Operations and Maintenance Manual

Wastewater Treatment Facility
(Sewage Lagoon System)

Municipality of Igloolik, Nunavut

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Version History

Date	Details
August 2014	Initial Release
February 2020	Re-submission
September 2020	This Release

1 Introduction

This operations and maintenance (O&M) manual (Manual) is intended to provide a framework for the Municipality of Igloolik (Municipality), Nunavut staff to operate and maintain the sewage lagoon system, in a manner that will protect public health and prevent adverse environmental impacts.

The sewage lagoon system is the Upgraded Sewage Disposal Facility used for treating the wastewater collected by the Municipality. This Manual have been prepared to update the existing wastewater treatment facility O&M manual to reflect the current state of the facilities, operational procedures, location maps, health and safety guidelines and monitoring stations. The original wastewater treatment facility O&M manual was released in August 2014 and re-submitted on February 20, 2020.

This Manual was developed according to requirements of the Nunavut Water Board in the water licence 3BM-IGL1520 and two amendments (Amendment No. 1 and Amendment No. 2) approved on February 16, 2016 and September 1, 2017, respectively, and included in Appendix B. Currently, the Municipality is applying for dual water licence renewal and amendment from Type B water licence to Type A water licence.

This Manual incorporates commitments and communications between Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) Nunavut Water Board (NWB), Community and Government Services (CGS), Municipality of Igloolik and EXP during the renewal application review process.

1.1 Objective of Sewage Lagoon System

The primary objective of the Municipality's sewage lagoon system is to apply appropriate technology and procedures to treat and dispose its sanitary sewage. The application of appropriate technology depends upon the geology, terrain and climate of the area, as well as the technical and financial capabilities of the Municipality. In the case of the Municipality, the appropriate technology is a storage cell system providing retention and treatment, and the vegetative filter strip wetland providing additional treatment and/or polishing. Photo 1 shows a sewage lagoon cell.

Photo 1: Sewage lagoon cell

The following general requirements for minimizing public health and environmental hazards are addressed in this O&M manual:

1. To minimize aesthetic nuisances that can interfere with community life and development;
2. To minimize the impacts to surface and subsurface waters through retention, decanting, and vegetative filter strip wetland treatment; and
3. To minimize the occurrence of environmental, public health and aesthetic impacts.

1.2 Reference Information

The preparation of this O&M manual is based upon the following information sources:

1. Duong, D. and Kent, R., 1996, Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories, Municipal and Community Affairs Community Development
2. EXP Services Inc., 2014, Design Brief, Optimization of the Wastewater Facility Igloolik, Nunavut, Submitted on November 2014
3. EXP Services Inc., 2014, rev 2020, Operations & Maintenance Manual Volume 1 – Document, Igloolik Waste Water Facility, Submitted August 2914 – rev February 2020

1.3 Contact List

Contacts for the Municipality are included in Table 1.

Table 1: Contact List

Title	Email	Phone Number
Interim CAO (Jean-Marie Ipkangnak)	financedirector@igloolik.ca	(867) 934-8830
Public Works Director & Foreman (Donald Ittusardjut)	publicworksdirector@igloolik.ca	(867) 934-8830
Water Plant Operator (Steve Sarpinak & Derek Aqqiaruq)	waterplant@igloolik.ca	(867) 934-8830
Fire Chief (Juluis Kappianaq)	officemanager@igloolik.ca	(867) 934-8888
Chief Administrative Officer (CAO)		(867) 934-8940
Baffin Regional Director		(867) 897-3601
Municipal Planning Engineer (Bhabesh Roy, P.Eng.)	broy@gov.nu.ca	(867) 899-7314
Spill Contact: Emergency Spill Hotline (24-hour line)		(867) 920-8130
Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) Inspector		(867) 975-4295
GN Pond Inlet Regional Office		(867) 899-7314
GN Emergency Measures Officer		(888) 624-4043
Igloolik Health Centre		(867) 934-2100
RCMP Igloolik		(867) 934-0123
Environment Canada Emergency Iqaluit		(867) 975-4644
GN Environment Health Office		(867) 473-2676
Canadian North (First Air) Air Cargo		+1 (800) 267-1247

2 Site Description

2.1 Project Location

The Municipality is geographically situated on Igloolik Island in the Foxe Basin close to Melville Peninsula, at 69°23' N latitude and 81°46' W longitude. Figure 1 in Appendix A shows the location of Igloolik on a map of Nunavut.

2.2 Climate

The average annual rainfall in Iqloolik is 102.5 mm and the average annual snowfall is 183.1 cm (RWDI, 2008). Temperatures in the summer range between plus 1.6°C and plus 7°C and in winter between minus 19.5°C and minus 30°C. It is generally quite windy with an average wind speed of 14.4 km/h. Igloolik is in the area of continuous permafrost with the depth of seasonal thaw of approximately 1 m below the ground surface. Table 2 summarizes the seasonal climatic conditions as extracted from the Canadian Normals published and posted by Environment Canada.

Table 2: Average Monthly Precipitation and Air Temperatures

Month	Precipitation (mm)	Average Maximum Temperature (°C)	Average Minimum Temperature (°C)
January	12.8	-27.4	-34.3
February	9.7	-27.9	-34.7
March	14.7	-24.1	-31.6
April	16.3	-15.0	-23.2
May	20.5	-4.6	-11.7
June	19.2	4.7	-0.7
July	27.9	11.3	3.8
August	43.0	8.0	2.2
September	31.0	1.8	-1.9
October	32.1	-5.8	-10.7
November	31.1	-15.6	-22.3
December	16.7	-22.3	-29.2

2.3 Population Projections

The population projections for the Municipality are based upon Baffin Community Projections as published by the Nunavut Bureau of Statistics, June 24, 2010. The Nunavut Bureau of Statistics population projections provide projected populations of the Nunavut communities to the year 2036. Table 3 summarizes the population projections to the year 2036.

Table 3: Population Projections

Planning Year	Year	Population	Planning Year	Year	Population
	2014	1760	10	2026	2098
	2015	1784	11	2027	2129
0	2016	1811	12	2028	2161
1	**2017**	**1839**	13	2029	2193
2	2018	1867	**14**	**2030**	**2226**
3	2019	1894	15	2031	2260
4	2020	1922	16	2032	2294
5	2021	1949	17	2033	2329
6	2022	1976	18	2034	2364
7	2023	2005	19	2035	2397
8	2024	2035	**20**	**2036**	**2431**
9	2025	2067			

3 Sewage Lagoon System Design

3.1 Historical Summary

The design for the existing sewage lagoon system has been prepared in 2014 to meet the requirements for the Municipality's storage and the Municipality's water licence. The resulted in an independent three-cell sewage lagoon system that is currently operating within the Municipality providing one-year retention storage capacity. The treatment provided by the sewage lagoon system is supplemented by a vegetative filter strip wetland treatment system. A sludge management cell was also developed to provide an evaporation and conditioning area for any biosolids that were removed from the pre-existing sewage cells.

The existing Upgraded Sewage Disposal Facility superseded the Modified Sewage Disposal Facility.

The record drawings for the sewage lagoon system are included in Appendix C. The drawings reference the sludge management cell relative to the new Cell A and two rehabilitated Cells B and C.

3.2 Sewage Lagoon System Location

The sewage lagoon system is located approximately 1,300 m north of the community and adjacent to the Municipality's solid waste site as shown in Figure 2 in Appendix A. The land between the sewage lagoon system and Turton Bay is undeveloped tundra.

The Municipality currently obtains its drinking water from South Lake, to annually supply water for over-winter storage in a reservoir located 2,000 m southwest of the community. The water supply pipeline is located on the north side of the reservoir with inclined pipes leading out into the reservoir where water is withdrawn. Filtration and chlorination are required for the primary disinfection of the raw water and treated drinking water is delivered by water truck to homes and facilities.

The existing water supply and its corresponding watershed are not influenced by the current location of the sewage lagoon system. The two sites are separated by approximately 5,300 metres with the water supply lake and corresponding watershed both at a higher elevation than the lagoon.

The existing sewage lagoon site complies with the separation requirements of the Public Health Act (450 m buffer), Transport Canada (3000 m airport buffer), and the community water supply (400 m buffer). The existing road servicing the lagoon is cleared and maintained year-round to access the community solid waste site, metal dump as well as the lagoon system. Figure 2 in Appendix A shows the location of the Municipality centre, water supply lake, and the airport with respect to the sewage lagoon system.

3.3 Sewage Generation

Sewage generation rates are generally assumed to be equal to the water consumption rates for a community, with the water consumption rate being the total of the residential and non-residential water consumption. The residential water usage (RWU) for a community is based on the method of water delivery and sewage collection in the community. The Municipality of Igloolik has a trucked

water and sewage system, therefore the RWU for the community is equal to 90 lpcd (litres per capita per day).

Non-residential water usage by a community tends to increase with increases in the population. To determine the total community water usage (TCWU), the residential water usage is adjusted based on population to provide a total water usage per capita. Total water usage per capita multiplied by the population is equal to the daily water consumption by the community. Based on the design population of 2431 for the year 2036, and a total water usage per capita of 137 lpcd, the daily sewage generation is equal to 333,047 lpd. This is equal to a yearly sewage generation of 121,562 m3. Similarly, based on the design population of 2226 for the year 2030, and a total water usage per capita of 137 lpcd, the daily sewage generation is equal to 304,962 lpd, which equals to yearly sewage generation of 111,311 m^3.

3.4 Influent Characteristics

The characteristics of sewage generated in a community are heavily dependent on the type of installation and sanitary facilities adopted. The Municipality of Igloolik water and sewage systems utilize holding tanks and truck delivery/collection systems. The waste generated from this arrangement is "Moderately Diluted Wastewater", as per the Cold Climate Utility Manual (1996 Edition). Table 4 is an excerpt from the Cold Climate Utilities Manual summarizing the characteristics of moderately diluted wastewater.

Table 4: Characteristic of Moderately Diluted Wastewater

Parameter	Units	Moderately Diluted
BOD_5	mg/L	460
COD	mg/L	1000
Suspended Solids	mg/L	490
Total Nitrogen	mg/l as N	--
Phosphorus	mg/L as P	--

Source: 'Canadian Society for Civil Engineering, 1986, Cold Climate Utilities Manual

3.5 Sewage Lagoon System

The sewage lagoon system is an independent three-cell engineered system working in parallel (individual retention). The cells store the sewage generated from the end of one decanting cycle to the start of the next and were sized to account for the population growth in the community. The storage cells were designed and construction to be completely impervious applying fully lined berms keyed into the underlying permafrost. The decanting is executed seasonally using a pumping system. Treatment includes settlement of sewage solids in the cells and facultative biodegradation during the summer months. The design life of the sewage lagoon system is 20 years. The design freeboard for the three lagoon cells is 1.0 m.

The three cells are Cell A, Cell B and Cell C as shown on the record drawing in Appendix C. The base dimensions, surface area and active volumes of the three cells are summarized in Table 5. Figure 3 in Appendix A compares the pre-existing and the existing lagoon cells on a Google image.

The three cells are described as:

- Cell A – a new cell constructed outside the pre-existing lagoon system, and to the northwest of the most northerly pre-existing cell.
- Cell B – a remediated cell constructed out of the most northerly pre-existing cell and part of the central pre-existing cell.
- Cell C – a remediated cell constructed out of the most southerly pre-existing cell and part of the central pre-existing cell.

Table 5: Sewage Lagoon Cells Dimensions and Storage Capacity

Cell	Length (m)	Width (m)	Base Area (m^2)	Active Volume (m^3)
Cell A	293	120	35,160	53,220
Cell B	250	83	20,750	35,500
Cell C	203	86	17,458	35,500

Containment berms are an integral part of the sewage lagoon system. The containment berms provide impermeable geomembrane boundary for the sewage in the lagoon cells. All the three berms have impermeable liner installed on the internal slopes and keyed into the underlying permafrost. The berm core is comprised of compacted granular materials (Granular 'C'), and where the original cell berms were used, Granular 'C' was keyed into the side slopes. The berms have been designed, constructed and rehabilitated with a minimum 3.H:1V internal slope and 3.25H:1V external slope and a 4 m wide crest.

The three cells have multiple deposition locations allowing more than one truck deposit at a time. The deposition is through a chute on a gravel pad orientated in different directions as shown in Photo 2.

The sewage lagoon system is decanted with a pumping system. The three cells are decanted in the fall during three pumping operations. Photo 3 shows decanting operations.

Photo 2: Deposition chute at Cell C.

Photo 3: Decanting operations

3.5.1 Lagoon Infrastructure

The permanent infrastructure associated with the lagoons are the trucked discharge points at each lagoon and the intake and outlet piping at lagoon cell used to decant each cell into the vegetative filter strip wetland, and the high-water level overflow spillway. The outlet pipe is connected to a distribution trough along the toe of the berm to disperse the pumped effluent across the head of the vegetative filter strip wetland as shown in Photo 4. The outlet pipe is erosion protected at the toe of the berm where it connects to the trough.

Photo 4: Distribution trough at the head of the vegetative filter strip wetland

The truck discharge points are part of the permanent lagoon infrastructure and include steel discharge chutes and an erosion protected discharge channels. A truck bumper is located at each discharge point to protect the discharge chutes and prevent the trucks from backing up too close to the lagoon edge.

An element to the emergency infrastructure associated with the lagoon is the erosion protected overflow spillway in each lagoon cell. In the unlikely event that the cell is overfilled, the cell will be protected from a catastrophic failure by the overflow spillway, which discharges at the elevation of the freeboard of the lagoon cell.

3.6 Vegetative Filter Strip Wetland

Treated sewage is released during decanting operations over a period of at least 30 days, late in the summer, for supplementary treatment in the downstream vegetative filter strip wetland. The vegetative filter strip wetland is an undeveloped tundra between the sewage lagoon system and Turton Bay with an approximate area of 42.8 hectares and slope between 2.5% and 9.5%.

3.7 Sludge Management

The sewage lagoon system has been designed to manage sludge by storage in the three lagoon cells for the design life of the system. Thus, sludge management through storage is anticipated for the 20-year design life of the system.

General sludge management practices have been included for completeness in Appendix D.

3.8 Technology Processes and Performance

This section is a summary of physical and biological processes occurring in the sewage lagoon and the vegetative filter strip wetland treatment area.

3.8.1 Sewage Lagoon

The sewage lagoon operates as a facultative lagoon, which accommodates the processes of sedimentation, and biodegradation. Sedimentation occurs through the gravity settlement of the sewage solids and the accumulation of sewage sludge at the bottom of the cell. Sedimentation is expected to remove through settling typically 35% BOD_5 and 65% suspended solids in a relatively short timeframe. The remaining BOD_5 and suspended solids are in a dissolved or colloidal form which undergo bio-chemical removal during the natural processes within the lagoon. Sedimentation is a process that occurs year-round in the cells.

The sewage undergoes biodegradation by bacteria, algae and plants. At the surface of the cells, oxygen and sun light mediate photosynthesis and aerobic degradation. At the bottom of the cells, anaerobic degradation of organic matter takes place.

There are several removal mechanisms within a sewage lagoon, including sedimentation and bio-chemical oxidation. The lagoon is not aerated or mechanically mixed. Similar processes are expected to take place in the three sewage lagoons.

Bio-chemical oxidation is estimated to reduce BOD_5 to meet the requirements of the Municipality's water licence. Suspended solids following bio-chemical oxidation are typically reduced to a level comparable to the BOD_5. To estimate the total suspended solids at the time of the release, the total suspended solid levels were assumed to be 20% higher than the levels of BOD_5 as per the general performance of lagoons in Southern Canada. The estimated quality of the effluent from the sewage lagoon is summarized in Table 6.

Table 6: Anticipated Effluent Quality from the Sewage Lagoon

Parameter	Units	Effluent from Lagoon
BOD_5	mg/L	100
Total Suspended Solids (TSS)	mg/L	170 (sedimentation only) 120 (includes bio-chemical oxidation)

3.8.2 Vegetative Filter Strip Wetland Treatment

The vegetative filter strip wetland will receive the treated sewage from the three sewage lagoon cells.

Existing native vegetation and microorganisms in the vegetative filter strip wetland will be the main contributors to the reduction in contaminants (BOD, TSS and pathogens) and nutrients through a combination of two processes: uptake of contaminants and nutrients by plant roots and degradation by microorganisms in the rhizosphere. The native plants (well-established willows, grasses, sedges and mosses) are considered suitable to reduce BOD and TSS in a phytofiltration process. Heterotrophic bacteria, which are ubiquitous in soils particularly in the rhizosphere of plants where organic materials are present, generally carry out the degradation of organic materials. The

availability of additional nutrients from the pre-treated sewage will result in increased microbial biomass production and growth of the existing vegetation.

The vegetative filter strip wetland treatment may to remove BOD between 70% and 90% and TSS between 60% and 100%.

Pathogens present in sewage include fecal coliforms and E. coli which have a limited life span outside of their host organism (warm blooded animals). The vegetative filter strip wetland treatment is expected to be as high as 100% as pathogen survival is very limited outside of host organisms.

4 Sewage Lagoon System Construction Summary

Record drawings presenting the completed sewage lagoon structure are included in Appendix C. An erratum has been prepared to amend the existing record drawings and is included at the beginning of Appendix C. The erratum summarizes corrections to the record drawings and forms an integral part of the record drawings package. The contractor was Kudlik Construction. EXP was on site to monitor construction tasks or review the construction progress for the lagoon upgrade project.

The lagoon construction was completed in three phases over three years between 2016 and 2018. Phase 1 construction was accomplished in 2016 and mainly included perimeter berms for Cell A. By September 30, 2016, the Cell A berms were nearing their design elevation of 27.8 m with the north berm at 26.9 m, south berm at 27.8 m, east berm at 25.2 m and west berm at 25.2 m. Cell A near the end of 2016 construction season is shown in Photo 5.

Photo 5: Cell A near the end of 2016 construction season

Most of the construction was completed in Phase 2 in 2017 starting with the base construction for Cell A. Construction activities included draining the pre-existing lagoon cells, construction of the berms for Cells B and C, and liner installation on the base and berm slopes. The remaining construction was accomplished in Phase 3 in 2018 including installation of discharge chutes.

The base for the lagoon cells was constructed in sections while dewatering the surrounding area. Soft/melted soils were removed to the frozen subgrade prior to base construction. A woven geotextile sandwiched between 150 mm layers of sand was installed over the frozen subgrade followed by a geosynthetic clay liner (GCL), followed by a 150 mm layer of sand and 300 mm layer of gravel. The granular layers were compacted with an excavator bucket. The materials placed in this construction sequence is shown in Photo 6. The connection of GCL segments is shown in Photo 7.

Photo 6: Construction sequence during base construction at Cell A. Visible layers (from the top) include gravel, sand, GCL, sand, woven geotextile and sand.

Photo 7: Connecting GLC segments

The berms were constructed over the tundra by placing and compacting layers of granular materials. New and re-used granular materials were used for the berm construction. Once constructed, a similar construction sequence was employed to install the GCL liner on the berm sideslopes as shown in Photo 8. The dividing berm between Cells B and C was constructed after the pre-existing lagoon cells were drained and sludge removed from base of the berm. The GCL liner was anchored on top of the berms in a key as shown in Photo 9. The Cell B during construction is shown in Photos 10 and 11. Gabions installed for a discharge chute are shown in Photo 12.

Photo 8: Cell A berm construction

Photo 9: Cell B key to anchor GCL liner

Photo 10: Cell B base construction

Photo 11: Cell B GCL liner installation

Photo 12: Gabions installed for a discharge chute

5 Operation Procedures

The operation procedures occur on a regular basis in the daily, weekly, monthly or yearly to make sure the facility is functioning. Main operation procedures include collection of sewage, discharge of sewage into the lagoon cells, decanting the lagoon cells, and managing sludge. Safety and environmental protection should be reviewed prior to carrying any operation procedures. The lagoon should be operated to prevent structural failure.

5.1 Safety and Environmental Protection

The users of the sewage lagoon system must make sure that all aspects of municipal sanitary sewage management are conducted safely. General public and unauthorized access to the lagoon site should be prevented. Possible contamination or infection from pathogenic microorganisms exists with every contact with the sanitary sewage.

Equipment associated with the operation of the sewage lagoon should be kept clean. Clean equipment reduces opportunities for contact with pathogenic organisms.

Caution should be used when working with sanitary sewage. After work, before eating, and at other convenient times, the lagoon system users should wash their hands thoroughly. If a truck operator is splashed accidentally with sewage, the area should be promptly washed with plenty of water. All cuts and skin abrasions should be treated immediately to prevent any infection.

Normal preventative health care vaccinations should be kept up to date by all those working with the sewage lagoon and sewage collection systems. Check with a with the community health resource as to the recommended vaccinations (usually includes typhoid and paratyphoid).

Operators and personnel should remain attentive and aware of any potential health and safety hazards, such as tripping hazards like debris or ice. When possible, hazards should be removed. Care should especially be taken when obtaining samples and gloves (nitrile, not latex) must be worn.

Due to the potential health hazards associated with sewage handling and treatment, the following safety procedures should be obeyed in order to minimize health risks to personnel working in and around the wastewater facilities:

- Equipment is to be kept clean.
- Always wear protective clothing such as gloves and boots.
- Work cloths should not be worn home.
- Hands to be washed frequently, as a minimum before eating and after work.
- Personnel should receive appropriate vaccinations and ensure they are kept up to date.
- Change rooms for changing in and out of work clothes as well as storage lockers to store work clothes should be provided on site.
- Clothes washing facilities should be available on site to wash soiled work clothes.
- Visit the Health Clinic for all injuries. When working with wastewater the smallest cut or scratch is potentially dangerous.

Lagoon cells are facilities for treating human and industrial wastes, and as such people should be advised to keep away from them.

5.2 Operation Procedures Summary

Operation procedures performed daily, weekly, monthly and yearly include these activities:

Daily

- Collect municipal wastewater from holding tanks and deliver to the sewage lagoon system.
- Discharge sewage into lagoon cells, ideally equal sewage depths in each cell. Ensure at least 1.0 m of freeboard.
- Utilize the discharge chute appropriate for the weather, such as wind direction to avoid splash back.
- Minimize spills, and immediately clean up when they occur.
- Repair the equipment when breakdowns occur.
- Maintain road, discharge point, and truck turning pads as required free of snow.
- Record Operation and Maintenance information as required. Review water licence requirements.

Weekly

- Remove non-sewage materials from the lagoon. Floating materials such as plastic bags should be removed, and solid items disposed at the solid waste site adjacent to the lagoon.
- Assess truck discharge location and containment berms for erosion.
- Record Operation and Maintenance information as required.

Monthly

- Conduct preventative maintenance measures and maintain sewage trucks.
- Assess inventory of parts for truck maintenance.
- Grade and maintain the access road as required.
- Conduct monitoring program as required.
- Record Operation and Maintenance information as required. Review water licence requirements.

Yearly

- Provide a minimum of ten (10) days' notice to an inspector prior to decanting.
- Carry out decanting process during the designated timeframe.
- Maintain the pump for decanting.
- Conduct annual monitoring and inspection program.
- Review the operation and maintenance records to evaluate the effectiveness of the sewage treatment system and plan for the upcoming year.
- Record Operation and Maintenance information as required. Review water licence requirements.

5.3 Wastewater Collection Procedures

Wastewater is collected from the holding tanks of each residential and municipal serviced structure within the Municipality. Suction trucks pump the wastewater out of the holding tanks through an outside service pipe accessible to the truck. The quick-connect fitting, on the service pipe and truck intake hosepipe, gives the operator a fast and reliable connection reducing spills and speeding up the operation.

The sewage truck will follow a predetermined set circuit throughout the Municipality collecting the wastewater until the holding tank is full. Once full, the truck will travel out to the sewage lagoon site, discharge the contents and then return to the collection circuit where it left off. Some structures will have to be serviced more than once per circuit, the Municipality office, hotel, and other high wastewater producing structures may require a higher frequency. These high producers will have to be scheduled on a more regular basis.

All sewage generated must be discharged to the sewage lagoon system.

5.4 Sewage Truck Discharge Procedures

Sewage trucks discharge the collected wastewater at the sewage lagoon at the designated sites along the berm where the steel chutes are located. The truck discharge locations are marked on the record drawings. The sewage truck must back up to the chute and discharge into the chute, which directs the wastewater to the lagoon.

Three chutes are available to the operators, and the choice of chute is dependent on the preference of the operator during the discharge stage. Wind direction, snow buildup, or other factors may lead the operator to choose one discharge location over the other.

5.5 Detention in the Lagoon

Over the period of eleven months, from mid September to mid August, sewage trucks continually deposit wastewater to the lagoon cells. During this period the lagoon cells act as a retention system containing the wastewater that is subject to the various treatment processes over the duration containment of the wastewater.

5.6 Decanting Procedures

The three sewage lagoon cells are decanted annually. The objective of decanting is to remove the treated wastewater. The treated wastewater is released over the natural vegetative filter strip wetland which will provide the supplementary treatment prior to the discharge into Turton Bay. The decanting is carried during the optimal period for treatment. In mid-August the filter strip wetlands are ice-free and biologically active.

The optimal period for decanting operations is between August 15 – September 15 , and the decanting will be completed using an engine powered pumping system connected to the intake and outlet piping at each lagoon. The description and operation and maintenance manual for the pump is included in Appendix E. Documenting of the water level decrease in the lagoon may be recorded to provide

information on the progress of the decanting of each of the cells . Sewage trucks will continue discharging to the lagoon throughout the decanting process.

5.6.1 Regulatory Requirements

The effluent discharged from the sewage lagoon cells at the compliance points shall not exceed the effluent quality limits as set out in the Municipality's water licence and presented in Table 7. The compliance points are the monitoring program stations IGL-4-A, IGL-4-B, IGL-4-C. The water licence further recognizes the supplemental treatment of the the vegetative filter strip wetland treatment area d and has set the compliance criteria recognizing the treatment the effluent will receive through this area Sampling and testing procedures are described in Section 6.

Table 7: Effluent Quality Standards Prior to Decanting

Parameter	Maximum Average Concentration
BOD_5	100 mg/L
Total Suspended Solids (TSS)	120 mg/L
Faecal Coliforms	1 x 10^6 CFU/100 mL
Oil and Grease	No visible sheen
pH	Between 6 and 9

5.6.2 Prior to Decanting

Prior to decanting, the following steps should be taken:

- The Municipality shall provide a minimum of ten (10) days' notice to an inspector.
- For public safety, the Municipality should complete a public announcement about the start time, date and estimated duration of the discharge before discharge is started.
- The pump should be inspected prior to use and regular startup procedures should be followed. The operation and maintenance manual for the pump can be found in Appendix E.
- The proper suction hoses should be used that can withstand the vacuum of the pump.
- The decanting area should be prepared for the decanting process to take place safely and adequately.

5.6.3 Decanting Process

The process of decanting includes the following:

- The pump will be transported from the Municipality storage garage and delivered to the pumping area marked on the record drawings prior to the operation.
- The pump will be set-up to decant the cell with the least freeboard first.

- Decanting the cells will be completed in sequence emptying one cell completely prior to beginning the next.
- The pump suction shall be connected to the intake infrastructure on the lagoon side. The hose gaskets and joints complete the connection from the pump to the intake piping. The hose gaskets and joints completing the connection from the pump to the intake piping shall be checked for leaks and should be airtight. Suction hoses for this connection must be able to withstand the vacuum of the pump.
- The pump discharge shall be connected to the outlet infrastructure found on the outside of the of the berm exiting the lagoon site. The outlet infrastructure is complete with a distribution trough along the toe of the berm used to disperse the pumped effluent across the head of the vegetative filter strip wetland.

5.6.4 After Decanting

After the decanting process is complete the e pump will be disconnected from the fixed structures and transported back to the Municipality garage. Over winter maintenance should be completed on the pump as described in Appendix E for over winter storage along with the connection hoses.

5.7 Vegetative Filter Strip Wetland

Arctic tundra and wetland vegetation communities are very sensitive to physical damage and take a long time to recover from disturbances. Arctic plant species have very slow growth rates and areas damaged by construction activities will not re-vegetate for many years. It is therefore important that construction equipment and trucks do not enter the wetland area. Damage to the wetland area would result in a decrease in treatment efficiency.

5.8 Snowdrift Management

The sewage lagoon system is in wind exposed area west of the Municipality where drifting snow is not expected to be a major problem. It is anticipated that the sloped terrain in this area is not enough to create significant drifting problems.

Large boulders are used as safety barriers at the lagoon site. However , the boulders will cause snowdrifts to develop and they will impede snow removal operations. The Municipality will use a front-end loader to remove snow from the lagoon area as necessary. Snow should be dumped to the east side of the lagoon to reduce the potential of the piled snow causing secondary drifting on top of the travelled berm.

5.9 Contingency Measures

Sewage spills may occur during collection, transport and discharging from trucks. In case a sewage spill occurs or is foreseeable, contingency measures would apply. Contingency measures are listed and described in the Spill Contingency Plan (SCP). Regular equipment maintenance and careful execution of tasks can limit or eliminate situations where use of contingency measures is necessary.

6 Monitoring and Inspection

Monitoring and inspection will be defined as those activities which must be done on a regular basis daily, weekly, monthly or yearly to make sure the wastewater treatment operations can be maintained. Monitoring and inspections should be conducted in a safe and environmentally responsible manner.

Monitoring and inspection of the sewage lagoon system have been divided into eight types of activities:

1. Checking Normal Operations (daily)
2. Safety (daily)
3. Checking (weekly)
4. Sampling (annually)
5. Reporting (monthly)
6. Record Keeping (daily/weekly/monthly/yearly)
7. Review (yearly)
8. Other Special Activities

Any kind of emergency, foreman or CAO immediately reports to Baffin Regional Engineer, GN-CGS for necessary action. Any repair or modification will be presented in the annual report and submitted to the Nunavut Water Board.

6.1 Normal Operations Sewage Lagoon Checks

The normal operational checks of the sewage lagoon system involve observing the truck discharge points, the level of the wastewater in the lagoon cells, the sewage colour, and the lagoon on a regular basis for any unusual situations. Observations should also be made of the lagoon surface, noting if there is material floating and what these materials may be.

6.1.1 Truck Discharge Points and Water Levels

The truck discharge points, and the surrounding area should be examined for erosion and water levels. During open water periods, the water level in the lagoons should be observed and recorded. All visible parts of the lagoon bank should be observed, and the condition be noted. The freeboard of 1.0 m should be maintained in each lagoon cell.

An entry should be recorded every day on a Daily Inspection Record to either indicate that the operation is normal, or that something abnormal was observed and what corrective steps had to be taken.

On a once-a-week or on regular basis, all main components of the sewage lagoon system should be inspected. The purpose of the checking is to notice things that may lead to problems later. The conditions and date checked should be recorded.

6.1.2 Sewage Colour

The variations in the colour of sewage can be an important indicator of a sewage lagoon system performance. This may only be possible during open water periods. The following list provides frequently observed sewage colours and indications:

- *Dark Green* – Good. High pH and high dissolved oxygen (DO).
- *Dull Green to Yellow* – Not very good. pH dropping, DO dropping, and blue-green algae are becoming established.
- *Grey to Black* – Very bad. Lagoon anaerobic.
- *Tan to Brown* – It is good if caused by a type of algae bloom. Not good if due to silt or bank erosion.
- *Red or Pink – Indicates presence of sulphur bacteria (anaerobic conditions) or presence of red algae (aerobic conditions).*

6.2 Perimeter Berm Monitoring and Inspection

The berms are a part of the sewage lagoon system and serve four main functions:

1. To provide impermeable containment for the sewage;
2. To form part of the access to the sewage lagoon system;
3. To allow variation in sewage levels due to changes in sewage volume; and
4. To provide 1.0 m freeboard in the lagoon cells.

