Operation and Maintenance Plan
CFS Eureka (ERK), Nunavut

In support of the
Nunavut Water Board Licence
No. 8BC-ERK1621

Originally prepared: November 2010
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Prepared for:
1 Canadian Air Division,
Department of National Defence

Originally prepared by:
Environmental Services
Defence Construction Canada

Revised by:
8 Wing Environmental Management
Department of National Defence

Canada

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LIST OF APPENDICES

ACRONYMS

ALT	CFS Alert
8 Wing	8 Wing Trenton
BOD	Biological Oxygen Demand
BRI-NRC	Biotechnology Research Institute of the National Research Council of Canada
CBO	Canadian Base Operator
CFS	Canadian Forces Station
DND	Department of National Defence
EC	Environment Canada
ERK	CFS Eureka
HAWS	High Arctic Weather Station
HazMat	Hazardous Material
MSDS	Material Safety Data Sheet
NWB	Nunavut Water Board
O&M	Operation and Maintenance
pH	Measure of acidity and alkalinity
PHC	Petroleum Hydrocarbon
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
SNP	Surveillance Network Program
TDGR	Transportation of Dangerous Goods Regulation
WHMIS	Workplace Hazardous Materials Information System

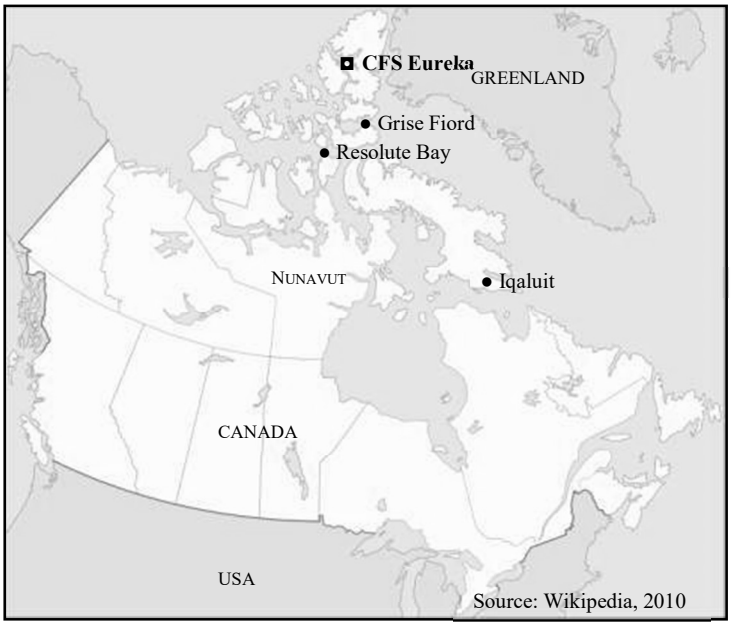
1. Introduction

1.1. Purpose

This document was prepared in response to the requirements of the Nunavut Water Board (NWB) for the submission of an Operation and Maintenance (O&M) Plan, under Licence number 3BC-ERK1015, issued to the Department of National Defence (DND) on June 18, 2010 (refer to Appendix B). This plan was updated Under Licence 8BC-ERK1621 in relation to the water licence renewal application in 2021. This new Class B Water Licence issued by the NWB allows for the use of water and the disposal of waste during operation and maintenance of Canadian Forces Station (CFS) Eureka ("Eureka"). This Plan has been 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*, published in 1996. The original O&M Plan (2010), updated in 2021 and was approved by the NWB and is implemented at CFS Eureka by 8 Wing Environmental Management.

1.2. Location

Eureka is located approximately 0.8 km north of Slidre Fiord on the west coast of Ellesmere Island within the Qikiqtani Region of Nunavut (Latitude 79°59'20"N/ Longitude 85°56'30"W). The nearest communities to Eureka are Grise Fiord, CFS Alert and Resolute Bay, and are located approximately 450 km, 475 km and 600 km from the station. Eureka has been operational since 1947 and was originally established as a High Arctic Weather Station, and is currently a remote camp maintained by DND as a military detachment and training area. Eureka is located approximately 2 km from the Eureka High Arctic Weather Station (HAWS) operated by Environment Canada (EC).



1.3. Geophysical Environment

Soils, Geology and Terrain
The surface horizon at Eureka and surrounding area consists of tundra soils, comprised of mostly sand/gravel fill underlain by silty sandy clays. The surficial geology in the region is underlain by sandstone and shale. Eureka infrastructure (i.e., roads, buildings, etc.) is constructed on fine to course gravel fill material. The topography in the region is rolling and ridged, with altitudes not exceeding 1,000 m above sea level.

