# Operation and Maintenance Plan
# CFS Alert (ALT), Nunavut

In support of the
Nunavut Water Board Licence
No. 3BC-ALT1015

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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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## ACRONYMS

| | |
|---|---|
| 8 Wing | 8 Wing Trenton |
| Alert | CFS Alert |
| BOD | Biological Oxygen Demand |
| BRI-NRC | Biotechnology Research Institute of the National Research Council of Canada |
| cBOD | Carbonaceous Biological Oxygen Demand |
| CFS | Canadian Forces Station |
| COD | Chemical Oxygen Demand |
| DND | Department of National Defence |
| HazMat | Hazardous Material |
| LWPH | Lower Pumphouse |
| 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 |

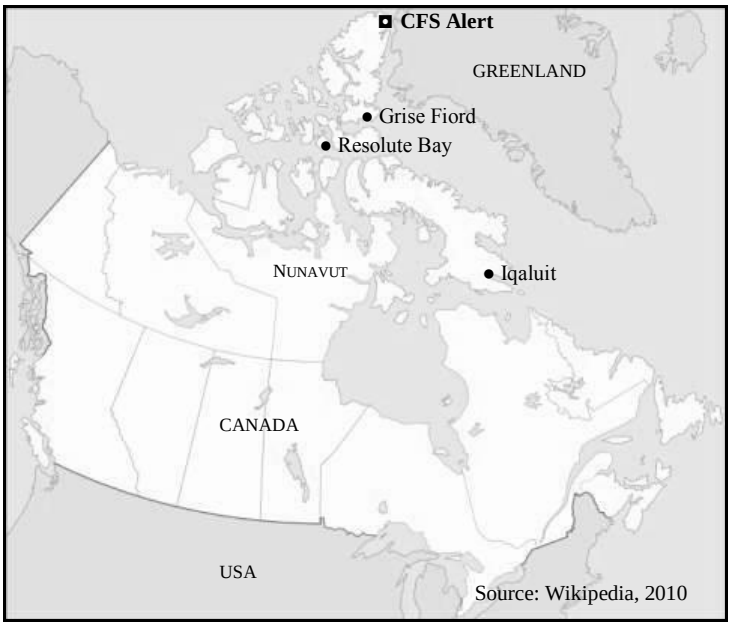
# 1. INTRODUCTION

## 1.1. Purpose

This document has been 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-ALT1015, issued to the Department of National Defence (DND) on August 5, 2010 (refer to Appendix B). 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) Alert ("Alert"). 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 last revised O&M Plan (2011) was approved by the NWB and is implemented at CFS Alert by 8 Wing Environmental Management.

## 1.2. Location

Alert is located on the north-eastern tip of Ellesmere Island within the Qikiqtani Region of Nunavut (Latitude 82°30'1"N/ Longitude 62°20'37"W; UTM Easting 552375.7996584666, Northing 6874583.726844844; map sheet number 120E05). Alert is situated on the coast of the Lincoln Sea, a water body part of the Arctic Ocean. The nearest communities to Alert are Grise Fiord and Resolute Bay, and are located approximately 780 km and 1080 km from the station. Alert was originally established as a High Arctic Weather Station in 1950, and is currently a remote camp maintained by DND which has been in continuous operation since 1958.



## 1.3. Geophysical Environment

*Soils, Geology and Terrain*

The surface horizon at Alert and surrounding area consists of tundra soils comprised of clay, silt and some gravel. The soil in this region is classified as a cryosol comprised of clayey silt. The region is underlain by shale and slate. Alert infrastructure (i.e., roads, buildings, etc.) is constructed on fine to course gravel fill material. The terrain at Alert is rugged and the station is surrounded by hills and valleys.

*Climate*

The polar climate is semi-arid. Alert experiences cool summers and cold winters, with prevailing winds from the west. The mean annual daily temperature is -18°C, with summer months having a mean daily temperature of 1°C and winter months having a mean daily temperature of -32°C. Alert experiences the most precipitation (in the form of rain and snow) during the months of July, August and September. Alert receives on average approximately 154 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) | -32.4 | -33.4 | -32.4 | -24.4 | -11.8 | -0.8 | 3.3 | 0.8 | -9.2 | -19.4 | -26.4 | -30.1 |
| Precipitation (mm) | 6.8 | 6.3 | 7.0 | 10.3 | 11.0 | 11.1 | 27.8 | 21.2 | 23.4 | 12.3 | 9.7 | 6.8 |

Source: Environment Canada, 2010.

*Permafrost*

Alert is located in a permafrost region classified as continuous permafrost. To date the maximum permafrost depth measured was 480 m in 1997. The active permafrost layer referred to as the permafrost table is at a depth of approximately 1 m from the ground surface (BRI-NRC, 2008).

*Hydrology*

Alert is located in a continuous permafrost region and lacks significant surface vegetation; therefore runoff is the primary water drainage process at the site. Runoff at the main station flows primarily to the east into Dumbell Bay and Parr Inlet, which are joined to Lincoln Sea. The sea is covered with pack ice year-round.

## 1.4. Location of Waste Facilities

Waste facilities at Alert include a sewage terrace system and the following four landfills: Main Station Landfill, Millionaire's Dump, Battery Dump and Dump 3. Refer to Figure 1, Appendix A for the location of these waste facilities at Alert.

## 1.5. Population Projections

The population at Alert generally ranges between 50-100 people throughout the year. Environment Canada is co-located at Alert and has a permanent station for various high arctic weather, flora and fauna studies. During summer months the population approaches 200 people

due to temporary visitors to the station (e.g., consultants, contractors, and visiting personnel), and during times of military exercises the population can expand to 400 people. The station's 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 Terrace System | CFS Alert $H_2O$ -(Civilian Contractor) Water Plant Supervisor | (613) 945-3145 ext 3215 |
| Sewage Terrace System Solid Waste Facilities | CFS Alert Site Manager-(Civilian Contractor) Site Manager | (613) 945-3145 ext 3262 |
| Sewage Terrace System | 8 Wing Construction & Engineering - Water, Fuel, Environment Supervisor | (613) 392-2811 ext 7498 or 2198 |

# 2. BACKGROUND

## 2.1. Water Supply

The community at Alert obtains its drinking water from Upper Dumbell Lake, a freshwater lake located approximately 2.5 km southwest of the core complex of the station (refer to Figure 1, Appendix A). The water intake pipe is located at a depth of 5 m and is comprised of a 250 mm high-density polyethylene tube containing a pump; the intake is equipped with a screen with a mesh size of 3 mm. The NWB has authorized the use of up to 185 $m^3$/day from the lake.