Regular inspections of the berms are required to control berm erosion and settlement. Erosion could be occurring from either leakage through the berm, or other factors related to the deterioration of the berms.

The berms should be inspected for any signs of:

- Seepage and ponding – the crest and berm slopes should be observed for any signs of seepage and ponding that could indicate internal soil erosion or piping;
- Stability – the crest and the upstream and downstream faces of the berms should be visually inspected for any signs of erosion scars, cracking, and if any liner is exposed;
- Settlement - the settlement readings should be undertaken at the beginning of spring and prior to onset of winter. Guidelines on settlement readings are provided below.

Settlement may be monitored using the following framework:

- Establish a survey benchmark on some stable point around the perimeter of the lagoons such as a fence post. Establish elevations of the benchmarks based on finished elevations of the top of berms. Several such benchmarks would be established for each lagoon cell. The benchmark should be able to accommodate setting up a survey level.

- Settlement monitoring points would be installed in various locations on the berms such as on the upstream and downstream crests and on the upstream slope. An example of a monitoring point would be a steel rod fastened onto the surface of the berm. Care should be taken not to damage the liner when installing settlement monitoring points.
- Measurements would be taken using a survey level and a survey rod. The survey level would be set up on the benchmark. Survey rod would be positioned on each settlement monitoring point and elevation readings would be taken with the survey level. This would be repeated at each lagoon cell.
- The readings would then be tabulated. The difference between the current reading and previous reading would be calculated for each monitoring point. This difference would provide information on differential vertical movement in the location of the monitoring point.

An annual inspection of the sewage lagoon system shall be conducted by a professional engineer (civil, municipal or geotechnical). The engineer's report shall be submitted to the NWB within sixty (60) days of the inspection including a cover letter from the Municipality outlining an implementation plan addressing each of the engineer's recommendations.

6.3 Lagoon Infrastructure

Accessible decanting infrastructure, truck discharge points and the spillways should be regularly inspected for any signs of deterioration. The lowest part of the intake pipe should be inspected annually after the decanting process has been completed and the pipe is exposed.

6.4 Sampling

The purpose of taking samples of the effluent and conducting laboratory tests on them is to obtain information on how well the sewage lagoon system performs and to meet regulatory requirements.

These are six important parts to the process of sampling:

- Taking the sample at the time called for
- Taking the sample in a properly cleaned container
- Careful collection of the sample from the correct location and performing any necessary field tests called for at that time
- Careful and correct labeling of the sample container and filling out a record sheet
- Where performing tests on-site, use of proper testing procedures
- Shipping of the sample in properly packaged containers and expeditiously so that it arrives to the laboratory with minimum delay

6.4.1 Sampling Points

Samples are collected at designated sampling points (monitoring program stations). The monitoring program stations are established to monitor the operation and efficiency of the sewage lagoon system. Sampling will provide information regarding the performance of the system and help identify

any degradation to the treatment provided. Samples are collected at the monitoring program stations listed in Table 8 and shown in Photo 13.

Table 8: Sampling Points (Monitoring Program Stations)

Monitoring Program Station Number	Description	Cell	Northing UTM	Easting UTM
IGL-4-A	Final effluent discharge control points from the sewage lagoon system	A	7698455.0	468711.0
IGL-4-B		B	7698233.0	468939.0
IGL-4-C		C	7698192.6	468998.1
IGL-5-A	Final effluent discharge points prior to entering Foxe Basin	A	7698806.9	468836.6
IGL-5-B		B	7698569.7*	469123.2*
IGL-5-C		C	7698347.9*	469343.7*

** Coordinates have been estimated from Google Earth application*

Photo 13: Sampling points plotted in Google Earth

6.4.2 Sampling Frequency

The following outlines the sampling testing and compliance requirements of the sewage lagoon system. Any other additional sampling during the year will be at the request of the regulatory agencies. Once collected, the samples will be shipped to the laboratory and analyzed using the same test/method/procedure. The flow rate of effluent discharge during the decanting period is required as well.

6.4.3 Sample Parameters

Samples will be taken and analyzed for fecal coliforms, BOD_5, total suspended solids, oil and grease and pH. The full list of parameters that the samples will be analyzed for is included in Table 9.

Table 9: Sample Parameters

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)
Carbonaceous Biochemical Oxygen Demand (cBOD5)	

6.4.4 Sample Collection

Normally, sampling will be done at the specified monitoring program stations, using two bottles; one sterile bottle for fecal coliforms and other bottle for the remaining parameters. The sample will be collected by dipping a sample bottle into the flow stream after rinsing the bottle with the flowing water for two (2) or three (3) times. This type of sample is referred to as a grab sample.

6.4.5 Sample Containers

Sewage samples will be collected in plastic bottles provided by an approved testing laboratory. If the samples are to be used for bacteria determination, then sterilized bottles must be used. These must be handled carefully so that the sample is not contaminated.

6.4.6 Laboratory Requirements

All analyses shall be performed by a laboratory certified by the Canadian Association for Laboratory Accreditation (CALA), or as otherwise approved by an Analyst.

Caduceon Environmental Laboratories will be used to satisfy laboratory requirements. Contact information of Caduceon Environmental Laboratories in Ottawa is:

Caduceon Environmental Laboratories
2378 Holly Ln
Ottawa ON K1V 7P1
Phone: (613) 526-0123

Wastewater sampling kit from Caduceon Environmental Laboratories is shown in Photo 14.

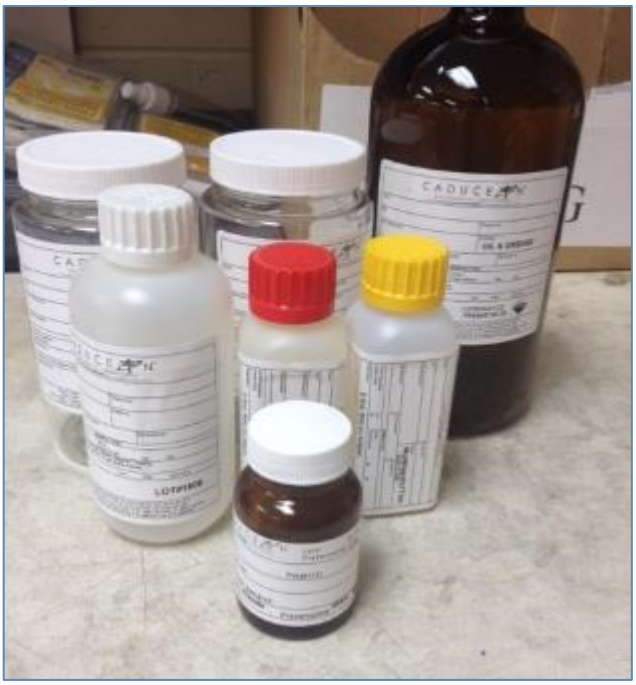

Photo 14: Wastewater sampling kit from Caduceon Environmental Laboratories.

7 QA/QC

A QA/QC program is a system of documented checks that validate the reliability of the data collected regarding any given site. Quality assurance (QA) is a system that ensures that quality control procedures are correctly performed and documented. Quality control (QC) refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives.

The QA/QC program will help monitor the treatment while verifying compliance with regulations. The general quality assurance and quality control are to follow QA/QC Guidelines for Use by Class "B" Licensees (Ref). All samples are to be collected using best industry practices and shall be submitted under a Chain-of-Custody protocol. Sampling protocols adhered to include the following:

- All sewage samples are to be collected in laboratory-supplied bottles and jars and analyzed at a laboratory certified by the Canadian Association for Laboratory Accreditation (CALA). All analytical reports are to include QA/QC reports.
- Duplicate samples should be analyzed when sampling sewage, with one duplicate per 10 samples or less, and 10% of duplicates for batches greater than 10 samples.
- Samples are to be placed in coolers and transported to the laboratory via courier. Sample holding times are to be adhered to.
- Disposable sampling gloves to be worn during the collection of samples and replaced between sampling points.
- Sampling tools are to be decontaminated between sampling points.
- Sampling and inspection events should be documented in field notes and, if possible, photographs should be taken of any work that is conducted.

8 Maintenance Program

The maintenance program consists of those activities which must be done on a regular basis to make sure that the system operation is consistence with the original operating conditions. The components to be maintained in the Municipality's sewage lagoon system can be listed as follows:

1. Truck discharge locations
2. Decanting infrastructures
3. Monitoring program stations
4. Odour, weed and vegetation, and insect control
5. Signage and fencing
6. Access road

8.1 Truck Discharge Locations

The sewage lagoon system has a free-fall truck deposition system, with a curb to position the trucks for discharge into the lagoon. The deposition area and the associated structures enable the lagoon to function properly. These structures require attention to make sure that they do not experience erosion or other deterioration from the discharge of the sewage from the trucks.

8.2 Decanting Infrastructures

The decanting infrastructure should be maintained to be used annually for the decanting operations. The infrastructure should be inspected at the beginning of the summer season and deterioration or damage should be identified and remedial work should be carried out in advance of the decanting procedure at the end of the summer.

8.3 Monitoring Program Stations

Monitoring program stations need to be maintained to be used for the monitoring of the sewage lagoon system. The monitoring program stations to be maintained are listed in Table 10.

Table 8: Monitoring Program Stations to be Maintained

Monitoring Program Station Number	Description	Cell	Northing UTM	Easting UTM
IGL-4-A	Final effluent discharge control points from the sewage lagoon system	A	7698455.0	468711.0
IGL-4-B		B	7698233.0	468939.0
IGL-4-C		C	7698192.6	468998.1
IGL-5-A	Final effluent discharge points prior to entering Foxe Basin	A	7698806.9	468836.6
IGL-5-B		B	7698569.7*	469123.2*
IGL-5-C		C	7698347.9*	469343.7*

8.4 Odour, Weed and Vegetation, and Insect Control

8.4.1 Odour Control

Under normal operating conditions, the sewage lagoon system will not cause any serious odour problems. However, at times, severe odours may occur subject to sewage quality and various environmental factors. The sewage lagoon is located a significant distance (1.3 km) from the nearest house, therefore, odour is not normally considered to be a problem.

The most troublesome conditions are:

1. Sewage lagoons in the period following ice break-up;
2. At the end of an extensive period of cloud cover, resulting in reduced sunlight and therefore reduced algae activity and low oxygen production; and
3. Extensive floating sludge mats.

An operator of the sewage lagoon system has limited control over these conditions. For Item 1, the problem will normally be of short duration, and it also occurs on an annual basis. For Item 2, 'hope' for sunshine soon. For Item 3, floating scum and algae mats need to be broken up and dispersed.

8.4.2 Weed and Vegetation Control

Surface weeds and vegetation may develop in sewage lagoons. Small size vegetation on the berms is beneficial, where large weeds and shrubs can cause root-related issues. A problem with these weeds is that they block out the sunlight which is needed by algae to produce oxygen. Another problem is that when the floating plants die, they begin to decompose and use up oxygen which is needed by the bacteria.

The ways to control surface weeds are as follows:

1. Natural control by ducks which may eat the weed;
2. Skimming;
3. Hand or mechanical removal; and
4. Chemical removal – Approval is required for their use.

The removed weeds should be landfilled and buried, where possible, to prevent odour and insect problems.

The ways to control lagoon vegetation are as follows:

1. Remove all trees and shrubs from the lagoon;
2. Plant or maintain shallow dense rooted, perennial grasses on the berms and embankments; and
3. Cut grass regularly during warm weather.

8.4.3 Insect Control

Flies and mosquitoes create the most common insect problems. Most mosquitoes breed in sheltered, calm water containing vegetation and floating materials to which the female can attach eggs. The egg clusters are fragile and easily damaged by turbulent action caused by wind and currents. Improper weed control and the accumulation of a scum layer will make insect problem worse.

8.5 Signage and Fencing

Warning signs are normally installed at regular intervals around the sewage lagoon system, usually 30 m to 40 m apart. Lost or damaged signs should be replaced as soon as possible. Whatever fencing is placed around the lagoon should be kept in good condition to make sure that access related to safety is minimized. Sewage lagoon fencing is shown in Photo 15.

Photo 15: Sewage lagoon fencing

8.6 Access Road

The access road was designed to be usable year-round to access the community solid waste site, metal dump and the sewage lagoon system.

Maintenance takes three basic forms: road shaping and smoothing, roadway filling, and snow removal. These activities follow normal Municipality procedures.

9 Reporting

Sample results will be reported to the NWB as required and will be included in the annual reports.

9.1 Recordkeeping

Record keeping is necessary to have information on the state of the sewage lagoon system at a specific time and details on any unusual operation or occurrence. The use of accurate records is very important for the Municipality, the NWB and its supporting agencies, and engineers that may need to work on the lagoon system.

The records must be detailed enough to allow evaluation of performance and to track the development of problems. The records also give a good check on completed and required tasks.

The records kept on four (4) different forms will be set up so that they are useful and accessible to all that need to use them:

- Daily Inspection Record;
- Equipment Record;
- Sampling Record; and
- Yearly Review Record.

Sample forms for record keeping are included in Appendix F.

9.2 Review

A summary of the operations, sampling and performance of the sewage lagoon system will be prepared once a year. This annual report will allow for an operational management review by the Municipality and will be submitted to the NWB.

9.3 Other Special Activities

Other special activities may form part of the operational requirements of the Municipality's sewage lagoon system. For example, the addition of chemicals to enhance biological activity may be considered as a special activity. Special activities must be approved by the NWB. WHMIS (Workplace Hazardous Material Information System) guidelines must be followed in the use of all chemicals.

The engineer’s report shall be submitted to the NWB within sixty (60) days of the inspection including a cover letter from the Municipality outlining an implementation plan addressing each of the engineer’s recommendations.

10 Modifications and Construction

The application of appropriate technology for the operation and maintenance of the Municipality's sewage lagoon system site is dependent upon the geology, terrain and climate of the area, as well as the technical and financial capabilities of the Municipality.

These factors limit the pace at which improvements may be undertaken. Improvements to the operation and maintenance of a sewage lagoon system are necessary; however, sometimes these improvements are incremental.

The Municipality may carry out modifications to sewage lagoon system provided that the modifications certified by a professional engineer licenced in Nunavut Territory and are consistent with the terms of the water licence and requirements of the water licence Plan of Compliance (NWB, 2020) are met. The NWB must be notified in writing of any planned modifications and a submission to the NWB is required at least sixty (60) days before the work is to be carried out.

The Water Licence Part E Conditions Applying to Modification and Construction states that 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 the 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.

11 References

Canadian Society for Civil Engineering. (1986). *Cold Climate Utilities Manual.*

Duong, D. and Kent, R. (1996). *Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories, Municipal and Community Affairs Community Development.*

EXP Services Inc. (2014, November). *Design Brief Optimization of the Wastewater Facility Igloolik Nunavut.* Submitted November 2014

EXP Services Inc. (2014, rev 2020). *Operations & Maintenance Manual Volume 1 – Document Igloolik Waste Water Facility.* Submitted August 2914 – rev February 2020.

Heinke, G.W. and Smith, D.W. (1988, November). *Guidelines for the Planning, Design, Operation and Maintenance of Wastewater Lagoon Systems in the Northwest Territories, Volume II – Operations and Maintenance for Department of Municipal and Community Affairs Government of the Northwest Territories Yellowknife Northwest Territories.*

Appendix A – Figures

Figure 1 –
Igloolik on Nunavut Map

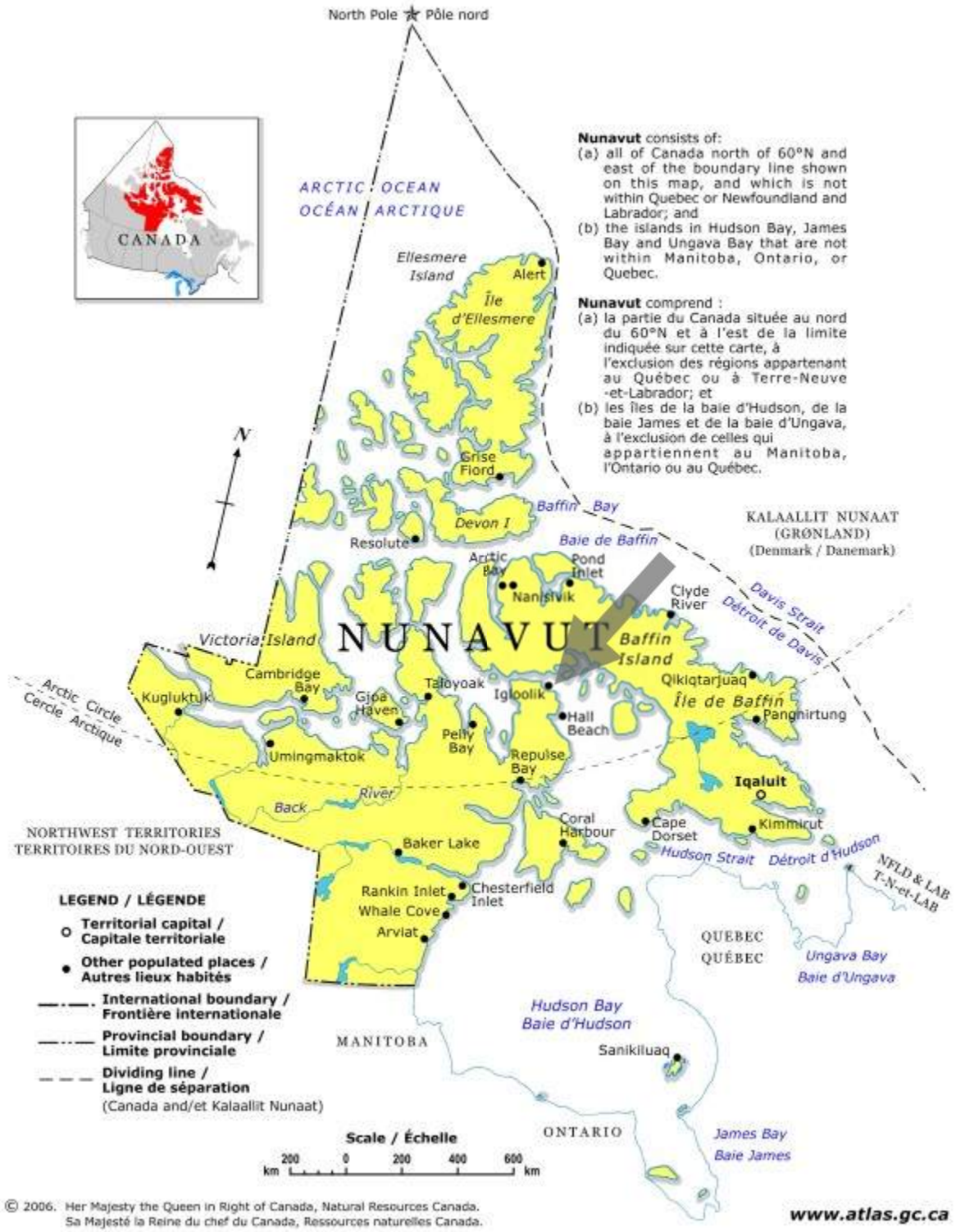

Figure 1: Igloolik on Nunavut Map

Figure 2 –
Location of Facilities

Figure 2: Location of Facilities

Figure 3 –
Pre-existing and Upgraded Sewage Disposal Facility

(A) Existing Lagoon Cells

(B) Pre-existing Lagoon Cells

Figure 3: (A) Existing Lagoon Cells and (B) Pre-existing Lagoon Cells

Appendix B – Water Licence

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-IGL1520/Renewal

March 31, 2015

Brian Flemming
Senior Administrative Officer
Hamlet of Igloolik
P.O.Box 30
Igloolik, NU XOA 0A0

E-mail: igloolik@magma.ca

Bhabesh Roy, P. Eng.
Municipal Planning Engineer, Baffin Region
Government of Nunavut
Dept. Community and Government Services
P.O Box 379, Pond Inlet, NU X0A 0S0

E-mail: broy@gov.nu.ca

RE: NWB Renewal Licence No. 3BM-IGL1520

Dear Mr. Flemming and Mr. Roy;

Please find attached Licence No. **3BM-IGL1520** issued to Hamlet of Igloolik 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* (*Nunavut Land Claims Agreement or NLCA*). 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 may be in contravention of the *Nunavut Land Claims Agreement* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*. 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 (3) 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's 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 sixty (60) days is required from time of acceptance by the NWB. It is the responsibility of the Licensee to ensure that all application materials have been received and are

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.[1]

Sincerely,

Thomas Kabloona
Nunavut Water Board
Chair

TK/ce/ri

Enclosure: Licence No. **3BM-IGL1520**
Comments – AANDC

Cc: Qikiqtani Distribution List

[1] Aboriginal Affairs and Northern Development Canada (AANDC), September 11, 2014;

TABLE OF CONTENTS

DECISION

LICENCE NUMBER: 3BM-IGL1520

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence renewal received on March 13, 2014, made by:

HAMLET OF IGLOOLIK

to allow for the use of water and deposit of waste during municipal activities by the Hamlet of Igloolik, located within the Qikiqtani Region of Nunavut at geographical coordinates as follows:

Latitude: 69°23'N and Longitude: 81°46'W

DECISION

After having been satisfied that the application was for a location that falls outside of an area with an approved Land Use Plan[2] as determined by the Nunavut Planning Commission (NPC) and exempt from the requirement for screening as described within Schedule 12-1 by the Nunavut Impact Review Board[3] in accordance with Article 12 of the *Nunavut Land Claims Agreement* (*NLCA*), the NWB decided that the application could proceed through the regulatory process. In accordance with S.55.1 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (*Act*) and Article 13 of the *NLCA*, public notice of the application was given and interested persons were invited to make representations to the NWB.

After reviewing the submission of the Applicant and considering the representations made by interested persons, 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 *Act*, waived the requirement to hold a public hearing, and determined that:

Licence No. 3BM-IGL0911 be renewed as Licence No. 3BM-IGL1520 subject to the terms and conditions contained therein. (Motion #: 2014-B1-045)

Signed this 31st day of March, 2015 at Gjoa Haven, NU.

Thomas Kabloona
Nunavut Water Board, Chair

TK/ce/ri

[2] Nunavut Planning Commission (NPC) Conformity Determination, August 13, 2014.
[3] Nunavut Impact Review Board (NIRB) Screen Exemption from Screening Decision, August 20, 2014

I. BACKGROUND

The Hamlet of Igloolik (Hamlet or Igloolik) is located on Igloolik Island in the northwest region of the Foxe Basin within the Qikiqtani Region of Nunavut, at the following coordinates: Latitude: 69°23'N and Longitude: 81°46'W. Igloolik is located within a zone of continuous permafrost and the island is composed of dolomitic conglomerates, with sandstone, dolostone and siltstone. The island is at a very low elevation with numerous ponds and an extensive tidal foreshore.

In 2014, the Hamlet of Igloolik has an estimated population of approximately 1,780. Existing Water Use and Waste Disposal Facilities include a freshwater intake pump, reservoir, truck fill station, a three cell sewage exfiltration lagoon system with a wetland, an older fourth sewage cell constructed prior to the three cell lagoon system, domestic landfill, and metallic waste landfill.

The Water Supply, Waste Water treatment by lagoon process and Waste Management systems within this Water Licence are at different stages with system upgrades and design/construction activities. The following is an update provided by the Licensee for each system:

Water Supply: This system consists of a Water Truck Fill Station, Water Storage Reservoir and an intake pipe from South Lake to the Water Storage Reservoir. The Licensee has indicated that the design and construction plans to expand the Water Storage Reservoir are currently on hold, pending capital fund approvals. The Board advises that an amendment application with construction drawings shall be submitted prior to the commencement of construction for the Water Supply system.

Wastewater Treatment by Lagoon: A three cell exfiltration lagoon is used to treat the entire wastewater produced annually in the Community. The older cell constructed prior to these three cells is still there and sometimes is used in case of emergency. The design for rehabilitation and improvement of the sewage lagoons is complete. The Licensee has expressed that the project is on hold. The Board advises that an amendment application with construction drawings shall be submitted prior to the commencement of construction for the Wastewater Treatment Facility.

Solid Waste Management: The solid waste management for the Hamlet is comprised of a domestic waste site and a metal waste site. The Licensee has expressed that the rehabilitation plans for the Waste Management Facilities is currently on hold due to funding. The Board advises that an amendment application with construction drawings shall be submitted prior to the commencement of construction or upgrades for the new Waste Management System.

II. FILE HISTORY

Information contained on the NWB's FTP site indicates that the Nunavut Water Board (NWB) has issued two licences to the Hamlet of Igloolik in past years.

Licences issued by the NWB to the Hamlet of Igloolik are the followings:

- ***Licence NWB3IGL0308***
  This licence was issued on February 5, 2003 with an expiry date of August 31, 2008. The licence allowed for the use of 70,000 cubic metres of water annually and deposit of waste in support of a Municipal undertaking.

- ***Licence 3BM-IGL0911***
  This licence was issued on July 10, 2009 with an expiry date of July 31, 2011. The licence allowed for the use of 70,000 cubic metres of water annually and deposit of waste in support of a Municipal undertaking.

III. PROCEDUAL HISTORY

The NWB received from the Government of Nunavut – Community Government Services (GN-CGS), on behalf of the Hamlet of Igloolik, the following application documents (Application) for the ten (10) year renewal of Licence 3BM-IGL0911, from March 13, 2014 to May 16, 2014:

- Hamlet Annual Reports 2009, 2010, 2011, 2012 and 2013
- Renewal Application Cover Letter, May 16 2014
- Hazardous Materials Spill Database, Baffin Spills in 2013
- Igloolik Bathymetic Survey, Arktis Solutions Incorporated, August 2011
- Igloolik Cover Letter to NWB Application March 2014
- Igloolik Water Licence Application March 2014
- Location of South Lake 2014
- Hamlet of Igloolik, Plan for Compliance Igloolik
- Technical Summary of Environmental Facilities under the Water License # 3BM-IGL 0911 (Part B:1.a) of the Hamlet of Igloolik, Baffin Region, Nunavut (in English & Inuktitut) March 2014
- Igloolik Water Supply Design Development ARKTIS March 2014
- CGS Letter to NWB for Igloolik May 2014
- Department of Community and Government Services Letter to NWB, May 16, 2014
- Igloolik Chemical Analysis of raw water 2008
- Igloolik Lab Final Report, Taiga Environmental Laboratory, September 04 2008
- Igloolik Operations and Maintenance Manual Water Truck Fill Station, 1980 (Chapter 1- 10)
- Design Development Report – Improvement of Water Supply System, Igloolik, Nunavut, 15 October2011

Following receipt and an internal review, NWB distributed the Application for a thirty (30)-day comment period on August 12, 2014. On September 11, 2014, submission was received from Aboriginal Affairs and Northern Development Canada (AANDC).

The NWB has placed in its Public Registry copies of the Application and all comments received from interveners. This information can be accessed on the NWB's File Transfer Protocol (FTP) site using the following link (Username: **public**; Password: **registr***y*):

ftp://ftp.nwb-oen.ca/1%20PRUC%20PUBLIC%20REGISTRY/3%20MUNICIPAL/3B/3BM%20-%20Municipality/3BM-IGL0911/

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 renewed the Licence 3BM-IGL0911 as Licence 3BM-IGL1520.

IV. ISSUES

The following sections provide background information relevant to the terms and conditions included in this Licence, in the context of submissions received and/or the Board's rationale. Where appropriate, the Board has removed or modified terms and conditions associated with the previous licence, which are no longer applicable under this renewal Licence.

Term of the Licence

In accordance with s. 45 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA or the Act), the NWB may issue a licence for a term not exceeding twenty-five (25) years. In determining an appropriate term for a renewal licence, the Board generally takes into consideration several factors including intervener's comments, the Licensee's compliance history, as well as the rationale contained in the Application.

The Licensee requested in its Application a ten (10) year term for the licence. The intervening party, AANDC, in their submissions recommended a renewal term of not more than five (5) years. The Board in examining the compliance history of the Licensee and the comments received from AANDC has granted a term of five (5) years to the Licence. In so doing, the Board believes and expects that the five-year terms will provide the Licensee with significant opportunities to prove that it can consistently abide by the terms and conditions in the licence overtime.

Moreover, it is noted that the Hamlet's actual daily water use may be higher than 300 cubic metres per day when filling the Water Storage Reservoir which could trigger a change of the Licence Type "B" to Type 'A". The five (5) year term shall allow the Licensee to measure the daily water use during two (2) full years and help the Board to accurately determine the Type of Licence for the future renewal

Annual Report

Under the reporting section of the Licence, Part B, Item 1, the Licensee is required to submit, on an annual basis, a report pertaining to water use and waste deposit activities. Although the 2011-2013 reports submitted include useful information, the AANDC noted that the reporting requirements specified in Part B, Item 1 of the Licence were not being fully satisfied. The NWB concurs with AANDC's recommendations and requests that the Licensee supplement the standard NWB reporting forms with additional documentation in order to ensure that all monitoring requirements are satisfied. The Licensee is encouraged to develop its own annual reporting template. This template should include tabular summaries of monitoring data pursuant of Part B, Item 1 (a) of the Licence. The Licensee is encouraged to contact AANDC, the NWB, or the GN-CGS to discuss its licensed monitoring program. This reporting information will be kept in the NWB's public registry

and made available to interested persons upon request. Further, the NWB maintains annual reporting information on its FTP site, which can be accessed using the following link (username: **public** and password: **registry**): ftp://ftp.nwb-oen.ca/1%20PRUC%20PUBLIC%20REGISTRY/.

Water Supply Facilities

The Hamlet of Igloolik currently obtains its potable water from South Lake to annually supply an existing reservoir with a capacity of 65,000 cubic metres. The Licensee has indicated that the Hamlet's plans to expand the existing reservoir are currently on hold, pending capital fund approvals. Water is currently withdrawn during the months of August and September with a maximum authorized water use quantity of 70,000 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.

In review of the application, the NWB relied on the new Nunavut Waters Regulations (Regulations) issued on April 18, 2013 and the definition of "Use" provided by the Act. All water taken from the South Lake, main water source to fill the reservoir would qualify under the definition as "use of water". Therefore, having given due consideration to the information presented during the review, the NWB has determined that water extracted from the source water supply, for any purposes, is considered as a Use of water and that the Licensee is requested to daily measure directly, on the source at the Freshwater Intake Pump, all freshwater used for all purposes. The Licensee shall also measure and on a daily, monthly and annual basis all freshwater used for all purposes at the Truck-fill Station.

The Licensee is also advised that according to the Schedule 2 of Regulations any use of 300 cubic metres or more per day and any use of waters related to the storage of 60,000 cubic metres or more water would require a Type "A" Water Licence. The Board has, therefore, set the maximum water usage for all purposes specified in this Licence at 81,208 cubic metres per year or up to 299 cubic metres per day for filling of the reservoir. Lastly, please note that the NWB has renewed the terms and conditions associated with water use by the Hamlet accordingly.