Climate
The polar climate is semi-arid. Eureka experiences cool summers and cold winters, with prevailing winds from the west. The mean annual daily temperature is -19.7°C, with summer months having a mean daily temperature of 3.5°C and winter months having a mean daily temperature of -37.6°C. Eureka experiences the most precipitation (in the form of rain and snow) during the months of July, August and September. Eureka receives on average approximately 75.5 mm of precipitation annually. Mean monthly temperatures and precipitation data are as follows:

Mean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	-37.1	-38.4	-37.4	-27.4	-11	2.3	5.7	2.6	-7.7	-22	-30.9	-34.7
Precipitation (mm)	2.9	2.6	2.7	3.5	3.4	8.1	12.5	14.9	10.1	7.9	3.9	3.3

Source: Environment Canada, 2010.

Permafrost
Eureka is located in a zone of continuous permafrost. The active layer in this region extends to a depth of approximately 80 cm.

Hydrology

Eureka is located in a continuously permafrost region and lacks significant surface vegetation; therefore runoff is the primary water distribution process at the site. Large trenches extend across the surface in the region, and are a result of seasonal drainage patterns (BRI-NRC, 2007). Runoff at the station generally flows south towards Slidre Fiord.

1.4. Location of Waste Facilities

Waste facilities at Eureka include a Sewage Lagoon and the following three landfills/dumps: landfill, Battery Dump and Barrel Dump. Refer to Figure 1, Appendix A for the location of these waste facilities at Eureka.

1.5. Population Projections

Eureka is only seasonally active during the summer months, which include June, July and August, and is used by DND, EC and arctic research projects (Polar Continental Shelf Project and the Polar Environment Atmospheric Research Laboratory). During the summer months the peak population is 35 people, and on average ranges between 20 to 25 people. People visiting the station can include DND personnel, consultants, contractors, and researchers. The population is anticipated to remain the same over the next 5 years.

1.6. Contact List

Personnel responsible for the operation and maintenance of the sewage and solid waste facilities are as follows:

Facility	Position	Telephone No.
Sewage Lagoon & Solid Waste Facilities	CFS Eureak OC – Officer Commanding	(613) 945-3145 ext 4425

2. Background

2.1. Water Supply

The community at Eureka obtains its drinking water from the EC weather station located adjacent to the station. The EC's source of freshwater is Station Creek which begins to flow in early June. Water is transported by truck from the EC reservoir and stored in a cistern at the station. Water reservoirs in the main building and Weather Heaven supply water to these buildings; there is no water supply (i.e., piping) between buildings.

All water used at Eureka is regulated under separate licence issued to EC (Licence 3BC-EUR1116). DND does not use any other freshwater sources; therefore, the NWB Licence issued to DND does not allow for the use of freshwater. In the event that DND requires a freshwater source in addition to the water obtained from the EC facility, an application to amend this Licence is required.

2.2. Sewage

Camp sewage comprised of black and greywater passes through a digester, then piped (i.e, gravity-fed) and discharged to the sewage lagoon. The lagoon is located on the south side of the main station (refer to Figure 1, Appendix A). The lagoon is a two-stage process (i.e., two cells) which eventually discharges effluent overland, which flows downhill to the receiving water body of Slidre Fiord. The quantity of wastewater (containing sewage) discharged to the sewage outfall is estimated based on the water usage at the station.

In 2009 an upgrade to the lagoon walls was completed extending the height of walls to approximately 2.5 to 3.0 m. To facilitate improved settling within the lagoon a pipe was installed connecting the two cells to allow transfer of primarily liquid from the first cell to the second cell of the lagoon.

2.3. Solid Waste

Landfill (East Airstrip Landfill)
This landfill is situated in a ravine and has been in operation since the inception of EC's Weather Station in 1947. Historically both hazardous and non-hazardous materials were deposited here. Currently the landfill is still active and is used to dump non-combustible solid waste. Garbage is collected daily in sealed containers or plastic bags. No data exists for determining the composition of the solid waste generated at the station. The landfill is covered as time/equipment is available.

Incinerator
Combustible garbage is taken to the incinerator building and incinerated as required. Ashes are shipped to 8 Wing Trenton and disposed of at a licensed waste disposal facility. There are no abandoned solid waste sites at the station; however, historically solid waste practices did not always meet current standards and as a result there are several areas of potential contamination.

