Appendix I

Closure and Decommissioning Plan

DILLON CONSULTING

DILLON CONSULTING

CITY OF IQALUIT

Closure and Decommissioning Plan (Draft)

Landfill and Waste Transfer Station

June 2019 | 19-9543

Table of Contents

Figures

Tables

1.0 Introduction

Dillon Consulting Limited (Dillon) has prepared this Draft Closure and Decommissioning Plan (Plan) for the City of Iqaluit's (City's) Landfill and Waste Transfer Station (WTS). This Plan has been prepared using the following key guidance documents:

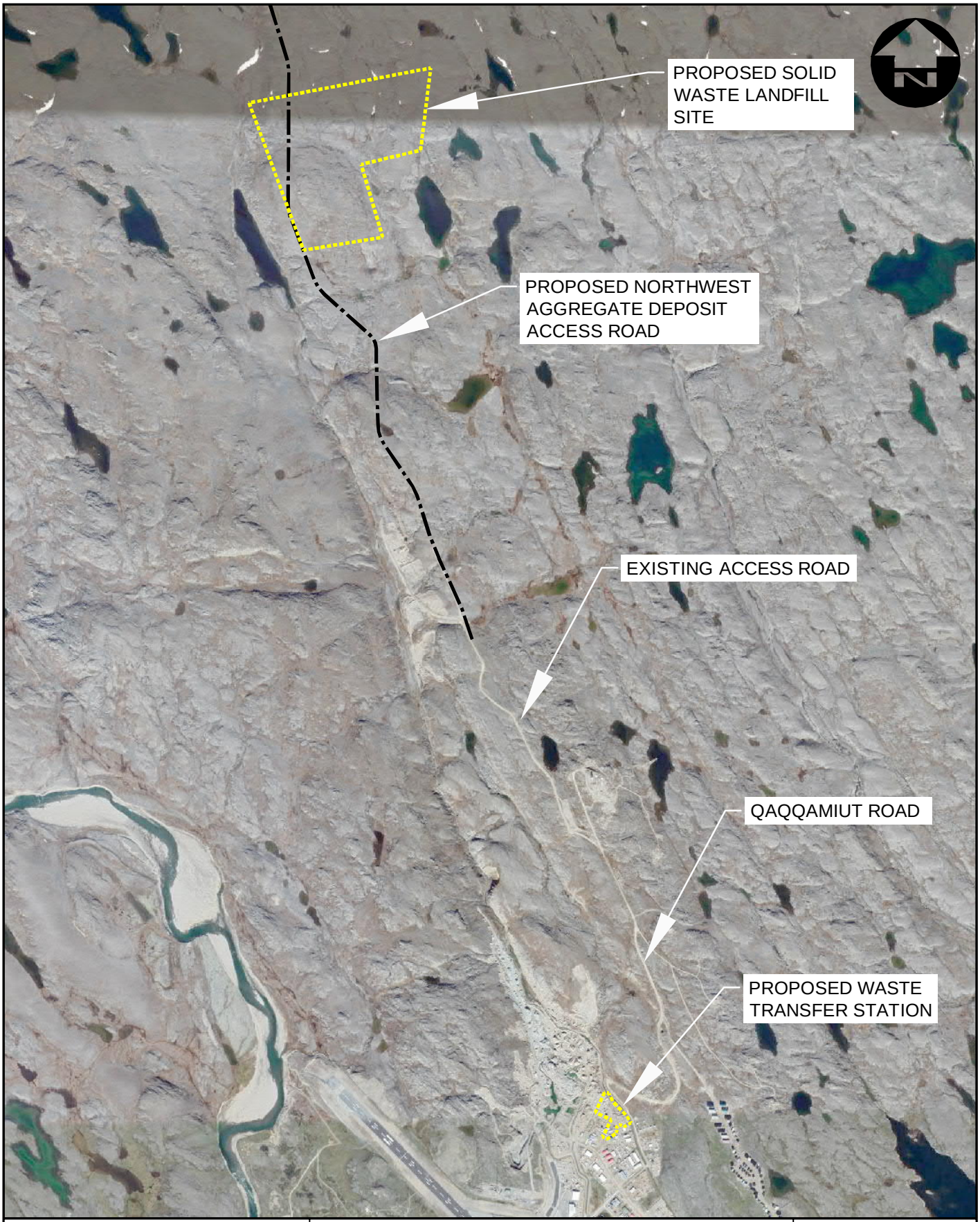
- *Solid Waste Management for Northern and Remote Communities, Planning and Technical Guidance Document*, Environment and Climate Change Canada, March 2017.
- *Consolidation of General Sanitation Regulations, Public Health Act*, Revised Regulations of the Northwest Territories. 1990, c.P-16, 1990.
- *Nunavut Solid Waste Management Plan,* Government of Nunavut, October 2014.
- *Nunavut Water Regulations*, SOR/2013-69, April 2013.

2.0 Site Description

2.1 General

The City is the Capital of Nunavut and is its largest community, along with being the Territories only city. Iqaluit is located at the south end of Baffin Island, on Frobisher Bay at 64° 44’ N latitude and 68° 31’ E longitude. Access to the City is limited as the only year-round access is provided by commercial aircraft, while during the summer month’s access is also provided by sea-lift.

