CITY OF YELLOWKNIFE

SOLID WASTE FACILITY OPERATIONS & MAINTENANCE MANUAL

Revision 6

January 2021

DOCUMENT CONTROL

Significant changes have been made to this document, refer to the revision table below.

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1	February 2010				City of Yellowknife
0	March 2009				City of Yellowknife

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1. INTRODUCTION AND BACKGROUND

1.1. Purpose

The purpose of this manual is to assist City of Yellowknife **(**the City**)** personnel with the operation and maintenance of the Yellowknife Solid Waste Facility (SWF). The manual has been developed based on the Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories (Duong and Kent, 1996) and Environment and Climate Change Canada (ECCC) Solid Waste Management for Northern and Remote Communities Planning and Technical Guidance Document (ECCC, 2017).

1.2. Site Location & Description

The SWF is located at the corner of Highway 3 and the old Highway 4 at Lot 1 Block 313 in Yellowknife, Northwest Territories (Figure 1 – Appendix A). The entire property is approximately 108 ha (1,080,000 m^2), and currently encompasses the SWF and the adjacent quarries.

The Yellowknife SWF consists of the Baling Facility, Landfill, Collections Areas, and Compost Facility. The SWF also includes a weigh scale, gatehouse, and office building. There are also five (5) recycling depots located throughout the City. Figures 2 and 3 (Appendix A) show the layout of the SWF and the location of the recycling depots. The City has in place the Solid Waste Management By-Law #4376, Appendix B. The maintenance checklists are in Appendix C.

1.2.1. Baling Facility

In October 1993, a 1,115 m^2 (12,000 ft^2) Baling Facility was commissioned at the existing SWF. The facility is the first of its kind in the Northwest Territories and one of only a few in Canada. The Baling Facility is centrally located on the site and is used for the transfer and processing of recyclable materials. Figure 4 in Appendix A shows the floor plans and a side view of the Baling Facility, which features a stepped design with the tipping floor on the upper level over a lower baling and shipping area. The tipping floor is accessed through four (4) vehicle entry doors at the front of the Baling Facility. The lower baling floor has vehicle entry doors on either side of the facility.

A skid steer pushes the sorted recyclables from the tipping floor into the baling machine's hopper. After compaction, the bales are tied with wire to maintain their shape and exit the baler at the lower section, where they are loaded onto a tandem dump truck by a front-end loader with fork attachments. Bales of recyclables are stored on site in designated areas until they can be sent to a southern recycling centre for disposal. The operation produces an average of 35 bales of recyclables per week, with each bale weighing approximately one (1) tonne.

1.2.2. Landfill

In 2011 a second-generation landfill cell was constructed in a quarry adjacent to the existing SWF, referred to as Cell A. Figure 2 in Appendix A shows the location of this cell. The cell features a liner and leachate collection system to contain the leachate generated by the cell. In 2016, as

Cell A was starting to reach its design capacity, an additional landfill cell was constructed with the same design as Cell A. This cell is referred to as Cell B.

With the waste material and granular materials above the composite liner system, the liner is not accessible for visual inspection; therefore, the integrity of the liner is determined through the monitoring of groundwater around the perimeter of the facility. Monitoring wells have been installed at the landfill for measuring the quality of the groundwater. For information regarding groundwater monitoring and reporting, refer to the Interim Groundwater Monitoring Plan (City, 2021a).

The leachate collection system consists of a series of pipes which collect liquids generated in the cell and directs them to the leachate collection sump, located in a manhole at the low point of the cell. Each individual collection pipe is equipped with a series of cleanout pipe.

1.2.3. Collection Areas

The SWF accepts a variety of materials as outlined in Section 3 of this document. The site has designated areas for different types of waste. In an effort to simplify the drop-off of materials, a drop-off loop was created which includes storage areas for all materials and confines the public to one area of the SWF. As part of this loop, a designated salvaging area was created in 2010. Each area is clearly marked with signs to delineate the different disposal areas to assist with proper disposal of materials.

In 2020, the three-cell salvage area was replaced by a Public Drop-Off (PDO) area. The PDO is located in front of the Baling Facility with adequate distance for safe traffic flow. The new PDO's purpose is to have a safe and supervised sorting area for the public while limiting public access to other work zones on site.

1.2.4. Compost Facility

In 2009 the City launched a compost pilot project to investigate the feasibility of municipal composting in a northern climate. Through this pilot project, participating local businesses and institutions were tasked with separating their organics from the regular waste stream. The City worked with a private hauler to collect the Source Separated Organics (SSO). City staff and a local non-profit organization monitored and managed the composting process. The resulting product was tested and sold to citizens of Yellowknife. Building on the success of the pilot project, Yellowknife City Council approved the implementation of a four (4) year expansion of the program in 2013. The completed expansion has the capacity to collect and process organic waste from both the residential and Industrial, Commercial, and Institutional (ICI) sectors. Construction of the facility was planned in phases and forms part of the overall landfill closure plan. Construction of the expansion began during the summer of 2014 (Phase 1) and the final phase of construction (Phase 4) was completed in 2017. The expansion was constructed on an area of the old landfill cell that was closed out and included installation of a cover system over the landfill waste.

The cover system formed the base on the Compost Facility and consisted of the following (from bottom to top above the waste):

- Geotextile
- Sand
- Geocomposite
- 60 mil Linear Low-Density Polyethylene (LLDPE) Geomembrane Liner
- Sand
- 50 mm minus crushed gravel
- 20 mm minus crushed gravel

A Compost Facility Operations & Maintenance Manual (City, 2021b) has been produced and contains a detailed overview of the compost pad operations. Additional information on the close-out procedures for the old landfill cell can be found in the City's Interim Closure and Reclamation Plan (City, 2021c).

1.2.5. Tipping Fees

To help generate revenue to offset the costs associated with operating the SWF, tipping fees are applied to most wastes accepted at the SWF. The fees also aid in keeping records of which companies deposit large amounts of waste, as well as what type of waste is deposited. In order to encourage the separation of recyclable materials, tipping fees are not charged to loads of recyclables received from the public. Loads of recyclables received from commercial businesses are charged a low tipping fee which is substantially less than the fee for general waste. Section 4 describes the wastes received at the landfill.

1.3. Site History

The SWF opened in 1974 and for the first 16 years of operation it was used as a non-licensed, unmonitored dump with uncontrolled burning. In 1989, Stanley Associates Engineering Ltd. (Stanley) was retained to develop a solid waste management master plan. In 1990, the SWF began operating as a modified landfill and in 1993, the Baling Facility was constructed and went into operation. In 1993, the City also assumed the responsibility of a recycling program that was previously initiated by Ecology North. Since that time, other alterations to the site have occurred including amongst others:

1. Implementation of the weigh scale (1998)
2. Construction of the Contaminated Soil and Water Treatment Facility (2006, with operations beginning in 2007)
3. Installation of a new baler (2008)
4. Introduction of the composting pilot project (2009)
5. Construction of a new weigh scale and gatehouse (2009)
6. Introduction of the three-cell system (2010)
7. A pilot project to test capping materials (2010)
8. Construction of landfill Cell A (2011)
9. Construction of Centralized Compost Facility (2014-2017)
10. Decommissioning of Contaminated Soil and Water Treatment Facility (2016)

11. Construction of landfill Cell B (2016)
12. Decommissioning of the three-cell system (2020)
13. Introduction of the Public Drop-Off area (2020)
14. Introduction of a CAT816K Compactor (2020)

Since the opening of Cell A in 2011 until the spring of 2020, all household waste has been baled and placed in the cell areas. The old landfill cell continues to operate but does not collect household waste. The old landfill cell is designated for construction and demolition debris.

With the arrival of a CAT 816k compactor on site in the spring of 2020, household waste no longer goes through the baling process but is hauled to the working face of the landfill by haulers. The waste is dropped off at a staging pad by the haulers and then is pushed and spread thin over the working face of the landfill cell using a dozer. This is done in preparation for the waste to be compacted by the compactor. As of 2020, the baler is used for recyclables. This change allows for a cleaner and safer operation in the Baling Facility while optimizing airspace utilization in the landfill cell.

2. SITE PERSONNEL

The SWF is staffed with eleven (11) full time positions. Figure 5 (Appendix A) shows the organizational chart for the SWF.

The City's Senior Administrative Officer (SAO) is ultimately responsible for the operation of the SWF. In general, the overall operation of the SWF is overseen by the Manager, Sustainability and Solid Waste, with the SWF Supervisor responsible for the daily operation and maintenance of the facility. SWF Attendants are responsible for performing the required day to day tasks as assigned by the SWF Supervisor. Sustainability Projects Coordinator is responsible for performing environmental sustainability duties and assisting with composting activities.

The following sections outline the responsibilities of the various positions.

