Operation & Maintenance Manual
Sewage Treatment Plant (STP)

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division – Whale Tail Pit Project

Version 3
May 2019

EXECUTIVE SUMMARY

Agnico Eagle has prepared the following document summarizes the operational and maintenance procedures to be followed at the Sewage Treatment Plant (STP).

This report documents the stand alone Operation & Maintenance Manual – Sewage Treatment Plant, includes the following requirements:

- The manual was prepared 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", and adapted for the use of a mechanical contact water treatment facility;
- The manual includes contingency measures in the event of a plant malfunction; and
- The manual includes sludge management procedures.

IMPLEMENTATION SCHEDULE

This Plan will be implemented upon Board approval and subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Agnico Eagle Internal:

- Energy & Infrastructures Services Superintendent
- Energy & Infrastructures Services General Foreman
- Environmental Superintendent
- Senior environmental Coordinator
- Environmental Compliance Counselor
- Sewage Treatment Plant Operator

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	2018/12/30			Operation and Maintenance Manual
2	2019/02/19			Comment from ECCC, CIRNAC
3	2019/05/14			Updated to support the Nunavut Water Board (NWB) Type A Water License Amendment Process

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Amaruq Permitting Lead

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1 INTRODUCTION

1.1 PURPOSE

This Sewage Treatment Plant (STP) Operation and Maintenance Manual (OMM) for the Whale Tail Gold Project (the Project) has been prepared based on the "*Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories, 1996, prepared by the Department of Municipal and Community Affairs, NWT*". The OMM has been adapted for the use of a mechanical contact water treatment facility.

This manual is a component of the Whale Tail Environmental Management System. The objectives of this plan are summarized as follows:

1. To define the location, design and operating procedures to be used in the treatment of sewage generated at the Project; and
2. To provide monitoring requirements for the STP.

The STP purpose is to treat domestic sewage from the camp and adjacent building which are not connected to the STP directly (sucker truck will discharge sewage from this building directly into the STP).

1.2 BRIEF DESCRIPTION OF THE PROJECT

Agnico Eagle Mines Limited – Meadowbank Division Agnico Eagle) is proposing an expansion to the Whale Tail Pit and Haul Road Project, a Meadowbank satellite deposit located on the Amaruq property. As an expansion to the Approved Project (Nunavut Impact Review Board (NIRB) Project Certificate No. 008 and Nunavut Water Board (NWB) Type A Water License 2AM-WTP1826), Agnico Eagle is proposing to expand and extend the Whale Tail Pit operations to include a larger Whale Tail open pit, development of the IVR open pit, and underground operations while continuing to operate and process ore at the Meadowbank Mine.

Access to the site is via a 64-kilometer road from Meadowbank mine. On-site facilities will include a power plant, maintenance facilities for both surface and underground operation, tank farm for fuel storage, Arsenic and TSS water treatment plant for surface water, TDS water treatment plant for underground water, underground mine surface facilities (e.g. ventilation), sewage treatment plant (STP), drinking water treatment plant, as well as extended accommodation and kitchen facilities for approximately 544 people.

This plan has been updated for the Project Expansion in support of the Nunavut Water Board (NWB) Type A Water License Amendment Process.

Figures 1, 2 and 3 illustrate the location and general arrangement of the STP.

