE) on or prior to January 11, 2008.

Based upon the results of the detailed assessment, including consideration of any potential accidents, malfunctions, or impacts to water that the overall project might have in the area, the Board approved the application and has issued Licence 3BM-COR0813.

III. ISSUES

Term of Licence

In accordance with section 45 of the Act, the NWB may issue a licence for a term not exceeding twenty-five years. In determining an appropriate term of a water licence, the Board considers a number of factors, including, but not limited to, the results of INAC site inspections and the compliance record of the Applicant. In review of the previous water licence NWB3COR0207 inspection reports, the NWB has noted that there were several issues of non-compliance and other related problems identified by the inspector, which include:

i. Record keeping for the freshwater intake facility;
ii. Leachate from the solid waste facility mixing with sewage lagoon effluent and exceeding *Canadian Guidelines for the Protection of Aquatic Life* for iron.
iii. Insufficient segregation of materials at the solid waste facility;
iv. Insufficient measures to deal with hazardous waste;
v. Unacceptable waste oil handling;
vi. Sewage treatment facility effluent exceeding licensed limits;
vii. The Hamlet has not submitted and Operation and Maintenance Plan; and
viii. Incomplete monitoring data.

In review of the application and the comments received from interested parties, there were no comments with respect to the Hamlet's request for a term of ten (10) years for the Licence renewal. However, the NWB has decided on a five (5) year term for the Licence. Although the Board has recently issued municipal licences for terms of two (2) years where compliance issues have been of a concern, the Board finds that a five (5) year term is warranted in this case given the information submitted as part of the application. The Board interprets the level of detail

contained in the application as a significant step towards achieving compliance. However, the Board fully expects the Hamlet to take further and immediate steps to come into full compliance with the Licence requirements for its water and waste facilities. The Board had included a requirement for a "Plan For Compliance" be submitted under Part B, Item 10 of the Licence, that will clearly demonstrates how the Hamlet will achieve full compliance with the Licence conditions. The Plan for Compliance must also address the issues raised by GN-DOE concerning sewage treatment and potential non-compliance during the winter when raw, untreated sewage may potentially be entering the environment with minimal or no treatment due to a combination of a leaky sewage lagoon and frozen conditions in the wetland area. This is of significant importance given the current design of the system, which consists of an exfiltration detention cell and large wetland area, both which have very limited capacity for the control of effluent discharge.

The NWB reminds the Licensee of its responsibility to be in compliance with the conditions of the Licence. If monitoring results demonstrate that the wetland area is incapable of treating sewage, at any time of the year, the Licensee will be required to take the necessary remedial actions to remedy the situation.

Annual Report

The NWB has imposed on the Licensee, the requirement to produce an Annual Report. These Reports are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to interested parties upon request. A *"Standardized Form for Annual Reporting"* is to be used by the Licensee and is available from the NWB file transfer protocol (FTP) site under the Public Registry link at the NWB Website.

Link = ftp://nunavutwaterboard.org/ADMINISTRATION/Standardized%20Forms/

Operational Plans

Appropriate Plans need to be developed to the satisfaction of the NWB for the operation and maintenance of the facilities, the protection of the environment with regard to potential spills through day-to-day operations, and abandonment and restoration of the sites.

It is noted that the Licensee has not submitted an Operations and Maintenance (O&M) Plan to the NWB. This Licence has therefore, included the requirement to provide O&M Manual to the NWB, which is to include the following in accordance with Part F, Item 1 of the Licence:

i. *Water Storage and Distribution Facility Operation and Maintenance (O&M) Plan*;
ii. *Sewage Disposal Facility Operation and Maintenance (O&M) Plan*;
iii. *Sewage Sludge Management Plan*;
iv. *Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan*;

v. Spill Contingency Plan; and
vi. Monitoring Program Quality Assurance/Quality Control Plan.

The purpose of the O&M Manual noted above is to assist Hamlet staff in carrying out the procedures relating to their water distribution and waste disposal facilities. The O&M Manual should demonstrate to the NWB that the Hamlet is capable of operating and maintaining the infrastructure related to water use and waste disposal adequately and to meet the requirements of the Licence. The O&M Manual should be based, at a minimum on the various NWB-approved guidelines available (i.e. *Guidelines for the Preparation of an Operations and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories,* Duong and Kent, 1996) and other regulatory guidelines as deemed appropriate.

Water Use

The Hamlet of Coral Harbour currently utilizes the Post River as a source of potable water with the quantity used not exceeding 35,000 cubic metres annually. No concerns were raised by the parties in their written submissions as to the amount of water required by the Hamlet, the manner in which it is obtained or in the manner in which this water will be used. The NWB has renewed the terms and conditions associated with water use by the Hamlet accordingly.

Sewage

The Hamlet of Coral Harbour currently provides trucked sewage services for the Community's residents, businesses and institutions. The trucked sewage is discharged to the Sewage Disposal Facilities, where primary treatment typically occurs. Within the Application, information was provided as to the plans to construct diversion berms to redirect wetland treatment flow away from the community. This information was contained in the report This information was considered very preliminary and the Licensee is required to provide the NWB with finalized As-Built Drawings, stamped and signed by an Engineer, for all construction of diversion berms associated with the Sewage Disposal Facilities and the Solid Waste Disposal Facility. This requirement is set out in Part E of this Licence.

Specific comments relevant to sewage disposal operations in the Hamlet were provided by GN-DOE, INAC and EC.

EC also noted that the wetland area was proposed as a treatment component of the overall Sewage Disposal Facility and suggests that much lower limits than those contained in the expired water licence be applied for the outflow from the wetland. The NWB, in accordance with the definitions provided in Part A of the Licence identifies the Sewage Disposal Facility and Wetland Treatment Area as separate components of an overall treatment strategy. The NWB also observes that the outflow from the Wetland Treatment Area eventually discharges to a large lake as indicated in the NJWA report (October 2007). Therefore, the NWB concurs with EC's recommendation and in being consistent with the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (Northwest Territories Water Board, 1992),

has included lower discharge limits within in Part D, Item 3 of this Licence to reflect the release of effluent from the wetland into a lake.

EC noted that any effluent discharged must be in compliance with Section 36(3) of the Fisheries Act. In order to effectively monitor the effluent for compliance purposes, the NWB has imposed acute toxicity testing as a Licence requirement under Part D, Item 6 at the outlet of the Wetland Treatment Area prior to entering the receiving lake.

In its submission, INAC noted that the Hamlet is not planning to upgrade the existing exfiltration berm and concern was raised over its stability. The NWB has added a requirement for a geotechnical inspection of the facilities to be carried out on an annual basis by a qualified engineer. This condition is consistent with other water licences issued in Nunavut. The Licensee must also address the Hamlet's response to potential berm failure within the Spill Contingency Plan in the O&M Manual.

EC noted that maintenance should include removal and disposal of sewage sludge. EC recommended that prior to removal of sludge occurring, that the Licensee submit for approval a Sewage Sludge Management Plan (as part of the above-mentioned O&M Manual) that clearly outlines the chemical composition of the sludge, and how sludge will be stored, treated and eventually disposed of. The NWB concurs with this recommendation, and has imposed this requirement in the Licence.

EC noted that a Spill Contingency Plan should be submitted to the NWB by the Licensee. The NWB concurs with this recommendation, and has imposed this requirement as part of the O&M Manual in the Licence.

Finally, as part of the Sewage Disposal Facility O&M Plan, the NWB requires that the Licensee include procedures and frequencies of inspections to be carried out to verify when there is flow from the Sewage Disposal Facility or outflow from the Wetland Treatment Area, which would trigger the monitoring program. Part D, Item 2 of the Licence requires that the Inspector be notified upon commencement on the monitoring program.

Solid Waste

The development of an O&M Plan for the Solid Waste Disposal Facility is required as part of the overall O&M Manual discussed above. The O&M Plan for the Solid Waste Disposal Facility should set out procedures for the segregation, storage and eventual removal for disposal of hazardous wastes, including waste oil, and should also address procedures for the incineration of solid waste.

The 2002 Application for water licence indicated that the Hamlet was currently using a Solid Waste Disposal Site located approximately 2.5km northwest of the community on the east side of a gravel ridge. The site covered an area of approximately 7,300m^2. The recent Application indicates that the Hamlet will continue to collect and deposit solid waste in the Landfill.

Comments provided by INAC noted a second waste storage location by the Coral Harbor Airport, which is not a licensed facility. The Supplementary Questionnaire submitted included a reference to this facility, however there is insufficient detail provided to licence its operation. The NWB requests that the Licensee submit for approval, the details concerning its location, construction including as-built design drawings stamped and signed by an Engineer, as well as including its operation within an Operations and Maintenance Manual. The Licensee will also be required to obtain an amendment to this licence for its use. Should the facility no longer be in use, the Licensee is required to comply with the abandonment and restoration conditions set out in Part G of this Licence and provide a Plan for the Abandonment and Restoration of the site.

The NWB also notes the concern raised by INAC regarding the mixing of leachate from the Solid Waste Disposal Facility with effluent from the Sewage Disposal Facility leading to the presence of metals in the Wetland Treatment Area. The NWB requires that the Licensee address this concern and propose a way to divert solid waste runoff from the wetland area. This may require modification to the current drainage from the Solid Waste Disposal Facility, with all modifications being subject to Part E of this Licence.

Abandonment and Restoration

To ensure that all existing end-of-life facilities are reclaimed in an appropriate manner, the NWB requires Licensees to submit an *Abandonment and Restoration Plan*. This Plan is to be submitted at least six (6) months prior to final closure of any licensed facility or upon submission of the final design drawings for the construction of new facilities to replace existing ones. The requirements for the Plan are outlined in Part G, Item 1 of this Licence.

IV. LICENCE 3BM-COR0813

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 CORAL HARBOUR
(Licensee)

of

CORAL HARBOUR, NUNAVUT X0C 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-COR0813**

Water Management Area **NUNAVUT 05**

Location **CORAL HARBOUR, NU (Latitude 64°08'N and Longitude 83°10'W**

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to Exceed **35,000 CUBIC METRES ANNUALLY**

Date of Licence **APRIL 2nd , 2008**

Expiry Date of Licence **MARCH 31, 2013**

Dated this 2nd day of April, 2008 at Gjoa Haven, NU.

Thomas Kabloona
Acting Chief Executive Officer

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Coral Harbour, Kivalliq Region, Nunavut (64°08' N; 83°10'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

In this Licence: **3BM-COR0813**

"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 composite or grab samples collected from the monitoring stations identified in Part H;

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

"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" in respect of an effluent means an identifiable discharge point of a facility beyond which the operator of the facility no longer exercises control over the quality of the effluent;

"Freeboard" means the vertical distance between water line and the designed maximum operating height on the crest of 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" comprises the exfiltration detention cell as described in the Application for Water Licence filed by the Applicant on October 11, 2007.

"Solid Waste Disposal Facilities" means the facilities designated for the disposal of solid waste, as described in the Application for Water Licence filed by the Licensee on October 11, 2007;

"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;

"Water Supply Facilities" comprises the area and associated intake infrastructure at Post River, as described in the Application for Water Licence filed by the Licensee on October 11, 2007;

"Wetland Treatment Area" comprises the area of land immediately downstream of the Sewage Disposal Facility as described in the supplemental information report entitled *Report of the Natural Tundra Wetland Sewage Treatment Facility, Coral Harbour, NU. Prepared for Nunavut Water Board in support of Licence renewal application NWB #COR0207;* Prepared by Nunami Jacques Whitford Limited, Rankin Inlet, Nunavut, October 2007.

3. Enforcement

a. 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*;

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

c. 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; and

d. 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:

   a. tabular summaries of all data generated under the "Monitoring Program";

   b. the monthly and annual quantities in cubic metres of fresh water obtained at the Water Supply Facilities;

   c. the monthly and annual quantities in cubic metres of each and all waste discharged;

   d. 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;

   e. a list of unauthorized discharges and summary of follow-up action taken;

   f. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

   g. Any updates or revisions for manuals and plans (i.e., *Operations and Maintenance Manual*) as required by changes in operation and/or technology;

   h. a summary of any studies or reports requested by the Board that relate to water use and waste disposal or restoration, and a brief description of any future studies planned;

i. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported; and

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 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.

7. 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

8. 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.

9. The Licensee shall ensure that all document(s) and correspondence submitted by the Licensee to the Board are received and acknowledged by the Manager of Licensing.

10. The Licensee shall submit to the Board for approval within the lesser of ninety (90) days or upon 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. The Plan for Compliance must also address the potential for minimally treated sewage to enter the environment during periods when the wetland area may be frozen or otherwise not fully capable of treating sewage.

11. 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.

12. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as approved by the Board in writing.

13. 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.

14. 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 Post River using the Water Supply Facilities or as otherwise approved by the Board.

2. The annual quantity of water used for all purposes shall not exceed 35,000 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. The Licensee shall direct all Sewage to the Sewage Disposal Facility or as otherwise approved by the Board.

2. The Licensee shall provide notice to an Inspector annually upon commencing the monitoring program when flow is observed from either the Sewage Disposal Facility, at monitoring station COR-3, or the Wetland Treatment Area at monitoring station COR-5.

3. All Effluent discharged from the Wetland Treatment Area Final Discharge Point at Monitoring Program Station COR-5 shall meet the following effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	30 mg/L
Total Suspended Solids	30 mg/L
Fecal Coliforms	1×10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

4. The Licensee shall maintain at all times, a freeboard of at least 1.0 metre, or as recommended by a qualified geotechnical engineer and as approved by the Board, for all dams, dykes or other structures intended to contain, withhold, divert or retain water or wastes.

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

6. All Effluent discharged from the Wetland Treatment Area Final Discharge Point, Monitoring Program Station COR-5, shall be demonstrated to be Not Acutely Toxic under the following tests to be conducted once annually approximately mid-way through discharge:

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

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

7. The Licensee shall dispose of and contain all solid wastes at the Solid Waste Disposal Facility or as otherwise approved by the Board.

8. The Licensee shall segregate and 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 until such a time as proper disposal arrangements are made.

9. The Licensee shall implement measures to control wind-blown litter at the Solid Waste Disposal Facility.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval, 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:

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

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

    c. 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

d. 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. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modification. These plans and drawings shall be stamped by an Engineer.

4. The Licensee shall provide as-built plans and drawings, stamped and signed by a professional Engineer registered in Nunavut, within ninety (90) days of completion of construction or, if already constructed, upon issuance of this Licence, including the following:

   a. Sewage Treatment Facilities upgrade, authorized under Amendment No.1, issued February 17, 2005 for the construction of additional infrastructure including perimeter containment berms and chain link fencing;

   b. Constructed diversion berms within the Wetland Treatment Area as identified in the conceptual Drawing No.3 and 4 of the Schematic Design Report (NJWL, August 2007), including location plans and cross sections; and

   c. Solid Waste Disposal Facilities and up grades authorized under Amendment No.1;

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

6. The Licensee shall ensure that sediment and erosion control measures are implemented prior to and maintained during activities carried out under this Part to prevent the release of sediment and minimize erosion.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board for approval, within ninety (90) days of issuance of the Licence, an Operations and Maintenance Manual prepared where appropriate, in accordance with the *"Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories; 1996"*. The Manual shall take into consideration the comments received during the application review process and shall contain the following plans:

   a. *Water Distribution Facility Operation and Maintenance (O&M) Plan*;

b. *Sewage Disposal Facility Operation and Maintenance (O&M) Plan*;
c. *Sewage Sludge Management Plan*;
d. *Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan*;
e. *Spill Contingency Plan; and*
f. *Monitoring Program Quality Assurance/Quality Control Plan (QA/QC Plan).*

2. The Licensee shall review the O&M Manual referred to in Part F, Item 1 as required by changes in operation and/or technology and modify accordingly. Revisions are to be submitted in the form of an Addendum to be included with the Annual Report.

3. An inspection of all engineered facilities related to the management of water and waste shall be carried out annually in July or August by a Geotechnical Engineer. 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.

4. The Licensee shall perform more frequent inspections of the engineered facilities at the request of an Inspector.

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

   a. employ the appropriate contingency measures as approved under the Operation and Maintenance Manual for the Hamlet of Coral Harbour;
   b. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
   c. submit to the Inspector, a detailed report on each occurrence, not 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 AND RESTORATION

1. The Licensee shall submit to the Board for approval an *Abandonment and Restoration Plan* at least six (6) months prior to abandoning any facilities or upon submission of the final design drawings for the construction of new facilities to replace existing ones. Where applicable, the Plan shall include information on the following:

   a. water intake facilities;
   b. the water treatment and waste disposal sites and facilities;
   c. petroleum and chemical storage areas;

d. any site affected by waste spills;
e. leachate prevention;
f. an implementation schedule;
g. maps delineating all disturbed areas, and site facilities;
h. consideration of altered drainage patterns;
i. type and source of cover materials;
j. future area use;
k. hazardous wastes; and
l. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

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
COR-1	Raw water supply intake at Post River	Active (Volume)
COR-2	Raw Sewage from pump-out truck	Active (Volume)
COR-3	Sewage on upstream side of lagoon berm	New
COR-4a, (corresponds to proposed SNP point 2)	Station within the Wetland Treatment Area	New
COR-4b(corresponds to proposed SNP point 3)	Station within the Wetland Treatment Area	New
COR-4c(corresponds to proposed SNP point 4)	Station within the Wetland Treatment Area	New
COR-5	Final Discharge Point of the Wetland Treatment Area	New
COR-6 (previously COR-2 under licence NWB3COR0207)	Run-off from the Solid Waste Disposal Facility	Active

2. The Licensee shall sample at Monitoring Program Stations COR-3, COR-4a, COR-4b, COR-4c and COR-5 once at the beginning, middle and near the end of the open water season when during periods of observed flow. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand (BOD_5)	Faecal Coliforms
Total Suspended Solids	pH
Conductivity	Nitrate-Nitrite

Oil and Grease (visual)	Total Phenols
Magnesium	Calcium
Sodium	Potassium
Chloride	Sulphate
Total Hardness	Total Alkalinity
Ammonia Nitrogen	Total Zinc
Total Cadmium	Total Iron
Total Cobalt	Total Manganese
Total Chromium	Total Nickel
Total Copper	Total Lead
Total Aluminum	Total Arsenic
Total Mercury	Total Organic Carbon (TOC)

3. The Licensee shall sample at Monitoring Program Station COR-6 annually during periods of runoff or seepage. Samples shall be analyzed for the following parameters:

TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

BOD_5	Faecal Coliforms
pH	Conductivity
TotalSuspended Solids	Oil and Grease
Nitrate-Nitrite	Ammonia Nitrogen
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

4. The Licensee shall report all results of acute toxicity testing as required under Part D, Item 6 within the Annual Report as per Part B, Item 1.

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

6. The Licensee shall measure and record, in cubic metres, the monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Program Station COR-2, for all purposes.

7. Additional monitoring stations, sampling and analysis may be requested by an Inspector.

8. 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.

9. All analyses shall be performed by a laboratory certified by the Canadian Association of Environmental Analytical Laboratories (CAEAL), or as otherwise approved by an Analyst.

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

11. 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 requested by an Inspector.

12. Modifications to the Monitoring Program may be made only upon written approval from the NWB.

13. The Licensee shall submit to the Board for review and approval, within six (6) months of the issuance of this licence, a report identifying any additional Final Discharge Points from the Wetland Treatment Area. The report shall at least include:

    a. Plans, specifications, geographic coordinates and a general description of each Final Discharge Point; and
    b. A description of how each Final Discharge Point is designed and maintained, if required.

14. If, during the term of this Licence, additional Final Discharge Points are identified, the Licensee shall submit the information as required by Part H, Item 13 for each new Final Discharge Point.

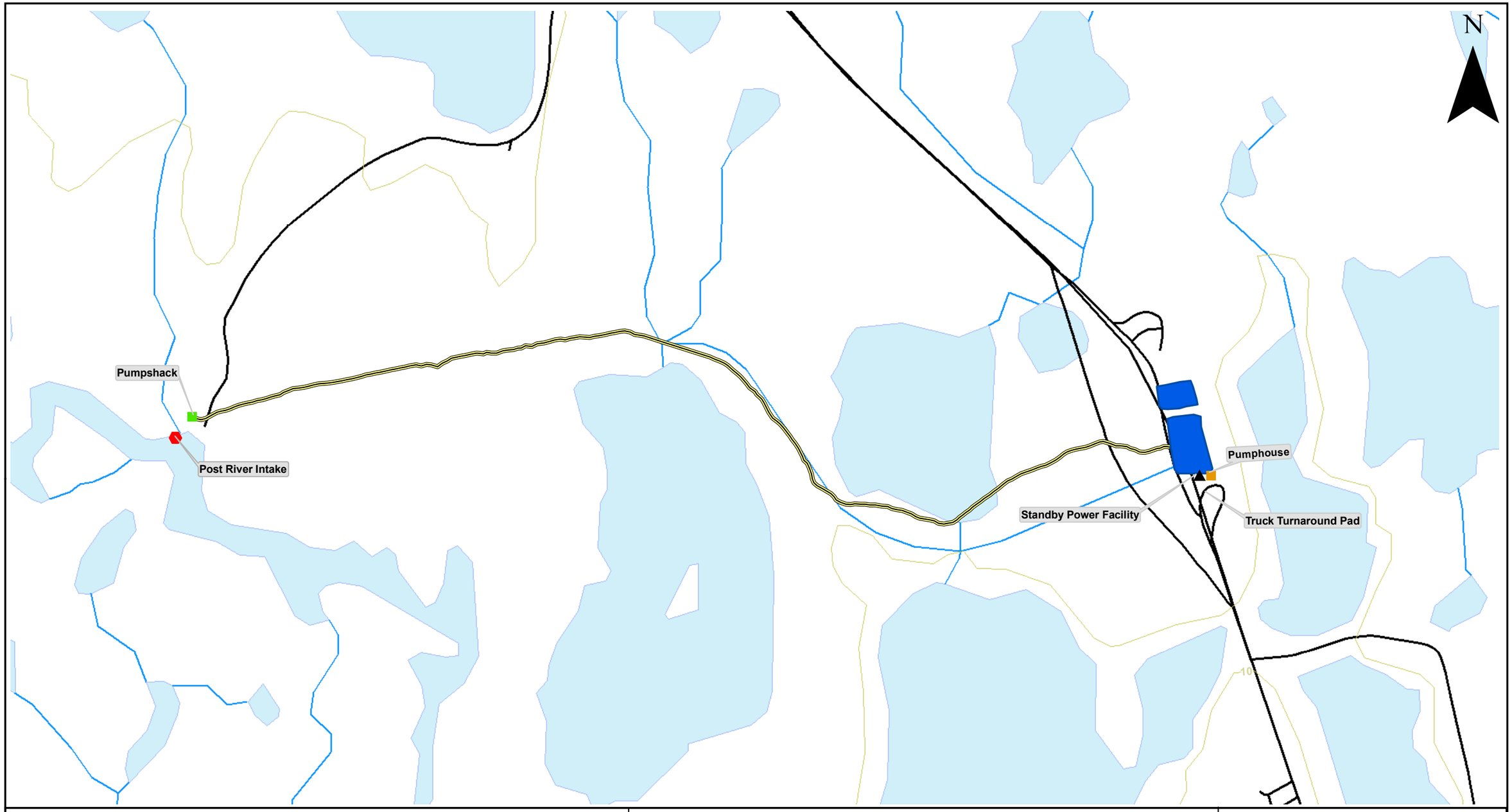
Appendix B Figures

Water, Sewage & Solid Waste Facilities Operation & Maintenance Manual
Coral Harbour, NU

Site Location Map

PREPARED BY
NUNAMI
JACQUES WHITFORD LIMITED

DRAFT DATE 13/11/2009			SCALE 1:250,000	
REVISION DATE			PROJECT 1054491	FIGURE NO. 1
DRAWN KS	CHECKED	APPROVED	VOL	



Water, Sewage & Solid Waste Facilities Operation & Maintenance Manual
Coral Harbour, NU

Water Distribution System

Post River Intake (Estimated)
Pumphouse
Pumpshack
Standby Power Facility
Pipeline
Stream
road
Reservoir
Water

0 125 250 500
Metres

PREPARED BY
NUNAMI
JACQUES WHITFORD LIMITED

DRAFT DATE	SCALE
13/11/2009	1:5,000
REVISION DATE	PROJECT 1054491 / FIGURE NO. 2
DRAWN KS / CHECKED / APPROVED	VOL

N

COR-2

Offload Area

COR-3

COR-4b

COR-5

COR-4a

COR-4c

Water, Sewage & Solid Waste Facilities Operation & Maintenance Manual
Coral Harbour, NU