2.1. Duties and Responsibilities

Manager, Sustainability and Solid Waste (SWF Manager)
The SWF Manager is responsible for the following:

- Liaison between Director of Public Works and Engineering and SWF staff.
- Maintaining Liaisons with Clients (private sector generators and government agencies), Contractors, and Suppliers.
- The SWF Manager shall:
    1. Perform operations at the facility in accordance with the SWF Operations & Maintenance Manual (latest approved version), applicable Engineering Drawings, and other documentation related to the SWF including safety protocols and management plans;
    2. Ensure that only acceptable wastes, as indicated on the approved list for disposal, are permitted at the site in consultation with regulatory agencies;
    3. Prepare facility operating budgets, participate in staffing selections, and contractor hiring;
    4. Communicate as required with regulatory agencies;
    5. Deal directly with the public, responding to disposal requests;
    6. Coordinate site visits;
    7. Ensure on site staff and contractors receive required training;
    8. Ensure that the site is maintained and operated in a clean and safe manner at all times, including regular collection of litter and compliance with the *Northwest Territories Safety Act and Regulations*;
    9. Coordinate the preparation of landfill areas for operation, and identify the requirement for the establishment of surface water control measures; and

10. Work with the Sustainability Projects Coordinator to research and develop ways to increase and promote waste diversion initiatives to prolong the lifespan of the landfill cells.

SWF Supervisor

The SWF Supervisor is responsible for general site operation and maintenance requirements at the SWF.

The SWF Supervisor reports directly to the SWF Manager and is responsible for the following:

- Supervising Full-Time and Part-Time SWF Attendants.
- The SWF Supervisor shall:
    1. Perform operations at the facility in accordance with the SWF Operations & Maintenance Manual (latest approved version), applicable Engineering Drawings, and other documentation related to the SWF including safety protocols and management plans;
    2. In consultation with the SWF Manager, ensure that only acceptable wastes, as indicated on the approved list for disposal, are permitted at the site;
    3. Prepare regularly scheduled reports (daily, weekly, monthly, annually) on progress and planning at the site;
    4. Ensure work orders are accurately completed for use in tracking of items such as waste volumes and operational costs;
    5. Provide overall direction for daily site activities;
    6. Conduct work in accordance with the City's Occupational Health and Safety Program and the Northwest Territories Safety Act and Regulations;
    7. Be responsible for the operations and maintenance of the site machinery;
    8. Make recommendations to the SWF Manager for major and minor repair work required for site equipment, as well as replacement of same;
    9. Ensure that the site is maintained and operated in a clean and safe manner at all times, including regular collection of litter;
    10. Ensure that solid waste is covered in accordance with the SWF Operations & Maintenance Manual;
    11. Coordinate snow removal and general maintenance for the access roads within the site and other areas as necessary;
    12. Operate and maintain the surface water control structures and other site infrastructure;
    13. Undertake site security checks, reporting any noted issues to the SWF Manager;
    14. Inspect the site access road on a regular basis to recover any accumulation of garbage or other debris;

15. In consultation with the SWF Manager, maintain the closed-out portions of the landfill;
16. Ensure that adequate signage and traffic control devices are in place in coordination with the SWF Manager;
17. Supervise and/or perform all duties related to the identification and recording of incoming vehicles and inspection of incoming waste;
18. Answer incoming telephone calls and requests for information, directing such requests as required; and
19. Perform such other related duties as may be assigned from time to time by the SWF Manager.

SWF Attendants

The SWF Attendants are responsible for tasks assigned to them by the SWF Supervisor. These positions typically address both ongoing and periodic general site operation and maintenance requirements.

The SWF Attendants report directly to the SWF Supervisor and are responsible for the following:

- The SWF Attendants shall:
    1. Perform duties as assigned by the SWF Supervisor;
    2. Accurately fill out work orders for tracking purposes; and
    3. Conduct work in accordance with the City's Occupational Health and Safety Program and the Northwest Territories Safety Act and Regulations.

Sustainability Projects Coordinator (SPC)

The SPC reports directly to the SWF Manager and is responsible for the following:

- The SPC shall:
    1. Perform duties relating to environmental sustainability as assigned by the SWF Manager;
    2. Assist with composting activities and monitoring; and
    3. Conduct work in accordance with the City's Occupational Health and Safety Program and the Northwest Territories Safety Act and Regulations.

Gatehouse Staff

The Gatehouse staff responsibilities are centered around performing cashier and data entry for the SWF. The Gatehouse staff are responsible for the following:

- The Gatehouse staff shall:
    1. Receive and record all tipping fees and inbound/outbound materials;

2. Maintain accurate clientele information database;
3. Direct users to proper disposal areas;
4. Complete hazardous waste manifests as required; and
5. Handle inquires and concerns of residents.

2.2. Personnel Training

The City is responsible for the training of staff. SWF staff are trained to perform their job in a safe and environmentally responsible manner, in accordance with applicable regulations.

SWF staff receive training through courses with the Solid Waste Association of North America (SWANA). Generally, the Landfill Operator Course and SWF Manager of Landfill Operations (MOLO) Certification are the training courses taken. The training and certification for each position is as follows:

SWF Manager.....MOLO Certification
SWF Supervisor .....MOLO Certification & Operator's Course
SWF Attendants .....Operator's Course

SWF staff attend regular bi-weekly safety meetings at which any safety issues are brought up for discussion unless there are urgent safety issues. The items from the safety meetings are discussed between the SWF Manager, the SWF Supervisor and the City's Safety and Training Officer. Results of the meetings are relayed to SWF staff by the SWF Supervisor during toolbox meetings. All personnel are to be familiar with and abide by the City's Occupational Health and Safety Program and the Northwest Territories Safety Act and Regulations. Furthermore, all staff are required to complete Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Good (TDG), fire safety, asbestos training, and first aid training. Confined Space and Fall Arrest courses have also been completed by some staff as required**.** Staff managing and/or handling accepted hazardous wastes are trained in the proper methods for managing the hazardous waste, as well as the use of any specialty equipment or Personal Protective Equipment (PPE) required. Some staff may have received heavy equipment operation training.

A review of this Operations & Maintenance Manual, and related documentation, is a prerequisite for any employee before being declared eligible for work at the SWF. Documentation to be reviewed includes, but is not limited to, the following:

- Hazardous Waste Management Plan (City, 2021d);
- Wildlife Management Plan (Appendix D);
- Landfill Fire Control and Risk Reduction Plan (Appendix E);
- Safe Work Practices, Policies, and Procedures;
- Service Standards; and

- Spill Contingency Plan (City, 2021e).

The SWF Manager is required to comply with all laws and regulations affecting the execution of the work at the site, including all applicable Federal, Territorial and local laws and regulations pertaining to socio-economic and environmental matters.

3. WASTE DISPOSAL OPERATIONS

The purpose of the SWF is to take waste from Yellowknife and dispose of it in a safe and environmentally conscious manner, as well as manage recyclables. The following sections describe the types of waste/recyclables accepted and the corresponding disposal/storage methods, what is done when unacceptable waste is encountered, and cover systems.

3.1. Acceptable Waste

The SWF Manager ensures that the SWF accepts only the materials that it has been designed to handle and that all waste is deposited in the designated areas. Any exceptions must be reviewed and approved by regulatory agencies.

The following items are accepted at the SWF:

- Household Materials
- White Goods
- Construction and Demolition Debris (including Waste Wood, Uncontaminated Soil and Granular Material)
- Animal Carcasses
- Tires
- E-Waste
- Scrap Steel
- Honey Bags & Pet Waste
- Recyclables including:
  - Newsprint
  - Glass Bottles & Containers
  - Boxboard
  - Tin Cans
  - Fine Office Paper (White & Coloured)
  - Shredded Office Paper
  - Cardboard
  - HDPE Plastics #1, 2, 3, 4, 5, & 7
- Hazardous Goods including:
  - Asbestos
  - Glycols
  - Household Hazardous Waste
  - Mercury Containing Materials
  - Ozone Depleting Substances
  - Propane Tanks
  - Used Oil
  - Batteries
  - Heating Oil Tanks
  - Paint
  - Residue Fuel Tanks/Drums
  - Vehicles
- Yard Waste including:
  - Grass Clippings
  - Leaves
  - Tree Branches, Roots & Stumps
  - Logs

- Uncontaminated Snow including:
    - Snow removed from streets by City staff
    - Snow removed from private lots by contractors with agreements with the City

The following items are NOT accepted at the SWF:

- Hazardous Wastes including:
    - Biomedical Waste/Medical Sharps

- Hazardous Wastes generated by the ICI sector including:
    - Glycols
    - Mercury Containing Materials
    - Oily Debris
    - Paint
    - Used Oil
    - Hydrocarbon Contaminated Soil/Snow/Water

- Materials without proper documentation including:
    - Asbestos

3.2. Disposal Methods

The SWF is divided into sections for disposal of different types of waste. Figure 2 in Appendix A shows the locations of the waste drop off areas.

3.2.1. Hazardous Waste

The SWF only accepts certain hazardous wastes as listed in Section 4.1 and the Hazardous Waste Management Plan (City, 2021d). Each accepted hazardous waste has potential health and/or environmental risks associated with the materials. Procedures for the management and handling of these wastes are outline in the Hazardous Waste Management Plan (City, 2021d), applicable regulatory guidelines, WHMIS, and Safety Data Sheets (SDS).

Please refer to the City's Hazardous Waste Management Plan (City, 2021d) for accepted items and disposal methods.

3.2.2. General Household Waste

A private hauler collects and transports general household waste to the SWF for the City based on contractual agreement. Household waste is transported to the working face of the engineered landfill cell where it is spread across the surface with a dozer and compacted using a compactor. The following sections detail the disposal process.

<u>Compacting</u>

The tracked Dozer Operator has the following main responsibilities:

- Push and spread waste across the working face. This action will optimize compaction. Dozer operator assesses the blade height to ensure that waste is spread evenly.
- Check for problematic waste that can cause damage to equipment.