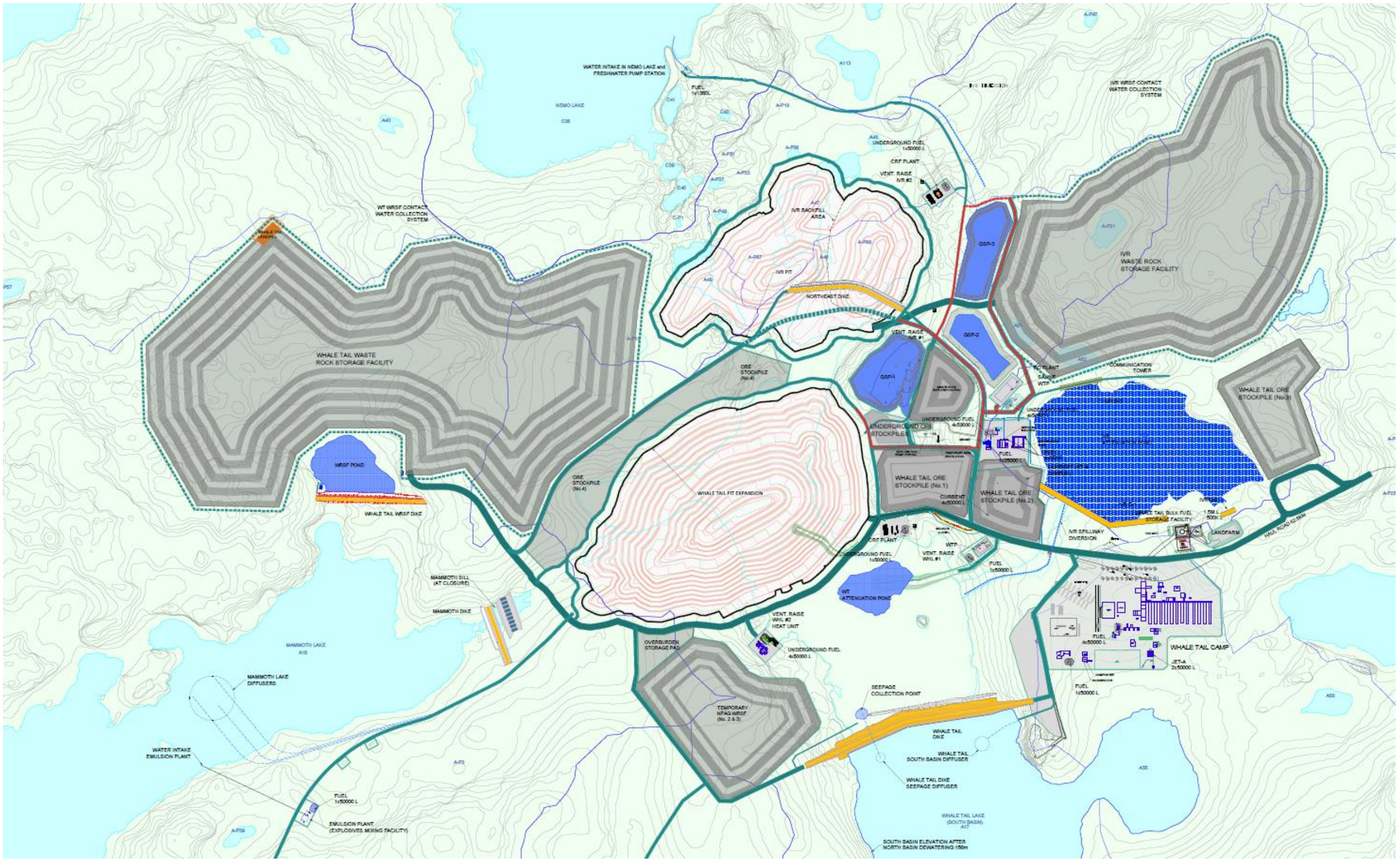

Figure 1 – Site Layout

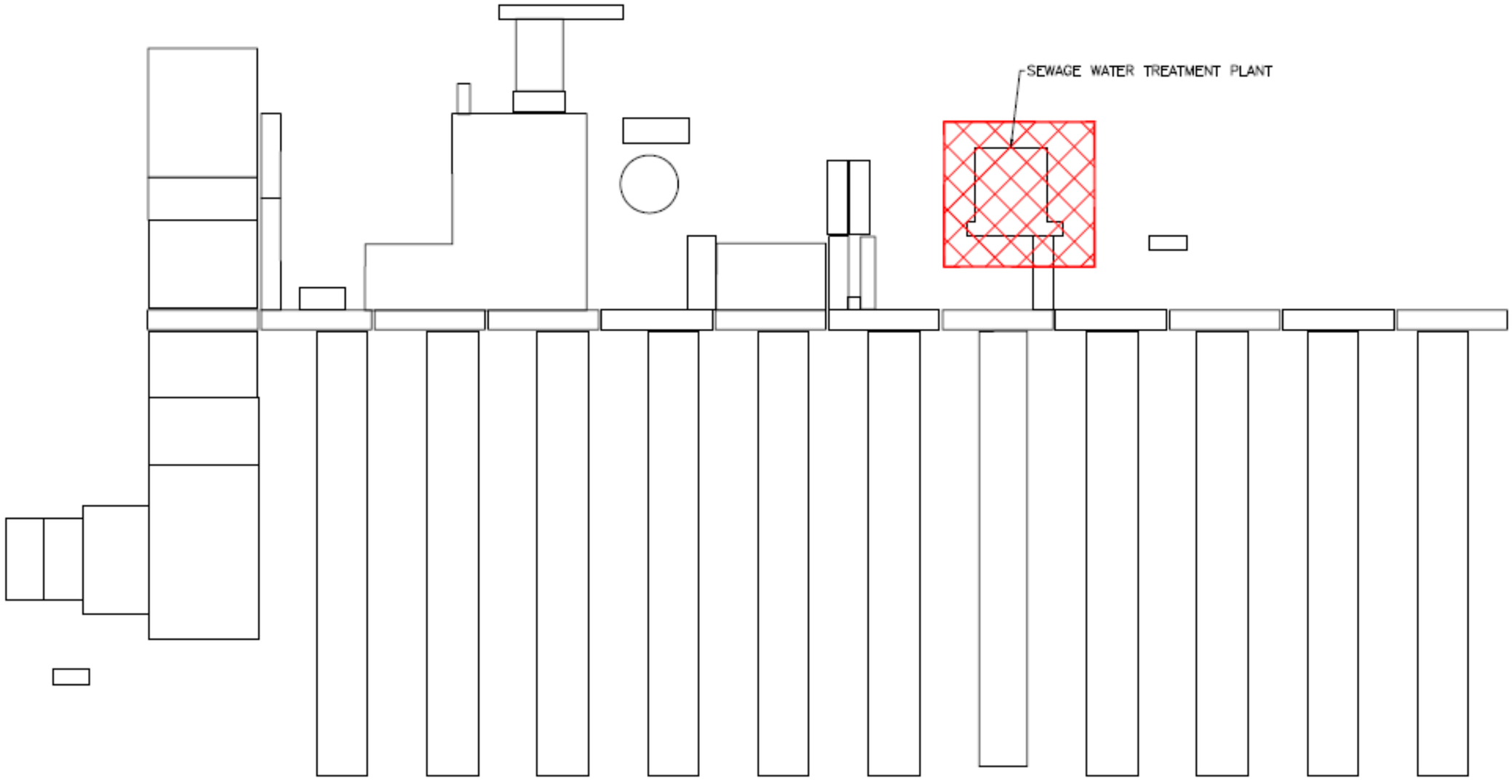

Figure 2 – Location of STP in the Whale Tail Camp

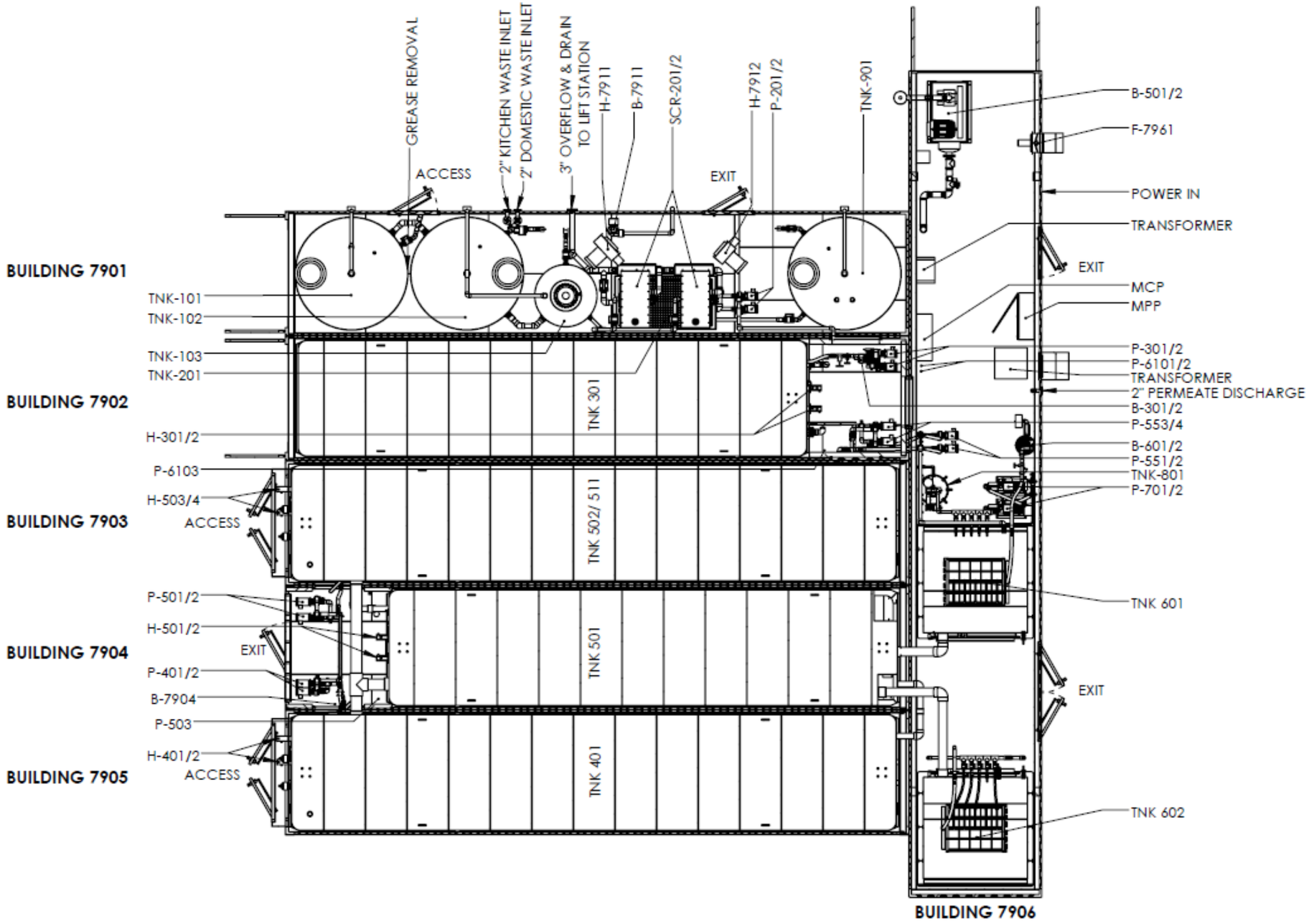

Figure 3 – General Arrangement of STP

1.3 CONTACT INFORMATION

The individuals responsible for the operation of the sewage treatment plant for the Project are the following:

Energy and Infrastructure Superintendent	819-856-3073
Energy and Infrastructure Supervisors	819 759-3555 ext. 6731 or 6902

2 DESCRIPTION

2.1 CURRENT SEWAGE TREATMENT PLANT (STP)

The current plant in operation on site is designed based on the occupation maximum of the camp for 400 persons (240L per day and per person). The design flows are presented in Table 1.

Table 1: Design flow rate

Parameters	Design Value	Unit
Per capita design flow	240	L/p/d
Number of persons	400	People
Average daily flow (ADF)	96	m^3/d
Maximum Daily Flow (MDF)	192	m^3/d
Peak Hourly Flow (PHF)	24	m^3/h
Overall time for peak to occur	2	hours
Maximum number of peak events per day	2	Qty

Table 2 presents the typical sewage composition used for the design (based on Meadowbank sewage quality).

Table 2: Sewage typical chemical composition

Parameters	Unit	Design Value
Biochemical Oxygen Demand (BOD_5)	mg/L	952
Total Suspended Solids (TSS)	mg/L	300
Total Kjeldahl Nitrogen (TKN)	mg/L	130
Ammonia nitrogen (NH_3-N)	mg/L	130
Oil and Grease	mg/L	30
pH	-	6 to 9.5
Water Temperature	^oC	10 to 25
Alkalinity	mg/L as $CaCO_3$	471.1

2.1.1 Process summary

The sewage treatment plant receives two streams of sewage as presented in Figure 4 (basic flowsheet of the STP). The first source is domestic sewage, which is fed directly to the fine screening process to remove any fibers or debris that might damage the membranes. The second source is kitchen sewage which is pre-treated in the oil and grease tanks to remove oil and grease prior to being fed into the fine

screens. The combined screened sewage is pumped to the equalization tank. The equalization tank buffers variability in the influent flow rate and concentrations of influent constituents, maintaining a consistent flow rate and sewage strength through the membrane bioreactor (MBR) system. Sewage is then pumped from the equalization tank to the pre-anoxic tank for denitrification.

In the pre-anoxic tank, screened sewage containing organics is combined with recycled mixed liquor from the aeration tank containing nitrates. Bacteria use some of the organics to drive the denitrification process, converting nitrate into nitrogen gas. This process occurs in an anoxic environment where there is minimal oxygen. As such a pump and eductors are used to mix the tank to prevent addition of oxygen. The denitrification process is used to meet the effluent nitrate operational target, reduce oxygen requirements and to recover alkalinity, thus reducing chemical consumption.

Mixed liquor from the anoxic tank flows by gravity to the first aerobic tank followed by the second aeration tank for aerobic biological degradation of the influent constituents (organics and ammonia). In the aerobic tanks, the nitrification process converts ammonia to nitrate in order to meet the effluent ammonia operational target. This process consumes alkalinity, so a caustic soda or soda ash dosing pump is used to control the pH. Additionally, liquid alum is dosed into the anoxic zone to precipitate phosphorus in order to meet the effluent phosphorus operational target. Mixed liquor flows by gravity from the second aeration tank to the post-anoxic tank for final denitrification polishing. In the post-anoxic tank there are minimal dissolved influent organics to drive the denitrification process. As such, an external carbon source in the form of MicroC is dosed to supplement the organics and drive the denitrification process.

Mixed liquor is pumped from the post-anoxic tank to the membrane tanks. The membrane tanks serve as additional volume for aerobic biological treatment to remove any excess MicroC (which would otherwise increase BOD in the effluent) and house the membrane filters used for solid-liquid separation. A treated effluent is drawn through the membranes by vacuum pumps.

Since the solid-liquid separation process results in an accumulation of solids in the membrane tank, the mixed liquor (containing both solids and filtrate) is continuously recycled to the first aeration tank. This prevents excessive solids build-up in the membrane tank, and maintains sufficient biomass in the anoxic and aeration tanks. The solids that accumulate in the system consist of biomass that has grown from the influent organics and ammonia, as well as non-biodegradable solids from the influent sewage. In order to maintain an optimal concentration of mixed liquor suspended solids (MLSS) (typically 10 g/L), a portion of the mixed liquor is periodically wasted by pumping from the Aeration Tank to the sludge holding tank. Wasted sludge in the sludge holding tank is thickened by decanting supernatant back to the screen tank. Thickened sludge accumulates in the sludge holding tanks until it is eventually pumped out for disposal.

The STP general flow diagram is illustrated in Figure 4 and Piping and Instrumentation Diagram (PID) in Figures 5 to 8. The following sections describe the STP components.