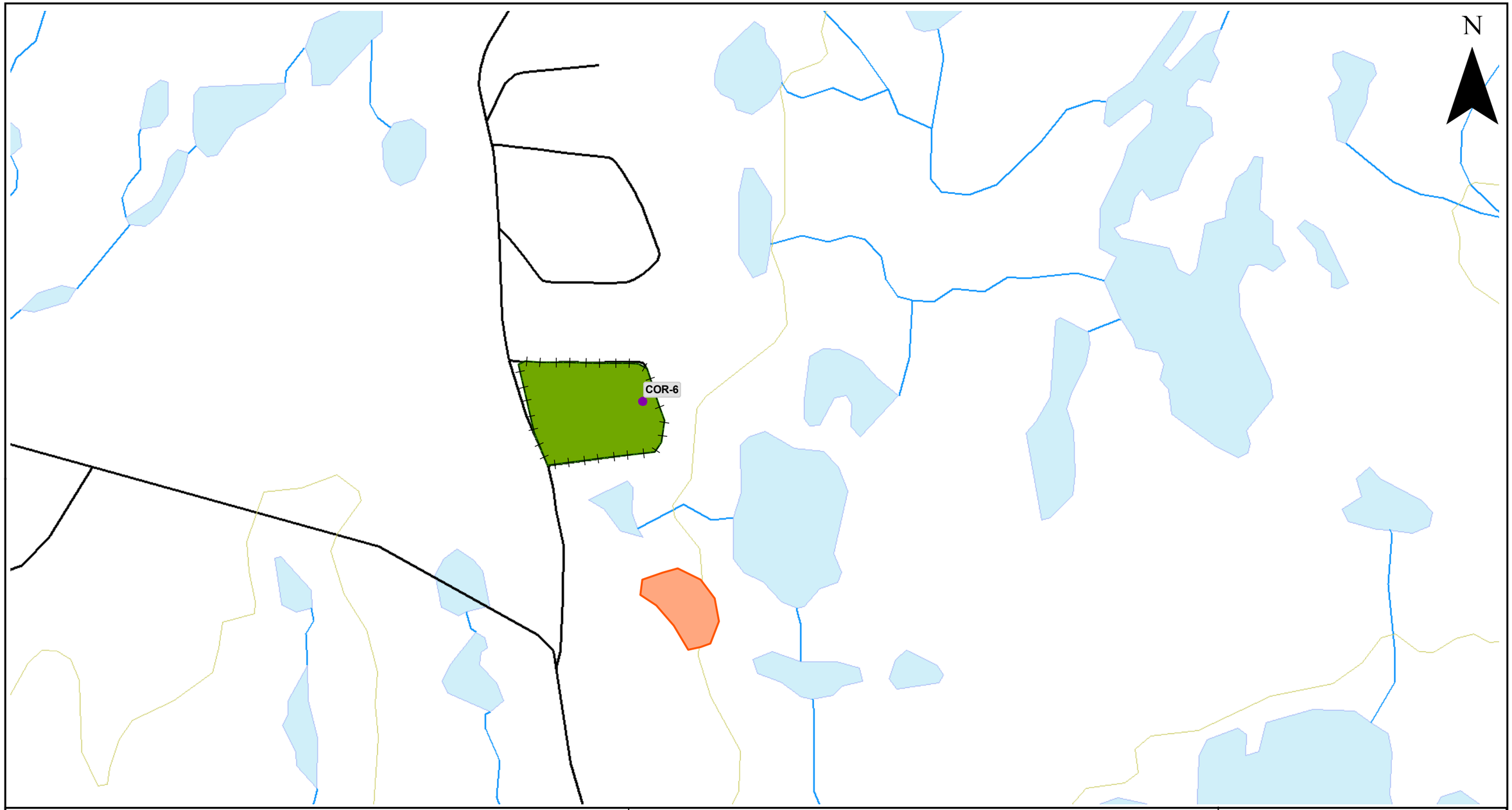
Sewage Disposal Facility

Monitoring Stations
Fence
Contour
Flow Diversion Berm
Stream
Sewage Disposal Facility
Road
Water

0 125 250 500
Metres

PREPARED BY
NUNAMI
JACQUES WHITFORD LIMITED

DRAFT DATE 13/11/2009			SCALE 1:5,000	
REVISION DATE			PROJECT 1054491	FIGURE NO. 3
DRAWN KS	CHECKED	APPROVED	VOL	



Water, Sewage & Solid Waste Facilities Operation & Maintenance Manual
Coral Harbour, NU

Solid Waste Disposal Facility

Monitoring Stations
Contour
Fence
Stream
Road
Bulk Metal Waste Disposal Area
Municipal Solid Waste Disposal Facility
Water

0 125 250 500
Metres

PREPARED BY
NUNAMI
JACQUES WHITFORD LIMITED

DRAFT DATE 13/11/2009			SCALE 1:5,000	
REVISION DATE			PROJECT 1054491	FIGURE NO. 4
DRAWN KS	CHECKED	APPROVED	VOL	

Appendix C 1985 Pumphouse and Standby Power Facility Operation & Maintenance Manuals

OPERATIONS AND MAINTENANCE MANUAL

CORAL HARBOUR

WATER SUPPLY SYSTEM

VOLUME I : PUMPHOUSE

Prepared by : W. L. WARDROP & ASSOCIATES LTD.

ENGINEERING CONSULTANTS

NOTICE TO USERS

The complete O&M manual is contained in two volumes. Volume I deals with the Pumphouse while Volume II deals with the Standby Power Facility. Refer to the Table of Contents for the locations of various sections and information within the two volumes. Note that as you use Volume II, reference will be made to information in Volume I, such as As-Built Drawings and Photographs.

CORAL HARBOUR WATER SUPPLY SYSTEM

OPERATIONS AND MAINTENANCE MANUAL

TABLE OF CONTENTS

NOTE: The complete O&M manual for the Coral Harbour Water Supply System is separated into two volumes. Volume I deals with those systems pertaining to the Pumphouse. Volume II deals with the Standby Power Facility. A complete listing of the contents of the O&M manual, the volume of the manual where each section may be found and the appropriate page number is provided below.

Manufacturers Brochures dealing with the pumphouse (ie: MB-1 to MB-40) are provided in Volume I of the O&M manual. Those dealing with the Standby Power Facility (ie: MB-41 to MB-51) are provided in Volume II.

Pumphouse: (Volume I)

1. Submersible Pumps
2. Pump Electrical Connectors
3. Heat Trace Cables
4. Heat Trace Controllers
5. Heat Trace Connectors
6. Heat Shrink Tape
7. Pumphouse Building
8. Pumphouse Skid Foundation
9. Three Way Valve
10. Butterfly Valve
11. Ball Valve

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BACKGROUND DATA

General

Prior to construction of the reservoir and pumphouse facility, the water supply system consisted of trucked water delivery from either the Post River approximately 1 km west of the community, or DOT Lake approximately 6.6 km north of the settlement. Occassionally, melting of ice was used in the spring due to inaccessability to the Lake and heavy surface run off in the river which resulted in water of objectionable quality.

In 1978, the Government of the Northwest Territories prepared a report entitled "Preliminary Engineering Study of Water Supply Systems in Coral Harbour". This study provided a comparison of alternative water supply systems, and concluded that the most cost effective method of providing a year round source involved the construction of a reservoir and associated pumphouse facility. The reservoir would be filled on an annual basis from the Post River.

In September, 1979, Thurber Consultants Ltd. prepared a report entitled "Design Brief, Water Supply Systems, Coral Harbour". This report was a study of alternative types and sites for a man-made reservoir and concluded that a reservoir blasted out of the bedrock at a location approximately 1 km north of the community was the most practical option. The construction of this reservoir was completed in 1980.

In 1979, W.L. Wardrop & Associates Ltd. prepared a set of design drawings and specifications for the construction of a pumphouse facility at the reservoir. However, this pumphouse was not constructed.

In 1985, various modifications were made to the 1979 design, and the project tendered. Construction of the pumphouse facility was completed in 1986.

Design Parameters

As mentioned above, the pumphouse facility at Coral Harbour was constructed based on a design produced in 1979, which was subsequently revised in 1985 just prior to construction. The following is a listing of the parameters used for the preparation of the design of the facility:

1. Populations and water consumptions:

Year	Population Projection	Water Consumption LPCPD	Water Consumption Total Annual (Millions of litres)
1978	425	45	6.98
1988	575	100	20.99
1998	780	110	31.32
2008	1075	115	45.12

2. Truck filling rate to be 1000 litres per minute.

3. Intake system to consist of dual inclined shafts, insulated and heat traced, with submersible pumps.

4. Preheating of water prior to pumping into the water delivery trucks is not required.

5. Pumphouse to be a Bally or Coldstream type building.

6. Chlorination for disinfection is only treatment required.

7. Pumphouse to be heated electrically using radiant style heaters.

8. Water meter to have remote readout for truck driver observation.

9 All piping to be graded to permit all lines to drain after pump is shut off.

10. Heat tracing to be self limiting type cable.

11. Alarms to be transmitted to dual red/green signal system outside pumphouse.

12. Pump operation to be controlled by switches at both the exterior control box or from truck fill line.

13. Running time of pumps to be timer controlled to prevent overfilling of trucks.

14. A standby power facility is to be provided to ensure a supply of electrical power to the pumphouse for pump operation in the event of failure of normal power. Specific design criteria for this facility are as follows:

- generator sizing to be based on running one pump. Voltage to be 120/208, 3 phase.
- heating loads not to be on standby power when pump is running.
- facility is to be enclosed in an unheated building separate from the pumphouse (this is due to the fact that design drawings for the pumphouse were already complete).
- electric building heater to be provided for maintenance on genset. Heater to be timer controlled to limit operation.
- fuel tank to be exterior to building and to be enclosed so that all spills are contained.
- complete facility is to be mounted on a skid frame for ease of construction and possible future relocation.

- engine to be equipped with thermostatically controlled immersion type oil heater and battery blanket to maintain temperature to permit cold weather starting (ie: keep engine warm, not building).
- transfer from normal to emergency power to be automatic. Genset to automatically start.
- battery charger to be provided to maintain battery condition. Charger shall not continuously trickle charge, since this results in loss of electrolyte over a long period of time.

3. OPERATING PROCEDURES

Notes:

In these procedures, references are made to other parts of this manual by abbreviations as per the following examples:

a) MB-3 refers to section 3 of the Manufacturer's Brochures. Manufacturers Brochures regarding the pumphouse are included in Volume I of the manual. Manufactures Brochures regarding the Standby Power Facility are included in Volume II of the manual.

b) AB-9/9 refers to as-built drawing number 9 of 9. All as-built drawings are contained in Volume I of the manual.

c) P-1 refers to Photograph #1. All photographs are contained in Volume I of the manual.

Refer to the Component Listing section for a detailed breakdown of the components of each system or subsystem. Component Listing for the Pumphouse is included in Volume I. Component Listing for the Standby Power Facility are included in Volume II.

A. PUMPHOUSE

3A.1 Water Intake System

Each of the two water intakes consists of three subsystems which are discussed below:

1) Intake Casing
   The intake casing is a static system and requires no operation.

2) Pump and Discharge Piping
   The operation of the pumps is described under Section 3A.3 entitled "Truck Fill System".

3) Intake Heat Trace

The intakes are heat traced with two Chemelex self limiting heat trace cables (see MB-3). One cable is a duty cable and should always be plugged into the wall socket using the plug in connector (see MB-5 and P-3). The other cable is a spare which is to be used if the first cable fails.

These cables are manufactured of materials which automatically adjust the amount of heat generated by the cable in relation to the ambient temperature surrounding the cable. In addition to the self limiting feature, the cables are also controlled by separate heat trace controllers (see MB-4and P-3). These controllers have two thermostats (thermistors) which are located inside liquid tight conduits which are mounted on the surface of the pump discharge pipe within the intake casings. Refer to AB-9/9 for the locations of the thermistors. One thermistor is the control thermistor, and it controls the on/off function of the heat trace cable. The other thermistor is a high limit thermistor, which is a safety device to turn off the heat trace if the temperature gets too high. A complete description of the setpoints of the heat trace controller and the thermistors, as well as a description of the three indicating lights on the face of the controller is provided in MB-4. The thermistors are connected to the heat trace controllers through quick connectors (see MB-5 and P-3). These cables should always be plugged in.

Normally, heat trace operation is controlled automatically by the controller. Power to the controller is provided by two 30 amp two pole breakers located in panel B in the pumphouse. Breaker # 2, 4 serves the heat trace on intake P-1, and Breaker # 9, 11 serves the heat trace on intake P-2. These breakers should always be in the "on" position, unless you want to shut off the heat trace for some reason (eg: maintenance check).

Refer to Section 3A.7 entitled "Electrical System" for a discussion on the normal and emergency power supply to Panel B.

Heat Trace Troubleshooting

As mentioned previously, there are two heat trace cables installed in each intake casing. In the event of a failure of the first heat trace cable, the second one may be plugged into the heat trace cable receptacle.

Note that the second heat trace cable may also be used in conjunction with the first cable to speed up the thawing process if the intake casing should freeze. To do this, plug in the second cable into the receptacle used for the duty heat trace on the other intake casing. Be careful with this operation, because:

- the second heat trace on the frozen intake is being controlled by the heat trace controller for the other intake, which has it's thermistors located in the other intake as well.

- two heat trace cables operating on one intake could possibly overheat the plastic pipes if left on for too long.

- the other intake (ie: not the frozen one) is left unprotected (ie: heat trace is not "on") in this operation, and may freeze if left like this for too long.

  In the event of a frozen intake, which would indicate a heat trace failure, you can check for the cause of the problem as follows:

  1. Check to make sure that the breakers in Panel B for the heat trace are "on".

2. Try plugging in the standby heat trace cable on the frozen intake into the controller for this intake. If this standby cable works (ie: you can tell if it works by the lights on the controller. Refer to MB-4), then the duty heat trace cable has failed. You now have to thaw the intake using the standby cable, and then pull out the pump and discharge piping (ie: Refer to Section 3A.8 entitled "Pump Removal System"). The heat trace cable can then be replaced.

3. If in step 2 above, the cable does not work, then the controller or the control thermistor are the problem.

4. To check the thermistor, unplug them from the controller on the frozen intake and plug them into the controller on the other intake. If the heat trace on the other intake works, then the thermistors are working. If the heat trace doesn't work, then you have to thaw out the frozen intake, remove the pump and replace the control thermistor.

5. To check the controller, unplug the control thermistor from the other intake into the controller on the frozen intake. If the heat trace doesn't work, then the controller is defective and must be replaced.

3A.2 Pumphouse Building System

The pumphouse building is a Bally building, and is constructed of 4" thick urethane insulated panels (see MB-7). The building and metal skid frame foundation (see MB-8) were constructed in Edmonton and shipped to Coral Harbour as a prefabricated unit. Prior to shipping, the exterior of the building was spray painted to match the blue color of the adjacent standby power facility.

The pumphouse is a static system and requires no operation. Regular building type maintenance should be performed to keep the structure in good condition. This includes regular inspections of the roof and walls, re-caulking of joints when required, and re-painting when required.

3A.3 Truck Fill System

The truck fill system inside the pumphouse is connected by piping to the discharge piping of the submersible pumps, which form part of the Water Intake System discussed in Section 3A.1. The operation of the pumps and the truck filling system may be performed from outside the pumphouse by the water truck driver to fill the water truck, or from inside the pumphouse by the pumphouse operator. Step by step directions for the operation of the truck fill system is as follows:

The operate the truck fill system from inside the pumphouse:

1. The two butterfly valves below the three way valve (see P-3) should be in the open position (ie: the valves are open when the handles of the valves are parallel to the pipes). This will allow water from either pump to flow out the truck fill line.

2. To start the pump in intake P-1, go to the two pump starters located below panel CP-1 (see MB-12 and P-11). On the starter labeled P-1, turn the hand-off-auto switch to the "hand" position. This will start the pump. The red indicator light on the starter will come on indicating that the pump is running.

3. The pump will run for as long as the "hand-off-auto" switch is in the "hand" position.

4. To stop the pump, turn the "hand-off-auto" switch to the "off" position.

CAUTION: AFTER STOPPING A PUMP, DO NOT IMMEDIATELY RE-START IT, BECAUSE WATER DRAINING BACK THROUGH THE PUMP CAUSES IT TO TURN BACKWARDS. RE-STARTING IT WHILE THIS IS OCCURRING MAY RESULT IN DAMAGE. WAIT AT LEAST ONE MINUTE BEFORE RE-STARTING.

5. To start pump P-2, follow the same procedure as above, but use the starter labeled P-2.

6. Note that you can run both pumps at the same time by turning both "hand-off-auto" switches to the "hand" position, but you should NOT run both pumps at the same time because of the way the three way valve operates (see MB-9).

7. Also, NEVER RUN BOTH PUMPS AT THE SAME TIME IF THE STANDBY GENERATOR IS BEING USED TO SUPPLY POWER TO THE PUMPHOUSE. The generator is sized for only one pump running.

To operate the truck fill system from outside the pumphouse:

1. Firstly, the "hand-off-auto" switches on the starters for the submersible pumps (see MB-12 and P-11) must be in the "auto" position. This transfers control of pump operation to the control panel CP-2 outside the pumphouse (see P-10). Normally these hand-off-auto switches should always be in this "auto" position (ie: pumps are normally operated by the truck driver).

2. In addition, the two butterfly valves below the three way valve (see MB-9 and P-3) should be in the open position. This will allow water from either pump to flow out the truck fill line.

3. To start pumping water into the water truck, you turn the "on-off" switch on panel CP-2 to its other position (see P-10) (ie: if this switch is over to the right, start the pump by turning it over to the left, and vice versa).

4. You can also start the pump by changing the position of the switch mounted on the truck fill line.

5. Note that steps 3 and 4 allow you to start the pump from either the truck fill line, or from control panel CP-2. These switches operate in the same way as a three-way light switch in your house. Note that you may have to change the position of these switches twice, (ie: turn it first to the left and then back to the right) depending on the status of the pump run timer discussed on Page 3A-7.

6. When the pump starts, the green "pump running" light on panel CP-2 will come "on" to indicate the pump is running (see P-10).

7. To stop the pump, simply change the position of either the switch on the truck fill line, or the "start-stop" switch on Panel CP-2.

8. On Panel CP-2, there is also a pump selector switch. When this switch points to pump #1, it means that the pump in intake #1 will be running. To run the pump in intake #2, change the position of this selector switch to pump #2. If you change the position of the selector switch, an alarm light on Panel CP-1 inside the pumphouse will come on (see P-11). This is to alert the pumphouse operator that it has been necessary to use a standby pump. Therefore, to prevent false alarms, don't change the position of the selector switch unless you try to start the initially selected pump, and it doesn't work.

Additional pump operating notes:

1. When you start either of the submersible pumps following the steps above, the pump will run for a preset length of time, unless you stop it manually. This timed running of the pumps is to reduce the potential for overfilling the water truck, or for the pump to be left on for a long length of time, thereby spilling water.

2. The length of time that a pump will run is adjustable by setting the pump run timer inside control panel CP-1 (see P-12 and MB-35). This timer should be set to run the pump for about 5 minutes.

You can adjust this timer by turning the clear plastic knob on the front. The red line will line up with the desired setpoint.

3. Whenever a pump is started (either using the "hand-off-auto" switch on the starters, or using the switches in control panel CP-2 or on the truck fill line) and then stopped (either manually or by the pump run timer), it cannot be immediately started again. There is a "pump wait timer" in panel CP-1 (see P-12 and MB-35). When the pump is stopped, this timer is turned "on". At the same time, the red "wait" indicator light on Panel CP-1 (see P-11 and MB-36) and the red "wait" light on Panel CP-2 (see P-10 and MB-36) will come on. These lights will stay on until the timer times-out. When these lights go off, then you can start the pump again.

   The reason for this "wait" timer is that when the pump stops, water in the discharge pipe drains back down into the reservoir through the pump. This causes the pump to turn backwards until all the water has drained. If you start a pump when it is turning backwards, damage could result. Therefore a timer was used to make sure that the pump could not be restarted until the water has drained back.

4. The "pump wait" timer (see P-12 and MB-35) is adjustable, and should be set at about one minute normally. To adjust it, turn the clear plastic knob on the front face, until the red line is even with the desired setpoint.

5. **CAUTION:**

   IF YOU PUSH ANY PUMP START BUTTON WHILE THE "WAIT" LIGHT IS "ON", THE PUMP WILL NOT START UNTIL THE LIGHT GOES OUT. THEREFORE, IF YOU LEAVE THE PUMPHOUSE IN THE MEANTIME, THE PUMP WILL COME ON WHEN YOU ARE NOT THERE, RESULTING IN WATER SPILLAGE.

   THEREFORE MAKE IT A PRACTISE TO <u>NEVER</u> PUSH A PUMP START BUTTON WHILE THE "WAIT" LIGHT IS ON.

6. When you are using the truck fill system to fill water trucks, a water meter and readout system (refer to P-5, P-10, P-11 and MB-14) records how much water is being pumped. A sensor in the truck fill line (see P-5) detects the amount of water flowing past it, and sends a signal to two readouts. One readout, mounted on Panel CP-1 (see P-11) is a non-resettable totalizer and flow rate indicator. This readout shows the total amount of water that has been pumped since the facility was put into operation. It also has a needle which indicates the pump flow rate (ie: litres per minute).

   The second readout, mounted in Panel CP-2 (see P-10) is a resettable totalizer. You can set this meter to zero by pushing the button on the face of the readout. You can use this to measure how much water is pumped into the delivery truck each time it is filled. Also, by watching this readout, you can tell when the truck is full. This second meter readout also has a non-resettable totalizer on it. It should read approximately the same as the non-resettable totalizer in Panel CP-1.

   When you are taking meter readings, you should always record both non-resettable totalizer readings.

Pump Troubleshooting:

1. If you try to run the pumps but can't get any water, you should go through the procedures in this section step by step to ensure that you are doing everyting correctly (ie: valves may be closed, switch in wrong position, etc.)

2. If you still can't get the pump to work, try running it manually using the "hand-off-auto" switch on the starter.

3. If the pump doesn't run on either automatic (ie: from outside the pumphouse) or on manual (ie: from inside the pumphouse) check the breakers for the pumps in Panel "A". These should be "on".

4. Check to make sure that the pump power cables are securely plugged in.

5. If still no water, the pump may be the problem. Try running the other pump. If it works, then you probably have a pump problem. You can check the first pump by plugging it into the receptacle used for the second pump. If it still doesn't work, then it is the problem. Refer to MB-1 for specific pump troubleshooting info.

3A.4 Chlorination System

To fill the chemical mixing tank:

1. Close the butterfly valve above the three way valve (see P-5).

2. Manually start either one of the submersible pumps by turning the "hand-off-auto" switch on the starter (see P-11) to the "hand" position.

3. Remove the cover of the mixing tank.

4. Open the filling valve on the waterline (see P-6), which will allow water to fill the chemical mixing tank.

5. When the tank is filled to the desired level, close the filling valve.

6. Stop the pump by turning the "hand-off-auto" switch to the "off" (or "auto") position.

7. Open the butterfly valve above the three way valve.

To mix chlorine solution:

Follow the directions provided on the wall plaque. These directions with additional comments added, are as follows:

1. To mix chlorine solution, add 70 grams (0.15 pounds) or about 1/2 cup of chlorine powder (Starchlon - 65% available chlorine) to each gallon of water (see MB-23). This will produce a 1% (10,000 mg/l) chlorine solution.

2. Add water to the mixing tank as per the directions given above.

3. You can tell how much water is added to the mixing tank by checking the markings on the side of the tank (for example, if the level is at 2 gallons and you fill it up to the 5 gallon mark, then you have added three gallons of water. You should add 1-1/2 cups of chlorine powder for 3 gallons of water).

4. After you have added the chlorine powder and the water, use the chemical mixing agitator to mix the water and chemicals together. To turn the mixer on, plug it into the wall receptacle labeled "mixer receptacle".

5. You should allow the mixer to run for quite awhile (about one hour is suggested) to thoroughly mix the chlorine powder with the water.

6. To stop the mixer, simply unplug it from the receptacle.

To add chlorine solution to the chlorine solution tank:

1. Open the chlorine solution transfer valve (see P-7) at the bottom of the chlorine mixing tank. This will allow chlorine solution from the mixing tank to flow into the solution tank.

2. When enough chlorine solution has been transferred, close the transfer valve.

CAUTION: DON'T TRANSFER CHLORINE SOLUTION FROM THE MIXING TANK TO THE SOLUTION TANK IMMEDIATELY AFTER MAKING UP A NEW BATCH, SINCE THE SETTLEMENT OF UNDISSOLVED POWDER WILL PLUG UP THE HYPOCHLORINATOR. WAIT ABOUT A DAY OR UNTIL THE CHLORINE LIQUID IN THE MIXING TANK IS CLEAR (IE: NO LONGER CLOUDY) BEFORE TRANSFERING TO THE SOLUTION TANK).

To test the water for the amount of chlorine:

1. Use the chlorine test kit (see P-7).

2. Collect a sample of chlorinated water from the water truck after it has been filled. Note that water samples collected from any other point are non-representative due to the pulse type operation of the hypochlorinator (ie: one sample may be very heavy in chlorine while another may be very low).