Upper Dumbell Lake has a surface area of 364 hectares and an average depth of 7.6 metres. Winter ice depth varies between 1,800 mm to 2,750 mm. Break-up is mid-July and freeze-up is early September. Runoff during open water was gauged at 13,600 $m^3$/day. The summer temperature reaches 4$^o$C and the winter temperature ranges from 0$^o$C to 2$^o$C at the bottom[1]. Upper Dumbell Lake discharges to Lower Dumbell Lake, then through an unnamed stream to the ocean.

Raw water is pumped continuously from Upper Dumbell Lake and transported via an aboveground heated insulated high-density polyethylene waterline approximately 2.5 km to the Water Treatment Plant in the core complex (refer to Figure 1, Appendix A). The water is treated with Kinetico's Macrolite media pressure filters and an ultraviolet purification treatment, then chlorinated and continuously pumped to storage reservoirs (2 x 227$m^3$ reservoir tanks). From the reservoir tanks water is either distributed out to the complex via a single pipe loop system throughout the station (refer to Figure 2, Appendix A), or returned to Upper Dumbell Lake to prevent freezing in the pipes and at the intake. Unused water at the termination of the water supply pipe within the complex is used as the feed for the fire sprinkler system for the main complex. Excess water from the storage reservoirs is discharged into the sewage pipeline. Bleeders are currently used to keep water lines flowing.

## 2.2. Sewage

Until recently sewage generated at the station was collected by a network of pipelines and discharged from an outfall in an area with a significant slope, approximately 250 m from the receiving body Parr Inlet. During the summer of 2010 a Sewage Terrace System, comprised of five terraces, was constructed between the sewage outfall and Parr Inlet. The old sewage outfall located to the south of the terrace system is no longer in use and has been decommissioned, forming the southern boundary of the Sewage Terrace System.

Sewage at the station is collected by a network of heated insulated high-density polyethylene gravity pipelines that collect sewage and wastewater from the buildings onsite (i.e., bathroom, kitchen, workplace, etc.) and discharges to the outfall (refer to Figures 2 and 3, Appendix A). The quantity of wastewater (containing sewage) discharged to the sewage outfall is estimated based on the water usage at the station.

[1] Arctic Water Supply System, E.G. Taylor, quoted by CFS Alert Water Treatment Plant Operation and Maintenance Manual, 1 Construction Engineering Unit, CFS Winnipeg, January 1979.

There is no activity or waste source at Alert that would indicate anything other than a normal domestic waste loading. The wastewater contains general residential-type waste, faeces, domestic cleaning compounds, and garburated food waste. Hazardous materials are not permitted to be disposed in the sewer. The sewage is diluted with unused drinking water and excess waste drinking water produced and bled from the water treatment plant, and then discharged to the terrace system from the sewage outfall. There is no primary or secondary treatment of sewage prior to discharge. The collection system is designed and operated conservatively to prevent freezing in the pipes.

## 2.3. Solid Waste

Garbage is collected daily in sealed containers or plastic bags. All combustible garbage is taken to the incinerator building and incinerated as required. Once cool, only ashes and clinker are disposed in the Main Station Landfill. The Main Station landfill is covered as time/equipment is available. Other dumps onsite include the Millionaire's Dump for disposing of large metals and bulky wastes, Dump 3 for disposing of vehicle parts and other metallic objects, and the Battery Dump formerly used to dispose of batteries (refer to Figure 1, Appendix A). No data exists for determining the composition of the solid waste generated at the station.

Recyclables such as metals, aluminum (and other valuable metals), plastics, and glass bottles are collected and shipped to 8 Wing Trenton, Ontario for recycling. Hazardous materials generated at the station, such as batteries, are collected and stored in hazmat over packs and shipped to 8Wing Trenton for management and disposal. The Department of National Defence CFS Alert, Government of Nunavut issued Hazardous Waste Generator number is: NUG100048 and the Hazardous Waste Carrier number is: NUC200012.

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. A delineation program led by the Royal Military College in Kingston, Ontario, and the National Research Council of Canada in Montreal, Quebec, are in place to characterize site contamination. It is understood that the station is moving toward an appropriate clean-up.

# 3. SEWAGE TREATMENT FACILITY O&M PLAN

## 3.1. Description

An engineered Sewage Terrace System is the type of facility used to dispose of sewage at the station. This system is located to the east of the station (refer to Figure 1) and is comprised of the outfall from the sewage pipe, hill side terracing, and once vegetation has established, a wetland at the base of the terrace.

Sewage is untreated and continuously flows from the outfall pipe and travels down grade approximately 200 to 250 m to the east through the terrace system prior to entering the receiving body Parr Inlet; refer to Figure 3 for as-built engineering drawing of terrace system. The terracing system length of approximately 500 m allows for sufficient dispersal of the sewage (or sludge) over the entire length of the system. The sediments settle and biodegrade during the summer through increased surface area exposure to aeration and natural ultraviolet-light exposure).

## 3.2. Operation and Maintenance Protocols

The purpose of Operation and Maintenance Plan for this system is to maintain continuous operation, prolong system life, prevent freezing of the sewer lines 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 disposal facility.

| Frequency | Tasks |
|---|---|
| Daily | ▪ Check sewer lines, monitor temperatures throughout the station.<br>▪ Remove accumulated ice at the sewage outfall by hand/backhoe to prevent freezing of effluent and any damage related to ice jamming or ice lifting of the outfall pipeline (2-3 times/week during subzero temperatures). |
| As required | ▪ Repair terraces, prevent channelling (summer).<br>▪ Repair/replace snow fencing to prevent snow accumulation at the Sewage Terrace System. |
| Monthly | ▪ Sampling of effluent (during times of flow).<br>▪ Report sewage volumes. |
| Annually | ▪ Report sampling results and sewage volumes. |

The Sewage Terrace System was constructed during the summer of 2010 and therefore maintenance records have not yet been developed. Maintenance records shall include the details of any maintenance undertaken on the terrace system.

