SUMMARY OF OPERATIONS AND MAINTENANCE PROCEDURES FOR DRINKING WATER, SEWAGE, SOLID WASTE DISPOSAL AND WASTE TREATMENT FACILITIES

— Eureka High Arctic Weather Station —

In support of the Nunavut Water Board License
No. 8BC-EUR2131

Prepared by Public Services and Procurement Canada (PSPC)

June 2022

Control Page

On receipt of revisions and/or amendments, this control page will be updated to ensure that the Summary of Operations and Maintenance Procedures for Sewage, Solid Waste Disposal and Treatment Facilities is current and reflects the operations and activities occurring at the Eureka High Arctic Weather Station (HAWS; the Site).

Version	Date in Force	Expiry date	Description / Purpose
1	November 23, 2007	November 22, 2008	Original Summary
2	March 3, 2009	March 3, 2010	Eureka Water License, II. General Considerations, ss. D(ii) Water License Inspection, Nov. 27, 2007 Station Program Manager Review
3	February 16, 2010	February 16, 2011	Update Hazardous Waste Disposal Update Appendices to reflect current practice
4	January 2011	June 2021	Updates required for licence renewal as per NWB
5	June 2021	None	Updates to Hazardous waste disposal,

			solid waste disposal, and Appendices to reflect current practices
6	June 2022	None	Update to include Exfiltration Trench

Table of Contents

Acronyms and Symbols

BOD_5	Biochemical oxygen demand
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
DND	Department of National Defence
ECCC	Environment and Climate Change Canada
HAWS	High Arctic Weather station
L	Litre
M	Metre
M^3	Cubic metre
MSDS	Material Safety Data Sheet
N	North
PCB	Polychlorinated biphenyl
PEARL	Polar Environment Atmospheric Research Laboratory
pH	Measure of acidity or alkalinity
UV	Ultraviolet
W	West

1. Introduction

This document has been produced to satisfy the requirement of the Nunavut Water Board (NWB) for the terms of water license number 8BC-EUR1621, Part H, Item 2

"*The Licensee shall submit to the Board for review, as part of the 2016 Annual Report, an Addendum to the manual referred to in Part H, Item 1, to address the following*

a) *Construction workers camp water and wastewater management, solid waste handling, incinerator operations and ash disposal procedures;*
b) *Black Top Creek mobile washcar water and wastewater management; and*
c) *An options analysis for the current, undersized sewage lagoon*;"

The Eureka High Arctic Weather Station (HAWS; the Site) is located on the north side of Slidre Fjord, at the northwestern tip of Fosheum Peninsula on Ellesmere Island, Nunavut (Appendix 1). Since 1947, Environment & Climate Change Canada (ECCC) has owned and managed the overall operations and maintenance of the site under Land Reserve #1021.

The Eureka HAWS is an operational weather monitoring facility as well as a hub of activity for the Department of National Defence (DND), the Polar Continental Shelf Project and the Polar Environment Atmospheric Research Laboratory (PEARL). Additional sites at Eureka are operated by the Canadian Network for the Detection of Atmospheric Change including the PEARL and the Surface and Atmospheric Flux, Irradiance and Radiation Extension and Zero Altitude PEARL Auxiliary Laboratory (Arcadis 2018).

Most of the work is carried out in the short Arctic summer during the months of June, July, and August. The number of people located on Site varies between eight and 40 (inclusive of DND staff).

2. Operation Practices for Drinking Water

At Eureka HAWS, drinking water is obtained from the Freshwater Lagoon located near Station Creek. Station Creek is located immediately to the west of the main Station that carries melt water from ice and snow in the Arctic spring (May and June). No inhabitants reside in the Station Creek watershed.

On average, Station Creek flows for approximately three to four months a year. The Water Lagoon is filled by pumping water from Station Creek, after the spring runoff has slowed down and the water is running clear of suspended solids. The volume of the water in the Water Lagoon must be sufficient to supply the Eureka HAWS needs for the year. The Water Lagoon holds approximately 12,000 m^3 of water. Daily consumption of water at Eureka HAWS has been estimated to be 290 L per person per day (Smith and Nahir, 2000). The volumes of water used in 2017 to 2020 by the Eureka HAWS are shown in Table 1.

Table 1. Volume of water used by Eureka HAWS from 2017 to 2020

Month	Volume (m^3)			
	2017	**2018**	**2019**	**2020**
January	109.6	176.6	127.2	103.8
February	135.7	111.1	77.9	95.6
March	196.0	225.7	70.9	74.7
April	103.6	115.9	226.2	146.4
May	140.3	189.0	102.2	104.0
June	248.0	245.3	330.5	161.2
July	240.6	341.9	379.5	206.7
August	214.6	222.6	372.3	207.5
September	181.4	276.8	316.6	160.9
October	142.6	91.5	85.0	161.0
November	120.3	109.8	136.4	102.0
December	148.7	101.3	152.9	141.4
Annual Total	**1981.4**	**2207.5**	**2377.6**	**1665.2**

Annual and monthly analysis of water samples collected from the Water Lagoon, holding tanks and from inside the Eureka HAWS indicate that the chlorination, filtration, ultraviolet (UV) and reverse-osmosis treatments of the raw water provides good quality water to the Site.

Monthly drinking water sampling and analysis is conducted to assess the acceptance of the treated water and to ensure no threat to the staff's health. The testing procedure and results analysis is further described in Appendix A of the Quality Assurance (QA) and Quality Control (QC) Program document supplied separately to the NWB. Water usage is monitored and recorded during any water pumping processes and the monthly/yearly water usage is calculated and recorded.

A daily visual inspection is performed of the drinking water system which includes verification of water levels in the holding tanks, chlorinator fluid levels, water filter conditions, as well as the proper operation of all related pumping, piping, and water delivery systems. Visual inspections are also performed on the Water Lagoon containment structure and fencing.

The chlorination system consists of an LMI Milton Roy Series P7 chlorinator including an electronic metering pump and dispenser which introduces chlorine (a 12% sodium hypochlorite solution) from the chlorine holding tank into the domestic water intake line. The chlorine holding tank is filled using 5 L containers of chlorine, which are appropriately labelled and stored on elevated shelving within the Power House. The 5 L containers are stored away from any potential water or other chemical sources. As required, chlorine is dispensed from the 5 L containers into the chlorine holding tank. The use of the small 5 L containers eliminates the potential of a large spill and facilitates handling and storage. Proper personal protective equipment is supplied for use when the transfer of chlorine is required. Should a spill occur, a combination of the cement floor and the contents within the spill kit, which is located within the Power House, will be able to appropriately contain and clean up the spill. The Material Safety Data Sheet (MSDS) for this product is stored within the Power House and a mobile eyewash station is also located within the room.

A schematic of the water distribution system is shown in Figure 1.

2.1 Quarry Mobile Wash-car and Temporary Work Camp

A delivery truck obtains water from the Freshwater Lagoon and is delivered to the mobile wash-car and temporary work camp. The water delivered to these locations is included in the total water usage reported for the Site.

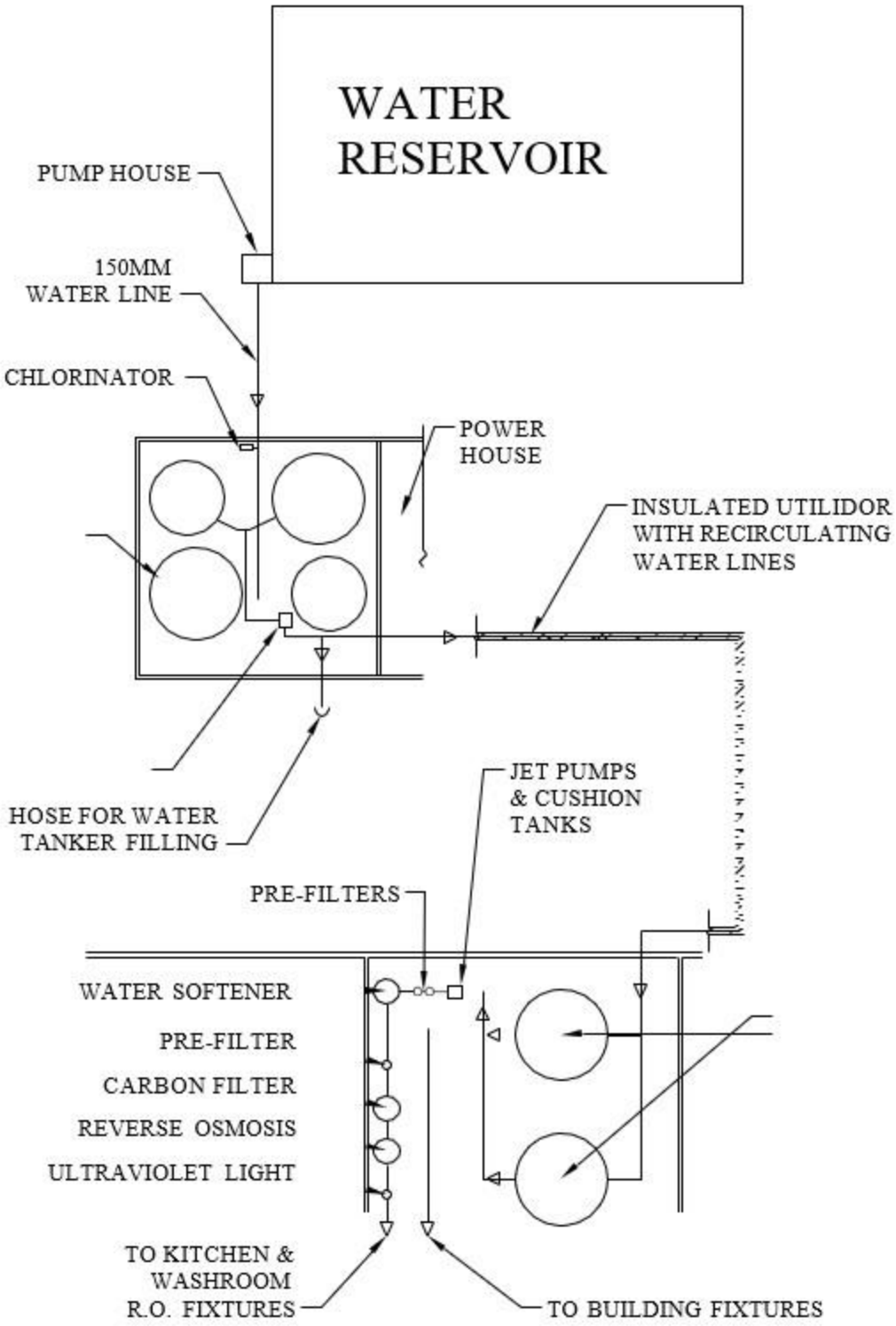


Figure 1. Water distribution system at Eureka HAWS

3. Management of Wastewater

The following section describes the management of wastewater at Eureka HAWS

3.1 General Description of the System

The wastewater and Sewage Lagoon at the Eureka HAWS is a single cell, engineered retention lagoon and is located to the south of the complex in the immediate vicinity of the Fjord (Figure 2). The volume of the lagoon was estimated as follows, by using the known dimensions and by integrating these in a formula by Smith and Nahir, 2000 (Table 2):