Sewage Disposal Facilities

The Hamlet of Igloolik currently provides trucked sewage services for the Community residents, businesses and institutions. No concerns were raised by the parties in their written submissions as to the manner in which the sewage is treated and disposed of. The NWB has renewed the terms and conditions associated with Sewage Disposal Facility accordingly. The NWB requests that the Licensee install flow-meters on the waste discharge pipelines by May 31, 2015 in order to accurately measure the sewage disposal volumes (of the year following the calendar year being reported) and comply with Part B, Item 1 and 4 of the current Licence. The NWB has also added a requirement that all inspection of engineered facilities related to the management of water and waste shall be carried by an Engineer (Civil, Municipal or Geotechnical) annually, in order to comply with Part F, item 3, the Licensee must ensure that it will provide annual Engineer reports within 60 days of inspections, including a cover letter outlining an implementation plan

addressing each of the Engineer's recommendations. The Board acknowledges that though no reports or cover letters have been provided to date, the Licensee has set forth, in the Igloolik Compliance Plan, a plan to comply with this condition in the future.

Finally, as part of the Sewage Disposal Facility Operation and Maintenance (O&M) Plan, the NWB requires that the Licensee include procedures and frequencies of inspections to be carried out to verify whether or not/when there is flow from the Sewage Disposal Facility. Visual inspections to verify flow from the Sewage Disposal Facility are required to ensure that the monitoring program under Part D, Item 2 of the Licence is initiated at the appropriate time and that the Inspector is notified upon its commencement.

Solid Waste Disposal Facilities

In the recently submitted *Technical Summary of the Environmental Facilities* document, the Hamlet expressed plans in 2014 to segregate hazardous wastes like batteries etc. The Board requests that the Hamlet submit an Operation and Maintenance (O&M) Plan for the Solid Waste Disposal Facilities that include procedures for the segregation, storage and eventual removal/disposal of hazardous wastes, including waste oil, and runoff management. The Licensee should note that a condition has been included in the licence for the submission of O &M Plan for the Solid Waste Disposal Facilities within ninety (90) days of issuance of this Licence under Part F, Item 1.

Operation & Maintenance Plans

In accordance with Part F, Item 1, of the expired licence, the Licensee was required to submit a Sewage Disposal Facility Operation and Maintenance (O&M) Plan (including the Sewage Sludge Management Plan, a Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan, and a Spill Contingency Plan. These 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 various sites.

The Licensee has submitted a document entitled: Igloolik Operations and Maintenance Plan Water Truck Fill Station that needs to be updated to include an Abandonment & Restoration Planning, and Spill Contingency Planning. The renewed Licence has therefore continued to include the requirement to provide separate updated O&M Manuals for Water Supply and Waste Disposal Facilities, to the NWB within a set timeframe of issuance of the Licence. The NWB reviewed and deemed the short-term goals of the submitted Compliance Plan dated March 13 2014, as satisfactory. The NWB also reviewed the Department of Community and Government Services' Letter to NWB, dated May 16 2014, clarifying and answering the questions put forward by the Board on the submitted Compliance Plan by the Licensee.

The only comments received from interested parties were from the AANDC. AANDC indicated that the NWB should either require the Licensee to submit any outstanding Operational Plans before renewing the licence, or require the submissions within 90 days of renewing the licence. This includes plans for Operation and Maintenance of the Solid Waste Management and Sewage Disposal Areas, Abandonment and Restoration and Spill Contingency.

Taking into account the review of the application and comments received, the O&M

Manuals to be submitted are as follows, in accordance with Part F, Item 1 of the Licence:

a. *Updates to the Water Storage and Distribution Facility Operation and Maintenance (O&M) Plan*; *Amendments required include:*
    i. *An improved description of the technology and process;*
    ii. *A detailed breakdown of maintenance work and schedule of work required for the system equipment (including the submersible pumps, intake screens, and valves);*
    iii. *Revisions to the faded Intake Screen and Reservoir Fill Line Drawings (Drawing No. 78-IB7-101 to 106); and*
    iv. *Submitted O &M details 1979 Service Contracts for the operating pumps, if these Service Contracts are still required please renew and update the submitted information.*
b. *Sewage Disposal Facility Operation and Maintenance (O&M) Plan* (including the *Sewage Sludge Management Plan)*;
c. *Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan*; and
d. *Spill Contingency Plan;*

The purpose of the O&M Manuals noted above is to assist Hamlet staff in carrying out the procedures relating to their water distribution and waste disposal facilities. The O&M Manuals should demonstrate to the NWB that the Hamlet is capable of operating and maintaining the infrastructure related to water use and waste disposal to meet the requirements of the Licence. The O&M Manuals should be based, at a minimum on the various 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) acceptable by NWB, and other regulatory guidelines as deemed appropriate.

Abandonment and Restoration Plan

General terms and conditions under Part G, Item 1 in the licence require the Licensee to submit an Abandonment and Restoration (A&R) Plan at least six (6) months prior to abandoning any facility under the scope of this renewal Licence. It should be noted that the Board is aware that the Licensee is contemplating abandoning the old water intake structure and pump house associated with the potable water treatment facilities. The Board expects that an appropriate A&R plan will be submitted in accordance with the terms and conditions in this licence.

Monitoring Plan

Although the 2011-2013 reports submitted include some of the required information, however, the reporting requirements specified in Part B, Item 1 of the Licence are not being fully satisfied. The Licensee needs to submit a relevant Monitoring and Quality Assurance / Quality Control (QA/QC) Plan for its operations, more detailed requirements for the QA/QC Plan are included in Part H, Item 9 and 10 of this Licence.

Engineered Drawings and Designs

The Licensee has stated that it will construct a new sewage lagoon, waste disposal facility, and expand its water reservoir once it secures the necessary capital funding. The Licensee shall refer to Part E of this Licence for the conditions applying to modifications and construction of the facilities included in this Licence. Part E Item 1 states that the Licensee

shall submit to the Board for approval in writing, for construction design drawings stamped by a qualified Engineer, sixty (60) days prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes. Part E, Item 4 of this Licence requires the Licensee to provide to the Board, for review, as-built plans and drawings, for facilities included under the scope of that licence, within ninety (90) days of completion of construction or, if already constructed, within ninety (90) days of issuance of the Licence.

NUNAVUT WATER BOARD
WATER LICENCE RENEWAL

Licence No. 3BM-IGL1520

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 IGLOOLIK

(Licensee)

P.O. BOX 30 IGLOOLIK NUNAVUT X0A 0L0

(Mailing Address)

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

Licence Number/Type:	3BM-IGL1520 TYPE "B"
Water Management Area:	KINGORA WATERSHED - 20
Location:	HAMLET OF IGLOOLIK QIKIQTANI REGION, NUNAVUT
Classification:	MUNICIPAL UNDERTAKING
Purpose:	DIRECT WATER USE AND DEPOSIT OF WASTE
Quantity of Water use not to Exceed:	81,208 CUBIC METRES *PER* ANNUM OR MAXIMUM OF 299 CUBIC METRES *PER* DAY
Date of Licence Issuance:	MARCH 31, 2015
Expiry of Licence:	MARCH 30, 2020

This Licence renewal, issued and recorded at Gjoa Haven, Nunavut, includes and is subject to the annexed conditions.

Thomas Kabloona,
Nunavut Water Board, Chair

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. Scope

This Licence allows for the use of water and the deposit of waste for a Municipal undertakings at the Hamlet of Igloolik, located within the Qikiqtani Region, Nunavut(Latitude: 69°23'N and Longitude: 81°46'W).

a. 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

b. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

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

"**Addendum**" means the supplemental text that is added to a full plan or report usually included at the end of the document and is not intended to require a full resubmission of the revised report;

"**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;

"**Appurtenant Undertaking**" means an undertaking in relation to which a use of water or a deposit of waste is permitted by a licence issued by the Board;

"**Board**" means the Nunavut Water Board established under the *Nunavut Land Claims Agreement* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

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

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Consolidation of Engineers and Geoscientists Act S. Nu 2008, c.2*

and the *Engineering and Geoscience Professions Act S.N.W.T. 2006, c.16 Amended by S.N.W.T. 2009, c.12*;

"**Existing Sewage Disposal Facilities**" refers to the pre-upgraded Sewage Disposal Facilities under Licence 3BM-IGL1520 that comprised numerous ponds as identified in the Technical Summary Environmental Facilities Report March 2014;

"**Existing Solid Waste Disposal Facilities**" refers to the pre-upgraded Solid Waste Disposal Facilities under Licence 3BM-IGL1520 designated for the disposal of solid waste, as described in the renewal application dated March 13, 2014 and supplementary documents submitted with the application;

"**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 an undiluted single water or wastewater sample, collected at a particular time and place that may be representative of the total substance being sampled, at the time and place it was collected.

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

"**High Water Mark**" means the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land (ref. Department of Fisheries and Oceans Canada, Operational Statement: Mineral Exploration Activities);

"**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 a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion;

"**Modified Sewage Disposal Facility**" refers to the upgrade Sewage Disposal Facilities that comprises the Primary Sewage Lagoon and Retention Sewage Lagoon as identified on Drawing No. C-O1, C-02 and C-04, Government of Nunavut Igloolik Waste Facilities, October 3, 2008, also as described in the renewal application dated March 13, 2014 and supplementary documents submitted with the application;

"**Modified Solid Waste Disposal Facilities**" referred to the up-graded Solid Waste Disposal Facilities designated for the disposal of solid waste, as identified on Drawing No. C-O1, C-02 and C-04, Government of Nunavut Igloolik Waste Facilities, October 3, 2008 and modified as described in the renewal application dated March 13, 2014 and supplementary documents submitted with the application;

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

"**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;

"**Regulations**" means the *Nunavut Waters Regulations* SOR/2013-69 18th April, 2013;

"**Retention Sewage Lagoon**" is the secondary cell of the Modified Sewage Disposal Facilities and is identified within the drawings submission dated October 3, 2008, "Igloolik Sewage and Solid Waste Facilities", specifically on Drawing No. C-01, Process Summary and drawing C-04, Sewage Lagoon Improvement Plan as described in the renewal application dated March 13, 2014 and supplementary documents submitted with the application;

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

"**Sewage Wetland**" compromises of the 'Sewage Wetland' Area Drawing No. C-O1, 'Wetland' Drawing No. C-02 and 'Proposed Wetland' Drawing No.C-04, Government of Nunavut Igloolik Waste Facilities, October 3, 2008 as described in the renewal application dated March 13, 2014 and supplementary documents submitted with the application;

"**Spill Contingency Plan**" means a Plan developed to deal with unforeseen petroleum and hazardous materials events that may occur during the operations conducted under the Licence;

"**Sump or Sumps**" A structure or depression that collects, controls, and filters liquid waste before it is released to the environment. This structure should be designed to prevent erosion while allowing percolation of liquid waste;

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

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

"**Waste Disposal Facilities**" consist of the Modified Sewage Disposal Facilities and the Modified Solid Waste Disposal Facilities as described in the renewal application dated March 13, 2014 and supplementary documents submitted with the application;

"**Water Supply Facilities**" comprises the area and associated intake infrastructure at Water Lake, the Intake Pump House and back-up truck fill station, the Water Treatment Plant, the Storage Tanks adjacent to the Water Treatment Plant and the Water Supply Pipe as described in the renewal application dated March 13, 2014 and supplementary documents submitted with the application;

"**Water" or "Waters**" means waters as defined in section 4 of the Act.

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*; and

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.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report on the Appurtenant Undertaking with the Board no later than March 31 of the year following the calendar year being reported, containing the following information:

   a. an executive summary as required by Part B, Item 8;
   b. tabular summaries of all data generated under the "Monitoring Program";
   c. the daily, monthly and annual quantities in cubic metres of fresh water obtained at the Water Supply Facilities;
   d. the daily, monthly and annual quantities in cubic metres of all waste discharged;
   e. 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;

f. a list of unauthorized discharges and summary of follow-up action taken;
g. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;
h. any Addendum with updates or revisions for manuals and plans (i.e., *Operations and Maintenance Manuals/Plans*) as required by changes in operation and/or technology;
i. 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; and
j. any other details on water use or waste disposal requested by the Board by November 1 of the year being reported;

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

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

4. Meters, devices or other such methods as approved by the Board in writing, 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 following the first visit by the Inspector, following issuance of this Licence, post the necessary signs to identify the stations of the "Monitoring Program," 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 and any notice provided to an Inspector, shall be made in writing to the attention of:

(a) 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@nwb-oen.ca

(b) Inspector Contact:
Manager of Field Operations, AANDC
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0

Telephone: (867) 975-4295
Fax: (867) 979-6445

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, 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.

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

12. 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.

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

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all fresh water from South Lake using the Water Supply Facilities, to be stored in the Hamlet Reservoir, or as otherwise approved by the Board in writing.

2. The annual quantity of water used for all purposes shall not exceed 81,208 cubic metres annually or a daily quantity of water for all purposes shall not exceed 299 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.

7. The Licensee shall submit to the Board for approval in writing, at least thirty (30) days prior to the use of water in sufficient volume that the source water body may be drawn down, the following information: volume required, hydrological overview of the water body, details of impacts, and proposed mitigation measures.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the Modified Sewage Disposal Facilities included under the scope of this licence.

2. The Licensee shall provide a minimum of ten (10) days' notice annually to an Inspector of the intent to discharge effluent from either the Modified Sewage Disposal Facilities.

3. All Effluent discharged from the Sewage Disposal Facility at Monitoring Program Station IGL-4, and IGL-5 shall meet the following Effluent quality standards:

Parameter	**Maximum Concentration of Any Grab Sample**
BOD_5	100 mg/L
Total Suspended Solids	120 mg/L
Fecal Coliforms	1×10^6 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 engineer and as approved by the Board in writing, for all dams, dykes or other structures intended to contain, withhold, divert or retain water or wastes.

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

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

7. The Licensee shall segregate and store all hazardous materials and/or hazardous waste within the Modified Solid Waste Disposal Facilities in such a manner as to prevent the

deposit of deleterious substances into any water, until such a time that the materials have been removed for proper disposal at an approved facility.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval in writing, for construction design drawings stamped by a qualified Engineer, sixty (60) days 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 to the NWB for review, as-built plans and drawings, stamped and signed by an Engineer, within ninety (90) days of completion of construction.

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 implement and maintain sediment and erosion control measures prior to and 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, Operations and Maintenance Manuals 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 following Manuals and Plans shall take into consideration the comments received during the application review process:

a. Sewage Disposal Facility Operation and Maintenance (O&M) Plan (including the Sewage Sludge Management Plan;
b. Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan; and
c. Spill Contingency Plan;

2. The Licensee shall review the Water Distribution Facility Operation and Maintenance (O&M) Plan. Changes in operation and technology should be modified accordingly. Revisions are to be submitted in the form of an Addendum to be included with the Annual Report. Additionally, the following specific amendments are required for the O&M:
    a. An improved description of the technology and process;
    b. A detailed breakdown of maintenance work and schedule of work required for the system equipment (including the submersible pumps, intake screens, and valves);
    c. Revisions to the faded Intake Screen and Reservoir Fill Line Drawings (Drawing No. 78-IB7-101 to 106); and
    d. Submitted O &M details 1979 Service Contracts for the operating pumps, if these Service Contracts are still required please renew and update the submitted information.

3. An inspection of all engineered facilities related to the management of water and waste shall be conducted by an Engineer (Civil, Municipal or Geotechnical) annually and before commissioning any facility. The Engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a Cover 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 Manuals for the Hamlet of Igloolik;
    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, RESTORATION AND CLOSURE

1. The Licensee shall submit to the Board for approval an *Abandonment, Restoration and Closure 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. proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

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

3. All disturbed areas shall be stabilized and re-vegetated as required, upon completion of work, and restored as practically as possible to a pre-disturbed state.

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
IGL-1	Raw water supply intake at South Lake	Active (Volume)
IGL-2	Runoff from Solid Waste Disposal Facility	Active (Water Quality)
IGL-3	Raw Sewage at Discharge point into the Sewage Disposal Facility	**Not** Active
IGL-4	Final control point from Sewage Disposal Facility	Active (Water Quality)
IGL-5	Final Effluent Discharge Point prior entering Foxe Basin	New (Water Quality)

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

3. The Licensee shall sample at Monitoring Program Stations IGL-4 and IGL-5, monthly during periods of observed flow. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand (BOD_5)	Fecal 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)
Carbonaceous Biochemical Oxygen Demand (cBOD5)	

4. The Licensee shall sample at Monitoring Program Station IGL-2 once at the beginning, middle and near the end of discharge/run-off observed. . Samples shall be analyzed for the parameters under Part H, Item 3.

   The Licensee shall measure and record the annual quantities of sewage solids removed from the Waste Water Treatment Plant along with the treatment/storage/disposal provided.

5. If additional Final Discharge Points are identified during the term of this Licence, the Licensee shall submit, along with the Annual Report, the following information:

   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.

6. 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 in writing.

7. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

8. The Licensee shall submit to the Board for review, within ninety (90) days of issuance of the Licence, a Quality Assurance/Quality Control Plan that conforms to the guidance document *Quality Assurance (QA) and Quality Control (QC) Guidelines For Use by Class "B" Licensees in Collecting Representative Water Samples in the Field*

and for Submission of a QAQC Plan INAC (1996). The Plan shall be acceptable to an accredited laboratory and include a covering letter from the accredited laboratory confirming acceptance of the Plan for analyses to be performed under the Licence.

9. The Licensee shall annually review the Quality Assurance/Quality Control Plan as required in Part H, Item 8 and modify the Plan as necessary. Proposed modifications shall be submitted to the accredited laboratory for approval.

10. Additional monitoring stations, sampling and analyses may be requested by an Inspector.

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 Board. Requests for changes to the Monitoring Program should be forwarded to the NWB in writing, and should include the justification and appropriate evidence to support the change.

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-IGL1520/Amendment No. 1

February 16, 2016

Brian Flemming
Senior Administrative Officer
Hamlet of Igloolik
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Bhabesh Roy, P. Eng.
Municipal Planning Engineer, Baffin Region
Government of Nunavut
Dept. Community and Government Services
P.O Box 379, Pond Inlet, NU X0A 0S0

E-mail: broy@gov.nu.ca

RE: Licence No. 3BM-IGL1520, Type "B" – Amendment No. 1 – Expansion and Rehabilitation of the Sewage Lagoon Facility

Dear Mr. Flemming and Mr. Roy:

Please find attached, Amendment No. 1 to Licence No. **3BM-IGL1520** issued to Hamlet of Igloolik by the Nunavut Water Board (NWB) under Motion 2015-27-56, 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* (*Nunavut Land Claims Agreement or NLCA*). The terms and conditions of the original Licence related to the use of Water and the deposit of Waste remain an integral part of this approval.

The Licensee is advised that this Amendment is for an undertaking that falls outside of an area with an approved Land Use Plan[1] as determined by the Nunavut Planning Commission (NPC) and subject to a 12.4.4(a) Screening Decision as described within Schedule 12-1 by the Nunavut Impact Review Board[2] in accordance with Article 12 of the *Nunavut Land Claims Agreement* (NLCA).

The NWB strongly recommends that the Licensee consult the comments received by interested persons on issues identified. This information is attached for your consideration.[3, 4]

[1] Nunavut Planning Commission (NPC) Conformity Determination, June 9, 2015.
[2] Nunavut Impact Review Board (NIRB), Screening Decision, dated December 8, 2015.
[3] Aboriginal Affairs and Northern Development Canada (AANDC), June 26, 2015;
[4] Fisheries and Oceans Canada (DFO), May 28, 2015;

Sincerely,

Thomas Kabloona
Nunavut Water Board
Chair

TK/ce/kk

Enclosure: **Licence No. 3BM-IGL1520 – Amendment No. 1**
Comments – AANDC, DFO

Cc: Qikiqtani Distribution List

LICENCE AMENDMENT No. 1

Licensee:	**Hamlet of Igloolik**
Licence No:	**3BM-IGL1520 – Type "B"**
Licence Issued:	**March 31, 2015**
Expiry Date:	**March 30, 2020**
Effective Date:	**February 16, 2016**

DECISION

Licence No. 3BM-IGL1520, issued on March 31, 2015 and set to expire on March 30, 2020, shall be amended to allow for the construction of a new lagoon cell and the rehabilitation of the Modified Sewage Lagoon Facility, as described in the Application received by the Board on April 20, 2015, for use as required in the deposit and management of Sewage Waste, operated by the Hamlet of Igloolik (the Hamlet or the Licensee), which is located within the Qikiqtani Region of Nunavut.

The NWB received from the Government of Nunavut – Community Government Services (GN-CGS), on behalf of the Hamlet of Igloolik, from March 16, 2015 to December 14, 2015, the following application documents (Application) for the amendment of Licence 3BM-IGL1520:

Water Licence Amendment Application, April 20, 2015

- Completed Amendment Application form and Cover Letter, April 20, 2015
- Hamlet Authorization letter by SAO, April 20, 2015
- Technical Summary of the Wastewater Treatment Facility, in English and Inuktitut, April 20, 2015
- Wastewater Treatment Facility, Hamlet of Igloolik (IGL-1 to IGL-8), dated March 27, 2015, April 20, 2015
- Operation and Maintenance Plan, Wastewater Treatment Plant, originally developed in 1979, April 20, 2015
- Operation and Maintenance Plan, additional amendments for the Wastewater Treatment Plant, August 17, 2015
- Preliminary Spill Contingency Plan, August 17, 2015
- Hamlet Annual Report 2014, March 16, 2015
- Design Brief, Optimization of the Wastewater Facility, Igloolik, Nunavut developed by exp Services Inc., dated November 2014, submitted April 20, 2015
- Vegetated Filterstrip Wetland Assessment for the Treatment of Pre-treated Sewage, Hamlet of Igloolik (Final), MTE, October 8, 2014. Prepared for the Government of Nunavut, CGS,
- Specifications Document, Government of Nunavut, Igloolik Sewage Lagoon (OTCD-00019838A); Stamped and Signed by exp Services Inc., November 13, 2015
- Stamped and Signed Tender Drawings, Rev.5, issued for NWB review, drawings IGL1 through IGL8
- Additional Geotechnical Investigation, developed by exp Services Inc., dated September 29, 2014, April 20, 2015

- Additional Geotechnical Investigation Results, developed by exp Services Inc., dated October and November, 2009, April 20, 2015
- Geothermal Analysis of Proposed Sewage Lagoon, developed by Naviq Consulting Inc, dated June 2010, April 20, 2015
- Geotechnical Investigation-attached results, developed by exp Services Inc., dated March 16, 2010, April 20, 2015
- Sewage Lagoon Upgrade Project Schedule, dated November, 2014, April 20, 2015
- Environmental Assessment Screening (Draft), Construction of New Sewage Lagoon and Rehabilitation of Existing Lagoons, developed by Global Tox, dated November, 2009, April 20, 2015
- Geotechnical Investigation, developed by Trow Associates Inc., dated March 16, 2010, July 30, 2015
- Geotechnical Report Letter, by exp Services Inc., dated November 5, 2014, December 14, 2015
- Email Correspondence for Amendment Application, July 20, 2015, August 5, 2015, and December 14, 2015

Following receipt and an internal preliminary review, NWB distributed the Application for a thirty (30)-day comment period on May 26, 2014. On May 28, 2015 a submission was received from Fisheries and Oceans Canada (DFO). On June 26, 2015, a submission was received from Aboriginal Affairs and Northern Development Canada (AANDC).

In their submission, the DFO requested clarification on whether any planned dewatering activities that are required for the new pipe installation, would have any impact on fish or fish habitat. Clarification was provided that areas of dewatering involved surface runoff areas that had no record of fish habitation.

AANDC, in their submission, requested additional information on the handling and storage of sewage sludge and confirmation that the storage of sludge has been considered in the design of the new and rehabilitated sewage lagoons. In addition, a description on how the Licensee planned to store excavated sludge during the rehabilitation of the existing sewage lagoon cells was requested.

Following the receipt of the comments, the applicant confirmed in its email correspondence of December 15, 2015 the use of the older cell for sludge storage and emergency use. It was also confirmed that the new construction would include design for 0.5m depth for sludge accumulation and that there are no plans to dispose of any sludge in a landfill.

Other concerns noted in AANDC's submission were the references to documents not submitted with the Application and the absence during the review. These supporting documents were either located in the NWB files or provided by the Applicant and subsequently placed in the Public Registry for future reference.

With respect to operational plans, AANDC submitted that all outstanding plans should be provided, including those for the Operation and Maintenance of the Solid Waste Management and Sewage Disposal Areas, Abandonment and Restoration and the Spill Contingency Plan.

Although the Licensee, with this amendment application, submitted two additional O&M documents[5,6] with respect to plans, further updates are required and have been addressed through the amendment of Part F, Item 1 of this amendment.

In addition to the intervener's comments received, the NWB received pre-licensing requirements in the form of the Nunavut Planning Commission's (NPC) Land Use Conformity Determination for the file, on June 9, 2015 and the Nunavut Impact Review Board's (NIRB) Screening Report on December 8, 2015.

The NWB has placed in its Public Registry copies of the Application documents, including all comments received from interveners. This information is maintained in the NWB's public registry and is available to interested persons upon request. In addition, the NWB maintains reporting information on its FTP site, which can be accessed using the following link: ftp.nwb-oen.ca

The NWB, having considered the information provided in support of the Application and the comments received from parties during the review process, and 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* and the *Nunavut Waters* and the *Nunavut Surface Rights Tribunal Act*, hereby grants Amendment No.1 to Licence No. 3BM-IGL1520. The amendment is subject to the following terms and conditions that are based on the comments received, and standard conditions imposed by the NWB for similar undertakings:

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. Definitions

Insert

> **"Upgraded Sewage Disposal Facilty"** consists of the new and rehabilitated Modified Sewage Disposal Facility, used for treating the waste water collected by the Hamlet of Igloolik, as described in the amendment application dated April 20, 2015 and supplementary documents submitted with the Application;
>
> **"Vegetative Filter Strip Wetland"** means the combination of treatment wetlands and vegetated filter strip areas and process as described in the document '*Vegetated Filter Strip Assessment for the Treatment of Pre-treated Sewage, Hamlet of Igloolik'*, prepared for the Government of Nunavut, CGS by MTE, dated October 8, 2014 (through exp Services Inc.);
>
> "**Waste Disposal Facilities**" consists of the Modified Solid Waste Disposal Facilities and the Modified Sewage Disposal Facilities (or upon completion, the Upgraded

[5]Operation and Maintenance Plan, additional amendments for the Wastewater Treatment Plant, August 17, 2015;
[6]Supplemental Spill Contingency information, August 17, 2015

Sewage Disposal Facility) as described in the renewal application dated March 13, 2014 and the amendment application dated April 20, 2015, as well as the supplementary documents associated with each application.

PART B: GENERAL CONDITIONS

Insert Item 1(k)

Provide an updated/revised Plan for Compliance, taking into account works achieved during the year, noting areas of (new) compliance and the anticipated goals and timelines for the next and future years.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

Amend Item 1

The Licensee shall direct all Sewage to the Modified Sewage Disposal Facility, or upon commissioning, to the Upgraded Sewage Disposal Facility, or as otherwise approved by the Board in writing.

Amend Item 2

The Licensee shall provide a minimum of ten (10) days' notice to an Inspector, of the intent to discharge Effluent from the Modified Sewage Disposal Facility, or upon commissioning, the Upgraded Sewage Disposal Facility.

Amend Item 3

All Effluent discharged from the Modified Sewage Disposal Facility, or upon commissioning, the Upgraded Sewage Disposal Facility, at Monitoring Program Stations IGL-4, and IGL-5 shall not exceed the following Effluent quality limits: (See Licence table).

Amend Item 5

The Modified Sewage Disposal Facilities, or upon commissioning, the Upgraded Sewage Disposal Facility, shall be maintained and operated in such a manner as to prevent structural failure.

Insert Item 8

The Licensee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of Water is not impaired, unless otherwise approved by the Board in writing.

Insert Item 9

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

Insert Item 10

The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood to prevent the deposition of Waste materials of incomplete combustion and/or leachate from contaminated ash residual,

from impacting any surrounding waters, unless otherwise approved by the Board in writing.

Insert Item 11

The Licensee shall segregate and store all hazardous materials and hazardous Waste including waste oil, within the Waste Disposal Facilities in a manner to prevent the deposit of deleterious substances into any Water, until such a time that the materials are to be removed for proper disposal at licensed facility.

Insert Item 12

The Licensee shall implement measures to ensure leachate from the Waste Disposal Facilities do not enter Water.

Insert Item 13

The Licensee shall remove and treat hydrocarbon contaminated soils on site or transport them to an approved disposal site for treatment.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

Amend Item 1(a)(i), (ii) and (iii)

a. Sewage Disposal Facility Operation and Maintenance (O&M) Plan (including the Sewage Sludge Management Plan), to include the following information:
   i. a summary of how the sludge management lagoon will be rehabilitated (e.g., re-enforced berms, lining, etc.);
   ii. how Effluent that accumulates within the sludge management lagoon will be managed;
   iii. design drawings of the sludge management lagoon including drawings that reference the sludge management cell relative to the planned new sewage lagoon and rehabilitated sewage lagoons;
   iv. the testing requirements that will be applied to sewage sludge and the criteria required prior to any plans for landfill disposal;
   v. a description of how sludge will be disposed in the landfill.

Insert Item 6

The Licensee shall conduct any equipment maintenance and servicing in designated areas and shall implement special procedures (such as the use of drip pans and liners) to manage motor fluids and other waste and contain potential spills.

Insert Item 7

The Licensee shall maintain appropriate spill response equipment and clean-up materials (e.g., shovels, pumps, barrels, drip pans, and absorbents) and be readily available during any transfer of fuel or hazardous substances.

PART H: CONDITIONS APPLYING TO MONITORING

Amend Item 1

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

Monitoring Program Station Number	Description	Status
IGL-1	Raw Water supply intake at South Lake	Active (Volume)
IGL-2	Runoff from Modified Solid Waste Disposal Facilities	Active (Water Quality)
IGL-3	Raw Sewage at Discharge point into the Modified Sewage Disposal Facility	**Not** Active
IGL-4	Final control point from the Modified Sewage Disposal Facility or upon commissioning, the Upgraded Sewage Disposal Facility	Active (Water Quality)
IGL-5	Final Effluent discharge point prior entering Foxe Basin	New (Water Quality)

Amend Item 4

Delete second paragraph "The Licensee shall measure and record…"

All remaining terms and conditions of Licence No. 3BM-IGL1520, Type 'B", issued March 31, 2015, are still applicable.

This Licence Amendment issued and recorded at Gjoa Haven, NU on February 16, 2016.

Approved by,

Thomas Kabloona
Nunavut Water Board, Chair

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File: 3BM-IGL1520 / Amendment No. 2

September 1, 2016

Shawn Stuckey
Senior Administrative Officer
Hamlet of Igloolik
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Bhabesh Roy, P. Eng.
Municipal Planning Engineer, Baffin Region
GN -Community and Government Services
P. O. Box 379
Pond Inlet, NU X0A 0S0

Email: broy@gov.nu.ca

RE: Licence No. 3BM-IGL1520, Type "B" – Amendment No. 2

Dear Mr. Stuckey and Mr. Roy:

Please find attached **Amendment No. 2** to Type "B" Water **Licence No. 3BM-IGL1520**, issued to the Hamlet of Igloolik by the Nunavut Water Board (NWB) under **Motion 2016-B1-011** 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* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*. The terms and conditions of the original Licence as they related to Waste deposit and Water use, remain an integral part of this approval.