Weed and insect control is not required at the site. Birds and mammals such as wolves have been frequently observed in the area of the sewage outfall and terrace system. For over 25 years the Canadian Wildlife Service has been conducting an annual avian study on the birds attracted

to the waste water particles in the upper portion of the treatment area to gain a better understanding of high Arctic avian populations and the continuing effects of climate change.

## 3.3. Safety Procedures

Safety procedures have not yet been formalized for the sewage facility. Access to the sewage disposal area is not restricted; however, the following safety measures were put into operation for the sewage pipeline:

- A permanent rope lifeline has been constructed to aide operators walking along the sewage pipeline (between the Water Treatment Plan and the sewage outfall).
- The sewage outfall area is well lit.

# 4. SOLID WASTE O&M PLAN

## 4.1. Description

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 |
| Main Station Landfill | Solid domestic waste, incinerator ash, clinker | North of core complex | 100x75 m | 200 m west of Dumbell Bay | 600 m south |
| Millionaire's Dump | Metals (larger metals, bulky wastes, etc.) | South of core complex | 100x100 m | 500 m west of Alert/Parr Inlet | 2.2 km south |
| Dump 3 | Vehicle parts, wire, other metallic objects | South of core complex | 150x200 m (estimate) | 200 m west of Alert/Parr Inlet | 2.1 km south |
| Battery Dump | Depleted batteries* | South of core complex | 75x75 m | 700m west of Alert/Parr Inlet | 2.5 km south |
| HazMat Barrel Compound | Empty metal drums/bins, other bulky metallic objects | South of core complex | 30x60 m | 400 m west of Alert/Parr Inlet | 1.8 km south |

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

Since these solid waste facilities were constructed prior to licence conditions, as-built drawings are not available. The Main Station Landfill site was designed to manage surface water runoff and eliminate surface and subsurface contamination. Surface water that appears outside the disposal area is routed around the berms. Berms and ditches are repaired as required during summer months to maintain effective surface water runoff.

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 Alert produces numerous types of solid waste which include paper/cardboard, plastics (including styrofoam), hazardous waste, food waste, recyclables, metal waste and wood materials. Waste is manually segregated onsite. Disposal procedures are waste specific and include:

- Dry combustible materials (e.g., papers and cardboard) are compressed into bales and incinerated onsite.
- Plastic waste materials (e.g., containers and bags) are shredded and disposed of in the Main Station Landfill.
- Waste oils are disposed of in the waste oil burner to heat the maintenance building.
- Hazardous wastes such as fuel, glycol and oil rags are collected and incinerated.

- Hazardous materials such as batteries are 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.
- Food waste such as bones and shells are incinerated to prevent attracting animals.
- All other food waste (i.e., non-bones/shells) is garburated, diluted and discharged through the waste water system to the sewage terrace system.
- Recyclables including aluminium cans, scrap metals, surplus appliances, and glass bottles are shipped to Trenton for further recycling.
- Metal waste materials are disposed of onsite at the Millionaire's Dump or recycled (see above).
- Untreated wood materials are incinerated.
- Remaining waste (e.g., plastics, treated wood, etc.) is disposed on onsite at the Main Station Landfill, or Dump 3 (refer to Figure 1, Appendix A for specific locations of the landfills at the station).
-

The composition of waste generated at Alert is not recorded; however, waste records are maintained for all Hazardous Materials (HazMat) Disposal and Incineration activities at Alert.

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

| **Activity** | **Procedures** |
|---|---|
| Waste Collection | ▪ Garbage is collected daily in sealed/secured in containers or plastic bags.<br>▪ For collection of Hazardous Waste refer to Section 5. |
| Segregation | ▪ Domestic, metal and recyclable waste materials are manually separated.<br>▪ Food waste (except bones and shells) is garburated.<br>▪ Metal waste materials are isolated and disposed of at the Millionaire's Dump. |
| Waste Compaction | ▪ All dry paper and cardboard waste are compacted into bails and incinerated in the incineration building.<br>▪ All plastic bags are shredded in the compaction room before disposal at the Main Station landfill. |
| Preventing Windblown Debris | ▪ Waste placed in sealed containers or indoors.<br>▪ Main Station Landfill and Millionaire's Dump are capped annually with clean gravel (from the quarry). |
| Fencing and Signs | ▪ No fencing or signs for the landfills due to strong winds.<br>▪ Safety signs and access control signs indoor for the incinerator building and compaction room. |
| Odour Control | ▪ Deodorizing products are generally used daily in the compaction room.<br>▪ Cleaning/washing of compaction room occurs after every use (i.e., daily).<br>▪ There are no controls for odour at the dump aside from capping activities.<br>▪ Capping with gravel/fill material occurs at least annually, near the end of the summer season. |
| Burning* | ▪ *Incinerator:* Incineration of dry waste, fuel/waste oils, other combustible wastes at Incinerator Building generally daily or as required (i.e., at least once a week). Ashes and clinker are disposed in the Main Station Landfill.<br>▪ *Open Air Bonfires:* Only non-treated wood materials (i.e., crates, pallets, scrap wood) are burned onsite in designated areas; bonfires are weather dependent and take place approximately 6-7 times per year. |

* Alternatives to burning are dependent on the type of waste. Hazardous waste (i.e., fuel, waste oil) would be shipped by air to Trenton, and wood materials would be disposed of in the landfill.

## 4.3. Safety Procedures

Solid waste at Alert 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. HAZARDOUS WASTE O&M PLAN

## 5.1. Description

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

## 5.2. Operation and Maintenance Protocols

All hazardous materials at Alert are managed in accordance with the *CFS Alert Hazardous Material (HazMat) Management Plan* dated September 2010 (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 personnel at Alert. All HazMat wastes are identified, collected, segregated/stored, labelled, and disposed by the HazMat Coordinator / Environmental Technician.

HazMat wastes are stored at registered storage sites, and as outlined in the *CFS Alert HazMat Management Plan* (Appendix C) in accordance with the following:

- Indoors, flammable HazMat is stored in approved flammable storage cabinets or 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 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 Alert.