The locations of the two sites addressed by the Plan are presented on **Figure 2-1**.



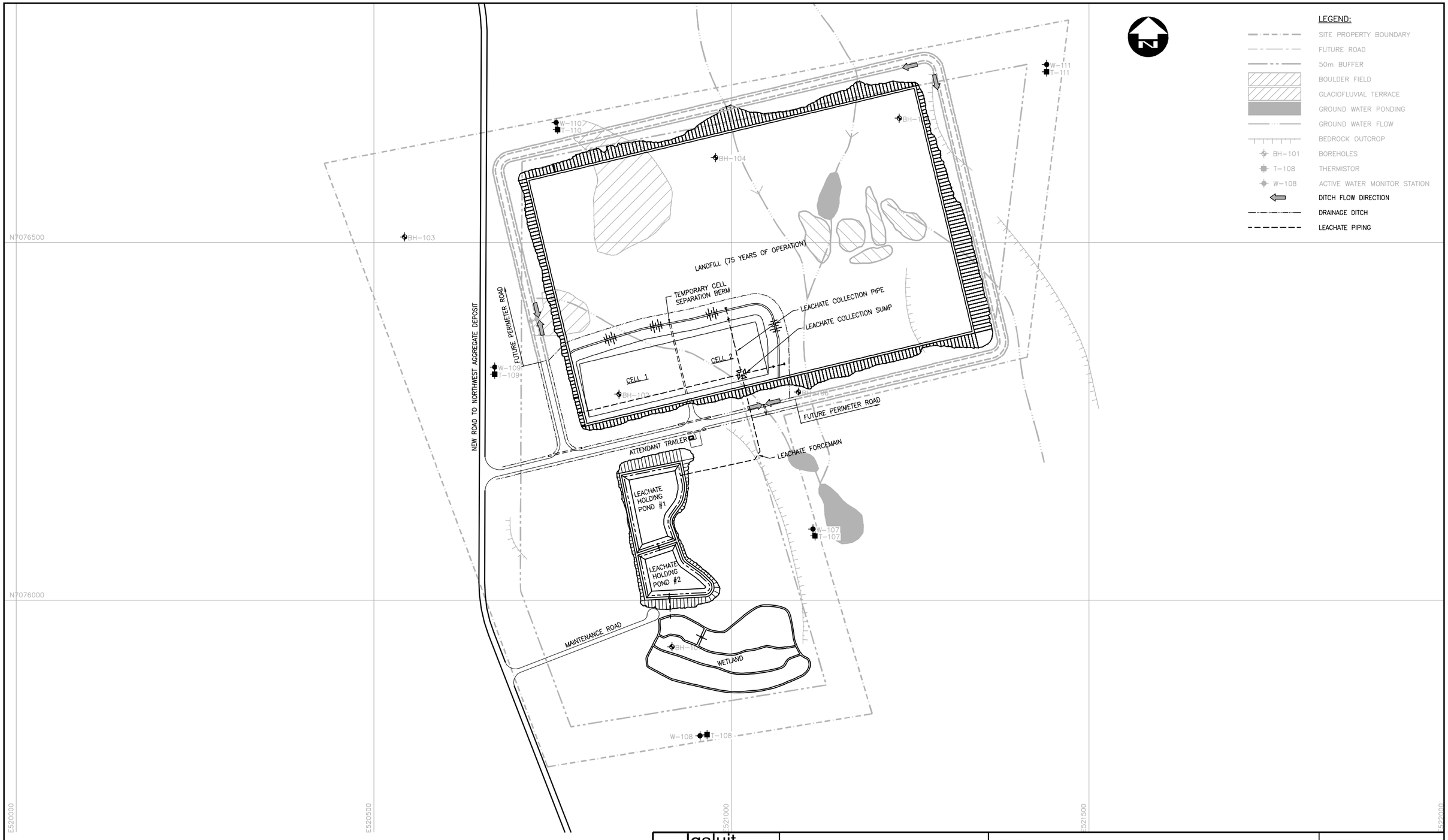
DILLON CONSULTING

DATE: JUNE 2019	PROJECT: IQALUIT LANDFILL AND WASTE TRANSFER STATION	PROJECT NO.: 19-9543
	TITLE: SITE LOCATIONS	FIGURE NO.: 2-1

FileName:c:\projectwise\working directory\projects 2019\50dbc\dms12727\199543-02-site-con-cover.dwg

2.2 Landfill

The City's Landfill site (Landfill) is located approximately 6 km northwest of the City. The overall Landfill property is approximately 64 ha, with the Landfill occupying 22 ha of the property. The Landfill footprint was designed to allow for a minimum of a 30 m buffer from the property line. The current Landfill layout is presented in **Figure 2-2**.



Iqaluit

DILLON CONSULTING

PROJECT: IQALUIT LANDFILL AND WASTE TRANSFER STATION	PROJECT NO.: 19-9543
TITLE: LANDFILL SITE PLAN	FIGURE NO.: 2-2
DATE: JUNE 2019	

FileName:c:\projectwise\working directory\projects 2019\50dbcidms\127212-199543-02-site-con-proposed.dwg

The Landfill is scheduled to commence operations in 2021 and is designed to be in operation for 75 years, with a planned closure in 2096. Prior to delivery to the Landfill, all waste materials are directed to the WTS for weighing and initial inspection. With the exception of periodic mixed loads of construction and demolition debris materials, all waste materials at the WTS will be processed into wire and plastic wrapped bales, prior to transfer and placement at the Landfill.