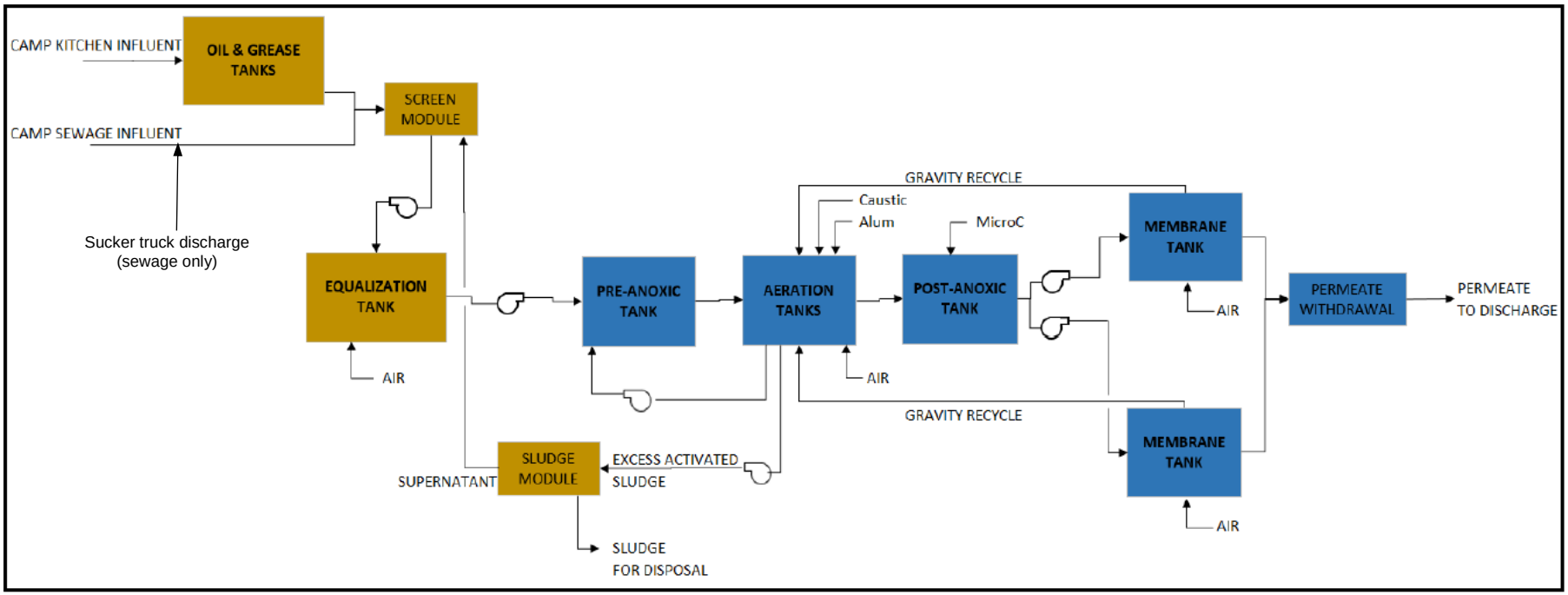

Figure 4 – Flowsheet

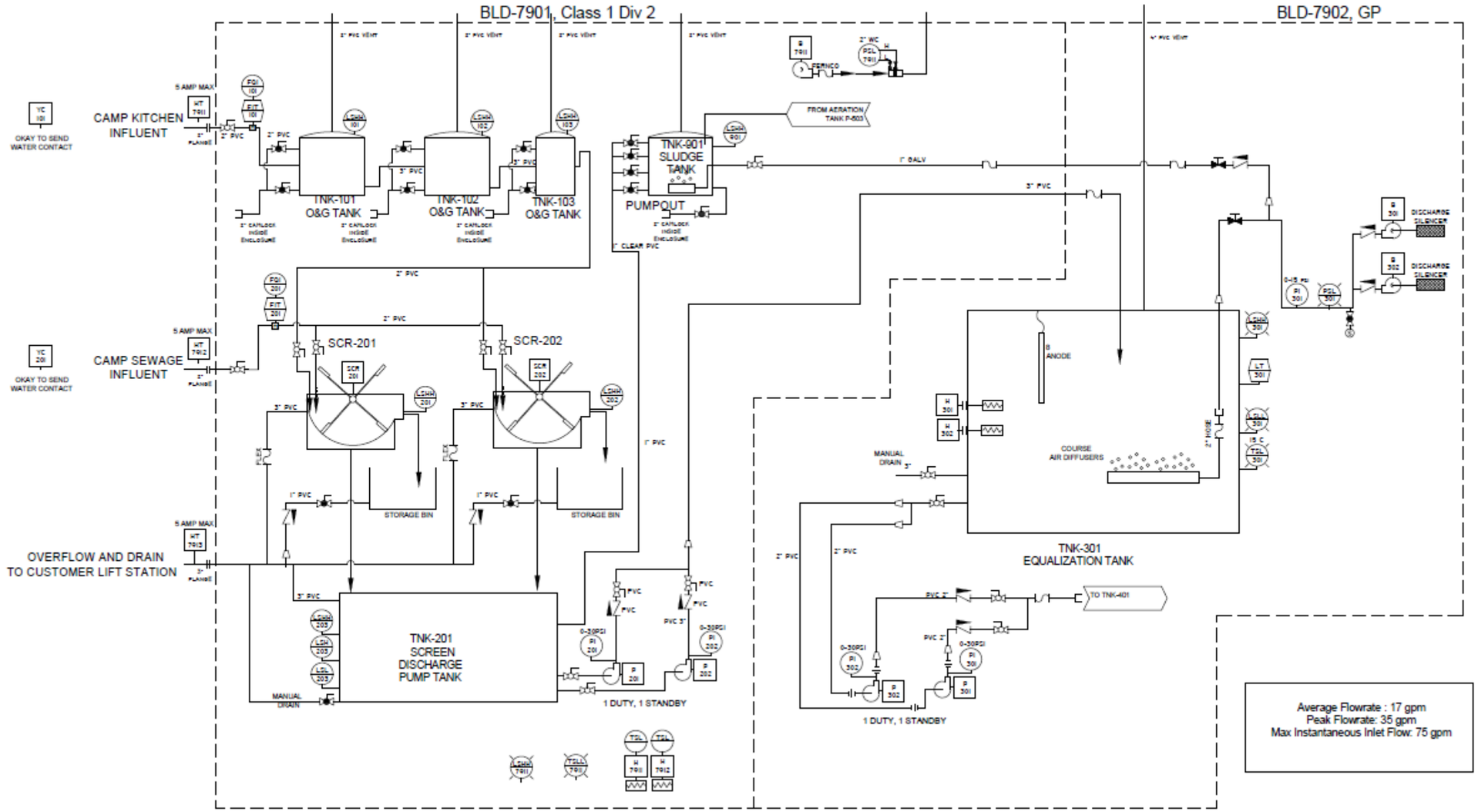

Figure 5 – Oils and grease removal, screening and equalization's tank

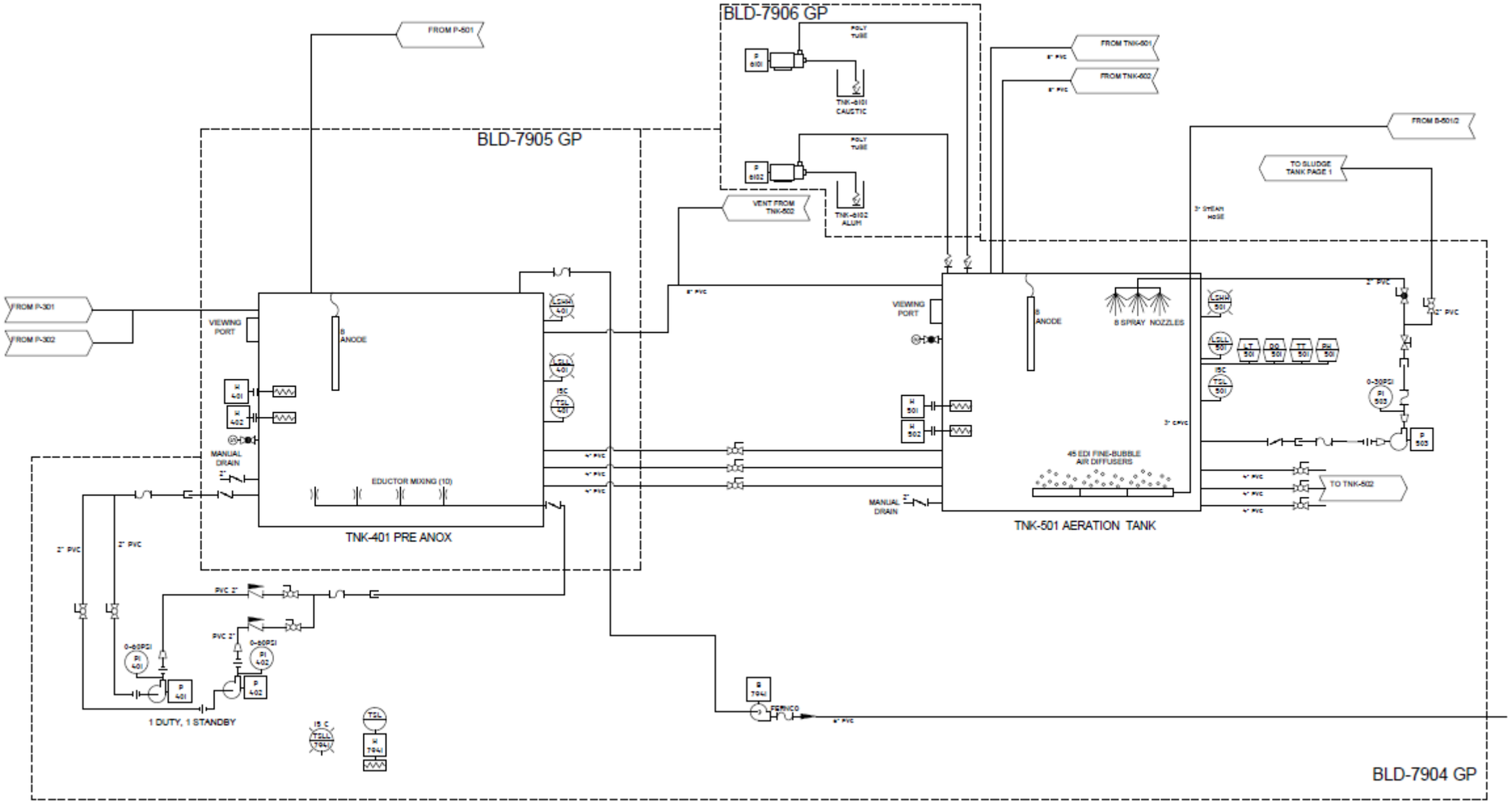

Figure 6 – Biological treatment

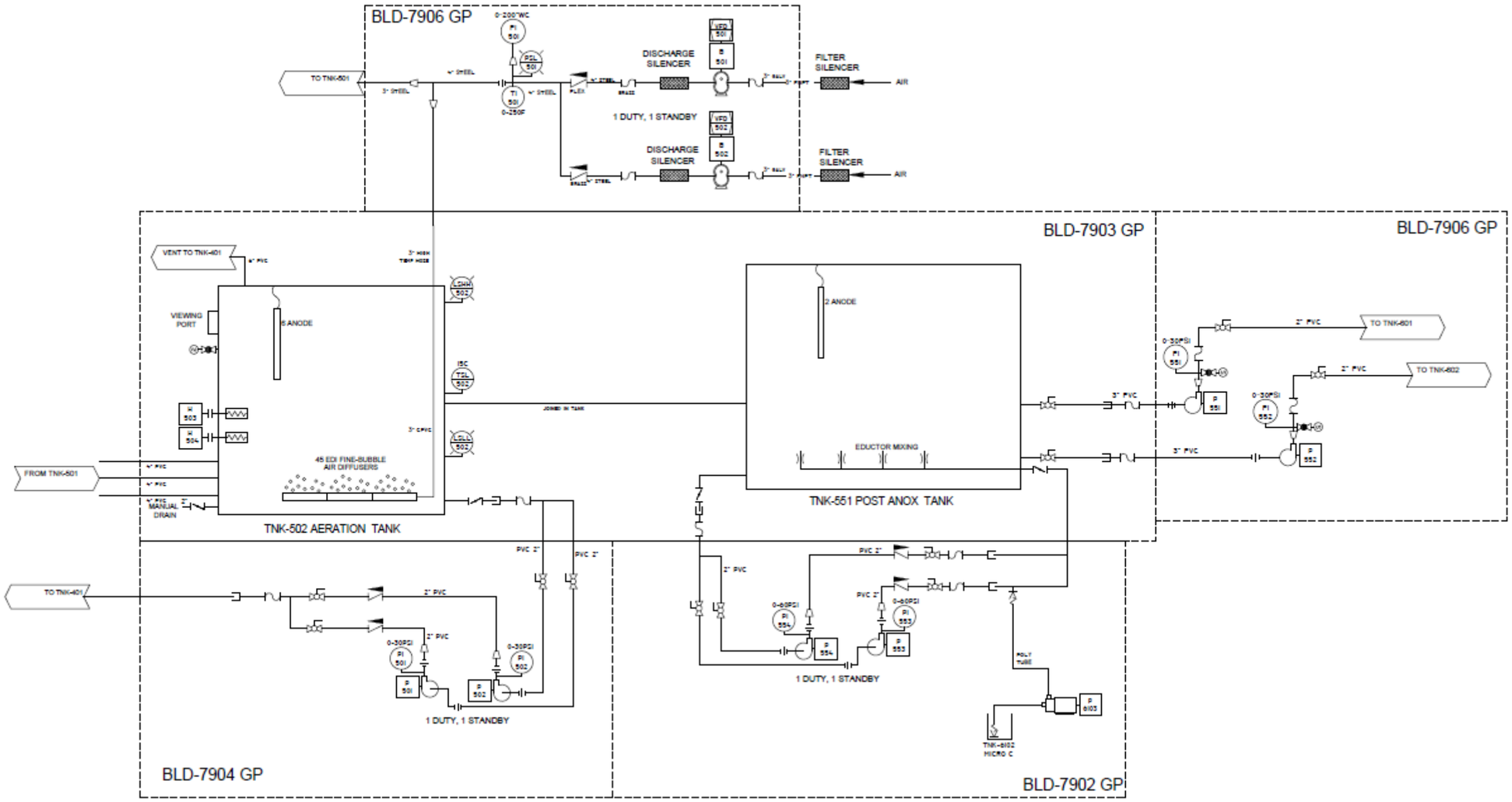

Figure 7 – Post Biological treatment

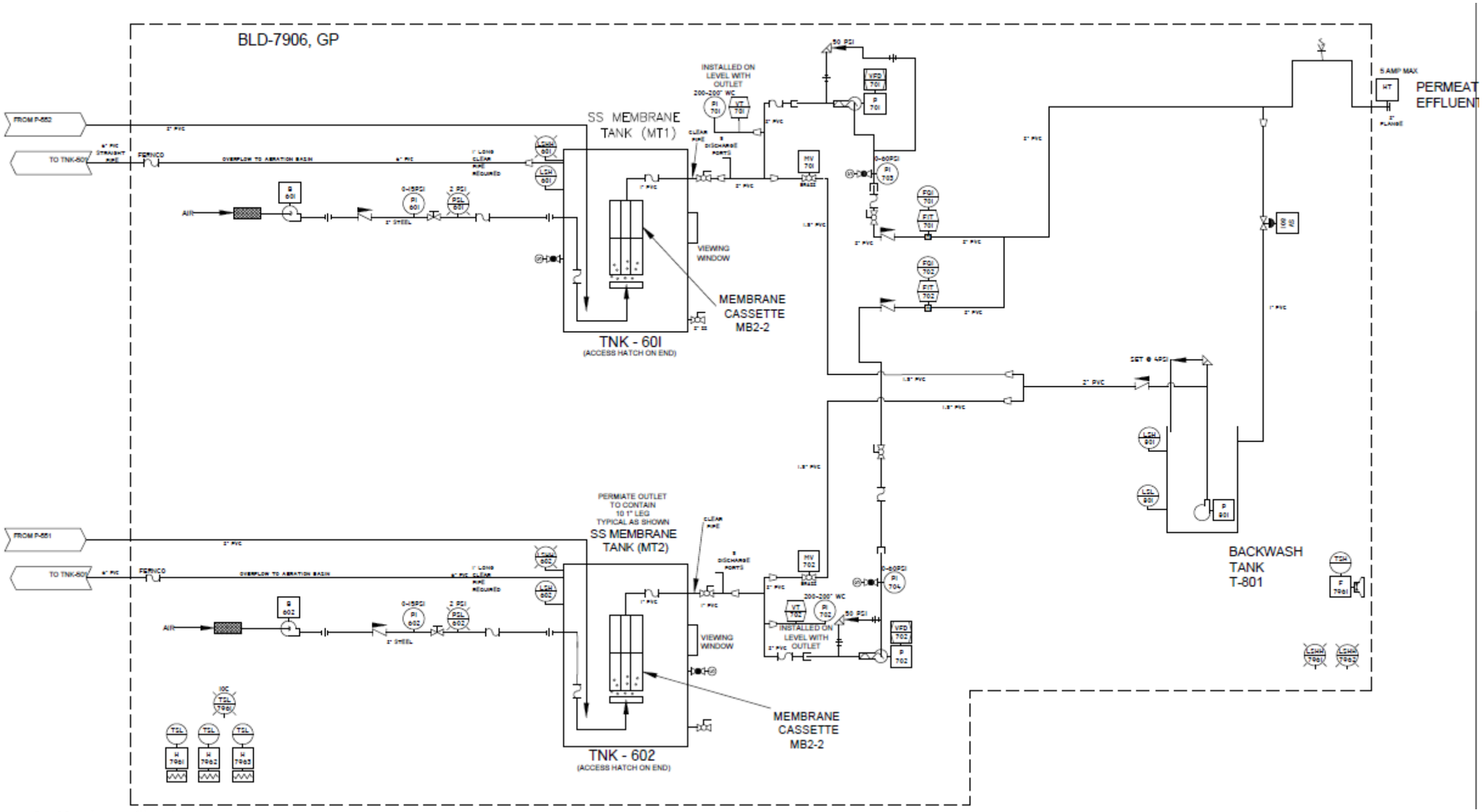

Figure 8 – Membrane filtration step

2.1.2 Process description

Oil and Grease (O/G) removal
Raw sewage from the kitchens entering the system can contain high levels of fats, oils and grease that can damage equipment and membranes downstream. To remove the oil and grease from the system a double trap grease interceptor is installed prior to the kitchen sewage entering the fine screen. Floating grease is removed via a vacuum truck hookup that will be used when the sludge tank is emptied. A pipe and vacuum truck hookup are also used to remove any debris that sunk to the bottom of the tanks. Vacuumed debris, oil and grease are to be disposed at the Meadowbank's tailings storage facility (TSF).