Table 2. Lagoon Dimensions at Eureka HAWS

Length	
Length – South Side	100.6 m
Length – North Side	89.8 m
Average Length	**95.2 m**

Width	
Width – East Side	19.7 m
Width – West Side	24.9 m
Average Width	**22.3 m**

Depth	
Average Depth	**2.0 m**

Estimation of volume of the Lagoon

Volume = Length x Width x Depth
= 95.2 m x 22.3 m x 1.05 m
= 2229 m^3
= 2.23 x 10^6 L

Maximum Daily Flow Rate (to fill the lagoon) = $\frac{\text{Volume}}{365 \text{ days}}$

$= \frac{2.23 \times 10^6 \text{L}}{365 \text{ days}}$

= 6109.6 L/day

It is estimated that a person will use 290 L of water per day and therefore:

$\frac{6109.6 \text{ L/day}}{290 \text{ L/day}}$

= waste from 21 people will fill the lagoon

Figure 2. Wastewater Sewage Lagoon at Eureka HAWS

3.2 Collection into the System

Due to the closed nature of the system, it is expected that the volume of wastewater produced will be virtually the same as the volume of the water used.

The collection of the wastewater throughout the main complex occurs by gravity. All piping is located within warm portions of the main complex. The wastewater is then collected in a storage tank in a separate building at the northeast corner of the main complex. The collected wastewater is intermittently pumped to the Sewage Lagoon when the volume of the liquid in the holding tank reaches a preset level.

3.3 Treatment and Discharge of the system

Wastewater is pumped to the Sewage Lagoon where solids settle, and limited decomposition takes place. A sump area was excavated in the bottom of the Sewage Lagoon. This allows a large pump to be placed below the level of the actual bottom of the Sewage Lagoon and pump out the content into the Fjord. On average, the Sewage Lagoon is emptied twice a year, at the beginning of July and the end of August. In early July, the Sewage Lagoon needs to be emptied as it has reached (or is close to reaching) capacity. The Sewage Lagoon is decanted a second time at the end of August (prior to freezing) to ensure that it is empty prior to the onset of winter.

Prior to the release of effluent from the Sewage Lagoon, samples are collected and analyzed. The decanting process normally takes 48 hours. Wastewater samples are collected at the discharge pipe. Samples of wastewater are collected when the Sewage Lagoon is 2/3 (16 hours) and 1/3 (32 hours) decanted and are submitted to the lab for analysis within 24 hours of collection. The quantity of wastewater decanted is estimated using a formula which multiplies the run time of the pumps with the rated output pumping volume of the pumps, as per the Water Licence Monitoring Program requirements.

The samples are analyzed for biochemical oxygen demand (BOD_5), total suspended solids, hardness, nitrate-nitrite, alkalinity, ammonia, fecal coliforms, pH, conductivity, metals, major cations, sulphates, oil and grease and total phenols.

There is no management of sludge from the Sewage Lagoon as all settled solids are left in place.

3.4 Inspection and Monitoring of the System

A daily visual inspection is performed of the wastewater treatment system which includes verification of wastewater levels in the holding tank and Sewage Lagoon as well as the proper operation of all related pumping, piping and wastewater delivery systems from the Operations Complex to the Sewage Lagoon. Visual inspections are also performed on the Sewage Lagoon containment berm when visible.

See appendix 3 for the map illustrating Site components of the system.

3.5 Quarry Mobile Wash-car and Temporary Work Camp Wastewater

A vacuum truck collects wastewater from the wash-car and temporary work camp and transfers the wastewater into the Sewage Lagoon.

3.6 Option Analysis for Current, Undersized Sewage Lagoon

An options analysis for the current, undersized Sewage Lagoon was completed in 2020 (see Appendix 5). This analysis includes raw and wastewater treatment options.

3.7 Grey Water Exfiltration Trench at the Temporary Work Camp

There is a seasonal grey water exfiltration trench (trench) at the temporary work camp for use during warm weather months starting in 2022. The estimated daily flow is:

- 50 people x 100 litres/capita = 5,000 litres per day (June to August)

The grey water from the camp drains to a 4,500 litre, dual compartment tank. Solids and grease collect on one side of the tank while the overflow is pumped to the grey water field through a 75 mm HDPE conveyance pipe. The trench is constructed of 30 m of 50 mm perforated distribution pipe inside a trenched area with a 1.5 m width and 0.6 m depth, that is slightly mounded.

On a normal basis the grey water trench will operate with little attention:

- A pump will convey water from the collection tank to the trench for natural soil treatment and to soak into the surrounding soil for disposal.
- Periodically the operator will need to confirm that the pump is operational and that the trench is functional.
- Machine and human activity should be kept away from the trench to minimize disturbance.
- At the end of the year the grey water will be pumped down to minimal levels in the tank, the pump will be removed, and the pipe will be disconnected.
- The piping is HDPE and can freeze in place if there is liquid remaining in the line.
- Sludge from the tank will be decanted and placed in polyethylene barrels lined with a cloth filter bag to allow freeze thaw for thickening.
- Over the winter the solids will consolidate, and the operator can decant the liquid back into the grey water system, leaving the solids in the barrels.
- Polyethylene barrels can store liquid over the winter without breaking. In the following summer the solids in the barrel will either be fed into the incinerator toilet for disposal or stored and hauled off site.
- In spring once the components have thawed, the pipe and pump can be reconnected for continued use.

4. Management of Solid Waste

4.1 Introduction

4.1.1 Purpose

This manual has been produced to assist Eureka HAWS personnel with the proper operation and maintenance of the site waste disposal facilities.

4.1.2 Site Setting

The Eureka HAWS is in the Eureka Hills Eco-region, within the Northern Arctic Eco-zone and the topography of the area is rolling and ridged, reaching altitudes of no more than 1000 m above sea level. Soils are primarily a sand/gravel fill underlain by silty, sandy clays. Permafrost is present with an active layer ranging between 0.6 and 1.2 m in thickness. The climate is cold and dry and mean annual temperatures range from -30.5°C in winter to 0.5°C in summer. Annual precipitation ranges between 50 to 75 mm. The prevailing winds are from the west.

The main complex of the Site occupies an area immediately east of Station Creek and contains approximately 22 buildings with associated infrastructure. An airstrip is located approximately 1.5 km northeast of the main complex. The Site is located on a hillside sloping down from the airstrip, levelling out where most facilities are located before sloping down further to the ocean. A 20 km road to the north connects the Site with an experimental facility, the former ASTRO Lab, now known as the PEARL Facility.

The total area of the occupied Site is approximately 2.23 hectares and is held under INAC (now CIRNAC) Land Use Permit N2017N0017. The permit was initially established in 1955.

4.1.3 Population Projection

While the population varies, particularly in the summer, the average population is 10 and is not expected to change in the foreseeable future.

4.1.4 Contact List

Name	Role	Responsibility	Authority	Contact Information
Greg Stansfield/ Andrew Creighton/ Don Lavallee	Eureka HAWS Station Program Manager (three-month rotation)	Eureka Real Property	ECCC	ec.gps-eureka-spm.ec@canada.ca (613) 945-3145 ext. 4460

4.2 Background

4.2.1 Context

- Management of solid waste at the Eureka HAWS is challenging for the following reasons:
    - Extreme cold
    - Isolation
    - High cost of transportation, and
    - Small population

The Eureka HAWS is located at 79º59'41"N and 85^{0}48'48"W with a population of approximately 10 people. The Site is only accessible by air and sea. Personnel, mail, freight, and food are flown into Site monthly. Once a year, a Canadian Coast Guard ice breaker brings supplies in late August. Any materials sent out from the Site for disposal or recycling on the return trip of the Coast Guard must remain in the Arctic port of Nanisivik for one year before it can be sent south.

Notwithstanding the constraints that the above place on normal waste management practices, Eureka HAWS is committed to practices of procurement of green products, diversion from waste disposal sites, reuse, and recycling.

4.2.2 Solid Waste Generation Types

- Organic kitchen wastes.
- Non-combustible waste, including mixed metals and bulk garbage.
- Metal drums.
- Uncontaminated wood wastes.
- Used motor oil filtered for particulates.
- Ozone depleting substances.
- Miscellaneous chemicals such as solvents and glycols.
- Old batteries.
- Other hazardous wastes including:
    - Asbestos
    - Lead (paint and lead-containing materials)
    - Mercury, radioactive and ozone depleting substances
    - Polychlorinated biphenyl (PCB) items
    - Petroleum/Cleaning products
- Creosote treated timbers. Characterization to be completed to determine whether hazardous or not.

A map showing location of waste disposal areas is provided in Appendix 3

4.3 Waste Disposal Facility Locations and Purpose

4.3.1 East Landfill

This landfill is used to contain non-organic/non-hazardous waste that cannot be incinerated and is located at the east end of the landing strip (79º 59.484'N and 85º 46.335'W). Non-hazardous ash from the incinerator is disposed of at this landfill.

4.3.5 Drum Crushing site

This site is located south of the runway (79º 59.374'N and 85º 55.586'W) and west of the East Landfill. This is a lined area used for crushing of drums prior to disposal.

4.3.6 History of Existing Landfills

An extensive, but unsuccessful, effort was undertaken to locate historical plans and drawings of the landfills at Eureka HAWS.