Barrel Dump
The Barrel Dump contains empty crushed burned barrels, capped with thin layers of clean fill. Barrels are primarily aviation fuel drums.

Battery Dump
The Battery Dump has been completely backfilled and is no longer used. Batteries used for the High Arctic Data Communications System, vehicles and other equipment onsite were previously disposed of in this location. Presently, there is no visual evidence of the dump; however, a sign is posted identifying the Department of National Defence Battery Disposal Area.

Hazardous Materials
Hazardous materials generated at the station, such as batteries, are collected and stored in HazMat overpacks and shipped to 8 Wing Trenton for management and disposal.

3. Sewage Lagoon O&M Plan

3.1. Description

Camp sewage passes through a digester prior to being discharged to the sewage lagoon. The lagoon is a two-stage process (i.e., two cells) which discharges effluent overland to the receiving water body of Slidre Fiord (approximately 700 m down gradient). The lagoon is located on the south side of the main station (refer to Figure 1, Appendix A).

3.2. Operation and Maintenance Protocols

The purpose of operation and maintenance for this system is to maintain continuous operation during the summer months, prolong system life and ensure the treatment area performs as intended. The following table outlines the frequency and tasks to be completed to operate and maintain the sewage facility.

Frequency	Tasks
Semi-annually (i.e. Opening/closing of camp)	▪ Inspect sewage lines and sewage lagoon. ▪ Inspection Report submitted to the 8 Wing Construction Engineering Officer
As required	▪ Repair piping, lagoon, etc. ▪ Sample effluent prior to release of effluent.

Maintenance records are kept onsite include the details of any maintenance undertaken at the sewage lagoon.

Weed and insect control is not required at the site.

3.3. Safety Procedures

Safety procedures have not yet been formalized for the sewage facility.

4. Solid Waste O&M Plan

4.1. Description

The solid waste facilities at Eureka include a landfill, barrel dump and battery dump. Since these solid waste facilities were constructed prior to licence conditions, as-built drawings are not available. The following table identifies the contents, location, and the dimensions of the landfills and dumps onsite, and respective distances and directions from water and airport runway.

Landfills	Contents	Location	Dimensions	Distance from	
				Water Body	Airfield
Landfill	Non-combustible solid waste	South of east end of air strip	7,500 m^3	230 m north of Slidre Fiord	N/A
Barrel Dump	Crushed empty barrels	Main station, south of air strip	N/A	N/A	N/A
Battery Dump	Depleted batteries*	Northeast of east end of airstrip	34 m x 20 m 4,350 m^3	500 m north of Slidre Fiord	N/A

***** Depleted and spent batteries are shipped to 8 Wing Trenton and are no longer disposed of onsite.
N/A: Not available.

Conditions that could potentially affect normal operations of the solid waste disposal activities include: flooding in low-lying areas during spring melt, severe winter storms and high winds, and/or lack of qualified personnel (i.e., certification, qualifications, expertise) to handle (i.e., store, transport, dispose) specialized wastes.

4.2. Operation and Maintenance Protocols

The community of Eureka produces numerous types of solid waste which include combustible and non-combustible waste, scrap metal, waste oil and hazardous waste, excess fuel and empty barrels. Waste is segregated onsite. Disposal procedures are waste specific and include:

- Combustible solid waste is incinerated.
- Non-combustible solid waste is landfilled.
- Bulky or scrap metal that cannot be re-used are landfilled.
- Waste oil and hazardous waste is collected, packaged and shipped to Trenton for further management/recycling; refer to Section 5.0 for further information on the disposal procedures for hazardous waste.
- Excess fuel is incinerated.
- Empty barrels are crushed and landfilled in the Barrel Dump or as directed by EC.

Solid waste maintenance activities for Eureka are identified and outlined as follows:

Activity	Procedures
Waste Collection	▪ Garbage is collected daily in sealed/secured in containers or plastic bags. ▪ For collection of Hazardous Waste refer to Section 5.
Segregation	▪ Combustible, non-combustible, and hazardous waste materials are separated.
Incineration	▪ Incineration of combustible wastes at Incinerator Building as required (i.e., at least once a week). Ash is shipped to 8 Wing and disposed of at a licenced waste disposal facility.
Preventing Windblown Debris	▪ Waste placed in sealed containers or indoors. ▪ Landfill is capped annually with clean gravel (soil, gravel).
Fencing and Signs	▪ Sign is posted at the Battery Dump to identify the location (as the dump has been completely backfilled). ▪ No fencing or signs for the landfills due to strong winds. ▪ Safety signs and access control signs indoor for the incinerator building.
Odour Control	▪ There are no controls for odour at the dump aside from capping activities. ▪ Capping with gravel/fill material occurs at least annually, near the end of the summer season.