The Compactor Operator has the following main responsibilities:

- Check for problematic waste that can cause damage to equipment.
- Compact waste by rolling over the waste in 3 to 5 passes.
- Compact waste on a flat working area.

The Loader Operator has the following main responsibilities:

- Check for problematic waste that can cause damage to equipment.
- Spread cover onto the working face.

3.2.3. Recyclables

Recyclable materials are collected from City recycling depots (Figure 3 - Appendix A) and brought to the facility by SWF staff. The bins are checked daily and emptied based on use; however, all bins are emptied at least once a month. Material collected from the bins and suitable for recycling are deposited on the tipping floor of the Baling Facility for processing. The following sections detail the disposal of the recyclable material listed in Section 3.1.

Baling

The Baler Operator controls the baling of the waste from the control room. From this location, the Baler Operator has three (3) main responsibilities:

1. Control of Baler Operation
   The Baler Operator controls both the baler and the flow of material into the hopper by observing the equipment operator and the hopper itself. A window and survey camera mounted in the hopper aids in observing the material in the baler.

2. Control of Tipping Floor Traffic
   The Baler Operator opens and closes the four entry/exit doors as required. A survey camera mounted above the tipping floor allows the operator to observe the deposit of recyclables onto the tipping floor.

3. Control of Bales Exiting the Baler
   The Baler Operator controls the wire-tying of the bales to ensure the bale remains intact after compression. A survey camera mounted above the wire-tying machine allows the operator to observe the process. Operations on the baling floor are monitored by the Baler Operator via a survey camera. This includes observing the loader as bales are picked up and placed in a designated area until ready to be shipped to southern recyclers.

Newsprint

Newsprint is brought to the facility from businesses with newspaper bins, as well as the City recycling depots. When sorting newsprint on the tipping floor, plain and coloured newsprint can be baled together. During baling, the baler's hopper should not be overfilled, or it may jam.

When the bale is discharged, it is double wire-strapped along its longer length to bind the ends of the bale. The bale is then stored until sufficient quantity is obtained for shipment to a southern recycling centre.

Glass Bottles and Containers

Upon delivery, the bins of glass bottles and containers are emptied within a designated area of the landfill cell. Then glass disposed within the landfill cell is crushed with the track dozer or compactor.

Boxboard

Boxboard is collected at each recycling depot and is delivered to the SWF. Upon delivery, the bins are emptied on the tipping floor and then baled. The bales are stored on site until there is a sufficient amount to be taken to a southern recycling centre.

Fine Office Paper (White and Coloured)

White and coloured papers are dealt with separately. Bales are shipped to a southern recycling centre.

Shredded Office Paper

Shredded office paper is either baled alone or added to the white paper. Bales of shredded paper are taken to the Compost Facility where they are added to the organic wastes to create compost. The remaining packaged bales are shipped to a southern recycling centre.

Cardboard

Cardboard is collected at each recycling depot, as well as various commercial establishments who have designated cardboard bins. Upon delivery, the bins are emptied on the tipping floor and then baled. The packaged bales are shipped to a southern recycling centre.

HDPE Plastics #1, 2, 3, 4, 5, & 7

Prior to 2020, The SWF only recycled containers made of #1, 2, 3, 4, 5, or 7 plastic. The containers were collected at each recycling depot and brought to the SWF. The material was emptied on the tipping floor and then baled. Packaged bales were shipped to a southern recycling centre.

In 2020, the decision was made to no longer ship mixed plastics collected from the blue bins depots around town down south. This is a result of the state of global recycling markets making landfilling a cheaper alternative then shipping down south. The collected plastics are therefore disposed within the landfill.

3.2.4. E-Waste

The SWF strongly encourages patrons bring eligible e-waste to the Electronics Recycling Program at the Bottle Depot for proper recycling E-Waste that is not accepted at the Bottle Shop is collected in a steel structure at the SWF.

3.2.5. Construction and Demolition Debris

Due to the short summers in Yellowknife, construction and demolition debris generally arrives during the warmer months when construction activity is high. Delivery of the material is performed by private contractors.

Construction and demolition debris include the waste material from most road and building projects in the surrounding area. There is the option for contractors to sort certain reusable items. There are different areas to dispose of the different types of construction and demolition debris within the SWF. The contractors will dispose of the construction and demolition debris in the appropriate areas. Loads of materials that can be used as cover material for the landfill are stored in a designated area. Materials with large rocks are not suitable for cover and are landfilled.

3.2.6. White Goods (Appliances)

White goods are household appliances including fridges, freezers, stoves, washers, dryers and hot water heaters. These items are placed in a designated area, so they can be processed. Any hazardous materials contained in the appliances are removed and disposed of by a qualified contractor according to the City's Hazardous Waste Management Plan (City, 2021d). Once the hazardous materials have been removed and properly marked, the items are shipped to a local metal recycler.

3.2.7. Tires

Tires are not considered to be hazardous waste and are stored in a designated area of the SWF. However, they are quite flammable and burning of tires produces heavy toxic smoke which poses a serious health hazard to residents of the City. Care must be taken to prevent fires within the SWF. Tires have been periodically baled and used to delineate waste drop off areas. The City is looking into the option of shredding tires for use as intermediate cover during the winter months.

3.2.8. Honey Bags and Animal Waste

The City currently has two (2) collection bins at the SWF for honey bags and animal waste that are dropped off by residents. The contents of the bin are deposited in the honey bag area at the Fiddler's Lake Treatment Facility.

3.2.9. Snow

There are currently two (2) snow disposal sites at the SWF. One (1) is used by City staff for snow removed during the City's Snow Removal Program. The other is used by private contractors for snow cleared from private lots. Any contractor wanting to make use of the contractor's snow dump area must register with the City prior to dumping to screen for potentially contaminated snow sources which are not accepted at the SWF. The location of the disposal areas are shown on Figure 2. Refer to the City's Municipal Stormwater Management Plan (City, 2021f) for information on snow disposal areas.

3.3. Waste Inspection

The checking of waste entering the facility is crucial to the safe and correct operation of the landfill. Proper screening reduces the likelihood of unacceptable waste entering the SWF and becoming the responsibility of the SWF and potentially contaminating the site and/or other waste. Vehicles are given a cursory inspection by SWF Staff when they arrive at the gatehouse to look for unacceptable or potentially hazardous wastes. The driver is then notified of the drop-off areas for their load. SWF Staff are occasionally on hand at the PDO area to direct people to proper drop off areas. When personnel encounter suspect waste in an incorrect drop-off area, they relocate the items to the appropriate area if it can be completed in a safe manner.

Material brought to the staging areas of the landfill's working face is regularly inspected by SWF staff prior to being compacted.

Material brought into the Baling Facility is inspected by SWF staff prior to loading it into the baler. Any materials that are not designated for baling are removed from the tipping floor, if safe to do so, and placed in the correct collection area.

The City has in place the Solid Waste Management By-Law #4376, which can be found in Appendix B. Item 14 of the By-Law outlines the authority of the SWF Staff. The following is an excerpt from the By-Law regarding the inspection of loads of waste entering the facility.

"Authority of SWF Attendants

14. (4) A SWF attendant may inspect any vehicle and/or load arriving at a solid waste site for the purpose of ensuring compliance with the provisions of this By-law and such inspection can include automated radiation detection, visual and manual inspection, use of hand held test instruments and the taking of samples for the purpose of laboratory or other further inspection.

(5) When a load is selected for inspection, the vehicle operator shall either comply with the directions of a SWF attendant or shall immediately remove the load from the Solid Waste Site.

(6) A SWF attendant may instruct a vehicle operator to deposit the load in a designated holding area, may request information regarding the nature and the source of the load, and may request that the vehicle operator sign a statement confirming the accuracy of the information given.

(7) Where a SWF attendant or an Inspector determines through inspection and testing that a load of solid waste is unsuitable for acceptance at the Solid Waste Site, he or she shall inform the vehicle operator or other appropriate person of the results and that person shall, as soon as it is practicable to do so, transport

the load from a solid waste site to another solid waste processing site that is licensed and otherwise able to accept it.

(8) If the person does not comply with the direction to remove and relocate the load as soon as is practicable, the City may arrange for the immediate transport and proper disposal of the load and to further assess a penalty pursuant to Part 5 of this By-law.

(9) Where a load is determined by a SWF attendant or an Inspector to be unsuitable for disposal at a solid waste site, the person attempting to dispose of the load will be liable for all related costs incurred by the City including:
(a) inspection costs;
(b) laboratory analysis costs;
(c) hauling, disposal, and facility decontamination costs where applicable; and
(d) any other related costs."

3.4. Handling Unacceptable Waste

Unacceptable wastes may be classified as non-hazardous, potentially hazardous or unacceptable, and, depending on the time of discovery, may or may not be associated with a known hauler. An example of unacceptable waste may be from an industry (mining camp, etc.) or other non-municipal generator of waste that the City's SWF is not equipped to accept. Once a waste is suspected to be hazardous or unacceptable, the onus is on the hauler to demonstrate otherwise, or to remove the waste at their expense. Repeat deliverers of unacceptable or hazardous wastes may be banned from the site at the discretion of and for a period determined by the SAO.