4.4 Operation and Maintenance of Solid Waste

4.4.1 Site Description

The waste disposal facilities are located immediately south of the east end of the airstrip, approximately 1.3 km from the Fjord. As the drainage from the above disposal grounds flows in the direction of the Fjord, there has been historic concern that the surface runoff and leachate could reach the Fjord. As required by the Surveillance Monitoring Program, pursuant to Eureka's Water Licence, runoff during periods of flow is monitored and samples are analyzed as per the parameters listed in the licence program monitoring requirements.

4.4.2 Waste Separation

Site waste is separated into organic (kitchen waste), non-organic (cans, bottles, old vehicles, etc.), construction and demolition (wood, mixed metals asbestos, etc.), and hazardous (waste oil, hydraulic fluids, batteries, oxygen depleting substances, old window and door frames with lead paint, etc.). It should be noted that Eureka HAWS uses green products (non-hazardous and biodegradable), when possible.

4.4.3 Temporary Construction Worker Camp Solid Waste Handling, Incineration and Disposal

Standard operating procedures for the temporary construction worker camp related to kitchen food and waste handling/storage, solid waste segregation and disposal, and waste incineration are included in Appendix 6.

4.5 Disposal Procedures

4.5.1 Organic Waste

Organic and burnable waste is disposed of in an incinerator or within an open burn bin. Materials burned in the open burn bin exclude materials listed under Part D, Item 3 of

license No. 8BC-EUR1621**.** On average, the heavy equipment operator incinerates 10-12 bags two to three times a week, which includes food cans. Ash generated by the incineration is packaged in clean 205 L barrels (approximately 24/year) and is transported via heavy equipment to the Station Drum Cache area. In the summer months, the ash (excluding the barrels) is deposited in a cell of the East Landfill and is capped with 0.3 m of gravel capping material at a 3:1 slope.

4.5.2 Non-Organic, Non-Hazardous Waste

Non-organic and non-hazardous waste that cannot be incinerated or burned in open burn bin is deposited in the East Landfill. The waste deposited in this landfill includes tires, construction materials (drywall, siding, wood, steel, tin, ash from incinerator), old vehicles and equipment (drained of fluids and batteries removed), wire, cable, tin, steel, copper, aluminum, empty compressed gas cylinders, plastics. Capping consists of 0.3 m of compacted native soils scraped from the surrounding gully.

4.5.3 Asbestos Waste

Previously, the limited amount of asbestos generated was double-bagged, placed in the Asbestos Landfill and covered with 1.5 m of gravel capping material and its location recorded so that subsurface soils will not be disturbed in the future. Currently, asbestos waste is containerized and shipped off Site for disposal.

4.5.4 Empty Metal Drums

Any remaining liquid in empty drums is collected as hazardous material; the drums are then crushed at the drum crushing site (a lined area), and then transported off Site for disposal or disposed of in an engineered landfill on Site.

4.5.5 Hazardous Waste

- Secondary containment of hazardous materials awaiting disposal is provided in the form of salvage drums, crates, constructed with plastic lining or secondary containment pallets and stored in the Station Drum Cache area (see Appendix 3). Used oil is stored in empty drums in the Station Drum Cache area (see Appendix 3) and is shipped as retrograde cargo on the annual sea lift to a certified recycling depot in the south.
- Used jet fuel is stored in empty drums in the Station Drum Cache area (see Appendix 3) and is shipped as retrograde cargo on the annual sea lift to a certified recycling depot in the south. ECCC is currently seeking a waste fuel burner which can burn fuel that contains water.
- When sufficient batteries are collected (approximately 2-3 pallets), they are packed with vermiculite and are stored in wooden crates in the “dead line” area behind the main complex adjacent to the Station Drum Cache area (see Appendix 3). The pallets are shipped as retrograde cargo on the annual sea lift to a certified recycling depot inthe south.
- Waste glycol is stored in empty drums in the Station Drum Cache area (see Appendix 3) and is shipped out on sealifts or flights of “opportunity” to Safety-

Kleen (Quebec) Ltd. 85 rue de Hambourg, Saint-Augustin-de Desmaures, QC, G3A 1S6.

- Ozone depleting substances (e.g., un-serviceable refrigerant containing machinery) are not disposed of on Site; rather, are shipped to recovery facilities located in the south .

4.6 Maintenance and Inspection

Inspections of the landfill sites are performed on a daily or weekly basis depending on weather conditions. During runoff periods, samples of runoff are collected and analyzed according to the parameters listed on the license requirements for the monitoring program.

Windblown debris is not a Site issue as most material subject to being carried by the wind is incinerated ash, sealed barrels, buried and capped, or it is fully covered in the summer.

Appropriate signage is posted.

Odour control is not an issue as all organic waste is incinerated.

Open burning is conducted within a burn bin, which excludes materials listed under Part D, Item 3 of license No. 8BC-EUR1621.

4.7 Records

- Quantities of garbage generated are recorded monthly. MSDS are readily available to Site personnel.
- Maintenance of waste disposal facilities are recorded and described under Progressive Reclamation Work Undertaken in Eureka's Annual Report to the NWB. Manifests are obtained and recorded for shipments of hazardous material.
- Annual inspections by CIRNAC are recorded and a response is forwarded to CIRNAC and the NWB.

References

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

Environmental Services, Public Works and Government Services Canada (Western and Northern Region) (1998). *Waste Management Plan for Eureka High Arctic Weather Station*. A report prepared for Atmospheric Environment Services, Environment Canada, Prairie and Northern Region.

Smith, D.W. and M. Nahir (2000). *Study of the Wastewater and Water Supply systems at the Eureka Weather Station*. A report prepared for Atmospheric Services, Environment Canada by Public Works and Government Services Canada, Western Region.

Appendix 1: Eureka High Arctic Weather Station Site Overview

Legend

Watercourse

N
W E
S

500 250 0 500 1,000 1,500 m

1:50,000

NAD 1983 UTM Zone 16N

Sources: NRCan
Imagery: Esri World Imagery

This drawing has been prepared for the use of AECOM's client and may not be used, reproduced or relied upon by third parties, except as agreed by AECOM and its client, as required by law or for use by governmental reviewing agencies. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without AECOM's express written

AECOM

EUREKA HIGH ARCTIC WEATHER STATION
WATER LICENSE 8BC-EUR1621 2020 ANNUAL REPORT
PUBLIC SERVICES AND PROCUREMENT CANADA, EUREKA HAWS
Project No.: 60638794 Date: January 2022

EUREKA HIGH ARCTIC WEATHER STATION SITE OVERVIEW

Figure: 1

Last saved by: STEPHANIE.CLARK (2022-01-18) Last Plotted: Tue Jan 18, 2022 Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm
Filename: \\na.aecomnet.com\LFS\AMER\Calgary-CACGY3\Legacy\CACGY5FS002\Library\Environment\GIS\Stephanie Clarke\Permitting & IAP\60638794_Eureka\02_MXDs\2020 Annual Report\Water License\H001_60638794_HAWS_Water_SiteOverview_20220118.mxd

Appendix 2: Waste and Storage Facilities on the Main Complex of the Eureka High Arctic Weather Station

Legend

Watercourse

N
W E
S

50 25 0 50 100 150 m

1:5,000

NAD 1983 UTM Zone 16N

Sources: NRCan
Imagery: Esri World Imagery

This drawing has been prepared for the use of AECOM's client and may not be used, reproduced or relied upon by third parties, except as agreed by AECOM and its client, as required by law or for use by governmental reviewing agencies. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without AECOM's express written consent.

AECOM

WASTE AND STORAGE FACILITIES ON THE MAIN COMPLEX OF THE EUREKA HIGH ARCTIC WEATHER STATION

EUREKA HIGH ARCTIC WEATHER STATION
WATER LICENSE 8BC-EUR1621 2020 ANNUAL REPORT
PUBLIC SERVICES AND PROCUREMENT CANADA, EUREKA HAWS
Project No.: 60638794 Date: March 2021

Last saved by: STEPHANIE.CLARK (2021-03-08) Last Plotted: Mon Mar 08, 2021 Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm
Filename: L:\Environment\GIS\Stephanie Clarke\Permitting & IAP\60638794_Eureka\02_MXDs\2020 Annual Report\Water License\H002_60638794_HAWS_Water_MainComplex.mxd

Appendix 3: Site Plan and Potential Environmental Areas of Concern

Last saved by: STEPHANIE.CLARK (2020-09-09) Last Plotted: Wed Sep 09, 2020
Filename: L:\Environment\GIS\Stephanie Clarke\Permitting & IAP\Eureka\02_MXDs\H001_60638794_Eureka_SitePlanAPECs.mxd
Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm

NOT TO SCALE

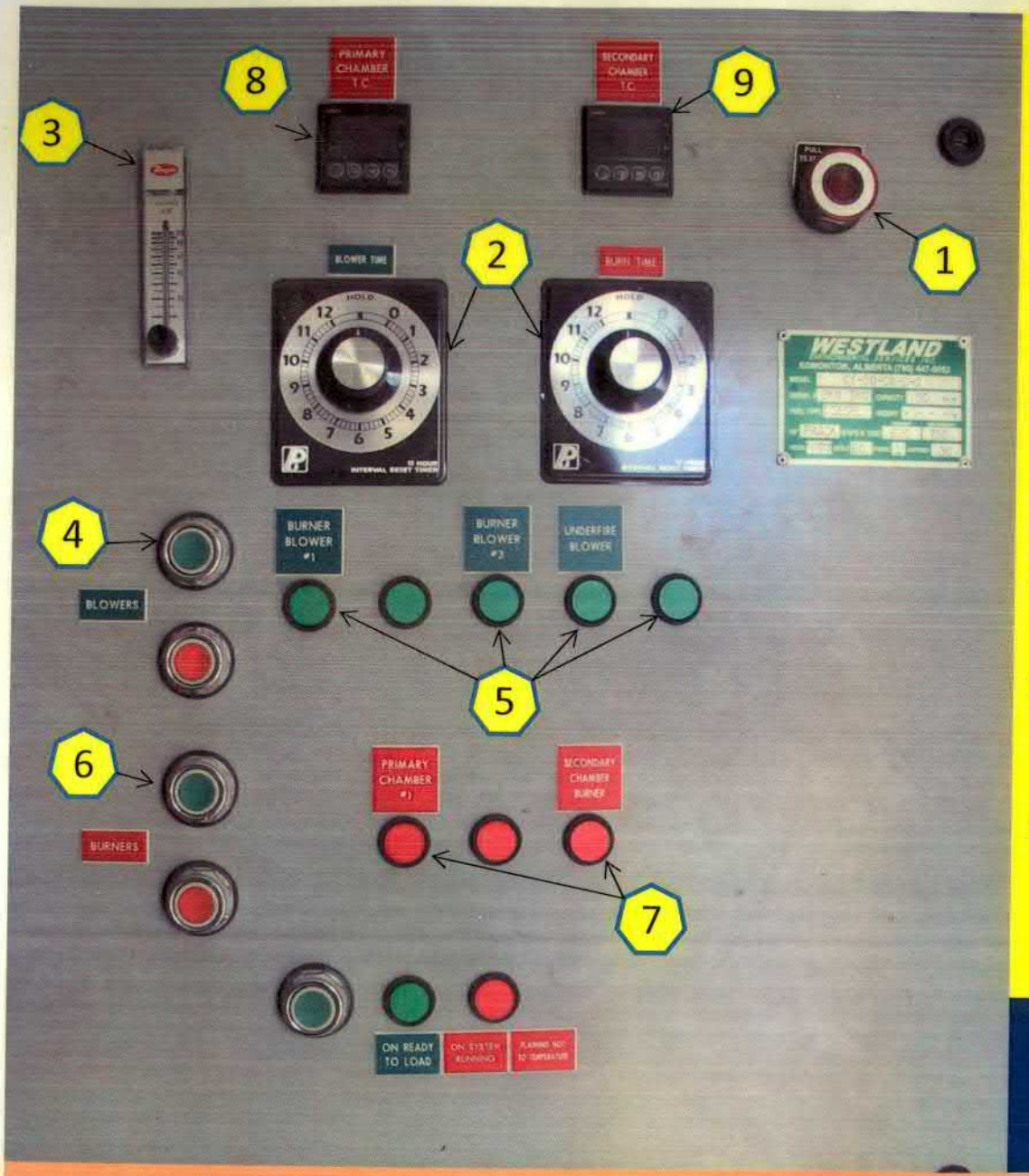
EUREKA HIGH ARCTIC WEATHER STATION (HAWS)
REGULATORY REVIEW, GUIDANCE AND SUPPORT
PUBLIC SERVICES AND PROCUREMENT CANADA
Project No.: 60638794 Date: September 2020

SITE PLAN AND POTENTIAL ENVIRONMENTAL AREAS OF CONCERN

AECOM

Figure: 1

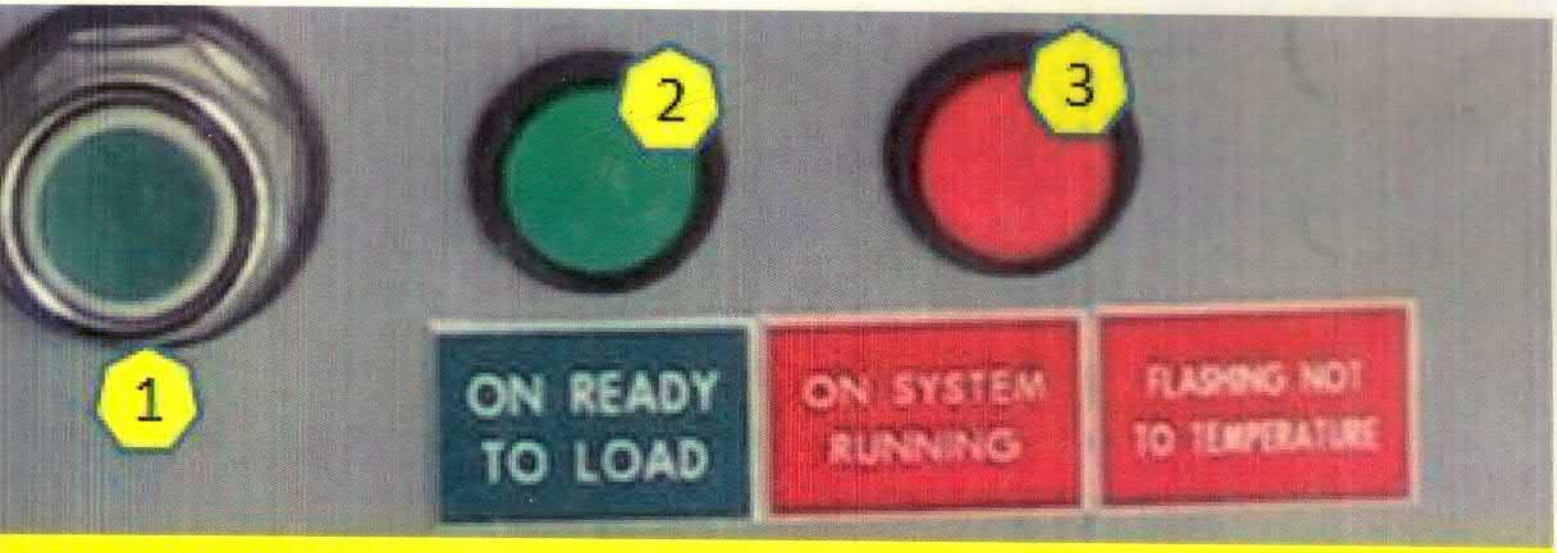
Appendix 4: Incinerator Operations Procedures



1. Twist E-STOP to the right to connect main power (button will pop up).
2. Turn BLOWER TIMER and BURNER TIMER clockwise for the intended period of operation.
3. Set oxygen probe air flow rotameter to 40 cc/min.
4. Push START button for BLOWERS.
5. Check all BLOWER INDICATOR LIGHTS are on.*
   Wait for one minute or more.**
6. Push START button of BURNERS.
7. Check that all BURNER INDICATOR LIGHTS are on.*
8. Check set point of PRIMARY CHAMBER TEMPERATURE and adjust to 700 C if necessary.***
9. Check set point of SECONDARY CHAMBER TEMPERATURE and adjust to 900 C if necessary.***

START-UP DONE

Notes:
* Report Error.
** Burner can only be started after blowers are on for at least one minute.
*** Consult instrument manual in the appendix of this manual



PRE-CHARGING CHECKS

1. If Light Indicator 3 is flashing, the PLC is NOT ready. WAIT.
2. If Light Indicator 2 is on steady, then check that the temperatures in the Primary Chamber and Secondary Chamber are up to the set points.
   a) If 2 is not steady, wait until the chamber temperatures are at the set points.

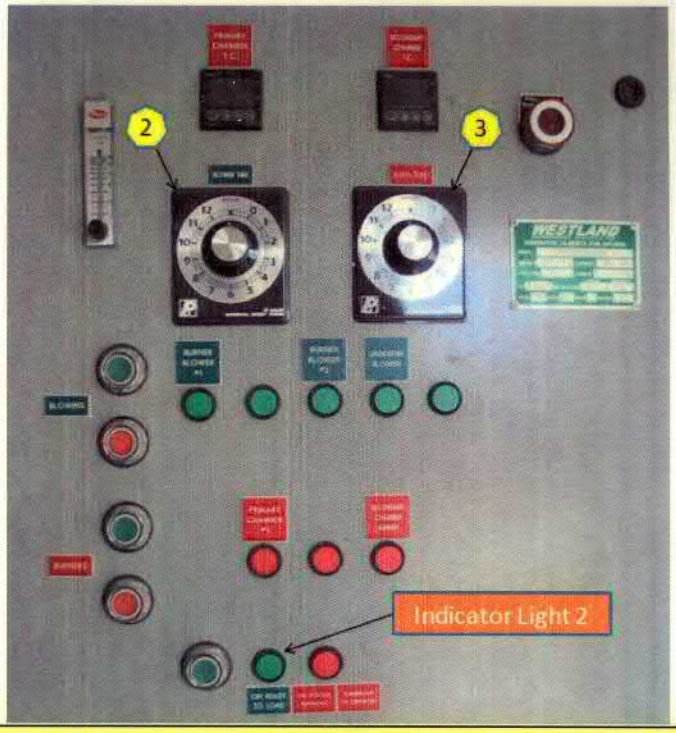
WASTE CHARGING

1. Confirm that Light Indicator 2 is on steady.
2. Open Charging Door, quickly load the batch and close door.**
3. ***IMMEDIATELY*** push Button 1. This activates the PLC.
4. Check that Light Indicator 2 is off.*
5. Wait until Light Indicator 2 is on again. This indicates that the system is ready for the next batch.***
6. Repeat STEPS 2 to 5 for three or four loads, then go to STEP 7.
7. Open Ash Door, rake the waste and close the door .
8. ***IMMEDIATELY*** push Button 1 and wait until Light Indicator 2 is off.***
9. Repeat STEPS 2 to 8 until the last waste batch is charged.

WASTE CHARGING DONE

Notes:
- * Report Error.
- ** This is very hazardous; see safety notes.
- *** The time varies.

4.8 Burn-Down: see Figure 15



When the LAST batch has been charged, and the indicator light 2 is ON (steady) , indicating readiness for the non-existent batch:

1. **Rake primary chamber.**
2. **Turn BLOWER TIMER to ~ 3 hours ***
3. **Turn BURNER TIMER to 0.5 to 1 hour**
4. **Wait.**
5. **When burner time period has elapsed, then shut down fuel valve.**

BURN-DOWN DONE

Note: * : The actual time depends on how much and what kind of waste has been charged. The rule-of-thumb is

Burn-Down Time (hours) = 1 + Waste Charging time (hours)/ 3

Figure 15 Procedure for Burn Down

4.9 Cool-down

There is nothing to be done here, except ensuring that the incinerator is sufficiently cooled (approximately 6 – 8 hours) for the scheduled ash removal for the next operation.

4.10 Maintenance and Inspection

In addition to the routine inspection and maintenance previously mentioned, only the burner(s) and the blower(s) require maintenance, which is quite minimal; see manuals in the binder. The following inspection steps are recommended:

When repairs to the incinerator's oxygen control system have been satisfactorily carried out, the flame-port butterfly valve and actuator can be reconnected, that is, the valve shaft can be tuned back to the 10% open position, and the wire reconnected to resume power to the actuator.