Leachate generated within the cells will be collected in the base granular layer and pumped via HDPE riser(s) to the surface holding pond, with the intent that the leachate will either evaporate or be discharged to a treatment wetland. The site is unserviced, requiring the use of portable generators for any electrical requirements. The Landfill will also have an attendant trailer, complete with a wood stove and composting toilet.

Stormwater at the site is intercepted and directed around the Landfill. Any stormwater generated on site is collected in on-site ditches and directed off-site to the access road ditch network. Runoff concentrates into channel flow to the east of Sylvia Grinnell Territorial Park, at which point it flows southerly toward the Iqaluit Airport, ultimately discharging to the Koojesse Inlet at Frobisher Bay. Leachate generated within the Landfill is pumped to leachate holding ponds, with the flow continuing to a treatment wetland area.

2.3 Waste Transfer Station

The WTS is located south of Qaggamiut Road, at the end of the Kakivak Court. The WTS site is on a 2.4 ha parcel, City Lots 3586 228/17/18/20 and 3480 220 1, located approximately 1-2 km north of Iqaluit Airport.

The WTS was designed for a 75 year lifespan. Throughout that period, it is expected that ongoing maintenance and/or technology upgrades will be required. The facility will include the WTS building, complete with municipal solid waste baler, a scale house, office trailer and a household hazardous waste depot. The site layout is provided in **Figure 2-3**.

BALE STORAGE AREA

CONSTRUCTION AND DEMOLITION DEBRIS PAD

SNOW STORAGE

BALES TO LANDFILL

CULVERT

SLIDING GATE

QAQQAMIUT ROAD

EMERGENCY GENERATOR

LIMIT OF SURVEY

0+200

5.0m

5.0m

WASTE TRANSFER STATION

PUBLIC DROP-OFF

PUSH WALL

5.0m

5.0m

0+100

TO PUBLIC DROP-OFF

SNOW STORAGE

MISCELLANEOUS METALS/WHITE GOODS STORAGE PAD

TIRE STORAGE

END OF LIFE VEHICLE AND MISCELLANEOUS METALS STORAGE

BALER LOGGER

APPROX. PROPERTY LINE

0+300

0+340

TO COMMERCIAL DROP-OFF

20.0m

HHW DEPOT

HHW STORAGE CONTAINERS

REUSE CONTAINER

20.0m

SITE OFFICE

22.9 x 3.0m

5.0m

5.0m

SCALES HOUSE

SCALE

SLIDING GATE (2 REQUIRED)

PERIMETER FENCE

PARKING AREA (10 SPACES)

SNOW STORAGE

1.0 c.m. BOULDER SPACED AT 5.0m (TYP.)

GREENHOUSE (FUTURE)

25.0m

10.0m

COMPOST PAD (FUTURE)

15.0m

0+000

KAKIVAK COURT

SNOW STORAGE

AREA FOR POTENTIAL COMPOST AND BIO-MASS EQUIPMENT

N7070900

N7070800

N7070700

E522400

BM 30.48

BH

OH

FileName:c:\projectwise\working directory\projects 2019\50dbcdms127281\199543-02-site-con-wts-proposed.dwg

Iqaluit

DILLON CONSULTING

DATE JUNE 2019

PROJECT
IQALUIT LANDFILL AND WASTE TRANSFER STATION

PROJECT NO.
19-9543

TITLE
WTS SITE PLAN

FIGURE NO.
2-3

Municipal solid waste is collected and sorted at the WTS. Material quantities are weighed using the truck scale on the outbound trucks heading to the Landfill. The material is sorted manually by site operators on the tipping floor. Scrap metal, tires, white goods, wood, household hazardous waste, and end of life vehicles are collected and stored in designated areas of the WTS. Residual waste is collected, compressed into bales, wrapped in plastic and transferred to the site. Being situated in the industrial area of the town, the building will have access to electricity. There will be a water tank and septic tank at the WTS to provide amenities such as a lunch room, washroom, locker room and an office.

Stormwater is directed around the WTS in on-site ditches and directed off-site to the access road ditch network. Runoff from the WTS site follows the City's drainage network in a southerly direction and into Koojesse Inlet. Effluent generated from waste materials within the building are collected in a shallow floor trench and pumped to a holding tank, with subsequent delivery to the City's Wastewater Treatment Plant.

2.4 Groundwater and Surface Water Monitoring

The Landfill and the WTS have active layer monitoring wells installed that are monitored in accordance with their associated approvals. Surface water monitoring stations have also been selected.

<To be finalized during Phase II – Preliminary Design>

3.0 Environmental Protection Plan

As a component of the Environmental Management Plan (EMP) for the overall City's waste management project (as associated with the original development and subsequent operation of the Landfill and WTS), two Environmental Protection Plans (EPPs) were developed; one addressing requirements during the Construction Phase and one applicable to the Operations, Closure and Post-Closure Phase. It is anticipated that revised versions of both of these documents (as well as the overall Environmental Management Plan) will be prepared during the proposed 75 year operational life of the two facilities.