The Licensee is advised that this Amendment is for an undertaking that falls outside of an area with an approved Land Use Plan as determined by the Nunavut Planning Commission (NPC)[1] and does not require a review pursuant to section 92(1)(a) of the Nunavut Planning and Project Assessment Act (NuPPAA) as indicated in the Nunavut Impact Review Board's (NIRB) Screening Decision Report.[2]

The NWB strongly recommends that the Licensee consult the comments and/or recommendations provided by intervener(s). This information is attached for your consideration.[3]

[1] Nunavut Planning Commission (NPC) Determination, March 1, 2016.
[2] Nunavut Impact Review Board (NIRB) Screening Decision Report, May 13, 20.16.
[3] Indigenous and Northern Affairs Canada (INAC) Comment Submission, August 22, 2016.

Sincerely,

Thomas Kabloona
Nunavut Water Board, Chair

TK/sj/vk

Enclosure: **Licence No. 3BM-IGL1520 – <u>Amendment No. 2</u>**
Comments – INAC

Cc: Qikiqtani Distribution List

Background

On June 2, 2016, the Government of Nunavut – Community and Government Services (the "GN-CGS"), on behalf of the Hamlet of Igloolik, submitted to the Nunavut Water Board ("NWB" or "Board") for consideration, an application and supporting information (the "Application") to amend Type "B" Water Licence No. 3BM – IGL1520 (the "Existing Licence") to allow for the expansion of an existing potable water supply reservoir, replacement of an intake line that transmits water from the South Lake source to the Hamlet's water supply reservoir, the construction of a new truck-fill station, and the inclusion of Fish Lake as an alternative water source to the scope of the Existing Licence.

Details included in the Application to amend the Existing Licence indicate that in 2015 the Hamlet experienced a shortage in the reservoir's over-winter water storage due to anoxic conditions at the South Lake water source. To protect the public's safety, the Government of Nunavut – Department of Health (GN-DOH) advised that use of the South Lake water source should be temporarily discontinued. The Hamlet accepted the GN-DOH advise, and it decided to use Fish Lake as its water supply source until the integrity of the South Lake source was restored.

The Hamlet indicated in its Application that to minimize the possibility of similar shortages in the future, it is proposing, as stated above, to expand the reservoir's annual over-winter storage capacity from 79,000 m^3 to 102,800 m^3 as well as upgrade some of the other structures/equipment associated with the Water Supply Facilities.

The Application submitted to amend Licence No. 3BM-IGL1520 included the following documents:

- Igloolik Approval Letter
- Reservoir Expansion Letter
- Amendment 2 Letter
- 012500 Special Provisions rev April 11, 2016
- Certificate of Analysis B1515523 R
- February 2, 2016 Final Design Brief
- Iglolik Amendment 2 Letter
- Igloolik Bathymetric Survey ARKTIS
- Igloolik Fish Lake Hydrology study August 12, 2015
- Igloolik Reservoir Expansion Sketch
- Igloolik Water Supply Design Development ARKTIS
- Inspectors Direction
- May 27, 2016 INAC Letter to Igloolik Reservoir Expansion Request
- NIRB Project Proposal of Igloolik Water Reservoir Expansion Project, February 18, 2016
- NIRB Project Proposal of Igloolik Water Reservoir Expansion Project, March 3, 2016
- October 27, 2015 Risk Assessment Report Final
- Signature Water Licence Amendment 2 Application
- Water Licence Amendment 2 Application

Following an internal preliminary review and receipt of additional information as well as confirmation from the respective regulators regarding pre-licensing issues related to the Application, the NWB distributed the Application on July 22, 2016 for a thirty (30) day comment and review period with the deadline for submissions set for August 22, 2016. Before

the deadline for comments elapsed, a submission was received from Indigenous and Northern Affairs Canada (INAC) in which INAC provided several comments and recommendations, which are summarized below:

- The Operation and Maintenance Plan associated with the undertaking should be updated to included the water supply system's two pump houses. The updated plan should be submitted to the NWB for review and approval;
- A spill contingency plan should be submitted to the NWB for review and approval;
- Spill involving fuel or hazardous material that occur adjacent to or into a water body regardless of quantity or size should be reported immediately to the NWT, 24-hour spill report line and to INAC's Manager of Field Operations; and
- In accordance with the *Consolidation of Spill Contingency Planning and Reporting Regulations* (R-068-93), any person storing contaminants in an above-ground storage facility, with capacity equal to or greater than 20,000 litres/kilograms, is required to file a spill contingency plan.

With respect to pre-licensing matters, the Nunavut Planning Commission (NPC) issued its determination[4] for the Application on March 1, 2016, stating that the project falls outside of the area in which an approved Land Use Plan is in place and that the proposal was forwarded to the Nunavut Impact Review Board (NIRB) for screening as it did not belong to the class of exempt works or activities. On May 13, 2016, the NIRB issue its Screening Determination[5] for the project.

Issues Considered by the Board

The following sections provide an overview of some of the main issues that the Board considered in its decision on whether or not to grant Amendment No. 2 to Licence No. 3BM-IGL1520:

Inspector's Direction

On June 2, 2016, Indigenous and Northern Affairs Canada (INAC) issued an Inspector's Direction[6] regarding the shortage of over-winter water storage for the Hamlet of Igloolik. The Inspector directed that the issue(s) that created the shortage be addressed immediately to prevent any potential threat to public health and safety. Further, the Inspector requested that a plan be provided prior to any work occurring, including the timelines and details of work required to address public health and safety concerns pertaining to the water shortage and that a final summary of work completed be provided on or prior to October 31, 2016.

In keeping with the Inspector's Direction and as part of the Licensee's strategy to prevent future shortages, the Licensee, as mentioned above, is proposing to expand the water storage facility and associated infrastructure. Written letters of support[7] for the proposed expansion were provided by the Nunavut's Deputy Chief Medical Officer of Health and the Mayor of the Hamlet of Igloolik.

Water Use/Type of Licence

[4] Nunavut Planning Commission (NPC), Land Use Determination, March 1, 2016.
[5] Nunavut Impact Review Board (NIRB) Screening Decision, May 13, 2016.
[6] J. Hack, Water Resource Officer, INAC, to D. Flynn, Assistant Deputy Minister, Local Government – GN-CGS; CC'd: E. Allain, INAC, Licensing, NWB; T. Toonoo, CGS; Dr. K. Barker and M. LeBlanc Havard, Department of Health; SAO, Hamlet of Igloolik; Re: Nunavut Waters and Nunavut Surface Rights Tribunal Act Inspector's Direction, June 2, 2116.
[7] Letter from P. Ivalu, Mayor, Municipality of Igloolik, to B. Roy, Municipal Planning Engineer, Re: Igloolik Water Reservoir Expansion, February 26, 2016; and letter from, M. Kaikie, Deputy Chief Medical Officer of Health, to M. Heath, Director of Community Infrastructure Division, GN- CGS, Re: Igloolik Water Reservoir Expansion, February 25. 20165.

Details included in the Application to amend the Licence indicate that while the Licensee is proposing to increase the storage capacity of the reservoir from 79,000 m^3 to 102,800 m^3, the actual water consumption rate for the Hamlet in the short-term will remain at the current volume allowed in Existing Licence. The Existing Licence authorizes the use of up to 81,208 cubic metres of water annually not exceeding 299 cubic metres per day directly from the water source authorized under the Existing Licence; however, the Licensee's 2013, 2014, and 2015 Annual Reports suggest that the Hamlet's annual water usage was on average 54,000 cubic metres during the aforementioned periods and that the rate of usage is unlikely to change in the short-term.

It should be noted that in the decision section of the Existing Licence, which was issued on March 31, 2015, it was mentioned that Schedule 2 of the *Nunavut Waters Regulations* (the "Regulations"), which came into effect on April 18, 2013, states that a Type "A" water licence is required for activities involving the storage of more than 60,000 cubic metres of water and/or the used of at least 300 cubic metres of water per day. It should be noted that the Board did not apply this requirement at the time the Existing Licence was issued due to a number of factors including the nature of the storage facility involved (the Regulations are based on storage utilizing dams or dikes – Column 2, Item 3 of Schedule 2) and the fact that the Hamlet's direct water usage from the source or its reservoir did not exceed the threshold outlined in Schedule 2 of the Regulations. The Licensee is advised, however, that if there is any proposed increase in direct source water use related to the Existing Licence in future, the associated renewal or amendment application for this potential increase in use may potentially be treated as a Type "A" application and processed in accordance with the relevant thresholds established in the Regulations.

Water Sources

Conditions included in the Existing Licence allow for the use of South Lake as the Hamlet's primary and only source of water supply. However, due to the over-winter shortage experienced in 2015 as a result of poor water quality that temporarily effected the South Lake source, the Hamlet was obliged to use Fish Lake as an alternative water source during that period. As part of its Application (Amendment No. 2 Application), the Licensee requested the inclusion of Fish Lake as a secondary water supply source. The memorandum entitled *Fish Lake Hydrology Study: Igloolik*, included as part of the Application, the yield to Fish Lake is estimated at 302,000 cubic metres, excluding evaporation and some other factors, while the annual community demand is expected reach approximately 165,000 cubic metres by the year 2045. Although the assessment did not examine the suitability of Fish Lake as an over-winter source, based on the information presented, Fish Lake may be considered capable of meeting the Hamlet's water supply needs as a secondary source, to some extent.

A bathymetric survey conducted by Arktis Solutions Incorporated for the South Lake water supply source estimates its volume at 491,956 cubic metres, suggesting, with the consideration of other factors, that the Hamlet's current and future water demand (20-year projection) could continue to be met by this source assuming that its integrity and yield are maintained over time.

The Board has considered the Licensee's request in the context of previous and potential risk(s) that may be inherent in using the South Lake water source as well as the potential implications for the Hamlet should such risk come to fruition, in deciding to grant the Licensee's request under Part C, Item 1 of this Amendment. The Licensee should note that in granting the use of Fish Lake as an alternative water source, the Board included requirements to inform the NWB

and the Inspector at least ten (10) days prior to withdrawing water from Fish Lake for any purpose under the Licence.

Management Plans
In accordance with the terms and conditions included in the Existing Licence, the Licensee is required to submit to the Board for review and/or approval, the following management plans:

a. An Operation and Maintenance Manual for the Sewage and Solid Waste Disposal Facilities, within ninety (90) days of issuance of the Existing Licence (Part F, Item 1). The Licensee submitted on August 17, 2015, a one-page document entitled *Operation and Maintenance Procedure of Wastewater Treatment by Lagoons of the Hamlet of Igloolik*, which the Board determined as being insufficient for meeting the requirements in the Licence. Therefore, the Licensee should note that the conditions in the Existing Licence as well as any added requirements imposed by Amendment No. 1 to the Existing Licence remain applicable and in effect.

   The Licensee should also be advised that the requirements under Part F, Item 1, which include the submission of a Spill Contingency Plan (SCP), remain outstanding. INAC in its submission related to this Application, requested that a SCP be submitted to the Board for approval, which the Board is in agreement with. As there is no SCP currently approved under the Existing Licence or submitted for approval at the time of the Application, the Board has included the condition under Part E, Item 8 of this Amendment for the submission of a separate spill contingency plan for the proposed construction activities.

b. Changes to the Operation and Maintenance Manual for the Water Distribution Facility, as an addendum within the annual report submitted for the Existing Licence (Part F, Item 2). The Licensee submitted on August 8, 2015 a document to satisfy this requirement; however, the Board determined shortly following submission that the document needed to be revised as it was inadequate. Consequently, this requirement remains outstanding and must be addressed as stipulated in the Exiting Licence and/or Amendment No. 1 to the Existing Licence.

   Apart from the aforementioned item, the Board has included terms and condition under Part F, Item 8 of this Amendment for the submission, within sixty (60) days of completion of the Water Supply Facilities expansion, an O&M manual that captures the upgraded facilities authorized under this amendment (Amendment No. 2). The Licensee should note that the requirement in the Existing Licence for submission of an O&M Manual for the current Water Supply Facilities remains in effect and outstanding. However, condition has been added to this Amendment for the submission of an O&M manual for the expanded facility once completed and commissioned that should take into consideration INAC's relevant comments and recommendations.

c. Submission of a Quality Assurance/Quality Control (QA/QC) Plan, within ninety (90) days of issuance of the Existing Licence (Part H, Item 8). The Licensee has indicated that it intends to submit a QA/QC Plan within ninety (90) days of issuance of Amendment No. 2. No changes have been made to this requirement in this Amendment or in Amendment No. 1; therefore, the requirement as included in the Existing Licence remains in effect and outstanding.

Closure and Reclamation

As the pertinent requirements in the Existing Licence are quite general and adequate enough to address closure and reclamation procedures for the current Water Supply Facilities once construction of the expanded facilities is completed and the facility is commissioned, the Board has not included any additional conditions regarding closure and reclamation activities. Licensee should note that the Water Supply Facilities and infrastructure that are no longer in use will require closure and reclamation in accordance with Part G, Item 1 of the Existing Licence.

Compliance

As mentioned above, the Board notes that some of the management plans associated with the Existing Licence remain outstanding and that an Inspector's direction, dated June 2, 2016, has been issued and remains in effect. Further, the Board notes that the Plan for Compliance required under Part B, Item 1(k) of Amendment No. 1 to the Existing Licence remains outstanding. The Board advises that it is the obligation of the Licensee to ensure that all requirements associated with its Existing Licence and related Amendment(s) are accordingly addressed.

Design Drawings

As part of the Application to amend the Existing Licence, the Licensee submitted a report prepared by exp Services Inc. that contained design parameters and drawings pertaining to the reservoir expansion, Figures 1 and 2. Further, a design development report for the water supply system improvement, prepared by Arktis Piusitippaa Inc., contained in addition to relevant design parameters, design drawings for the truck-fill station and pump house, Figures 5-12. The Licensee should note that as the drawings provided in both documents were not signed and stamped by an engineer, and it is inconclusive as to whether they are for-construction or for tendering purposes. Conditions have been included under Part E, Item 9 in this Amendment, requiring the submission of for-construction drawings for the Board's review at least two (2) weeks prior to the commencement of construction activities.

Project Execution

Based on details included in the Application, the proposed expansion of the reservoir will be undertaken in two phases:

- Phase 1 – Mobilization, dewatering of existing reservoir, drill and blasting, excavation, temporary water truck filling facility, and recharging of reservoir. Phase 1 is schedule to commence September 30, 2016 or prior to the freeze-up period.
- Phase 2 – Mobilization, dewatering of existing reservoir, drill and blasting excavation, temporary water truck filling facility, and recharging of reservoir. Phase 2 is schedule to commence September 30, 2017 or prior to the freeze-up period.

Decision

Considering that above-mentioned issues and the Licensee proposed investment in infrastructure improvements to enhance its ability to adequately address the community's potable water supply needs, the Board has decided to approve the issuance of Amendment No. 2 to Licence No. 3BM-IGL1520.

LICENCE AMENDMENT No. 2

Licensee:	**Hamlet of Igloolik**
Licence No:	**3BM-IGL1520, Type "B"**
Licence Issued:	**March 31, 2015**
Amendment No.1	**February 16, 2016**
Amendment Effective Date:	**September 1, 2016**
Expiry Date:	**March 30, 2020**

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* and the *Nunavut Waters and the Nunavut Surface Rights Tribunal Act*, with respect to the Application for Amendment No. 2 to Licence No. 3BM-IGL1520, dated April 29, 2016, made by the Government of Nunavut – Community and Government Services (GN-CGS) on behalf of the Hamlet of Igloolik, the Nunavut Water Board hereby grants the following Licence Amendment.

The Licence issued on March 31, 2015 with an expiry date of March 30, 2020, shall be further amended to include the following terms and conditions, with respect to the use of Water and the deposit of Waste for a Municipal undertaking within the boundaries of the Hamlet of Igloolik, in the Qikiqtani Region, Nunavut, at the following geographical coordinates: Latitude: 69º 23' N and Longitude 81º 46' W.

The Licence shall be amended as follows:

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

Item 1 – Scope

Amended to read:

> This Licence allows for the deposit of Waste use and use of Water, including the expansion of the Hamlet's water supply reservoir, construction of a new truck-fill station, replacement of the transmission main that supplies water from the South Lake water source, and the use of Fish Lake as an alternative water source; for a Municipal undertaking at the Hamlet of Igloolik, located within the Qikiqtani Region, Nunavut (Latitude: 69°23'N and Longitude: 81°46'W).

Item 2 –Definitions

Amended to read

> "**Water Supply Facilities**" – Consists of pre-expanded and/or expanded facilities and associated infrastructure including the South Lake water source, intake infrastructure, and transmission line to the Hamlet's water supply reservoir and the reservoir, as well as the

Fish Lake Water source, a secondary and alternative source, as described in the Application dated March 13, 2015 and/or Amendment No. 2 Application dated June 2, 2016.

PART C: CONDITIONS APPLYING TO WATER USE

Item 1 Amended to read:

The Licensee is authorized to withdraw freshwater using the Water Supply Facilities for the purposes allowed under the Licence and associated amendments, from either South Lake, as a primary source, or Fish Lake, as a secondary source.

Insert Item 8

The Licensee shall provide to the Board and an Inspector, at least (10) days written notice, prior to withdrawing and using fresh water from Fish Lake, the secondary water source authorized under this Amendment.

PART E: CONDITIONS APPLYING TO MODIFICTAION AND CONSTRUCTION

Insert Item 7

The Licensee shall, within ninety (90) days of completion of construction of the reservoir expansion and related infrastructure, submit to the Board for review a Construction Summary Report that includes stamped, as-built plans and drawings, explanations for deviations from the construction specifications and drawings, and consideration of construction and field decisions and their effects on the performance of engineered facilities.

Insert Item 8

The Licensee shall submit to the Board for Approval, within thirty (30) days prior to commencing construction activities, a Spill Contingency Plan to assist the Licensee in preventing and/or minimizing spills during construction works and activities.

Insert Item 9

The Licensee shall submit to the Board for review, at least two (2) weeks prior to commencing construction activities, for-construction drawings and plans, signed and stamped by Engineer.

Insert Item 10

The Licensee shall ensure that surface runoff or discharges impacted by construction activities associated with the undertaking, not exceed the following Effluent Quality Limits, where flow may directly or indirectly enter Water:

Parameter	**Maximum Average Concentration**	**Maximum Concentration of Any Grab Sample (mg/L)**
Total Suspended Solids	50	100
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

Insert Item 8

The Licensee shall submit, to the Board for approval, an Operation and Maintenance Manual for the updated or expanded Water Supply Facilities authorized under the scope of Amendment No. 2, at least sixty (60) days prior to commissioning the facility.

PART H: CONDITIONS APPLYING TO MONITORING PROGRAM

Item 1 Amended to read:

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

Monitoring Station ID	**Description**	**Status**
IGL-1	Raw Water Supply Intake at South Lake	Active (Volume)
IGL-1a (New)	Raw Water Supply Intake at Fish Lake	Active (Volume)
IGL-2	Runoff from the Modified Solid Waste Disposal Facility	Active (Water Quality)
IGL-3	Raw Sewage at Discharge point into the Modified Sewage Disposal Facility	Not Active
IGL-4	Final control point from the Modified Sewage Disposal Facility or upon commissioning, the Upgraded Sewage Disposal Facility	Active (Water Quality)
IGL-5	Final Effluent Discharge Point prior entering Foxe Basin	Active (Water Quality)

Item 2 Amended to read:

The Licensee shall measure and record, in cubic metres, the monthly and annual quantities of water pumped at Monitoring Program Stations IGL-1, and IGL-1a for all purposes under the Existing Licence associated Amendments.

All remaining terms and conditions of Licence No. 3BM-IGL1520, Type 'B", dated March 31, 2015, and Amendment No.1 dated February 16, 2016 still apply.

This Amendment, Amendment No. 2 to Licence No. 3BM-IGL1520, is issued and recorded at Gjoa Haven, NU on September 1, 2016.

Approved by,

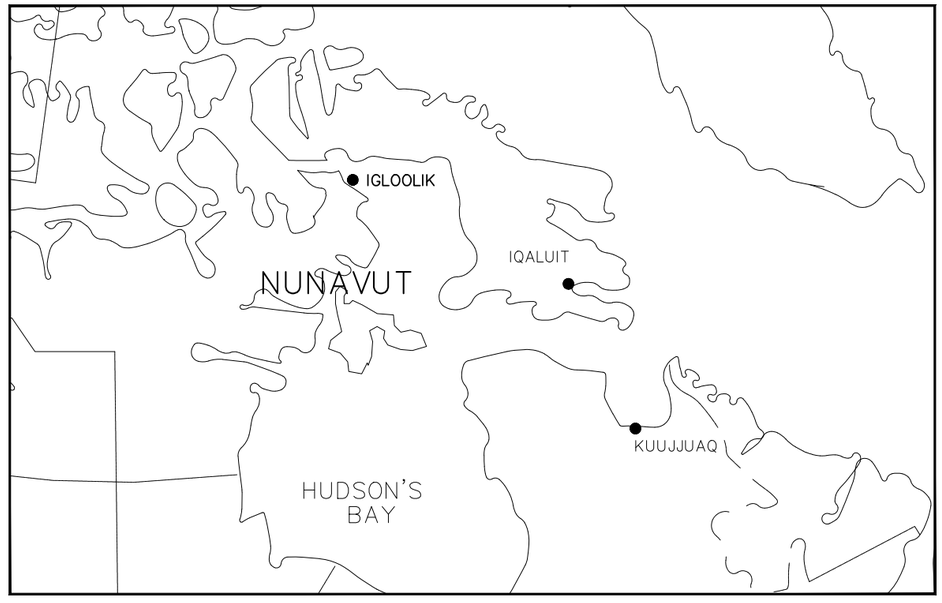
Thomas Kabloona
Nunavut Water Board, Chair

Appendix C –
Record Drawings (September 25, 2018)

ERRATUM

Drawing No. IGL-1	PROPOSED WASTEWATER TREATMENT FACILITY – delete PROPOSED
	DATE NOV. 2014 – delete NOV. 2014
Drawing No. IGL-2	PROPOSED WASTEWATER TREATMENT FACILITY – delete PROPOSED
	DATE NOV. 2014 – delete NOV. 2014
Drawing No. IGL-3	DATE NOV. 2014 – delete NOV. 2014
Drawing No. IGL-4	DATE NOV. 2014 – delete NOV. 2014
Drawing No. IGL-5	DATE NOV. 2014 – delete NOV. 2014
Drawing No. IGL-6	DATE NOV. 2014 – delete NOV. 2014
Drawing No. IGL-7	DATE NOV. 2014 – delete NOV. 2014

HAMLET OF IGLOOLIK



INDEX OF INCLUDED DRAWINGS

DRAWING NO.	REVISION	DESCRIPTION
		COVER SHEET
OTCD00019838-IGL-1	REV 7	SITE LOCATION PLAN
OTCD00019838-IGL-3	REV 7	PROPOSED FACILITY AND PHASING PLAN
OTCD00019838-IGL-4	REV 9	NEW LAGOON CELL 'A'
OTCD00019838-IGL-5	REV 9	NEW LAGOON CELL 'B' & 'C'
OTCD00019838-IGL-6	REV 7	PUMPING AND DEWATERING DETAILS
OTCD00019838-IGL-7	REV 7	LINER AND SPILLWAY DETAILS
OTCD00019838-IGL-8	REV 7	TRUCK DISCHARGE AND MISC. DETAILS

RECORD
DRAWINGS
DATE: SEPTEMBER 25, 2018

GOVERNMENT OF NUNAVUT

WASTEWATER MANAGEMENT FACILITY

PROJECT OTT-00019838-A0

exp Services Inc.
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Ottawa, ON K2B 8H6
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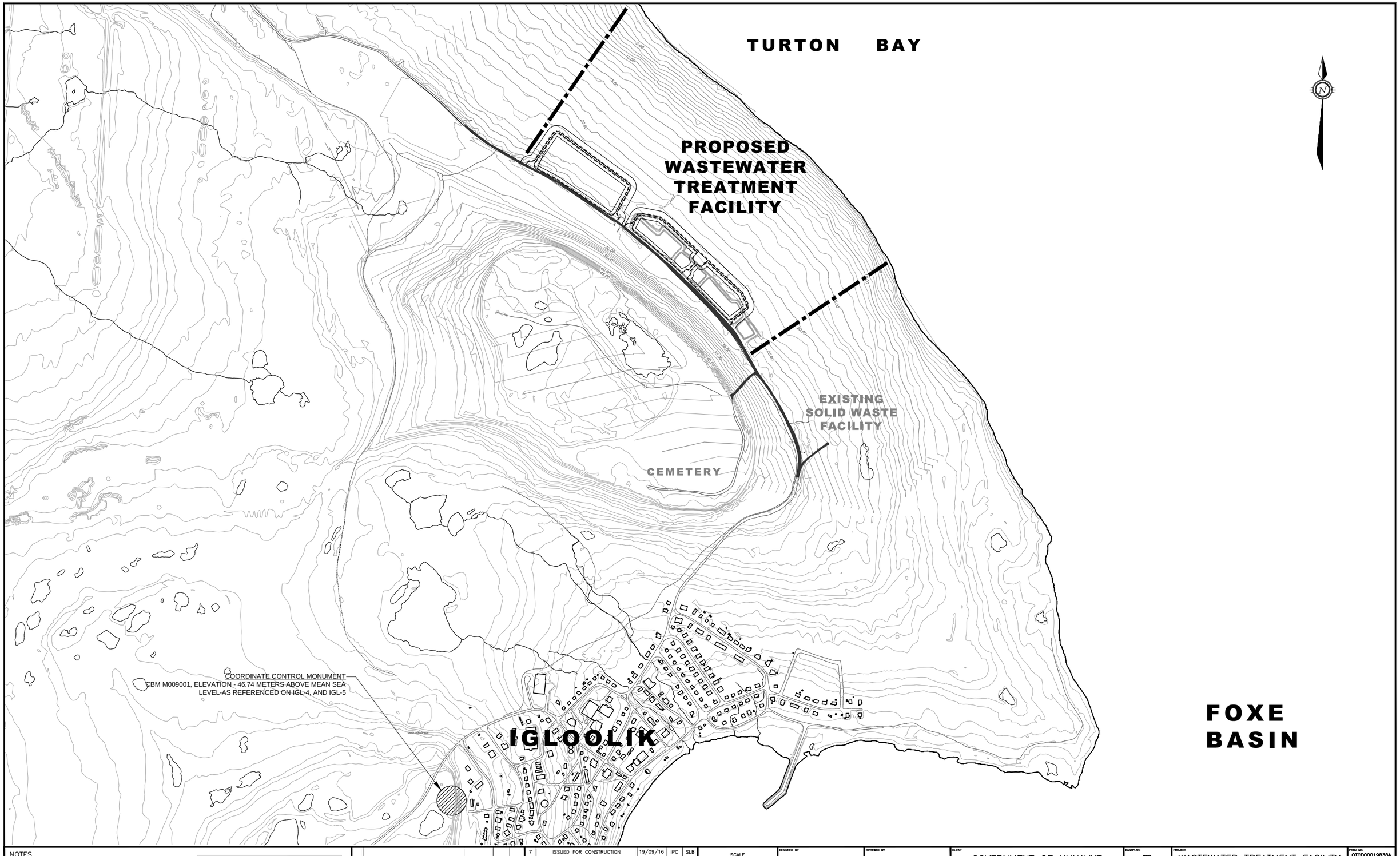

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

RECORD DRAWINGS

DATE: SEPTEMBER 25, 2018

NO.	REVISION DESCRIPTION	DATE	BY	APPD
7	RECORD DRAWINGS	25/09/18	AO	IPC

NO.	REVISION DESCRIPTION	DATE	BY	APPD
7	ISSUED FOR CONSTRUCTION	19/09/16	IPC	SLB
6	ISSUED FOR TENDER	27/04/15	IPC	SLB
5	ISSUED FOR NWB REVIEW	27/03/15	IPC	SLB
4	ISSUED FOR 100% REVIEW	05/03/15	IPC	SLB
3	ISSUED FOR 99% REVIEW	19/01/15	IPC	SLB
2	ISSUED FOR 75% REVIEW	21/11/14	IPC	SLB
1	ISSUED FOR REVIEW	13/03/12	MEB	SLB

SCALE

HORZ 1:5000

0 50m 100m 200m

HORIZONTAL 1:5,000

DESIGNED BY

REVIEWED BY

CLIENT

GOVERNMENT OF NUNAVUT
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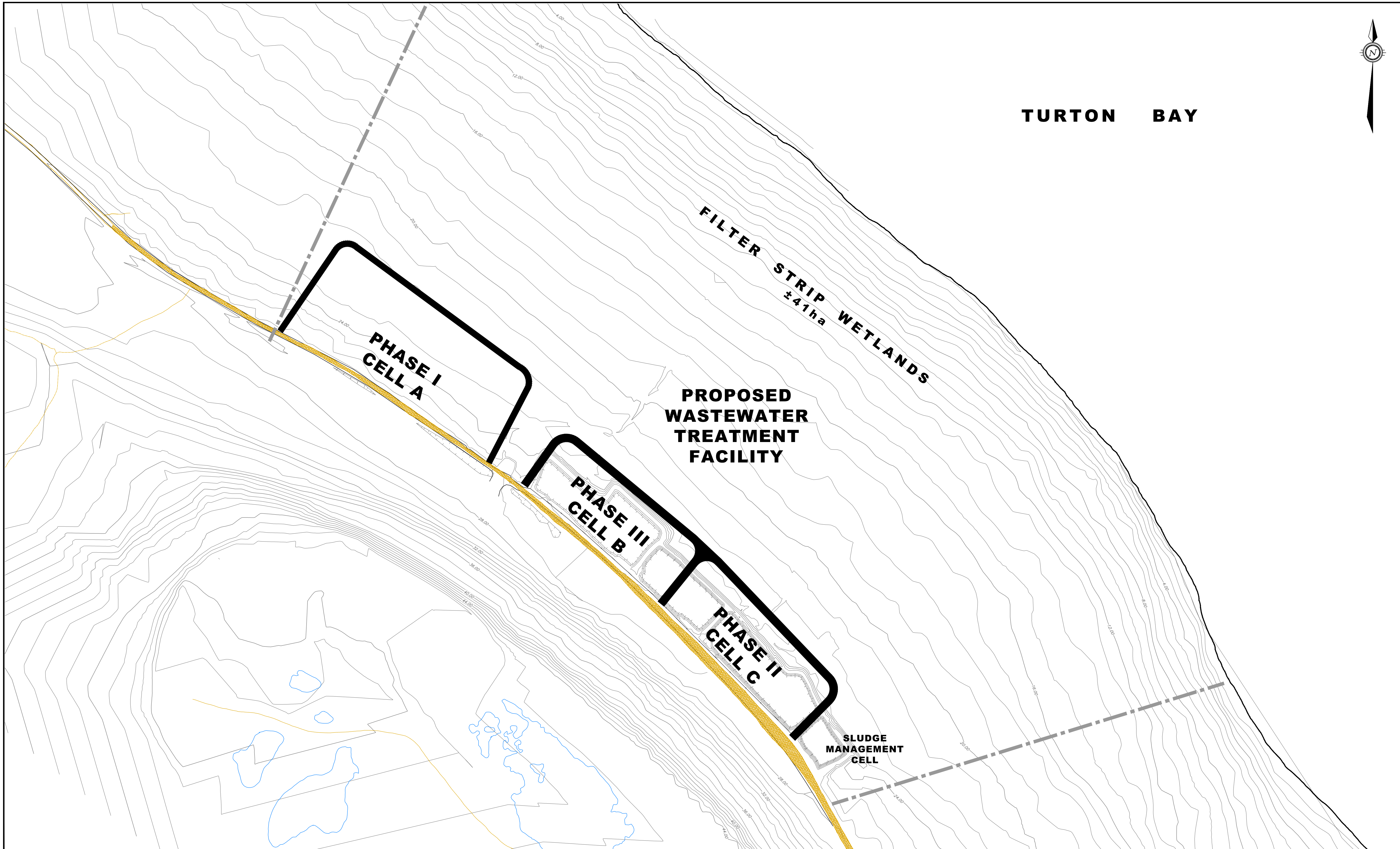
● INDUSTRIAL ● INFRASTRUCTURE ● SUSTAINABILITY ●