3. Allow the sample to sit for at least twenty (20) minutes before you test it.

4. To test the water, follow the directions inside the lid of the test kit. These directions are repeated below:

Free Chlorine Test:

- fill a color viewing tube to the 5 ml mark with clear water and place it in the left hand opening of the comparator.

- fill the other viewing tube to the 5 ml mark with the water to be tested.

- add the contents of one DPD Free Chlorine Reagent Powder Pillow to the test sample. Swirl to mix and place it in the comparator.

- hold the comparator up to light source, such as a window, the sky or a lamp, and view through the openings in front. Rotate the disk until a color match is obtained. Read the mg/l free chlorine within one minute through the scale window.

Total Chlorine Test:

- fill a color viewing tube to the 5 ml mark with clear water and place it in the left hand opening of the comparator.

- fill the other viewing tube to the 5 ml mark with the water to be tested.

- add the contents of one DPD Total Chlorine Reagent Powder Pillow to the test sample. Swirl to mix.

- let sample stand for at least 3 minutes, but not more than 6 minutes to allow for color development.

- place the sample in the comparator.

- hold the comparator up to a light source, such as a window, the sky or a lamp, and view through the opening in front. Rotate the disk until a color match is obtained. Read the mg/l total chlorine through the scale window.

5. When you test the water, you should get results of about 2 mg/l (ppm) for total chlorine, and about 0.1 to 0.3 mg/l (ppm) for free chlorine.

   If you obtain results that are higher than these, then too much chlorine is being added. This may result in complaints from the consumers. If you obtain chlorine residual results that are lower than these, then too little chlorine is being added, and there may be a possibility that all bacteria in the water is not being destroyed. This could result in health problems for the people using the water.

To adjust the amount of chlorine added to the water:

1. Turn the adjustment knob on the hypochlorinator (see P-7 and MB-20).

2. To increase the amount of chlorine, turn the knob to a higher number.

3. To decrease the amount of chlorine, turn the knob to a lower number.

4. To start, set the hypochlorinator adjustment knob on "5".

5. After 2 or 3 water trucks have been filled, take a sample of water and test it as per the instructions above.

6. If the results are too low, increase the chlorine as per step #2 above.

7. If the results are too high, decrease the chlorine as per step #3 above.

SAFETY NOTE: USE GLOVES, SAFETY GLASSES, AND APRON WHEN HANDLING CHLORINE POWDER OR SOLUTION.

How the hypochlorinator works:

1. When water flows down the truckfill line, it passes by a flow switch (see MB-24 and P-5), which makes an electrical contact and initiates the flow switch delay timer (see P-12 and MB-35) in Panel CP-1.

2. When the timer times out, power is supplied to the switched side of the hypochlorinator receptable (see P-5). This timer should be set for about 3 to 5 seconds.

3. With power at the receptacle, the hypochlorinator begins pumping chemical into the water in the truckfill line through the injection fitting (see MB-22) by stroking a piston back and forth at a prescribed rate. The frequency or pumping rate is adjustable by the knob on the top of the chlorinator (stroke length is fixed although it can be altered as per instructions provided in MB-20).

4. When water stops flowing past the flow switch, this opens the electrical circuit, and the hypochlorinator stops.

Hypochlorinator troubleshooting:

1. If you suspect that the hypochlorinator is not working, you can test it by plugging it into the "un-switched" side of the receptacle. When you plug it in, it should pump. If it doesn't, and the receptacle has power, then the hypochlorinator should be replaced. A spare one is provided in the cabinet.

3A.5 Heating System

The heating system in the pumphouse consists of two electrical radiant heating units (see MB-26 and P-5). These units are controlled by the room thermostats (see MB-27 and P-9). Each thermostat controls one heater.

Normally, these thermostats should be set for about 20°C (68°F).

To increase pumphouse temperature, turn up the room thermostats to a higher setpoint. To decrease pumphouse temperature, turn down the thermostats.

In the summer, these thermostats should be set to the lowest position to prevent the heaters from coming on.

The electric radiant heaters are provided with power from breakers # 1-3 and 5-7 in Panel "B" (see P-8). To shut off the power supply to the heaters, turn these breakers to the "off" position. Normally, however, these breakers should always by "on".

3A.6 Alarm System

Transmitted Alarms:

There is one transmitted alarm for the pumphouse. This is for low building temperature. A transmitted alarm is one which activates the red/green alarm light system on the roof of the pumphouse.

A low building temperature alarm thermostat (see MB-28 and P-9) senses building temperature. If this temperature gets too low, an alarm is signified by the red alarm light on the outside of the building (see MB-40 and P-1). If there is an alarm, the red light will come on and the green light will go off. If everything is normal, the green light will be "on", and the red light will be "off".

Normally, the green light should always be "on". If it is not "on" then the bulb may be burned out, or there may be no power at the pumphouse. If the power is out in the settlement, then this may be an indication that the standby generator has not started. In any case, if neither the green or the red light is "on", you should check the pumphouse.

Normally, the low building temperature alarm thermostat should be set at about $7^{o}C$ ($45^{o}F$).

About once a month, you should check to make sure that the low building temperature alarm and the alarm light system is working.

To check this system;

- make sure that the green light is "on".

- go to the low building temperature alarm thermostat and turn it up until the setpoint is above pumphouse room temperature. This simulates an alarm condition.

- check to make sure that the red alarm light goes on and the green light goes off.

- if the red light does not go on, check the bulb. If it is burned out, replace it.

- assuming that the red light is "on", go back to the alarm thermostat and lower the setpoint. This should turn the "red" alarm light "off" and the green one should go "on" again.

If you happen to find that the red light is "on" at some time, this indicates that the low building temperature alarm has been activated. In this case you should check the following:

- check the setting on the alarm thermostat. It should be set at about $7^{o}C$ (or about $45^{o}F$).

- check the breakers for the radiant heaters. They should both be "on".

- check the thermostats controlling the radiant heaters. These should be set at about $20^{o}C$. If you turn them up the heaters should come on.

- check the heaters for proper operation.

Non-transmitted alarms:

There is one non-transmitted alarm, namely the standby pump alarm. This alarm is signified by the red alarm light (see MB-36) on panel CP-1 (see P-11). This alarm does not affect the red/green alarm lights on the roof of the pumphouse and is therefore classified as a non-transmitted alarm.

If you come into the pumphouse and find that the red "standby pump alarm" light on the panel is "on", then you should first check with the water truck operator to see why he switched pumps. (He did this by turning the pump selector switch in panel CP-2 (see P-10) to the other position). He may have switched pumps because one pump wasn't working.

If there is no problem with the pump, and you wish to continue to use the presently selected pump, you can turn off the standby pump alarm light by turning the alarm reset selector switch (see P-11) to the other position. This will cause the red light to go off and will reset the alarm.

Additional alarm information:

Alarms with respect to the Standby Power Facility are discussed in Sections 3B.3 in Volume II which deals with this equipment.

Note that standby power facility alarms are not transmitted to the pumphouse red/green alarm light system. However, contacts are provided in the standby generator control panel for this purpose (Refer to MB-46). A set of terminals (ie: #33 and #34) are provided in control panel CP-1. To transmit standby power facility alarms to the red/green alarm light system would require that a pair of wires be used to connect the contacts to the terminals.

3A.7 Electrical System

Electricity for the pumphouse comes from either the normal utility (ie: NCPC) power supply, or from the standby power facility in the event of a failure in the utility power supply system.

The electrical power comes into the pumphouse via two underground electrical feeders from the standby power facility to electrical panelboard "A" (see MB-31).

Generally, Panel "A" will always have power to it, because it is connected to both the normal power supply system as well as the standby generator. Therefore, the electrical loads served by this panel are considered essential loads which need to be supplied with power at all times. An example of an essential load are the submersible pumps. This provision allows you to operate the pumphouse facility when the normal power is out by using the standby power facility to generate the electricity.

Panel "B" (see MB-31) is fed from Panel "A".

Generally, Panel "B" will also always have power supplied to it, UNLESS you are on standby power and a pump is running. (Note: Panel "B" is supplied with power from Panel "A" through a contactor which opens when a pump starts). The reason for this is that this panel serves "non-essential" loads, or loads which can be shut off for a short period of time. An example of this is pumphouse building heating. Under normal circumstances, this panel is provided with power from Panel "A". If NCPC (or normal) power goes out, and the standby generator facility starts up, this panel will continue to receive power until you start a pump. When you do this, the contactor in the standby power facility will open, thereby cutting off the power to Panel "B". When the pump is stopped, the contactor is closed and the panel is provided with power once again.

Generally, the breakers in panelboards "A" and "B" are operated in the same fashion as the breakers in your house. Normally, all breakers should be "on". A "tripped" breaker indicates an overloaded circuit.

3A.8 Pump Removal System

The submersible pumps, the discharge piping along with all related heat trace cables, and controls may be removed from the intake casing for servicing or maintenance following the general procedure as described below;

1. Unplug the following at the wall receptacle,
   - pump power cable
   - heat trace cable
   - heat trace control cables (ie: thermistor leads)

2. Locate the winch stand (see AB 6/9 and 7/9) in front of the intake to be dismantled, and fasten it in place. Use the threaded inserts in the floor that are provided for this purpose.

3. Turn off the pump in the intake by turning the "hand-off-auto" switch to the "off" position. In addition, turn "off" the local disconnect switch located below the starter for the pump to be removed.

4. Turn off the breaker in Panel A that serves this pump. Also turn off the breaker serving the heat trace cable in this intake.

5. Close the butterfly valve located below the three way valve that serves this intake (see P-3).

6. Disconnect the victaulic pipe coupling above the 45^{o} elbow (see P-3).

7. Thread the pump removal cable through the winch (see MB-29) and hook the winch onto the winch stand.

8. Remove the split flange assembly at the top of the intake casing.

9. Once you have disconnected all piping and electrical equipment, remove the entire pump discharge assembly by winching it out with the winch. Guide the end of the system out the open door way.

10. It is suggested that as the removal of the discharge assembly takes place, that the free end of the system which is outside the door be carefully guided over the ground around the site to prevent damage.

11. Continue to winch out the assembly until the pump is removed.

12. The re-installation of the assembly is accomplished by reverse order of the above.

3A.9 Fire Protection System

The fire protection system consists of a wall mounted fire extinguisher (see MB-30)

Once a month check the extinguisher to ensure that it is fully charged. If it is not fully charged, make arrangements to have it recharged or replaced.

Once a year, have the extinguisher inspected by the Fire Marshall and have it tagged to verify that it has passed inspection.

3A.10 Lighting System

Pumphouse interior lighting consists of two fluorescent light fixtures (see MB-38) mounted on the ceiling, and controlled by a light switch located near the door. Pumphouse exterior lighting consists of photo-cell controlled low pressure sodium fixtures (see MB-39).

Other than replacement of burned out lamps, the only other maintenance required is periodic cleaning and dusting of the reflector and lens, which may be done whenever required.

3

A.11 Truck Fill Line Heat Trace System

The truck fill line is insulated and heat traced to prevent it from freezing. The heat trace and insulation was added to the system following construction.

The heat trace (see MB-17) is supplied with power from circuit breaker #6 in Panel B (see P-8). To turn on the heat trace, put this breaker in the "on" position. To shut off the heat trace, put the breaker in the "off" position.

The heat trace should be turned "on" in late fall and left "on" all winter. It should be shut off in the spring and left off all summer.

3A - PUMPHOUSE

3A.1 WATER INTAKE SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Intake Casing					
	a) Insulated Pipe (pump casing)	250 mm Ø series 60 and series 80 insulated high density polyethylene (HDPE) pipe	Used as carrier pipe for pumps and discharge power cables, heat trace cables, etc.	4/9	P-2	-
	b) Flanges		Used for pump casing connection	5/9	-	-
	c) Insulated Half Shells		Used over flange assemblies to provide continuous insulation	5/9	P-2	-
	d) Heat Shrink Tape	Canusa heat shrink tape	Used to protect joints between half shells and insulated pipe	5/9	-	MB-6
	e) Reinforced Concrete Ballast Blocks	Fabricated by Contractor	Used as ballast to hold intake casing	4/9	P-2	-
2.	Pump Discharge Piping					
	a) Submersible Pumps (P1 & P2)	Grundfos SP 45-2	Pumps water from reservoir to truck fill line	5/9	-	MB-1
	b) Pump skids	Fabricated by Contractor	Act as torque arrestor	5/9	-	-

3A.1 WATER INTAKE SYSTEM
(Continued)

COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
2. Pump Discharge Piping (Continued)					
c) Coupling	Victaulic Style 77	Pump connection to discharge piping	5/9	-	MB-18
d) Transition Fitting		Mechanical joining of steel & polyethylene piping	5/9	-	-
e) Discharge Pipe	100 mm Ø series 100 high density polyethylene (HDPE) pipe	Use as discharge pipe from submersible pump	4/9, 5/9	-	-
f) Pump Removal Cable	8.3 mm Ø, 85 m long	Attached to pump skid for pump removal	5/9	P-3	-
g) Pump Electrical Connectors	Hubble 8450 receptacle 8451 plug	Used as quick connector on pump power supply cable	8/9	P-3	MB-2
3. Intake Line Heat Trace					
a) Primary & Standby Heat Trace Cable	Chemelex auto-trace self-limiting Type 8BTV2	Used for heat tracing of HDPE pump discharge pipe	4/9, 5/9, 8/9	-	MB-3

3A.1 WATER INTAKE SYSTEM
(Continued)

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
3.	Intake Line Heat Trace (Continued)					
	b) Heat Trace Carrier Pipe	22 mm Ø series 160 polyethylene (HDPE) pipe	Used to house heat trace cable	-	-	-
	c) Heat Trace Controller	Model TCS-2 in CEMA-4 enclosure	Used to control heat trace cables	8/9	P-3, P-9	MB-4
	d) Twist Lock Connector (heat trace cable)	Hubble 2631 plug, 2630 receptacle	Used as quick connector for heat trace cable connection to controller	8/9	P-3	MB-5
	e) Connector (thermistor leads)	Amphenol MC4M plug MC4F receptacle	Used as quick connector for thermistor leads to controller	8/9	P-3	MB-5

3A.2 PUMPHOUSE BUILDING SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Building	Bally building, size 4700 X 3530 X 2800 mm high	Houses pumphouse equipment	3/9	P-1, P-4	MB-7
2.	Skid Foundation	Fabricated by Contractor	Metal skid frame for pumphouse building	-	-	MB-8

3A.3 TRUCK FILL SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Pumphouse Piping	Water piping 100 mm Ø galvanized steel Schedule 40, ASTM 53	Used to supply water to truck fill line	6/9	P-3	-
2.	Three Way Valve	Tech-Taylor valve Model T2FV4	Used to connect two pump discharge pipes to a common outlet	6/9	P-3	MB-9
3.	Butterfly Valve	Victaulic series 700, c/w latch lock handle	Used to control water flow in pumphouse	6/9	P-3	MB-10
4.	Ball Valve	Victaulic series 700	Used to control back pressure on three way valve	6/9	-	MB-11
5.	Couplings	Victaulic style 71	Mechanical joining of piping and fittings		P-3	MB-18
6.	Flow Meter & Readout	Signet Model MK515 sensor, Model 578 resettable counter and Model 575 non-resettable totalizer and flow rate indicator	Measures flow of water through truck fill line	9/9	P-5, P-10, P-11	MB-14
7.	Truck Fill Hose	Wire reinforced water hose	Used to fill water truck	6/9	P-1, P-4	MB-15

3A.3 TRUCK FILL SYSTEM
(Continued)

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
8.	Truck Fill Hose Connector	Bayco No. 700 AF threaded female adapter. Bayco No. 710 CS shank coupler	Quick connectors for truck fill hose	6/9	P-4	MB-16
9.	Pressure Gauge	Trerice No. 450 B, Range 0-700 kPa (0-100 psi)	Used to measure water pressure	6/9	P-5	MB-13
10.	Pump Starters	Square D Model 8536-SCG3	Used to start pumps	-	P-11	MB-12
	a) Hand-Off-Auto Switches	Allan Bradley 3 position AB-800T-32A	Used to control pumps	-	P-11	MB-34
11.	Local Disconnects	Bryant 4602, double pole switch	Used to electrically isolate pump starters for maintenance	8/9	-	MB-37
12.	Truck Fill Line Switch	Allan Bradley AB-800T-FX204	Used to control start/ stop operation of pumps	9/9	-	MB-34

NOTE: Refer to Electrical System for components in control panels.

3A.4 CHLORINATION SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Chlorine Mixing Tank	114 liter (30 U.S. gal.) polyethylene tank c/w cover and drain valve	For mixing of chlorine solution	6/9	P-5, P-6, P-7	MB-19
2.	Chlorine Feed Tank	114 liter (30 U.S. gal) polyethylene tank c/w cover	For storage of chlorine solution used for chlorination of water	6/9	P-5	MB-19
3.	Chlorine Mixer	Wallace & Tiernan Mixer U 21742 & Shaft U 21751	For mixing of chlorine solution	6/9	P-6	MB-21
4.	Hypochlorinator	Wallace & Tiernan Model 94-130	Pumps chlorine solution to truck fill line	6/9	P-7	MB-20
5.	Chlorine Solution Injection Fitting	Wallace & Tiernan U 24769	Used to inject chlorine solution into water in truck fill line.	6/9	-	MB-22
6.	Foot Valve	Wallace & Tiernan	Used as foot valve & strainer on hypo-chlorinator suction line	-	-	MB-20
7.	Flow Switch	McDonnel FS4-3	Used to control hypo-chlorinator operation	6/9 9/9	P-5	MB-24
8.	Chlorine Test Kit	Hach CN-66	Used to measure amount of total chlorine & chlorine residual in water	-	P-7	MB-25

3A.5 HEATING SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Radiant Heaters	Chromalox KRR 2124C1	Used as heat source for pumphouse	8/9	P-5	MB-26
2.	Control Thermostats	Johnson T265-18J/C	Used to control radiant heaters	8/9	P-9	MB-27

3A.6 ALARM SYSTEMS

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Low Building Temperature Alarm					
	a) Thermostat	Tradeline T631C	Used to sense low building temperature & activate alarm	8/9	P-9	MB-28
	b) Outside Alarm Light	Rab VAS100CG	Green light indicates normal building temperature, red light indicates alarm condition	8/9	P-1	MB-29

3A.7 ELECTRICAL SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Panel "A"	Square D, NQOB-24AB	Power distribution for pumphouse essential services	8/9	P-8	MB-31
2.	Panel "B"	Square D, NQOB-24AB	Power distribution for pumphouse non-essential loads (ie: heating load of pumphouse)	8/9	P-8	MB-31
3.	Control Panel CP-1	Fabricated by electrical sub-contractor	Interior control panel for pumps	8/9 9/9	P-10	MB-32
	a) Water Meter Readout	Signet Model 575 non-resettable counter & flow rate indicator	Indicates total water flow out of reservoir & pumping rate	9/9	P-11	MB-14
	b) Indicator Lights	Oiltight, push to test type Allan Bradley AB-800T-PT-16R	Indicates alarms, pump running, etc.	9/9	P-11	MB-36
	c) Selector Switch	Allan Bradley 2 position selector 800H-HR2A	Used to designate which pump is to be duty pump	9/9	P-11	MB-34
	d) Electrical Relays	Omron LY2-US and LY4-US	Used for control of pumps	9/9	P-12	MB-35
	e) Flow Switch Relay Timer	Agastat SSC 12 AIA range 10 sec. to 300 sec.	Used to prevent "chattering" in chlorinator control	9/9	P-12	MB-35

COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
3. Control Panel CP-1 (Continued)					
f) Pump Run Timer	Omron H3BA-AC-120	Used to control length of time pump runs	9/9	P-12	MB-35
g) Pump Wait Timer	Omron H3BA-AC-120	Used to control length of time you wait before restarting pumps	9/9	P-12	MB-35
4. Control Panel CP-2	Fabricated by electrical sub-contractor	Exterior control panel for pumps	8/9 9/9	P-11, P-12	MB-33
a) Pump "On-Off" Switch	Allan Bradley 2 position selector 800H-HR2A	Used to start and stop pumps	9/9	P-10	MB-34
b) Pump Selector Switch	Allan Bradley 2 position selector 800H-HR2A	Used to select which pump will run	9/9	P-10	MB-34
c) Water Meter Readout	Signet Model 578 resettable counter and non-resettable totalizer	Used to indicate amount of water pumped to truck	9/9	P-10	MB-14
d) Indicator Lights	Oil tight push to test type, Allan Bradley AB 800T-PT-16R	Used to indicate pump operation	9/9	P-10	MB-36
5. Electrical Disconnects	Bryant 4602, double pole switch	Used to electrically isolate pump starters	8/9, 9/9	-	MB-37

3A.8 PUMP REMOVAL SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Winch	Anthes sure pull Model A-7, 1250 kg pulling capacity	Used to remove submersible pumps	6/9	-	MB-29

3A.9 FIRE PROTECTION SYSTEM

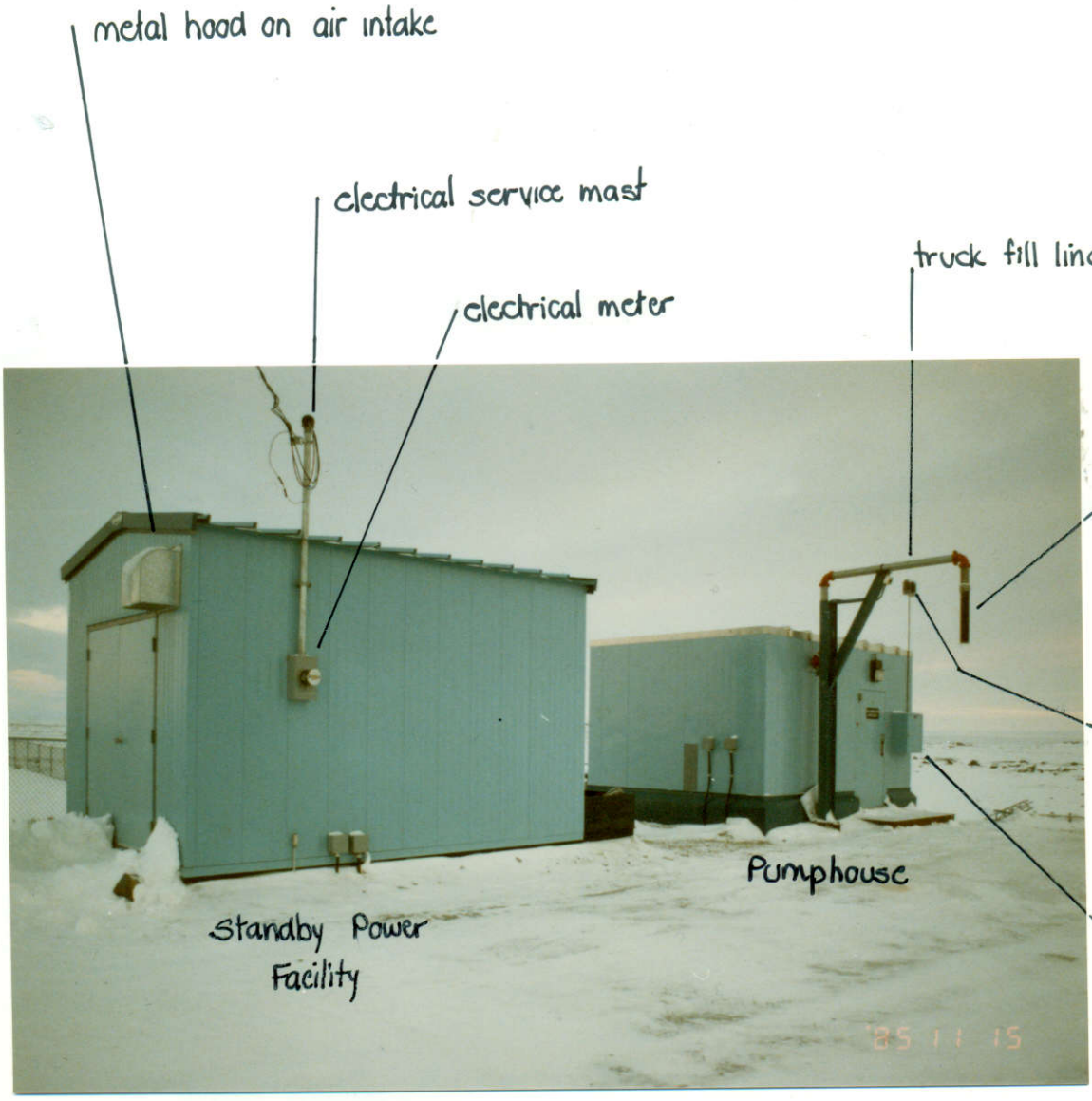
	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Fire Protection					
	a) Portable Fire Extinguisher	Ansul Model A-10-E for Class A, B, C fires	Used to extinguish small fires	6/9	-	MB-30