## 5.3. Safety Procedures

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

Spill prevention measures, spill response procedures including initial response, containment methods, emergency contacts and incident reporting are outlined in the: (i) *CFS Alert HazMat Management Plan* (Appendix C), and (ii) *CFS Alert Spill Contingency Pla*n (Appendix D).

# 6. LANDFARM MANAGEMENT PLAN

## 6.1. Description

There are two Landfarm Facilities: 1) ALT-11 Landfarm (Airfield); and, ALT-10 Day Tank Landfarm (newly constructed Sept 2013).

The ALT-11 Landfarm Facility was constructed in August 2007 for the purposes of remediating soil contaminated with 22,000L Petroleum Hydrocarbon (i.e., JP-8 heating fuel). The Landfarm is located approximately 25 m east of Lancaster Drive, southeast of the Lower (i.e., Airfield) Fuel Tank Farm (refer to Figure 1, Appendix A). It is 40 m X 90 m in size with a capacity of 3,750 $m^3$ (refer to Figure 4, Appendix A), and is comprised of the following:

- Berm Liner: 3-layers of Arctic-NT Polyvinyl Chloride (PVC).
- Berm Material: Limestone (i.e., fine screening from Alert's Quarry).
- PHC Contaminated Soil: Type B soil layered 1.2 to 1.4 m thick.
- Controlled Soil: Located in the southeast corner of the Landfarm.

The ALT-10 was constructed in September 2013 for the purposes of remediating soil contaminated with Petroleum Hydrocarbon (i.e., JP-8 heating fuel) from past operations of the old Day Tank Fuel System Facility. The NWB Letter dated July 10, 2013, advised the inclusion of this new landfarm management plan. A new modern Day Tank Facility replaced the old system, and as a result of historical contamination, the soils directly beneath the foot print of the newly constructed system were excavated for remediation. For management of contact water within the ALT-10 Landfarm Facility, the conditions of the NWB Licence, sampling and testing criteria, for ALT-11 are applied identically. It is 13 m X 29.5 m in size with a capacity of 500 $m^3$ (refer to Figure 5, Appendix A), and is comprised of the following:

- Berm Liner: HDPE 60 mil textured impervious membrane.
- Berm Material: Screened gravel (20 mm, 100-150 mm thick from Alert's Quarry).
- PHC Contaminated Soil: Type B Soil layered 0.8 to 1.2 m thick.

## 6.2. Operation and Maintenance Protocols

The Landfarm Facilities operate year-round as part of the ongoing ex-situ bioremediation project under the Contaminated Sites Program, operated by the National Research Council of Canada (NRC) and DND. The Landfarms are self-contained; therefore, no water is pumped outside of the Landfarm. Due to polar desert condition any water within the berm (e.g., produced from snowmelt) is used to hydrate the contaminated soil.

In the event that a hydrocarbon spill occurs at the station, contaminated soil is placed in the Landfarms onsite. This activity is controlled by DND-8 Wing Environmental Management. Records are maintained for soil placed in the Landfarm identifying the volume and concentration of hydrocarbons in the soil.

Ongoing monitoring of the ALT-11 Landfarm involves:

- Two sampling rounds/year during the summer months (June to August).
- Approximately 10 samples are collected/round.
- Samples sent to the NRC Laboratory in Montreal and analysed using the following methods:
  i) Micro-organism Enumeration by Most-Probable Analysis (MPA) through incubation.
  ii) Polymerase Chain Reaction (PCR) of hydrocarbon degradation potential of Indigenous Microbial Populations.
  iii) Microcosm Studies: Radio-labelled substrates for determining mineralization activity, and cold (non-radioactive) analysis.
  iv) Total residual hydrocarbon concentration (F1-F4 fraction) analysis.

NRC prepares and submits annually a Monitoring Report (i.e., summarizing the results of the soil analysis) to 8 Wing Environmental Management.

DND will conduct ongoing monitoring at ALT-10 Landfarm using identical, but at a smaller scale approach due to the smaller volume of soil, as those for ALT-11.

As per the NWB licence, 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.

### 6.3. Safety Procedures

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

Spill prevention measures, spill response procedures including initial response, containment methods, emergency contacts and incident reporting are outlined in the: (i) *CFS Alert HazMat Management Plan* (Appendix C), and (ii) *CFS Alert Spill Contingency Pla*n (Appendix D).

# 7. MONITORING PROGRAM

## 7.1. Monitoring Stations

The Alert Monitoring Program is scheduled to commence within one month of NWB approval of the Quality Assurance and Quality Control (QA/QC) Plan (refer to Appendix E). The Surveillance Network Program (SNP) at Alert consists of the following 11 monitoring stations:

| Station No. | Monitoring Station | Monitor | Frequency of Sampling |
|---|---|---|---|
| ALT-1 | Water Supply at Raw Water Intake (i.e., Pumphouse) | Quantity | Daily |
| ALT-2 | Discharge Point at the Sewage Outfall | Quality | Monthly* |
| ALT-3 | Final Discharge Point of the Sewage Treatment Facility (at weir box prior to entry into Parr Inlet) | Quality | Monthly during summer |
| ALT-4 | Runoff and Leachate from the Main Station Landfill | Quality | Annually |
| ALT-5 | Runoff and Leachate from the Battery Dump | Quality | Annually |
| ALT-6 | Runoff and Leachate from the Millionaire's Dump | Quality | Annually |
| ALT-7 | Runoff and Leachate from Dump 3 | Quality | Annually |
| ALT-8 | Discharge from Lower (i.e., Airfield) Fuel Tank Farm (secondary containment) | Quality | Prior to release of effluent |
| ALT-9 | Discharge from Upper Fuel Tank Farm (secondary containment) | Quality | Prior to release of effluent |
| ALT-10 | Discharge from Day Fuel Tank Farm (secondary containment)<br>Discharge from Day Tank Landfarm[A] | Quality | Prior to release of effluent |
| ALT-11 | Discharge from the Landfarm | Quality | Prior to release of effluent |

* Timing of sampling to correspond with sampling of ALT-3.

[A]In accordance with Fuel Systems modification completed in September 2013, an additional Landfarm Facility was added to ALT-10 to remediate excavated petroleum impacted soils. DND will apply the ALT-11 landfarm conditions to the new ALT-10 landfarm facility starting in 2014 SNP campaign.