If unacceptable waste is found disposed at the SWF, the waste will be removed from the site in a safe manner and transported to a facility that accepts the waste. The initial step will be to investigate the unacceptable waste to determine proper handling and management of the waste prior to transporting the material. A waste manifest will then be completed, if required, and the waste material prepared for transport as required by the transport authority. Records will be kept that include, but not limited to, the following:

- Type of unacceptable waste.
- Date and time the unacceptable waste was discovered.
- Location the unacceptable waste was found.
- Procedures used to handle and manage the waste safely.
- Applicable transport documentation.
- Waste manifest (if required).
- Final destination of unacceptable waste.

The SWF Supervisor will notify the SWF Manager of anyone dumping unacceptable or rejected waste at the landfill site. The report shall contain the following information:

- Vehicle licence number
- Date and time of incident
- Material dumped, or rejected
- Type of vehicle
- Name of offender, if possible

A list of unacceptable wastes is found in Section 4.1.

3.5. Cover Systems

Daily and intermediate cover are important aspects of the design and operation of landfills. These covers are utilized to:

- Contain the waste materials
- Prevent water infiltration
- Reduce windblown litter
- Reduce odours
- Reduce the risk of fire ignition/spread
- Deter scavenging from wildlife
- Minimize presence of disease vectors

When landfill cells reach the design waste elevation, the cells are typically progressively capped. The final cover is installed to:

- Cover the waste and provide acceptable aesthetics
- Control and reduce the infiltration of precipitation and surface water into waste and therefore limit leachate generation
- Limit erosion via wind and water
- Control release and prevent landfill gas from escaping from locations other than landfill gas vents. For information regarding landfill gas, refer to the Interim Closure and Reclamation Plan (City, 2021b).

3.5.1. Daily Cover

150 mm of daily cover is placed over the exposed waste in the active disposal area at the end of each working day.

3.5.2. Intermediate Cover

300 mm to 450 mm of intermediate cover is placed as waste is compacted in 3 m lifts. The frequency of the installation of intermediate cover is dependent on the amount of waste material received. Clean fill material from the City's Water & Sewer Infrastructure Replacement Program and the Road Reconstruction – Paving Program are typically utilized for intermediate cover. There is the option to utilize shredded tires as intermediate cover.

3.5.3. Final Cover

The final cover includes a barrier layer, with a maximum hydraulic conductivity of 1×10^{-7} m/s, to prevent the infiltration of precipitation into the waste and therefore limiting leachate generation. Specific materials to be utilized for the final cover will be analyzed/laboratory tested to suitability

prior to use. Further information related to the final cover are covered in the Interim Closure and Reclamation Plan (City, 2021b).

4. MAINTENANCE PROCEDURES

Proper maintenance of the SWF site is crucial to ensuring the efficient operation of all components. All maintenance is done in accordance with the City's Service Standards and records of the maintenance are kept at the SWF. Once a month, the entire SWF site is inspected as part of the City's Safety program. The maintenance checklist for this program is in Appendix C. The following sections outline the different maintenance activities.

4.1. Storage Maintenance

As the first step in the waste collection process, residential and commercial storage containers are to be adequately maintained by the residential/commercial customers. Garbage containers are to be covered to prevent wind-blown debris from littering the City and to prevent animals from getting into the garbage.

4.2. Collection Maintenance

The collection of municipal solid waste is done by a private contractor who is responsible for maintaining their vehicles in accordance with their maintenance program.

4.3. Equipment Maintenance

Regular maintenance is performed on all City-owned equipment as per the original manufacturer's suggested specifications, and the City's Service Standards. This includes but is not limited to regular:

- Cleaning
- Oil changes
- Fluid changes
- Greasing
- Checking of tire pressure
- Brake pad replacement
- Preventative maintenance
- Breakdown maintenance as required to operate equipment safely.

Appendix C contains the checklists for both light and heavy-duty equipment.

4.4. Facility Maintenance

The SWF has seven (7) – the Baling Facility, the Compost Facility Shelter, the Gatehouse, the SWF office building, the Hazardous Waste Collection PDO building, the Hazardous Waste/E-Waste Storage Shelter, and the PDO salvaging trailer. These buildings are inspected monthly by the SWF Supervisor to observe signs of building deterioration or problems with heating, roofing, etc. Any problems are immediately reported to the SWF Manager. The problem(s) are investigated, and appropriate remedial measures undertaken.

4.4.1. Baling Facility

The Baling Facility requires periodic maintenance due to scattered debris and normal operations. Maintenance is subdivided as follows:

- Entry Doors
- Mechanical Systems
- Equipment Maintenance
- Control Room and Change Rooms
- Fire Suppression
- Wood Pellet Boiler.

Entry Doors

Appropriate air circulation limits the amount of condensation. Should the problem of ice build-up still occur, the mechanism can be opened, and the ice melted with a hot-air hair dryer.

The door spring mechanism, bearings, tracks and chains are inspected every month for excessive wear and adjustments. As these doors are several thousand kilograms in weight each, the maintenance of the support hardware is extremely important.

Mechanical Systems

The boilers and sump pumps require little maintenance. The systems are checked on a weekly basis and receive annual servicing to prevent any potential problems from occurring.

Building air flow uses Make-up Air Units, which form a critical component in odour control. These air units control fresh-air percentages, which are usually set at 10% during the winter and 90% - 100% during the summer. The filters within this system are replaced every three to four months. Preventative maintenance checks are completed on a daily basis.

Equipment Maintenance

The baler equipment is maintained according to the manufacturer's specifications. A period of 2 weeks is required to do major maintenance tasks on the baler every few years. Preventative maintenance checks are completed on a daily basis. A new baler was installed in December 2008. Appendix C contains the checklist for the baler.

Control Room and Change Rooms

The control room and the change rooms are swept and mopped as needed. Janitorial services are provided three (3) times a week by a local contractor.

Fire Suppression

The Fire Suppression system undergoes annual maintenance by a system specialist**.**

Wood Pellet Boiler

The Baling Facility is heated using a wood pellet boiler which is maintained by the City's Public Works Tradesperson. All regular and emergency maintenance is performed by this employee.

The silo that holds the pellets, as well as the boiler, undergo weekly checks to ensure they are operating smoothly.

4.4.2. Gatehouse and Scale

The gatehouse is mopped and swept by SWF staff as needed. The Scale is maintained in proper working order to meet the Canada Weights and Measures Act.

4.4.3. Hazardous Waste/E-Waste Shelter

The E-Waste Shelter is a steel structure used for the collection and sorting of electronic waste and certain hazardous waste material. The doors of the shelter require regular maintenance twice yearly to ensure they are operating smoothly.

4.4.4. Compost Facility Shelter

The Compost Facility Shelter is located on the compost pad. It is a small building which is mopped and swept by SWF staff as needed.

4.4.5. SWF Office Building

The SWF Office Building is a small trailer that has meeting space and offices in it. The building is cleaned two (2) or three (3) times a week by a contractor.

4.5. Waste Disposal Areas Maintenance

The current SWF site handles MSW, construction wastes, hazardous wastes, recyclables, and salvaging. Because of this diversity of uses, distinct areas are designated for each use. These areas are kept separate, usually by having a travel lane for truck use in between the designated storage areas. Suitable signs indicating the locations for various waste types are made clear and visible to both facility personnel and the public.

Monitoring of the drop-off areas is completed by staff while working at their various tasks around the site. Areas are checked depending on usage, with some areas, such as the recycling and salvage areas, being checked on a more frequent basis. At the end of the day closing time, a staff member will complete a tour of the entire site. Maintenance and cleaning of the various designated areas are completed as required. Any issues observed will be recorded and the Supervisor will be notified to further investigated and remediated.

4.5.1. Leachate Collection System Maintenance

As previously stated in Section **2**, the new landfill cells contain two (2) separate leachate collection systems consisting of a series of pipes to collect and carry the leachate, and a sump from which to pump the liquid. A vac truck is used to pump leachate out of the manhole when needed.

The manhole housing of the sump for the cells are to be checked on a regular basis to determine the level of leachate. These checks are to be completed and recorded on a weekly basis during the spring freshet and monthly during the rest of the year. Section 6 contains details of the SWF's sampling and monitoring program, including sampling parameters.

4.5.2. Dams, Berms, Dyke, and Control Structure Maintenance

A qualified Engineer will complete an inspection of all dams, berms, dykes, and control structures at the SWF for stability once every two (2) years. The Engineer will provide a report summarizing the inspection, recommendations, and any actions to be undertaken. The report will be submitted to the Mackenzie Valley Land and Water Board (MVLWB) in accordance with the Water Licence.

4.6. Fencing Maintenance

An eight (8) foot tall chain-link gate is in place at the access of the landfill. The gate is locked when the SWF is closed in order to prevent dumping of unauthorized wastes. The fence must be regularly inspected, and repairs must be completed as necessary to ensure that the fence remains in good condition and site access is controlled.

4.6.1. Wildlife Fence Maintenance

Regular maintenance of the fencing is required in order to ensure their performance. Snow removal around the fence is carried out from November through April with repairs being done on an as-required basis. Waste on or around the fencing is cleaned on a regular basis.

Records of all maintenance and repairs for the fencing are kept at the SWF.