BASEPLAN exp.
DESIGN IPC
CHECKED SLB
CAD IPC
PROJ. MAN SLB
APPROVED SLB

PROJECT
WASTEWATER TREATMENT FACILITY
IGLOOLIK, NUNAVUT

TITLE
SITE LOCATION PLAN

PROJ NO. OTCD00019838A
SURVEY exp.
DATE NOV. 2014
DRAWING NO. IGL–1



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DATE: SEPTEMBER 25, 2018

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5	ISSUED FOR NEW REVIEW	27/03/15	IPC	SLB
4	ISSUED FOR 100% REVIEW	05/03/15	IPC	SLB
3	ISSUED FOR 99% REVIEW	19/01/15	IPC	SLB
2	ISSUED FOR 75% REVIEW	21/11/14	IPC	SLB
1	ISSUED FOR REVIEW	13/03/12	MEB	SLB

SCALE

HORZ 1:1500

0 15m 30m 60m
HORIZONTAL 1:1500

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BASEPLAN	exp.
DESIGN	IPC
CHECKED	SLB
CAD	SLB
PROJ. MAN	SLB
APPROVED	SLB

PROJECT
WASTEWATER TREATMENT FACILITY
IGLOOLIK, NUNAVUT

TITLE
PROPOSED FACILITY AND PHASING PLAN

PROJ. NO. OTCD00019838A
SURVEY exp.
DATE NOV. 2014
DRAWING NO. IGL–2

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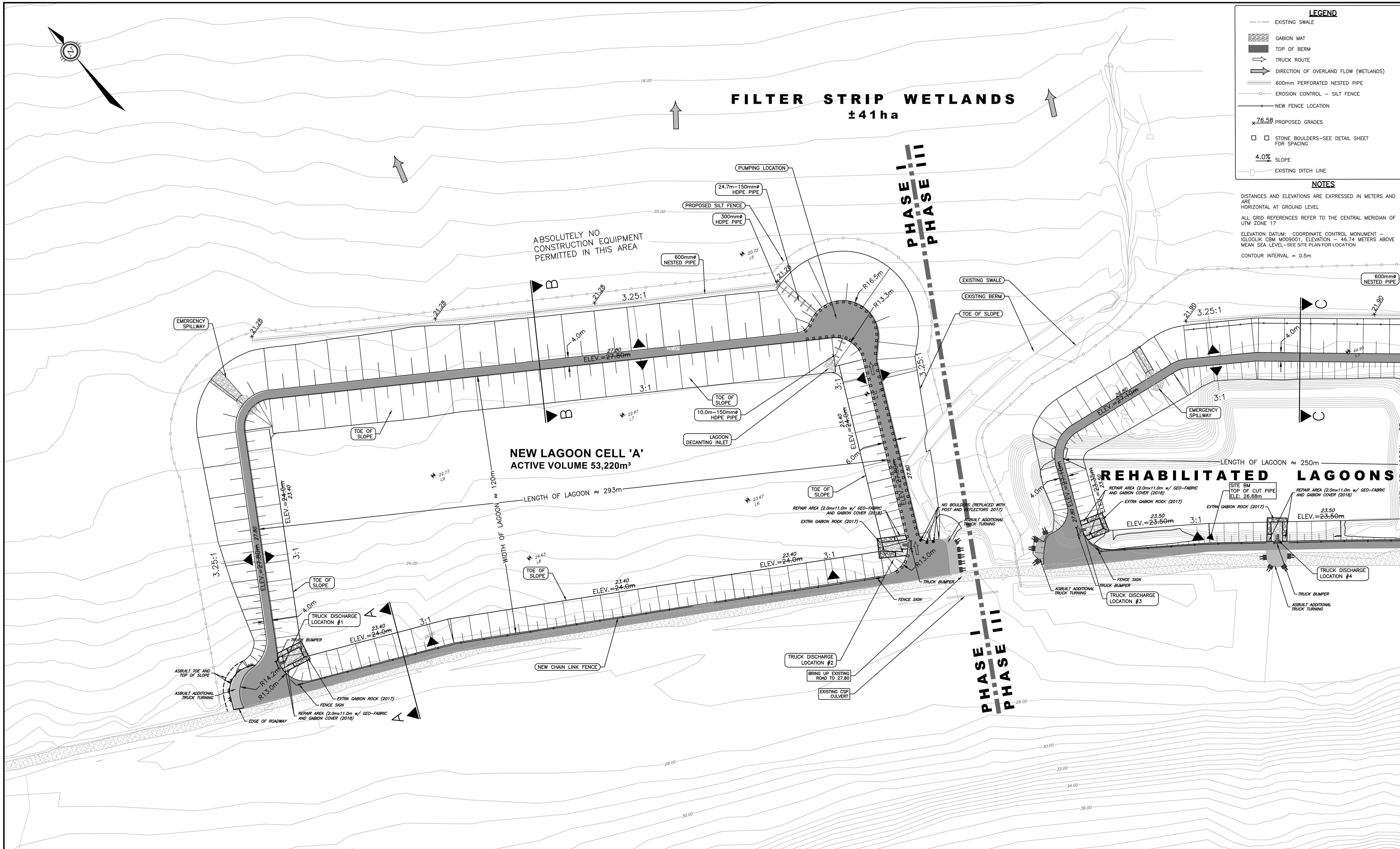

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References: infrafull et mg20.dwg

RECORD DRAWINGS

DATE: SEPTEMBER 25, 2018

NO.	REVISION DESCRIPTION	DATE	BY	APPD
9	RECORD DRAWINGS	25/09/18	AO	IPC
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1	ISSUED FOR REVIEW	13/03/12	MEB	SLB

SCALE: HORZ 1:750

0 5m 10m 30m HORIZONTAL 1:750

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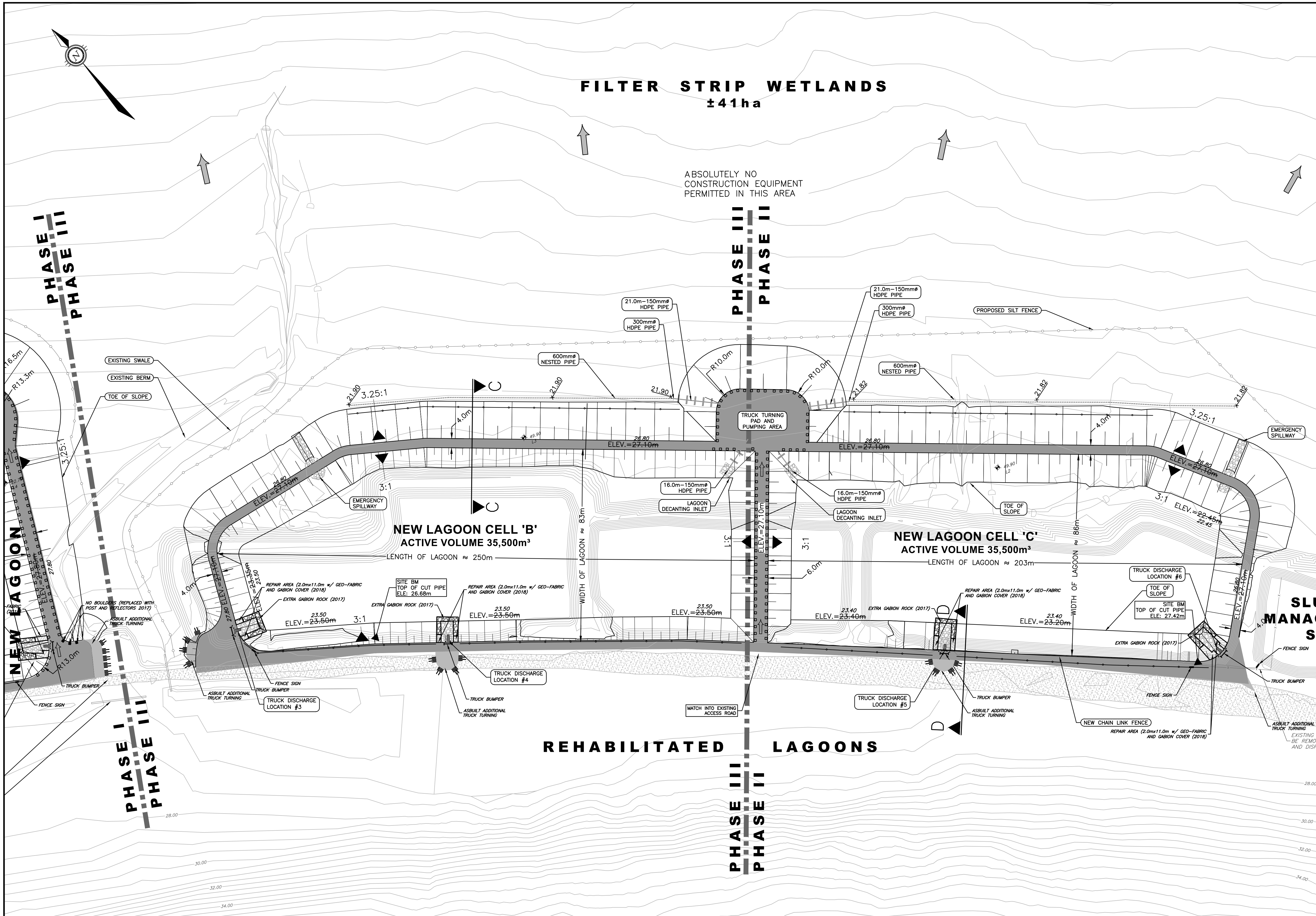
BASEPLAN: exp.
DESIGN: IPC
CHECKED: SLB
CAD: IPC
PROJ. MAN: SLB
APPROVED: SLB

PROJECT: WASTEWATER TREATMENT FACILITY IGLOOLIK, NUNAVUT

TITLE: NEW LAGOON CELL 'A' PHASE I

PROJ NO.: OTCD00019838A
SURVEY: exp.
DATE: NOV. 2014
DRAWING NO.: IGL–3



LEGEND

- EXISTING SWALE
- GABION MAT
- TOP OF BERM
- TRUCK ROUTE
- DIRECTION OF OVERLAND FLOW (WETLANDS)
- 600mm PERFORATED NESTED PIPE
- EROSION CONTROL – SILT FENCE
- NEW FENCE LOCATION
- 76.58 PROPOSED GRADES
- STONE BOULDERS–SEE DETAIL SHEET FOR SPACING
- 4.0% SLOPE
- EXISTING DITCH LINE

NOTES

DISTANCES AND ELEVATIONS ARE EXPRESSED IN METERS AND ARE HORIZONTAL AT GROUND LEVEL.

ALL GRID REFERENCES REFER TO THE CENTRAL MERIDIAN OF UTM ZONE 17.

ELEVATION DATUM: COORDINATE CONTROL MONUMENT – IGLOOLIK CBM M009001, ELEVATION – 46.74 METERS ABOVE MEAN SEA LEVEL–SEE SITE PLAN FOR LOCATION.

CONTOUR INTERVAL = 0.5m.

THE RE–USE OF BERM MATERIALS FROM THE EXISTING SEWAGE LAGOON SHALL BE ON CONDITION THAT THEY DO NOT POSE UNACCEPTABLE ACUTE HEALTH RISKS TO SITE WORKERS. PRIOR TO RE–USE SAMPLES OF THE BERM MATERIALS SHALL BE SUBMITTED FOR LABRATORY TESTING FOR BACTERIOLOGICAL PATHOGENS (INCLUDING AT A MINIMUM–E.COLI, TOTAL COLIFORMS, AND FECAL COLIFORMS). SITE WORKERS SHOULD USE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN HANDLING BERM MATERIALS FROM EXISTING SEWAGE LAGOONS.

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1	ISSUED FOR REVIEW	13/03/12	MEB	SLB

SCALE: HORZ 1:750 (HORIZONTAL 1:750; 0, 5m, 10m, 30m)

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BASEPLAN	DESIGN	CHECKED	CAD	PROJ. MAN	APPROVED
exp.	IPC	SLB	IPC	SLB	SLB

PROJECT: WASTEWATER TREATMENT FACILITY
IGLOOLIK, NUNAVUT

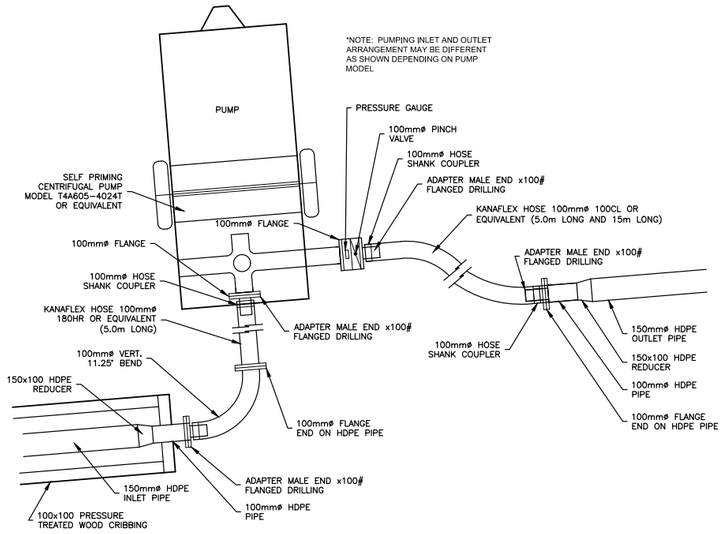
TITLE: NEW LAGOON CELLS 'B' & 'C'
PHASE II & PHASE III

PROJ NO. OTCD00019838A

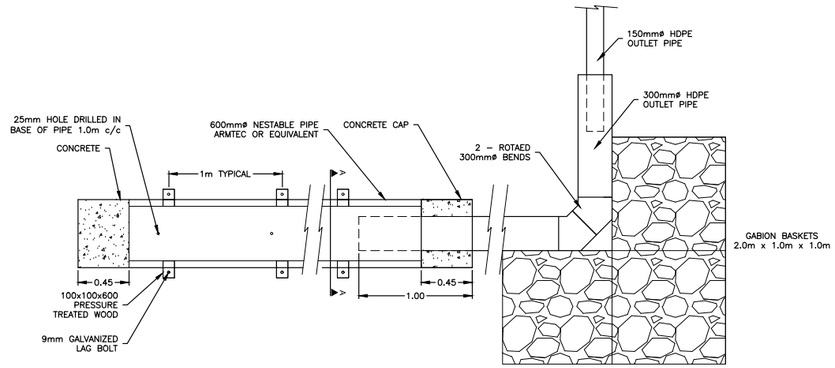
SURVEY exp.

DATE NOV. 2014

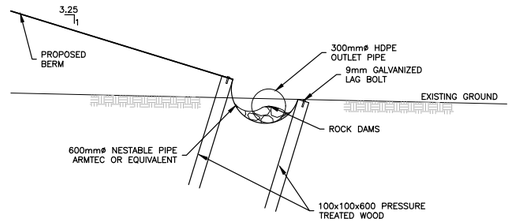
DRAWING NO. IGL–4



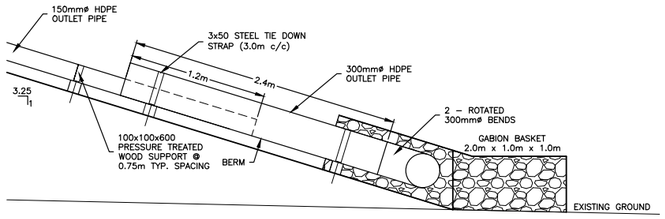
LAGOON DEWATERING PUMP INFRASTRUCTURE PLAN VIEW
1:25



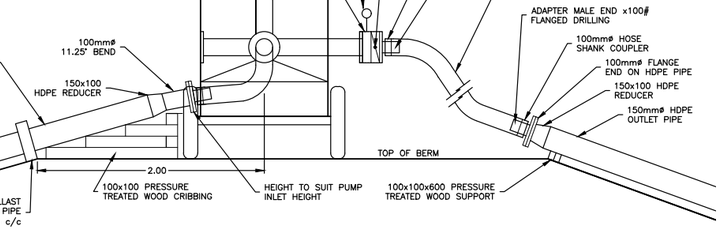
LAGOON DEWATERING OUTLET PLAN VIEW
1:25



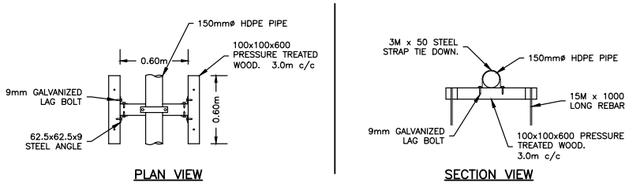
NESTABLE PIPE DETAIL SECTION A-A
1:25



LAGOON DEWATERING OUTLET INFRASTRUCTURE SECTION VIEW
1:25

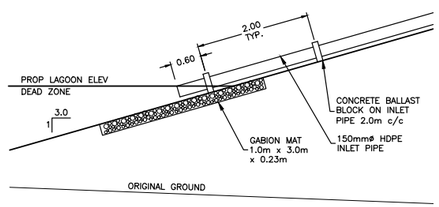


LAGOON DEWATERING PUMP INFRASTRUCTURE
1:25

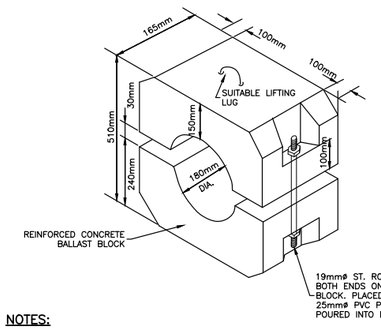


OUTLET PIPE SUPPORT
1:25

	CELL A	CELL B AND C
TOP OF BERM	27.80	27.10
FREEBOARD	1m FROM TOP OF BERM	1m FROM TOP OF BERM
ACTIVE ZONE	VARIES	VARIES
DEAD ZONE	1m FROM BOTTOM OF LAGOON	1m FROM BOTTOM OF LAGOON
BOTTOM OF LAGOON	VARIES	VARIES



LAGOON DEWATERING INLET
1:50



NOTES:

1. CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR CONCRETE BALLAST BLOCKS C/W REINFORCING.
2. CONTRACTOR TO USE 6.25mm THICK NEOPRENE SPONGE PADDING BETWEEN PIPE AND BLOCKS TO PREVENT CONTACT. WIDTH TO BE 180mm.

CONCRETE BALLAST BLOCK
N.T.S

NOTES

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DATE: SEPTEMBER 25, 2018

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3	ISSUED FOR 99% REVIEW	19/01/15	IPC	SLB
2	ISSUED FOR 75% REVIEW	21/11/14	IPC	SLB
1	ISSUED FOR REVIEW	13/03/12	SAB	SLB

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BASEPLAN: exp.
DESIGN: IPC
CHECKED: SLB
CAD: IPC
PROJ. MAN: SLB
APPROVED: SLB

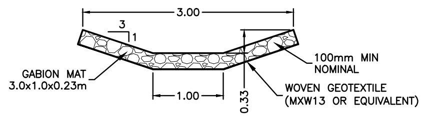
PROJECT
WASTEWATER TREATMENT FACILITY
IGLOOLIK, NUNAVUT

PROJ NO. OTCD00019838A
SURVEY exp.
DATE NOV. 2014

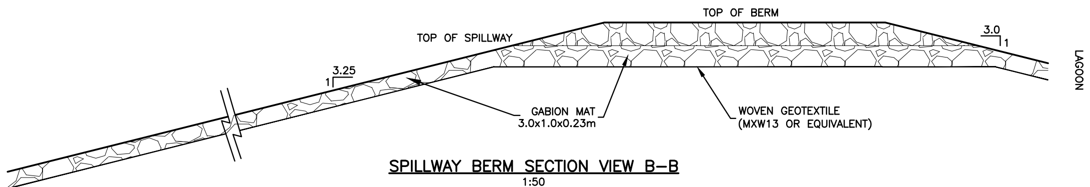
TITLE
DETAIL PLAN
PUMPING AND DEWATERING DETAILS

DRAWING NO. IGL-5

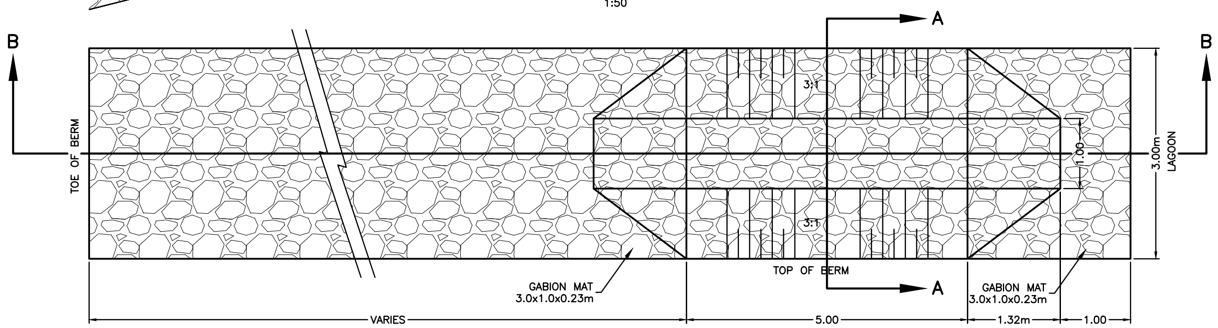
Pen Table: ---
Reference: Drawing: 04/05 - NEW LAGOON.dwg



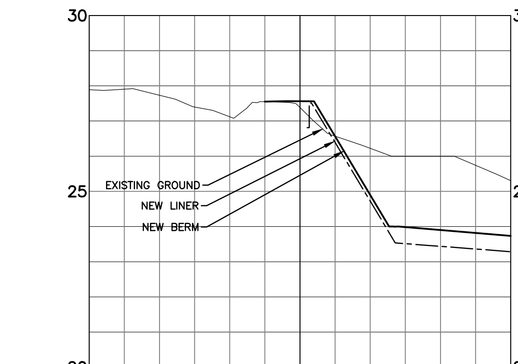
SPILLWAY DETAIL SECTION VIEW A–A
1:50



SPILLWAY BERM SECTION VIEW B–B
1:50

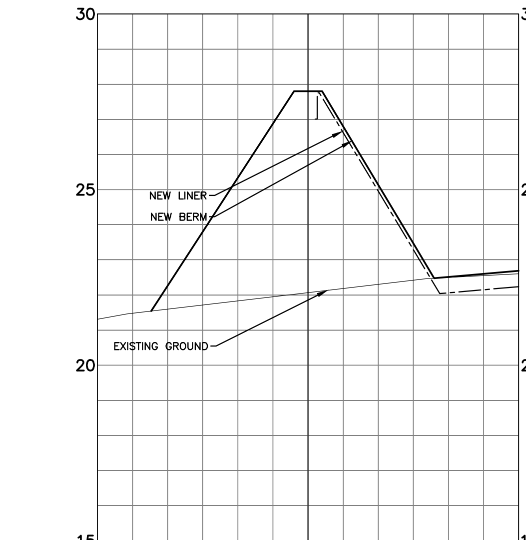


SPILLWAY BERM PLAN VIEW
1:50



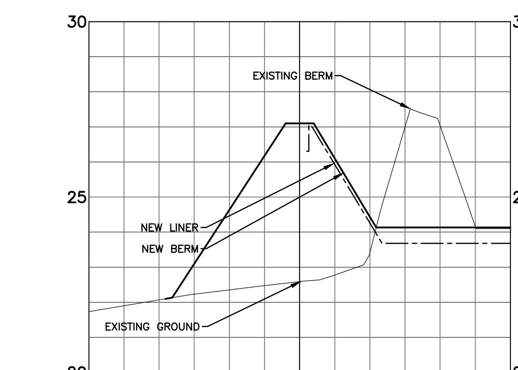
OFFSET	–25	–20	–15	–10	–5	0.00	5	10	15	20	25
PROPOSED ELEVATION					27.56	27.56	26.56	24.90	23.98	23.90	23.82
EXISTING ELEVATION	27.91	27.73	27.40	27.12	27.55	27.38	26.57	26.22	26.00	26.00	25.74

SECTION A (DWG NO. IGL–4 AND IGL–5)
1:500 HORIZ
1:100 VERT



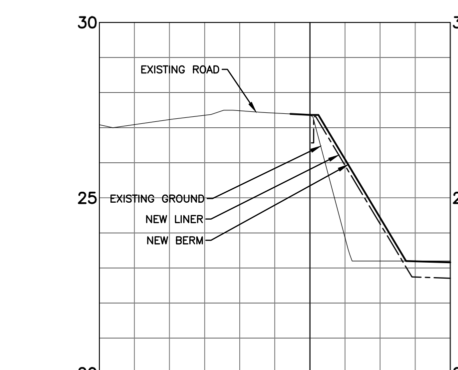
OFFSET	–25	–20	–15	–10	–5	0.00	5	10	15	20	25
PROPOSED ELEVATION		22.26	23.80	25.34	26.88	27.80	26.80	25.13	23.47	22.51	22.60
EXISTING ELEVATION	21.48	21.60	21.71	21.83	21.95	22.07	22.19	22.30	22.42	22.50	22.55

SECTION B (DWG NO. IGL–4 AND IGL–5)
1:500 HORIZ
1:100 VERT



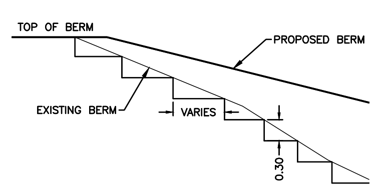
OFFSET	–25	–20	–15	–10	–5	0.00	5	10	15	20	25
PROPOSED ELEVATION		22.07	23.01	24.16	26.06	27.10	26.10	24.43			
EXISTING ELEVATION	21.90	22.07	22.23	22.35	22.47	22.59	22.78	23.41	27.00	27.03	24.17

SECTION C (DWG NO. IGL–4 AND IGL–5)
1:500 HORIZ
1:100 VERT

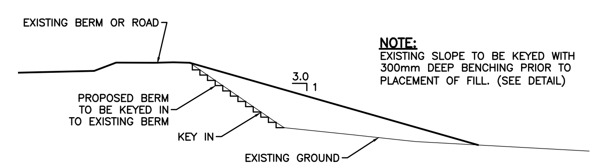


OFFSET	–25	–20	–15	–10	–5	0.00	5	10	15
PROPOSED ELEVATION					27.10	27.10	26.10	24.43	23.19
EXISTING ELEVATION	27.09	27.23	27.35	27.48	27.42	27.36	23.87	23.20	23.20

SECTION D (DWG NO. IGL–5)
1:500 HORIZ
1:100 VERT

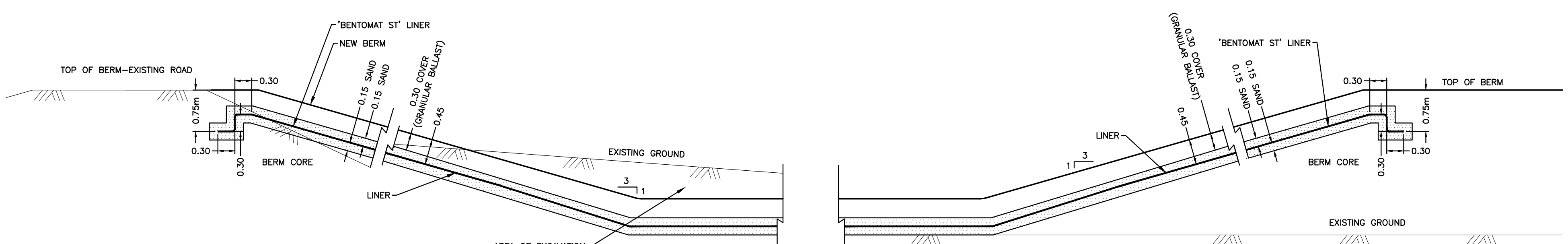


KEY IN DETAIL
1:50



NOTE:
EXISTING SLOPE TO BE KEYED WITH 300mm DEEP BENCHING PRIOR TO PLACEMENT OF FILL. (SEE DETAIL)

EXISTING BERM REHABILITATION DETAIL
1:200



LINER DETAIL
1:50

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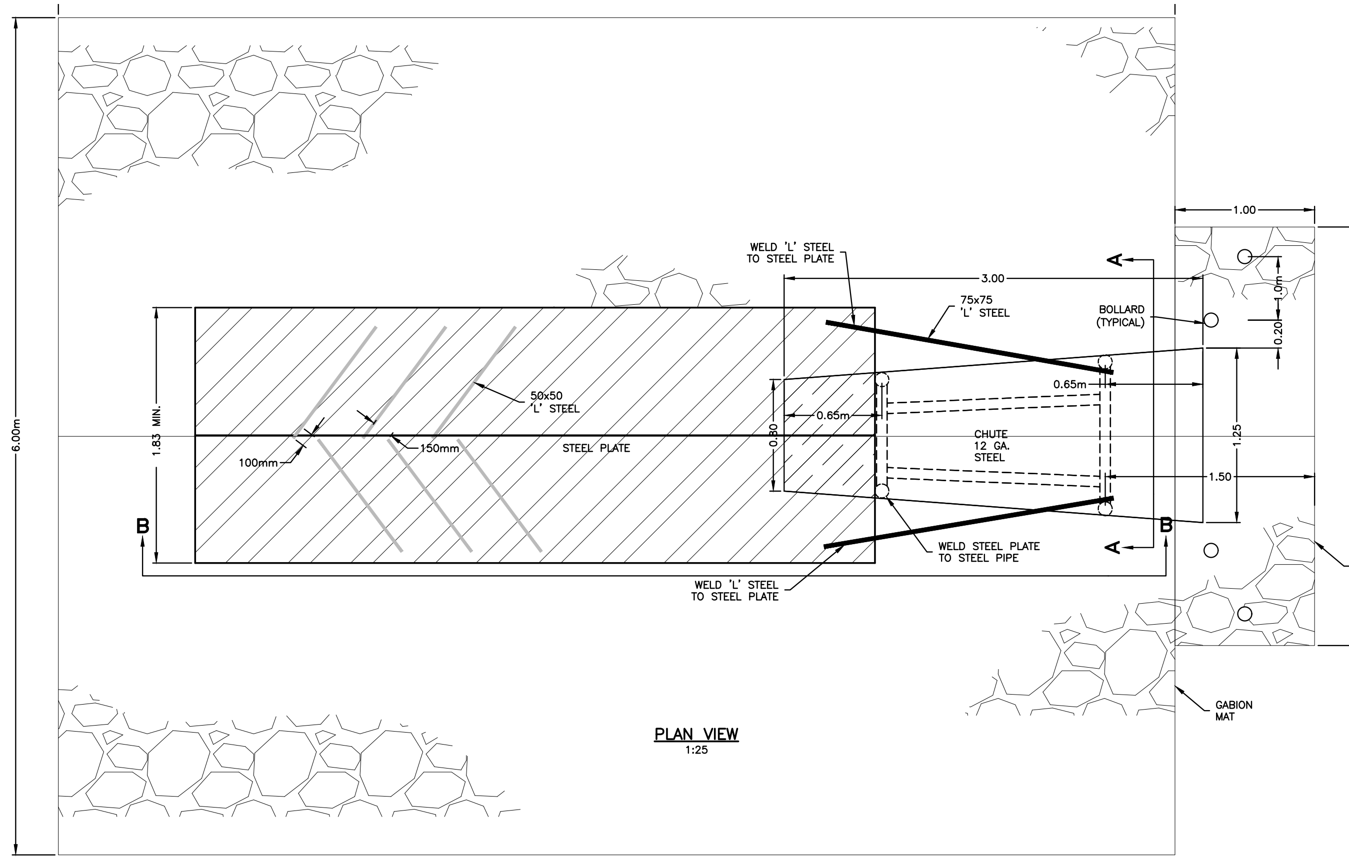
BASEPLAN: exp.
DESIGN: IPC
CHECKED: SLB
CAD: IPC
PROJ. MAN: SLB
APPROVED: SLB