## 7.2. Monitoring of Water Supply

Water usage in cubic metres is to be recorded daily and reported annually to the NWB.

## 7.3. Monitoring of Sewage Treatment Facility

Sampling procedures for the sewage effluent are provided in the QA/QC Plan dated November 2010 (refer to Appendix E). Sewage samples are to be analysed for $BOD_5$, total suspended solids, oil and grease and pH. Analytical results of effluent discharged from the Sewage Treatment Facility 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.

*COD-BOD Parameters*

DND commits to meeting the spirit and intent of the National Compliance Standards for sampling and compliance, and previously put forth a compliance proposal to the NWB to establish the site-specific relationship between COD, cBOD, and TSS. The purpose of this compliance proposal was to meet the requirements of the NWB given the transportation difficulty and practicality of meeting the short life of BOD samples. At present, onsite testing for COD is not feasible.

The NWB has identified in the licence requirements that sewage effluent samples are not to exceed $BOD_5$ criteria. In 2010, the contracted external CALA-certified Laboratory, AGAT Laboratories Ltd. (AGAT) in Mississauga had identified a maximum storage time (i.e., sample expiry) of 4 days for cBOD and $BOD_5$ samples. DND will analyse sewage effluents samples for $BOD_5$; however, should DND choose to monitor COD in lieu of traditional criteria (cBOD and $BOD_5$) an amendment application must be submitted to the NWB accompanied by site-specific information and the relationship between the parameters (i.e., COD, cBOD, $BOD_5$).

## 7.4. 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 four landfills/dumps at the station. Results are to be reported annually to the NWB.

## 7.5. Monitoring of Landfarms and Tank Farms

Sampling procedures for the Landfarm are provided in the QA/QC Plan (refer to Appendix E).

In addition to the ongoing NRC Landfarm Soil Monitoring Program, effluent samples will be collected and analysed by an external CALA-certified Laboratory for benzene, toluene, ethylbenzene, lead, oil and grease and phenols, prior to the release of effluent from the Landfarms at ALT-10 and ALT-11.

Prior to the release of effluent from the secondary containments for the tank farms, samples will be analysed by an external CALA-certified Laboratory for benzene, toluene, ethylbenzene, lead, oil and grease and phenols.

The Inspector will be notified at least 10 days prior to discharging effluent compliant with the NWB standards from the Landfarm and secondary containments for the tank farms; effluent is to be discharged on the land in areas at a minimum distance of 31 m from the high water mark.

In addition, CFS Alert has obtained a portable water oil/water (with a lead metal add-on filter) filtration system that is capable of treated effluence that exceed NWB standards. The use of this system is coordinated on a case by case basis between DND and the Inspector; typical requirements involve the collection of effluent samples at the start, intermediate, and near the end of the treatment operation to ensure effluent quality. The effluent samples are sent to a CALA accredited laboratory for analyses.
Results of effluent sample analysis are to be reported to the NWB annually.

# INSPECTIONS, MODIFICATIONS, AND PLANS

## 7.6. 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.

## 7.7. 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).

## 7.8. 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 Alert. 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.

## 7.9. Abandonment and Restoration Plan

An Abandonment and Restoration Plan, to address closure, will be prepared and submitted to the NWB for approval 6 months prior to the abandonment of a water and/or waste facility at Alert.

## 8. REFERENCES

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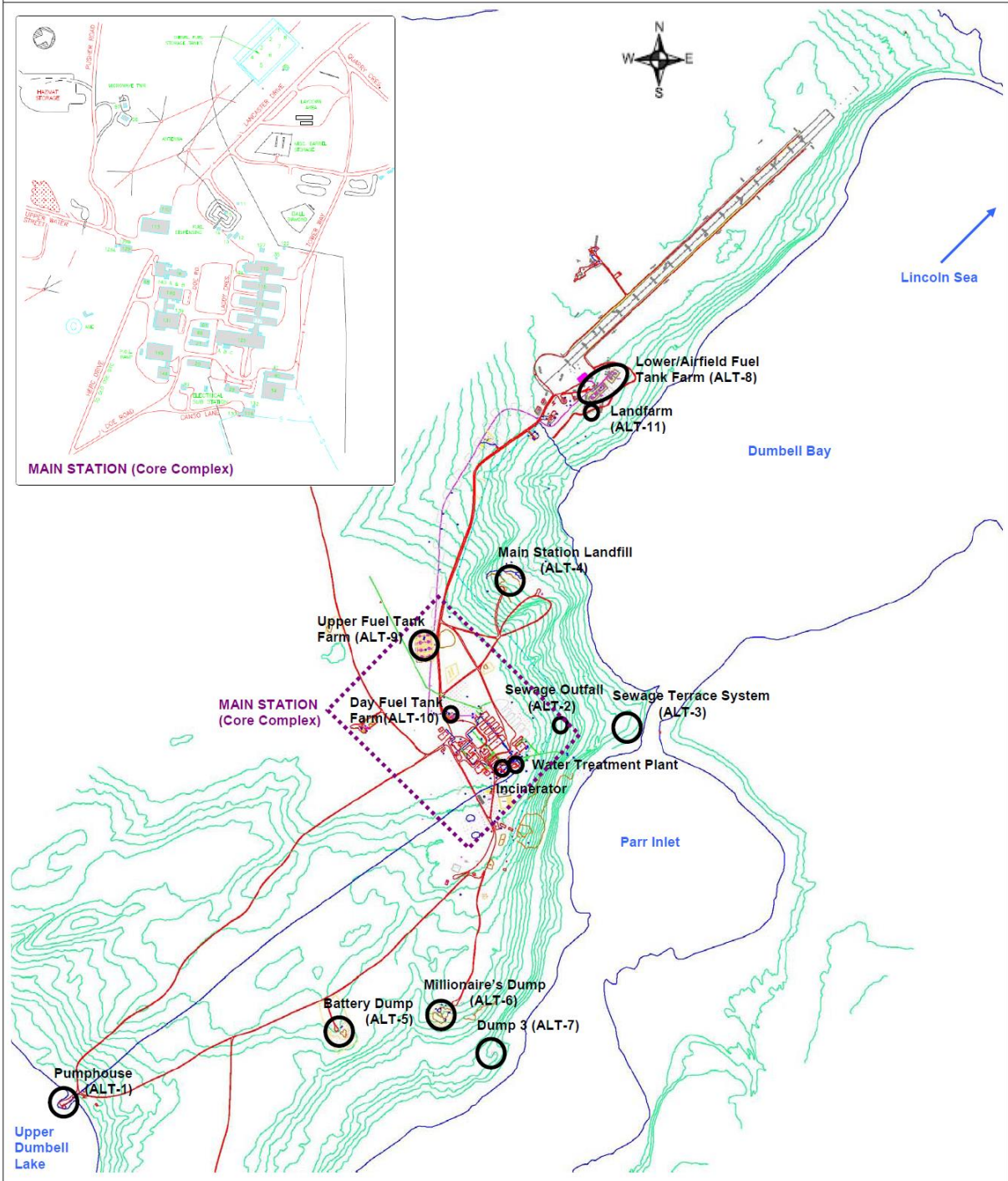
[2] Permission was provided by 1 Canadian Air Division Headquarters to include information verbatim from the Supplementary Information report prepared by FSC Architects & Engineers in the preparation of this Operation and Maintenance Plan.