3A.10 LIGHTING SYSTEM

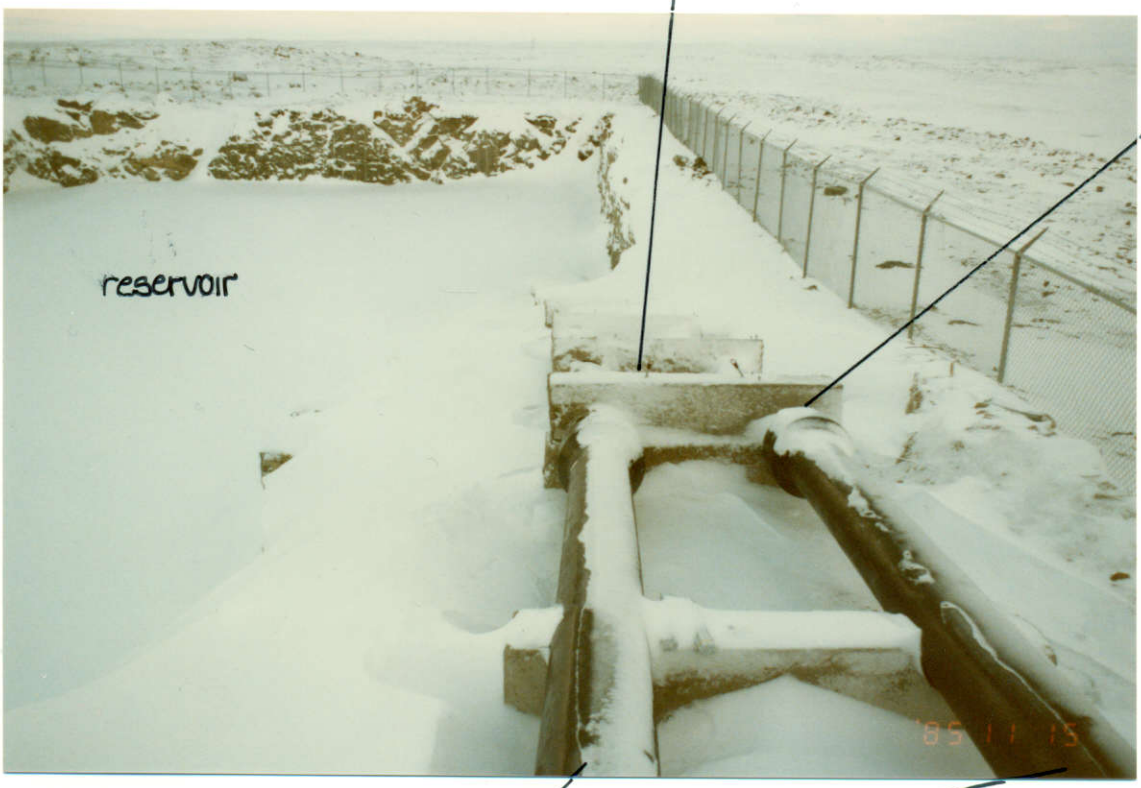
	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Interior Lights	Fluorescent light fixtures 2 lamp 40 watt Peerless Electric ICSL	Pumphouse interior lighting	8/9	P-5	MB-38
2.	Exterior Lights	35 watt low pressure sodium light fixture, Keene Corporation 300 Wallcube	Pumphouse exterior lighting	8/9	P-1	MB-39

3A.11 TRUCK FILL LINE HEAT TRACE SYSTEM

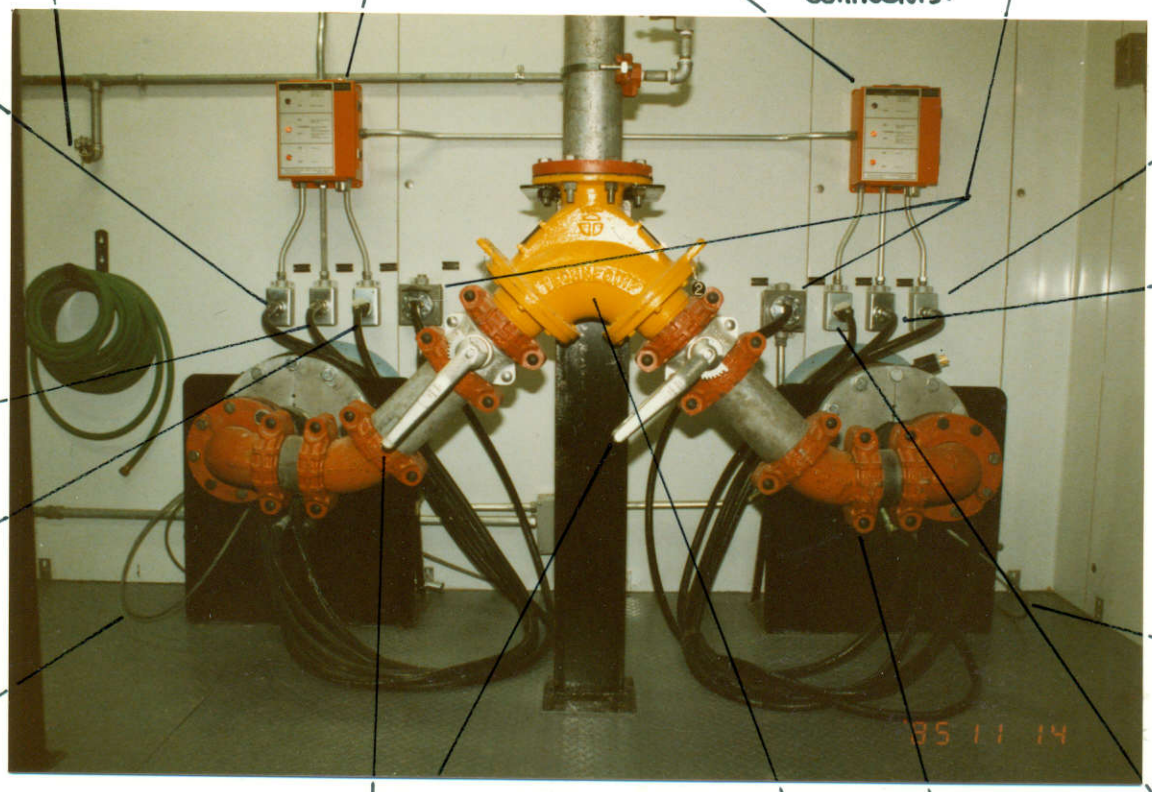
	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Heat Trace Cable	Chemelex 8BTV-2	Used to keep truck fill line from freezing	8/9	-	MB-17



PHOTOGRAPH #1.



PHOTOGRAPH #2



PHOTOGRAPH # 3

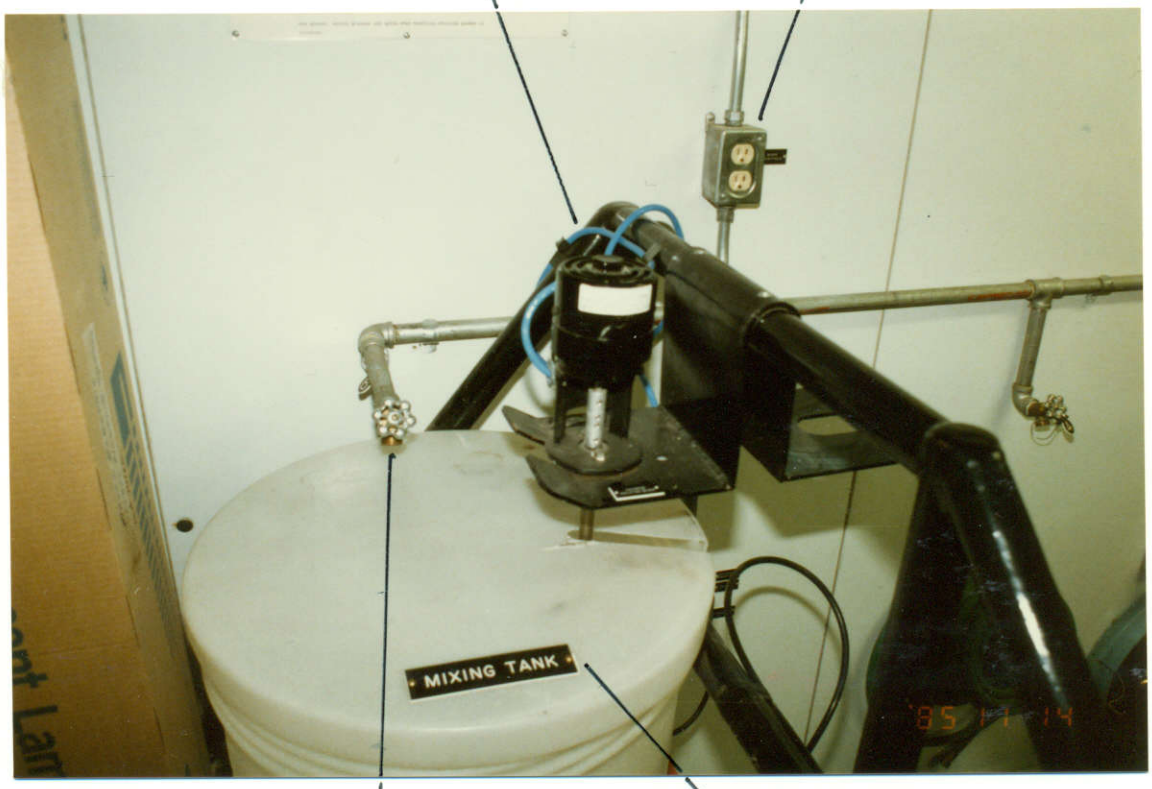
NOTE: This photograph was taken prior to relocation of the "on-off" control switch and before the truck fill line was heat traced and insulated.

PHOTOGRAPH # 4

PHOTOGRAPH # 5

chemical mixing agitator

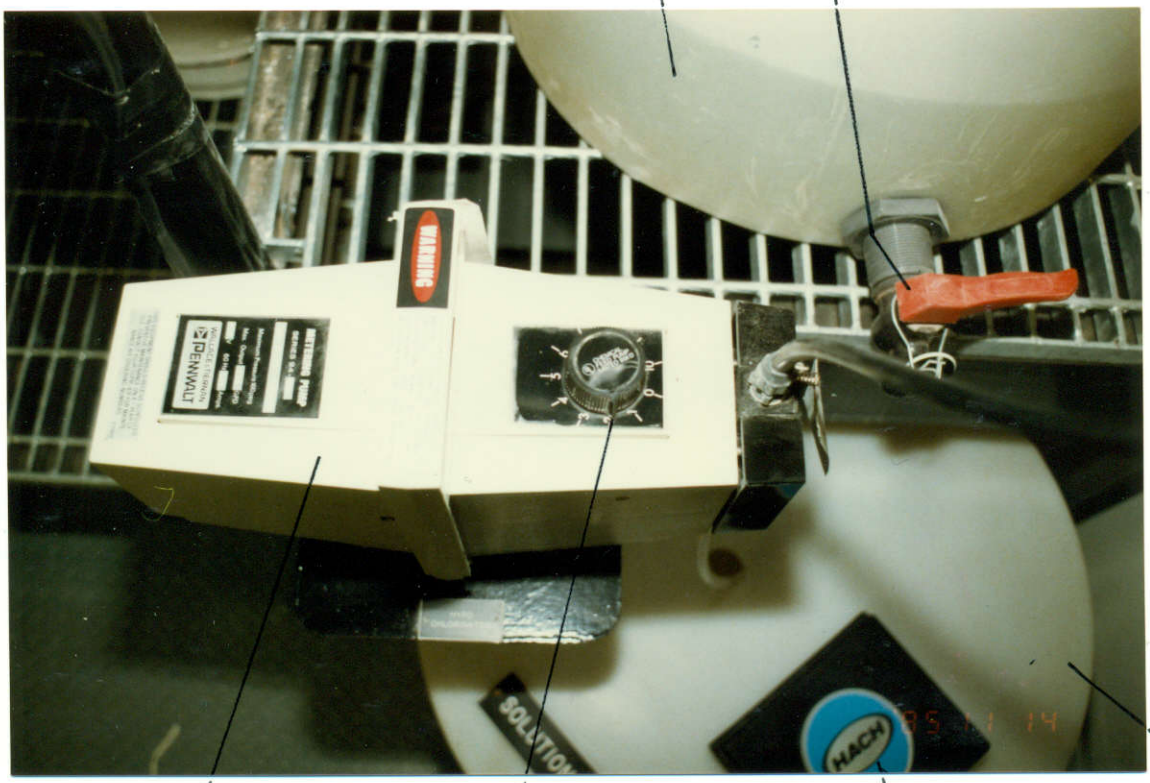
mixing agitator receptacle



filling valve (open this valve to fill tank)

chlorine mixing tank

PHOTOGRAPH #6



Chlorine mixing tank

chlorine solution transfer valve

hypochlorinator

hypochlorinator adjustment knob

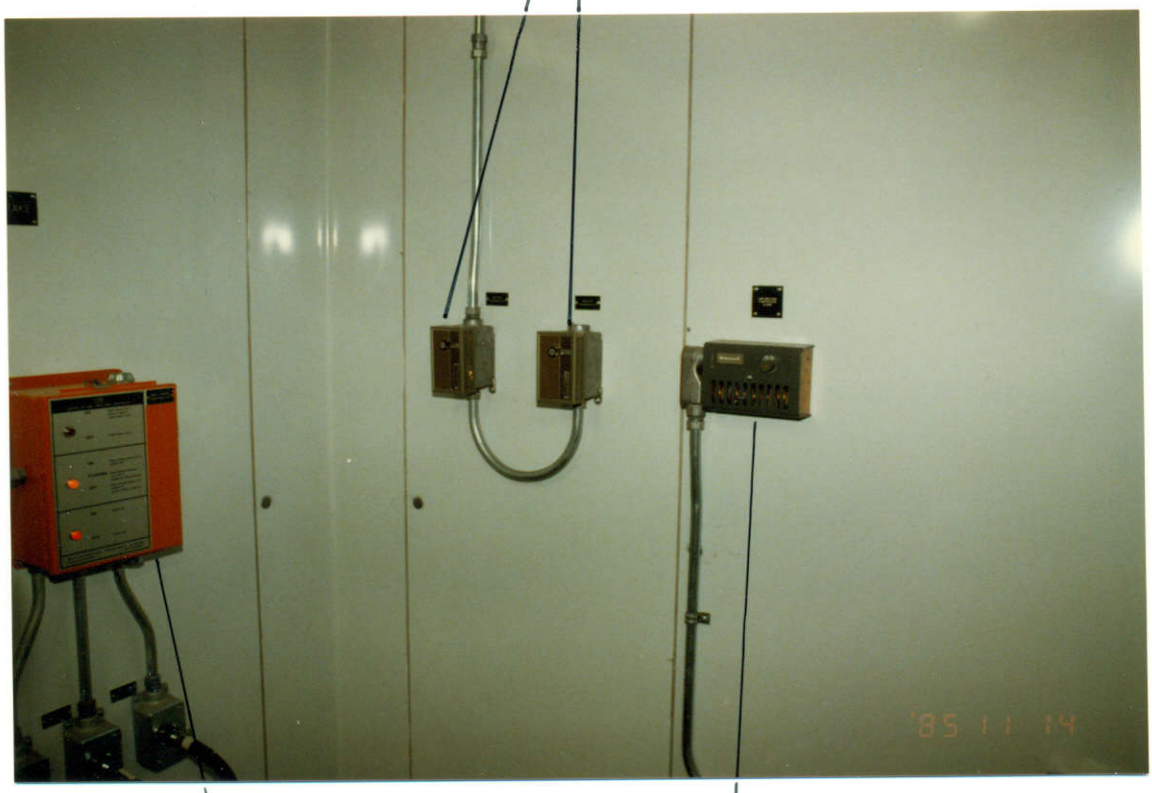
chlorine test kit

chlorine solution tank.

PHOTOGRAPH # 7

PHOTOGRAPH #8

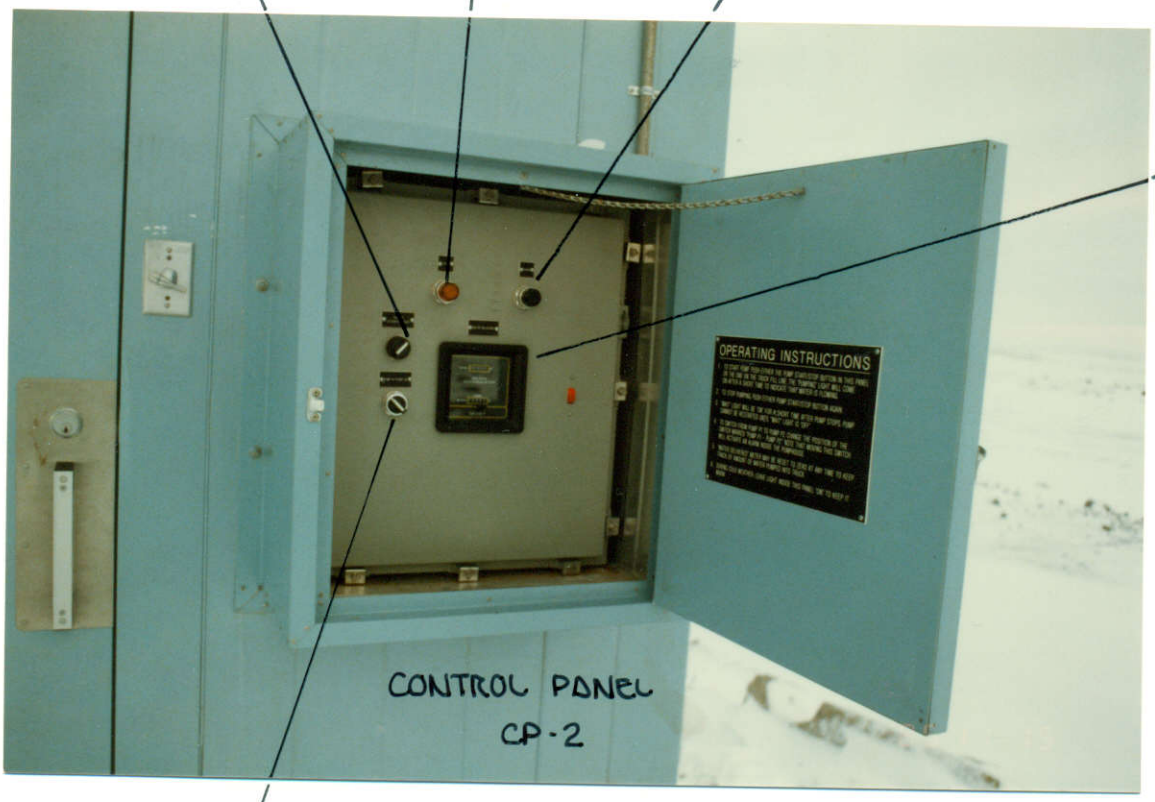
room thermostat
(control electrical
radiant heaters)



heat tracc
controller

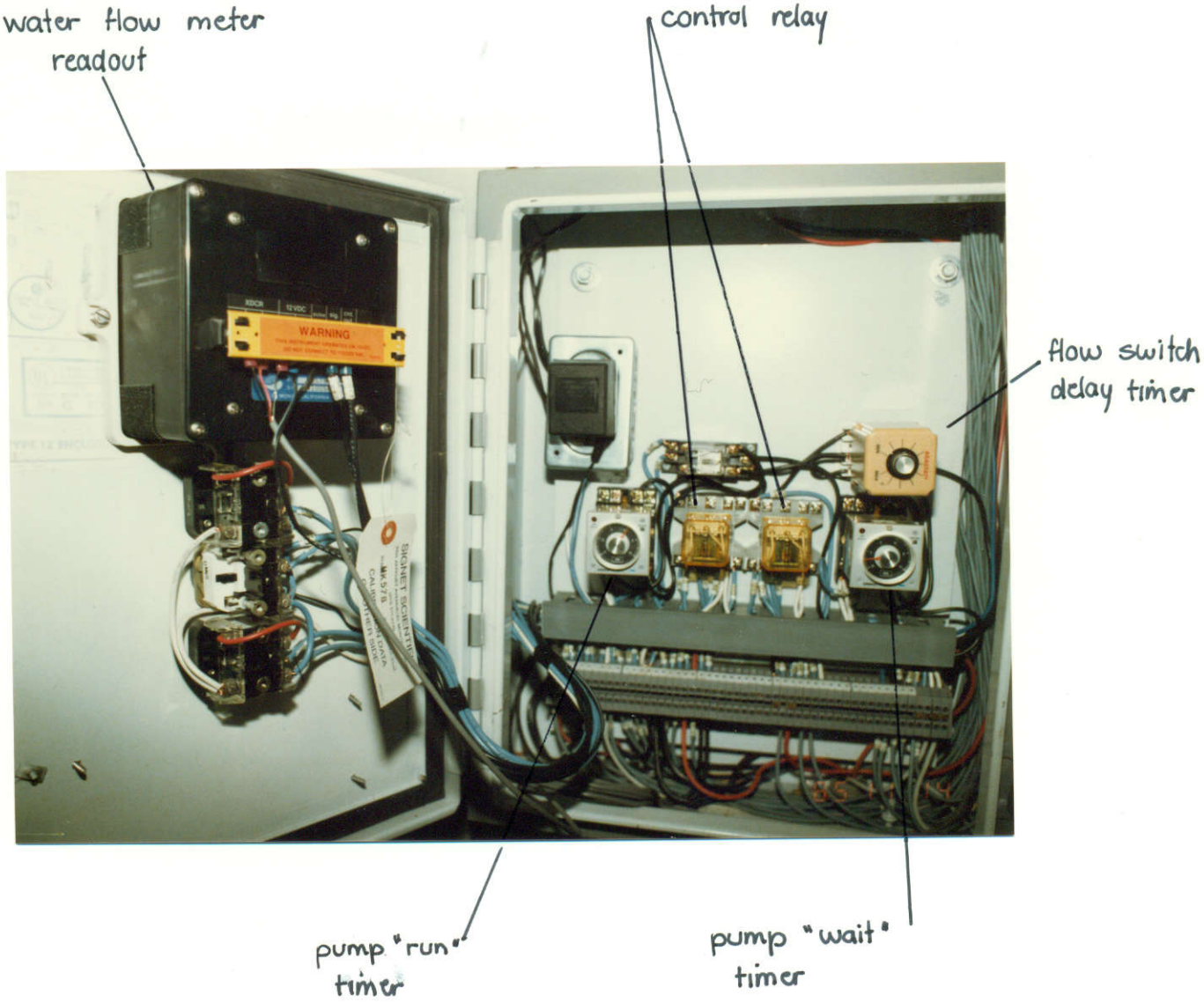
low building
temperature
alarm thermostat

PHOTOGRAPH #9



PHOTOGRAPH #10

PHOTOGRAPH #11



Inside of panel CP-1 inside of pumphouse.

PHOTOGRAPH #12

OPERATIONS AND MAINTENANCE MANUAL

CORAL HARBOUR

WATER SUPPLY SYSTEM

VOLUME II : STANDBY POWER FACILITY

Prepared by : W. L. WARDROP & ASSOCIATES LTD.

ENGINEERING CONSULTANTS

3. OPERATING PROCEDURES

Notes:

In these procedures, references are made to other parts of this manual by abbreviations as per the following examples:

a) MB-3 refers to section 3 of the Manufacturer's Brochures. Manufacturers Brochures regarding the pumphouse are included in Volume I of the manual. Manufactures Brochures regarding the Standby Power Facility are included in Volume II of the manual.

b) AB-9/9 refers to as-built drawing number 9 of 9. All as-built drawings are contained in Volume I of the manual.

c) P-1 refers to Photograph #1. All photographs are contained in Volume I of the manual.

Refer to the Component Listing section for a detailed breakdown of the components of each system or subsystem. Component Listing for the Pumphouse is included in Volume I. Component Listing for the Standby Power Facility are included in Volume II.

B. STANDBY POWER FACILITY

3B.1 Building

The standby power facility is housed in a metal clad, insulated building constructed by Brytex (see MB-41). Perform general maintenance, such as replacement of weatherstripping, possible touch-up painting, etc. as required.

3B.2 Electrical Distribution System

The electrical distribution system and it's operation is generally described as follows: (Refer to the building services single line diagram in AB-8/9)

1. Normal (ie: NCPC) power enters through the electrical service mast (see P-1) from the power pole, passes through the meter and then enters the standby power building.

2. Inside the building, the power is fed to a 100 amp main breaker (see P-14).

3. Normally, the main breaker should always be "on" unless you want to shut off all normal power to the facility (Note that if you shut off this breaker, this simulates a power failure, and the standby generator will start if the unit is on "automatic").

4. At the splitter box (see P-14) the electrical supply is split to serve a "heating panelboard" (see P-14) and the transfer switch (see MB-48 and P-14).

5. The "heating panelboard" serves the heating loads inside the standby power facility. This includes the battery blanket, the oil heater and the building heater.