Adjustment Steps to Under-Fire (PC7) and Flame-Port (SC4) Butterfly Valves for Manual Mode Operation:

1. Press the Emergency Stop button on the control panel to disconnect power from the incinerator.
2. Remove actuator cover 1.
3. Remove actuator electronics cover 2.
4. Disconnect the black wire 3 and tape the exposed wire with a small piece of electrical tape.
5. Loosen the U-clamp nuts 4.
6. Use a flat-blade screwdriver to turn the shaft 5 to the desired setting: 10% open for PC7 and 100% open for SC4.
7. Tighten the U-camp nuts 4 to secure the valve shaft in place: DO NOT RE-CONNECT THE BLACK WIRE.
8. Replace covers.
9. Place a tag on the valve to indicate that it has been adjusted for manual mode operation.
10. Twist the Emergency Stop button on the control panel to re-connect power to the incinerator.

Adjustments for Manual Mode Done

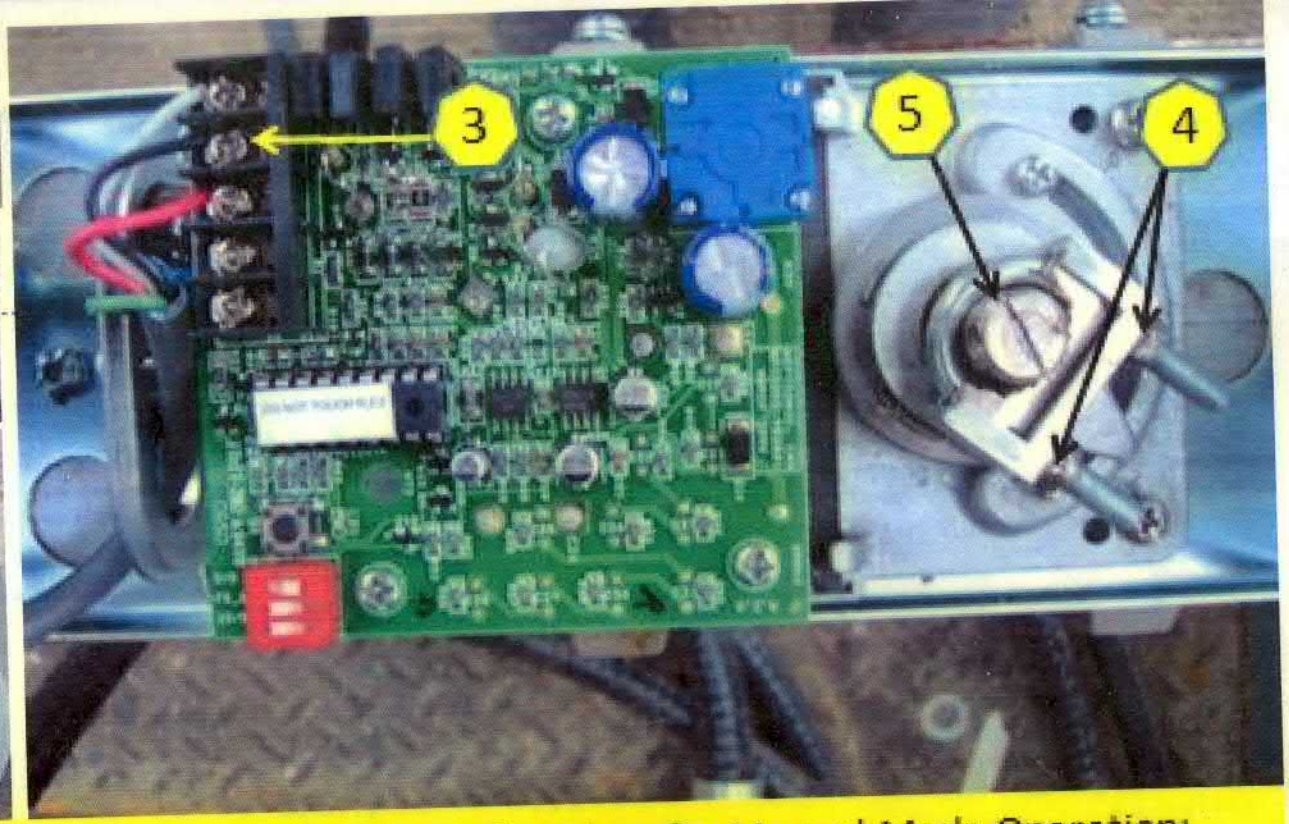
Figure 17 Butterfly Valve Adjustment for Manual Mode Operation

5.2 Modification to Operation during Manual Mode

During manual mode operation of the incineration system, there are some changes to the loading procedure when compared to normal operation with the oxygen control system in good working order. The Procedure for Startup as outlined in Figure 13 remains the same, but **the Procedure for Waste Charging as outlined in Figure 14 must be ignored**. When the Procedure for Startup has been completed, the procedure shown in Table 10 should be followed for waste charging. The Procedure for Burn Down as outlined in Figure 15 must still be followed during manual mode operations, though the reference to "Indicator Light 2" can be ignored.

Table 10 Waste Charging in Manual Mode

STEP	PROCEDURE
1	Confirm that the primary and secondary chambers are at their respective set points (see Figure 13).
2	Open the Charging Door, quickly load the batch and close the door.**
3	Wait approximately 10*** minutes and repeat Step 2.
4	Repeat Steps 2 and 3 for three or four loads, and then proceed to Step 5.
5	Open the Ash Door or the Charging Door, rake the waste, and then close the door.
6	Wait approximately 10 minutes for any unburned waste to be consumed.
7	Repeat Steps 2 to 6 until the last waste batch has been charged.
8	Follow the Burn Down Procedure outlined in Figure 15.
	WASTE CHARGING DONE
**	This is very hazardous, see the safety notes following Figure 14.
***	The time varies depending on the waste being incinerated.



Adjustment Steps to Under-Fire (PC7) and Flame-Port (SC4) Butterfly Valves for Manual Mode Operation:

1. Press the Emergency Stop button on the control panel to disconnect power from the incinerator.
2. Remove actuator cover 1.
3. Remove actuator electronics cover 2.
4. Disconnect the black wire 3 and tape the exposed wire with a small piece of electrical tape.
5. Loosen the U-clamp nuts 4.
6. Use a flat-blade screwdriver to turn the shaft 5 to the desired setting: 10% open for PC7 and 100% open for SC4.
7. Tighten the U-camp nuts 4 to secure the valve shaft in place: DO NOT RE-CONNECT THE BLACK WIRE.
8. Replace covers.
9. Place a tag on the valve to indicate that it has been adjusted for manual mode operation.
10. Twist the Emergency Stop button on the control panel to re-connect power to the incinerator.

Adjustments for Manual Mode Done

Appendix 5: Water and Sewage Systems Options Analysis

AECOM Imagine it. Delivered.

AECOM
99 Commerce Drive 204 477 5381 tel
Winnipeg, MB, Canada R3P 0Y7 204 284 2040 fax
www.aecom.com

To: Mr. Mark Mogan, P.Eng.
Project Manager
Public Services and Procurement Canada
100-167 Lombard Avenue
Winnipeg, MB R3B 0V3

Date: January 29, 2020
Project #: 60428978

From: Paul Barsalou, M.Sc., P.Eng.

cc:

Memorandum

Subject: **Eureka Sewer and Water Project– Design Summary**
ET 025151029

1. Introduction

Public Works Government and Services Canada (PWGSC), on behalf of Environment Canada, retained AECOM Canada Ltd. to review conditions at the Eureka High Arctic Weather Station and provide recommendations for the sewer and water systems upgrading and / or replacement. This summary builds on the feasibility and design work completed by AECOM Canada Ltd in 2015/2016, and previous planning studies over the last 10 years. The work remained on hold for a 4-year period based on a lack of funding; however, it has been restarted with an updated design package ready for February 2020. It is anticipated that the project would be tendered in late 2020, with work initiating on site in 2021 and completion by 2024. The short construction season and seasonal shipping results in an estimated 4-year intermittent construction period.

2. Raw Water Sources

Options were evaluated for a viable water source including ocean water, surface water from Station Creek and other fresh water sources much further away. The preferred raw water source continues to be Station Creek. Other sources of water such as the ocean required a complicated desalination plant and there were issues with a water intake, disposal of a significant volume of reject water, and inherent freezing difficulties with installing permanent piping at the ocean edge. More distant fresh water sources still had issues with intermittent flow and there was difficulty in piping the water a long distance.

Raw water will be drawn from a temporary floating intake in Station Creek in a similar location as previous. As the Creek runs intermittently from June to August, the intake will be placed in the water yearly, to transfer water to the reservoir over a two to three week period. The intake, pump house and piping would be newly supplied and installed equipment. A stainless-steel screen with 10 mm openings will be installed on the seasonal floating intake. The Creek is frozen 9 months of the year and is unlikely to support much aquatic life.

3. Raw Water Reservoir

The existing raw water storage reservoir will stay in operation after the new reservoir is built to increase the total raw water storage capacity and to provide for some sedimentation prior to storage in the new reservoir. The existing reservoir pump house and raw water supply pipe will be decommissioned. A new raw water transfer pump station and piping will be installed between the two reservoirs to transfer water from the existing reservoir to the new reservoir.