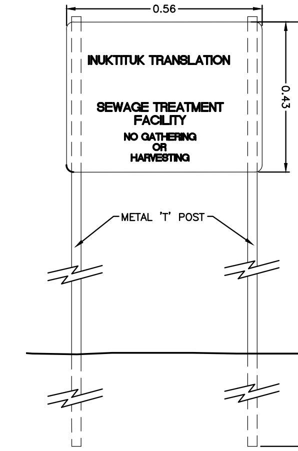
PROJECT
WASTEWATER TREATMENT FACILITY
IGLOOLIK, NUNAVUT

TITLE
DETAIL PLAN
LINER AND SPILLWAY DETAILS AND CROSS SECTIONS

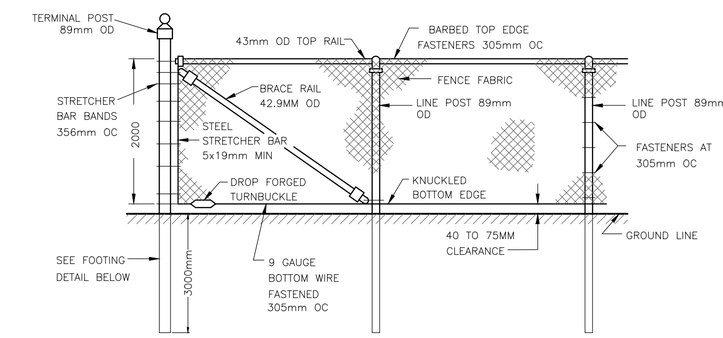
PROJ. NO.: OTCD00019838A
SURVEY: exp.
DATE: NOV. 2014
DRAWING NO.: IGL–6



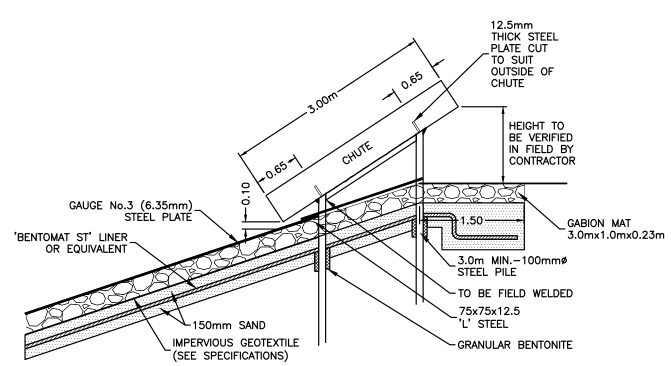
PLAN VIEW
1:25



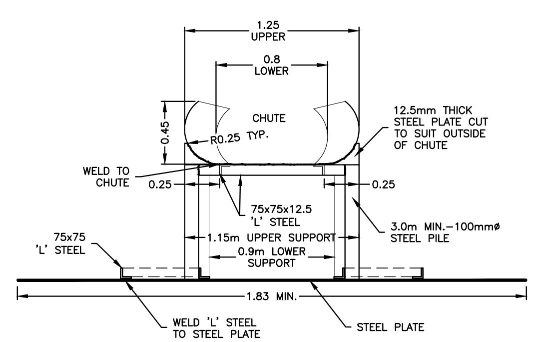
SIGN DETAIL
SCALE 1:10



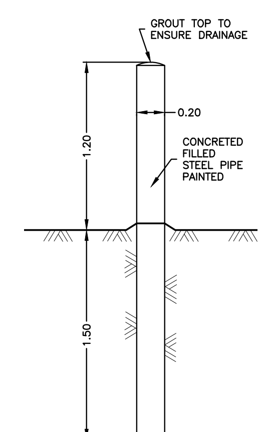
CHAIN LINK FENCE WITH TOP RAIL
N.T.S.



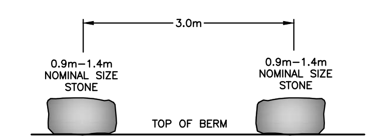
TRUCK DISCHARGE CHUTE SECTION B–B VIEW
1:50



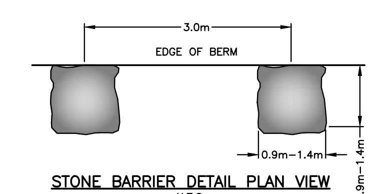
TRUCK DISCHARGE CHUTE SECTION A–A VIEW
1:25



BOLLARD DETAIL
1:25



STONE BARRIER DETAIL SECTION VIEW
N.T.S.



STONE BARRIER DETAIL PLAN VIEW
N.T.S.

References: Details.dwg; 04-05 - NEW LAGOON-asb.dwg

NOTES

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BASEPLAN	DESIGN	CHECKED	CAD	PROJ. MAN	APPROVED
exp.	IPC	SLB	IPC	SLB	SLB

PROJECT: WASTEWATER TREATMENT FACILITY
IGLOOLIK, NUNAVUT

TITLE: DETAIL PLAN
TRUCK DISCHARGE AND MISC. DETAILS

PROJ. NO.: OTCD00019838A
SURVEY: exp.
DATE: NOV. 2014
DRAWING NO.: IGL–7

Appendix D –
Sludge Management General Practices

SLUDGE MANAGEMENT GENERAL PRACTICES

The accumulation of settled solids is referred to as sewage sludge or biosolids . The accumulation of sludge by gravity sedimentation is one of the two main processes of treatment in a sewage lagoon. The sludge is not released to the environment and must be stored in a sludge zone in the base of the sewage cell.

A sewage lagoon may not require desludging during its design life as the available storage for the sludge might be greater than the quantity estimated to be generated. A sewage lagoon design typically accounts for the depth of sludge accumulation in lagoon cells.

Sludge Monitoring

The depth of sludge should be measured on a periodic basis to confirm the rate of sludge accumulation. The level of the sludge accumulation will be a factor in determining when desludging is required. Sludge monitoring for the purposes of determining the accumulation in the lagoon may be completed manually by either a physical sampling of the water column to observe the position of the top of the sludge zone, or by electronic measurement of the solids density of the water column to detect the top of the sludge zone. The periodic measure of the position of the sludge zone may be done every 5 years.

De-sludging

De-sludging involves removal of the sludge from the sludge zone of the lagoon cell and depositing into a sludge management lagoon. The sludge remains in the sludge management lagoon until it is naturally dewatered and conditioned for ultimate disposal into a landfill. The natural dewatering and conditioning reduce the water content, stabilizes the biodegradable material, and reduces the pathogens in the biosolids.

The process to naturally dewater and condition the sewage sludge occurs over a period of at least one freeze thaw cycle, which is approximately 18 months.

Prior to disposal of the sludge into the landfill, the sludge may be tested for solids content, pathogens and metal to ascertain its quality.

Sludge Management Cell

The sludge deposited in the sludge management cell undergoes processes to reduce the moisture, reduce the pathogenic organisms and reduce the odour. The processes of evaporation, sublimation and freeze thaw separation of the moisture accomplishes the reduction of the moisture from the biosolids. The reduction of pathogens occurs with time from the harsh environment of natural environment. The stabilization of the biosolids to reduce the anaerobic biological activity and the associated odour occurs with the exposure to the natural environment.

De-sludging Procedures

De-sludging operations consist of the removal of sludge from the lagoon cells and depositing it into the sludge management cell. The sewage lagoon system typically allows for de-sludging individual cells while active storage is continued to be provided.

Prior to removal of the sludge from the lagoon cells, the sludge must be tested to ensure the disposal method chosen is safe and environmentally responsible.

De-sludging procedures include:

- Advise the Nunavut Water Board of the intended de sludging activity 6 months in advance.
- Measure the sludge accumulation in each of the cells and prioritize the de sludging for the cell with the most sludge accumulation.
- Engage a qualified contracting resource for the desludging activity.
- Include a report from the contractor as part of the scope of work.
- Spill kit should be readily available in case spill occurs during de-sludging operations. Refer to the Spill Contingency Plan for the location of the spill kit and spill response procedures.
- Inspect the sludge cell for deterioration of the berm structures and complete remedial work as required.
- Prepare the area to safely position the desludging activity.
- Monitor the activity of the contractor.

Sludge Management Cell Operations

Activities conducted at the sludge management cell include Inspection of the berms of the sludge management cell for deterioration and the need for remedial work in advance of landfilling of sludge after it is dewatered and stabilized.

Appendix E –
Pump Specification and Capacity

COM—06487—01
October 5, 2011
REV B October 8, 2014

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS™

PA SERIES PUMP

MODEL

PA6A60—4045T

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A

www.grpumps.com.

Register your new
Gorman-Rupp pump online at
www.grpumps.com

Valid serial number and e-mail address required.

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

Please record your pump model and serial number in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

INTRODUCTION

Thank You for purchasing a Gorman-Rupp pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump.

This pump is a PA Series, priming-assisted centrifugal model. The unit is designed for handling non-volatile, non-flammable liquids containing specified entrained solids. The basic material of construction is ductile iron, with alloy steel shaft and ductile iron wear ring.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for every aspect of each specific application. Therefore, it is the responsibility of the owner/installer of the pump to ensure that applications not addressed in this manual are performed **only** after establishing that neither operator safety nor pump integrity are compromised by the installation. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

If there are any questions regarding the pump which are not covered in this manual or in other literature accompanying the unit, please contact your Gorman-Rupp distributor or the Gorman-Rupp Company:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901—1217
Phone: (419) 755—1011
or:
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631—2870

For information or technical assistance on the engine, contact the engine manufacturer's local dealer or representative.

The following are used to alert personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.

WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY - SECTION A

This information applies to Prime Aire® Series pumps. Refer to the manual accompanying the engine or power source before attempting to begin operation.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Shut down the engine and disconnect the positive battery cable to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature and make sure the pump is cool before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

This pump is equipped with an automatic starting system, and is subject to automatic restart. Keep hands and clothing away from the unit to prevent injury during automatic operation. Disconnect the positive battery cable before performing any maintenance. Failure to do so may result in serious personal injury.

WARNING!

Do not attempt to disengage any part of an overheated pump unit. Vapor pressure within the pump casing can eject these parts with great force when they are disengaged. Allow the pump to completely cool before servicing it.

WARNING!

This pump is designed to handle most non-volatile, non-flammable liquids containing specified entrained solids. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Attach lifting equipment to the lifting device fitted to the pump. If chains or cable are wrapped around the pump to lift it, make certain that they are positioned so as not to damage the pump, and so that the load will be balanced. The bail is intended for use in lifting the pump assembly only. Suction and discharge hoses and piping must be removed from the pump before lifting.

WARNING!

After the pump has been installed, make certain that the pump and all piping or

hose connections are tight, properly supported and secure before operation.

WARNING!

Do not operate the pump against a closed discharge valve. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode. Momentary closure of a discharge valve is acceptable only when required for startup or shutdown procedures.

WARNING!

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool completely before servicing.

WARNING!

This pump may be used to handle materials which could cause illness through direct exposure or emitted fumes. Wear adequate protective clothing when working on the pump or piping.

WARNING!

Do not operate the pump without guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers or tools, causing severe injury to personnel.

CAUTION

Make sure the pump is level. Lower jack stands and chock the wheels, if so equipped. Use caution when positioning the skid-mounted unit to prevent damage to the fuel tank.

DANGER!

Do not operate an internal combustion engine in an explosive atmosphere. When operating an internal combustion engine in an enclosed area, make sure exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless and odorless.

WARNING!

Fuel used by internal combustion engines presents an extreme explosion and fire hazard. Make certain that all fuel lines are securely connected and free of leaks. Never refuel a hot or running engine. Avoid overfilling the fuel tank. Always use the correct type of fuel.

WARNING!

Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. Refer to the performance curve on page E—1 for the maximum continuous operating speed for this pump.

INSTALLATION – SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

Most of the information pertains to a standard **static lift** application where the pump is positioned above the free level of liquid to be pumped.

If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line configuration, and priming must be tailored to the specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve.

For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

PREINSTALLATION INSPECTION

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

a. Inspect the pump for cracks, dents, damaged threads, and other obvious damage.

b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated. Note that the pump shaft rotates in the required direction.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **Maintenance and Repair Manual** and perform duties as instructed.

e. If the pump has been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

Battery Installation

Unless otherwise specified on the pump order, the engine battery is **not** included with engine driven units.

Refer to the information accompanying the battery and/or electrolyte solution for activation and charging instructions.

Before installing the battery, clean the positive and negative cable connectors, and the battery terminals. Secure the battery by tightening the holddown brackets. The terminals and clamps may be coated with petroleum jelly to retard corrosion. Connect and tighten the positive cable first, then the negative cable.

POSITIONING PUMP

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Attach lifting equipment to the lifting device fitted to the pump. If chains or cable are wrapped around the pump to lift it, make certain that they are positioned so as not to damage the pump, and so that the load will be balanced. The bail is intended for use in lifting the pump assembly only. Suction and discharge hoses and piping must be removed from the pump before lifting.

Lifting

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses or piping before attempting to lift existing, installed units.

CAUTION

The pump assembly can be seriously damaged if the chains or cables used to lift and move the unit are improperly wrapped around the pump.

Mounting

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation. The pump may have to be supported or shimmed to provide for level operation and eliminate vibration.

For engine driven units, the pump **must** be positioned as level as possible to ensure sufficient lubrication and fuel supply to the engine.

If the pump has been mounted on a moveable base, make certain the base is stationary by setting the brake and blocking the wheels before attempting to operate the pump.

WARNING!

If the pump has been mounted on a movable base, do not attempt to operate the pump unless the unit is level. Be sure the leveling stands are positioned on a solid surface, and the wheels are chocked.

SUCTION AND DISCHARGE PIPING

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve and operating range shown on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

Materials

Either pipe or hose maybe used for suction and discharge lines; however, the materials must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could

cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

Gauges

The pump is drilled and tapped for installing discharge pressure and vacuum suction gauges. It is recommended that gauges be installed to monitor pump performance. Seal the gauge threads with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

Strainers

Be certain to use the strainer furnished with the pump; any spherical solids which pass through the strainer will also pass through the pump itself.

If a strainer not furnished with the pump is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 3 inch (76,2 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1 1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance 1-1/2 times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

Suction Line Positioning

The depth of submergence of the suction line is critical to **efficient** pump operation. Figure 2 shows recommended minimum submergence vs. velocity.

Although not recommended, the vacuum assisted priming feature allows the pump to be operated

temporarily in a “slurping” application with varying water levels.

NOTE

The pipe submergence required may be reduced by installing a standard pipe increaser fitting at the end of the suction line. The larger opening size will reduce the inlet velocity. Calculate the required submergence using the following formula based on the increased opening size (area or diameter).

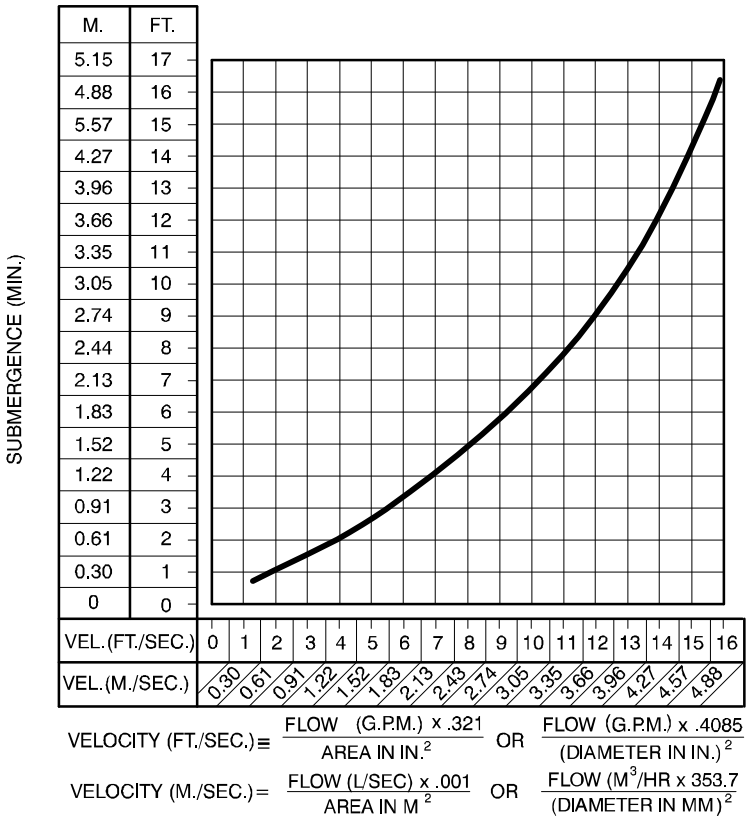


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

DISCHARGE LINES

Siphoning

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action causing damage to the pump could result.

Valves

This pump is designed with a check valve in the discharge line.

If a throttling valve is desired in the discharge line, use a valve as large as the largest pipe to minimize friction losses. Never install a throttling valve in a suction line.

With high discharge heads, it is recommended that a throttling valve be installed in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

ALIGNMENT

The alignment of the pump, air compressor and engine is critical for trouble-free mechanical operation. See Section E, **Securing Intermediate And Drive Assembly To Engine** in **MAINTENANCE AND REPAIR**, for details.

AUTO-START

The standard pump is equipped with an auto-start control system which allows the pump to start and stop as the liquid level in the wet well or sump rises and falls.

Refer to the information which follows for installation details for the liquid level sensing system provided with your pump.

Float Switch Installation

The Float Switch autostart system employs either a single or double float switch, where a bulb raises or lowers (floats) with the liquid level, thus activating an enclosed miniature switch. The floats are equipped with a socket type connector that plugs into a matching receptacle on the auto-start control box.

Standard floats are equipped with 50 feet (15,2 m) of cable.

When installing the floats, note the following:

a. **Be sure** to provide sufficient room in the wet well or sump so that floats do not get obstructed or drawn into the suction line. If a flexible suction hose is used, it may be extended to lay along the bottom of the wet well or sump and the float can be attached to the hose above the point where it bends along the bottom. Direct the suction line toward the flow, and the float(s) away from the flow. If a standpipe is available, attach the float switch cable to the standpipe in the sump at the approximate desired liquid level.

b. In a single float system, the cable can be tethered to the suction line or standpipe approximately 6 inches (152 mm) above the float. This setting allows approximately 9 inches (229 mm) of liquid rise between pump start/stop. The start/stop interval may be increased by extending the float end of the cable. The liquid level in the sump will increase approximately 8 inches (203 mm) between start/stop intervals for every 6 inches (152 mm) of cable increase.

c. If a double float switch system is used, position the “Start” float at the desired high water level in the sump, and the “Stop” float at the desired low water level in the pump.

d. Refer to Figure 3 for additional float switch data.

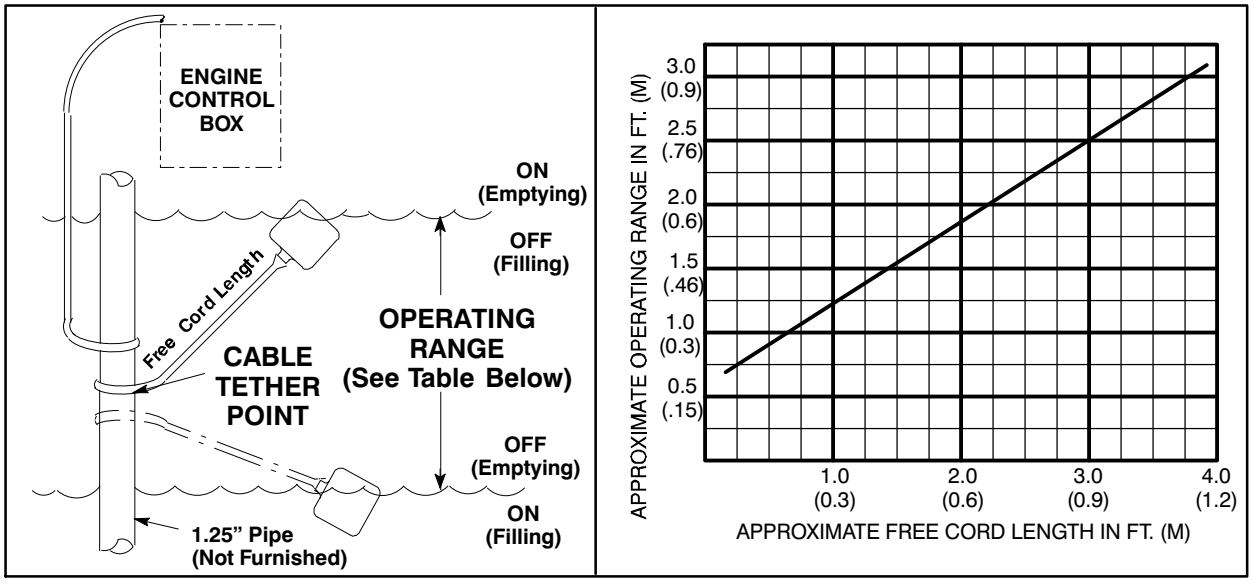


Figure 3. Float Switch Data

OPERATION — SECTION C

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.

DANGER!

Do not operate an internal combustion engine in an explosive atmosphere. When operating an internal combustion engine in an enclosed area, make sure exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless and odorless.

OPERATION

WARNING!

This pump is designed to handle most non-volatile, non-flammable liquids containing specified entrained solids and corrosives. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

CAUTION

Pump speed and operating condition points must be within the continuous performance range shown on the performance curve in Section E on page E—1.

PRIMING

Install the pump and piping as described in **INSTALLATION**. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

The pump will begin to prime upon startup. The air in the suction line will be discharged from the eductor discharge line. Complete priming is indicated by a positive discharge pressure reading.

If full priming is not achieved, the discharge check valve may be malfunctioning. If this occurs, shut down the pump and consult **Maintenance and Repair,** Section E for further details.

STARTING

Check the fuel level and oil levels in the engine, air compressor, pump bearings and seal housing.

Make sure the pump is level. Lower the jack stands and chock the wheels, if so equipped.

CAUTION

Make sure the pump is level. Lower jack stands and chock the wheels, if so equipped. Use caution when positioning the skid-mounted unit to prevent damage to the fuel tank.

WARNING!

This pump is equipped with automatic liquid level controls, and is subject to automatic restart. Keep hands and clothing away from the unit to prevent injury during automatic operation. Disconnect the positive battery cable before performing any maintenance. Failure to do so may result in serious personal injury.

Consult the engine operations manual before attempting to start the unit.

Manual Starting

On initial start-up, set the engine speed at the half-throttle position. Turn the key switch on the control

box to the “MANUAL” position, then press and hold the “ENTER” button until the engine starts.

CAUTION

Pump speed and operating condition points must be within the continuous performance range shown on the curve on Page E-1.

Automatic Starting

With the float system installed, follow the procedures outlined for manual starting and adjust the throttle to the desired flow rate. Turn the key switch to “OFF”, then move it to the “AUTO” position.

The pump will start automatically when the liquid level in the sump or wet well increases and the float(s) rise to the “on” position. An alarm will sound and the control box will begin a countdown display before the unit starts. When the liquid is sufficiently pumped down, the unit will automatically shut down.

The unit can be stopped while in the “AUTO” mode by moving the key switch to the “OFF” position.

NOTE

If the key switch is moved to the “OFF” position while in the “AUTO” mode, the engine will stop. However, the auto-start process will continue as soon as the key switch is moved back to the “AUTO” position.

The control panel is equipped with high oil temperature, low oil pressure, engine overspeed and engine overcrank safety shutdowns. If any of these problems occur, the engine will not start. When the problem is corrected, turn the key switch to the “OFF” position to reset the control.

Priming

The pump will begin to prime upon startup. The air in the suction line will be discharged from the eductor discharge line. Complete priming is indicated by a positive discharge pressure reading.

If full priming is not achieved, the discharge check valve may be malfunctioning. If this occurs, shut down the pump and consult the separate **Maintenance and Repair** manual for further details.

Routine Operation

DANGER!

Do not operate an internal combustion engine in an explosive atmosphere. When operating an internal combustion engine in an enclosed area, make sure exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless and odorless.

Adjust the engine speed to achieve the desired output. Do not exceed the factory set engine speed and system operating pressure. Do not operate below the recommended operating speed (if applicable).

WARNING!

Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. Refer to the performance curve on page E—1 for the maximum continuous operating speed for this pump.

Operation In Extreme Heat

The safety shutdown system will automatically stop the unit if engine operating temperature exceeds design limits. If engine over-temperature shutdown occurs, allow the unit to cool before restarting.

If engine overheating continues, check the engine lubricant level and viscosity. Consult the engine operation manual for the recommended lubricant for operation in extreme heat.

If the unit is being operated in the **automatic** mode, adjust the float(s) to allow shorter run and longer cooling periods, if possible.

WARNING!

This pump is equipped with automatic liquid level controls, and is subject to automatic restart. Keep hands and clothing away from the unit to prevent injury during automatic operation. Disconnect the battery before performing any maintenance. Failure to do so may result in serious personal injury.

OPERATIONAL CHECKS

Leakage

Once the pump is fully primed, no leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Pump Vacuum Check

Read the vacuum gauge with the pump primed and at operation speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum gauge.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160° F (71°C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump immediately and allow it to completely cool before servicing it. **Approach any over-heated pump cautiously**.

WARNING!

Allow an over-heated pump to completely cool before servicing. Do not remove plates, covers, gauges, or fittings from an overheated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

Strainer Check

Check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. Monitor and record the vacuum suction gauge readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

STOPPING

Manual Stopping

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

In the manual mode, reduce the throttle speed slowly, and allow the engine to idle briefly before switching the engine key switch to ‘OFF’.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

After stopping the pump, switch off the engine ignition and remove the key to ensure that the pump will remain inoperative.

Automatic Stopping

In the automatic mode, the pump will stop when the liquid in the wet well or sump lowers and activates the “Off” float switch(s). The pump will restart automatically when the liquid rises and activates the “On” float switch(s).

Safety Shutdown System

The unit is equipped with a safety system to automatically shut down the engine under certain conditions. The engine will automatically shut down:

1. If the engine exceeds its safe operating temperature.
2. If the engine oil pressure drops below design limits.
3. If the engine fails to start within a pre-set period of time.
4. If the engine speed exceeds the safe operating range.
5. If the engine fan belt breaks.

Lights on the control panel will indicate which of the safety features has caused the engine to shut down.

Should any of the safety features cause the engine to shut down, **the cause must be determined and corrected** before putting the unit back into service. The engine **will not restart** until the key switch has been returned to the ‘OFF’ position for at least 10 seconds.

All safety shutdown features are pre-set at the factory for optimum performance and safety; **do not** attempt to adjust these settings.

WARNING!

Never disconnect any of the safety shutdown features; this will void the warranty and could result in serious damage to the unit and/or injury to personnel. Safety shutdown features are pre-set at the factory; do not attempt to adjust any of the settings. Determine the cause of shutdown before putting the unit back into service. Consult the factory for additional information.

PERIODIC CHECKS

Seal Cavity And Bearing Lubrication

Both the seal and bearing cavities were fully lubricated at the factory. Check the lubrication levels before startup, and regularly thereafter as indicated in Section E, **Maintenance and Repair**. When lubrication is required, use **only** SAE No. 30 non-detergent oil.

Bearing Temperature Check

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160°F (71°C) are considered normal for bearings, and they can operate safely to at least 180°F (82°C).

Checking bearing temperatures by hand is inaccurate. Bearing temperatures can be measured accurately by placing a contact-type thermometer against the housing. Record this temperature for future reference.

A sudden increase in bearing temperatures is a warning that the bearings are at the point of failing to operate properly. Make certain that the bearing lubricant is of the proper viscosity and at the correct level (see **LUBRICATION** in Section E, **Maintenance and Repair**). Bearing overheating can also be caused by shaft misalignment and/or excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Continued operation should bring the temperatures down to normal levels.

Engine Fuel Filter

Consult the manual accompanying the engine, and change the fuel filter periodically as indicated. If operated under extremely dusty and/or humid

conditions, change the filter more frequently. Irregular performance and loss of power usually indicate a dirty fuel filter.

Engine Oil

The engine was lubricated for test at the factory. However, **always** check the lubrication level before startup.

Consult the manual accompanying the engine, and change the oil filter periodically as indicated. If operated under extremely dusty conditions, change the filter more frequently.

Consult the manual accompanying the air compressor and preform all duties and checks as indicated.

COLD WEATHER PRESERVATION

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts. If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from completely draining, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

TROUBLESHOOTING — SECTION D

Review all SAFETY information in Section A.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Shut down the engine and disconnect the positive battery cable to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

This pump is equipped with an automatic starting system, and is subject to automatic restart. Keep hands and clothing away from the unit to prevent injury during automatic operation. Disconnect the positive battery cable before performing any maintenance. Failure to do so may result in serious personal injury.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Discharge check valve contaminated, damaged, or unable to seat.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION**.
	Air compressor damaged or belts broken.	Check and repair/replace.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Eductor clogged.	Check and clean eductor.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Strainer clogged.	Check strainer and clean if necessary.
	Discharge check valve clogged.	Check and clean check valve.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.
	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Impeller clogged.	Free impeller of debris.
	Discharge head too high.	Install bypass line.
	Suction lift too high.	Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.
	Pump speed too slow.	Check engine output; consult engine operation manual.
	Belt or flexible coupling broken.	Check and replace as necessary.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check engine output.
	Extreme ambient temperature.	Reduce pump output.
	Discharge head too low.	Adjust discharge valve.
	Fuel filter clogged.	Check & replace often in extreme operating conditions.
	Liquid solution too thick.	Dilute if possible.
	Fuel contaminated.	Check and replace as required.
	Pump or jack shaft bearing(s) frozen.	Disassemble, check and replace bearing(s) as required..
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
	Liquid solution too thick.	Dilute if possible.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check piping installation for proper support.
	Drive misaligned.	Align drive properly.
	Excessive tension on drive belt.	Check belt tension. Adjust as required.