6. Since the heating panelboard is served with normal power only, all loads connected to this panelboard are not operational during a power outage, regardless of whether or not the standby generator is running.

7. Normally, all breakers in the heating panelboard should be "on". This permits all heating loads in the standby power facility to be "on" during normal power situations.

8. As per step 4 above, the splitter box is also connected to the transfer switch. Under normal operation, the transfer switch is in the position where normal power passes through it and feeds the "lighting and building subfeed panelboard" (see P-14). This panel serves the light circuits in the standby power facility and also feeds Panel A in the pumphouse. Once again, for normal operation, all breakers in the "lighting and building subfeed panelboard" should be in the "on" position.

3B.3 Standby Generator and Diesel Engine

The standby generator and diesel engine are designed to start and stop automatically on power failures, and may also be operated manually.

Automatic operation:

1. The breaker switch on the right hand side of the control panel (see P-2) should be in the "on" position. This switch isolates and protects the generator from all loads, and therefore it should always be "on" unless you are servicing the generator.

2. For automatic operation, the" auto-off-manual" switch on the control panel on the genset (see P-20 and MB-46) must be in the" auto" position. Under normal operation, this switch should always be in this position (ie: genset is then always ready to start automatically).

3. The four position selector switch (test-off-auto-engine test) (see MB-48) on the face of the transfer panel (see P-14) should be in the "auto" position. This switch controls automatic operation of the transfer switch.

4. On a power failure from the utility (ie: NCPC), the three voltage sensing relays in the transfer switch (see P-15 and MB-49) will sense there is a power failure by sensing a drop in voltage.

On these relays, there are two adjustment knobs labelled "Drop-out" and "Pick-up" (see P-15). The "Drop-out" voltage adjustment knob on each relay is used to adjust the voltage at which the standby generator will start. For example, normal NCPC supplied power is 208 volts, 3 phase. The voltage between each phase and neutral is 120 volts normally. If the drop-out voltage adjustment knob is set at say 110 volts, then when the phase to neutral voltage drops to below this level, the genset will start. There are three of these relays, because there are three phases (ie: one relay per phase). A drop in any one of the three phase to neutral voltages will cause the genset to start.

The Drop-out adjustment has a range of 90 to 138 volts, and should be set at the highest voltage below 120 volts which does not cause false genset starts due to voltage fluctuations from the utility. Normally, the Drop-out adjustments are set at 108 to 110 volts. The mid point of the adjustment range is 114 volts, and the quarter range is 102 volts. Therefore, you should set the Drop-out adjustment knob at slightly below the midpoint of the full range of adjustment and above the quarter range. All three relays should be adjusted to the same level.

CAUTION: Don't set the Drop-out voltage too low, since low voltage may damage electrical equipment in the pumphouse. You want the genset to start to provide power when the voltage drops too low.

Refer to step 9 for discussions on the "Pick-up" adjustment on the relays.

5. When the voltage sensing relays sense a drop in the voltage, a genset start delay timer begins timing (see P-15 and MB-50). This timer is used to prevent genset starting on a simple momentary drop in voltage. If this timer times out, and there is still a low voltage sensed by the voltage sensing relays, then the genset will start.

This timer has a range of 1 second to 300 seconds. It should be set for about 10 seconds. This means that you must have a power failure of at least 10 seconds in duration before the genset will start.

6. When the genset starts, the engine speed pick-up timer begins timing (see P-15 and MB-50). This timer allows for the genset to come up to full speed before the electrical load is transferred.

   This timer has a range of 1 to 30 seconds, and should be set for about 5 seconds.

7. When the pick-up timer times out, the transfer motor turns a nylon cam which in turn operates a steel transfer lever which operates two breaker handles (see P-15). This operation switches the electrical load from normal NCPC supplied power to electrical power as generated by the diesel engine driven genset.

8. Once the genset starts on automatic as described above, it will continue to run until normal utility power is restored (or unless an alarm shuts down the genset. Refer to section 3B.3 and the part entitled Genset alarms and shutdowns for a discussion on genset alarms).

9. When normal utility power is restored, the voltage sensing relays (ie: same ones as in step 4 above) will sense this, and the transfer switch will switch back to normal power.

   The voltage sensed by the relays which causes the transfer back to normal power is adjustable by the "pick-up voltage adjustment knob" (see P-15). This knob has a range of 92 to 150 volts. It should be set at a position which is at least two volts higher than the drop-out voltage adjustment discussed in step 4, and not higher than 118 to 120 volts (ie: minimum facility operating voltage. The mid point setting on this knob is 121 volts and the quarter point setting is 106.5 volts. Therefore, this knob should be set at slightly less than the mid point. All three pick-up voltage adjustment knobs on the three voltage sensing relays should be set at the same point, since any one can control the transfer of power.

When normal utility power is restored, the time delay for retransfer back to normal power (see P-15) begins timing. This timer ensures that utility power has been truly restored (ie: it has been back on for a certain length of time) before the pumphouse is taken off the genset. The timer has a range of 20 seconds to 10 minutes, and should be set at about one minute.

When the timer times out, the transfer motor turns the nylon cam again, which operates the steel transfer lever which again operates the two breaker handles (see P-15). This operation switches the electrical load from the genset back to utility (ie: NCPC) supplied power.

10. Following retransfer back to normal power, the genset will continue to run on a cool down cycle. When retransfer is accomplished, this starts an engine cool down timer (see P-15 and MB-50). This timer allows the diesel engine to continue running so it has time to cool off before it is shut down.

    This timer has a range of 20 seconds to 10 minutes and should be set at about 3 minutes.

    When this timer times out the genset will stop and will be in it's ready position (ie: automatic mode) to start on the next power failure.

To test genset automatic operation:

Method 1: (simulates actual power failure)

1. In the standby power facility, go to the 100 amp main breaker (see P-14), and turn this to the "off" position. By doing this you shut off all power to the facility, which is the same thing that happens in a real power failure.

2. If all is in order, the genset will go through the automatic start procedure as described previously.

3. When you are satisfied with the genset starting operation, you can simulate the restoration of utility power by turning the main breaker back to the "on" position. This has the same effect as the utility power coming back on.

4. The genset will go through the retransfer and cool-down and stop procedures as described previously.

Method 2:

1. On the front of the transfer switch (see P-14 and MB-48) there is a four position (test-off-auto-engine test) switch.

2. If you turn this switch to the" test" position, the standby power facility will go through all the normal start-up procedures as well as transfer of the electrical load from normal power to standby power.

3. The genset will continue to run until you turn this switch back to the "auto" position, at which time the electrical load will be retransfered back to utility power and the genset will go through the cool-down and stop procedures.

To test genset starting only:

There are two methods that may be used to test run only the genset. In either case, electrical load is NOT transferred to the genset, but remains connected to normal utility supplied power. Also note that the timers and time delays as described for automatic operation do not apply in these cases, since the genset is running with manual control under no load.

Method 1:

1. Go to the genset control panel (see P-20 and MB-46) and turn the "auto-off-manual" switch to the "manual" position. This will start the genset.

2. The genset will continue to run for as long as the switch is in the manual position (unless the engine shuts down due to an alarm condition).

3. To stop the engine, turn this switch to the "off" or "auto" position.

4. Note that if the "auto-off-manual" switch is in the "off" position, then the genset will not run in either manual or automatic mode. Therefore, this switch should always be left in the "auto" position to permit the unit to start automatically on a power failure.

Method 2:

1. Go to the genset control panel (see P-20 and MB-46) and ensure that the "auto-off-manual" switch is in the "auto" position.

2. Now go to the transfer switch (see P-14). On the front face of this panel is a four position selector switch (test-off-auto-engine test) (see MB-48). Turn this to the "engine test" position. This will start the engine and the genset.

3. The genset will continue to run until this switch is turned to the "auto" or "off" position.

4. Note that turning this switch to the "off" position will take the transfer switch out of service. Therefore, unless maintenance is being performed, this switch should always be in the "auto" position so that the standby power facility will automatically start on a power failure.

Monitoring generator performance

The electrical power supplied by the genset to the pumphouse may be monitored by inspection of the three gauges on the front face of the genset control panel (see P-20). The gauges measure the voltage, frequency and amperage draw on each of the three phases of the electrical power generated by the unit. Use the phase selector switch to have these gauges indicate the voltage, frequency and amperage of each of the three phases.

On any of the three phases, the voltage should be 120 volts plus or minus 4 volts. The amperage draw may vary from 0 (ie: no load on genset) to a maximum of 70 amps, which indicates full load on the unit. Frequency should be 60 H_z.

Genset alarms and shutdowns:

The genset control panel (see MB-46) has a number of small lights on the front face (see P-20). The green light (when it is "on", indicates that the genset unit is in the "auto" mode and is ready to start automatically. Therefore, this light should normally always be "on". The red lights indicate an alarm and/or shutdown condition. A listing of these alarms and short descriptions of each are as follows:

- Engine Overspeed - if the diesel engine rpm is too high, this will cause the genset to shut down. The alarm light will come on to indicate that this is the reason for the shut down. This may be caused by incorrect adjustment of the speed control on the engine.

- Engine Overcrank - if the genset is called to start, but does not start after a three minute cranking cycle, it will cease trying to start, and the overcrank alarm will come on. The genset will not attempt another start until the reason for not starting is corrected. Reasons for engine overcranking (ie: not starting) are listed in Pages 14 - 16 of the Operators Handbook provided in MB-47.

- Low Oil Pressure - if the engine oil pressure is too low, this alarm will shut down the genset. This alarm light will come on to indicate that this is the reason for the shut down. Reasons for low oil pressure are listed in Pages 14 - 16 of the Operators Handbook provided in MB-35.

- High Temperature - if the engine gets too hot, this alarm will shut down the genset, and this alarm light will come "on" to indicate overheating as the problem. Reasons for engine overheating may be due to improper operation of the building ventilation system (ie: fan does not run, or dampers do not open). Other reasons for engine overheating are provided on Page 16 of the Operators Handbook provided in MB-47.

- No Speed Signal - if the engine starts but does not reach a prescribed speed, then the no speed signal alarm and shutdown will be activated.

When any of the above alarms or shutdowns are activated, the cause of the alarm must be corrected. To reset the alarm, turn the "auto-off-manual" switch on the front face of the genset control panel to the "off" position and then back to the "auto" position. This will cause the alarm light to go out, and will allow the genset to start. Note that the engine cannot be started when one of the safety shutdowns has been activated.

In addition to the alarms and shutdowns on the genset, there is also a frequency shutdown in the transfer switch (see MB-48). If the standby genset starts, but the power produced is outside the range of 57-63 H_z, then the frequency shutdown in the transfer switch will stop the genset.

In the event of a power failure, if the genset does not start;

1. Check that the "auto-off-manual" switch on the genset control panel (see P-20) is in the "auto" position.

2. Check that the four position selector switch on the face of the transfer switch is in the "auto" position.

3. Ensure that there are no alarms (ie: safety shutdowns) indicated on the genset control panel (refer to Genset Alarms and Shutdowns Section).

4. Check the genset start delay timer (see P-15) and its setting (ie: it may be set for too much time).

5. If all controls for the genset are in the "auto" position (ie: system ready for automatic start) but the unit is not cranking, try to start it manually by putting the four position selector switch in the "test" position. This should manually start the engine and transfer the load. If the genset starts on manual, look for a problem in the automatic control circuitry. You should also check the frequency of the power being generated to ensure that the frequency shutdown has not been activated.

6. If a manual start in #5 fails, try starting the unit using the four position selector switch in the "engine test" position (ie: this will start only the genset but won't transfer the load).

7. If #6 fails as well, try manual starting using the "manual" position on the "auto-off-manual" switch on the genset control panel.

8. If #7 fails, check for such things as a dead battery (ie: engine won't crank over).

9. If the engine cranks, but does not run, check for the reason for not starting, ie: no fuel, etc. (refer to Pages 14 to 16 in the Operators Handbook provided in MB-47).

In the event of a power failure, if the genset starts but transfer of the load to the genset does not occur;

1. Check the breaker on the right side of the genset control panel (see P-21). It must be "on".

2. Check the engine speed pick-up timer in the transfer switch (see P-15). This timer must time out before the load is transferred. It may be set too high, or may not be working properly.

3. Check the steel transfer lever (see P-15). In the photograph, the transfer lever is in the position where normal utility power is being used to serve the load. If the transfer switch is operating properly, the lever will be in the opposite position.

Genset battery system:

The genset battery is automatically charged by the wall mounted electrical battery charger (see P-14 and MB-51). This charger does not continuously trickle charge, but rather monitors battery voltage and only charges when required. A full description of the operation of this charger is provided in MB-51.

The genset battery also has a battery blanket installed around it to keep it warm for cold weather system operation (see P-20). The blanket is plugged into an electrical receptacle on the side of the genset. This receptacle is thermostatically controlled, and has no power when the building is warm. The blanket should be left plugged in all winter, but may be unplugged for the summer.

Engine oil heater:

The diesel engine driving the genset is air-cooled. To keep the engine warm during the winter when the building is not heated, an immersion type oil heater is installed in the oil pan. This heater is plugged into the thermostatically controlled receptacle along with the battery blanket. This heater should be left plugged in all winter, but may be unplugged for the summer.

3B.4 Ventilation System

The ventilation system in the standby power facility consists of a motorized air intake damper and louvre, an exhaust fan, a motorized air exhaust damper and louvre, and a control thermostat (see MB-43, MB-44 and MB-45).

When the thermostat senses a rise in building temperature (for instance, due to the standby generator running), it will:

- open the air intake and exhaust dampers
- start the exhaust fan

This permits cooler outside air to be drawn into and through the building, and then exhausted, thereby cooling the building.

When the temperature is reduced to the setpoint on the thermostat, the exhaust fan stops and the dampers close.

Galvanized metal hoods (see P-1) with birdscreens on the air inlet and exhaust serve to limit wind, rain and snow from entering the building.

To test the operation of the ventilation system, turn down the thermostat until you reach the temperature of the building. This will automatically start the ventilation system.

The ventilation thermostat should be set at about 24 to 29^{o}C (75 to 85^{o}F).

The ventilation system is provided with power from the "lighting and building subfeed panelboard" (see P-14) in the standby power building. Therefore, this system is provided with power at all times (ie: served by both normal and standby power).

3B.5 Heating System

The heating system in the standby power facility consists of an electrical unit heater (see MB-42 and P-19) a timer and a thermostat. Normally, the unit heater should be off and should not be used to heat the building.

Heating the standby power building at all times is not necessary because the engine and all other essential equipment is provided with their own heat sources for cold weather operation. For example, the engine has an oil immersion heater and the battery has a thermostatically controlled battery blanket. Therefore, the components are protected for cold weather operation.

The unit heater should only be used to warm the building when maintenance or repair is necessary to be performed. To start the heater, set the thermostat to the desired temperature and set the timer for the length of time you want the heater to run.

The heater will run until the timer runs out, or until the building is warm and the thermostat shuts it off.

The timer will prevent the use of the heater on a continuous basis.

3B.6 Fuel System

The fuel system for the genset consists of a 250 gallon fuel oil storage tank mounted on the skid frame foundation of the standby power facility. The tank is located inside a welded containment area which will contain any spill or leak from the tank and prevent it from entering the reservoir.

The level in the fuel tank should be checked once per week, and refilled if necessary. It should be checked more often if the unit has been running for any extended length of time, or if power failures are occurring frequently.

From the tank, the fuel flows through a pipe into the building. The valve on this supply line should always be open to provide fuel to the genset. Inside the building, the fuel passes through a filter and then goes to the engine. A return line from the engine to the tank returns any unused fuel.

The filter on the fuel line should be changed regularly (once every six months is suggested)

3B.7 Lighting System

The lighting system in the standby power facility consists of incandescent light fixtures controlled by a switch near the door. Replacement of bulbs as they burn out is the only maintenance required.

Power for the lighting system comes from the "lighting and building subfeed panelboard".

3B - STANDBY POWER FACILITY

3B.1 BUILDING

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Building	4570 X 3350 X 2820 high	Houses standby power equipment (genset)	2/9	P-1	MB-41
2.	Skid Foundation	Welded metal skid frame	Foundation for standby power facility	2/9	P-1	MB-41

3B.2 ELECTRICAL DISTRIBUTION SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Electric Meter		Used to meter amount of NCPC (normal) power consumed by the water supply system	8/9	P-13	-
2.	Main Breaker		Used to electrically isolate complete system from normal (NCPC) power	8/9	P-14	-
3.	Splitter Box		Used to divide power supply between panelboards	8/9	P-14	-
4.	Heating Panelboard		Used to hold breakers that supply power to heating loads in standby power building	8/9	P-14	-
5.	Lighting and Building Subfeed Panelboard		Used to hold breakers that supply power to the lights in the standby power facility and power to the pumphouse	8/9	P-14	-
6.	Transfer switch	Westinghouse Robonics	Used to transfer from normal (NCPC) power to standby power	8/9	P-14	MB-48

3B.2 ELECTRICAL DISTRIBUTION SYSTEM
(Continued)

COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
6. Transfer switch Continued					
a) Voltage Sensing Relays	Potter & Brumfield CSJ-70010	Used to sense voltage drop in the normal (NCPC) power and start the genset on a drop in voltage (ie: power failure)	-	P-15	MB-49
b) Genset Start Delay Timer	Agastat SCE 222	Used to prevent genset starting on very short power failures (ie: those lasting only a few seconds)	-	P-15	MB-50
c) Engine Speed Pickup Timer	Omron H3BA	Used to permit genset to start and get up to operating speed before electrical load is transfered	-	P-15	MB-50
d) Retransfer Timer	Omron H3BA	Used to control automatic transfer back to normal (NCPC) power until normal power has been truly restored (ie: it has been back "on" for some time)	-	P-15	MB-50

COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
6. Transfer switch Continued					
e) Engine Cool Down Timer	Omron H3BA	Used to allow genset to continue running to allow engine to cool down after load has been transferred back to normal (NCPC) power	-	P-15	MB-50

3B.3 STANDBY GENERATOR AND ENGINE

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Standby Generator	Lima SER 208 volt, 3 phase, 25 kw	Used to supply electrical power to facility in event of normal (NCPC) power failure	-	P-20	MB-46
2.	Diesel Engine	Lister HR3	Used to drive electric generator	-	P-20	MB-47

3B.4 VENTILATION SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Exhaust fan		Used to exhaust air from the standby generator building to keep it cool when the genset is running	-	P-17	MB-43
2.	Louvres		Used to prevent snow and rain from entering building through the dampers	-	-	MB-45
3.	Dampers		Used to close off the air supply and exhaust openings in the wall when the ventilation system is not in operation	-	P-17, P-18	-
4.	Damper Motors		Used to open and close the dampers	-	P-17, P-18	MB-44
5.	Thermostat		Used to control the operation of the ventilation system	-	-	-

3B.5 HEATING SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Unit Heater		Used to keep standby power building warm for maintenance purposes	-	P-19	MB-42
2.	Thermostat		Used to control on-off operation of heater by temperature	-	P-19	-
3.	Timer		Used to prevent continuous operation of unit heater	-	P-19	-

3B.6 FUEL SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Fuel Tank	250 gallon oval fuel tank	Used to store fuel for diesel engine	-	P-13	-
2.	Fuel Filter		Used to filter fuel before it reaches the diesel engine	-	-	-

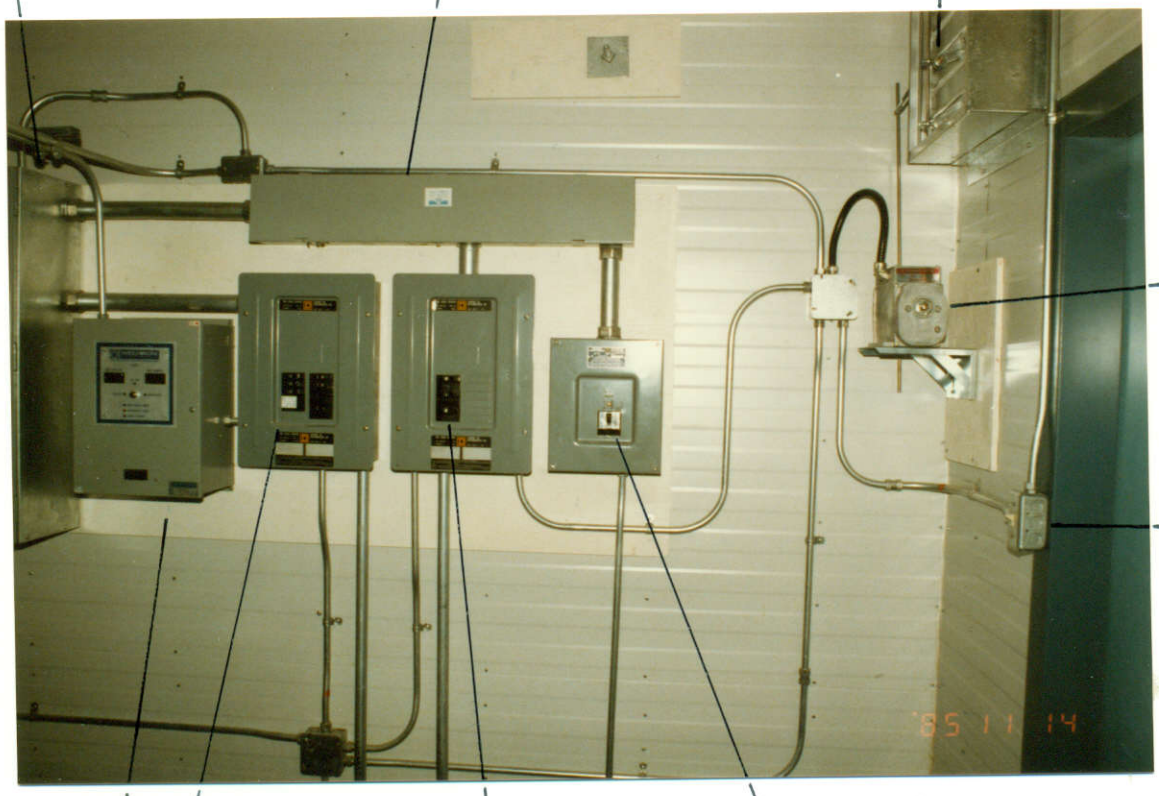
3B.7 LIGHTING SYSTEM

	COMPONENT	DESCRIPTION	FUNCTION/REMARKS	DRAWING REFERENCE	PHOTO REFERENCE	MANUFACTURERS BROCHURE REFERENCE
1.	Lights	Incandescent	General standby power building interior lighting	-	-	-