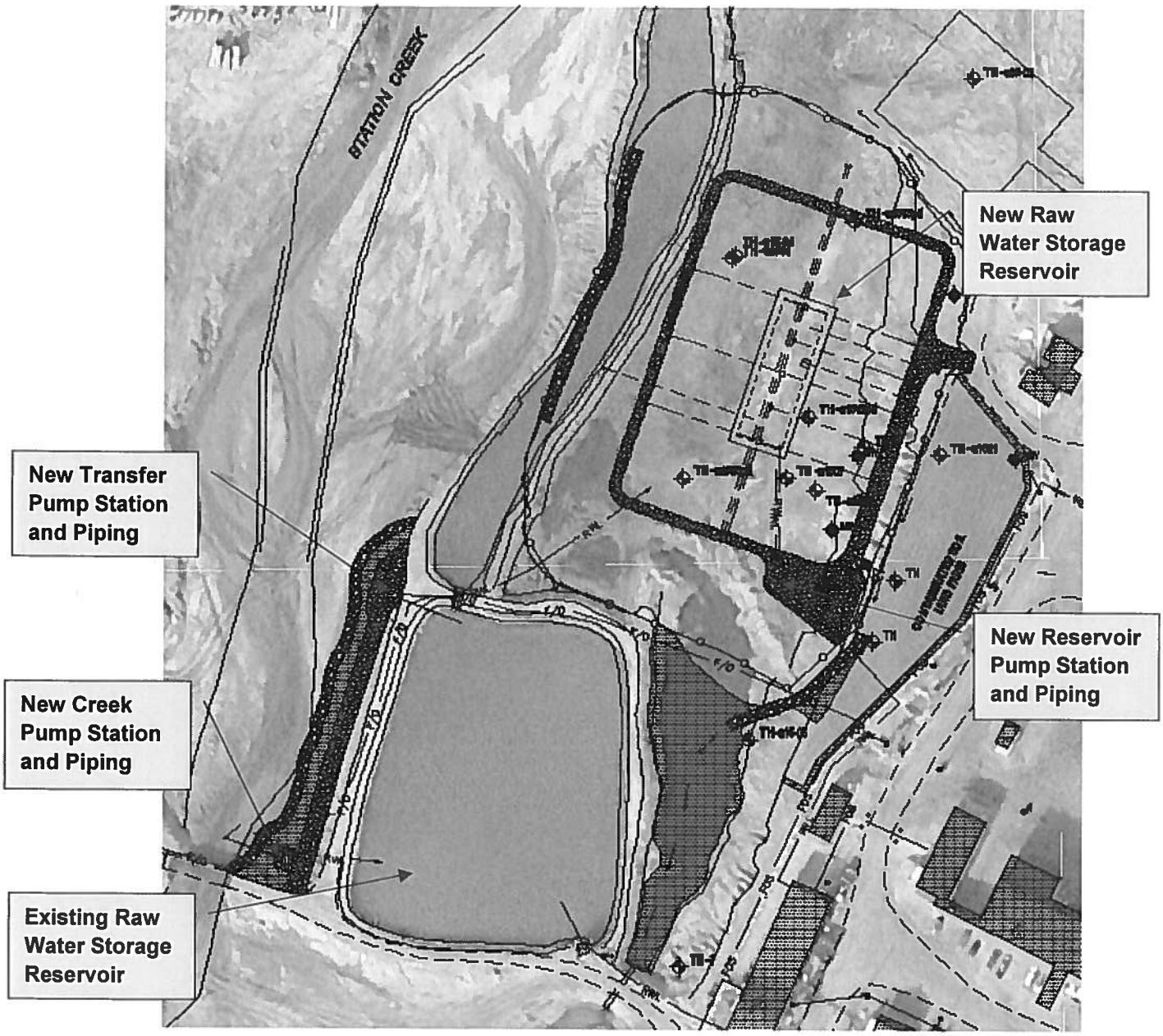
The proposed raw water reservoir is sized for a future population of 32 people, which is approximately double the average population that is onsite of 16 people. The additional cost for a larger reservoir was marginal, resulting in additional storage capacity in case staffing levels change in the future. This is also a method of mitigating the potential issue of extreme low flow conditions in summer from Station Creek.

A new double lined reservoir is proposed for raw water storage immediately north of the existing reservoir. In order to accommodate local conditions, the proposed reservoir is 6.2 m deep, which includes: 0.70 m of freeboard to prevent damage from wind and erosion; 2.4 m of water storage for ice formation; 2.6 m of water storage for active use; and 0.5 m of dead storage at the bottom of the reservoir for silt collection. The reservoir has an active volume for usage of 3,580 m^3 and a total liquid volume in the range of 15,000 m^3 excluding the 0.7 m of freeboard. The selected liner is composed of twin layers of 60 mill low density polyethylene LDPE (with quality control testing during installation), along with protective geotextile and geocomposite layers and dewatering underdrains to prevent ballooning of the liner. A cellular geotextile product will be used for erosion control, as it designed to hold a 300 mm layer of protective granular material in place over the liner.

A new pump station will be provided to transfer untreated water from the new reservoir to the Station for additional storage and treatment. A new water recirculation line will be installed between the reservoir pump station and the raw water storage tanks to prevent freezing. In order to measure raw water flow entering the Station complex, a new flow meter will be installed on the supply line prior to treatment.

The layout of the existing and the proposed reservoir is provided in **Figure 1**.

Figure 1: Raw Water Reservoir Location



4. Water Treatment Plant (WTP)

The existing WTP currently uses ion exchange softening to reduce hardness for utility water consumption, paired with reverse osmosis (RO) filtration for drinking water. This treatment process is located within the Eureka Station buildings and will not be altered. The pumping station transfers raw water into a series of four storage tanks (two 43 m^3 tanks and two 37 m^3 tanks). Raw water is pre-chlorinated using sodium hypochlorite, with follow-up treatment processes including: 50 micron and 25 micron pre-filters, and duplex 0.6 m diameter ion exchange softener units. An RO system includes a high-pressure pump, an RO filtration unit, a 1 m^3 holding tank, Ultraviolet (UV) disinfection, and its own distribution system. Backwash and reject water from the treatment process is currently disposed of with the municipal wastewater. With the new wastewater system, the ion exchange

backwash and reject water will be isolated and will bypass the treatment plant for mixing with the treated wastewater and direct disposal to the outfall. RO reject will continue to be disposed of in the wastewater stream.

The option of reusing the existing treatment system was recommended with no substantial change to the current process. If additional capacity is required in the future for an altered staffing regime, the system will be upgraded.

5. Wastewater Treatment Plant (WWTP)

Wastewater treatment is proposed to change from a single cell lagoon to a mechanical biological treatment system. The process of a Moving Bed Biofilm Reactor (MBBR) has been recommended for Eureka as it is robust, it has limited complex technology and has a smaller footprint, in comparison to other mechanical treatment systems such as membrane bioreactors (MBR) or sequencing batch reactors (SBR). Effluent will be pumped through a duplex UV disinfection system to the disposal location. In order to facilitate transportation to Eureka, the package treatment plant will be installed within intermodal shipping containers, preassembled to the extent possible. The containers will be selected by the final contractor but they will likely be two or three high top 8 foot by 20 foot containers linked together. Shipping a 40 foot container to site may not be practical so the shorter containers are more likely.

A separate container would be provided for sludge dewatering prior to disposal. The process would include adding a dewatering polymer to the aerobically digested waste activated sludge and flow to a sludge filter bag. Water will drain out of the filter bag for retreatment at the main treatment facility. As the water drains, the sludge will dewater and thicken to an anticipated 30% solids over a few days. It is anticipated that less than 5 kg of dewatered sludge would be produced daily at capacity. As this would be considered solid waste, it would be incinerated on site or alternatively disposed of at the landfill. The filter bags would be disposed of with the dewatered sludge, once or twice per week on average.

The current Water Board Licence is for lagoon discharge to a marine environment. It is understood that Nunavut is in the process of reviewing its wastewater effluent limits relative to the Wastewater Systems Effluent Regulation (WSER). These new limits do not directly apply to Eureka as they are for systems over 100 m^3/day and the Eureka Station averages 5 m^3/day. However, Environment Canada has requested that the facility meet WSER requirements. The population in Eureka varies from as low as 8 people in winter with a peak population of 42 people occasionally in summer. Depending on the populations arriving on site, there may be some treatment brief excursions while the system becomes accustomed to the higher flow. The following design guidelines have been recommended (**Table 1**).

Table 1: Recommended Effluent Guidelines

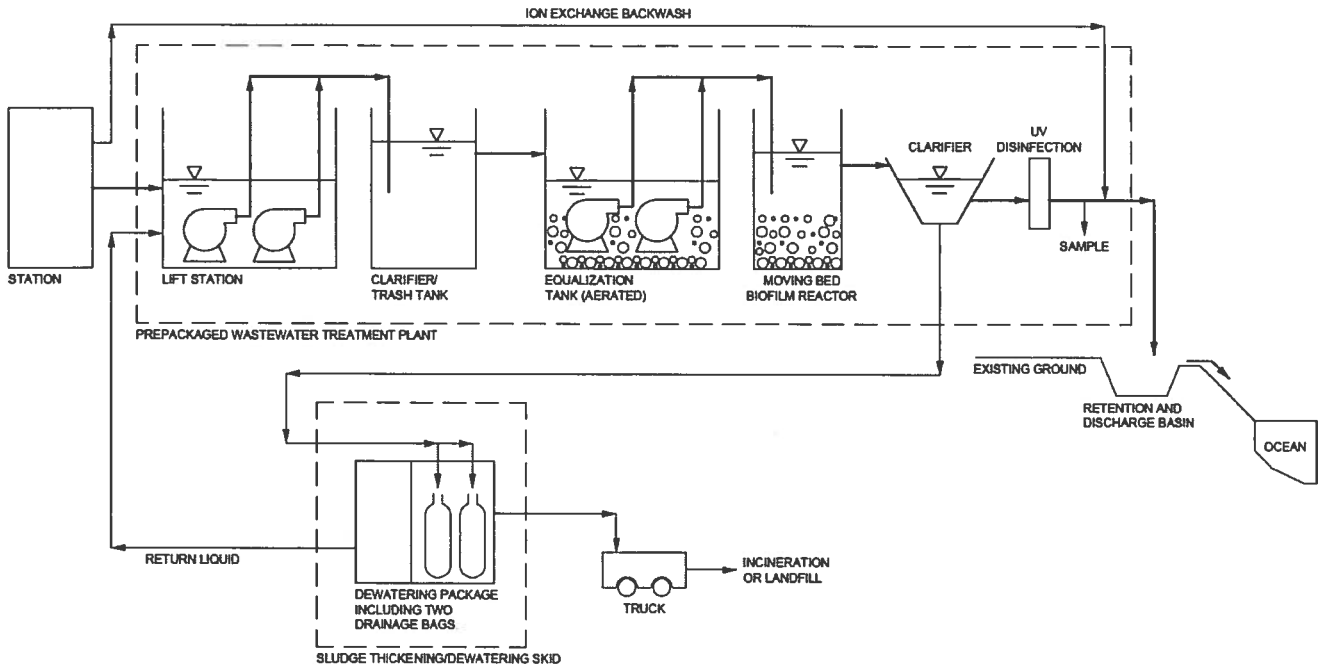
Condition	BOD_5, mg/L	TSS, mg/L	Fecal Coliform, CFU/100 ml	Oil and Grease	pH	Total Residual Chlorine, mg/L	Un-ionized Ammonia (NH_3), mg/L
Current Licence	100	120	10^6	No visible sheen	6-9	N/A	N/A
Proposed Effluent Limits	<25	<25	2000	No visible sheen	6-9	<0.02	<1.25
WSER Limits	<25	<25	N/A	N/A	N/A	<0.02	<1.25

Process water from the ion exchange WTP would upset the WWTP so it is being collected and disposed of in the wastewater outfall after the municipal wastewater has been treated. It is proposed that this process water stream

bypass treatment because there it consists of raw river water and brine, and it should not be part of the municipal stream. It is proposed that this stream be excluded from the effluent licence.