Definition of detailed requirements for Closure and Post-Closure are to be developed consistent with the latest version of the Operations, Closure and Post-Closure Phase EPP. Should the Contractor be engaged to complete select activities associated with the closure/post-closure effort, the Construction Phase EPP should also be referenced.

4.0 Closure and Decommissioning

The closure program has been developed to provide a cost effective and environmentally responsible plan for closure of the Landfill and WTS. The closure plan, including scheduled dates and relevant procedures, should undergo a detailed design and be submitted to the Nunavut Water Board (NWB) for comment and approval, prior to its implementation.

The closure plan has four distinct stages:

1. Planning.
2. Public Information and Education.
3. Implementation.
4. Monitoring and Maintenance.

The **initial planning stage** is used to assess the existing situation and to develop a process or plan to ensure the closure objectives can be met in an effective and safe manner, while striving to satisfy the objectives of all parties involved.

The **second stage**, public information and education, is an important component of a closure program and should be introduced early in the plan. The education program is outlined in this report; however, the development of specific materials will be completed closer to the closure timing.

The **third stage**, implementation, includes closure activities such as demolition, decommissioning, final grading, compacting and capping of the Landfill, as well as vector and wildlife control programs.

Stage four, monitoring and maintenance, is the post-closure period during which the site is periodically inspected. This section focuses on the assessment of the existing site, and the preparation of procedures for the implementation and maintenance phases.

4.1 Regulator Notification

As the facilities are nearing the end of their useful lives, the regulator will be notified, as per the requirements of the Approval. Final documentation on the proposed plan for closure, including designs, will be prepared for review and approval, prior to commencing closure.

4.2 Public Education and Notification

The closure of the Landfill and the WTS should be proactively communicated to the public so that members of the community are aware of the potential changes to their solid waste management services, in addition to the possibility of increased traffic as a result of construction activities. This is an important aspect in reducing the likelihood of illegal dumping and confusion about the location of services. Notice may be given in the form of flyers, e-notices, educational/outreach campaigns,

community gatherings, etc. All content should be accessible, with content being available in multiple languages and in various forms of media (i.e., electronic or print media).

4.3 Signage and Access Restrictions

Fully enclosed fence systems that restricts access to the Landfill and WTS must remain and be maintained during closure and post-closure. Signage stating the permanent closure of the facilities, as well as the new location(s) for waste disposal, will be clearly posted on the fence.

Durable signage should be established around the perimeter of the former Landfill area, confirming that disposal activities have ceased and are prohibited in this location. Suggested wording is presented below:

NO DUMPING
AUTHORIZED PERSONNEL
ONLY
FORMER LANDFILL AREA
By Order of the City of Iqaluit

4.4 Structure Disassembly and Storage

The only planned building at the Landfill will be the Attendant's Trailer. This building (noting that is anticipated that it will be replaced several times during the 75 year operational period) is mobile in design and will be potentially relocated to the new disposal site or re-purposed within the City.

It is expected that the WTS building will have reached its useful life after 75 years, and will be decommissioned and disassembled. The resulting materials will be disposed and/or reused, as per current regulations.

Where observed, hazardous materials (including wastes) and unidentified substances stored on-site after operations cease, shall be listed and relative quantities of material, types of containers, and storage conditions described. The area below, and immediately surrounding the derelict vehicle area, should be tested for possible soil contamination. If a hazard is identified, additional assessment may be required.

4.5 Equipment Decommissioning and Salvage

Mobile and stationary equipment at the Landfill and WTS will be assessed for future use or for end-of-life disposal/salvage value. As necessary, equipment will be cleaned, temporarily stored, and then removed from the Landfill and WTS. Auxiliary equipment will include but not be limited to:

- Truck scale
- Baler
- Waste Shredder
- Pelletizer
- Forklift
- Wheel Loader
- Compact Wheel Loader
- Bale Truck
- Vehicle Baler/Logger
- Staff Truck

4.6 Site Grading and Surface Restoration

Any loose municipal solid waste (MSW) will be collected and managed prior to closure. This includes materials that may be located at either the Landfill or WTS. If there is not sufficient capacity at the Landfill, the materials will be disposed of at an approved facility, depending on the types of waste. Soil stockpiles will be utilized to form a smooth final grade on the Landfill, prior to placement of the final cap (see **Section 4.12**). Excess soils will also be disposed of at an alternative approved disposal facility.

At the WTS, remaining household hazardous waste and special waste, end-of-life vehicles, bulky waste, and unclaimed items from the free store will be sorted and disposed of according their material type. As part of building decommissioning activities, the final site will be graded to suit the future proposed use.

As the waste disposal face is filled above grade to the proposed final elevations at the Landfill, the perimeter slopes and surfaces are reclaimed. In this way, the Landfill is closed and reclaimed progressively throughout the active landfill life. The placement of soil will fill any gaps between bales and will make for a smooth continuous surface, in which the final capping materials may be placed.