* Presently there are no alternatives to incinerating combustible waste onsite.

4.3. Safety Procedures

Solid waste at Eureka is generally managed to prevent animals from eating station waste. Upon arrival to the station, all personnel receive the solid waste orientation. Safety procedures for waste facility operators include adequate training (e.g., WHMIS, etc.) and the appropriate personal protective equipment (PPE) to be worn to handle waste and spills.

5. Incineration Management Plan

An Incineration Management Plan has not been formalized. Combustible garbage is taken to the incinerator building and incinerated as required. Incinerator ash is shipped to 8 Wing Trenton and disposed of at a licensed waste disposal facility.

6. Hazardous Waste O&M Plan

6.1. Description

HazMat wastes at the station may include: paint, batteries, ash, battery acid, pcb (present and/or suspected), waste oil, waste oil drums, waste fuel, coolant, glycol, oil rags, oil-antifreeze mixture, oil filters, and aerosol cans.

6.2. Operation and Maintenance Protocols

Currently no Hazardous Material (HazMat) Management Plan is in place for Eureka. In the absence of this Plan the main elements of the CFS Alert HazMat Management Plan have been adopted (refer to Appendix C). The CFS Alert HazMat Management Plan defines cradle-to-grave HazMat management (e.g., distribution, storage, application, etc.) and provides direction to all onsite personnel. All HazMat wastes are identified, collected, segregated/stored, labelled, and disposed by the Alert HazMat Team Leader.

HazMat wastes are stored at registered storage sites, and as outlined in the CFS Alert HazMat Management Plan (Appendix C) the following is applied to serviceable HazMat storage:

- Indoors, flammable HazMat is stored in approved flammable storage cabinets of in a manner approved by the Station Fire Safety.
- Refillable compressed gas cylinders are secured upright.
- HazMat is labelled in accordance with the WHMIS guidelines.
- Incompatible classes of hazardous materials are physically separated.
- HazMat storage areas are subject to siting approval by the Station Fire Chief.

Procedures outlining the return and disposal of HazMat waste to 8 Wing Trenton are attached in Annex D of Appendix C. These procedures provide a waste transfer template which is completed and accompanies return waste during the transfer. The following information is required on HazMat waste transfers: dates of waste collection, description, volume, generator of wastes, method of storage, name of carrier transferring waste and contact. Manifests for off-base shipping conform to the Transportation of Dangerous Good Regulation (TDGR). Disposal records are maintained for all HazMat waste onsite at Eureka.

6.3. Safety Procedures

This adopted HazMat Plan applies to all personnel working onsite, including integral, lodger, contractors and sub-contractors. Hazardous wastes onsite are handled only by WHMIS-trained qualified personnel (i.e., HazMat responders) wearing appropriate personal protective equipment (PPE). MSDS are maintained and accessible to personnel on site.

Spill prevention measures, spill response procedures and incident reporting are outlined in the: (i) CFS Alert HazMat Management Plan (Appendix C), and (ii) CFS Eureka Spill Contingency Plan (Appendix D).

7. Landfarm Management Plan

7.1. Description

The Landfarm (i.e., Biopile) at Eureka was constructed for the purposes of remediating soil contaminated with petroleum hydrocarbons. The Landfarm is located approximately 90 m south of the airstrip (refer to Figure 1, Appendix A). The Landfarm is approximately 18 m x 3 m in size with a capacity of approximately 44 m3. The Landfarm is comprised of the contaminated soil and a berm enclosing the Landfarm. Since this Landfarm facility was constructed prior to licence conditions, an as-built drawing is not available.

7.2. Operation and Maintenance Protocols

The Landfarm operates year-round as part of the ongoing ex-situ bioremediation project under the Contaminated Sites Program operated by the Biotechnology Research Institute of the National Research Council of Canada (BRI-NRC). Due to polar desert condition, any water accumulated within the berm is reapplied to hydrate the contaminated soil; no water is discharged outside of the Landfarm.