Fine Screening
Raw sewage entering the MBR system contains particulates and solids that could damage the equipment and membranes downstream. 0.5mm wedge wire fine screening protects the downstream equipment by removing large solids and fibrous material. Two screens are used for redundancy so that no unscreened influent enters the EQ tank. Redundant pumps are used to move the screened influent to the equalization tank.

Flow-Equalization
Throughout the day the flow and strength of the sewage will vary. To accommodate this, an equalization tank will buffer the flow and homogenize the loading. The equalization tank is aerated to maintain an aerobic environment to reduce odors and to maintain suspension of solids and pumps transfer sewage to biological treatment. This tank is provided with tank heaters. All wetted materials in this tank are either stainless steel or polypropylene to eliminate the possibility of corrosion. In addition, the tank has two liners, one primary, one secondary, with interstitial monitoring, providing the protection of a double wall tank.

Biological Treatment
In the anoxic zone, the pre-treated sewage is combined with return activated sludge from the aerobic tank and is kept mixed while maintaining a low level of dissolved oxygen (DO). Denitrification occurs as specific microorganisms convert nitrates to nitrogen gas – reducing the total nitrogen (TN) in the mixed liquor. Additionally, the anoxic stage optimizes the biological treatment process, which recovers alkalinity, aids in stabilizing pH, and improves energy efficiency by reducing overall aeration demand. In the aerobic zone, fine bubble diffusers create an aerobic environment where the organics contributing to biological oxygen demand (BOD) and ammonia are oxidized by the biology. Dissolved oxygen is continuously measured and aeration blowers controlled to maintain it in the range of 2 to 3 mg/L for process optimization and energy savings. In the post-anoxic zone, return activated sludge from the aerobic tank is kept mixed while maintaining a low level of dissolved oxygen (DO). The denitrification process continues in the post anoxic zone to reduce the TN even further.

Phosphorous Reduction
Chemical precipitation is used to remove inorganic phosphate. An aluminum sulphate or "Alum" solution is dosed into the mixed liquor causing dissolved phosphate to precipitate and coagulate. The suspended phosphate cannot pass through the Newterra MicroClearUltra Filtration membrane (UF), and the phosphate is eventually removed from the system as a solid with the waste activated sludge (WAS).

Membrane Filtration
After being treated biologically, the treated effluent is separated from the mixed liquor and solids by the Newterra MicroClear membrane modules and the permeate extraction system. The membrane

modules are continually air scoured to induce flow of mixed liquor over the flat sheet membrane surface and prevent fouling and buildup of solids on the membrane surface without the use of chemicals. The mixed liquor is then transferred to the inlet of the biological treatment to maintain even distribution of solids throughout the system and to introduce activated biology to the raw sewage. Newterra MicroClear membranes are produced with true ultrafiltration membrane material with 0.04 µm pore size, which blocks all bacteria and most viruses. Secondary disinfection is not required to exceed effluent requirements. Figure 9 presents a schematic view of the UF process.

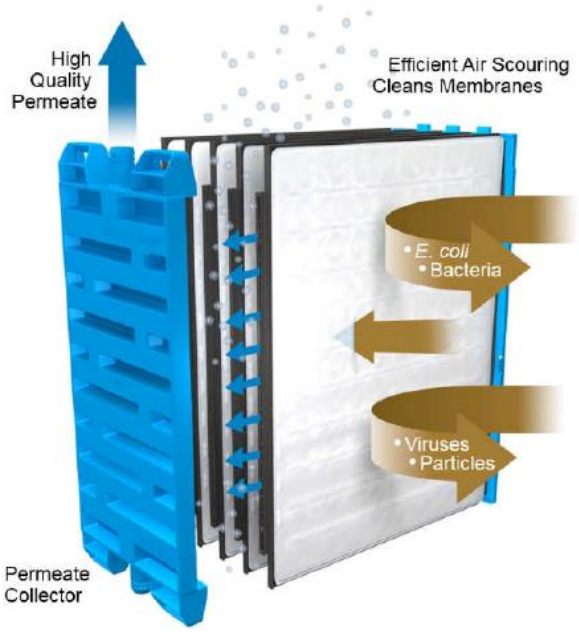

Figure 9 – Membrane filtration concept

2.1.3 Sludge Management Strategy

As solid-laden sewage enters the system and solid-free effluent is discharged, the suspended solids concentration in the mixed liquor suspended solids (MLSS) will increase. To maintain the proper level of MLSS, solids must be removed from the system as Waste Activated Sludge (WAS) which is mixed liquor discharged from the aerobic tank at approximately 0.8% dry. WAS is discharged to a tank for holding and decanting. The holding tank is aerated to maintain an aerobic environment to reduce odors. In the decanting process the WAS is allowed to settle and supernatant is pumped off, and returned to the MBR, thickening the sludge in the holding tank. By thickening the sludge to approximately 2% dry solids by weight, the total volume that must be disposed of is decreased, extending holding time and reducing operational costs. Level control in the tank indicates when the tank should be decanted or a vacuum truck should be scheduled to dispose of the WAS.

2.2 SEWAGE TREATMENT PLANT EXPANSION

Currently, the sewage treatment plant at the Amaruq camp can accommodate 400 workers as presented previously. With the addition of four wings to the Operations Camp for potential Project Expansion, the total camp capacity will increase to 544 workers. An expansion of the sewage treatment systems is thus required. These systems are built with typical 40-foot containers.

To upgrade the STP from the current 400 people to 544 persons, additional containers of equipment would be required. The following equipment would be added:

- Screens system;
- Anoxic tank;
- Aeration tank;
- Membrane tanks.

No major change in operation and water quality are expected with this expansion. Table 3 presents the design flow of the expanded STP.

Table 3: Design flow rate of the expanded STP

Parameters	Design Value	Unit
Per capita design flow	240	L/p/d
Number of persons	544	People
Average daily flow (ADF)	131	m^3/d

Figure 10 presents the potential location of STP expansion.

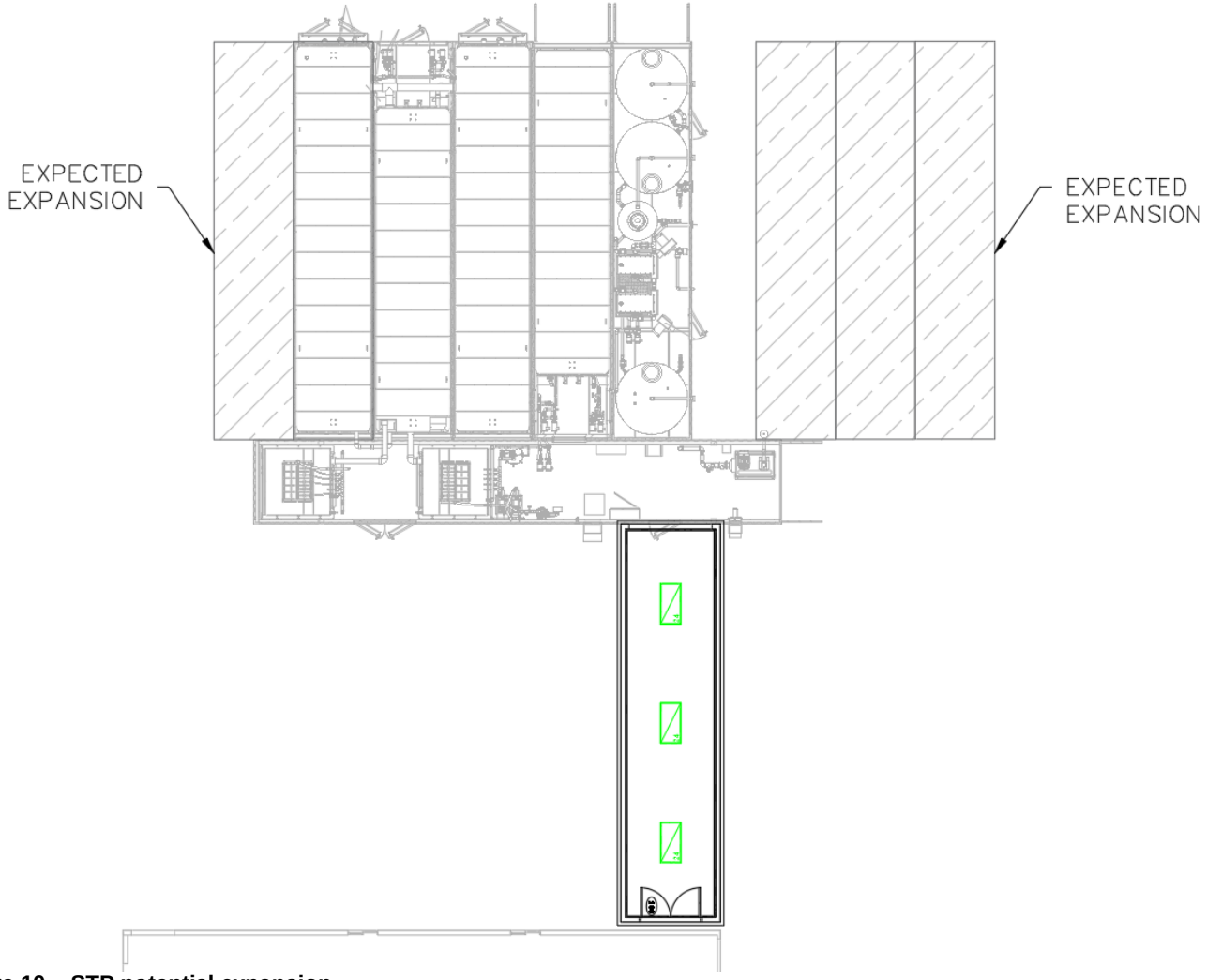

Figure 10 – STP potential expansion

3 OPERATION AND MAINTENANCE

3.1 PUMPING

The system includes several pumps for the operation of the STP. All pumps are regularly inspected by the Operator who will ensure that the pumps continue to operate efficiently and address any deficiencies. If the pumps require maintenance, the Operator will report the situation and take appropriate action. Some of the pumps are installed with a standby unit that allows the Operator to switch from one pump to the other if necessary. In some specific situations, it may be necessary to temporarily shutdown the STP for servicing of the equipment.

A preventative maintenance program, as recommended by the pump supplier, will be followed to ensure the pumps are always kept in good working order.

3.2 SEWAGE COLLECTION

The sewage from the kitchen must pass through a grease trap (or similar facility for grease/fat removal). The large amount of oil and fat can harm treatment facility (e.g., clogging pumps and piping and cause foaming in the aeration tank). To avoid premature membrane fouling, maximum O/G concentrations should not exceed 30 mg/L.

The raw wastewater should not contain any of the following substances:

- Hydrocarbons – lubricants, gasoline, diesel, etc.;
- Paints, solvents, silica, silicon and polymers;
- Antibacterial solutions and products with quaternary ammonia;
- Large quantities of chemicals such as water softener, disinfectants, strong acids & alkalis, pesticides or photographic chemicals;
- Silicone based defoamers;
- Non-biodegradable solid waste (plastic, rubber products, disposable diapers, etc.);
- High amount of metals, such as iron, magnesium, calcium, barium and strontium.

3.3 SLUDGE DISPOSAL

Sludge will be disposed at Amaruq or Meadowbank site in the Waste Rock Storage Facility or the Tailings Storage Facility (Meadowbank only) or in a landfarm as a nutrient amendment as per the Water License Part F Item 3.

3.4 CONTROL

MBR (Membrane Bioreactor) treatment technology is an effective combination of an activated sludge biological treatment process with MBR membrane filtration technology. The STP can be operated in either manual or automatic mode. The system is designed to always run in auto mode. The manual option is provided mainly for maintenance purposes.

STP's control and automation system is based on several instruments measuring key parameter of the process, combined with a PLC. The STP do not require continuous operator intervention except for daily inspection and maintenance. The user interface can be accessed on-site from the control panel mounted touch-screen HMIs or remotely from a computer. Alarm messages can be set up to alert operators to issues.

The STP PLC is programmed to:

- Receive analogue and digital input signals from the switches and transmitters being controlled;
- Process the information using the structure and rules entered into the program;
- Generate outputs that control the equipment - turn equipment OFF or ON.
- Generate alarms if critical conditions are present
- Provide a HMI (Human Machine Interface) touch-screen for use of operator process monitoring and control.

More information are provided in the Operation and Maintenance Manual in Appendix.

3.5 REAGENTS

Some chemicals are required for treatment operation and also for Membrane cleaning. Chemicals will be used according to the MSDS recommendation. MSDS are provided in Appendix. Table 4 presents the estimated chemical consumption per year for the current STP without expansion.