The proposed final grades of the Landfill maintain a minimum slope of 5 % across the top of the waste fill area to allow surface water drainage off of the Landfill, while maintaining integrity and stability of the soils and final cover. The side slopes will be maintained at a minimum 4:1 slope, consistent with the original engineering design.

A detailed final grading plan must be completed within the final year leading to closure and this Plan must be approved by the NWB.

4.7 Buffer Zone and Litter/Debris Management

A properly developed buffer zone provides visual screening and wind protection. The 30 m buffer area around the Landfill should; therefore, be maintained. While the principal requirement for the buffer zone relates to an active operating site, it is desirable to maintain an area around former sites after

closure to provide a physical barrier. It is recommended that the entire buffer area be designated a "No Hunting Area".

The City should implement measures to collect and consolidate scattered litter and debris around the perimeter of the former Landfill and WTS area. Prior to the installation of the final cover, the overall landfill footprint itself, as well as the access roadways, should be inspected and cleaned of remnant litter.

4.8 Surface Water Management

Acknowledging the local surficial soil conditions, and noting design elements of the Landfill and WTS, surface water management and sediment generation is not expected to be an ongoing challenge. The surface water management system used during operations will continue to be operational post-closure. Surface run on will be intercepted and diverted around the site. Site ditching will gather any stormwater collected on-site and carry the water to the discharge location away from the open waste face to avoid any leachate generation.

4.9 Vector and Wildlife Management

Birds, rodents and other wildlife frequent municipal waste management sites because of the availability of food sources in the waste. Once delivery of waste stops, the final cover has been placed on the Landfill and the food source has been eliminated, these populations tend to decrease adjacent to the waste management facilities.

Prior to closure, a rodent baiting program could be implemented by a professional pest control company to effectively determine the presence and quantities of rodents, and to prevent migration, if necessary.

4.10 Landfill Gas Management

Landfill gas (LFG) will be generated throughout the life of the Landfill. Methane (CH_4) and carbon dioxide (CO_2) are the primary constituents of LFG, and are produced by microorganisms within the buried waste. Carbohydrates from materials such as paper and cardboard are decomposed initially to sugars, acetic acid, and finally to CH_4 and CO_2. Other components of LFG include non-methane organic compounds and inorganic compounds.

The amount of LFG generation varies with site conditions (e.g., waste composition, cover materials, design, anaerobic state), and may also vary with climatic conditions such as precipitation rates and temperatures. Due to the design and local climactic conditions of the Landfill, it is anticipated that the rate of LFG generation, as compared to traditional unprocessed MSW landfills in more southern locations, will be quite limited. The fact that the bales are wrapped will limit the amount of moisture that will come in contact with the waste and the temperatures for most of the year are not conducive to LFG generation.

Because $CH_4$is combustible, it poses a greater risk to safety than CO_2. If vented in an uncontrolled manner, CH_4 can accumulate in enclosed spaces on, or close to, the disposal site. CH_4 gas is odourless and because its density is less than that of air, it rises until its movement is restricted by some impermeable medium. Concentrations of CH_4 between 5 and 15% in air are explosive. However, with proper venting, CH_4 gas should not pose an unacceptable hazard. Research has shown that the rate of decomposition in landfills, as measured by CH_4 gas production, reaches a peak (within the first two years and then slowly tapers off; although continuing in many cases, can continue for periods up to 25 years or more. Therefore, CH_4 venting must be accommodated during and after disposal completion. Passive LFG vents, as depicted in the Landfill Engineering Drawings, are proposed to allow for the controlled discharge and periodic monitoring of this gas.

A post-closure LFG monitoring program developed for this site is discussed in **Section 5.5**.. If explosive concentrations of CH_4 are detected during the program, the ventilation capability of the vent itself, as well as the overall spacing of vents, should be investigated. It may become necessary to consider a positive type ventilation system (such as gas extraction), if the problem is not easily remedied.

CO_2 gas is not considered to present a high risk to safety with regards to above ground operations. However, since it is heavier than air, carbon dioxide will collect in the bottom of manholes, poorly vented trenches and other below-ground areas. Therefore, site personnel should take appropriate precautions, such as the use of a respirator or forced ventilation, prior to entering these areas.

4.11 Leachate Management

The Landfill's leachate collection and treatment system incorporates several components and will be required to remain operational after closure. Leachate will continue to be collected from inside the Landfill, which will flow to an on-site manhole. From the manhole, the leachate will continue to be pumped to holding ponds, with flow continuing to an engineered treatment wetland. Similar to normal operations, upon the confirmation of freeze up conditions in the fall, the pump will be removed from the manhole and the forcemain will be decommissioned (drained) for the winter. Assessment of leachate generation status (e.g., observations within the manhole) shall commence in the late spring, confirming when active pumping efforts should be initiated. Once the Landfill is closed and completely capped (noting that the cap will be installed in sections during the 75 year operational life, as landfill cells reach final design elevations), the amount of leachate generated should decrease significantly.