DND will seek confirmation from the Government of Nunavut, Department of Environment prior to the final disposal or use of the treated landfarm soils, as the disposal/use is dependent on the Treatment Objective.

7.3. Safety Procedures

This adopted HazMat Plan applies to all personnel working onsite, including integral, lodger, contractors and sub-contractors. Hazardous wastes on site are handled only by WHMIS-trained qualified personnel (i.e., HazMat Responders) wearing appropriate personal protective equipment (PPE). MSDS are maintained and accessible to personnel on site.

Spill prevention measures, spill response procedures and incident reporting are outlined in the: (i) CFS Alert HazMat Management Plan (Appendix C), and (ii) CFS Eureka Spill Contingency Plan (Appendix D).

8. Monitoring Program

8.1. Monitoring Stations

The Eureka Monitoring Program is scheduled to commence in June 2011 as the station is only seasonally active (i.e., June through August). The Surveillance Network Program (SNP) at Eureka consists of the following 5 monitoring stations:

Station No.	Monitoring Station	Monitor	Frequency of Sampling
ERK-1	Final Discharge Point of the Sewage Treatment Facility	Quality	Prior to release of effluent
ERK-2	Final Discharge Point of the Landfarm Facility	Quality	Prior to release of effluent
ERK-3	Runoff/leachate from the Landfill	Quality	Monthly during periods of runoff or seepage (while station active)
ERK-4	Runoff/leachate from the Battery Dump	Quality	Monthly during periods of runoff or seepage (while station active)
ERK-5	Runoff/leachate from the Barrel Dump	Quality	Monthly during periods of runoff or seepage (while station active)

8.2. Monitoring of Water Supply

No monitoring requirements.

8.3. Monitoring of Sewage Treatment Facility

Control (QA/QC) Plan (refer to Appendix E). Sewage samples are to be analysed for BOD5, total suspended solids, fecal coliforms, oil and grease and pH. Analytical results of effluent discharged from the sewage lagoon will be reported against and are not to exceed the effluent quality standards provided by the NWB. Results are to be reported annually to the NWB in the Annual Report.

An Inspector will be notified at least 10 days prior to discharging effluent compliant with the NWB standards from the sewage lagoon.

8.4. Monitoring of Solid Waste Facilities

Sampling procedures for the leachate are provided in the QA/QC Plan (refer to Appendix E). Sampling stations have been identified to monitor contaminants in the leachate from each of the three landfills/dumps at the station. Results are to be reported annually to the NWB in the Annual Report.

8.5. Monitoring of Landfarms

Sampling procedures for the Landfarm (i.e., Biopile) are provided in the QA/QC Plan (refer to Appendix E). Effluent samples from the Landfarm are to be analysed for benzene, toluene, ethylbenzene, lead, oil and grease and phenols. Analytical results of effluent discharged from the Landfarm will be reported against and are not to exceed the effluent quality standards provided by the NWB. Results are to be reported annually to the NWB in the Annual Report.

An Inspector will be notified at least 10 days prior to discharging effluent compliant with the NWB standards from the Landfarm; effluent is to be discharged on the land in areas at a minimum distance of 31 m from the high watermark. Effluent that does not meet the NWB effluent standards is treated as hazardous waste and disposed off-site at an approved facility.

9. Inspections, Modifications, and Plans

9.1. Facility Inspections

Engineered water and waste facilities will be inspected annually during the summer (i.e., July or August); any required maintenance will be addressed.

9.2. Facility Modifications

The NWB is to be notified in writing at least 60 days prior to the commencement of the modifications to the water supply and waste disposal facilities. Modifications are to be consistent with the terms of the Licence (Appendix B).

9.3. Review of O&M Plan

This document shall be reviewed annually by DND to ensure that this plan remains current and consistently reflects the operations, activities and technology at Eureka. Revisions required to this document shall be made as necessary, and shall be submitted to the NWB in the form of an addendum in the Annual Report.

The NWB requires notification of any changes to the operating plans or conditions associated with this project at least 30 days prior to implementation.

9.4. Abandonment and Restoration Plan

In the event the station is to close an Abandonment and Restoration Plan will be prepared and submitted to the NWB for approval 6 months prior to the abandonment of the station.

10. References

Biotechnology Research Institute of the National Research Council of Canada (BRI-NRC). *Characterization of Contaminated Sites, CFS Alert and CFS Eureka, Nunavut, Final Report.* March 2007.