4.7. Road Maintenance

4.7.1. Access Road Maintenance

The access road between the highway and fence before the gatehouse is made of gravel and approximately 100 metres long. Basic road maintenance is conducted as follows:

- On a regular basis the road is to be maintained (potholes filled in, surface levelled) so as to afford a reasonably smooth surface for vehicles;
- At least twice per year, the road is to be graded smooth and the surface reshaped; and
- During the winter, snow is to be removed and the road regularly sanded to ensure unrestricted access to the site for vehicles.

4.7.2. Site Road Maintenance

There are roads within the SWF that require regular maintenance in order to ensure they remain passable by a variety of vehicles and equipment. Maintenance of these roads includes clearing away of debris, smoothing the surface, and the addition of granular materials when required (i.e. during winter for traction purposes).

4.8. Erosion and Sediment Control

If areas of significant erosion are observed during inspections, they will be remediated to prevent potential site drainage issues. If erosion persists in certain areas, alternative erosion and sediment control measures will be investigated.

4.9. Nuisance Control

The SWF has items which can become a nuisance to operations. These items include litter, odours, and birds. Control methods for these items are described in the following sections. If there are persistent issues with these nuisances, alternative controls measures will be investigated.

4.9.1. Litter Control

Litter can be a significant problem at the SWF. Litter from the site is often blown about the entrance road and the building, as well as around the different waste collection areas. Incoming and outgoing vehicles transporting waste, such as contractor delivery trucks, also drop litter around the facility. Litter control is accomplished through a combination of proper transportation and disposal operations, litter retaining fences, and a litter picking program. A clean, litter-free appearance will be maintained at the site, not only for public relations, but also for efficient operation of the landfill. Poor litter control attracts unwanted scavengers and contributes to surface drainage problems by blocking ditches and culverts.

Litter control measures shall include:

- Regular covering of wastes in the active disposal area;
- Litter collection fencing located around the active fill area to catch blowing litter;
- A litter collection schedule as directed by the SWF Supervisor;
- Enforcement of the by-law requirement for vehicles to tarp their loads to reduce dropping litter;
- Monitoring and regular collection of litter on fencing, on site roadways, in ditches and adjacent properties;
- Where possible, vegetation will be used as a screen to block wind.

4.9.2. Odour Control

Odours will be controlled at the facility by implementation of the following daily measures:

- Cover material shall be applied at the active disposal area;
- Routine site inspections to identify and eliminate localized surface water ponding and/or surface water drainage problems.

4.9.3. Bird Control

Solid waste disposal facilities attract birds due to the availability of food. The SWF is within the airport buffer zone and therefore bird control is very important. The City has implemented a Wildlife Management Plan, included in Appendix D, which outlines measures taken to limit the availability of food as well as techniques to manage wildlife. Please refer to this plan for details on Bird Control.

4.10. Indiscriminate Dumping

Waste will be disposed at designated areas at the facility (appliances, vehicles, tires, hazardous materials, etc.) only. When indiscriminately dumped materials are discovered, they will be relocated to the appropriate designated area in a timely fashion.

4.11. Fire Control

There is NO burning of waste at any time at the SWF. Please refer to the Landfill Fire Control and Risk Reduction Plan, included in Appendix E, for details on fire prevention measures.

5. SAMPLING AND MONITORING PROGRAM

There are multiple sampling programs in effect at the SWF. The City is required by the Water Licence to sample surface water as part of the Surveillance Network Program (SNP) for monitoring runoff from the SWF upstream and downstream of the facility. The City also samples groundwater to assess the potential migration of leachate in the groundwater table.

5.1. Surface Water Sampling

There are currently seven (7) SNP stations located throughout and around the landfill to monitor runoff, seepage, and leachate composition. Table 1 describes each of the stations and the frequency of sampling. The information is taken from the City's current Water Licence. Figure 6 (Appendix A) show the locations of the SNP stations.

All sampling, sample preservation, and analyses are conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater", or by such other methods approved by an Analyst. All analyses are performed in an International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 170125 accredited laboratory that is accredited to analyze for the water quality parameters identified above. The results of the analysis are provided in a report from the lab which states the results and detection limits, as well as the quality assurance and quality control data.

The data and information required by the SNP is reported in the Quarterly and Annual Reports, which are submitted to the MVLWB in accordance with the City's Water Licence.

Table 1: SNP Station Information

SNP Station ID	Description	Sampling Frequency
0032-13	A point approximately 400 m northwest of the SWF above the confluence of an unnamed feeder creek. Used to monitor water quality associated with runoff and seepage from the SWF.	Twice a year (June & September)
0032-13A	A point approximately 400 m northeast of the SWF that captures the drainage from the SWF and from the snow disposal area. Used to monitor water quality associated with runoff and seepage from the SWF and the snow disposal area.	Twice a year (June & September)
0032-14	Upstream of culvert located on Hwy #4, upstream of fault and downstream of confluence of unnamed feeder creek. Used to monitor water quality associated with runoff and seepage from the SWF.	Twice a year (June & September)
0032-15A	West side of Hwy #4 across from culvert on Ski Club access road. Used to monitor water quality associated with runoff and seepage from the SWF.	Twice a year (June & September)
0032-16	Upstream of culvert on Hwy #3 opposite jackfish Lake. Used to monitor water quality associated with runoff and seepage from the SWF.	Twice a year (June & September)
0032-19	Effluent/drainage water collected from the landfill cell opened in 2011-12 (Cell A)	Before discharge of water from Cell A
0032-20	At the south end of Fault Lake where the runoff enters the lake. Used to monitor water quality associated with runoff and seepage from the SWF.	Twice a year (June & September)
0032-21	At the Vicinity Lake #3 within the boundaries of the SWF. Used to monitor water quality associated with runoff and seepage from the SWF.	Twice a year (June & September)

SNP Stations 0032-13A, 0032-14, 0032-15A, 0032-16, 0032-19, 0032-20, and 0032-21 are tested for the following parameters:

ICP-MS Metal Scan (Total)

- Aluminum
- Arsenic
- Beryllium
- Boron
- Cadmium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Manganese
- Mercury
- Molybdenum
- Nickel
- Selenium
- Silver
- Strontium
- Vanadium
- Zinc

Field Parameters

- Dissolved oxygen
- Temperature
- pH
- Conductivity

Major Ions

- Calcium
- Magnesium
- Chloride
- Sodium
- Alkalinity
- Fluoride
- Potassium
- Sulphate
- Total Dissolved Solids
- Total Hardness

Other

- Faecal Coliforms
- Total Ammonia
- Nitrate and Nitrite
- BOD_5
- Total Mercury
- Oil and Grease
- Total Phenols
- Methyl Tert Butyl Ether
- Total & Ortho Phosphorus
- Dissolved Organic Carbon
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX)
- Total Petroleum Hydrocarbons – Fraction 1 (C6-C10) + Fraction 2 (>C10-C16) + Fraction 3 (>C16-C34) + Fraction 4 (>34)

5.2. Groundwater Sampling

Please refer to the most recent version of the City's Interim Groundwater Monitoring Plan (City, 2021a) for information on the groundwater wells and the sampling procedure.

If there is an exceedance of groundwater monitoring criteria and a potential source is identified, an evaluation will be undertaken to determine an effective method to manage the source to prevent additional leachate generation. Depending on the source material and location of it, this

may include relocation of the source material to the lined area of the landfill or to an appropriate off-site facility approved to handle the source material by a third-party contractor.

5.3. Leachate Sampling

As described in Section 2.2.2, Cells A and B are each equipped with leachate collection systems which consists of a series of pipes which collect liquids generated in the cell and transport them to a leachate collection sump, located in a manhole at the low point in each of the cells. The City is considering the use of evaporation cannons to recirculate leachate to the active waste areas of the landfill. If off-site disposal is required, the leachate will be sampled and tested in accordance with the Water Licence. A third-party contractor will be retained to dispose of the leachate at an appropriate disposal facility.

5.4. Landfill Gas Monitoring

The safety measures for protection from the dangers of landfill gas at the SWF is awareness through training and monitoring by staff as part of their workplace safety plan. Dillon Consulting Limited (Dillon) (2016) noted that the presence of landfill gas can be detected through odour, hissing noises on top of an existing cell, or surface bubbling of any ponded water. Staff at the SWF are briefed on this during safety training sessions and any such instances are to be recorded and reported. No such reports have been received to date, which suggests that landfill gases are not present at levels warranting immediate action at the SWF. City staff are also trained to look for stressed vegetation as an indication of landfill gas as part of their daily work activities. The City is currently investigating the purchase of a portable landfill gas detection instrument.

A second form of gas monitoring that is available at the Baling Facility is an Armstrong Monitoring AMC-1400 Gas Monitor. This monitor is installed at the baling facility and set up to monitor levels of methane, carbon monoxide and hydrogen sulfide. For additional information, refer to the Interim Closure and Reclamation Plan (City, 2021b).

6. SITE RECORDS

Copies of records pertaining to operation and maintenance of the SWF are kept at the SWF. Information in these records (as outlined in the Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Facilities in the Northwest Territories, Duong and Kent, 1996) includes:

- Estimated volume of waste collected and the generator of the waste (e.g. Residential) both monthly and annually;
- Details of any maintenance and repairs undertaken at site;
- Inspections;
- Record sheets;
- Visits by regulatory authorities;
- Copy of the City's Water Licence;
- As-built information for site facilities;
- Copies of annual reports;
- Copies of all manuals pertaining to the operation and maintenance of the SWF including, but not limited to, the SWF Operation & Maintenance Manual, Hazardous Waste Management Plan (City, 2021d), Landfill Fire Control and Risk Reduction Plan (Appendix E), Wildlife Management Plan (Appendix D), Biotreatment Pad Operation and Maintenance Manual, Safe Work Practices Index (City, 2017), Service Standards, and Spill Contingency Plan (City, 2021e); and
- Copies of spill reports and related regulations.