4.12 Landfill Cap

The final cover design provides a protective cap over the waste fill area. The objectives of the final cover design are to:

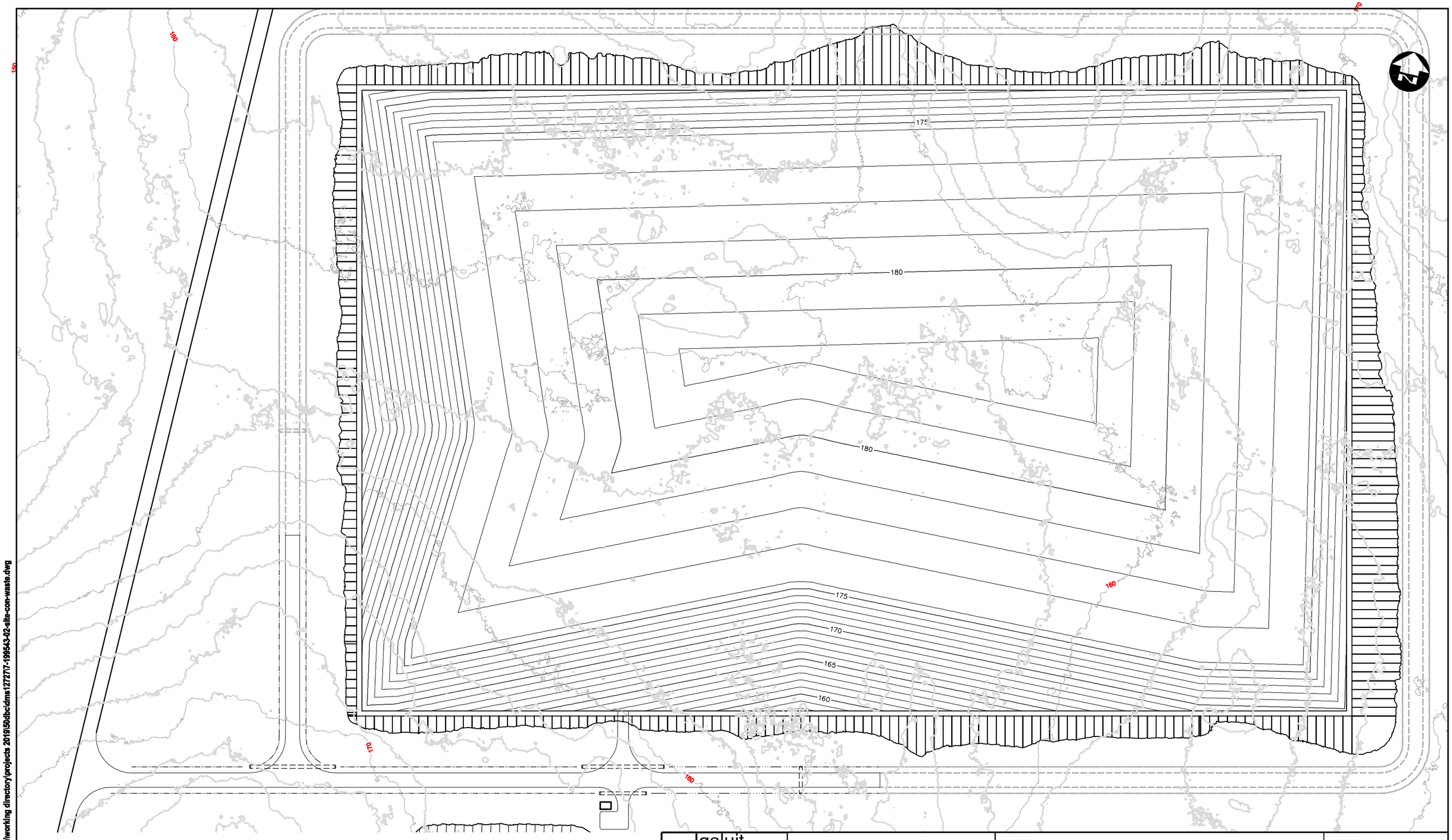
- Provide a barrier layer over the waste to minimize infiltration of precipitation into the landfill cells to minimize leachate generation.

- Create and maintain positive drainage of precipitation off of the landfill cells and minimize erosion.
- Provide a layer of soil/gravel on which to establish an acceptable level of vegetative cover.

For the purpose of the Landfill closure, the final active portion of the Landfill at the end of the 75 year operational period will require capping (assuming all previously filled portions of the Landfill have a final cap in place). If the undisturbed ground identified throughout the site (under roads, areas not surveyed, etc.) is not filled prior to regrading, it will be included within the cover design, in order to ensure proper drainage off of the cap. Otherwise, areas left uncapped within the final covered footprint may collect surface water and compromise the final cover system.

The final contours of the Landfill (see **Figure 4-1**) have been selected to promote drainage away from the site to discourage infiltration and leachate production, while also preventing erosion. To suit these criteria, a 4H:1V slope is proposed for the side slopes with a 5% grade upwards to the crown of the Landfill, directing drainage away from the Landfill to the adjacent surface water system

The construction of final cover, or cap, needs to be constructed to satisfy the future management and integrity of the waste fill area. Due to the lack of availability of soil, the top of the Landfill will include a granular layer. The purpose of the cap is to prevent erosion of the Landfill and maintain the integrity of the site. A cross section of the proposed cap is provided in **Figure 4-2**.