The process flow diagram for the proposed WWTP and sludge dewatering is shown in **Figure 2**. The effluent from the treatment plant will be under pressure and will be discharged periodically (to reduce freezing potential) to the detention basin.

Figure 2: Wastewater Treatment Plant – Process Flow Schematic



6. Treated Effluent Discharge Location

The proposed treated wastewater disposal route is to a detention basin and overflow to the ocean in summer. The existing one-cell wastewater treatment lagoon will be cleaned of sludge, and converted to a detention basin. A detention basin serves two primary purposes: winter storage of treated WWTP effluent, and additional flow dilution volume if there are any mechanical plant operating issues. It should be noted that such an event is expected only if population growth doubles or triples in one week; the new plant capacity cannot be increased in such a short period of time.

Other discharge options were reviewed such as direct ocean discharge and disposal on the ocean bank 12 months per year, but they both had inherent issues with weather, ice scour and maintenance. It is believed that this detention basin has enough storage capacity to store the winter treated WWTP effluent while reusing existing infrastructure on site.

Work required to alter the lagoon includes:

- Clean out the existing lagoon cell and reshape, stabilize banks add traffic gravel.
- Provide an overflow for treated water to the ocean and discharge rip rap above high water level for erosion protection.
- Provide an above ground discharge pipe into the detention basin from the treatment plant.
- Provide a simple pump station that can be used to drain the basin in late August.

The wastewater discharge pipe and basin are shown in **Figure 3**.

Figure 3: Wastewater Discharge Pipe and Detention Basin

7. Manage Existing Site Contamination

There is historical hydrocarbon site contamination in the Eureka area that has been monitored for over a decade. Some of the contamination is in the area of the proposed reservoir, specifically adjacent to one berm and potentially under part of the base at the south east end of the reservoir. An assessment has been made on whether to move the new reservoir north to a less disturbed area without contamination or manage it on site. If the reservoir was to be moved, additional work would be needed to determine geotechnical conditions, and manage additional

settlement with melting ice lenses (in the undisturbed area). A significant amount of additional granular would be required for berm development as the existing site uses natural slopes to reduce granular volumes.

AECOM recommends building the reservoir up against an escarpment and adjacent to the contaminated site, allowing it to remain frozen in place. Due to location it is not likely that reasonable remediation techniques will be developed in the future. To manage existing contamination the following remedial action was recommended:

- Minimal excavation in the area of contaminated soil as much as possible.
- Where excavation is required over excavate 300 mm and replace with clean fill.
- Cap the area by placing the berm over the plume (5 to 6 m of fill) which will cause the area to become permanently frozen.
- Place a minimum of 4 m of fill over the sloped area that the berm is to lean against.
- Use a synthetic double liner in the raw water reservoir that is impermeable to PHC and BTEX.
- Provide drainage from under the reservoir, that flows to an overflow and hydrocarbon absorbent mat.
- Freeze contamination in place where it comes in proximity to the reservoir.
- Add 100 mm – 200 mm thick layer of rigid foam insulation under the reservoir bottom and berms to prevent permafrost from thawing.
- Build a 0.4 m high perimeter berm on the east-southeast side of the contaminated area to prevent mixing of the surface runoff with contaminated soil.

8. Conclusion

The proposed upgrade to the Eureka sewer and water system is intended to provide a reliable source of raw water to the Station and to improve wastewater effluent quality to meet proposed more stringent targets. The capital cost of the proposed upgrades is in the range of $11 million, excluding granular production. The project is likely to cause temporary disturbances during summer construction but will result in positive impacts on site.

Sincerely,
AECOM Canada Ltd.

REGISTERED PROFESSIONAL ENGINEER
P.R. BARSALOU
LICENSEE
Jan 29/2020
NWT/NU

Paul Barsalou, M.Sc., P. Eng.
Process Engineer, Water, Western Canada
Paul.Barsalou@aecom.com

PB:ag

Appendix 6: Temporary Construction Worker Camp Waste Handling, Storage and Incineration Standard Operating Procedures

STANDARD OPERATING PROCEDURE

Department	ENVIRONMENT, HEALTH & SAFETY		
Section	Health, Hygiene and Wellness		
Procedure Name	Kitchen Food and Waste Handling Storage	**Date**	January 1, 2021
Procedure #	EHS B.09	**Revision**	003

1.0 INTRODUCTION

1.1 To promote healthy handling and storage of food and the environmentally friendly handling of food wastes on Nuna projects and designated work sites.

2.0 SCOPE

2.1 This procedure applies to all workers, contractors, and visitors handling food and food waste on Nuna projects and designated work sites.

3.0 ROLES AND RESPONSIBILITIES

KITCHEN STAFF:

3.1 Moving kitchen wastes to the proper area that will be incinerated at the end of the shift, and

3.2 Following this procedure.

CAMP MANAGER/CHEF:

3.3 Ensuring that food products are properly stored as soon as they arrived.

3.4 Ensuring that waste is collected and incinerated as necessary.

3.5 Ensuring that kitchen staff are appropriately trained and understand this procedure.

3.6 Implementing this procedure as they apply to the kitchen staff.

3.7 Maintaining current governmentally-required certifications related to food handling and preparation.

CAMP MAINTENANCE PERSONNEL:

3.8 Ensuring that the incinerator is properly cleaned out on a regular basis and that items that are not allowed to be incinerated are properly disposed of.

3.9 Ensuring that the kitchen staff is properly trained in ensuring that the waste is placed in the right barrels to be incinerated or disposed of.

SITE SUPERVISOR:

3.10 Ensuring that this procedure is implemented and followed by all kitchen staff.

PROJECT MANAGER:

3.11 Ensuring that this procedure is implemented and maintained.

CORPORATE EHS MANAGER:

3.12 Monitoring the implementation of this procedure.

4.0 DEFINITIONS

4.1 N/A

5.0 REFERENCES AND RELATED DOCUMENTS

5.1 Nuna Standard Operating Procedures:

- EHS C.09 Solid Waste Segregation, Handling and Disposal
- EHS C.12 Safe Waste Incineration
- EHS F.03 Disposal of Aerosol and Pressurized Containers/Small Dry-Cell Batteries

6.0 PREPARATION

6.1 Tools

- PPE,
- Fire Retardant Coveralls and
- Gloves.

6.2 Hazards

- Attracting Wildlife,
- Burns,
- Damage to Equipment, Environment,
- Fire Hazard,
- Wasting Food.

○ Requirements

- Proper Training and Certification.

7.0 PROCEDURE

RECEIVING FOOD PRODUCTS

7.1 Unload food goods from the aircraft and transport them to the kitchen as quickly as possible.

7.2 Store all food goods as soon as they arrive. Store fresh foods first, then frozen foods and lastly dry and canned goods.

7.3 Remember to rotate items – first in must be first out (unless expiry date on incoming goods is before present stock expiry dates.

FOOD WASTES

7.4 Food wastes and other domestic garbage from all areas of the accommodations complex are to be brought to the kitchen area for disposal with kitchen waste.

7.5 Waste and leftover food from lunches being consumed outside the main camp area are to be brought to the appropriate designated area for proper disposal.

7.6 Waste aerosol cans, pressurized containers and batteries are disposed of and handled separately.

7.7 Waste from the kitchen and the kitchen storage area is to be collected several times daily and taken out to the proper area to be incinerated. The frequency of collection depends on the number of people in camp. During periods of high camp load, designated kitchen staff will remove the final loads of kitchen wastes (in the evening) to the appropriate area to be incinerated as the last load. This removes wildlife attractants from the kitchen.

7.8 The volume of garbage to be taken to the incinerator shall not exceed a normal single load. Anything above a single load is to be left inside the kitchen storage area until it can be incinerated. The storage room attached to the incinerator should be used only for short-term storage and amounts there must be minimized so as to reduce the possibility of attracting wildlife.

7.9 Grease from grills and grease traps will be incinerated with the kitchen garbage as it aids in burning wet garbage.

7.10 Each time that the cooking oil in the deep fryers is changed, approximately twenty-three (23) liters of used oil will be produced. This volume is too large to be mixed with the regular kitchen wastes at any one time and presents a serious fire hazard if not disposed properly.

7.11 Used oil is to be poured into pails lined with double garbage bags. These are only to be filled with six to seven (6-7) liters of cool used cooking oil and must be labeled with its contents. This is done to minimize spills when handling and to keep the volumes to the appropriate level for safe incineration. These sealed pails are to be kept in the kitchen away from outside doors.

7.12 The use oil can be incinerated with wet kitchen wastes or sludge and the total loading of the incinerator must be reduced from normal loading.

7.13 The emptied pail will be returned to the kitchen to be reused.

PACKAGING WASTE

7.14 The kitchen generates substantial amounts of cardboard from food packages. All cardboard boxes must be broken down to ensure that no traces of food are left inside.

7.15 Cardboard will be separated into two (2) piles.

7.16 Cardboard packaging that contained fresh food which may contain food smells must be separated and piled separately for the incinerator.

7.17 Cardboard that is free from smells can be piled into another pile that will be burned at the burn pit.

7.18 All other food packaging will be placed in the normal garbage stream for incineration.

8.0 ATTACHMENTS

- N/A

9.0 APPROVAL RECORD

	NAME	POSITION	SIGNATURE	DATE
OWNER	Corey Kinsey	Corp. EHS Manager		Jan 1, 2021
EXECUTIVE	Miles Safranovich	President & CEO		Jan 1, 2021

10.0 REVISION HISTORY

VERSION	REVISED ON	DESCRIPTION
003	Jan 1, 2021	New Format

STANDARD OPERATING PROCEDURE

Department	ENVIRONMENT, HEALTH & SAFETY		
Section	Environment		
Procedure Name	Solid Waste Segregation, Handling and Disposal	**Date**	January 1, 2021
Procedure #	EHS C.09	**Revision**	003

1.0 INTRODUCTION

1.1 The Preservation of the environment and minimizing wildlife attractants is of paramount importance to Nuna. It is the responsibility of all employees, contractors and visitors to properly handle and dispose of solid wastes while on Nuna projects and designated work sites.