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

Preventive Maintenance Schedule

Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr's Literature					

Legend:
I = Inspect, Clean, Adjust, Repair or Replace as Necessary
C = Clean
R = Replace

* Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

PUMP MAINTENANCE AND REPAIR – SECTION E

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

WARNING!

Before attempting to install, operate, or service this pump, familiarize yourself with this manual, and with all other literature shipped with the pump. Unfamiliarity with all aspects of operation or maintenance could lead to destruction of equipment, injury or death to personnel.

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. If slings or chains are used to move the pump or components, make sure that the load is balanced; otherwise serious personal injury or death could result. The bail is intended for use in lifting the pump assembly only. Suction and discharge hoses and piping must be removed from the pump before lifting.

The maintenance and repair instructions in this manual are keyed to the sectional views and the corresponding parts lists on the following pages.

This manual provides troubleshooting instructions required to properly diagnose operational problems. Maintenance instructions within this manual are limited to the pump hydraulic, priming and drive components only. Maintenance of engines and factory-supplied air compressors are detailed in separate literature provided by the manufacturer(s).

Check **TROUBLESHOOTING**, Section D to determine causes and remedies of pump problems. Disassemble the pump only as far as required.

As described in **SAFETY**, Section A, this manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established shop procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Select a suitable location, preferably indoors, to perform required maintenance. All work must be performed by qualified personnel.

Lifting

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses or piping before attempting to lift existing, installed units.

For the approximate weight of your pump, refer to the pump specification data sheet or contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

ILLUSTRATION

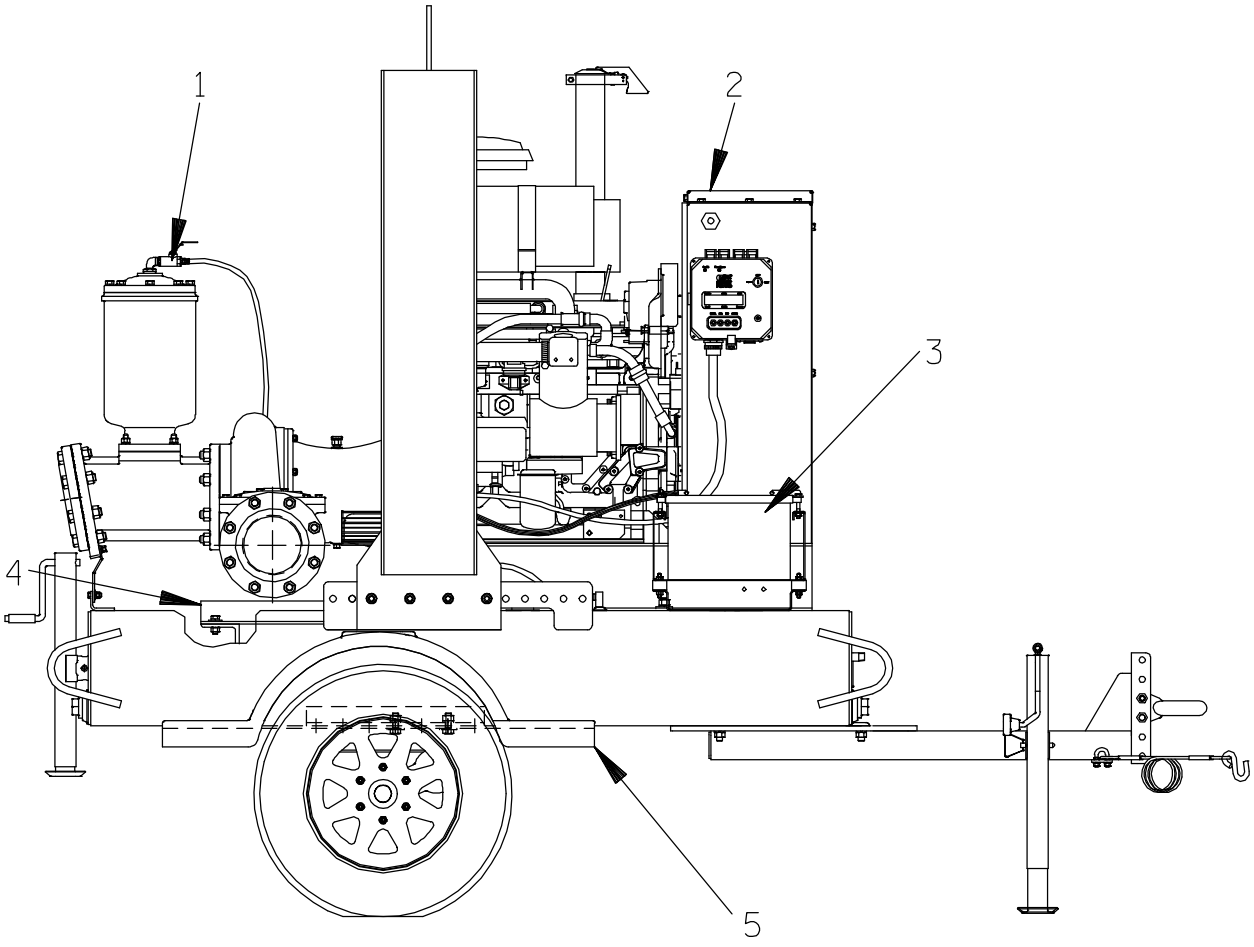


Figure 1. Pump Model PA6A60—4045T

Pump Model PA6A60–4045T

PARTS LIST

(CANADA S/N 1498445 Up)

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	
1	PUMP END ASSEMBLY	PA6A60–(SAE 4/10)	–––	1	
2	POWER UNIT	46143–114	–––	1	
3	BATTERY	29331–527	–––	1	(REF)
4	PUMP MOUNTING KIT	48157–033	–––	1	
5	WHEEL KIT (OPTIONAL)	GRP30–262	–––	1	
NOT SHOWN:					
	G-R DECAL	GRC06	–––	3	
	PRIME AIRE DECAL	38812–078	–––	2	
	INSTRUCTION TAG	38817–085	–––	1	
	CAUTION DECAL	2613FJ	–––	1	

ILLUSTRATION

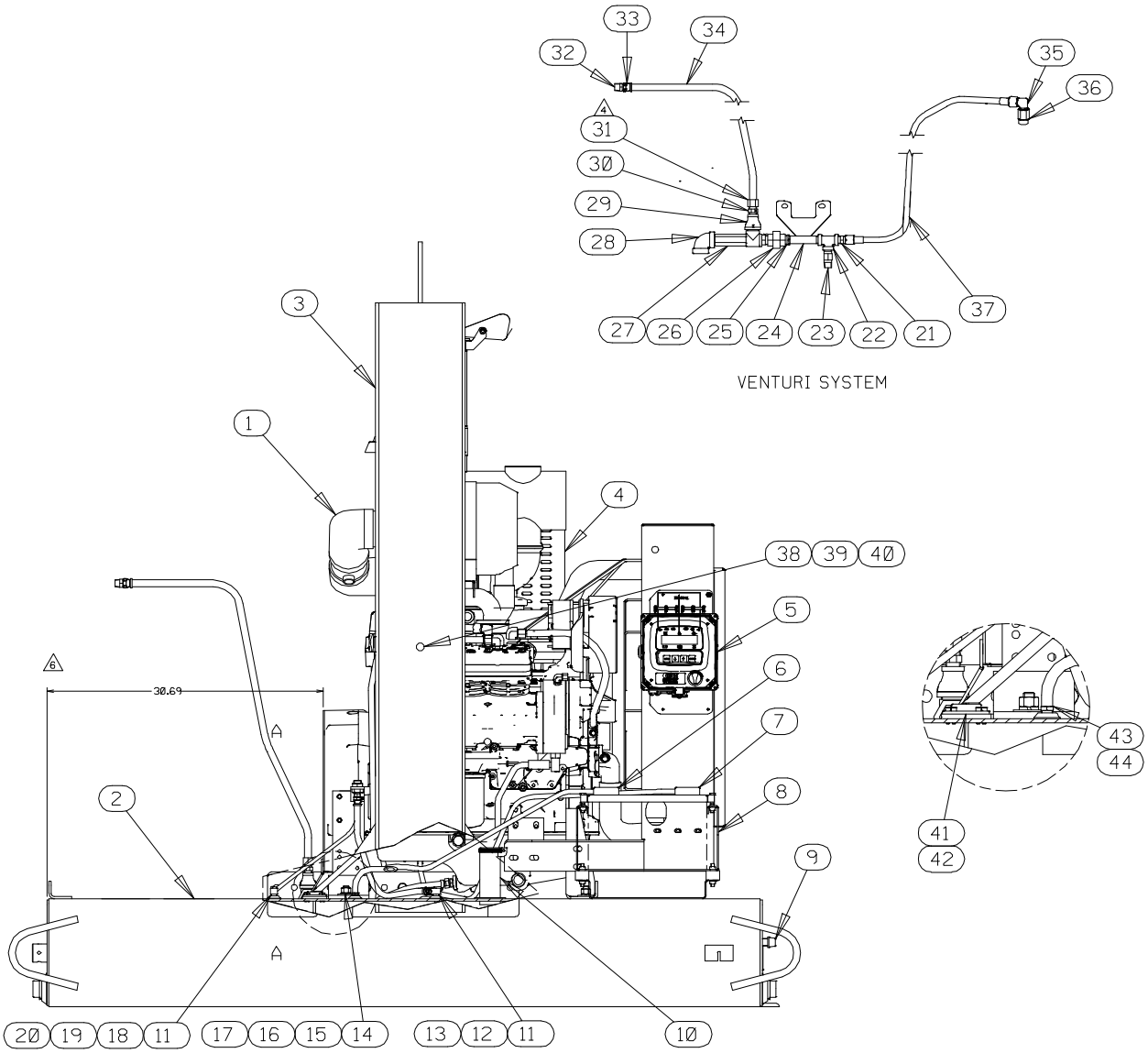


Figure 2. 46143–114 Power Unit Kit

PARTS LIST
46143–114 Power Unit Kit

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	J.D. ENGINE	29224–373	–––	1
2	BASE/FUEL TANK	41553–029	24150	1
3	LIFTING BAIL KIT	48274–804	–––	1
4	MUFFLER GRD ASSY	42331–061	–––	1
5	CONTROL PANEL	48122–543	–––	1
6	NEG BATT CABLE	47311–173	–––	1
7	POS BATT CABLE	47311–118	–––	1
8	BATTERY BOX KIT	42432–005	–––	1
9	OIL DRAIN ASSY	46342–013	–––	1
10	FUEL GAUGE	29332–111	–––	1
11	FUEL PICKUP/RETURN	29332–145	–––	2
12	CONNECTOR	S1447	–––	2
13	HOSE ASSY	46341–787	–––	1
14	FLAT WASHER	K10	15991	8
15	HEX HD CAPSCREW	B1008	15991	4
16	LOCK WASHER	J10	15991	4
17	HEX NUT	D10	15991	4
18	HOSE BARB FITTING	26523–386	–––	2
19	HOSE CLAMP	26518–641	–––	2
20	HOSE	11308G	–––	1
21	CONNECTOR	26351–065	–––	1
22	PIPE TEE	U08	11999	1
23	PRESS RELIEV VALVE	26662–028	–––	1
24	VENTURI MTG BRACKET	41888–199	24150	1
25	RED PIPE BUSHING	AP1208	15079	1
26	PIPE UNION	AH12	11999	1
27	VENTURI	26817–001	–––	1
28	PIPE ELBOW	R16	11999	1
29	REDUCING COUPLING	AE1608	15079	1
30	CHECK VALVE	26641–092	–––	1
31	HOSE BARB FITTING	26523–446	–––	1
32	CONNECTOR	S1598	–––	1
33	HOSE BARB FITTING	26523–047	–––	1
34	.50 ID X 60 IN LG HOSE	18513–113	–––	1
35	MALE ELBOW	26341–310	–––	1
36	HEX ADAPTOR	26523–188	–––	1
37	HOSE ASSY	46341–427	–––	1
38	AIR VENT	S1703	–––	1
39	HOSE BARB FITTING	26523–447	–––	1
40	CABLE TIE	27111–218	–––	1
41	MECH FUEL GUAGE ASSY	29332–173	–––	1
42	SOC HEAD CAPSCREW	BD#10–03S	15991	5
43	HOSE BARB FITTING	26523–389	–––	1
44	HOSE	18513–302	–––	3
NOT SHOWN:				
	ENGINE STARTUP TAG	38816–269	–––	1
	WARNING DECAL	38816–203	–––	4
	INSTRUCTION DECAL	38818–144	–––	1
	FLOAT SWITCH KIT	48312–980	–––	1

ILLUSTRATION

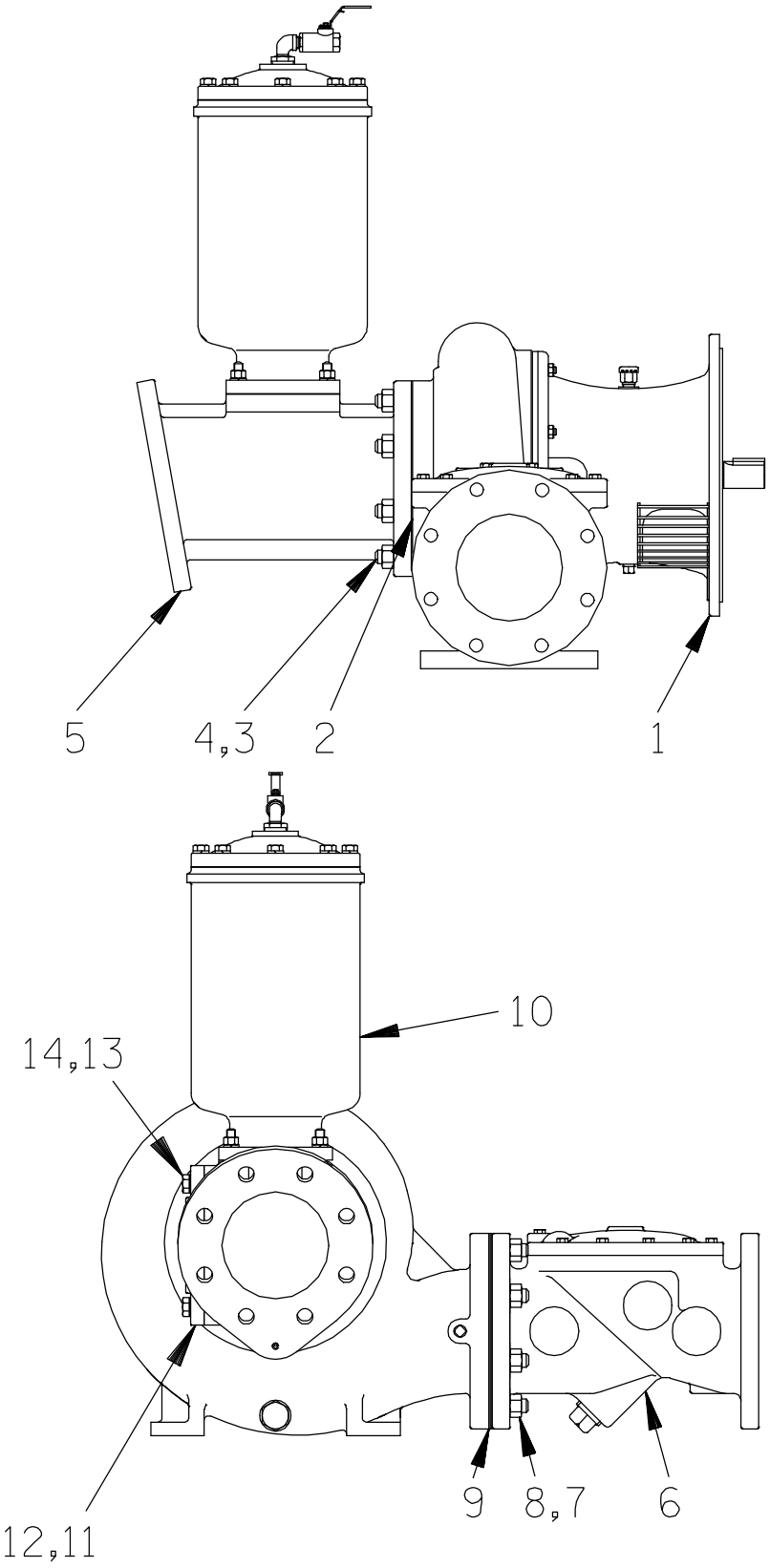


Figure 3. PA6A60–(SAE 4/10) Pump End Assembly

PA6A60–(SAE 4/10) Pump End Assembly

PARTS LIST

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PUMP MODEL ASSY	66E60–(SAE 4/10)	–––	1
2	✳	FLANGE GASKET	1679G	18000	1
3		STUD	C1211	15991	8
4		HEX NUT	D12	15991	8
5		HOPPER SPOOL	38642–507	–––	1
6		DISCH CHECK VALVE ASSY	26642–126	–––	1
	✳	–FLAPPER	26688–001	–––	1
	✳	–COVER O-RING	25152–377	–––	1
7		STUD	C1211	15991	8
8		HEX NUT	D12	15991	8
9	✳	CHECK VALVE GASKET	25113–036	–––	1
10		PRIMING CHAMBER ASSEMBLY	48275–005	–––	1
11		4" BLIND FLANGE	25353–908	–––	1
12	✳	4" GASKET	25113–034	–––	1
13		HEX HEAD CAP SCREW	B1008	15991	8
14		LOCKWASHER	J10	15991	8
NOT SHOWN:					
		G-R DECAL	GR–06	–––	1
		LUBE DECAL	38816–079	–––	1
		SUCTION STICKER	6588AG	–––	1
		DISCHARGE STICKER	6588BJ	–––	1
		WARNING DECAL	2613FE	–––	1
		STRAINER	7823A	24000	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

ILLUSTRATION

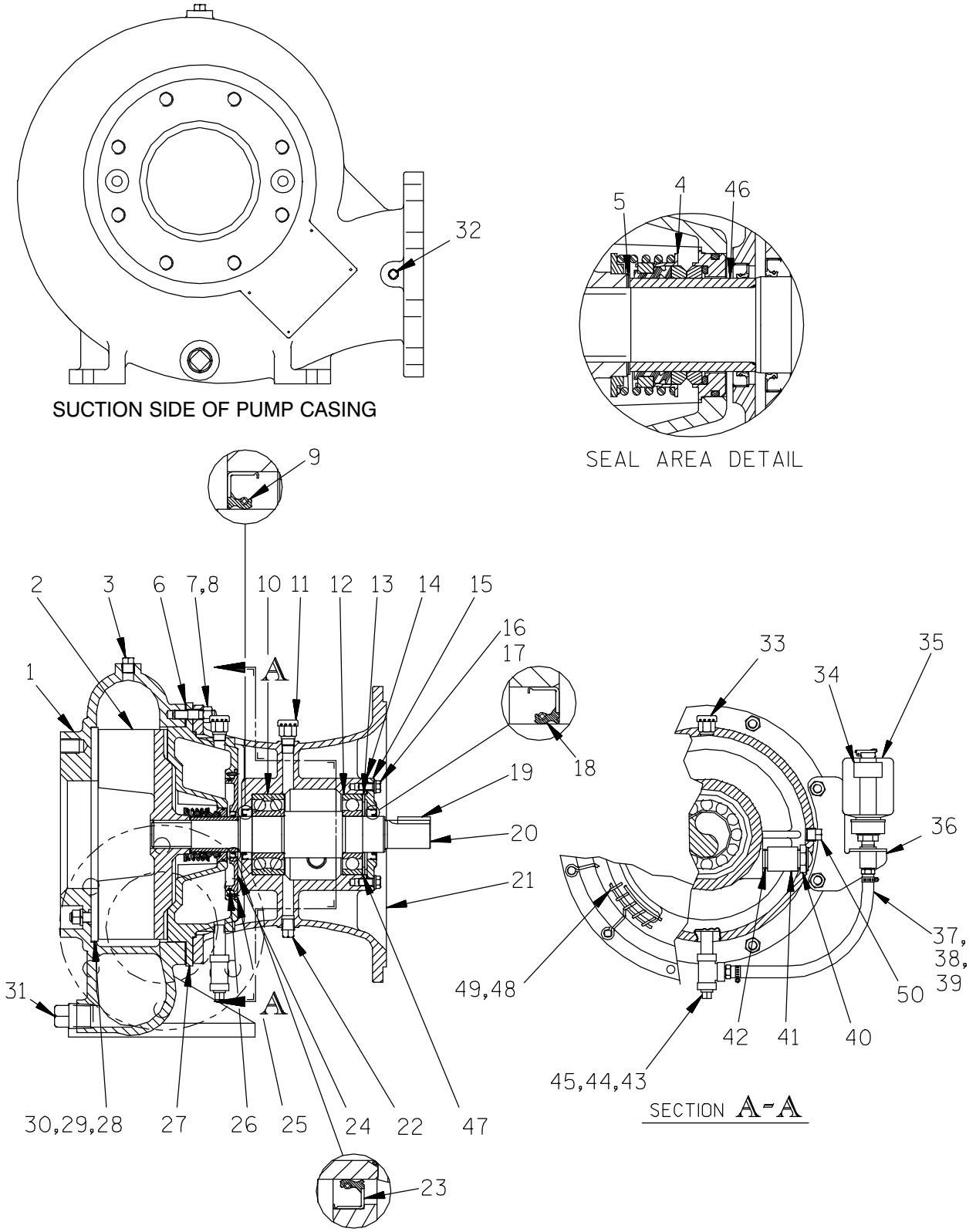


Figure 4. 66E60–(SAE 4/10) Pump End Assembly

PARTS LIST
66E60–(SAE 4/10) Pump End Assembly

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PUMP CASING	38218–014	10000	1
2	✳	IMPELLER ASSY	46151–409	–––	1
3		PIPE PLUG	P06	15079	1
4	✳	SEAL ASSY	46512–048	–––	1
5	✳	ADJ SHIM SET	5091	17090	1
6	✳	CASING GASKET SET	34G	18000	1
7		STUD	C0809	15991	8
8		HEX NUT	D08	15991	8
9	✳	OIL SEAL	25258–622	–––	1
10	✳	INBOARD BALL BEARING	23421–461	–––	1
11		AIR VENT	S1703	–––	1
12	✳	OUTBOARD BALL BRG	S1077	–––	1
13		THRUST WASHER	31133–197	15210	1
14	✳	BRG COVER GSKT	5413G	18000	1
15		BEARING CAP	4185A	10010	1
16		HEX HD CAPSCREW	B0604	15991	4
17		LOCKWASHER	J06	15991	4
18	✳	OIL SEAL	25258–622	–––	1
19	✳	IMP SHAFT KEY	N0607	15990	1
20	✳	IMPELLER SHAFT	38514–807	1706H	1
21		INTERMEDIATE	38263–614	10010	1
22		BRG CAV DRAIN PLUG	P06	15079	1
23	✳	OIL SEAL	25258–620	–––	1
24		SEAL PLATE COVER	38242–707	10000	1
25		FH MACHINE SCREW	Y#10–02	15991	4
26	✳	SEAL PLATE O-RING	25152–256	–––	1
27		SEAL PLATE	38272–527	10000	1
28	✳	WEAR PLATE ASSY	46451–746	24150	1
29		HEX NUT	D08	15991	2
30		LOCKWASHER	J08	15991	2
31		PIPE PLUG	P16	10009	1
32		PIPE PLUG	P04	15079	1
33		AIR VENT	S1703	–––	1
34		OIL LEVEL DECAL	38816–123	–––	1
35		BOTTLE OILER	26713–004	–––	1
36		BOTTLE OILER BRKT	41881–619	24150	1
37		MALE CONNECTOR	26523–409	–––	2
38		HOSE	18513–054	–––	1
39		HOSE CLAMP	26518–642	–––	2
40		OIL LVL SIGHT GAUGE	S1471	–––	1
41		PIPE COUPLING	AE12	15079	1
42		PIPE NIPPLE	T12	15079	1
43		PIPE NIPPLE	T0608	15079	1
44		PIPE TEE	U06	11999	1
45		SEAL CVTY DRAIN PLUG	P06	15079	1
46	✳	SHAFT SLEEVE	31163–016	1706H	1
47	✳	BRG SHIM SET	8546	15990	1
48		INTERMEDIATE GUARD	42381–031	24152	1
49		INTERMEDIATE GUARD	42381–032	24152	1
NOT SHOWN:					
		DRIVE ASSY	44162–119	–––	1
		NAME PLATE	38818–127	13000	1
		DRIVE SCREW	BM#04–03	17000	4

✳ INDICATES PARTS RECOMMENDED FOR STOCK

ILLUSTRATION

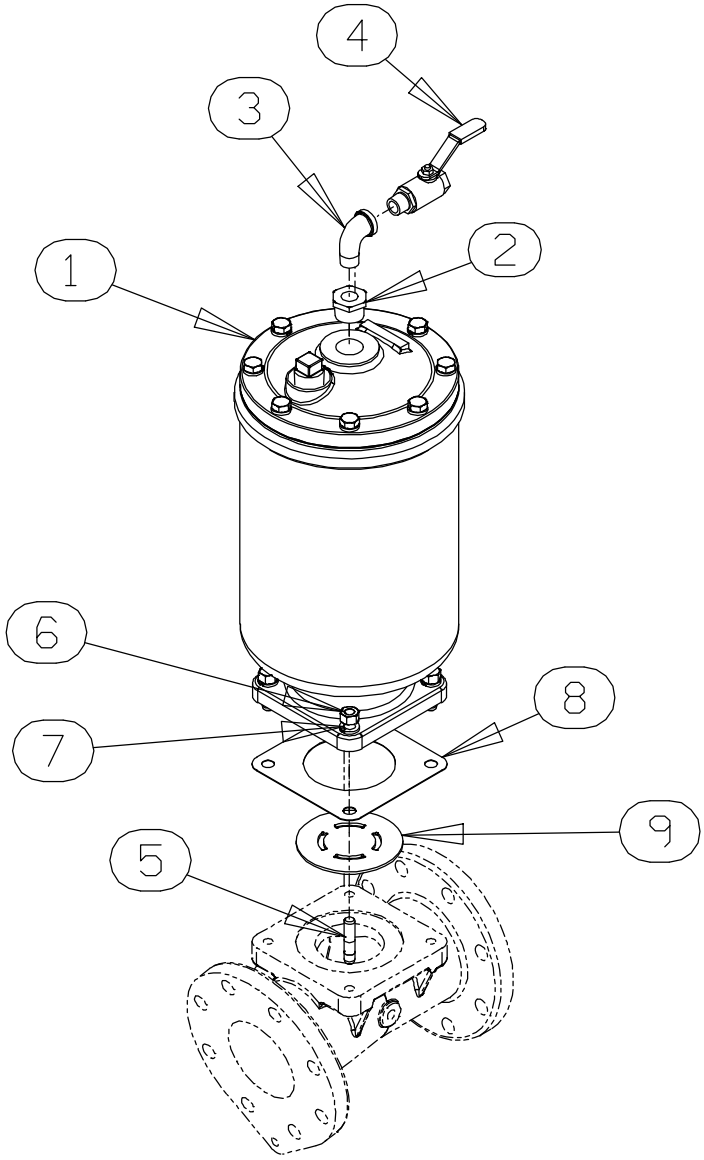


Figure 5. 48275−005 Priming Chamber Kit

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PRIMING CHAMBER ASSY	46112−709	−−−	1
2		PIPE BUSHING	AP1608	11999	1
3		STREET ELBOW	RS08	11999	1
4		BALL VALVE	26631−052	−−−	1
5		STUD	C0809	15991	4
6		HEX NUT	D08	15991	4
7		LOCK WASHER	J08	15991	4
8	✳	GASKET	38687−053	19060	1
9		BAFFLE	31113−011	17000	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

ILLUSTRATION

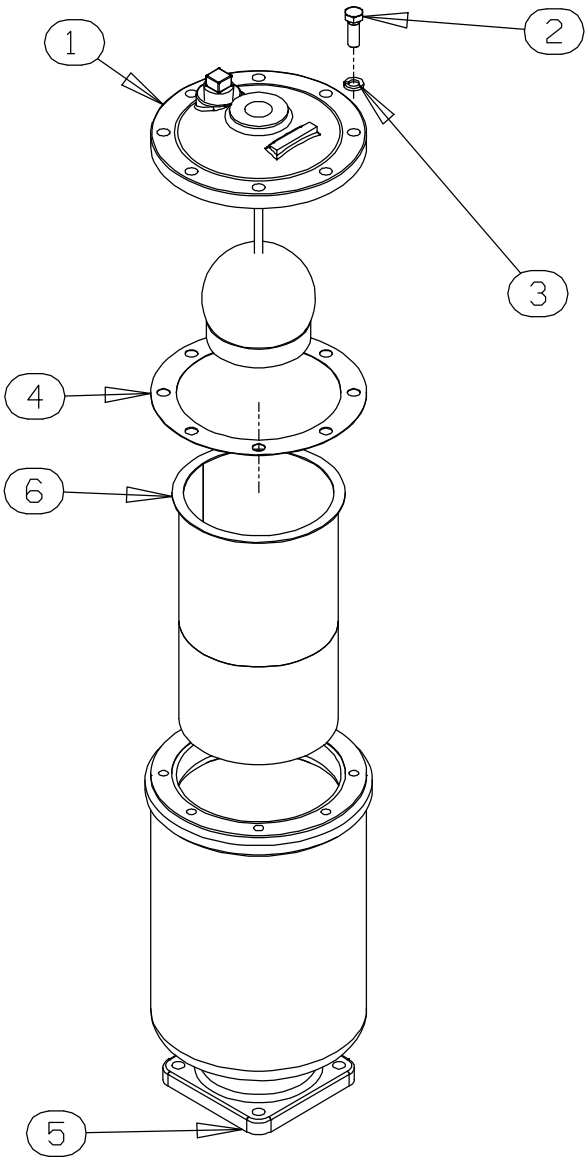


Figure 6. 46112–709 Priming Chamber Assembly

PARTS LIST

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PRIMING VALVE	26664–007	–––	1
		–ORIFICE BUTTON	26688–021	–––	1
2		HEX HD CAPSCREW	B0806	15991	8
3		LOCKWASHER	J08	15991	8
4	✳	PRIMING VALVE GASKET	38683–657	19060	1
5		PRIMING CHAMBER	38343–020	10000	1
6		STRAINER ASSY	46641–222	17000	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

ILLUSTRATION

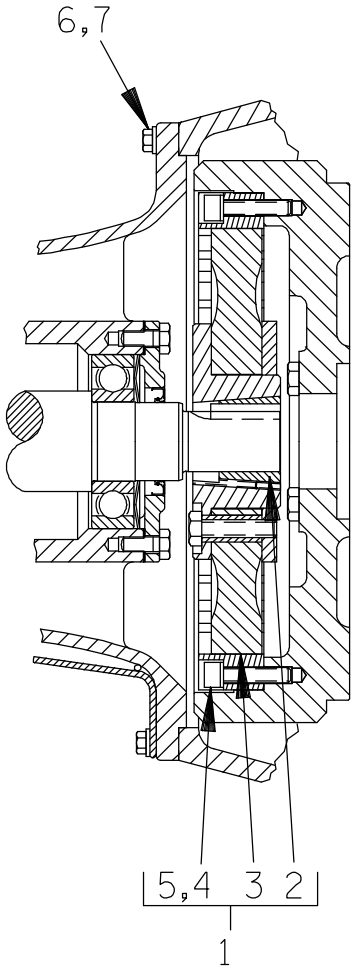


Figure 7. 44162–119 Drive Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	COUPLING KIT	48112–001	–––	1
2	–BUSHING	24131–345	–––	1
3	–COUPLING ASSEMBLY	44165–011	–––	1
4	–LOCKWASHER	21171–536	–––	8
5	–SOCKET HD CAPSCREW	22644–220	–––	8
6	HEX HD CAPSCREW	B0605	15991	12
7	LOCKWASHER	J06	15991	12

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the illustrations (see Figures 1 through 7) and the corresponding Parts Lists. Instructions for the engine are covered separately in specific literature supplied by the manufacturer.