Copies of the documents listed above are also kept at City Hall, along with the following:

- Copies of sampling and analysis reports of the groundwater monitoring wells, runoff from the SWF, and leachate, and
- Copies of annual reports submitted to the MVLWB.

7. SAFETY PROCEDURES

The following safety procedures are to be obeyed to minimize health risks to personnel working in and around the SWF:

- Equipment is to be kept clean;
- All personnel working at the SWF are to wear appropriate PPE such as gloves, safety glasses/goggles, coveralls, high-visibility vest and safety boots when onsite. Site staff should be provided with appropriate PPE to fulfill their responsibilities in a safe manner. In certain situations, specialty PPE may be required to complete specific tasks or handle specific waste materials. In those cases, personnel will receive appropriate training related to the management and use of the specialty PPE;
- Work clothes must be kept in a designated change room and employees are to change into them when they arrive for work. Work clothes must NOT be worn home. The SWF office trailer is equipped with laundry facilities to wash work coveralls on site;
- Eye wash station, first aid kits, and fire extinguishers available on site;
- Hands are to be washed frequently, as a minimum before eating and after work; and
- Personnel should receive appropriate vaccinations and ensure they are kept up to date. Please contact the Department of Health for a list of the appropriate vaccinations.

Safety procedures for specific tasks are outlined in the City's Safe Work Practices, Policies and Procedures. Appendix F contains a list of all the Safe Work Practices. Please refer to the Manual for information on specific tasks.

7.1. Wildlife Safety

Solid waste facilities are an attractant for wildlife species, including bears. While the SWF is surrounded by a wildlife fence, it is imperative that all personnel working in and around the SWF be properly trained in wildlife safety. All staff must complete an online wildlife safety course. Please refer to Appendix G for documents relating to bear safety.

8. SITE ACCESS CONTROL

The SWF is open to the contractors with SWF accounts according to the following hours:

Summer Hours (approx. May to Sept.)	**Winter Hours (approx. Oct. to April)**
Monday to Friday..... 7:30am to 5:15pm	Monday to Friday .....7:30am to 4:15pm
Saturday and Sunday .. 10:00am to 5:15pm	Saturday and Sunday ...10:00am to 4:15pm
Statutory Holidays ..... 7:30am to 5:15pm	Statutory Holidays .....CLOSED

The SWF is open to the public according to the following hours:

Summer Hours (approx. May to Sept.)	**Winter Hours (approx. Oct. to April)**
Tuesday to Sunday ..... 11:00am to 5:15pm	Tuesday to Sunday .....11:00am to 4:15pm
Mondays ..... CLOSED	Monday .....CLOSED
Statutory Holidays ..... 11:00am to 5:15pm	Statutory Holidays ..... CLOSED

During non-operational hours, the gate to the SWF is locked to prevent unauthorized dumping. Access to the active face of the SWF is restricted to City staff and authorized haulers.

8.1. Signage

The SWF has a sign posted at the entrance to inform the public of the location of the SWF site. Additional signage erected around the gatehouse includes the following information:

- Materials/wastes accepted for landfill and recycling
- Materials/wastes banned from the site
- Penalties
- Hours of operation
- Emergency contact information.

Signs identifying the locations of all waste areas are posted at the SWF. The signs are erected in the appropriate areas and maintained by City personnel. If signs become illegible, they should be replaced.

8.2. Contact Numbers

Contacts of those responsible for overseeing the operation and maintenance of the SWF are as follows:

SWF Manager:.....(867) 669-3404
SWF Supervisor: .....(867) 669-3451
Gatehouse:.....(867) 669-3406

9. EMERGENCY RESPONSE

The City must be able to respond efficiently and effectively to all possible emergencies that may be encountered in the operation of the City's facilities. These include, but are not limited to fuel, chemical and wastewater spills, as well as fires. Due to the nature of the City's facilities, burning or spillage of unknown or hazardous materials may occur. Only SWF personnel who are properly trained to deal with these situations should respond to such emergencies.

All SWF personnel must familiarize themselves with the emergency preparedness plans before an accident or emergency occurs. Appropriate SWF personnel shall be trained to implement the emergency preparedness plans. Copies of these plans are kept in all common work areas. The following sections list contact numbers and outline procedures to follow in the event of an emergency.

9.1. Emergency Contact Numbers

The following is a list of contact numbers in the case of an emergency:

Emergency Assistance: ……9-1-1
Fire Department: .....(867) 873-2222
RCMP Detachment: .....(867) 669-1111
24 Hour Spill Response Line: .....(867) 920-8130

9.2. Spill Contingency Plan

A Spill Contingency Plan (City, 2021e) has been created for activities associated with City operations including the water treatment plant, Fiddler's Lake Treatment System, and SWF. A copy of the Plan may be found at the MVLWB water licence registry page and the SWF office. City personnel must familiarize themselves with the plan to respond quickly and effectively in the event of a spill.

9.3. Fire Response Plan

The City has developed a Landfill Fire Control and Risk Reduction Plan (Appendix E) which outlines the appropriate response to any occurrence of fire at the landfill. Please refer to this plan for detailed information.