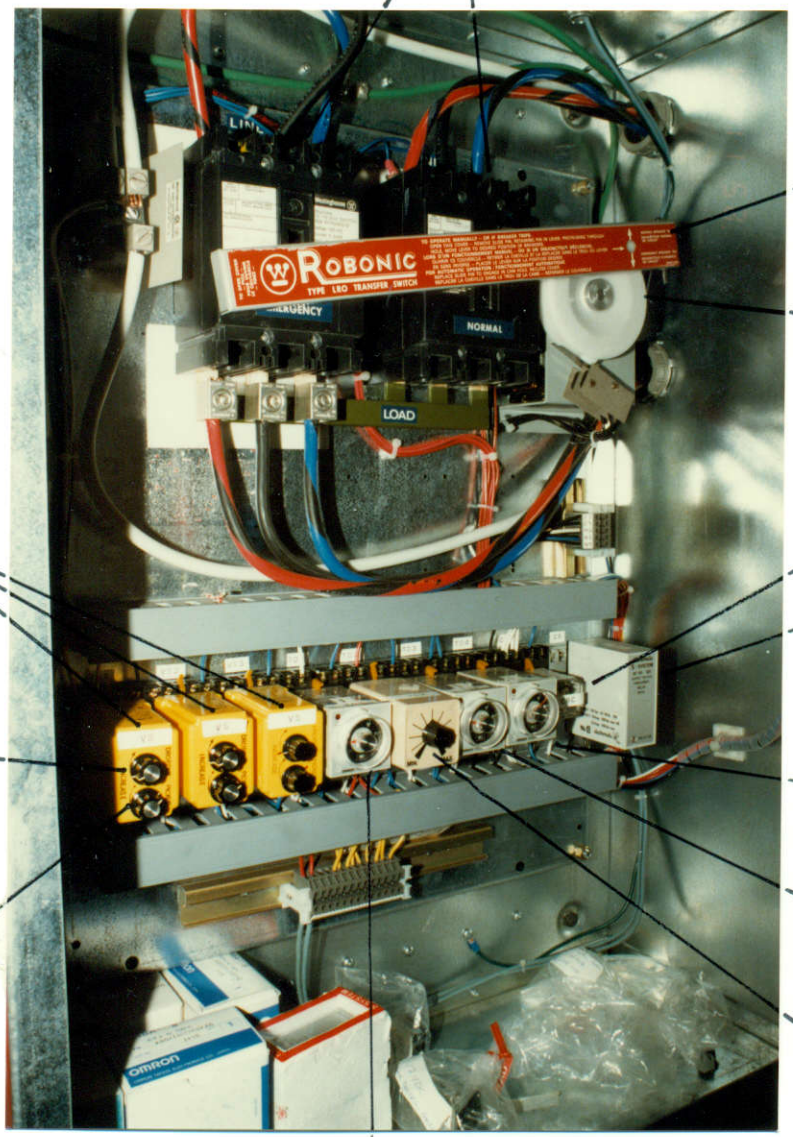
fuel oil storage tank

fuel containment walls

PHOTOGRAPH #13



PHOTOGRAPH #14



breakers (operated by transfer lever)

steel transfer lever (shown in "normal" position)

nylon cam on transfer motor (operates transfer lever)

voltage sensing relays

control relay CRC

control relay CR

drop-out voltage adjustment

engine speed pick up timer

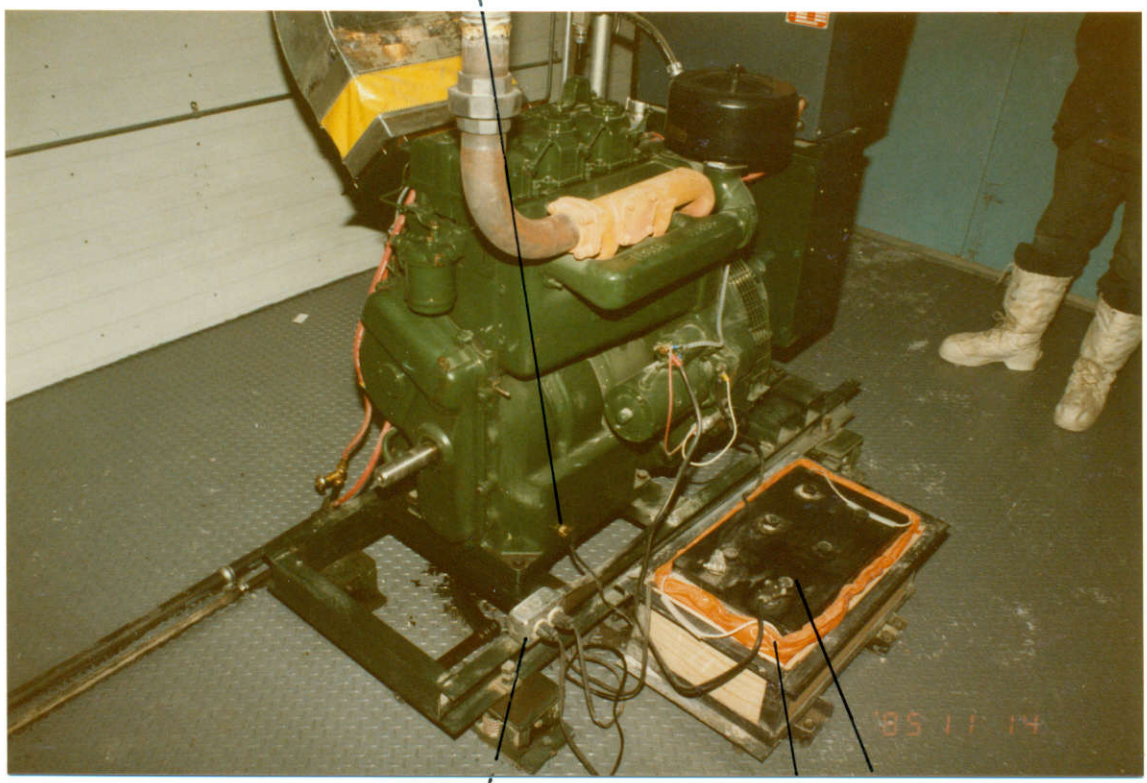
pick-up voltage adjustment

engine speed cool down timer

genset start time delay

timer delay for retransfer back to normal power

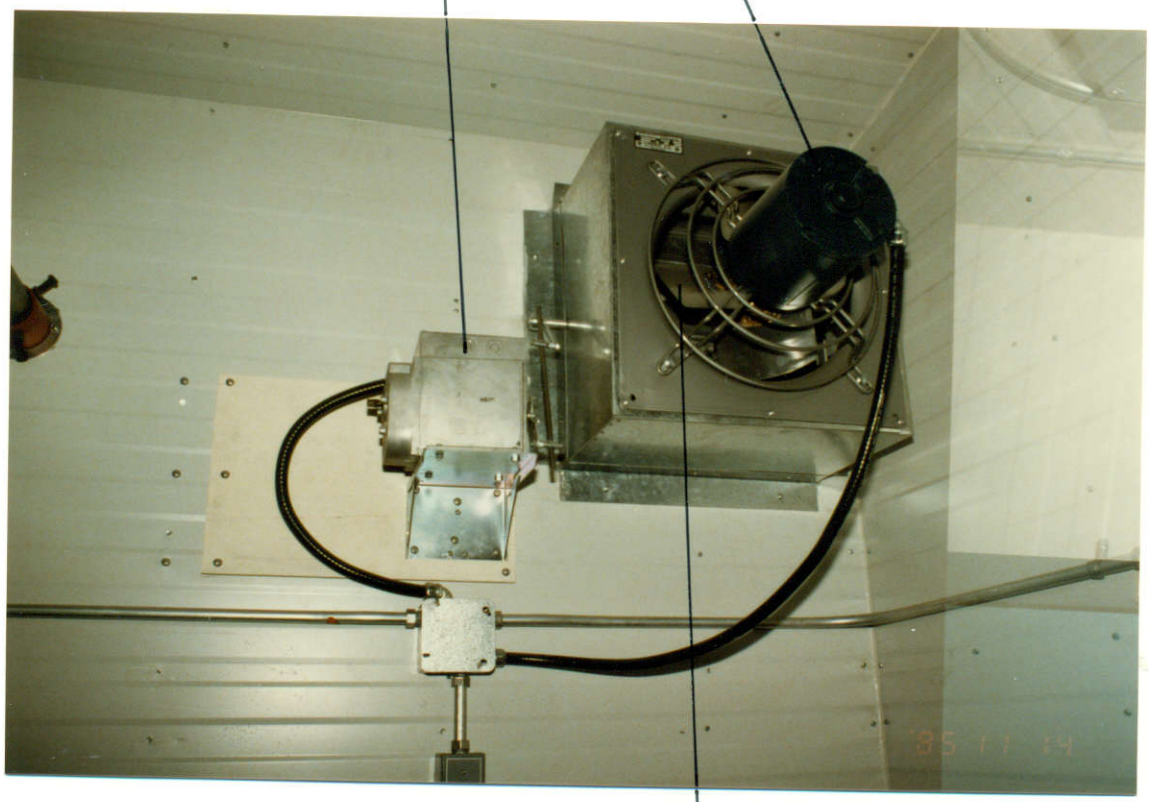
PHOTOGRAPH # 15



PHOTOGRAPH # 16

damper motor

ventilation (exhaust fan)

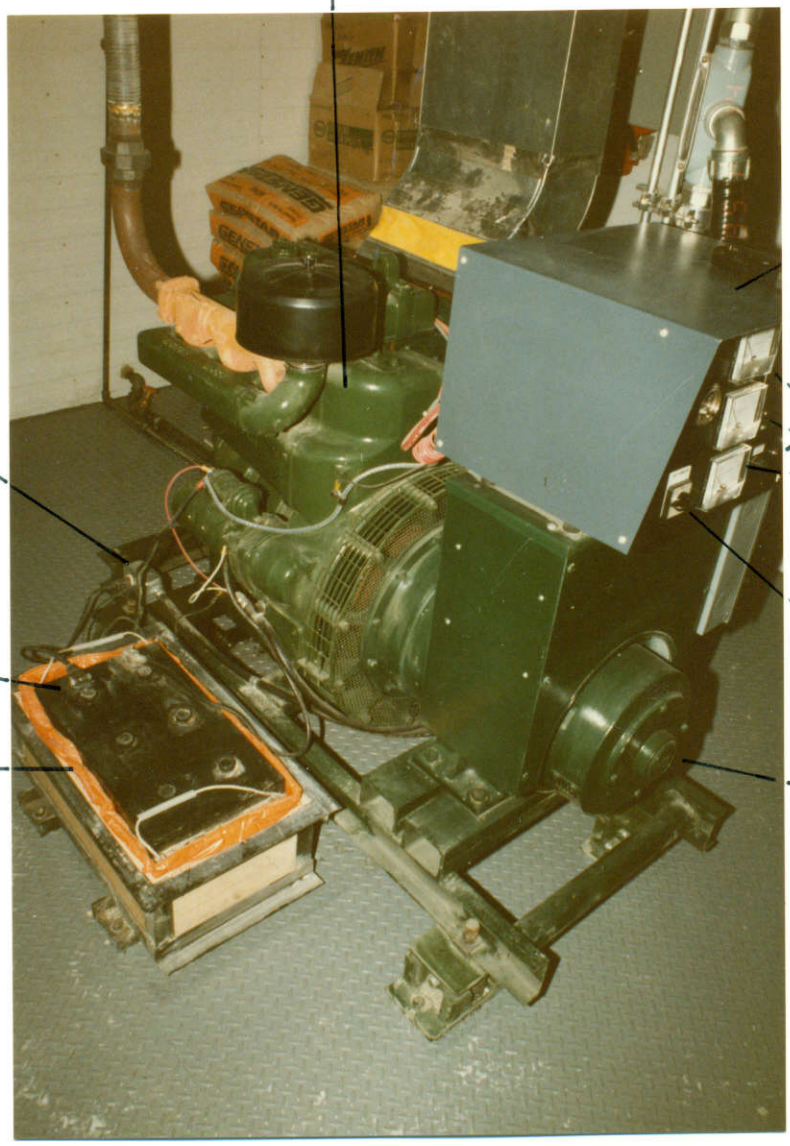


damper

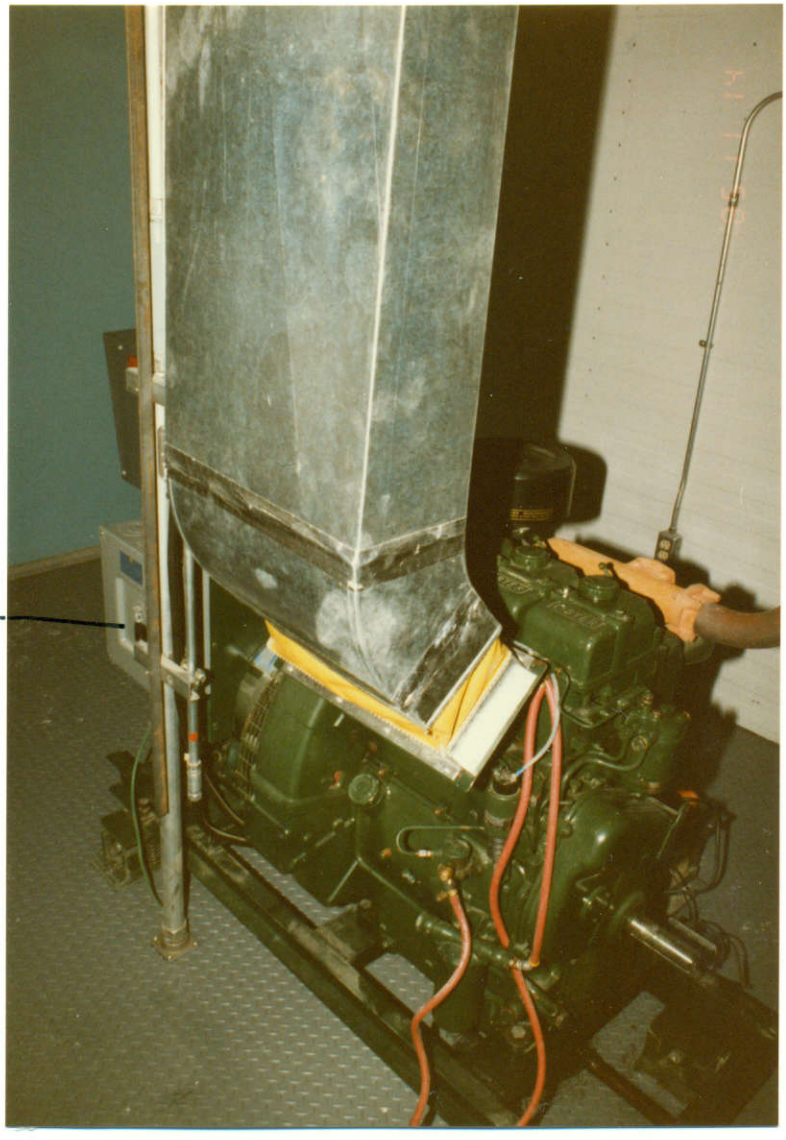
PHOTOGRAPH #17

PHOTOGRAPH # 18

PHOTOGRAPH #19



PHOTOGRAPH 20



PHOTOGRAPH #21

Appendix D Sampling Procedures for Bacterial Water Samples from the Water Distribution System

INSTRUCTIONS TO COLLECT WATER SAMPLES FOR BACTERIAL ANALYSIS

Water Distribution System
Coral Harbour, NU

These water sampling procedures should be followed for all bacterial water sampling carried out for the drinking water in Coral Harbour, NU. Following the sampling procedures will help ensure the correct sample bottles are obtained, proper sampling procedures are completed, and contamination of the samples is minimized.

1. Bottle Order:

    i. Clean and sterilised sample bottles must obtained from the laboratory before any water sampling can begin. This is especially important for water samples being analysed for bacteria. Clean and sterilised sample bottles help ensure the water samples are not contaminated during collection, handling, storage and transport.

    To obtain clean sample bottles, contact the Environmental Health Officer in Rankin Inlet. If the Environmental Health Officer in Rankin Inlet is unreachable, contact the Environmental Health Officer in Iqaluit to send you bottles. You will be sent the correct sample bottles and an Analysis Request form to submit with the water samples. Contact information for the Environmental Health Officers in Rankin Inlet and Iqaluit are provided:

    Environmental Health Officer
    P.O. Box 298
    Rankin Inlet, NU X0E 0G0
    Ph: (867) 645 – 2171 Ext. 241
    Fax: (867) 645 – 2409

    Wanda Joy
    Environmental Health Officer
    Station 1031, Building 155
    Iqaluit, NU X0E
    Ph: (867) 975 – 4817
    Fax: (867) 975 – 4833

    ii. Once you receive the sample bottles, they should remain unopened, be kept in the sample cooler they arrived in, and stored in an area away from potential contamination sources (e.g. gasoline/diesel, oils, chemicals, etc). DO NOT open the sample bottles you are ready to sample.

2. Preparation:

    i. Check local weather forecasts to determine weather conditions when sampling and if there are going to be flight delay or cancellations. Bacterial water samples need to be shipped to the laboratory as soon as possible. Ideally they should make it to the laboratory within 24 hours of sampling. If there are going to be flight delays or cancellations, collect samples on another day.

    ii. Double check that you have the required bottles, nitrile gloves, and forms.

3. Sample Collection:

   i. Once you arrive at your sampling station, wash your hands thoroughly with soap and water.

   ii. Turn on the COLD water tap and let the tap run continuously for 2 – 5 minutes.

   iii. Put your on nitrile gloves and get the sample bottle ready for sampling. Remove any plastic seal if present. DO NOT OPEN THE SAMPLE BOTTLE.

   iv. Once the tap has run, remove the lid from the sample bottle and either hold the lid in your hand or place it in a secure location. DO NOT touch the inside of the lid, bottle or neck of the sample bottle.

   v. Holding the sample bottle near the base of the bottle, place the sample bottle under the running water and carefully fill the sample bottle to just past the mark on the side of the bottle. DO NOT let the bottle touch the tap at all. DO NOT OVERFILL THE BOTTLE.

      You will notice that there is a white powder already present in the sample bottle. This is a preservative (sodium thiosulphate) and is required to properly preserve the bacterial sample. DO NOT dump this white powder out, rinse the sample bottle or overfill the sample bottle! You will lose some or all of the white powder by doing this and will need to start over with a new sample bottle.

   vi. When the sample bottle is full, IMMEDIATELY replace the lid of the sample bottle and screw it back on. DO NOT over tighten! DO NOT RE-OPEN THIS BOTTLE.

   vii. Write the identification information on the label of the sample bottle, including:

      Date and Time of sampling
      Location sampled
      Sampler initials

   viii. Place the sample back in the cooler.

   ix. Repeat steps iii to viii if taking more than one sample, changing nitrile gloves with each sample.

4. Sample Storage and Transport:

   i. Sample Storage – bacterial water samples MUST analysed at the laboratory as soon as possible (within 24 hours) and must be shipped out as soon as they can. Until you are able to ship the sample(s) out, you must ensure they stay cold. Pack the sample cooler with frozen freeze packs or place the samples in a fridge. DO NOT FREEZE THE SAMPLE(S).

   ii. Fill out the Analysis Request form that came with the sample bottles. Before you can send the samples to the laboratory, you must tell them what to analyse the samples for. A completed example and a blank form is included following this procedure.

      It is good practice to put the form in a Ziploc bag to ensure it does not get wet during transport.

   iii. To properly ship the water samples, ensure sample bottles are wrapped so they do not get broken during transport. Pack the sample coolers with freeze packs so the samples stay cold during transport. You can also fill the remaining space in the cooler with packing peanuts or shredded paper to ensure samples do not move around too much during transport. Make certain the form is in the cooler and tape the cooler shut.

iv. Label the top of the cooler(s) with the laboratory address and your address. Mark the top of the cooler as URGENT. The address of the laboratory in Rankin Inlet is provided:

Kivalliq Health Centre
1 – 61 Tupirviq Avenue
P.O. Bag 008
Rankin Inlet, NU X0C 0G0

Attention: Marie Tiktak
Ph: (867) 645 – 8329

v. Ship the cooler(s) to the laboratory using Express service. Ensure the cooler is delivered to the Kivalliq Health Centre.

Barcode/Code à barres

Date Received/Reçu le

Laboratory No./N° du laboratoire

Ontario

Ministry of Health and Long-Term Care
Ministère de la Santé et des Soins de longue durée
Public Health Laboratories /
Direction des laboratories de sante publique

Bacteriological Analysis of Drinking Water for Private Citizen, SINGLE HOUSEHOLD ONLY
Analyse bactériologique de l'eau potable – Particuliers, MÉNAGES UNIFAMILIAUX SEULEMENT

Property owner or resident's name and mailing address/
Nom et adresse postale du propriétaire de la propriété ou du résident

Name/Nom (First/Prénom Last/Nom de famille): John Doe
Street, R.R., Box No./Rue, R.R., casier postal: Hamlet of Coral Harbour
City, Town/Ville: Coral Harbour
Province: NU
Postal Code/Code postal *: X0E0C0

Location of Water Source/Emplacement de la source d'eau

Street address/Adresse municipale: Enter address where the
or Lot, Concession/ou lot, concession: water sample was taken
Township/Municipality/Canton, municipalité: Coral Harbour
Emergency Locator #/ *:
County/Comté *:
ON
Postal Code/Code postal *: X0E0C0

☐ Location of Water Source same as Property owner or resident's mailing address/
Emplacement de la source d'eau identique à l'adresse postale du propriétaire ou du résident

☐ No Phone / Pas de téléphone

Date collected/Date du prélèvement: 2010/04/20
Health Unit #/N° du bureau de santé *: n/a
Your Daytime Telephone #/Votre n° tél. le jour: (867)925-8867

☐ I will pick up report at the laboratory./Je viendrai chercher le rapport au laboratoire.
☑ Please mail to my mailing address above./Veuillez le faire parvenir à mon adresse postale indiquée ci-dessus.

WATER WILL NOT BE TESTED IF THE SHADED AREAS OF THIS FORM ARE NOT COMPLETELY AND ACCURATELY FILLED IN/ NOUS N'ANALYSERONS PAS L'ÉCHANTILLON D'EAU SI LES PARTIES OMBRÉES DE LA FORMULE N'ONT PAS ÉTÉ REMPLIES EN ENTIER ET DE FAÇON EXACTE

Instructions - Please read instructions page carefully before sampling and note information on reverse of this page./Prière de lire la page d'instructions attentivement avant l'échantillonnage et prendre note des renseignements figurant au verso de cette page.

* **Please assist the laboratory if possible by also providing this information. A List of the 4-digit Health Unit numbers is on the previous page./** Ces renseignements faciliteront le travail du laboratoire. La liste des numéros à quatre chiffres des bureaux de santé se trouve à la page précédente.

For Laboratory Use Only/Réservé à l'usage du laboratoire

Interpretation for this water sample/Interprétation de cet échantillon d'eau

This water sample was only tested for the presence of both Total Coliform and *E.coli* bacterial indicators of contamination, by Membrane Filtration. / Cet échantillon d'eau n'a été analysé que pour déceler la présence des coliformes totaux et des bactéries collibacillaires, indicateurs de contamination par filtration sur membrane.

☐ NO SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION
(3 consecutive samples, taken 1 to 3 weeks apart, with this designation are needed to determine the stability of the water supply).
AUCUNE PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE
(cette désignation doit être affectée à 3 échantillons consécutifs, dont le prélèvement aura été espacé de 1 à 3 semaines, pour que la source d'approvisionnement en eau soit jugée stable).

☐ **SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION May be unsafe to drink. *(Consult local health unit for information as soon as possible).***
PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE Peut être non potable. *(Consultez le bureau de santé local le plus tôt possible pour plus de détails).*

Date Reported Stamp/
Date du rapport

☐ **UNSAFE TO DRINK Evidence of sewage contamination.** ***Consult local health unit for appropriate action as soon as possible***
EAU NON POTABLE Preuve de contamination par les égouts. ***Consultez le bureau de santé local le plus tôt possible pour de plus amples renseignements sur les mesures à prendre.***

Total Coliform per 100 mL/Coliformes totaux par 100 mL	*E. coli* per/par 100 mL

Date of Analysis/ Date de l'analyse	Read by/ Analyse par	Date Read/ Analyse effectuée le	Authorized by (Technologist)/ Autorisé par (Technologiste)

3743-44 (01/07)

These results relate only to the sample tested. / Le résultat obtenu se rapporte seulement à cet échantillon d'eau analysé.

Barcode/Code à barres

Date Received/Reçu le

Laboratory No./N° du laboratoire

Ontario

Ministry of Health and Long-Term Care
Ministère de la Santé et des Soins de longue durée
Public Health Laboratories /
Direction des laboratories de sante publique

Bacteriological Analysis of Drinking Water for Private Citizen, SINGLE HOUSEHOLD ONLY
Analyse bactériologique de l'eau potable – Particuliers, MÉNAGES UNIFAMILIAUX SEULEMENT

Property owner or resident's name and mailing address/
Nom et adresse postale du propriétaire de la propriété ou du résident

Name/Nom (First/Prénom Last/Nom de famille)

Street, R.R., Box No./Rue, R.R., casier postal

City, Town/Ville

Province

Postal Code/Code postal *

Location of Water Source/Emplacement de la source d'eau

Street address/Adresse municipale

or Lot, Concession/ou lot, concession

Township/Municipality/Canton, municipalité

Emergency Locator # *

County/Comté *

ON

Postal Code/Code postal *

☐ Location of Water Source same as Property owner or resident's mailing address/
Emplacement de la source d'eau identique à l'adresse postale du propriétaire ou du résident

No Phone / Pas de téléphone ☐

Date collected/Date du prélèvement
yyyy/aaaa/mm/mm/dd/jj

Health Unit #/N° du bureau de santé *

Your Daytime Telephone #/Votre n° tél. le jour
( ) -

☐ I will pick up report at the laboratory./Je viendrai chercher le rapport au laboratoire.

☐ Please mail to my mailing address above./Veuillez le faire parvenir à mon adresse postale indiquée ci-dessus.

WATER WILL NOT BE TESTED IF THE SHADED AREAS OF THIS FORM ARE NOT COMPLETELY AND ACCURATELY FILLED IN/ NOUS N'ANALYSERONS PAS L'ÉCHANTILLON D'EAU SI LES PARTIES OMBRÉES DE LA FORMULE N'ONT PAS ÉTÉ REMPLIES EN ENTIER ET DE FAÇON EXACTE

Instructions - Please read instructions page carefully before sampling and note information on reverse of this page./Prière de lire la page d'instructions attentivement avant l'échantillonnage et prendre note des renseignements figurant au verso de cette page.

* Please assist the laboratory if possible by also providing this information. A List of the 4-digit Health Unit numbers is on the previous page./ Ces renseignements faciliteront le travail du laboratoire. La liste des numéros à quatre chiffres des bureaux de santé se trouve à la page précédente.

For Laboratory Use Only/Réservé à l'usage du laboratoire

Interpretation for this water sample/Interprétation de cet échantillon d'eau

This water sample was only tested for the presence of both Total Coliform and *E.coli* bacterial indicators of contamination, by Membrane Filtration. / Cet échantillon d'eau n'a été analysé que pour déceler la présence des coliformes totaux et des bactéries collibacillaires, indicateurs de contamination par filtration sur membrane.