Table 4: Chemical consumption of the current STP

Consumable		Usage Rate			
Purpose	Name	Value	Unit	Value	Unit
Supplemental Alkalinity	Dry Soda Ash	6.28	kg/d	2292	Kg/year
Phosphorus Removal	Liquid Alum, 48%	14.6	L/d	5346	L/year
Nitrate Removal	MicroC 2000	16.5	L/d	6025	L/year
Membrane Cleaning	Sodium Hyprochlorite, 12%	-	L/d	150	L/year

With expansion from 400 to 544 persons, the chemicals estimated in table 4 with be increase by a factor 1.4 approximately.

Sodium Carbonate (Soda Ash) is used for pH adjustment in case there is a deficiency in alkalinity in influent sewage and pH drops. It is hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation (lung irritant).

Sodium hypochlorite (NaOCl) and **Citric Acid** ($C_6H_8O_7$) are used for cleaning the membranes.

- Sodium hypochlorite is a common disinfectant, which can be an irritant or corrosive, depending on its concentration. It cannot be mixed with organics, ammonia compounds or acids. Contact with acids produces highly toxic chlorine gas. It has to be mixed only with pure water.
- Citric Acid is hazardous in case of skin contact (irritant, sensitizers), or ingestion, eye contact (irritant) and inhalation (lung irritants).

Aluminum Sulfate ($Al_2(SO_4)_3$) is used for Phosphorus Removal. Mild to moderate irritation can occur from unprotected contact. Aluminum is very poorly absorbed through the skin and toxic effects would not be expected following short-term skin contact. Inhalation of mists can be irritating to the respiratory tract and lungs.

MicroC 2000 is used for nitrate removal. Exposure to eyes may cause slight irritation. Exposure to Skin may cause slight irritation. Inhalation of high mist concentrations may cause irritation of respiratory tract.

3.6 BIOLOGICAL OPERATION

The following table presents target parameters required for a good operation of the STP.

Table 5: Biological system targets operational parameters

Parameter	Recommended	Range	Notes
MLSS (mg/L): Mixed Liquor Suspended Solids	10,000	8,000 – 15,000	Never operate the membranes if MLSS < 3,000 mg/l. Sludge wasting should be undertaken as required to maintain target MLSS
Temperature (°C)	15 - 35	10 – 35	Avoid sudden changes in temperature. Minimum operating temperature is 15 °C
pH	6.8 - 8.5	6.0 – 9.0	Membrane module can handle a change in pH. However it is recommended to keep pH between 6.8 - 8.5
Aeration Tank, DO (mg/L)	≥ 2.0	1.0 – 8.0	This can be maintained by adjusting the volume of air supplied to the aeration tank
Viscosity (mPa-s)	Not applicable	0 – 300	
Aeration Tank to Anoxic Tank Recirculation	400%	200 – 500%	
Membrane Tank to Aeration Tank Recirculation	400%	200 – 600%	
F:M (kg BOD/kg MLSS/d)	0.1	0.03 – 0.2	F:M = [Flow (m3/d) x BOD conc (mg/l)] / [Process volume (m3) x MLSS conc (mg/l)]
F:M (kg COD/kg MLSS/d)	0.15	0.05 – 0.3	F:M = [Flow (m3/d) x COD conc (mg/l)] / [Process volume (m3) x MLSS conc (mg/l)]
SRT : sludge retention time (days)	> 15	12 – 50	

3.7 MEMBRANE OPERATION

This section outlines the operating conditions that are required for proper sewage treatment, and longevity of the membranes.

Generally, the following points can be used to operate the MBR system properly:

- The MBR system is designed to treat wastewater with specified influent characteristics.
- Never operate the MBR tank below the minimum membrane submerged level. It is necessary to maintain a minimum of 250 mm liquid level above the membrane modules to ensure they are wet at all times and to allow for proper filtration.
- Always supply the required amount of air for scouring to the membrane module.
- Always filter sewage at or below design flow rate.

- Periodically, relax the membranes by ending filtration while allowing the membrane aeration scour to operate continuously and initiate backwash operation during membrane relaxation (default relaxation mode preset in PLC - permeation continues for 9 min and stops for 1 min).
- Always operate the MBR in accordance with the parameters listed in the supplier O&M Manual.
- Clean the membranes in-place with a dilute chemical in accordance with the supplier O&M Manual.

3.8 MEMBRANE CLEANING

In order to enhance life duration of the membrane, several cleaning are required as presented below.

In-situ Chemically Enhanced Backflush (CEB)
It is recommended that in-situ CEB be carried out before the trans membrane pressure (TMP) exceeds 0.25 bar (or permeability drops rapidly to 50 LMH/bar) This is typically done once every couple weeks/months depending on biomass characteristics and system operating condition. On certain occasions, membrane module/cassette may need to be physically inspected for membrane integrity if membrane permeability performance is not recovered after the cleaning (i.e., suspect of membrane deterioration). Hypochlorite is used for organic fooling and citric acid for inorganic acid.

Membrane Recovery Cleaning
The membrane recovery cleaning is to be done once a year at a minimum. On certain occasions, membrane cassette may need to be inspected for membrane integrity (suspect of membrane deterioration, membrane permeability performance does not recover after the cleaning, etc.).

- **Cleaning with High pH Solution:** This step is to be done if membrane fouling is a result of high fat, oil and grease. Sodium hydroxide can be used for this cleaning (400 mg/L, pH 12, 1 to 2 hours).
- **Cleaning with Sodium Hypochlorite** (500 mg/L free Cl_2, 12 hours)
- **Cleaning with Citric Acid** only in case of inorganic fouling (2 to 20 g/L during 2 h).
- **Checking Permeability.**

3.9 SERVICE WATER

For better cleaning performance, it is recommended to use:

- Potable water (permeate is acceptable if potable water is unavailable for the CEB cleaning),
- Water temperature is above 20^0C.

3.10 OPERATIONNAL PERFORMANCE TARGETS

The plant is designed to meet the following criteria presented in Table 6. Note that the treated water from STP is not directly discharged to the environment. The target concentrations presented in the following table for the treated water from STP, are set to limit effect on the receiving Environment after mixing with surface water into the Whale Tail attenuation pond and treatment in the AsWTP. There are no Water Licence criteria for the STP treated water. Reaching these values assure Agnico Eagle to operate the STP at a highest level of efficiency.

Table 6: STP treated water quality operational target

Parameters	Unit	Effluent
pH	s.u.	6.5 – 9.5
Oil, Grease	mg/L	<5
Biological Oxygen Demand (BOD)	mg/L	<25
Total Suspended Solids (TSS)	mg/L	<25
Total Kjeldahl Nitrogen (TKN)	mgN/L	-
Unionized Ammonia Nitrogen (NH3-N)	mgN/L	<1.25
Nitrate Nitrogen (NO3-N)	mgN/L	<5
Total Phosphorus (TP)	mgP/L	<0.5
Fecal Coliform	CFU/100 ml	<200
Total Residual Chlorine	mg/L	<0.02

3.11 GENERAL OPERATION & MAINTENANCE, SAMPLING PROCEDURES AND FREQUENCY

To ensure efficiency of STP, samples of water must be collected periodically. Table 7 presents sampling schedule to assess that STP performance comply with operational target values.

More samples can be taken at different locations in the plant to assess any default on STP operation.

Visual inspection is also important to verify STP operation. The following sign must be reported as soon as possible:

- **Plant Visual Checks Noise**
  During normal operation, there is a uniform humming sound at the plant. In case of an unusual noise, it could be an indication that the blower needs maintenance or repairs
- **Smell**
  The MBR is an aerobic system. During normal operation, the system has an earthy smell similar to that of a well-maintained compost pile. If other odors are noticed, the aeration process may not be operating or the system has been overloaded. Check the DO manually and the blower to verify the proper operation.
- **Effluent Aspect**
  Normally, the effluent is reasonably clear, colorless, and odorless. If the effluent becomes turbid, there is a pin hole in the membrane or a leakage in the piping. Take the unit out of operation and investigate. Check uniformity of membrane air distribution periodically to ensure air scouring is effective across all membrane plates.

Table 7: Monitoring program for operational efficiency assessment.

Parameters	Sewage	Aeration tank	Membrane tank	Effluent
Flow	daily			daily
Oil and Grease	As required			As required
Alkalinity	As required			
Biological Oxygen Demand	Weekly			Weekly
Total Suspended Solids	Weekly			Weekly
Total Kjeldahl Nitrogen / Total Nitrogen	Monthly			As required
Ammonia Nitrogen				As required
Nitrate				As required
Total Phosphorus	Weekly			Weekly
Mixed Liquor Suspended Solids (MLSS)			Weekly	
Mixed Liquor Volatile Suspended Solids (MLVSS)			As required	
Temperature		daily		
pH	As required	daily		Weekly
Dissolved Oxygen		daily		
Filterability			3 times weekly	
Turbidity				As required
Fecal Coliform / E-Coli				Weekly

Table 8 summarizes also Routine Operation and Maintenance Checkups. More details are provided in the supplier O&M Manual.

According to the water licence, Group 1 Parameters shall be analyzed four times per calendar year during operation and closure. The parameters are presented herein:

- pH, turbidity, hardness, alkalinity, chloride, fluoride, sulphate, total dissolved solids (TDS), total suspended solids (TSS), ammonia nitrogen, nitrite, nitrate, orthophosphate, total phosphorus, Total Metals (aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium and zinc).

Table 8: Routine Operation and Maintenance Checkups

Location	Item	Action	Comments
Grease trap	Periodic cleaning	As needed	Waste sent to Meadowbank TSF
Process	Visual check	Daily	Performance evaluation
	Flow rate in and out	Daily	
	Sampling	Daily / as requested	For water quality and performance evaluation
	Vacuum pressure on membrane	Daily	Evaluate Membrane fouling
Mechanical & process	Inspect Membrane	Weekly	
	Sensor cleaning and calibration	Weekly / yearly	
	Valves, fittings	Weekly	Prevent spill
	Membrane Cleaning	Quarterly/Yearly	Permeability recovery
	Aeration diffuser	Yearly	Process efficiency
	Pumps	Quarterly	Prevent spill
	Blower	Monthly	Process efficiency
	Screening device	Daily/ Weekly/ Quarterly	Prevent clogging, remove solid waste and dispose it
	Dosing pumps	Quarterly	Prevent spill
	Fan and heaters	Yearly	Health and safety of operator
Electrical	Leads	Quarterly	Health and safety of operator and Process efficiency
	Panel fan filter, inspection breaker, fuses, motor bold, clean dust	Monthly	Health and safety of operator Process efficiency
	PLC functionality	Weekly	Process efficiency

3.12 TROUBLESHOOTING AND MAINTENANCE PROCEDURES

MBR operation relies critically on the ability of the membrane unit to pass all flow incoming to the plant. If membrane permeability is impaired, the MBR plant cannot process all flow with potentially negative results even though effluent quality remains consistently high. Membrane fouling (and associated reduction of flux or increase of TMP) remains as an operational challenge.

Membrane fouling in MBR is a result of the interaction between the incoming water quality, mixed liquor filterability, system operation condition, and membrane material. There are four categories of membrane fouling.

Microbial/Biological Fouling
Microbial fouling is a result of the formation of biofilms on membrane surfaces. This structure protects bacterial cells from hydraulic shearing and from chemical attacks of biocides such as chlorine. Chemical cleaning would be required to restore permeability.

Particulate/Colloid Fouling
This type of fouling may be associated with high concentrations of colloidal solids present in mixed liquor. In most cases, particles and colloids do not really foul the membrane because the flux decline caused by their accumulation on the membrane surface is largely reversible by hydraulic cleaning measures such as backwash and air scouring. However, the accumulation of solids between the membranes can create increased membrane resistance to permeation and permanent physical membrane damage.

Inorganic Fouling
Inorganic fouling or precipitative fouling is caused by the accumulation of inorganic precipitates such as metal hydroxides, and “scales” on membrane surface or within pore structure. Chemical cleaning will be required in that case.

Organic Fouling
Organic fouling is the attachment of materials such as oil or grease to the membrane surface. Oil and grease trap will prevent this type of fouling and chemical cleaning is also achievable to restore permeability.

Excessive foaming (white foam accumulating over the liquid surface) in aeration and/or membrane tanks could also reduce performance of the STP. Remediation should be taken to eliminate foaming agent or restore design parameters of the plant.

Permeate bad quality can also indicate default in MBR membrane and operation.

Finally, biological system can also indicate default in operation.

- Black color of biomass indicates a lack of aeration,
- Increase of bacteria quantity in the reactor indicates a low sludge wasting,
- Unpleasant odor can indicate overload of the system, blower failure, etc.
- Water quality not achieved: Mixed liquor characteristics are not within proper operating standards.

Further details are available in the manufacturer’ operating manuals in Appendix.

3.13 RECORD KEEPING

Records of the operational, maintenance and sampling procedures will be kept daily in order to assist in the evaluation of the effectiveness of the STP.