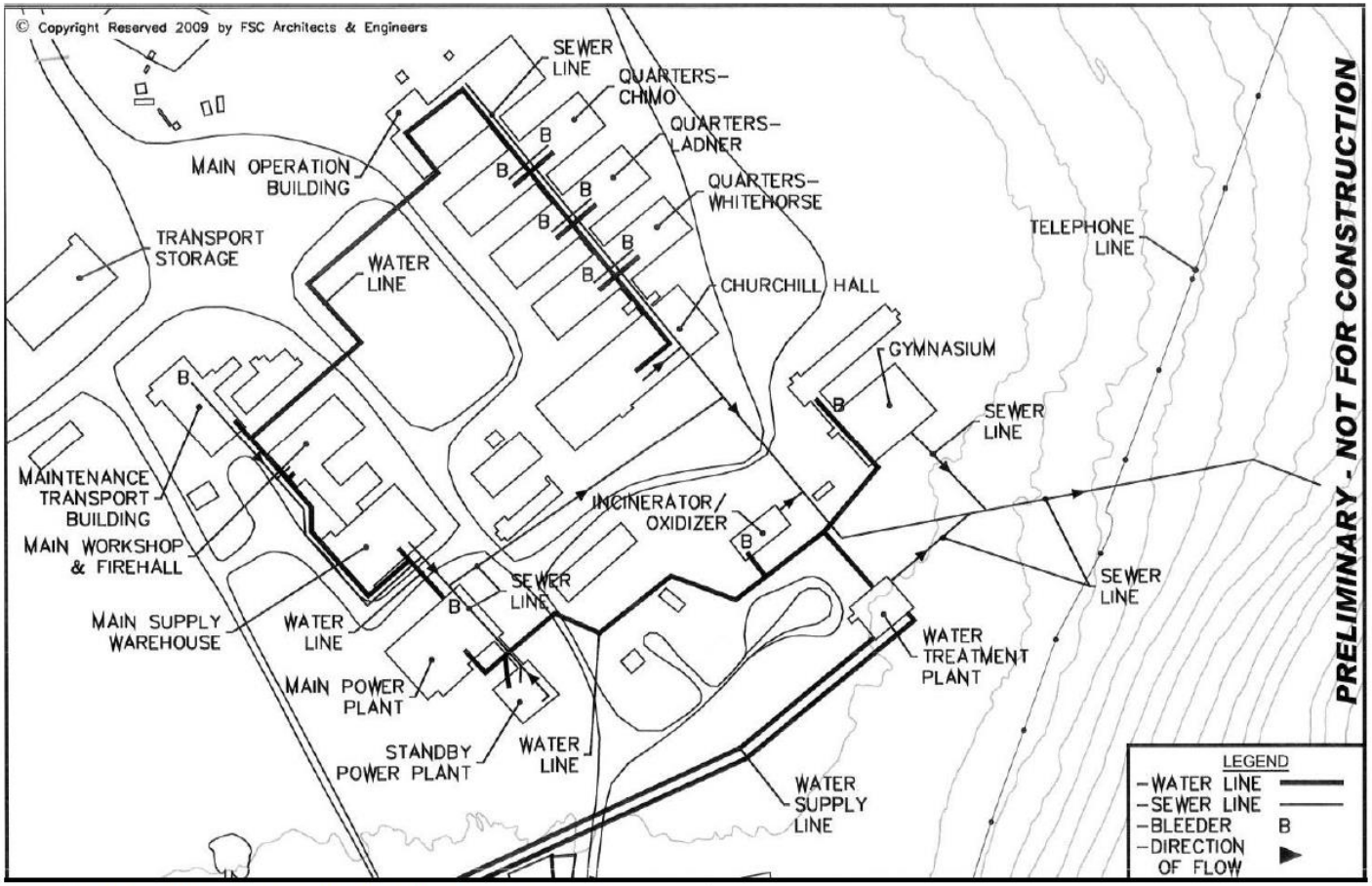
# Appendix A: Figures

Defence Construction Canada
Construction de Défense Canada




| | |
|---|---|
| **Title:** CFS Alert Site Overview | **Date:** November 2010 |
| **Project:** Operation and Maintenance Plan, CFS Alert | **Figure:** Figure 1 |
| **Client:** Department of National Defence | **Source:** DND, 1999 |

**Defence Construction Canada**
**Construction de Défense Canada**




| | |
|---|---|
| **Title:** Preliminary Design - Water Treatment Plant, Water and Sewage Pipelines, CFS Alert | **Date:** November 2010 |
| **Project:** Operation and Maintenance Plan, CFS Alert | **Figure:** Figure 2 |
| **Client:** Department of National Defence | **Source:** FSC Architects & Engineers, 2009 |