☐ NO SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION
(3 consecutive samples, taken 1 to 3 weeks apart, with this designation are needed to determine the stability of the water supply).
AUCUNE PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE
(cette désignation doit être affectée à 3 échantillons consécutifs, dont le prélèvement aura été espacé de 1 à 3 semaines, pour que la source d'approvisionnement en eau soit jugée stable).

☐ **SIGNIFICANT EVIDENCE OF BACTERIAL CONTAMINATION May be unsafe to drink.** ***(Consult local health unit for information as soon as possible).***
PREUVE DE CONTAMINATION BACTÉRIENNE SIGNIFICATIVE
Peut être non potable. ***(Consultez le bureau de santé local le plus tôt possible pour plus de détails).***

Date Reported Stamp/
Date du rapport

☐ **UNSAFE TO DRINK Evidence of sewage contamination.**
Consult local health unit for appropriate action as soon as possible
EAU NON POTABLE Preuve de contamination par les égouts.
Consultez le bureau de santé local le plus tôt possible pour de plus amples renseignements sur les mesures à prendre.

Total Coliform per 100 mL/Coliformes totaux par 100 mL	*E. coli* per/par 100 mL

Date of Analysis/ Date de l'analyse	Read by/ Analyse par	Date Read/ Analyse effectuée le	Authorized by (Technologist)/ Autorisé par (Technologiste)

3743-44 (01/07)

These results relate only to the sample tested. / Le résultat obtenu se rapporte seulement à cet échantillon d'eau analysé.

Appendix E Sampling Procedures for General Chemistry Water Samples from the Tundra Wetland

INSTRUCTIONS TO COLLECT WATER SAMPLES FOR GENERAL CHEMISTRY ANALYSIS

Coral Harbour, NU

These water sampling procedures should be followed for all water sampling carried out for the sewage and MSW disposal facilities in Coral Harbour. Following the sampling procedures will help ensure the correct sample bottles are obtained, proper sampling procedures are completed, and contamination of the samples is minimized.

1. Bottle Order:
    i. Clean sample bottles must obtained from the laboratory before any water sampling can begin. Clean sample bottles help ensure samples are not contaminated during collection, handling, storage and transport. To obtain clean sample bottles, the following form must be filled out and faxed or emailed. A blank Bottle Request form is included in following this procedure.
    ii. Some water samples will require preservatives. Preservatives are typically acids and help ensure the chemical characteristics of the sample stays the same once it has been sampled. The required preservatives will be added to your bottle order by the laboratory.
    iii. Once you have completed the bottle request form, submit it to Taiga Environmental Laboratory. You can submit the form by fax at (867) 669 – 2718 or email at taiga@inac.gc.ca.
    iv. Once you receive the sample bottles and preservatives, they should be kept in the sample cooler they arrived in, or stored in an area away from potential contamination sources (e.g. gasoline/diesel, oils, chemicals, etc)

2. Field Preparation:
    i. Check local weather forecasts to determine weather conditions when sampling and if there are going to be flight delay or cancellations. Water samples should be shipped to the laboratory as soon as possible. If there are going to be flight delays or cancellations, you may have to collect samples on another day.
    ii. Pre-label sample bottles – before you go into the field to collect water samples, it is good practice to label all required sample bottles first. This ensures all required bottles are present, no samples are missed, and samples between monitoring stations do not get mixed up. Always wear nitrile gloves when handling sample bottles.
    iii. Ensure you have all required preservatives, nitrile gloves, personal equipment (e.g. rubber boots, bug net) and field book or forms (if any).

3. Sample Collection:
    i. To further ensure samples remain free from contamination, it is best practice to begin sampling at the “cleanest” monitoring station in the tundra wetland: COR-5, the final discharge point. From this point, you can work your way backwards through the monitoring stations, towards the detention cell, sampling at COR-3 or COR-6 last.

ii. Once you arrive at your monitoring station, try not to disturb anything. Ensure the streambed, banks and water upstream of your station are not disturbed. Try to confine all your activities and equipment downstream of the monitoring station.

iii. Put your on nitrile gloves and get all bottles and preservatives ready for sampling at the station.

iv. If possible, stand in the middle of the stream or outlet point, downstream from where you will be sampling.

v. Holding the sample bottle near the base of the bottle, remove the lid from the sample bottle and either hold the lid in your hand or place it in a secure location. DO NOT touch the inside of the lid, bottle or neck of the sample bottle.

vi. Dip the sample bottle into the water upstream from where you are standing, being careful not to touch the stream bottom with the bottle or your hand. Allow the bottle to fill up.

If there is preservative already in the sample bottle (i.e. the bottle for bacterial samples; it will be a white powder), be careful not to fill the bottle too fast or dunk the entire bottle in the stream. This will cause you to lose all the preservative.

vii. If your sample requires you to add a preservative, pour some water out of the sample bottle making room for the preservative. Ensure you add the correct preservative to the correct sample. The following samples should have the following preservatives added:

Sample	Preservative
Bacteria	Sodium thiosulphate ($Na_2S_2O_3$) (already in bottle)
Ammonia Nitrogen	Sulphuric acid (H_2SO_4)
Total Phenols	Sulphuric acid (H_2SO_4)
Total Metals	Nitric acid (HNO_3)
Total Organic Carbon	Hydrochloric acid (HCl)

viii. Screw the lid of the sample bottle back on. If you have added preservative, lightly shake the sample to mix it with the preservative. Place the sample in the cooler.

ix. Repeat Steps v to viii for the remaining sample bottles at the monitoring station.

x. Repeat Steps ii to ix for the remaining monitoring stations. Ensure you change your nitrile gloves between each sampling station.

4. Sample Storage and Transport:

vi. Sample Storage – water samples MUST analysed at the laboratory as soon as possible; bacterial samples must be analysed within 24 hours. All water samples must be shipped out as soon as possible. Until you are able to ship the sample(s) out, you must ensure they stay cold. Pack the sample cooler with frozen freeze packs or place the samples in a fridge. DO NOT FREEZE THE SAMPLES.

vii. Fill out the Chain of Custody form – before you can send the samples to the laboratory, you must tell them what to analyse the samples for. This is done through a Chain of Custody

(COC) form, which must be filled out and sent with the samples. An example COC form and a blank COC form are included following this procedure.

It is good practice to put the COC form in a Ziploc bag to ensure it does not get wet during transport.

viii. To properly ship the water samples, ensure any glass sample bottles are wrapped with paper or bubble wrap so they do not get broken during transport. Pack the sample coolers with freeze packs so the samples stay cold during transport. You can also fill the remaining space in the cooler with packing peanuts or shredded paper to ensure samples do not move around too much during transport. Make certain the COC is in the cooler and tape the cooler shut.

ix. Label the top of the cooler(s) with the laboratory address and your address. If you are sending more than one cooler, ensure you write 1 of _, 2 of _, etc. The address to the laboratory has been provided:

Taiga Environmental Laboratory
4601 – 52 Avenue
Yellowknife, NT X1A 2R3
Ph: (867) 669 – 2788
Fax: (867) 669 – 2718

x. Ship the cooler(s) to the laboratory.

TAIGA ENVIRONMENTAL LABORATORY

Bottle &/or Preservative Order Form

Date Ordered: 200__	Date Required: 200__		
Name: John Doe	Company: Hamlet of Coral Harbour	**Project name or Location** Coral Harbour Wetland	
Address: ENTER SHIPPING ADDRESS...			X0E 0C0
Phone: 867-925-8867 / 867-925-8970		Fax: 867-925-8233	
Pick up: ❒ Yes ☑ No	Ship by Air: ☑ Yes ❒ No	Pack as TDG : ☑ Yes ❒ No	Cooler required: ☑ Yes ❒ No
Date Filled: 200__		Filled By:	

NOTE: Bottles and preservatives are provided free of charge for analysis carried out at Taiga. Bottles, preservatives and laboratory supplies for other use, may be subject to additional charges. Unused bottles and preservative cannot be returned to the laboratory for reuse.

Parameter Type	**No. of Field Blanks**	**No. of Travel Blanks**	**No. of Bottles for Samples**	**QC Batch # of Bottles Sent**	**Number of Preservatives**	**QC Batch # of Pres. Sent**
Routine (Green)			6		Not Required	
Nutrients (Black)			6		Not Required	
Bacti (Sterile sealed)	Not Required	Not Required	6		Not Required	
BOD (Purple)	Not Required	Not Required	6		Not Required	
Total Metals (Red)			6		6	
Dissolved Metals (Red) *see note 1*						
Arsenic Speciation Bottle	Not Required	Not Required			Not Required	
Cyanide (Blue)						
Thiocyanate (Orange)						
Hexane Extractable Material (Oil & Grease) (Brown glass, wide or narrow-mouth)			6		6	
(P) Phenol (Brown glass, narrow-mouth)			6		6	
(S) Sulphide						
(R) Radionuclide						
Chlorophyll A (1L brown plastic bottle)	Not Required	Not Required			Not Required	
Extractable Hydrocarbons (Brown glass) *see note 2*					Not Required	
BTEX/Purgeable HC *see note 2*					Not Required	
THM (Glass vial 40mL)					Not Required	
Metals or Hydrocarbons in sediment (500mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (250mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (125mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (60mL jar or Whirl Pak Bag)	Not Required	Not Required			Not Required	
Other:						
Other Field Supplies: (e.g. Type I UV^+ water)						

Notes:

1- Dissolved metals bottles will be preserved at the laboratory if the sample is not filtered in the field. The filtering and addition of preservative is $20.00/sample.

2- For TPH requests, both the extractable hydrocarbons (brown glass bottle) and the BTEX/Purgeable HC (40mL vial) have to be submitted.

Shaded areas are for laboratory use only.

TAIGA ENVIRONMENTAL LABORATORY
LABORATOIRE ENVIRONNEMENTAL TAIGA
4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3
Tel: (867) 669-2788 • Fax: (867) 669-2718
www.taiga.gc.ca

Batch No. : [illegible]

Send Results & Invoice to:
(Please notify if results or invoice are to be sent to different locations)

Company/Agency: Hamlet of Coral Harbour
Address: SHIPPING ADDRESS
City/Town: Coral Harbour Province/Territory: NV
Postal Code: X0E 0C0
Phone: 867-925-8867 Fax: 867-925-8233
E-mail: john.doe@hamlet.com
Signature :

Client Project No:
Date collected:
Time collected:
Sampler: JD
Location: Coral Harbour wetland
Rush Required: ☐Yes ☒No (Surcharge applies, please check with Laboratory for price and availability)
Note: *Analysis may be subcontracted without prior notice.*

Date Received: Received By:
Comments:
(Laboratory use only)

-WATER SAMPLES –

Sample Type (freshwater, sewage, wastewater, potable , groundwater, salt water, *etc*)	Sewage	Wastewater	Wastewater
Client Sample ID (As it should appear on final report)	COR-3	COR-4a	COR-4b
Taiga Sample ID (Laboratory use only)			

Bottle Type and Parameter | [√] PLEASE CHECK PARAMETERS REQUESTED BELOW:

Routine	pH, Conductivity, Alkalinity	pH ✓ Cond ✓ Alk ✓	pH ✓ Cond ✓ Alk ✓	pH ✓ Cond ✓ Alk ✓
	Individual Anions Suite ☐	Cl ✓ SO_4 ✓ F NO_2-N NO_3-N	Cl ✓ SO_4 ✓ F NO_2-N NO_3-N	Cl ✓ SO_4 ✓ F NO_2-N NO_3-N
	Total Nitrite (NO_2) + Nitrate (NO_3)	NO_2 + NO_3-N	NO_2 + NO_3-N	NO_2 + NO_3-N
	Individual Cations Suite ☑	Ca Mg Na K	Ca Mg Na K	Ca Mg Na K
	Hardness (Calculated)	Hardness ✓	Hardness ✓	Hardness ✓
	Reactive Silica	SiO_2	SiO_2	SiO_2
	Color	Apparent True	Apparent True	Apparent True
	Laboratory use only	Rec'd: Y N	Rec'd: Y N	Rec'd: Y N
Nutrients	Chemical Oxygen Demand	COD	COD	COD
	Nitrogen: Total, Dissolved	TN DN	TN DN	TN DN
	Turbidity	Turbidity	Turbidity	Turbidity
	Total Suspended Solids, Dissolved Solids	TSS ✓ TDS	TSS ✓ TDS	TSS ✓ TDS
	Ammonia	NH_3 ✓	NH_3 ✓	NH_3-N ✓
	Phosphorus: Total, Dissolved, Ortho	TP DP OP	TP DP OP	TP DP OP
	Carbon: Total, Dissolved	TOC DOC	TOC DOC	TOC DOC
	Chlorine: Total, Residual	T. Cl R. Cl	T. Cl R. Cl	T. Cl R. Cl
	Visible Oil and Grease	Visible ✓	Visible ✓	Visible ✓
	Laboratory use only	Received : Y N	Received : Y N	Received : Y N
Sterile	Fecal Coliforms (FC)	FC ✓	FC ✓	FC ✓
	Total Coliforms (TC), E. Coli (EC)	TC EC	TC EC	TC EC
	Fecal Streptococcus (FS)	FS	FS	FS
	Laboratory use only	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N
	Biological Oxygen Demand	BOD ✓	BOD ✓	BOD ✓
	Laboratory use only	Received: Y N T: ____°C	Received: Y N T: ____°C	Received: Y N T: ____°C
Metals	Please indicate if sample is preserved and/or filtered	Pres ✓ Filt ☐ Pres ☐	Pres ✓ Filt ☐ Pres ☐	Pres ✓ Filt ☐ Pres ☐
	ICP-MS(1): Cd, Cr, Cu, Co, Mn, Ni, Pb, Zn, Fe	Total Dissolved	Total Dissolved	Total Dissolved
	ICP-MS(2): 25 element scan includes As (not included: B, Bi, Hg, Sn)	Total Dissolved	Total Dissolved	Total Dissolved
	Individual Metals by ICP-MS (please circle each metal): Ag, Al, As, B, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Hg, Li, Mn, Mo, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn	Total ✓ Dissolved	Total ✓ Dissolved	Total ✓ Dissolved
	Laboratory use only	TM rec'd: Y N DM rec'd: Y N	TM rec'd: Y N DM rec'd: Y N	TM rec'd: Y N DM rec'd: Y N
	Hexane Extractable Material (O&G)	HEM	HEM	HEM
	Laboratory use only	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N
	BTEX, Purgeable HC (40mL x 2 vials)	BTEX Purg HC	BTEX Purg HC	BTEX Purg HC
	Extractable HC (1L amber glass bottle)	Ext HC	Ext HC	Ext HC
	Trihalomethanes (40 mL x 2 vials)	THM	THM	THM
	Laboratory use only	Vial rec'd: Y N Ext rec'd: Y N	Vial rec'd: Y N Ext rec'd: Y N	Vial rec'd: Y N Ext rec'd: Y N
	Other: *see special request form*			

For safety purposes, please disclose any contaminants (e.g. heavy metals, cyanide, etc.) that may be present at high levels and pose a risk to human health:

TAIGA ENVIRONMENTAL LABORATORY

Bottle &/or Preservative Order Form

Date Ordered: 200__	Date Required: 200__	
Name:	Company:	**Project name or Location**
Address:		
Phone:	Fax:	

Pick up:	Ship by Air:	Pack as TDG :	Cooler required:
❒ Yes ❒ No	❒ Yes ❒ No	❒ Yes ❒ No	❒ Yes ❒ No

Date Filled: 200__	Filled By:

NOTE: Bottles and preservatives are provided free of charge for analysis carried out at Taiga. Bottles, preservatives and laboratory supplies for other use, may be subject to additional charges. Unused bottles and preservative cannot be returned to the laboratory for reuse.

Parameter Type	**No. of Field Blanks**	**No. of Travel Blanks**	**No. of Bottles for Samples**	**QC Batch # of Bottles Sent**	**Number of Preservatives**	**QC Batch # of Pres. Sent**
Routine (Green)					Not Required	
Nutrients (Black)					Not Required	
Bacti (Sterile sealed)	Not Required	Not Required			Not Required	
BOD (Purple)	Not Required	Not Required			Not Required	
Total Metals (Red)						
Dissolved Metals (Red) *see note 1*						
Arsenic Speciation Bottle	Not Required	Not Required			Not Required	
Cyanide (Blue)						
Thiocyanate (Orange)						
Hexane Extractable Material (Oil & Grease) (Brown glass, wide or narrow-mouth)						
P Phenol (Brown glass, narrow-mouth)						
S Sulphide						
R Radionuclide						
Chlorophyll A (1L brown plastic bottle)	Not Required	Not Required			Not Required	
Extractable Hydrocarbons (Brown glass) *see note 2*					Not Required	
BTEX/Purgeable HC *see note 2*					Not Required	
THM (Glass vial 40mL)					Not Required	
Metals or Hydrocarbons in sediment (500mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (250mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (125mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (60mL jar or Whirl Pak Bag)	Not Required	Not Required			Not Required	
Other:						

Other Field Supplies: (e.g. Type I UV^{+} water)

Notes:

1- Dissolved metals bottles will be preserved at the laboratory if the sample is not filtered in the field. The filtering and addition of preservative is $20.00/sample.

2- For TPH requests, both the extractable hydrocarbons (brown glass bottle) and the BTEX/Purgeable HC (40mL vial) have to be submitted.

Shaded areas are for laboratory use only.

TAIGA ENVIRONMENTAL LABORATORY
LABORATOIRE ENVIRONNEMENTAL TAIGA
4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3
Tel: (867) 669-2788 • Fax: (867) 669-2718
www.taiga.gc.ca

Batch No. : *Lab use only*

Send Results & Invoice to:
(Please notify if results or invoice are to be sent to different locations)

Company/Agency: _____

Address: _____

_____

City/Town: _____ Province/Territory: _____

Postal Code: _____

Phone: _____ Fax: _____

E-mail: _____

Signature : _____

Client Project No: _____

Date collected: _____

Time collected: _____

Sampler: _____

Location: _____

Rush Required: ❑Yes ❑No (Surcharge applies, please check with Laboratory for price and availability)

Note: *Analysis may be subcontracted without prior notice.*

Date Received: _____ Received By: _____
Comments:_____
(Laboratory use only)

-WATER SAMPLES –

Sample Type (freshwater, sewage, wastewater, potable , groundwater, salt water, *etc*)			
Client Sample ID (As it should appear on final report)			
Taiga Sample ID (Laboratory use only)			

Bottle Type and Parameter

[√] PLEASE CHECK PARAMETERS REQUESTED BELOW:

Routine	pH, Conductivity, Alkalinity	pH | Cond | Alk	pH | Cond | Alk	pH | Cond | Alk
	Individual Anions Suite ☐	Cl | SO_4 | F | NO_2-N | NO_3-N	Cl | SO_4 | F | NO_2-N | NO_3-N	Cl | SO_4 | F | NO_2-N | NO_3-N
	Total Nitrite (NO_2) + Nitrate (NO_3)	NO_2 + NO_3-N	NO_2 + NO_3-N	NO_2 + NO_3-N
	Individual Cations Suite ☐	Ca | Mg | Na | K	Ca | Mg | Na | K	Ca | Mg | Na | K
	Hardness (Calculated)	Hardness	Hardness	Hardness
	Reactive Silica	SiO_2	SiO_2	SiO_2
	Color	Apparent | True	Apparent | True	Apparent | True
	Laboratory use only	Rec'd: Y N	Rec'd: Y N	Rec'd: Y N
Nutrients	Chemical Oxygen Demand	COD	COD	COD
	Nitrogen: Total, Dissolved	TN | DN	TN | DN	TN | DN
	Turbidity	Turbidity	Turbidity	Turbidity
	Total Suspended Solids, Dissolved Solids	TSS | TDS	TSS | TDS	TSS | TDS
	Ammonia	NH_3	NH_3	NH_3-N
	Phosphorus: Total, Dissolved, Ortho	TP | DP | OP	TP | DP | OP	TP | DP | OP
	Carbon: Total, Dissolved	TOC | DOC	TOC | DOC	TOC | DOC
	Chlorine: Total, Residual	T. Cl | R. Cl	T. Cl | R. Cl	T. Cl | R. Cl
	Visible Oil and Grease	Visible	Visible	Visible
	Laboratory use only	Received : Y N	Received : Y N	Received : Y N
Sterile	Fecal Coliforms (FC)	FC	FC	FC
	Total Coliforms (TC), E. Coli (EC)	TC | EC	TC | EC	TC | EC
	Fecal Streptococcus (FS)	FS	FS	FS
	Laboratory use only	Received: Y N T: _____°C Sterile container: Y N	Received: Y N T: _____°C Sterile container: Y N	Received: Y N T: _____°C Sterile container: Y N
	Biological Oxygen Demand	BOD	BOD	BOD
	Laboratory use only	Received: Y N T: _____°C	Received: Y N T: _____°C	Received: Y N T: _____°C
Metals	Please indicate if sample is preserved and/or filtered	Pres ☐ | Filt☐ Pres☐	Pres ☐ | Filt☐ Pres☐	Pres ☐ | Filt☐ Pres☐
	ICP-MS(1): Cd, Cr, Cu, Co, Mn, Ni, Pb, Zn, Fe	Total | Dissolved	Total | Dissolved	Total | Dissolved
	ICP-MS(2): 25 element scan includes As (not included: B, Bi, Hg, Sn)	Total | Dissolved	Total | Dissolved	Total | Dissolved
	Individual Metals by ICP-MS (please circle each metal): Ag, Al, As, B, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Hg, Li, Mn, Mo, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn	Total | Dissolved	Total | Dissolved	Total | Dissolved
	Laboratory use only	TM rec'd: Y N | DM rec'd: Y N	TM rec'd: Y N | DM rec'd: Y N	TM rec'd: Y N | DM rec'd: Y N
	Hexane Extractable Material (O&G)	HEM	HEM	HEM
	Laboratory use only	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N
	BTEX, Purgeable HC (40mL x 2 vials)	BTEX | Purg HC	BTEX | Purg HC	BTEX | Purg HC
	Extractable HC (1L amber glass bottle)	Ext HC	Ext HC	Ext HC
	Trihalomethanes (40 mL x 2 vials)	THM	THM	THM
	Laboratory use only	Vial rec'd: Y N | Ext rec'd: Y N	Vial rec'd: Y N | Ext rec'd: Y N	Vial rec'd: Y N | Ext rec'd: Y N
	Other: *see special request form*			

For safety purposes, please disclose any contaminants (e.g. heavy metals, cyanide, etc.) that may be present at high levels and pose a risk to human health:

INSTRUCTIONS TO COLLECT WATER SAMPLES FOR TOXICITY ANALYSIS

Coral Harbour, NU

The Hamlet is required to complete toxicity testing at the final discharge point of the sewage disposal facility, approximately halfway through the open water season. The recommended toxicity test is a Pass/Fail test on two different species: the water flea (*Daphnia magna*), and rainbow trout (*Oncorhynchus mykiss*) (A. Wilson, *pers. comm.*). The Pass/Fail toxicity test will determine if aquatic species can survive in the effluent alone (100% concentration). If the effluent passes the test, the discharge from the sewage disposal facilities would be considered not acutely toxic. The volume of water required for the toxicity test is 20 L per species; due to the large volume of water needed for the each toxicity test, the use of a peristaltic pump is recommended.

These sampling procedures should be followed for collecting all water samples for toxicity testing at COR-5, the final discharge point of the sewage disposal facility in Coral Harbour. Adhering to the sampling procedures will help ensure the correct sample containers are obtained, proper sampling procedures are completed, and contamination of the samples is minimized.

1. Bottle Order:

   i. Clean sample containers must obtained from the laboratory before any water sampling can begin. Clean sample containers help ensure the collected water is not contaminated during collection, handling, storage and transport. To obtain clean sample containers, contact ALS Laboratories in Winnipeg, MB, by phone or fax:

      ALS Laboratories
      1329 Niakwa Road East, Unit 12
      Winnipeg, MB R2J 3T4
      Ph: (204) 255 – 9720
      Fax: (204) 255 – 9721

      NOTE: As previously mentioned, using a peristaltic pump to obtain water for the toxicity tests is recommended due to the large volume of water required. If the Hamlet does not already own a peristaltic pump, it may be possible to rent one from a rental agency, having them ship it to Coral Harbour if the agency is not local.

      If there is no access to a peristaltic pump, it is recommended to use a laboratory-cleaned container to transfer water into the sample pails for the toxicity tests. A clean container (e.g. 4 L) can be obtained from ALS Laboratories if requested.

   ii. Once you receive the sample containers, they should remain unopened and kept in the sample cooler they arrived in, or stored in an area away from potential contamination sources (e.g. gasoline/diesel, oils, chemicals, etc). You will likely receive two to three 20 L sample pails with plastic liners for the two toxicity tests (20 L per test).