The following will be recorded on a daily basis:

- Volume of effluent discharged to the whale tail attenuation pond;
- Sewage volume collected;
- Details of any maintenance undertaken at site;
- Volume of sewage sludge removed from the STP;
- Locations and methods of sewage sludge disposal;
- Water quality parameter results required to follow the STP performance.

The record sheets will be kept in the STP office.

3.14 SAFETY PROCEDURES FOR OPERATORS

Operators working in the STP facility must be trained prior to work so that they are aware of the health and safety risks as well as the operational procedures associated with the STP. The following are important safety considerations:

- The wastewater contains a mixture of viable bacteria and other biological organisms. A wastewater treatment plant poses a number of bacterial hazards and consequently potential health risk. Immunization protects operator against infection. The use of proper hygiene measures, protective equipment, good housekeeping and common sense prevent contact with pathogens. Ensure that hands are washed with an antibacterial soap and warm water and dried by disposable towels on a regular basis, especially prior eating. Do not expose cuts or open sores to wastewater. Any concern about possible infection should be brought to the attention of medical physician immediately.
- Follow local laws and regulations with respect to entering a confined space.
- Working within the plant, especially with chemicals, requires adequate personal protective equipment (PPE) for Operators. This includes wearing steel toed boots, hard hat, rubber aprons, safety glasses with side shields and gloves.
- Operators are required to conduct good housekeeping of the working area to minimize the risk of incidents.
- Lock-out/tag-out procedures must be applied when servicing equipment.
- The MSDS for reagents used in the STP will be readily available for the operator at all times.
- Eyewash stations are located within proximity of reagent systems in the STP.

3.15 CONTROLLING ACCESS TO THE STP

Access to the STP will be restricted to authorized personnel only. Signs will be posted at the STP entrance.

4 EMERGENCY RESPONSE

4.1 FIRE

In case of fire at the STP, the on-site emergency response team (ERT) will be notified as per Agnico Eagle's protocol. Instructions from the on-site emergency response team will be followed by all personnel at the STP. Further details of fire response are provided in the "*Risk Management & Emergency Response Plan*". The STP will include the necessary fire safety protection measures in accordance with the Nunavut and North West Territories Mine Act.

4.2 SPILL

In the event of a spill at the STP, the Environment Department will be notified immediately and provide support, as required. In the event of a large spill, the on-site ERT will be notified as per Agnico Eagle's protocol. Instructions from the ERT will be followed by all personnel at the STP. All spill will be reported and treated according to the "*Spill Contingency Plan".*

4.3 PLANT MALFUNCTION

If there is a major problem or failure in the STP it would be most likely due to changes in the influent (raw sewage) (i.e. high strength sewage (BOD high) killing bacteria in the STP) or membrane failure. In this case, there would be visible effluent problems (part of daily operational checks), poor water quality, and increased odours that the operator would note. If this occurs, a sample will be taken to try to determine the source of the problem.

The following other contingent measures can be applied by Agnico Eagle in the event of a malfunction at the STP:

- Cut back on allowable camp water until the malfunction is corrected and use the equalization tank to retard the peak flow;
- Shut down the malfunctioning unit until the malfunction is repaired and use only one of the two parallel units until repairs are completed (for equipment in parallel);
- Bypassing untreated STP influent around the malfunctioning unit. Sucker truck can collect sewage from the equalization tank and carry it to Meadowbank facilities. Sewage would then be stored into the Tailing storage facility or would be treated into the sewage treatment plant (STP) at Meadowbank depending on the available capacity remaining.
- Shut down temporarily all water use in the camp until the repairs are completed.

Appendix A: Reagent MSDS Sheets

FICHE DE DONNÉES DE SÉCURITÉ

SDS00221
Sodium Hypochlorite 12%

Date de préparation: 09-févr.-2018 Version: 4

1. IDENTIFICATION

Identificateur de produit

Nom du produit Sodium Hypochlorite 12%

Autres moyens d'identification

Code(s) du produit SDS00221

Synonymes Sodium oxychloride; Soda bleach liquor; Javel water; Clorox; Javex.

Utilisation recommandée pour le produit chimique et restrictions en matière d'utilisation

Utilisation recommandée Intermédiaire chimique Agent de blanchiment Réactif de laboratoire. Pulpe er papler. Traitement de l'eau. Désinfectant

Restrictions d'utilisation du produit chimique Aucun renseignement disponible

Données relatives au fournisseur
Univar Canada Ltd.
9800 Van Horne Way
Richmond, BC V6X 1W5
Telephone: 1-866-686-4827

Numéro d'appel d'urgence

Numéro de téléphone d'urgence 24 heures sur 24 (CANUTEC): 1-888-226-8832 (1-888-CAN-UTEC)

2. IDENTIFICATION DES DANGERS

Classement de la substance ou du mélange

Corrosifs pour les métaux	Catégorie 1
Corrosion cutanée/irritation cutanée	Catégorie 1
Sous-catégorie B	
Lésions oculaires graves/irritation oculaire	Catégorie 1

Éléments d'étiquetage

Pictogrammes de danger

Mention d'avertissement: Danger

Mentions de danger
Peut être corrosif pour les métaux
Provoque de graves brûlures de la peau et des lésions oculaires

Conseils de prudence

Prévention
Ne pas respirer les poussières/fumées/gaz/brouillards/vapeurs/aérosols
Se laver le visage, les mains et toute surface de peau exposée soigneusement après manipulation
Porter des gants de protection/des vêtements de protection/un équipement de protection des yeux/du visage

Appeler immédiatement un CENTRE ANTIPOISON ou un médecin
EN CAS DE CONTACT AVEC LES YEUX : rincer avec précaution à l'eau pendant plusieurs minutes. Enlever les lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer
EN CAS DE CONTACT AVEC LA PEAU (ou les cheveux) : Enlever immédiatement les vêtements contaminés. Rincer la peau à l'eau ou se doucher
Laver les vêtements contaminés avant réutilisation
EN CAS D'INHALATION : Transporter la personne à l'extérieur et la maintenir dans une position où elle peut confortablement respirer
EN CAS D'INGESTION : Rincer la bouche. NE PAS faire vomir

Entreposage
Garder sous clef
Stocker dans un endroit bien ventilé. Maintenir le récipient fermé de manière étanche

Élimination
Éliminer le contenu/récipient dans une usine d'élimination des déchets approuvée

Très toxique pour les organismes aquatiques, entraîne des effets à long terme

COMPOSITION/INFORMATION SUR LES INGRÉDIENTS

Substance

Non applicable.

Mélange

Nom chimique	No. CAS	% en poids	Synonymes
Eau	7732-18-5	80 - 90%	Eau

Hypochlorite de sodium	7681-52-9	10 - 20%	Hypochlorite de sodium

4. PREMIERS SOINS

Description des premiers soins

Conseils généraux
Une consultation médicale immédiate est requise. Présenter cette fiche de données de sécurité au médecin traitant.

Inhalation
Déplacer à l'air frais. Pratiquer la respiration artificielle si la victime ne respire plus. Obtenir immédiatement des soins médicaux. Ne pas utiliser la méthode bouche-à-bouche si la victime a ingéré ou inhalé la substance, appliquer la respiration artificielle à l'aide d'un masque de poche muni d'une valve à sens unique ou autre appareil médical approprié. En cas de respiration difficile, (un personnel formé devra) administrer de l'oxygène. Un œdème pulmonaire retardé peut se produire.

Contact avec les yeux
Rincer immédiatement avec une grande quantité d'eau, y compris sous les paupières, pendant au moins quinze minutes. Garder les yeux grands ouverts lors du rinçage. Ne pas frotter la partie touchée. Enlever les lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer. Consulter immédiatement un médecin.

Contact avec la peau
Laver immédiatement avec du savon beaucoup d'eau tout en retirant tous les vêtements et toutes les chaussures contaminés. Consulter immédiatement un médecin.

Ingestion
NE PAS faire vomir. Nettoyer la bouche avec de l'eau et boire ensuite beaucoup d'eau. Ne jamais rien administrer par la bouche à une personne inconsciente. Consulter immédiatement un médecin.

Équipement de protection individuelle pour les intervenants en premiers soins
S'assurer que le personnel médical est conscient du (des) produit(s) en cause, qu'il prend des mesures pour se protéger et qu'il empêche la progression de la contamination. Éviter le contact avec la peau, les yeux ou les vêtements. Éviter un contact direct avec la peau. Utiliser une barrière pour effectuer du bouche à bouche. Porter des vêtements de protection individuelle (voir la section 8).

Symptômes/effets les plus importants, aigus ou retardés:
Provoque une irritation de la bouche, de la gorge et des voies nasales. Corrosif Cause des brûlures dans la bouche, la gorge et l'estomac. Peut provoquer une grave irritation de la peau. Corrosif pour les voies respiratoires. Corrosif pour les tissus oculaires; peut causer de graves lésions aux yeux et entrainer la cécité. Le contact prolongé du produit avec les yeux peut causer des maux de tête, des nausées, des vertiges, de la dyspnée, un état de choc, des convulsions, une insuffisance respiratoire, un collapsus cardiovasculaire, pouvant entrainer la mort. Si la victime survit, elle risque de souffrir ultérieurement de troubles de la fonction hépatique et de la fonction rénale. Provoque des vomissements, des nausées et la diarrhée. Les expositions répétées et/ou prolongées peuvent causer une toux productive, une hydorrhée nasale, une bronchopneumonie, un œdème pulmonaire (accumulation de fluide dans les poumons) et une diminution de la fonction pulmonaire. Peut entrainer le coma, un état de choc et même la mort. Peut causer le blanchiment de la peau. Si mélangé avec les acides ou si réchauffé à des tempérautres supérieures à 40 °C, les solutions d'hypochlorite de sodium produisent un gaz de chlore. Le gaz en question peut causer une grave irritation du nez et de la gorge. Les expositions à des niveaux élevés de gaz de chlore peuvent causer une grave lésion pulmonaire. Le contact porlongé peut causer des brûlures et des ampoules, et risque d'aggraver une dermatite.

Indication des éventuels besoins médicaux immédiats et traitements particuliers nécessaires:

Note aux médecins
En raison de la nature gravement irritante et corrosive de la matière, l'ingestion peut causer une ulcération et l'inflammation des voies alimentaires supérieures ainsi qu'une hémorragie et une perte de fluide. De plus, il y a risque

de perforation de l'œsophage ou de l'estomac et de médiastinite ou de péritonite accompagnés des complications résultantes.

5. MESURES À PRENDRE EN CAS D'INCENDIE

Agents extincteurs appropriés
Utiliser des agents extincteurs appropriés pour les matières environnantes.

Dangers spécifiques du produit
Dans un incendie, les contenants fermés risquent d'exploser. Garder les contenants frais afin de prévenir la rupture et le dégagement du produit. La matière déversée peut rendre les planchers glissants et les surfaces avec lesquelles elle entre en contact.

Produits de combustion dangereux
Chlore. Oxydes de sodium. Oxygène. Emet de la fumeé âcre et des vapeurs irritantes, lorsque chauffé jusqu'à décomposition.

Équipement de protection particulier pour les pompiers
Les pompiers doivent porter un appareil respiratoire autonome et une tenue d'intervention complète de lutte contre l'incendie. Utiliser de l'équipement de protection individuelle.

6. MESURES À PRENDRE EN CAS DE DÉVERSEMENT ACCIDENTEL

Précautions individuelles, équipement de protection et procédures d'urgence

Attention! Corrosive material. Éviter le contact avec la peau, les yeux ou les vêtements. S'assurer une ventilation adéquate. Utiliser l'équipement de protection individuelle requis. Évacuer le personnel vers des endroits sécuritaires. Tenir les gens à l'écart des, et contre le vent par rapport aux, déversements/fuites.

Précautions pour le protection de l'environnement

Empêcher d'autres fuites ou déversements lorsqu'il est possible de le faire en toute sécurité. Ne doit pas être rejeté dans l'environnement. Ne pas laisser pénétrer dans le sol/sous-sol. Empêcher le produit de pénétrer dans les drains.

Méthodes et matériaux pour le confinement et le nettoyage

Empêcher d'autres fuites ou déversements lorsqu'il est possible de le faire en toute sécurité.

7. MANUTENTION ET STOCKAGE

Précautions à prendre pour une manipulation sans danger

Pour usage industriel seulement. Manipuler et ouvrir les contenants avec prudence. Éviter tout contact avec les yeux, la peau et les vêtements. Ne pas ingérer. Éviter l'inhalation du produit chimique. NE PAS manipuler ni entreposer à proximité d'une flamme nue, de la chaleur ou des autres sources d'inflammation. NE PAS pressuriser, découper, chauffer ni souder les contenants. Les contenants vides peuvent renfermer des résidus de produit dangereux. Garder les contenants fermés lorsqu'ils ne sont pas utilisés. Protéger contre les dommages matériels. Utiliser un équipement de protection personnelle approprié. Lors de la dilution, ajouter le produit à l'eau en petites quantités pour éviter les éclaboussures. Ne jamais ajouter l'eau au produit.