FileName:c:\projectwise\working directory\projects 2019\50\dbcldms\272717-199543-02-site-con-waste.dwg

Iqaluit

DILLON CONSULTING

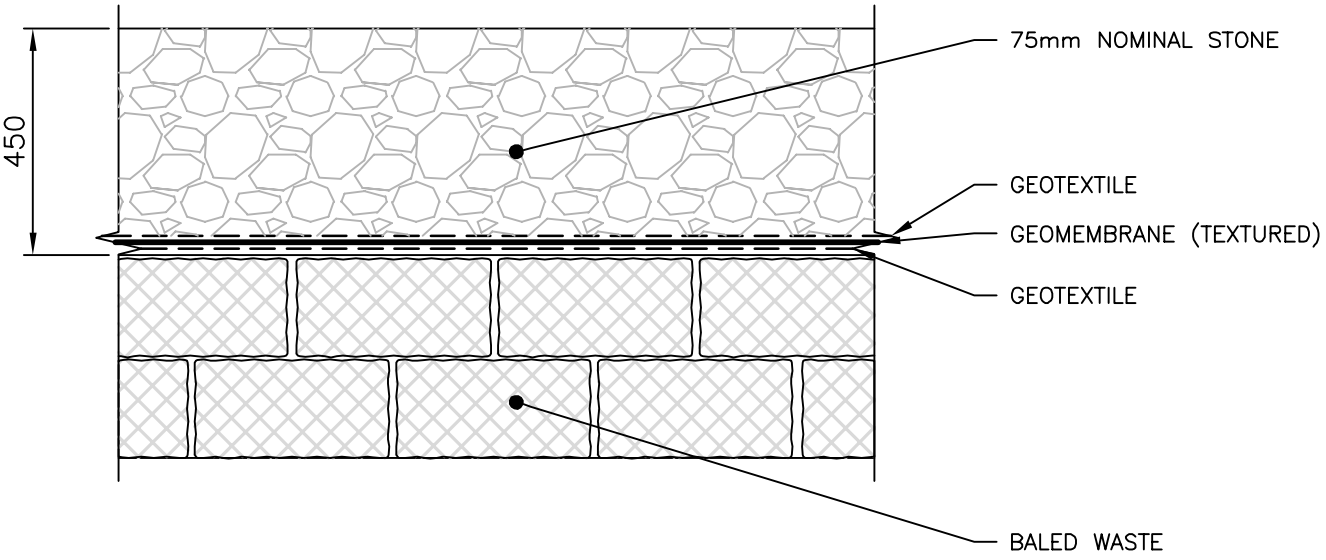
DATE JUNE 2019

PROJECT
IQALUIT LANDFILL AND WASTE TRANSFER STATION

PROJECT NO.
19-9543

TITLE
FINAL CAP CONTOURS

FIGURE NO.
4-1



CAP SYSTEM SCHEMATIC

N.T.S.

DILLON CONSULTING	PROJECT: IQALUIT LANDFILL AND WASTE TRANSFER STATION	PROJECT NO.: 19-9543
DATE: JUNE 2019	TITLE: LANDFILL CAP SCHEMATIC	FIGURE NO.: 4-2

FileName:c:\projectwise\working directory\projects 2019\50dbc\dms12727\11-199543-02-site-con-liner.dwg

4.13 Landfill Settlement

Settlement of MSW landfills is caused by primary consolidation and secondary compression of the soil/waste matrix. Primary consolidation occurs when the voids in the site decrease as fluids are forced out of the material under pressure. Secondary compression occurs as the number of voids decrease and the site material deforms to fill the voids. Additionally, biological decay, oxidation, combustion and corrosion can cause voids to form in the site.

Consolidation settlement generally occurs during the Operational Phase of the site and should not affect the integrity of the cover system. Settlement due to the compression of the waste layers, caused by the decrease in voids occurs over time (i.e., months to years), can cause the cover system to subside. This could lead to depressed areas and "cracking" of the top cover, which in turn will create easy access for rainwater infiltration.

In an effort to determine the degree to which the disposal site is settling, a grid survey of spot elevations tied into an established grid should be documented at known locations upon completion of site closure activities. This will provide a basis to gauge the rate of settlement and degradation, and the data will provide a baseline for which to assess future changes. As a result of bale filling operations at the site, it is anticipated that a high degree of compaction will be achieved resulting in little settlement.

Additional surveys should be initially conducted on a five year basis and spot checks undertaken, if settlement at the site is observed during the routine surveys. The process of settlement, coupled with the elastic nature of the disposal site and ability to trap gases, may cause buoyant items, particularly past landfilled tires, to migrate up through the Landfill and re-emerge through the cover system. If this occurs, the items should be collected, reburied and the final cover repaired.

4.14 Waste Transfer Station Closure

When the closure of the WTS is imminent, it is expected that an environmental assessment will be necessary to confirm future usage for the site. A Phase I Environmental Site Assessment (ESA) would include, at a minimum:

- Evaluation of all historical information and current land use.
- Assessment of the site for contamination of potential concern or any unsafe conditions.
- Review facility documentation including operation and company records.
- Site reconnaissance.
- Interviewing the facility operator and facility attendants.
- Reporting.

Upon completion of the Phase I ESA, additional efforts may be necessary to clarify the potential extent of environmental concerns. Additional efforts may include:

- Initial intrusive screening level sampling.