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Some pump service functions may be performed without separating the pump end assembly from the engine. However, the priming chamber (2, Figure 4) and discharge check valve assembly (12, Figure 4) must be removed to service most pump components. The following instructions assume complete disassembly of the pump is required.

Before attempting to service the pump, shut down the engine and take precautions to ensure that it will remain inoperative. Close all valves in the suction and discharge lines and drain the pump casing by removing the lowermost pipe plug (5, Figure 5). Clean and reinstall the plug.

WARNING!

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed instructions and precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that only safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed only after establishing that neither personal safety nor pump integrity are compromised by such practices.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Shut down the engine and disconnect the positive battery cable to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature and make sure it is cool before opening any covers, plates, gauges, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity

to prevent injuries to personnel or damage to equipment. If slings or chains are used to move the pump or components, make sure that the load is balanced; otherwise serious personal injury or death could result. Suction and discharge hoses and piping must be removed from the pump before lifting.

CAUTION

Use **only** replacement parts provided or approved by Gorman-Rupp. Use of non-authorized parts may result in damage to the equipment and/or injury to personnel and **will** invalidate the warranty.

Priming Chamber Removal And Disassembly

(Figure 5)

Disconnect both the suction piping and the air discharge tubing from the priming chamber assembly (10, Figure 3). Support the priming chamber assembly using a sling and a suitable lifting device. Remove the hardware (6 and 7) and separate the priming chamber assembly, gasket (8) and baffle (9) from the spool (5, Figure 3).

(Figure 6)

Remove the hardware (2 and 3) securing the priming valve (1) to the priming chamber (5). Carefully lift the valve components from the priming chamber. Remove the gasket (4) and clean the mating surfaces.

If the priming valve float is stuck or the strainer (6) is clogged, it can usually be cleaned without further disassembly.

The only serviceable part of the priming valve is the orifice button (not shown). If liquid continues to bypass through the priming chamber after adjusting the orifice button (see **Priming Chamber Reassembly and Installation** for adjustment), the button may require replacement. To replace the orifice button, remove one of the “e-clips” from the pivot pin closest to the orifice button and remove the pivot pin. This will allow the linkage to be raised high enough to access the orifice button.

Remove the hex nut and lockwasher securing the orifice button to the linkage bar and unscrew the orifice button from the linkage bar.

Discharge Check Valve Removal and Disassembly

(Figure 3)

Remove the hardware (not shown) securing the discharge check valve bracket to the base.

Support the discharge check valve assembly (6) using a sling and a suitable lifting device. Remove the nuts (8) and separate the discharge check valve assembly and gasket (9) from the pump assembly (1).

The flapper and cover O-ring are the only serviceable parts of the check valve. If the flapper requires replacement, remove the hardware securing the cover. Separate the cover and O-ring and remove the flapper.

Pump Casing And Wear Plate Removal

(Figure 4)

Support the pump casing using a suitable hoist and sling.

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. If slings or chains are used to move the pump or components, make sure that the load is balanced; otherwise serious personal injury or death could result. Suction and discharge hoses and piping must be removed from the pump before lifting.

Remove the hardware (not shown) securing the pump casing to the base.

NOTE

Unless impeller or seal replacement is required, it is not necessary to drain the oil from the bottle oiler (35) or seal cavity when removing the pump casing.

Remove the nuts (8) securing the pump casing and bracket assembly (36) to the intermediate. Loop a piece of wire through one of the holes in the support and around the seal cavity air vent (33) to support the sight gauge assembly while removing the pump casing.

Pull the pump casing straight away from the intermediate to prevent binding on the impeller. Remove the casing gasket (6) and clean the contacting surfaces.

Inspect the wear plate assembly (28) for excessive wear or scoring. If replacement is required, remove the hardware (29 and 30) and pull the wear plate out of the volute casing.

Draining Oil From Seal Cavity

(Figure 4)

If any further disassembly is to be performed on the pump, the seal oil cavity must be drained to prevent the oil in the seal cavity from escaping as the impeller is removed.

Lower the bottle oiler (35) below the seal cavity drain plug (45) to prevent the oil in the bottle oiler from being released as the seal cavity is drained.

Position a **clean** container under the seal cavity drain plug. Remove the plug and drain the oil from the seal cavity into the container. Clean and reinstall the drain plug. Inspect the oil for water, dirt or a cloudy condition which could indicate seal failure.

With the bottle oiler below the level of the drain plug, loosen the lower hose clamp (39) and pull the hose (38) off the connector (37) at the tee (44). Plug the end of the hose and rest the bottle oiler in a vertical position to prevent the oil from spilling.

Impeller Removal

(Figure 4)

To remove the impeller (2), tap the vanes in counterclockwise direction (when facing the impeller) with a block of wood or soft-faced mallet. **Be careful** not to damage the impeller. When the impeller breaks loose, unscrew it from the shaft. Use caution when removing the impeller; tension on the shaft seal spring will be released as the impeller is unscrewed. Inspect the impeller and replace it if cracked or badly worn.

Seal Removal

(Figures 4 and 9)

This pump is designed with two seals; a primary mechanical seal (4) located directly behind the impeller and a secondary oil seal (23) located at the back of the seal plate (27). If the liquid being pumped leaks past the oil seal, both seals should be replaced immediately.

Slide the impeller adjusting shims (5) off the impeller shaft (20). Tie and tag the shims or measure and record their thickness for ease of reassembly.

Remove the seal spring. Slide the shaft sleeve (46) and rotating portion of the seal (consisting of the bellows, retainer, and rotating element) off the shaft as a unit.

Remove the rotating element. Apply oil to the sleeve and work it up under the rubber bellows. Slide the bellows and retainer off the sleeve.

Carefully slide the seal plate and stationary portion of the seal off the shaft as a unit. Remove the machine screws (25) and pull the seal plate cover (24) and oil seal (23) out of the seal plate as a unit. Use a suitable sized dowel to press the stationary portion of the seal out of the seal plate from the back side.

Inspect the oil seal and, if replacement is required, press it from the seal plate cover. Remove the O-ring (26) from the seal plate cover.

If no further disassembly is required, refer to **Seal Installation**.

Separating Intermediate And Drive Assembly From Engine

(Figure 5)

If it is necessary to separate the intermediate and drive assemblies from the engine, support the intermediate using a hoist and sling, and remove the hardware (6 and 7) securing the intermediate to the engine bellhousing. Remove the intermediate guards (48 and 49, Figure 4), and separate the assemblies by pulling the intermediate straight away from the engine.

As the assemblies separate, the flexible portion of the coupling assembly (3) will remain on the shaft. To remove the coupling from the shaft, unscrew the two allen head setscrews from the bushing (2). Screw one of the setscrews into the puller hole on the circumference of the bushing. As the coupling and bushing separate, remove the bushing, and slide the coupling off the shaft. Remove the shaft key (19, Figure 4).

It is not necessary to remove the outer ring of the coupling from the engine flywheel unless the coupling must be replaced. To remove the ring, disengage the hardware (4 and 5) securing it to the flywheel.

Shaft and Bearing Removal and Disassembly

(Figure 4)

When the pump is properly operated and maintained, the intermediate should not require disassembly. Disassemble the shaft and bearings **only** when there is evidence of wear or damage.

CAUTION

Shaft and bearing disassembly in the field is not recommended. These operations should be performed only in a properly-equipped shop by qualified personnel.

Remove the intermediate drain plug (22) and drain the lubricant. Clean and reinstall the drain plug.

Disengage the hardware (16 and 17) and remove the bearing cap (15), gasket (14), bearing cap oil seal (18), and thrust washer (13). Press the oil seal from the bearing cap.

Place a block of wood against the impeller end of the shaft (20) and tap the shaft and assembled bearings from the intermediate. Press the inboard oil seal (9) from the intermediate.

After removing the shaft and bearings, clean and inspect the bearings **in place** as follows.

CAUTION

To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Clean the intermediate, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage and replace as necessary.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Clean the bearings thoroughly in **fresh** cleaning solvent. Dry the bearings with filtered compressed air and coat with light oil.

CAUTION

Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. **Do not** spin dry bearings. This may scratch the balls or races and cause premature bearing failure.

Rotate the bearings by hand to check for roughness or binding and inspect the bearing balls. If rotation is rough or the bearing balls are discolored, replace the bearings.

The bearing tolerances provide a tight press fit onto the shaft and a snug slip fit into the bearing housing. Replace the bearings, shaft, or intermediate if the proper bearing fit is not achieved.

If bearing replacement is required, use a bearing puller to remove the inboard and outboard bearings (10 and 12) from the shaft.

Shaft and Bearing Reassembly and Installation

(Figure 4)

Inspect the shaft for distortion, nicks or scratches, or for thread damage on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

Clean and inspect the bearings as indicated in **Shaft And Bearing Removal And Disassembly**.

CAUTION

To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

The bearings may be heated to ease installation. An induction heater, hot oil bath, electric oven, or hot plate may be used to heat the bearings. Bearings should **never** be heated with a direct flame or directly on a hot plate.

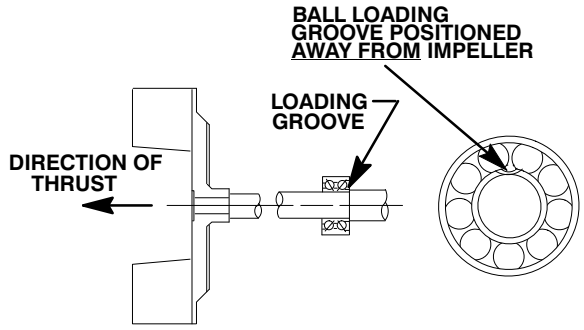
NOTE

If a hot oil bath is used to heat the bearings, both the oil and the container must be **absolutely** *clean. If the oil has been previously used, it must be* **thoroughly** *filtered.*

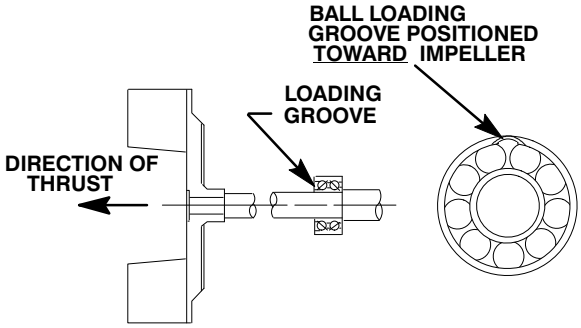
Heat the bearings to a uniform temperature **no higher than** 250°F (120°C) and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.

NOTE

Position the inboard bearing (10) on the shaft as indicated in Figure 8.



INSTALLATION OF NEW DEPARTURE OR BCA/FEDERAL MOGAL 5300W SERIES BEARINGS (OPEN OR ENCLOSED IMPELLERS)



INSTALLATION OF MRC/SKF 5300M OR FAFNIR 5300W SERIES BEARINGS (OPEN OR ENCLOSED IMPELLERS)

Figure 8. Inboard Bearing Positioning

After the bearings have been installed and allowed to cool, check to ensure that they have not moved away from the shaft shoulders in shrinking. If movement has occurred, use a suitable sized sleeve and a press to reposition the bearings against the shaft shoulders.

If heating the bearings is not practical, use a suitable sized sleeve, and an arbor (or hydraulic) press to install the bearings on the shaft.

CAUTION

When installing the bearings onto the shaft, **never** press or hit against the outer race, balls, or ball cage. Press **only** on the inner race.

Slide the shaft (20) and assembled bearings (10 and 12) into the intermediate bore until the inboard bearing is fully seated against the bore shoulder.

CAUTION

When installing the shaft and bearings into the bearing bore, push against the outer race. **Never** hit the balls or ball cage.

Apply a light coating of oil to the lip of the inboard oil seal (9) and press it into the intermediate bore with the lip positioned as shown in Figure 4. Press the oil seal into the housing until the face is **just flush** with the machined surface on the housing.

Apply a light coating of oil to the lip of the outboard oil seal (18) and press it into the bearing cap (15) with the lip positioned as shown in Figure 4. The face of the oil seal should be just flush with the outer face of the bearing cap.

Install the thrust washer (13) and bearing cap gasket (14), and secure the bearing cap to the intermediate with the hardware (16 and 17). **Be careful** not to damage the lip of the oil seal (18) on the shaft keyway.

Lubricate the bearings as indicated in **LUBRICATION** at the end of this section.

Securing Intermediate And Drive Assembly To Engine

(Figure 5)

Install the shaft key (19, Figure 4) in the shaft keyway. Position the flexible portion of the coupling assembly (3) on the shaft as shown in Figure 5.

NOTE

The flexible portion of the coupling must be properly positioned on the shaft. The heads of the capscrews in the center of the coupling ***must be positioned toward the pump end of the shaft****.*

Align the keyway in the bushing (2) with the shaft key, and slide it onto the shaft until it is **just flush** with the end of the shaft. Rotate the flexible portion of the coupling until the tapped holes for the two setscrews align with those in the bushing, and install the setscrews.

CAUTION

Make certain that the flexible portion of the coupling is mounted as shown in Figure 5. **This is critical.** If the coupling is not properly positioned on the shaft, the coupling parts may not fully engage, or a pre-load condition can cause premature bearing failure.

The end of the shaft must be **just flush** with the face of the bushing. This will allow the two portions of the coupling to fully engage when the intermediate is secured to the engine bellhousing, without pre-loading the bearings.

With the flexible portion of the coupling and the bushing properly positioned on the shaft, tighten the two setscrews in an alternating sequence until the bushing and coupling are fully secured. Torque the setscrews to 14.6 ft. lbs. (175 in. lbs. or 2 m. kg.).

If the complete coupling assembly is being replaced, apply 'Loctite Retaining Compound No. 242' or equivalent to the threads of the hardware (4 and 5), and secure the outer ring of the coupling to the engine flywheel by torquing the hardware to 45 ft. lbs. (540 in. lbs. or 6,2 m. kg.).

Using a suitable lifting device, position the assembled coupling, intermediate, shaft and bearings so the flexible portion of the coupling seats inside the outer ring attached to the engine flywheel.

NOTE

To ease installation, ***lightly*** *lubricate the rubber portion of the coupling with a* ***non-petroleum based lubricant*** *such as vegetable oil or glycerin, or a silicon-based lubricant such as "WD40" or equivalent.* ***Do not*** *use petroleum-based lubricants, or any other substance which may soften or otherwise damage the rubber.*

Install the intermediate guards (48 and 49, Figure 4), and secure the intermediate to the engine bell-

housing with the previously removed hardware (6 and 7).

Seal Reassembly and Installation

(Figures 4 and 9)

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

The seal is not normally reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in **fresh** cleaning solvent and allow to dry thoroughly.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Clean and polish the shaft sleeve, or replace it if there are nicks or cuts on either end. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

To ease installation of the seal, lubricate the O-rings and bellows with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 9).

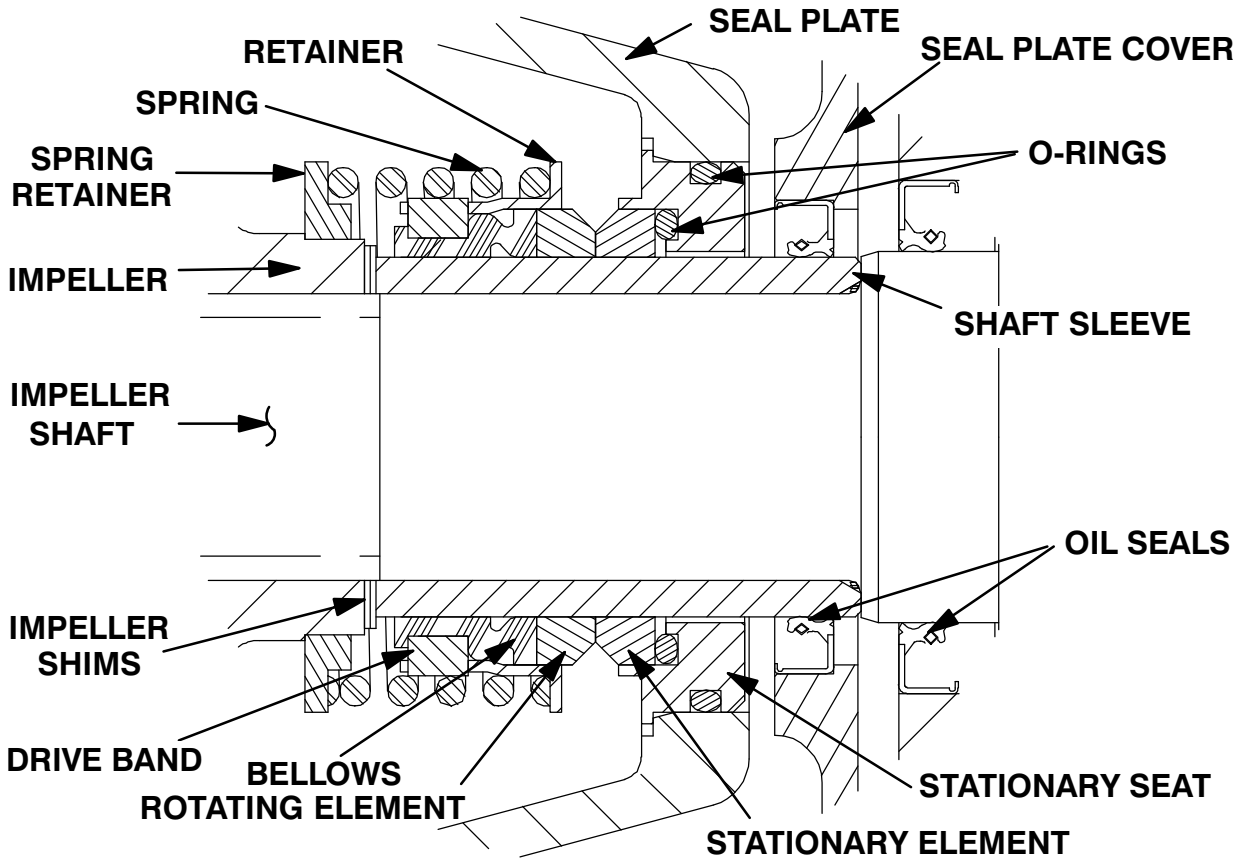


Figure 9. Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

Press the oil seal (23) into the seal plate cover (24) with the lip positioned as shown in Figure 4. Make sure the oil seal is fully seated. Lubricate the O-ring (26) and install it in the groove in the seal plate cover. Press the seal plate cover into the seal plate and secure it with the machine screws (25).

To ease installation it is recommended that the shaft sleeve (46) be installed in the seal plate cover before installing the seal plate (27). Lubricate the sleeve and slide it through the oil seal from the intermediate side of the seal plate cover. **Be sure** to position the sleeve with the chamfered end toward the intermediate side of the cover.

Slide the assembled shaft sleeve and seal plate onto the shaft until the sleeve seats against the shaft shoulder. Position the seal plate against the intermediate with the air vent (33) toward the top and temporarily secure the seal plate to the intermediate with two capscrews and nuts (1/2 UNC by 1—1/2 inch long, not supplied).

Assemble the O-rings into the stationary seat. Press the stationary element into the stationary seat with the chamfered side facing away from the seat. Press this subassembly into the seal plate bore until fully seated. A push tube cut from a length of plastic pipe would aid this installation. The I.D. of the tube should be approximately the same as the I.D. of the seal spring.

It is recommended that a tapered sleeve be installed over the shaft threads to ease installation of the seal. With the tapered sleeve in place, subassemble the rotating element into the rotating portion of the seal assembly with the chamfered side facing out. Lubricate the I.D. of the bellows and slide the rotating portion of the seal assembly onto the shaft sleeve until the sealing faces contact.

Remove the tapered sleeve and install the seal spring.

Lubricate the seal as indicated in **LUBRICATION**, after the impeller has been installed.

Impeller Installation And Adjustment

(Figure 4)

Inspect the impeller assembly (2) and replace it if cracked or badly worn. The impeller assembly consists of the impeller with a spring retainer (2A) pressed onto the back side. If the retainer requires replacement, use a puller to remove the old one. Press the new retainer onto the impeller with the step toward the seal side of the impeller.

CAUTION

The shaft and impeller threads **must** be completely clean before reinstalling the impeller. Even the slightest amount of dirt on the threads can cause the impeller to seize to the shaft, making future removal difficult or impossible without damage to the impeller or shaft.

Install the same thickness of impeller adjusting shims (5) as previously removed and screw the impeller assembly onto the shaft until tight. **Make sure** the seal spring seats squarely over the step on the spring retainer.

NOTE

*At the slightest sign of binding, **immediately** back the impeller off, and check the threads for dirt. **Do not** try to force the impeller onto the shaft*.

A clearance of .025 to .040 inch (0,64 to 1,02 mm) between the impeller and the seal plate is necessary for maximum pump efficiency. Measure this clearance, and add or remove impeller adjusting shims as required.

Pump Casing And Wear Plate Installation

(Figure 4)

If the wear plate (28) was removed, position the replacement wear plate in the pump casing and secure it with the hardware (29 and 30).

Remove the two capscrews temporarily holding the seal plate and install the same thickness of casing gaskets (6) as previously removed. Secure the seal plate and pump casing to the intermediate with the nuts (8). **Do not** fully tighten the nuts until the impeller face clearance has been set.

A clearance of .010 to .020 inch (0,25 to 0,51 mm) between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance may be determined by reaching through the suction inlet and measuring the clearance with a feeler gauge. Add or remove gaskets in the pump casing gasket set until the proper clearance is achieved.

Reinstall any leveling shims used under the casing mounting feet and secure the casing to the base with the previously removed hardware.

Connect the hose (38) to the connector (37) and secure it with the hose clamp (39). Secure the bottle oiler (35) and bracket (36) to the back of the intermediate with the previously removed hardware.

(Figure 3)

Apply a small amount of light grease to the gasket (9) to hold it in place and position it against the pump casing flange. Position the discharge check valve assembly (5) and secure it with the nuts (8).

Discharge Check Valve Reassembly And Installation

(Figure 3)

If the discharge check valve (6) was disassembled to replace the flapper or cover O-ring, position the flapper in the valve body and check to ensure free movement.

Install the valve cover O-ring and secure the cover to the body with the previously removed hardware.

Apply a small amount of light grease to the discharge flange gasket (9) to hold it in place and position it against the pump casing flange. Support the discharge check valve assembly using a sling and a suitable lifting device. Using the previously removed nuts (8), secure the discharge check valve assembly and flange gasket to the pump assembly (1). Secure the discharge check valve to its support bracket using the previously removed hardware.

Priming Chamber Assembly And Installation

(Figure 6)

Clean and inspect the components of the priming valve (1). Inspect the linkage and ensure the orifice button (not shown) squarely engages the valve seat. Replace the orifice button if required (see **Priming Chamber Removal and Disassembly** for orifice button removal).

If the orifice button was removed, screw the new orifice button into the linkage bar until fully seated. Align the hole in the linkage bar with the holes in the bracket and reinstall the pivot pin. Secure the pivot pin with the previously removed “e-clip”.

Adjust the orifice button seating as necessary by screwing the orifice button into or out of the linkage bar. Proper adjustment is achieved when the orifice button fully seats against the orifice before the linkage bar on the float bottoms against the threads on the orifice button. When adjustment is complete, install and tighten the lock washer and hex nut securing the orifice button.

Install the strainer (6) and priming valve gasket (4).

Lower the float into the priming chamber (5) and secure the priming valve with the previously removed hardware (2 and 3).

(Figure 5)

Install the baffle and gasket (8 and 9) and use a sling and suitable lifting device to position the priming chamber assembly on the pump suction spool (7, Figure 4). Secure the priming chamber assembly with the hardware (6 and 7).

Reconnect both the suction piping and the air discharge tubing to the priming chamber assembly.

LUBRICATION

Seal Assembly

Fill the bottle oiler (35) to the line on the glass with SAE No. 30 non-detergent oil. When lubricating a dry seal cavity, add approximately 3 quarts (2,8 L) of oil through the air vent (33) to level indicated. Check the oil level regularly and refill as required.

Bearings

The intermediate was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge (40) and maintain it at the midpoint of the gauge. When lubrication is required, remove the air vent (11) and add SAE No. 30 non-detergent oil through the opening. When lubricating a dry (overhauled) intermediate, fill the bearing cavity with approximately 7.5 ounces (222 ml.). Clean and reinstall the air vent. **Do not** over-lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Under normal conditions, drain the bearing housing once each year and refill with clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.

CAUTION

Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially important in areas where variable hot and cold temperatures are common.

For cold weather operation, consult the factory or a lubricant supplier for the recommended grade of oil.

Engine

Consult the literature supplied with the engine, or contact your local engine representative.

For U.S. and International Warranty Information,
Please Visit www.grpumps.com/warranty
or call:
U.S.: 419—755—1280
International: +1—419—755—1352

For Canadian Warranty Information,
Please Visit www.grcanada.com/warranty
or call:
519—631—2870

THE GORMAN-RUPP COMPANY ● MANSFIELD, OHIO
GORMAN-RUPP OF CANADA LIMITED ● ST. THOMAS, ONTARIO, CANADA

Appendix F –
Sample Forms for Record Keeping

Form 1: Daily Sewage Record
(Number of trucks) x (Volume per truck)
(Volume pumped per minute) x (Minutes running)

Form 2: Sewage lagoon Levels
(Monthly record)

Form 3: Equipment Record Card

Form 4: Operating Cost Record

Form 5: Transfer Drawdown Record

Form 6: Annual Sewage Test Record

Form 7: Receiving Water Analysis Record

Form 8: Annual Report
(Cost)

Form 9: Preventative Maintenance

DAILY SEWAGE RECORD

Form 1

Month of _____, 19__

Date	Sewage Amount
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 Total	

SEWAGE LAGOON LEVELS

MONTHLY RECORD

Year _____

MONTH	PRIMARY										SECONDARY									
	Distance "A" at locations indicated								Average "A"	Primary Cell Sewage Depth (see Note 1)	Distance "A" at locations indicated								Average "A"	Secondary Cell Sewage Depth (see Note 2)
	1	2	3	4	5	6	7	8			1	2	3	4	5	6	7	8		
JANUARY																				
FEBRUARY																				
MARCH																				
APRIL																				
MAY																				
JUNE																				
JULY																				
AUGUST																				
SEPTEMBER																				
NOVEMBER																				
DECEMBER																				

Note 1: Primary cell sewage depth = 1.31 metres (4'-4") minus "Average A" dimensions

Note 2: Secondary cell sewage depth = 3.00 metres (9'-10") minus "Average A" dimensions

Note 3: Refer to sketch entitled Sewage Lagoon Level Measurements for instructions on how to measure "A" dimension

Form 2

EQUIPMENT RECORD CARD

Form 3

EQUIPMENT INFORMATION

DESCRIPTION OF EQUIPMENT:		EQUIPMENT NO:
		LOCATION:
MODEL NO:	SERIAL NO:	DATE INSTALLED:
ELECTRICAL OR MECHANICAL DATA:		
PURCHASED FROM:		PARTS & SERVICE AVAILABLE FROM:

MAINTENANCE SCHEDULE

NO:	MAINTENANCE PROCEDURE	MANUAL REF.	FREQUENCY

MAINTENANCE RECORD

DATE	DESCRIPTION OF WORK PERFORMED	PARTS USED	P.O.NO.	LABOUR	INITIAL

OPERATING COST RECORD

Form 4

MONTH _____ YEAR _____

LABOR	HR	COST
ADMINSITRATIVE		
MAINTENANCE		
LABORATORY		
SUBTOTAL		
CHEMICALS	QUANTITY	COST
CHLORINE		
MISCELLANEOUS		
SUBTOTAL		
SUPPLIES	QUANTITY	COST
LABORATORY		
MAINTENANCE		
MISCELLANEOUS		
SUBTOTAL		
MAINTENANCE		
PARTS		
NEW EQUIPMENT		
SUBTOTAL		
UTILITIES	QUANTITY	COST
ELECTRICITY		
NATURAL GAS		
WATER		
TELEPHONE		
SUBTOTAL		
TOTAL		
COST PER CUBIC METRE		
OR GALLON		

TRANSFER/DRAWDOWN RECORD

Date(s) Operation Occurred: _____ to _____

Type of Operation (circle one): Transfer, Drawdown

	PRIMARY										SECONDARY									
	Distance "A" at locations indicated								Average "A"	Primary Cell Sewage Depth (see Note 1)	Distance "A" at locations indicated								Average "A"	Secondary Cell Sewage Depth (see Note 2)
	1	2	3	4	5	6	7	8			1	2	3	4	5	6	7	8		
Prior to Operation																				
After Operation																				

Pump Description (indicate size, make, model of pump and length and diameter of suction and discharge pipes).

_____

_____

_____

_____

Pumping Time (in hours): _____

COMMENTS: _____

_____

ANNUAL SEWAGE TEST RECORD

(to be completed once per year, preferably in October just prior to freeze-up)

Form 6

Raw Sewage Sample

Date samples collected _____

Date samples tested _____

Results:

BOD

Suspended Solids

pH

Secondary Cell Samples

Date samples collected _____

Date samples tested _____

Results:

		Sample Number						Average
		1	2	3	4	5	6	
BOD								
Suspended Solids								
pH								
Phosphorus								
Oil & Grease								
Coliforms:	Fecal							
	Total							

COMMENTS: _____

RECEIVING WATER ANALYSIS RECORD

Form 7

PART A:
Prior to Secondary Cell Discharge

Date samples collected _____
Date samples analysed _____
Sample collection point _____
Results:
BOD _____
Coliforms: fecal _____
total _____

PART B:
One to Two Weeks after Secondary Cell Discharge

Date samples collected _____
Date samples analysed _____
Sample collection point _____
Results:
BOD _____
Coliforms: fecal _____
total _____
Suspended Solids _____
pH _____
Phosphorus _____
Oil & Grease _____

PART C:
Sample in the Spring of the Year following Secondary Cell Discharge

Date samples collected _____
Date samples analysed _____
Sample collection point _____
Results:
BOD _____
Coliforms: fecal _____
total _____

ANNUAL REPORT Form 8

COST DATA

Salaries, operation and maintenance	_____
Salaries, administration	_____
Equipment replacement	_____
Equipment repairs (nonsalary expense)	_____
Chlorine	_____
Laboratory	
chemicals and supplies	_____
apparatus	_____
Vehicle operation (nonsalary)	_____
Electricity	_____
Natural Gas	_____
Insurance	_____
Miscellaneous	_____
Total Expenses	$ _____
Budget or revenue	$ _____

PREVENTIVE MAINTENANCE CARD

Form 9

EQUIPMENT NOMENCLATURE	SERIAL NUMBER
MANUFACTURER	INST DATE
LOCATION	
LUBRICANTS	
PREVENTIVE MAINTENANCE SCHEDULE	FREQUENCY