Conditions pour un stockage sans danger, y compris d'éventuelles incompatibilités

Entreposer dans un endroit frais, sec et bien ventilé, loin de la chaleur et des sources d'inflammation. Conserver à l'abri de la lumière directe du soleil. Ne pas congeler. Entreposer à l'écart des produits chimiques organiques, des

bases fortes, des poudres métalliques, des carbures, des sulfures et des matières facilement oxydables. Les lieux d'entreposage doivent être munis de planchers résistants à la corrosion, de fosses de relevage et le drainage doit être maîtrisé pour s'écouler dans un réservoir de récupération. Entreposer à une température inférieure à 29 °C. Entreposer dans un contenant doublé de polyéthylène et fermé hermétiquement.

8. CONTRÔLE DE L'EXPOSITION/PROTECTION INDIVIDUELLE

Paramètres de contrôle

Limites d'exposition Sous sa forme commerciale, ce produit ne contient aucune matière dangereuse avec des limites d'exposition professionnelles établies par les organismes de réglementation particuliers à une région.

Nom chimique	Alberta OEL	British Columbia OEL	Ontario	Quebec OEL	Limites d'exposition de l'ACGIH.	Danger immédiat pour la vie ou la santé - DIVS
Eau 7732-18-5	Non disponible	Non disponible	Non disponible	Non disponible	Non disponible	Non disponible
Hypochlorite de sodium 7681-52-9	Non disponible	Non disponible	Non disponible	Non disponible	Non disponible	Non disponible

Consulter les autorités locales pour les limites d'exposition recommandées

Contrôles techniques appropriés

Mesures d'ingénierie
Ventilation d échappement locale selon les besoins pour maintenir les expositions à l intérieur des limites applicables. De l'air d'appoint doit toujours être fourni pour remplacer l'air rejeté (de façon générale ou locale). Une ventilation est requise lors de la pulvérisation ou l'application dans un espace fermé. La ventilation doit être antidéflagrante. Éliminer les sources d'inflammation.

Mesures de protection individuelle, telles que les équipements de protection individuelle

Protection des yeux/du visage
Lunettes de sécurité et (ou) masque couvrant tout le visage si le produit est manipulé d'une façon où il pourrait y avoir éclaboussement dans les yeux.

Protection des mains
Nitrile de caoutchouc. Gants en néoprène. Gants imperméables. Gants en caoutchouc.

Protection de la peau et du corps
Tablier de néoprène ou porter des vêtements résistant du produit. Bottes étanches.

Protection respiratoire
Un appareil de protection respiratoire a adduction d'air homologue par le NIOSH est recommande quand la concentration des particules dans l'air dépasse les limites d'exposition. Porter un respirateur muni d'un élément facial complet contre les gaz acides ou un appareil respiratoire autonome approuvé par NIOSH si les concentrations du produit en suspension dans l'air sont inférieures à 5 ppm.

Considérations générales sur l'hygiène
Éviter le contact avec la peau, les yeux ou les vêtements. Porter des gants appropriés et un appareil de protection des yeux/du visage. Ne pas manger, boire ou fumer en manipulant le produit. Retirer et laver les vêtements et les gants contaminés, y compris l'intérieur, avant de les réutiliser. Les vêtements de travail contaminés ne devraient pas sortir du lieu de travail. Il est recommandé de nettoyer régulièrement l'équipement, l'aire de travail et les vêtements. Se laver les mains avant les pauses/arrêts et immédiatement après avoir manipuler le produit.

9. PROPRIÉTÉS PHYSIQUES ET CHIMIQUES

Informations sur les propriétés physiques et chimiques essentielles

Aspect

État physique	Liquide
Couleur	Transparent Vert à jaune.
Odeur	Chlore
Seuil olfactif	Aucun renseignement disponible

PROPRIÉTÉS	Valeurs	Remarques • Méthode
pH	11.5 - 13	
Point de fusion / point de congélation	-25 °C / -13 °F	
Point d'ébullition / Domaine d'ébullition	Aucune donnée disponible	Aucun à notre connaissance
Point d'éclair	Aucune donnée disponible	Aucun à notre connaissance
Taux d'évaporation	Aucune donnée disponible	Aucun à notre connaissance
Inflammabilité (solide, gaz)	Aucune donnée disponible	Aucun à notre connaissance
Limites d'inflammabilité dans l'air		
Limite supérieure d'inflammabilité:	Aucune donnée disponible	
Limite inférieure d'inflammabilité	Aucune donnée disponible	
Pression de vapeur	17.5 mmHg	
Densité de vapeur relative	Aucune donnée disponible	Aucun à notre connaissance
Densité relative	1.175	
Solubilité dans l'eau	Soluble dans l'eau	
Solubilité dans d'autres solvants	Aucune donnée disponible	
Coefficient de partage	Aucune donnée disponible	
Température d'auto-inflammation	Aucune donnée disponible	Aucun à notre connaissance
Température de décomposition	Aucune donnée disponible	Aucun à notre connaissance
Viscosité cinématique	Aucune donnée disponible	Aucun à notre connaissance
Viscosité dynamique	Aucune donnée disponible	Aucun à notre connaissance
Propriétés explosives	Aucun renseignement disponible.	
Propriétés comburantes	Aucun renseignement disponible.	
Masse moléculaire	Aucun renseignement disponible	
Teneur en COV	Aucun renseignement disponible	
Masse volumique du liquide	Aucun renseignement disponible	
Masse volumique apparente	Aucun renseignement disponible	

10. STABILITÉ ET RÉACTIVITÉ

Réactivité/Stabilité chimique
Unstable above 40°C / 104 °F.

Possibilité de réactions dangereuses
L'hypochlorite peut réagir avec les amines primaires et former du trichlorure d'azote, une substance qui explose spontanément dans l'air. Les agents de blanchiment à l'hypochlorite réagissent avec l'urée et produisent du trichlorure d'azote, une substance qui explose spontanément dans l'air. Certains métaux accélèrent la décomposition de l'hypochlorite de sodium. Nickel. Cuivre. Étain. Fer et ses alliages. Manganèse.

Polymérisation dangereuse
Ne se produira pas.

Conditions à éviter
Températures élevées. Exposition à la lumière.

Matières incompatibles
Comburants puissants. Acides. Agents réducteurs. Ammoniac. Métaux.

Produits de décomposition dangereux
Chlore. Oxydes de sodium. Oxygène. Emet de la fumeé âcre et des vapeurs irritantes, lorsque chauffé jusqu'à décomposition.

11. DONNÉES TOXICOLOGIQUES

Informations sur les voies d'exposition probables

Inhalation
Provoque une irritation de la bouche, de la gorge et des voies nasales. Corrosif pour les voies respiratoires. Les expositions répétées et/ou prolongées peuvent causer une toux productive, une hydorrhée nasale, une bronchopneumonie, un œdème pulmonaire (accumulation de fluide dans les poumons) et une diminution de la fonction pulmonaire. Si mélangé avec les acides ou si réchauffé à des tempérautres supérieures à 40 °C, les solutions d'hypochlorite de sodium produisent un gaz de chlore. Le gaz en question peut causer une grave irritation du nez et de la gorge. Les expositions à des niveaux élevés de gaz de chlore peuvent causer une grave lésion pulmonaire.

Contact avec les yeux
Corrosif pour les tissus oculaires; peut causer de graves lésions aux yeux et entrainer la cécité. Le contact prolongé du produit avec les yeux peut causer des maux de tête, des nausées, des vertiges, de la dyspnée, un état de choc, des convulsions, une insuffisance respiratoire, un collapsus cardiovasculaire, pouvant entrainer la mort. Si la victime survit, elle risque de souffrir ultérieurement de troubles de la fonction hépatique et de la fonction rénale.

Contact avec la peau
Corrosif. Peut provoquer une grave irritation de la peau. Peut causer le blanchiment de la peau. Le contact porlongé peut causer des brûlures et des ampoules, et risque d'aggraver une dermatite.

Ingestion
Cause des brûlures dans la bouche, la gorge et l'estomac. Corrosif. Provoque des vomissements, des nausées et la diarrhée. Peut entrainer le coma, un état de choc et même la mort.

Informations sur les effets toxicologiques

Symptômes
Les effets corrosifs sur la peau et les yeux peuvent être retardés et une lésion peut se produire sans aucune sensation ou signe de douleur. L'aspiration peut causer des lesions pulmonaires.

Mesures numériques de la toxicité

Toxicité aiguë

Les valeurs suivantes sont calculées d'après le chapitre 3.1 du document du SGH .

ETAmél (orale)	68,333.00 mg/kg
ETAmél (cutané)	83,417.00 mg/kg

Toxicité aiguë inconnue Aucun renseignement disponible

Nom chimique	DL50 par voie orale	DL50 par voie cutanée	CL50 par inhalation

Eau 7732-18-5	> 90 mL/kg (Rat)	Non disponible	Non disponible
Hypochlorite de sodium 7681-52-9	= 8.91 g/kg (Rat)	> 10000 mg/kg (Rabbit)	Non disponible

Effets retardés et immédiats et effets chroniques d'une exposition de courte et de longue durée

Corrosion cutanée/irritation cutanée
Corrosif. Peut provoquer une grave irritation de la peau. Peut causer le blanchiment de la peau. Le contact porlongé peut causer des brûlures et des ampoules, et risque d'aggraver une dermatite.

Lésions oculaires graves/irritation oculaire
Corrosif pour les tissus oculaires; peut causer de graves lésions aux yeux et entrainer la cécité. Le contact prolongé du produit avec les yeux peut causer des maux de tête, des nausées, des vertiges, de la dyspnée, un état de choc, des convulsions, une insuffisance respiratoire, un collapsus cardiovasculaire, pouvant entrainer la mort. Si la victime survit, elle risque de souffrir ultérieurement de troubles de la fonction hépatique et de la fonction rénale.

Sensibilisation respiratoire ou cutanée
Aucun renseignement disponible.

Mutagénicité sur les cellules germinales
Aucun renseignement disponible.

Cancérogénicité
Aucun renseignement disponible.

Le tableau ci-dessous indique si chaque agence a inscrit un ingrédient comme un cancérogène.

Nom chimique	ACGIH	CIRC	NTP	OSHA
Eau 7732-18-5	Non disponible	Non disponible	Non disponible	Non disponible
Hypochlorite de sodium 7681-52-9	Non disponible	Group 3	Non disponible	Non disponible

Légende
CIRC (Centre international de recherche sur le cancer)
Groupe 3 - Ne peut être classifié pour la cancérogénicité chez les humains

Toxicité pour la reproduction
Aucun renseignement disponible.

Toxicité systémique pour certains organes cibles - exposition unique
Aucun renseignement disponible.

Toxicité systémique pour certains organes cibles - exposition répétées
Aucun renseignement disponible.

Danger par aspiration
Aucun renseignement disponible.

12. DONNÉES ÉCOLOGIQUES

Écotoxicité
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Nom chimique	Toxicité algaire aiguë:	Toxicité aigué de poisson:	Toxicité pour les microorganismes	Crustacés
Eau 7732-18-5	Non disponible	Non disponible	Non disponible	Non disponible
Hypochlorite de sodium	Non disponible	0.06 - 0.11 mg/L LC50	Non disponible	EC50: 0.033 - 0.044mg/L

7681-52-9		(Pimephales promelas) 96 h flow-through 4.5 - 7.6 mg/L LC50 (Pimephales promelas) 96 h static 0.4 - 0.8 mg/L LC50 (Lepomis macrochirus) 96 h static 0.28 - 1 mg/L LC50 (Lepomis macrochirus) 96 h flow-through 0.05 - 0.771 mg/L LC50 (Oncorhynchus mykiss) 96 h flow-through 0.03 - 0.19 mg/L LC50 (Oncorhynchus mykiss) 96 h semi-static 0.18 - 0.22 mg/L LC50 (Oncorhynchus mykiss) 96 h static		(48h, Daphnia magna)

Persistance et dégradabilité Aucun renseignement disponible.

Bioaccumulation Aucun renseignement disponible.

Nom chimique	Coefficient de partage
Eau 7732-18-5	Non disponible
Hypochlorite de sodium 7681-52-9	Non disponible

Autres effets néfastes Aucun renseignement disponible.

13. DONNÉES SUR L'ÉLIMINATION

Méthodes de traitement des déchets

Éliminer conformément à la réglementation locale. Éliminer les déchets conformément à la réglementation environnementale.

Ne pas réutiliser les contenants vides.

14. INFORMATIONS RELATIVES AU TRANSPORT

TDG (Canada):

Numéro ONU	UN1791
Appellation d'expedition	HYPOCHLORITE EN SOLUTION
Classe	8
Groupe d'emballage	III
Polluant marin	Non disponible.