- Determination of the presence or absence of contamination of potential concern at the site.
- If present, the type, extent, degree and approximate volume of contamination.
- Comprehensive delineation of contaminated areas.
- Remediation of contamination.
- Confirmatory sampling investigation after remediation.

4.15 Closure Activity Schedule

The closure schedule is contingent on the timing for the development of the City's future waste management facility and the waste filling option(s) selected from by the City. The closure of the Landfill may be initiated within two years of schedule final closure, but is subject to confirmation by additional surveying of the area. Once the closure timing has been determined, a number of activities must be undertaken. Below is a list of the primary activities, this list should be completely in consecutive steps:

- Finalize Closure Plan Documentation in consultation with the NWB.
- Communicate with stakeholders the plan for closure.
- Commence initial closure activities (weather permitting), focusing on leachate spring repair, slope stabilization and diversion of runoff from stabilized areas.
- Prepare detailed design documents to support the implementation of the Landfill Closure Plan in consultation with NWB.
- Complete tendering activities to support implementation of the Landfill Closure Plan.
- Complete closure activities, as presented on the detailed design documents and within the Landfill Closure Plan.
- Ongoing: Conduct overall site monitoring activities, as required.

5.0 Post-Closure Plan

Post-closure is defined as the period of time after the Landfill is closed for active use when ongoing monitoring and maintenance is required. The proposed post-closure period for the Landfill is 25 years. Post-closure activities include:

- Definition of potential property use.
- Periodic site inspections and maintenance.
- Ongoing environmental effects monitoring.

5.1 Post-Closure Property Use

The ongoing decomposition of the buried waste mass could influence the character of the site and potentially cause adverse effects to the environment for some time into the future.

First, differential settlement over time could cause damage to the final cover, increasing surface water infiltration, and ultimately enhancing the generation of leachate and the eruption of leachate springs. Second, it is possible that gases will be generated by the decomposition of the organic waste portion in the disposal site. Third, the exposure of debris at the surface due to slope erosion could result in physical and/or chemical hazards, due to exposure of debris at surface. Fourth, the release of contaminants directly associated with the waste mass could cause impact to the surface and/or groundwater regimes.

For these reasons, and until post-closure monitoring indicates site stability, the area within the Landfill footprint should not, under any circumstances, be used for recreational, industrial/commercial, or any other purpose including material or equipment storage. The determination of site stability should be made by a qualified professional engineer or geoscientist. The landfill cover should have a well established grass cover and there should be no indication of differential settlement, surface erosion, gas generation, or leachate springs. Water chemistry data should indicate either general improvement or no significant change, over several consecutive sampling events. Once these conditions are achieved, use of the property may be re-evaluated.

5.2 Post-Closure Site Inspection and Maintenance

During the post-closure care period, the City should inspect the final cover system at least once per year, and complete an annual report that includes a record of:

- Continue regular operations of the leachate treatment system.
- Visit the site to visually confirm that the Landfill remains in compliance with the Closure Plan Documentation.
- Assess any impact to the final cover system. This is usually present as leachate springs, erosion, subsidence or cracking in the final cap.

- Provide repairs to the final cover system, as necessary, to correct settlement, subsidence, erosion, and leachate break-out.
- Assess structural integrity of any infrastructure, such as LFG vents and provide corrective measures, as necessary.

Given the nature of the original facility design and proposed decommissioning activities, post-closure inspection and maintenance activities are not expected to be necessary at the former WTS site.

5.3 Contingency Plan for Emergency Response

The Contingency Plan for Emergency Response during the post-closure period will be consistent with requirements presented in:

- Operations and Maintenance Manual (latest revision).
- Emergency Response Plan (latest revision).

5.4 Closure Cost Estimate

Closure costs for the Landfill consist of the capital costs required to grade the active face of the existing site to meet minimum slope guidelines and construct the necessary final cap. It is expected that the Landfill will be closed as in sections over time and only a small remaining face will be left to cap.

Table 5-1: Preliminary Cost Estimate for Common Closure Items

Item	Description	Estimated Budget
1	Public Education	$10,000
2	Signage and Site Security	$20,000
3	Buffer Zone and Litter Management	$15,000
4	Vector and Bird Management	$15,000
5	Site Settlement	$10,000
6	General Site Maintenance Allowance	$15,000
7	LFG Wells	$30,000
8	Subtotal	$115,000
	Total	$138,000

Table 5-2: Soil Cap Preliminary Cost Estimate

Item	Description	Units	Estimated Quantity	Unit Price	Budget
1	Site Grading	m^2	10,000	$2	$20,000
2	Geotextile	m^2	20,000	$3	$600,000
3	Geomembrane	m^2	10,000	$30	$300,000
				Subtotal	$920,000
				Contingency (20% of Subtotal)	$184,000
				Engineering and Construction (10% of Subtotal)	$92,000
				Total	**$1,196,000**

5.5 Post-Closure Environmental Effects Monitoring

During post-closure, it is anticipated that ongoing environmental effects monitoring will be required. The level of monitoring will be defined by the monitoring required during operations.

<To be finalized during Phase II – Preliminary Design>

It is anticipated that this will include surface water monitoring and active layer water monitoring.