2. Field Preparation:

   i. Check local weather forecasts to determine weather conditions when sampling and if there are going to be flight delay or cancellations. Water samples need to be shipped to the laboratory as soon as possible. If there are going to be flight delays or cancellations, collect samples on another day.

ii. Pre-label sample containers – before going into the field to collect toxicity samples, it is good practice to label all sample containers first. Always wear nitrile gloves when handling sample containers.

Sample containers should be labelled with:

- Date and time sample was collected (may complete this once sample is collected)
- Station name (i.e. COR-5)
- Sample type (i.e. grab water sample)
- Name of sampler(s)
- Number of containers per sample (e.g. 1 of __, 2 of __, etc.)

iii. Ensure you have nitrile gloves, personal equipment (e.g. rubber boots, bug net) and field book or forms (if any).

3. Sample Collection:

i. Once you arrive at COR-5, try not to disturb anything. Ensure the streambed, banks and water upstream of your station are not disturbed. Try to confine all your activities and equipment downstream of the monitoring station.

ii. Put on nitrile gloves and get all containers and equipment ready for sampling at the station.

iii. If using a peristaltic pump, turn on the pump and check which tubing is the incurrent (suction) end. Place the incurrent tubing in the middle of the stream, ensuring the tubing remains at mid-depth and does not touch the bottom. The tubing may have to be held in place.

iv. Turn on the pump and allow the water to run through the pump for 2 – 5 minutes.

v. Remove the lid from one of the sample pails. Place the lid in a secure location and DO NOT touch the inside of the lid or sample pail. If a plastic liner (large plastic bag) is included in the pail, line the pail with the liner being careful not to touch the inside of the liner. Rinse the inside of the liner with sample water.

vi. Fill the sample pail using the peristaltic pump. The sample pails should be filled so that no air space is present in the sample pail.

a. If you are not using a peristaltic pump, holding the larger (e.g. 4 L) clean sample bottle, stand in the middle of the stream or outlet point, downstream from the sampling location.

b. Holding the sample bottle near the base of the bottle, remove the lid from the sample bottle. DO NOT touch the inside of the bottle or neck of the sample bottle.

c. Dip the sample bottle into the water upstream from where you are standing, being careful not to touch the stream bottom with the bottle or your hand. Allow the bottle to fill up. Pour water from the sample bottle into the sample pail. Repeat until sample pail is full (no air space).

vii. Once the sample pail is full, twist and tie the top of the plastic liner to securely close the liner. Thoroughly rinse the lid of the sample pail with water from the pump and replace the lid on the sample pail, ensuring it snaps in place. A rubber mallet may be required.

viii. Repeat Steps v to vii to fill the remaining sample pails for the toxicity tests.

4. Sample Storage and Transport:

   xi. Sample Storage – water samples MUST be analysed at the laboratory as soon as possible. All water samples must be shipped out as soon as possible. Until you are able to ship the sample(s) out, you must ensure they stay cold. Place the sample pails in a refrigerator or other cool place. DO NOT FREEZE THE SAMPLES.

   xii. Fill out the Chain of Custody form – before you can send the samples to the laboratory, you must tell them what to analyse the samples for. This is done through a Chain of Custody (COC) form, which must be filled out and sent with the samples. An example COC form is included following this procedure; blank COC forms will be sent with your bottle order.

   It is good practice to put the COC form in a Ziploc bag to ensure it does not get wet during transport. Tape the Ziploc bag with COC form securely to the outside of one of the sample pails.

   xiii. To properly ship the water samples, ask the airline to keep the sample pails cold by placing in a refrigerator or other cool (NEVER FROZEN) transport, if available. Tape the top of the sample pails to ensure they do not open during transport.

   xiv. Label the top of each sample pail with the laboratory address and your address. Since you are likely sending more than one pail, ensure you write 1 of _, 2 of _, etc, on the pails. The address to the laboratory has been provided:

   ALS Laboratories
   1329 Niakwa Road East, Unit 12
   Winnipeg, MB R2J 3T4
   Ph: (204) 255 – 9720
   Fax: (204) 255 – 9721

   xv. Ship the sample pails to the laboratory.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

COC # C048758

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

Page 1 of 1

REPORT TO:	REPORT FORMAT / DISTRIBUTION	SERVICE REQUESTED
COMPANY: Hamlet of Coral Harbour	STANDARD ✓ OTHER ____	✓ REGULAR SERVICE (DEFAULT)
CONTACT: John Doe	PDF ✓ EXCEL ____ CUSTOM ____ FAX ____	RUSH SERVICE (2-3 DAYS)
ADDRESS: SHIPPING ADDRESS	EMAIL 1: john.doe@hamlet.ca	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2:	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 867925-8867 FAX: 867-925-8233		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? (YES) / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	
COMPANY: (If NO, enter information)	CLIENT / PROJECT INFORMATION:	
CONTACT:	JOB #: n/a	
ADDRESS:	PO /AFE: n/a	
	Legal Site Description: COR-5	
PHONE: FAX:	QUOTE #: (Enter # if you have)	
Lab Work Order # (lab use only)	SAMPLER (Initials): J.D.	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	TROUT-P/F-WP	DAPHNIA-P/F-WP	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	COR-5 - TOX	18-Aug-2010	11:00	Grab	X	X			6

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
John Doe	18/Aug/10 14:00			TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:		

REFER TO BACK PAGE FOR REGIONAL LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF14.00

Appendix F O&M Manual Forms

Hamlet of Coral Harbour
Monthly Pumphouse Inspection Form

Date: _____ **Inspector(s):** _____

Air Temperature (°C): _____ **Ground Cover:** _____
(e.g. snow covered, vegetation)

Wind Direction & Speed: _____ **Precipitation:** _____

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Reservoir (fence, general condition, intake pump casing assemblies, etc)						
Access Road (condition, ditches, snow cover, surface, erosion, etc)						
Truck Pad (condition, snow cover, surface, erosion, etc)						
External Building & Electrical Connection (condition, stability, etc)						
Signs (presence, condition, readability)						
Exterior Truck Fill Line (line condition, obviious signs of repair, complaints, switches, etc)						
Interior Electrical System (obvious signs of repair, etc)						

Hamlet of Coral Harbour
Monthly Pumphouse Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Heating System (system check OK, obvious signs of repair, etc)						
Alarm System (system check OK, obvious signs of repair, etc)						
Pumphouse Water Lines (obvious signs of repair, condition, leaks, rust, valves, flow switches, meter readouts, etc)						
Chlorination System (cleanliness of components, quantity of chlorine chemical, vavles, mixing tanks, agitator, etc)						
Hypochlorinator (condition, function, receptacle, etc)						
Pumphouse Intake System - General (function, condition, alarms, etc)						
Pumphouse Intake System - Internal (requires removal of components out of pump casing assembly - annual inspection)						
Heat Trace System (function, condition, alarms, receptacles, etc)						
Equipment (water trucks, winch, etc)						

Hamlet of Coral Harbour
Monthly Pumphouse Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Interior Building (condition, cleanliness, etc)						
Health & Safety (public and personnel)						

General Comments:

Hamlet of Coral Harbour
Monthly Standby Power Facility Inspection Form

Date: _____ **Inspector(s):** _____

Air Temperature (°C): _____ **Ground Cover:** _____
(e.g. snow covered, vegetation)

Wind Direction & Speed: _____ **Precipitation:** _____

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Health & Safety (public and personnel)						
Access Road (condition, ditches, snow cover, surface, erosion, etc)						
Truck Pad (condition, snow cover, surface, erosion, etc)						
External Building & Electrical Connection (condition, stability, etc)						
Signs (presence, condition, readability)						
Fuel Tank (tank condition, fuel level, containment condition, leaks, spills, etc)						
Interior Electrical System (obvious signs of repair, etc)						

Hamlet of Coral Harbour
Monthly Standby Power Facility Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Ventilation System (system check OK, obvious signs of repair, etc)						
Heating System (system check OK, obvious signs of repair, etc)						
Standby Power Generator (system check OK, generator performance if checked, battery system, etc)						
Diesel Engine (system check OK, engine oil heater, etc)						
Fuel System (supply & return lines, connections, spills, leaks, etc)						
Interior Building (condition, cleanliness, etc)						

General Comments:

Hamlet of Coral Harbour
Monthly Sewage Volume Record

Month: _____ **Year:** _____ **Truck Number:** _____

Date	Number of Trips	Volume per Trip (litres [L])	Total Daily Volume (litres [L])	Comments / Concerns
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Monthly Totals				

Hamlet of Coral Harbour
Monthly Sewage Disposal Facility Inspection Form

Date: _____ **Inspector(s):** _____

Air Temperature (°C): _____ **Ground Cover:** _____
(e.g. snow covered, vegetation)

Wind Direction & Speed: _____ **Precipitation:** _____

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Health & Safety (public and personnel)						
Access Road (condition, ditches, snow cover, surface, erosion, etc)						
Offload Truck Pad (condition, snow cover, surface, erosion, etc)						
Offload Chutes & Bollards (condition, stability, etc)						
Signs (presence, condition, readability)						
Detention Cell (berm stability & condition, fence, sewage level, etc)						
Tundra Wetland (flow diversion berms condition & stability, drainage courses, water presence, etc)						

Hamlet of Coral Harbour
Monthly Sewage Disposal Facility Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Wildlife						
Odour / Appearance						
Equipment (sewage trucks)						

General Comments:

Hamlet of Coral Harbour
Monthly Municipal Solid Waste Quantity Form

Month: _____ **Year:** _____

Date	Waste Delivered by Hamlet Personnel		Waste Delivered by Others	Total (m^3)	Activities Completed at the Municipal Solid Waste Facility (e.g. burning, compacting, segregating, covering, etc)	Staff Initials
	Number of Loads	Estimated Quantity (m^3)	Estimated Quantity (m^3)			
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Hamlet of Coral Harbour
Monthly Municipal Solid Waste Quantity Form

Date	Waste Delivered by Hamlet Personnel		Waste Delivered by Others	Total (m^3)	Activities Completed at the Municipal Solid Waste Facility (e.g. burning, compacting, segregating, covering, etc)	Staff Initials
	Number of Loads	Estimated Quantity (m^3)	Estimated Quantity (m^3)			
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Monthly Totals						

Hamlet of Coral Harbour
Monthly Municipal Solid Waste Disposal Facility Inspection Form

Date: _____ **Inspector(s):** _____

Air Temperature (°C): _____ **Ground Cover:** _____
(e.g. snow covered, vegetation)

Wind Direction & Speed: _____ **Precipitation:** _____

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Health & Safety (public and personnel)						
Access Road (condition, ditches, snow cover, surface, erosion, etc)						
Signs (presence, condition, readability)						
Litter (at fences, on site, off site, etc)						
Berm and Fence (berm stability & condition, fence, sewage level, etc)						
General Waste Segregation						
Burn Area (only burnables present, burn practices followed, etc)						

Hamlet of Coral Harbour
Monthly Municipal Solid Waste Disposal Facility Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Landfill Area						
Landfill Waste Placement & Compaction						
Landfill Waste Cover (stockpile, exposed waste, depth, etc)						
Landfill Cell/Layer Construction (slopes, cover, etc)						
Hazardous Waste Storage Area						
Public Waste Drop-off Area						
Surface Drainage (water flow, erosion, drainage, waste in ditches, etc)						
Leachate Seepage from MSW Disposal Facility (for COR-6 monitoring station)						
Site Equipment						

Hamlet of Coral Harbour
Monthly Municipal Solid Waste Disposal Facility Inspection Form

Issues	Are there Concerns?		Description of Concern / Condition / Problem	Action / Maintenance Required	Recurring Problem?	
	Yes	No			Yes	No
Site Planning & Organization						
Wildlife						
Odour / Appearance						

General Comments:

Appendix G Spill Contingency Forms

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER _____-_____
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS

F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION	
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION	
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

NUNAVUT SPILL REPORT (Oil, Gas, Hazardous Chemicals or other Materials)

ᓄᓇᕗᑦ ᐊᕐᕌᒍᓂᐊᖅ ᐅᓂᒃᑳᖅ (ᐅᖃᓕᓴᐃᔨᓪᓚᑦ, ᓯᓚᑦ, ᐊᑦᑕᕐᓇᖅᑐᑦ, ᐃᓕᓴᕐᓚᐃᑦ ᐅᑦᔨᓐ ᐊᓕᖓᑦ)

24-Hour Report Line 24-ᓄᑦ ᐃᑲᖏᓄᑦ ᐅᓂᒃᑲᕐᐊᐅᔪᓐᓇᖅᑐᖅ ᐅᖃᓕᑦ

Phone/ᐅᖃᓕᐅᑦ **(867) 920-8130**

Fax/ᓱᒃᑐᒃᓴᑦ **(867) 873-6924**

A Report Date and Time ᐅᑎᓪᓗᖅ ᓴᖅᑭᖓᔪᓂᑦ ᖃᓄᐃᓕᐊᖏᑎᒋᓪᓗᐊ ᐅᓂᒃᑲᐅᑎᕐᕕᐃᓚᑦ	**B** Date and Time of Spill(if known) ᐅᑎᓪᓗᖅ ᐊᐃᑎᒋᓪᓗᐊ ᖃᓄᐃᓕᐊᖏᑎᒋᓪᓗᐊᓗ (ᖃᐅᔨᒪᓕᐅᔨᕕᑦ)	**C** ☐ Original Report ᓱᓕᓐᓂᖅᓯᒪᔭ ᐅᓂᒃᑲᐅᓱᐅᔪᖅ ☐ Update No. _____ ᓂᒃᑲᐅᓱᐅᒃᑲᓂᕐᓗᖅ ᓇᓕᐅᑦ	Spill Number ᐊᐃᑎᒋᑦ ᓇᓕᐅᑦ

D Location and Map Coordinates (if known) and Direction (if moving) ᓇᓂ ᐊᐃᓕᑦ ᐊᒻᒪᓗ ᓄᓇᕐᔪᐊᑦ ᓇᓕᐅᑎᖓᑦ (ᖃᐅᔨᒪᓕᐅᔨᕕᑦ) ᐊᒻᒪᓗ ᓇᒧᓐᖓᐅᓪᓕᐊᓕᖓᑦ (ᐃᖅᑲᖑᕕᑦ)

E Party Responsible for Spill (Full Name and Address) ᑭᖑᑦ ᐊᐃᑎᑦᑎᐊᓐᑦ (ᐃᑎᑦ ᐊᒻᒪᓗ ᑐᕌᑎᖓ)

F Product(s) Spilled and Estimated Quantities(provide metric volumes/weights if possible) ᑭᓱᑦ ᑭᓱᓪᓗᓐᓂᑦ ᐊᐃᓐᑦ ᖃᓄᑎᓗ ᐊᖏᓂᖃᖅᑕᑦ (ᐊᖏᓂᖓ ᐅᑭᖑᓂᖏᓪᓗᓐᓂᑦ ᐊᓯᓇᕐᑐᑦ)

G Cause of Spill ᑭᓱ ᐊᐃᔨᔪᑎᑦᓴᐅᓴᐅᑦ

H Is Spill Terminated? ᐊᐃᔪᖅ ᓄᖅᖃᑎᒌᓴᐅᑦ? ☐ Yes/ᐃ ☐ No/ᐊᒃᑲ	**I** If Spill is Continuing, Give Estimated Rate ᓱᓕ ᐊᐃᔨᔪᑦ ᖃᓄᑎᑎ ᓱᒃᑲᓕᑎᑎᖃᖅᓯᒪᔪᖅᑐᑦ	**J** Is Further Spillage Possible? ᐊᐃᔨᒃᖃᓗᐃᓪᓕᐊᑭᖃᖅᑐᑦ? ☐ Yes/ᐃ ☐ No/ᐊᒃᑲ	**K** Extent of Contaminated Area (in square metres if possible) ᖃᓄᖅ ᐊᖏᑎᑎᓴᐅ ᐊᐃᔨᔪᐃᓕᐊᖅ (ᐅᑦᔪᓂᒪᓚᓗᒍ ᐊᔪᓐᓇᖏᑦᑐᑦ)

L Factors Affecting Spill or Recovery(weather conditions, terrain, snow cover, etc.)
ᑭᓱᑦ ᐱᔨᔪᑎᑦᓴᐅᑦ ᐊᐃᔪᔨᒧᑦ ᐅᑦᔪᓐᓇᖅᑐᑦ ᐊᖑᓪᓚᑦ (ᓱᓕ ᖃᓄᐃᓕᓐᓂᓕᖅᓂᑦ, ᓄᓇ ᖃᓄᐃᓕᓐᓂᓕᖅᓂᑦ ᐊᑐᐊᓴᐅᓱᒪᓕᖅᓂᖅ, ᐊᓱᑲᓪᓚᑦ)

.

M Containment (natural depression, dykes, etc.)
ᐅᖃᓱᒪᓕᖃᖏᑦᑐᑦ ᑭᓕᐊᑦ ᐃᓱᖅᓴᓕᓱᒪᓕᕐᓂᖅ (ᓄᓇᒥ ᐃᓱᖅᓴᐃᑦ, ᐊᓱᑲᓪᓚᐅᔭᕐᓗᑦ)

N Action, if any, taken or Proposed to Contain, Recover, Clean Up or Dispose of Product(s) and Contaminated Materials
ᖃᓄᐃᓕᐅᑉᐳᓴᒃ, ᖃᓄᐃᓕᐅᑉᐳᓂᐊᖏᓕᖅᑐᑦ ᐅᑦᔪᓂ ᖃᓄᐃᓕᐅᑉᐳᓂᐊᖏᓕᖅᑐᑦ ᐊᑕᐅᓂᖅᑎᑎᑐᓴᐅᓕᖅᓂᒃ, ᓄᖅᑲᑎᑕᐅᓴᐅᓕᖅᓂᒃ, ᓴᓗᒪᓂᖅᑕᐅᓴ ᐅᑦᔪᓂ ᐃᑎᑕᐅᓂᖏᓕᖅᑐᑦ ᐊᐃᔪᖅ (ᐊᐃᔨᔪᑎᑦᓴᐅᑦ) ᐊᒻᒪᓗ ᐊᐃᔨᔪᐃᓕᐊᖅ.

O Do You Require Assistance? ᐃᑲᔪᖅᑕᐅᔾᔨᓇᖖᖅᓱᒋᑦ? ☐ No ᐊᒃᑲ ☐ Yes, describe: ᐃ, ᓇᓗᓇᐃᔨᑦᓗᒍ	**P** Possible Hazards to Persons, Property or Environment e.g. fire, drinking water, fish or wildlife ᐊᑦᑕᕐᓇᐃᓕᓐᓇᓇᖖᖅᓱᒋᑦ ᐃᓇᓐᓄᑦ, ᑕᐃᔪᑎᑦᓴᐅᑦ ᐅᑦᔪᓂ ᐊᐸᑎᒪᑦ ᓄᓪᑦ - ᐃᑭᓪᓗᓄ, ᐃᒥᓪᓚᑦ ᓄᐅᖖᖅᑕᐅᓄᓪᒍᑦᓗᓄ, ᐃᖖᓕᔪᓄᑦ ᐅᑦᔪᓂ ᓄᑦᔪᑎᓄᑦ

Q Comments and/or Recommendations ᐅᖖᐅᓄᓪᓚᐃᑦ ᐊᒻᒪᓗ ᐅᑦᔪᓐᓂᖅᑐᑦ ᖃᓄᐃᓕᑎᑦᔪᐅᔪᖅ

FOR SPILL LINE USE ONLY
ᐊᑐᖖᑕᐅᔪᓪᓚᖖᖅ ᐊᐃᔪᓄᑦ ᐅᖃᓄᑦᓴᐃᐅᕐᖖᐅᑐᓄᖖᖅ

Lead Agency
ᐃᖖᓄᐃᑉᐳᖖᓕᓂᑦᓴᐃᑦ ᐊᐃᔪᒥᒃ ᑲᒪᒋᔭᖖᖅᑐᑦ

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Spill Significance ᐊᐃᔨᑦ ᖃᓄᐃᓕᓐᓂᓐᖓ

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Lead Agency Contact and Time
ᐃᖖᓄᐃᑉᐳᖖᓕᓂᑦᓴᐃᑦ ᐊᐃᔪᒥᒃ ᑲᒪᒋᔭᖖᖅᑐᑦ ᖃᓄᐃᓕᐅᔨᓐᓂᓐᖓ ᐊᒻᒪᓗ ᖃᓄᖅᑲᐅᑎᕐᕕᐃᓚᑦ

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Is this file now closed?
ᒥᓂᓄ ᐅᓂᒃᑲᓕᐅᔪᖅ ᒪᑐᐅᑦᑭᓚᐅᖅ? .....

Reported By ᐅᓂᒃᑲᖖᑦᑐᖖᖅ	Position, Employer, Location ᖃᓄᐃᓕᒋᑦ ᐃᖖᓄᐃᑉᐳᓂᒃ, ᐃᖖᓄᐃᑉᐳᖖᓕᓂᓐᓂᖅ, ᓄᓇ	Telephone ᐅᖃᓕᐅᑦ
Reported To ᐅᓂᐊᐅᔪᖅ	Position, Employer, Location ᖃᓄᐃᓕᒋᑦ ᐃᖖᓄᐃᑉᐳᓂᒃ, ᐃᖖᓄᐃᑉᐳᖖᓕᓂᕐᓗᑦ, ᓄᓇ	Telephone ᐅᖃᓕᐅᑦ

Instructions for Completing the NT-NU Spill Report Form

This form can be filled out electronically and e-mailed as an attachment to spills@gov.nt.ca. Until further notice, please verify receipt of e-mail transmissions with a follow-up telephone call to the spill line. Forms can also be printed and faxed to the spill line at 867-873-6924. Spills can still be phoned in by calling collect at 867-920-8130.

A. Report Date/Time	The actual date and time that the spill was reported to the spill line. If the spill is phoned in, the Spill Line will fill this out. **Please do not fill in the Report Number**: the spill line will assign a number after the spill is reported.
B. Occurrence Date/Time	Indicate, to the best of your knowledge, the exact date and time that the spill occurred. Not to be confused with the report date and time (see above).
C. Land Use Permit Number /Water Licence Number	This only needs to be filled in if the activity has been licenced by the Nunavut Water Board and/or if a Land Use Permit has been issued. Applies primarily to mines and mineral exploration sites.
D. Geographic Place Name	In most cases, this will be the name of the city or town in which the spill occurred. For remote locations – outside of human habitations – identify the most prominent geographic feature, such as a lake or mountain and/or the distance and direction from the nearest population center. **You must include the geographic coordinates** (Refer to Section E).
E. Geographic Coordinates	This only needs to be filled out if the spill occurred outside of an established community such as a mine site. Please note that the location should be stated in degrees, minutes and seconds of Latitude and Longitude.
F. Responsible Party Or Vessel Name	This is the person who was in management/control/ownership of the substance at the time that it was spilled. In the case of a spill from a ship/vessel, include the name of the ship/vessel. Please include full address, telephone number and e-mail. Use box K if there is insufficient space. **Please note that, the owner of the spilled substance is ultimately responsible for any spills of that substance, regardless of who may have actually caused the spill.**
G. Contractor involved?	Were there any other parties/contractors involved? An example would be a construction company who is undertaking work on behalf of the owner of the spilled substance and who may have contributed to, or directly caused the spill and/or is responding to the spill.
H. Product Spilled	Identify the product spilled; most commonly, it is gasoline, diesel fuel or sewage. For other substances, avoid trade names. Wherever possible, use the chemical name of the substance and further, identify the product using the four digit UN number (eg: UN1203 for gasoline; UN1202 for diesel fuel; UN1863 for Jet A & B)
I. Spill Source	Identify the source of the spill: truck, ship, home heating fuel tank and, if known, the cause (eg: fuel tank overfill, leaking tank; ship ran aground; traffic accident, vandalism, storm, etc.). Provide an estimate of the extent of the contaminated/impacted area (eg: 10 m^2)
J. Factors Affecting Spill	Any factors which might make it difficult to clean up the spill: rough terrain, bad weather, remote location, lack of equipment. Do you require advice and/or assistance with the cleanup operation? Identify any hazards to persons, property or equipment: for example, a gasoline spill beside a daycare centre would pose a safety hazard to children. Use box K if there is insufficient space.
K. Additional Information	Provide any additional, pertinent details about the spill, such as any peculiar/unique hazards associated with the spilled material. State what action is being taken towards cleaning up the spill; disposal of spilled material; notification of affected parties. If necessary, append additional sheets to the spill report. Number the pages in the same format found in the lower right hand corner of the spill form: eg. “Page 1 of 2", “Page 2 of 2" etc. **Please number the pages to ensure that recipients can be certain that they received all pertinent documents.** If only the spill report form was filled out, number the form as “Page 1 of 1".
L. Reported to Spill Line by	Include your full name, employer, contact number and the location from which you are reporting the spill. Use box K if there is insufficient space.
M. Alternate Contact	Identify any alternate contacts. This information assists regulatory agencies to obtain additional information if they cannot reach the individual who reported the spill.
N. Report Line Use Only	**Leave Blank**. This box is for the **Spill Line’s use only**.