DOT (U.S.)

Numéro ONU	UN1791
Appellation d'expedition	HYPOCHLORITE EN SOLUTION
Classe	8
Groupe d'emballage	III
Polluant marin	Non disponible

15. INFORMATIONS SUR LA RÉGLEMENTATION

Réglementations/législation particulières à la substance ou au mélange en matière de sécurité, de santé et d'environnement

NSF International

Renseignements complémentaires
Utilisation maximum pour l'eau potable 95 mg par litre. Seuls les produits portant la marque NSF sur le produit, l'emballage du produit, et / ou ladocumentation livrés avec le produit sont certifiés.

Dispositions réglementaires des É.-U.

Nom chimique	CERCLA/SARA - section 302:	Classe de risques SARA (311, 312):	CERCLA/SARA - section 313:
Eau - 7732-18-5	Non inscrit(e)	Non inscrit(e)	Non inscrit(e)
Hypochlorite de sodium - 7681-52-9	Non inscrit(e)	Listed	Non inscrit(e)

Inventaires internationaux

TSCA	Est conforme à (aux)
LIS/LES	Est conforme à (aux)

Légende :
TSCA - États-Unis - Section 8 (b) de l'inventaire TSCA (loi réglementant les substances toxiques)
LIS/LES - liste intérieure des substances/liste extérieure des substances pour le Canada

16. AUTRES INFORMATIONS, Y COMPRIS LA DATE DE PRÉPARATION DE LA DERNIÈRE RÉVISION

NFPA:	**Risques pour la santéInflammabilité** 0 3		**Instabilité** 0		**Propriétés physiques et chimiques** -
HMIS Health Rating:	**Risques pour la santéInflammabilité** 0 3		**Dangers physiques** 0		**Protection individuelle** X

Légende Section 8 : CONTRÔLES DE L'EXPOSITION/PROTECTION INDIVIDUELLE

TWA	TWA (moyenne pondérée dans le temps)	STEL	STEL (Limite d'exposition de courte durée)
Valeur plafond	Valeur limite maximale	*	Désignation de la peau

Préparé par:	Le Service de la santé, de la sécurité et de l'environnement d'Univar Canada ltée.
Date de préparation:	09-févr.-2018
Date de révision :	09-févr.-2018

Avis de non-responsabilité
AVIS AU LECTEUR:
Univar renonce expressément à toute garantie de qualité marchande et d'adaptation à un usage particulier,

expresse ou implicite, en ce qui a trait au produit et aux renseignements contenus dans la présente, et elle n'est pas responsable des dommages accessoires ou indirects.

Ne pas se servir des renseignements sur les ingrédients et/ou du pourcentage des ingrédients indiqués dans la présente FS comme spécifications du produit. Pour obtenir des renseignements sur les spécifications du produit, se reporter à la feuille des spécifications du produit et/ou au certificat d'analyse. Ces documents sont disponibles à votre bureau de vente Univar local.

Tous les renseignements indiqués dans la présente sont basés sur des données fournies par le fabricant et/ou par des sources techniques reconnues. Même si les renseignements sont supposés être exacts, Univar ne fait aucune représentation quant à leur justesse ou leur convenance. Les conditions d'utilisation sont hors du contrôle de Univar. En conséquence, les utilisateurs sont responsables de vérifier eux-mêmes les données conformément à leurs conditions d'exploitation afin de déterminer si le produit convient aux applications prévues. De plus, les utilisateurs assument tous les risques afférents à l'emploi, la manipulation et l'élimination du produit, à la publication, à l'utilisation des renseignements contenus dans la présente et à la confiance qu'on leur accorde. Les renseignements se rapportent seulement au produit indiqué dans la présente et ne concernent pas son utilisation avec une autre matière ou dans un autre procédé.

Fin de la fiche de données de sécurité

SAFETY DATA SHEET

NC00525
MICROC 2000

Preparation Date: 09/Mar/2018 Version: 1

1. IDENTIFICATION

Product identifier

Product Name MICROC 2000

Other means of identification

Product Code(s) NC00525

Synonyms none

Recommended use of the chemical and restrictions on use

Recommended Use Reducing agent for biological purposes

Restricted Uses No information available

Initial Supplier Identifier
Univar Canada Ltd.
9800 Van Horne Way
Richmond, BC V6X 1W5
Telephone: 1-866-686-4827

Emergency telephone number

24 Hour Emergency Phone Number (CANUTEC): 1-888-226-8832 (1-888-CAN-UTEC)

2. HAZARD IDENTIFICATION

Hazardous Classification of the substance or mixture

none

Label elements

Hazard pictograms None

Hazard statements

The mixture does not meet the criteria for classification.

Prevention
Wash hands thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
In case of inadequate ventilation wear respiratory protection

Response
Read the label and safety data sheet before use.
Flush eyes with plenty amounts of water.
If eye irritation persists: Get medical advice/attention
Wash skin with plenty of water.
If skin irritation occurs: Get medical advice/attention
Move person to fresh air.
Do NOT induce vomiting. Never give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Storage
Store in accordance with good industrial practices.

Disposal
Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Not applicable.

Mixture

Chemical Name	CAS No	Weight-%	Synonyms
Glycerine	56-81-5	70 - 80%	Glycerine
Water	7732-18-5	20 - 30%	Water
Sodium Chloride	7647-14-5	0 - 10%	Sodium Chloride
Methanol	67-56-1	0 - 10%	Methanol

4. FIRST AID

Description of first aid measures

Inhalation
Remove to fresh air.

Eye contact
Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin contact
Wash skin with soap and water.

Ingestion
Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects, both acute and delayed:
May cause slight eye irritation Symptoms include pain, redness and tearing. May cause slight skin irritation. Prolonged or repeated contact may cause discomfort and local redness. High concentrations of mist or vapor may cause irritation of the respiratory tract. May be harmful if swallowed

Indication of any immediate medical attention and special treatment needed:

Note to physicians
Treatment based on sound judgment of physician and individual reactions of patient.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media
Use extinguishing agent suitable for type of surrounding fire. Water spray. Alcohol foam. Dry chemical or CO2. Water or Foam may cause frothing.

Specific hazards arising from the substance or mixture
No information available.

Hazardous combustion products
See section 10 for more information.

Special protective equipment for fire-fighters
Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Avoid breathing vapors or mists.

Environmental precautions

See Section 12 for additional Ecological Information.

Methods and materials for containment and cleaning up

Prevent further leakage or spillage if safe to do so. Eliminate all ignition sources.

7. HANDLING AND STORAGE

Precautions for safe handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Avoid breathing vapors or mists. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Conditions for safe storage, including any incompatibilities

Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits .

Chemical Name	Alberta OEL	British Columbia OEL	Ontario	Quebec OEL	Exposure Limit - ACGIH	Immediately Dangerous to Life or Health - IDLH
Glycerine 56-81-5	TWA: 10 mg/m^3	TWA: 10 mg/m^3 TWA: 3 mg/m^3	Not available	TWA: 10 mg/m^3	Not available	Not available
Water 7732-18-5	Not available	Not available	Not available	Not available	Not available	Not available
Sodium Chloride 7647-14-5	Not available	Not available	Not available	Not available	Not available	Not available
Methanol 67-56-1	TWA: 200 ppm TWA: 262 mg/m^3 STEL: 250 ppm STEL: 328 mg/m^3 Skin	TWA: 200 ppm STEL: 250 ppm Skin	TWA: 200 ppm STEL: 250 ppm Skin	TWA: 200 ppm TWA: 262 mg/m^3 STEL: 250 ppm STEL: 328 mg/m^3 Skin	250 ppm STEL 200 ppm TLV-TWA	6000 ppm

Consult local authorities for recommended exposure limits

Appropriate engineering controls

Engineering controls
Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Eye/face protection
Chemical goggles; also wear a face shield if splashing hazard exists.

Hand protection
Use gloves chemically resistant to this material, examples of preferred glove barrier materials include:. Nitrile gloves.

Skin and body protection
Skin contact should be prevented through the use of suitable protective clothing, gloves and footwear, selected for conditions of use and exposure potential. Consideration must be given both to durability as well as permeation resistance.

Respiratory protection
If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator.

General hygiene considerations
Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance

Physical state	Liquid
Color	Light brown

Odor	MUSTY to Sweet
Odor threshold	No information available

PROPERTIES	Values	Remarks • Method
pH	4 - 11	
Melting point / freezing point	No data available	None known
Initial boiling point/boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		
Upper flammability limit:	No data available	
Lower flammability limit:	No data available	
Vapor pressure	No data available	None known
Relative vapor density	No data available	None known
Specific Gravity	1.225@ 20°C	
Water solubility	Soluble in water	
Solubility in other solvents	No data available	None known
Partition coefficient	No data available	
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	45 cPs @ 20C	
Dynamic viscosity	No data available	None known
Explosive properties	No information available.	
Oxidizing properties	No information available.	
Molecular weight	No information available	
VOC Percentage Volatility	No information available	
Liquid Density	No information available	
Bulk density	10.22 lbs/gal	

10. STABILITY AND REACTIVITY

Reactivity/Chemical Stability
Stable under normal conditions

Possibility of hazardous reactions
None under normal processing.

Conditions to avoid
Heat, flames and sparks.

Incompatible materials
Oxidizing agents. Nitric acid. Peroxides. Chromates.

Hazardous decomposition products
Oxides of carbon.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation
High concentrations of mist or vapor may cause irritation of the respiratory tract.

Eye contact
May cause slight eye irritation.

Skin contact
May cause slight skin irritation.

Ingestion
May be harmful if swallowed.

Information on toxicological effects

Symptoms
Prolonged exposure may cause headaches, nausea, dizziness, eye, skin and respiratory irritation.

Numerical measures of toxicity

Acute toxicity

The following values are calculated based on chapter 3.1 of the GHS document .

ATEmix (oral) 13,548.00 mg/kg
ATEmix (dermal) 13,903.00 mg/kg

Unknown acute toxicity No information available

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Glycerine 56-81-5	= 12600 mg/kg (Rat)	> 10 g/kg (Rabbit)	> 570 mg/m^3 (Rat) 1 h
Water 7732-18-5	> 90 mL/kg (Rat)	Not available	Not available
Sodium Chloride 7647-14-5	= 3 g/kg (Rat)	Not available	> 42 g/m^3 (Rat) 1 h
Methanol 67-56-1	= 6200 mg/kg (Rat)	= 15840 mg/kg (Rabbit)	= 22500 ppm (Rat) 8 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation
May cause slight irritation with discomfort and local redness.

Serious eye damage/eye irritation
Symptoms include pain, redness and tearing.

Respiratory or skin sensitization
No information available.

Germ cell mutagenicity
No information available.

Carcinogenicity
No information available.

Chemical Name	ACGIH	IARC	NTP	OSHA
Glycerine 56-81-5	Not available	Not available	Not available	Not available
Water 7732-18-5	Not available	Not available	Not available	Not available
Sodium Chloride 7647-14-5	Not available	Not available	Not available	Not available
Methanol 67-56-1	Not available	Not available	Not available	Not available

Reproductive toxicity
No information available.

Specific target organ systemic toxicity - single exposure
No information available.

Specific target organ systemic toxicity - repeated exposure
No information available.

Aspiration hazard
No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

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Chemical Name	Ecotoxicity - Freshwater Algae Data	Ecotoxicity - Fish Species Data	Toxicity to microorganisms	Crustacea
Glycerine 56-81-5	Not available	51 - 57 mL/L LC50 (Oncorhynchus mykiss) 96 h static	Not available	Not available
Water 7732-18-5	Not available	Not available	Not available	Not available
Sodium Chloride 7647-14-5	Not available	5560 - 6080 mg/L LC50 (Lepomis macrochirus) 96 h flow-through 12946 mg/L LC50 (Lepomis macrochirus) 96 h static 6020 - 7070 mg/L LC50 (Pimephales promelas) 96 h static 7050 mg/L LC50 (Pimephales promelas) 96 h semi-static 6420 - 6700 mg/L LC50 (Pimephales promelas) 96 h static 4747 - 7824 mg/L LC50 (Oncorhynchus mykiss) 96 h flow-through	Not available	EC50: =1000mg/L (48h, Daphnia magna) EC50: 340.7 - 469.2mg/L (48h, Daphnia magna)
Methanol 67-56-1	Not available	28200 mg/L LC50 (Pimephales promelas) 96 h flow-through 100 mg/L LC50 (Pimephales promelas) 96 h static 19500 - 20700 mg/L LC50 (Oncorhynchus mykiss) 96 h flow-through 18 - 20 mL/L LC50 (Oncorhynchus mykiss) 96 h static 13500 - 17600 mg/L LC50 (Lepomis macrochirus) 96 h flow-through	Not available	Not available

Persistence and degradability No information available.

Bioaccumulation No information available.