**Defence Construction Canada**
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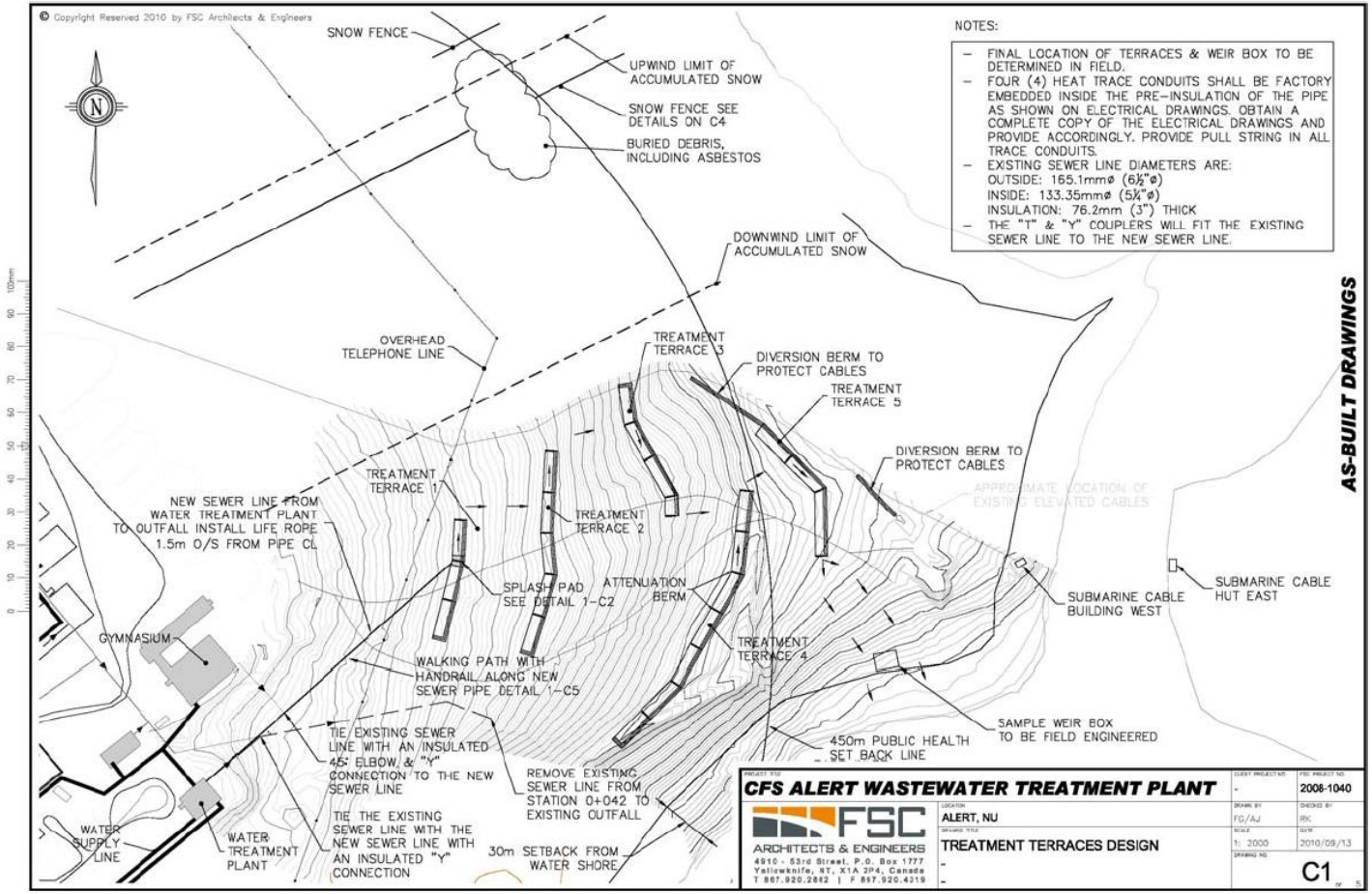


| | |
|---|---|
| **Title:** As-Built Drawing - Sewage Terrace System, CFS Alert | **Date:** November 2010 |
| **Project:** Operation and Maintenance Plan, CFS Alert | **Figure:** Figure 3 |
| **Client:** Department of National Defence | **Source:** FSC Architects & Engineers, 2010 |

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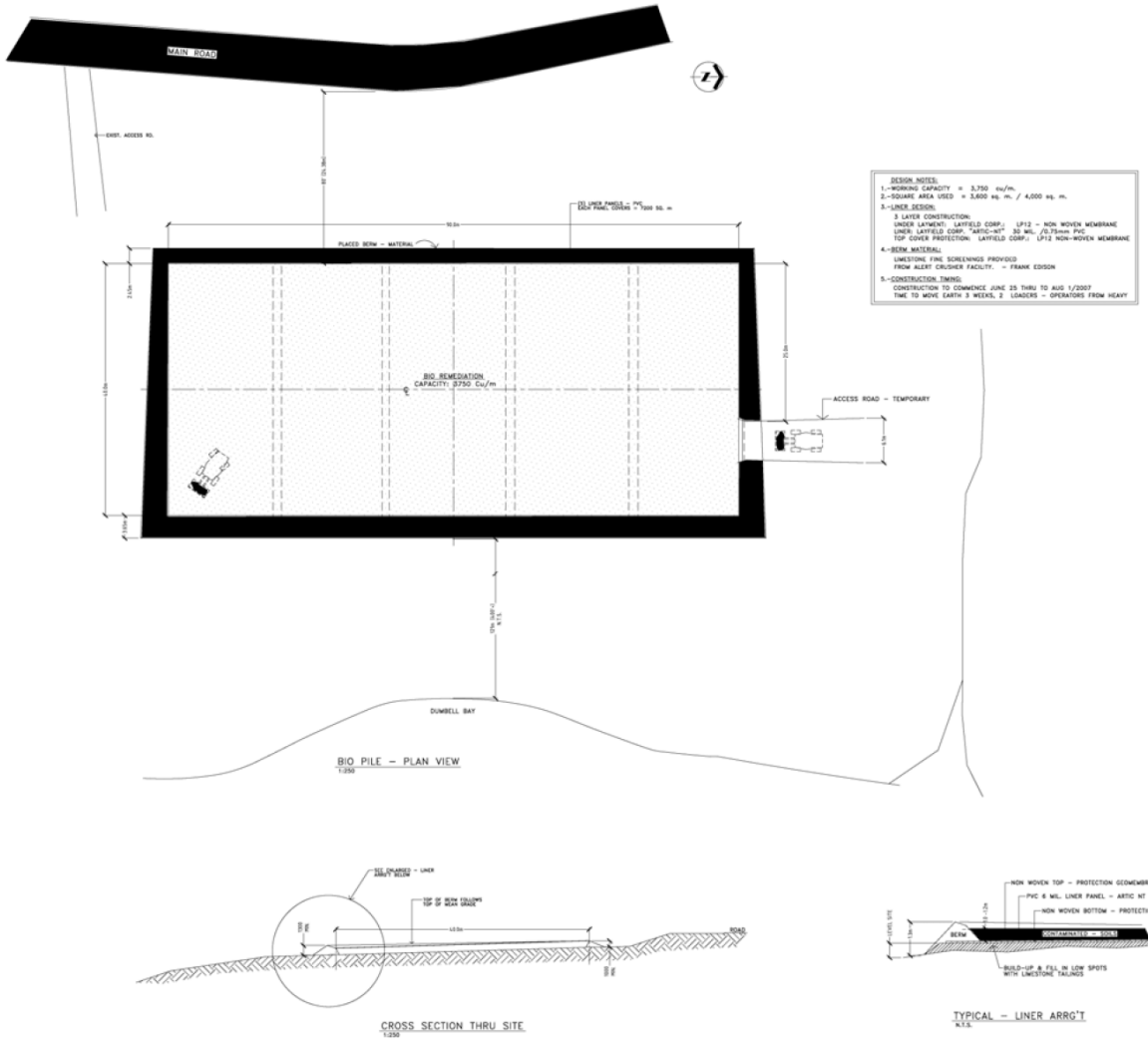
Construction de Défense Canada