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APPENDIX A

Figures

Figure 1: Solid Waste Facility Location

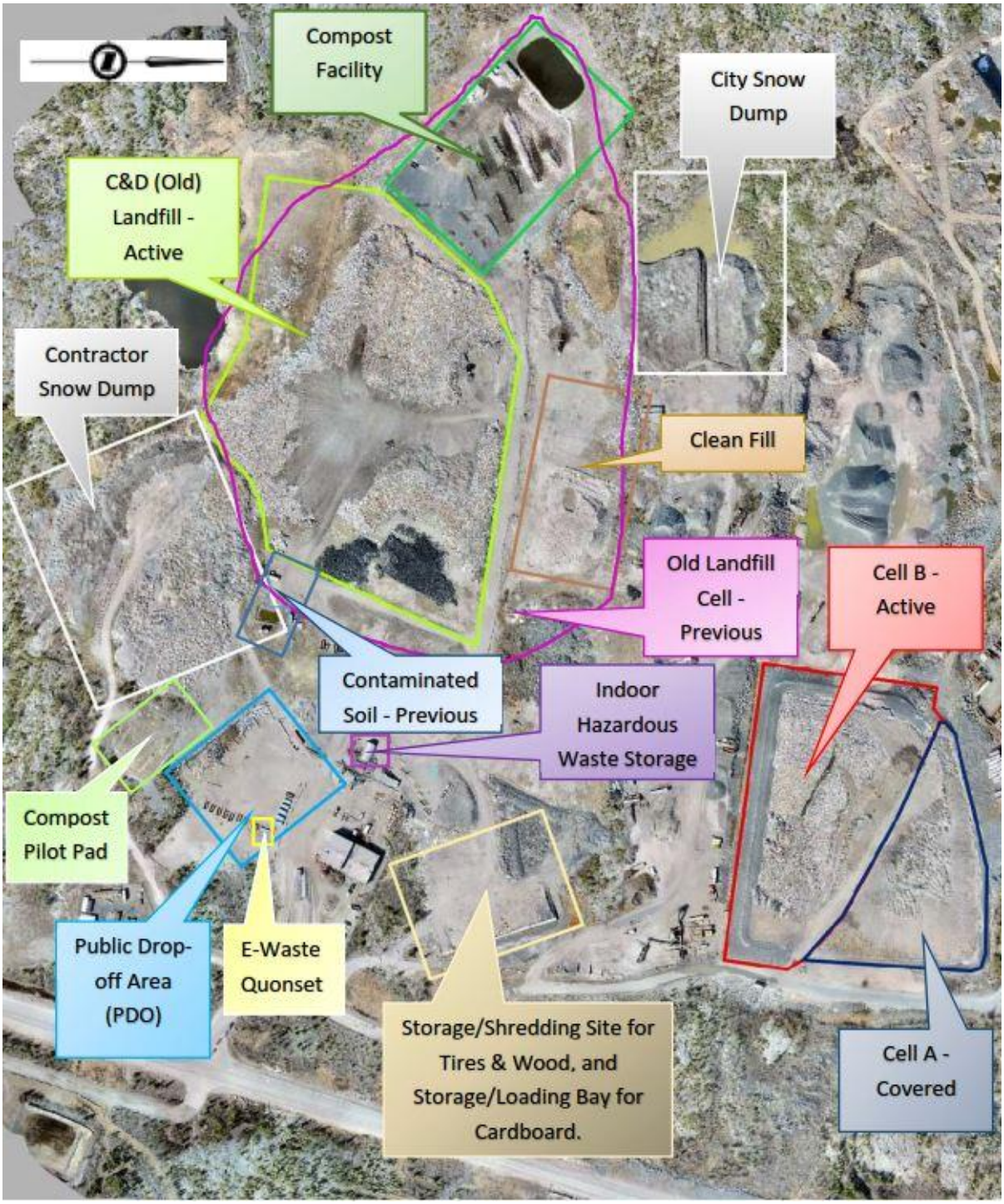

Figure 2: Solid Waste Facility Site Layout

City of Yellowknife

Public Works & Engineering

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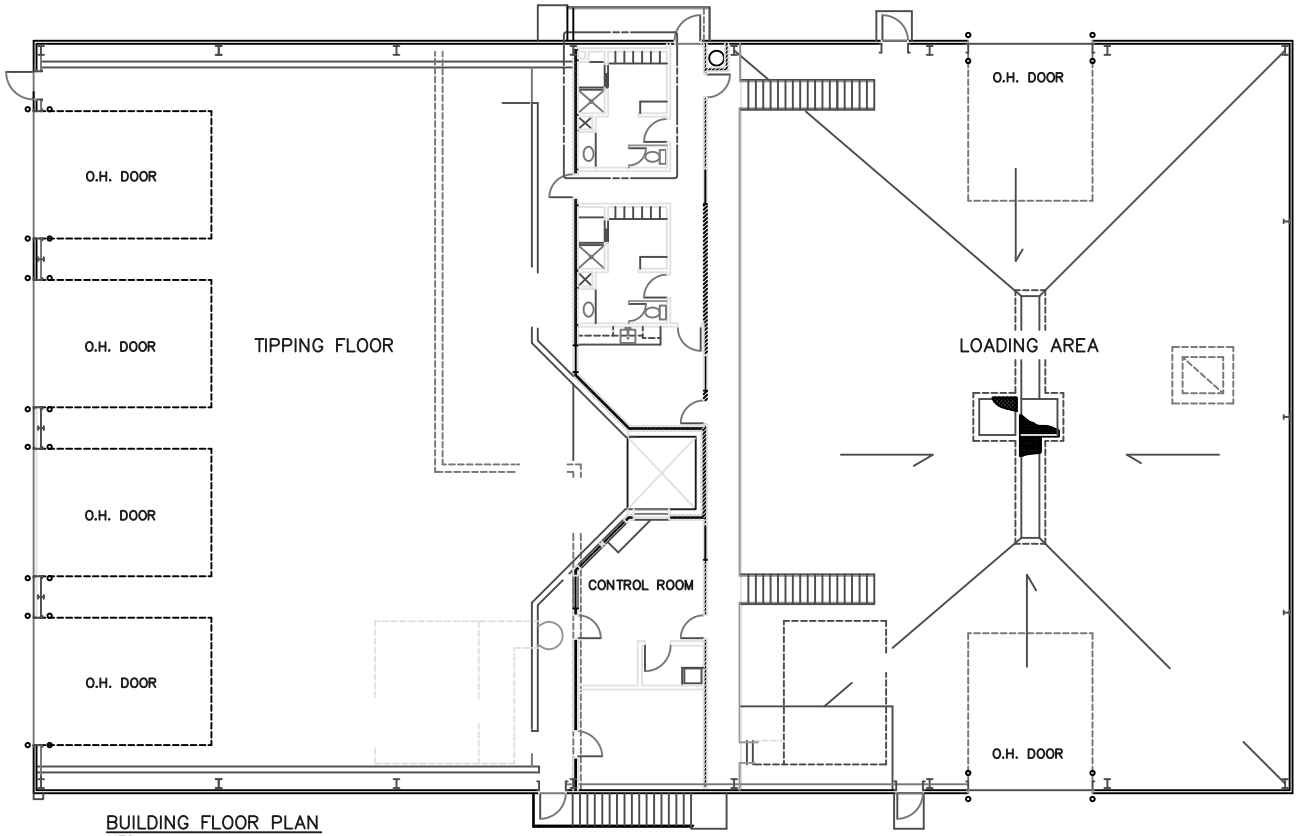
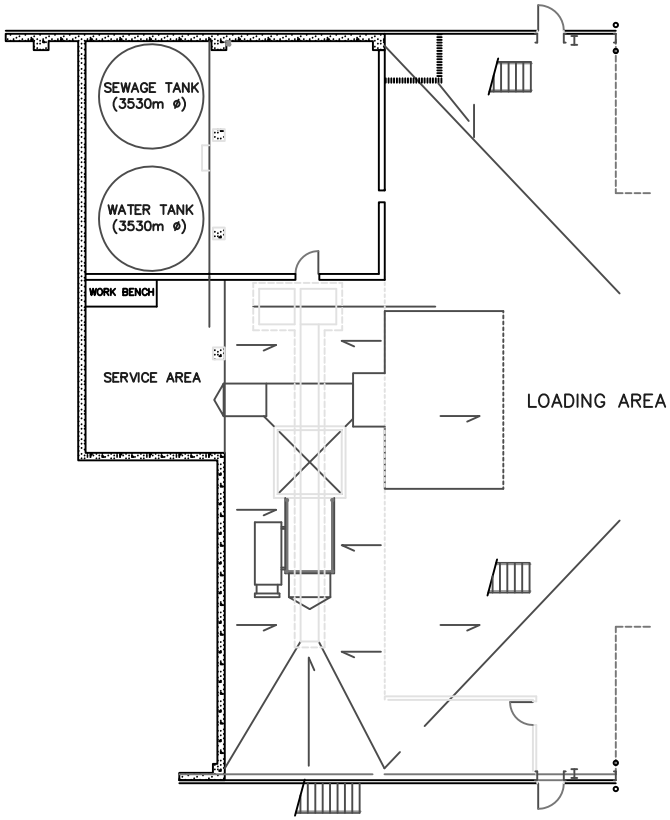
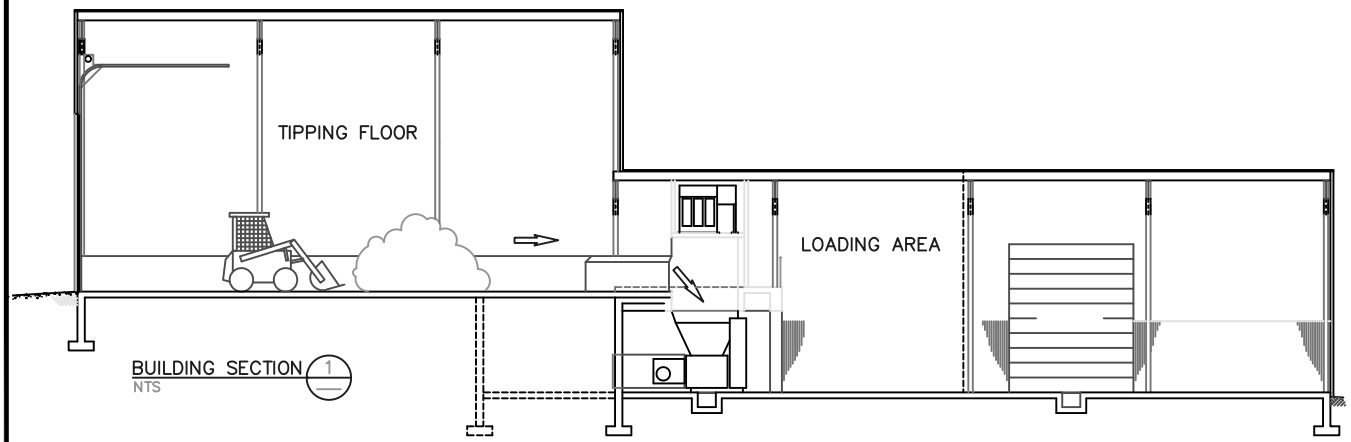
FILE:	*16_SWF_O&M_Recycling_Depots.mxd*
DATE:	*November 23, 2016*