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Appendix A: Figure

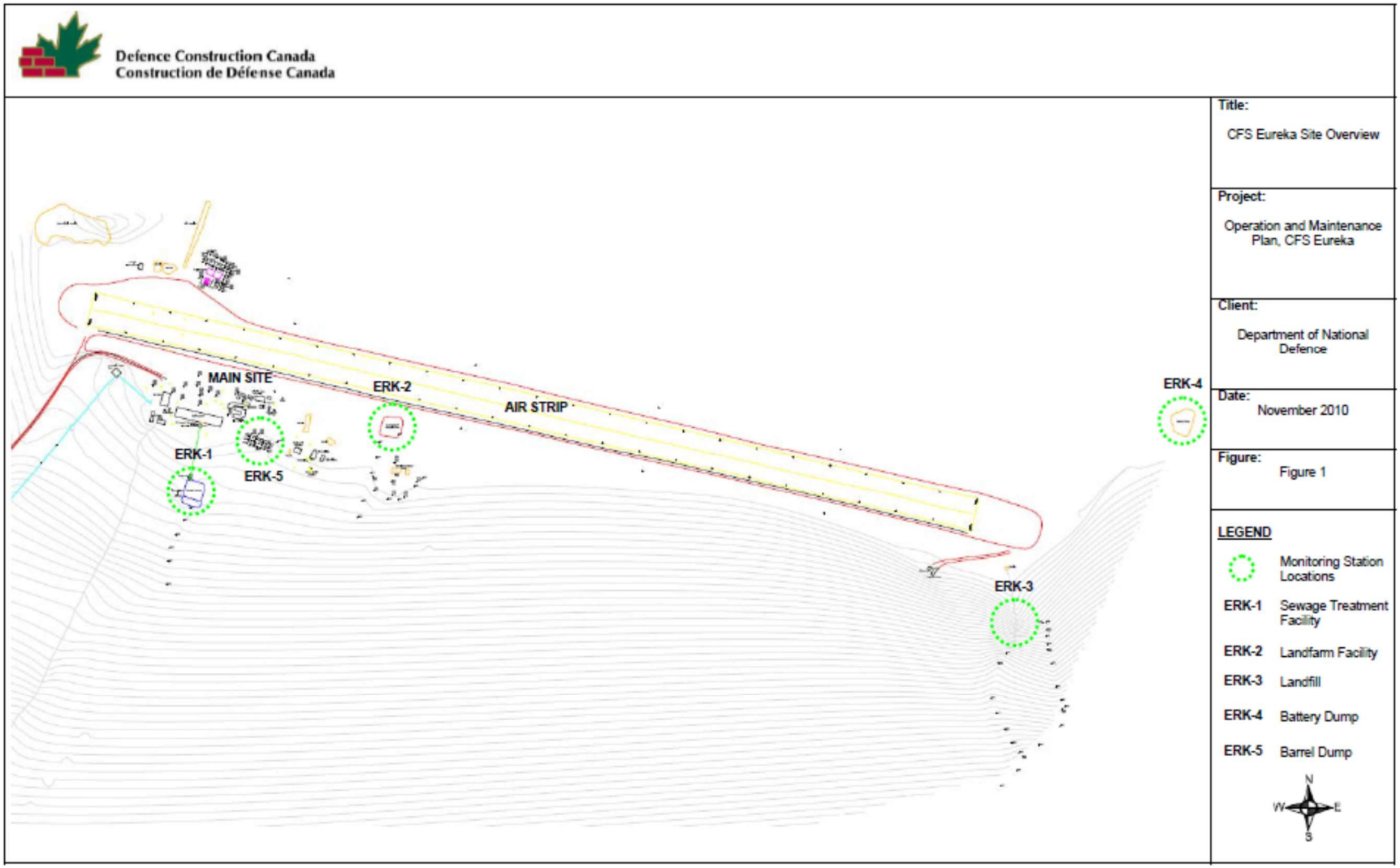

Figure 1 – CFS Eureka Site Overview

Appendix B: NWB Licence No. 8AC-ERK1621

Appendix C: CFS Alert – Hazardous Materials Management Plan

Appendix D: Spill Contingency Plan, CFS Eureka, Nunavut

Appendix E: Quality Assurance and Quality Control Plan, CFS Eureka, Nunavut

Appendix F: Abandonment and Restoration Plan Battery and Barrel Dumps CFS Eureka (ERK), Nunavut