**Title:** Landfarm Design, CFS Alert

**Project:** Operation and Maintenance Plan, CFS Alert

**Client:** Department of National Defence

**Date:** November 2010

**Figure:** Figure 4

**Source:** DND, 2007

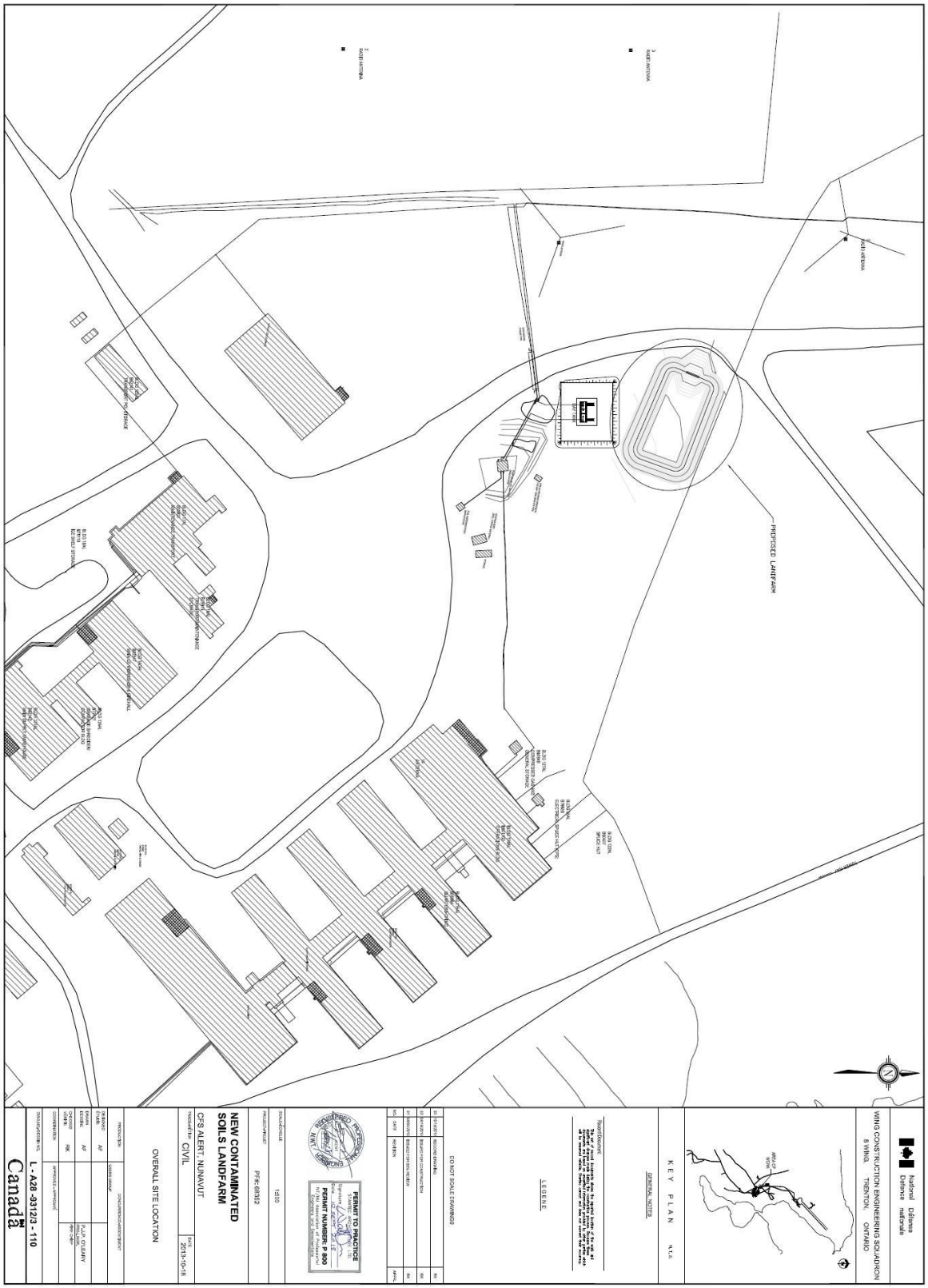



**Figure 5. New Alert Landfarm Design at ALT-10 (Day Tank Fuel Farm) (Sept. 2013).**

# Appendix B: NWB Licence No. 3BC-ALT1015

# Appendix C: CFS Alert – Hazardous Materials Management Plan

# Appendix D: Spill Contingency Plan, CFS Alert, Nunavut

# Appendix E: Quality Assurance and Quality Control Plan, CFS Alert, Nunavut

(Source: Wikipedia, 2010)

**Appendix F: Characterization of Emissions from the Eco Waste Solutions Thermal Waste Oxidizer Burlington, Ontario – Report 2003**