2.0 SCOPE

2.1 This procedure applies to employees, contractors and visitors on Nuna projects and designated work sites.

3.0 ROLES AND RESPONSIBILITIES

PROJECT MANAGER

3.1 Ensuring that this procedure is implemented and maintained.

CONTRACTORS

3.2 Delivering their waste materials to the lay down area or the incinerator waste storage area.

SUPERVISOR

3.3 Arranging disposal of waste materials off-site, at appropriate locations.

EHS COORDINATOR

3.4 The designation of appropriate off-site disposal locations.

4.0 DEFINITIONS

5.0 DEFINITIONS

5.1 **Domestic Waste**: Garbage from everyday activities, including office, kitchen and general camp garbage.

5.2 **Hazardous Waste/Materials:** Is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors or materials. Such materials include but are not limited to:

- Acids
- Asbestos and/or materials containing asbestos
- Caustic substances
- Disinfectants
- Glues
- Heavy metals, including mercury, lead, cadmium and aluminium
- Paint
- Pesticides
- Petroleum products
- Radioactive material and/or
- Solvents

5.3 **Non-Hazardous Liquid Waste:** Liquids that are not classified as hazardous under Canadian legislations

5.4 **Sanity Waste**: Any human and food-processing waste.

5.5 **Solid Waste**: All non-hazardous solid waste that does not react with other materials to create hazardous materials. Such materials include but are not limited to:

- Glass
- Masonry
- Non-asbestos insulation
- Non-reactive metal
- Paper
- Plastic
- Roofing material
- Wood

6.0 REFERENCES AND RELATED DOCUMENTS

6.1 National Research Council of Canada – 1995 – National Fire Code of Canada

7.0 PREPARATION

7.1 Tools

- PPE,
- Gloves,
- Goggles,
- Waste Management Log.

7.2 Hazards

- Cuts,
- Burns,
- Slips, Trips, Falls,

- Spills.

7.3 Requirements

- WHMIS 2015 certification.

8.0 PROCEDURE

GENERAL STORAGE AND HANDLING OF SOLID WASTES

8.1 Nuna will segregate waste by type, compatibility and store reactive wastes a safe distance apart to prevent inadvertent reaction and/or contamination in a proper reactive disposal device. All employees, contractors and subcontractors' personnel shall separate and label their solid, non-hazardous wastes into the following categories:

- Aerosol Cans
- Batteries
- Beverage containers
- Clean/dirty metals
- Clean/Dirty Wood
- Contaminated waste
- Domestic waste
- Kitchen waste
- Lube oils and filters
- Plastic
- Sewage treatment plant sludge bags
- Tires

8.2 The inappropriate storage of domestic waste in on or around a garbage storage shed will attract wildlife therefore domestic waste (and Sewage treatment plant sludge bags) must be collected and incinerated as soon as possible.

8.3 Clean and dirty steel and plastic wastes are to be transported to the lay down area and deposited in the appropriately labeled containers.

8.4 Aerosol cans and other pressurized containers will explode when heated, therefore they MUST not be incinerated. All aerosol cans must be stored in a separate container located in the hazardous waste laydown area to be appropriately disposed of. This enviro-drum will be shipped off-site to an approved hazardous waste handler.

8.5 All waste containers on-site are to be kept covered and/or protected from exposure and so that they do not attract animals or will be blown away by the wind.

OFF-SITE DISPOSAL

8.6 All waste stored in crates and/or barrels must be uniquely identified in the Waste Management Log for tracking purposes.

8.7 The Waste Management Log records the following information:

a. Unique identification number on barrel,
b. A brief description of material,
c. The date and crate or barrel of solid waste was stored,
d. Spill report number if waste is result of a spill,
e. WHMIS 2015 and/TDG Labelling
f. A comment section.

8.8 A WHMIS 2015 workplace label and/or TDG Label must be affixed to all containers that contain controlled products or hazardous materials.

8.9 All waste containers will be given an identification number so they can be tracked in the Waste Management Log.

8.10 Identification numbers are provided by the EHS Coordinator or designate. Each waste container will be labeled with one identification number. A detail description of this process can be found in the Nuna Waste Management Log.

9.0 ATTACHMENTS

9.1 N/A

10.0 APPROVAL RECORD

	NAME	POSITION	SIGNATURE	DATE
OWNER	Corey Kinsey	Corp. EHS Manager		Jan 1, 2021
EXECUTIVE	Miles Safranovich	President & CEO		Jan 1, 2021

11.0 REVISION HISTORY

VERSION	REVISED ON	DESCRIPTION
003	Jan 1, 2021	New Format

STANDARD OPERATING PROCEDURE

Department	ENVIRONMENT, HEALTH & SAFETY		
Section	Environment		
Procedure Name	Safe Waste Incineration	**Date**	January 1, 2021
Procedure #	EHS C.12	**Revision**	002

1.0 INTRODUCTION

1.1 To identify the appropriate precautions for workers, contractors and personnel who are authorized to conduct incinerating operations in conjunction with Provincial or Territorial regulations and legislation.

2.0 SCOPE

2.1 This procedure applies to workers, contractors and personnel authorized to operate the incinerator and conduct incinerating operations on Nuna projects or designated work sites.

3.0 ROLES AND RESPONSIBILITIES

PROJECT MANAGER

3.1 Ensuring that all manufacture operator instructions are followed for incinerator use is followed.

3.2 Ensuring incinerator operators are adequately trained in the proper care and use of the equipment.

ENVIRONMENT, HEALTH AND SAFETY COORDINATOR

3.3 Ensuring this procedure is followed by the incinerator operator.

INCINERATOR OPERATOR(S)

3.4 Wearing the appropriate PPE for the task including supplied fire-retardant coveralls.

3.5 Ensuring that all waste to be burned in the incinerator is packaged in clear plastic garbage bags.

3.6 Ensuring that no sharp objects are added to normal garbage.

3.7 Ensuring that products generated from spill clean-ups are packaged as per this procedure.

3.8 Reporting improper packaging of waste for incineration to the EHS Coordinator.

4.0 DEFINITIONS

4.1 **Primary Chamber**: The lower portion of the incinerator that the garbage is loaded into. It burns at a temperature of approximately five-hundred fifty (550) ˚C.

4.2 **Secondary Chamber**: The upper portion of the incinerator which burns at eight-hundred fifty (850) ˚C, to burn off the emissions.

5.0 REFERENCES AND RELATED DOCUMENTS

5.1 Nuna's Standard Operating Procedures:

- EHS A.29 Pre-Use Inspection and Equipment Inspection Checklist
- EHS B.10 Housekeeping
- EHS F.03 Disposal of Aerosol & Pressurized Containers / Small Dry-Cell Batteries

6.0 PREPARATION

6.1 Tools

- Fire Retardant Clothing,
- Long Cuffed Puncture Resistant Gloves,
- Full Face Shield,
- PPE,
- Empty Drums for Ashes,
- Respirator.

6.2 Hazards

- Working in Congested Areas,
- Equipment Damage,
- Slips, Trips, Falls,
- Personal Injury,
- Working in High Temperatures,
- Burns,
- Pinch Points,
- Crush Points.

6.3 Requirements

- Proper Training and Certification

7.0 PROCEDURE

PRE-USE

7.1 A daily routine inspection of the incinerator each day before its use should be done thoroughly, looking for leaks and damages. Should any leaks or damages be noted, tag out the machine and report the findings to your supervisor and inform maintenance so that it can be fixed by a competent and qualified worker.

7.2 The incinerator's primary combustion chamber requires cleaning out daily. Ashes should be cool, which could take approximately six (6) to eight (8) hours and placed in a non-combustible container. Care should be taken to avoid plugging or damaging the combustion holes and burner tips. Under no circumstances should you spray water into the combustion chamber.

7.3 Ensure that there is adequate fuel for the burn. Do not operate if the fuel supply is inadequate for the burn.

7.4 Clean the primary combustion chamber (if required).

7.5 All waste for incineration must be in clear plastic garbage bags. Only authorized competent and trained personnel may fire the incinerator or add waste products to the incinerator.

General items that may be burned include:

- Camp food waste
- Camp garbage from offices and rooms
- Rags used for cleaning purposes
- Old clothing
- Grease from kitchen grease taps (burned with camp food waste garbage bags)

Items that may be burned with specific restrictions or precautions:

- Absorbent pads used to clean up spills of gasoline, Jet-B, solvents, diesel fuel or hydraulic fluid may be burned, whilst following special safety precautions.
- Oily or greasy rags from drilling operations, whilst following safety precautions.
- Snow contaminated with gasoline, Jet-B, solvents, diesel fuel, or hydraulic fluids whilst following special safety precautions.
- Absorbent pads or snow from small spill of antifreeze, (i.e. not to exceed one normal size garbage bag).
- Solid waste gathered in garbage cans from treatment plants, environment labs, First Aid room etc.
- Waste cooking oil in quantities not exceeding six (6) to seven (7) litres per burn.
- Any animal carcass remnant, after permission is granted from Jurisdictional Wildlife Officers.

SPECIAL SAFETY PRECAUTIONS

7.6 No more than one half (1/2) of a normal size garbage bag at any time may be added to the incinerator.

7.7 Items must be added as the first load into a cold incinerator (i.e. incinerator must not have been used in the last ten (10) hours – normally the first load is added in the morning).

7.8 After items are loaded into the incinerator, the doors must be closed, and the incinerator must be fired immediately to avoid the build-up of vapors.

7.9 Products stored for burning must be placed in enviro-drums located away from any flammables, due to the possibility of spontaneous combustion.

ITEMS THAT MUST NOT BE BURNED

7.10 The following are items that are not to be burned and arrangements for proper disposal must be made:

- Aerosol or other pressurized containers
- Dry cell batteries
- First Aid room sharp objects
- Rubber products

8.0 ATTACHMENTS

8.1 N/A

9.0 APPROVAL RECORD

	NAME	POSITION	SIGNATURE	DATE
OWNER	Corey Kinsey	Corp. EHS Manager		Jan 1, 2021
EXECUTIVE	Miles Safranovich	President & CEO		Jan 1, 2021

10.0 REVISION HISTORY

VERSION	REVISED ON	DESCRIPTION
002	Jan 1, 2021	New Format