BUILDING FLOOR PLAN
NTS



LOWER LEVEL PLAN (PARTIAL)
NTS



BUILDING SECTION 1
NTS

NORTH

City of Yellowknife
Public Works & Engineering

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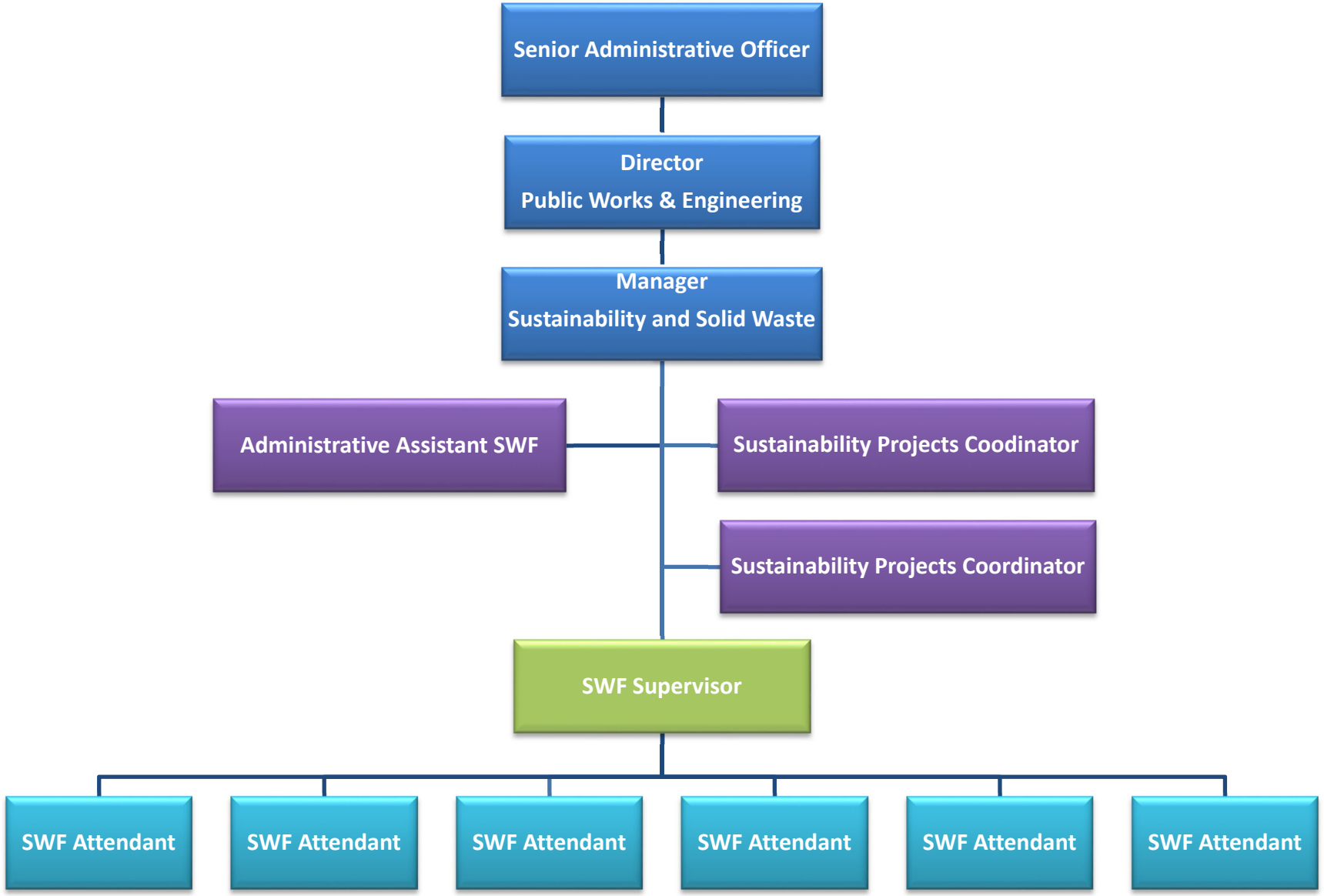
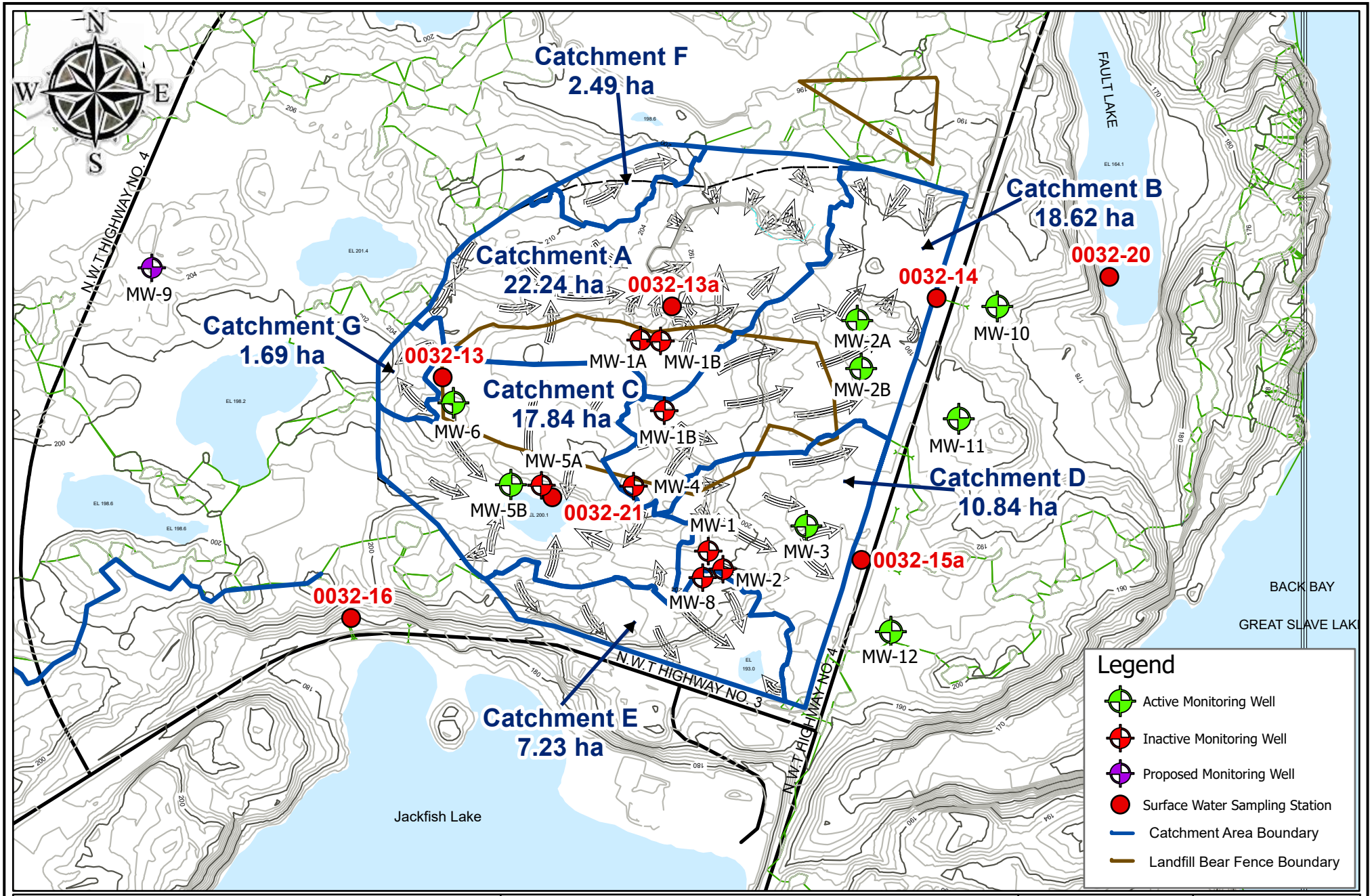
Figure 5 – Solid Waste Facility Organizational Chart





City Of Yellowknife

Public Works & Engineering

PROJECT:	Solid Waste Facility O&M Manual
TITLE:	Figure 6 - SWF Drainage and Sampling Locations
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FILE:	*20_SWF_O&M_SNP_Station_Locations*
DATE:	*November 04, 2020*

APPENDIX B

Waste Management By-Law No 4376

THE CITY OF YELLOWKNIFE

NORTHWEST TERRITORIES

CONSOLIDATION OF
SOLID WASTE MANAGEMENT
BY-LAW NO. 4376

Adopted September 12, 2005

AS AMENDED BY

Fees and Charges By-law No. 4436 – as amended

(This Consolidation is prepared for convenience only. For accurate reference, please consult the City Clerk's Office, City of Yellowknife)

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CITY OF YELLOWKNIFE
BY-LAW NO. 4376

A BY-LAW of the Council of the Municipal Corporation of the City of Yellowknife in the Northwest Territories, to provide for the management of solid waste in the City of Yellowknife, which includes the collection, transportation and disposal of solid waste, as per the authorities set out in the *Cities, Towns and Villages Act* S.N.W.T. 2003, c. 22 ("Cities, Towns and Villages Act"), and in the interests of the health, safety, and welfare of the residents of this City.

WHEREAS pursuant to section 58 of the *Cities, Towns and Villages Act,* a municipal corporation may, for a municipal purpose, establish, deliver and operate services, public utilities and facilities and in doing so shall, in a by-law:

(a) set the terms and conditions applicable to users,
(b) set reasonable rates or amounts of deposits, fees and other charges,
(c) provide for charging and collecting deposits, fees and other charges,
(d) provide criteria for when service will be discontinued or refused, and
(e) provide for a right of entry onto private property to determine compliance with terms and conditions of use;

AND WHEREAS, pursuant to section 70 of the Cities, Towns and Villages Act, a council may make by-laws for municipal purposes respecting public utilities, programs, services, infrastructure and facilities provided or operated by, or on behalf of, the municipal corporation and the enforcement of by-laws;

AND WHEREAS, pursuant to section 72 of the Cities, Towns and Villages Act, a council may in a by-law, among other things:

(a) regulate or prohibit activities,
(b) deal with any activity or thing in different ways, divide each of them into classes and deal with each class in different ways,
(c) provide for a system of licences, permits or approvals including any or all of the matters listed therein, and
(d) provide remedies for the contravention of a by-law;

AND WHEREAS, pursuant to section 90 of the Cities, Towns and Villages Act, a council may, in a by-law respecting a public utility, provide for the prohibition or regulation of the discharge of substances and liquids into a waste management system;

AND WHEREAS, pursuant to s. 10 of the Environmental Protection Act, R.S.N.W.T. 1988, c. E-7 ("Environmental Protection Act"), a municipal corporation may, by by-law prohibit or regulate the disposal of litter;

AND WHEREAS the City of Yellowknife deems it desirable and in the public interest to establish, operate, maintain and levy fees for a solid waste management system in the City of Yellowknife;

NOW, THEREFORE, THE COUNCIL OF THE MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE, in regular session duly assembled, enacts as follows:

SHORT TITLE

1. This By-law may be cited as the "Solid Waste Management By-law".

PART 1 - INTERPRETATION

DEFINITIONS

2. (1) In this By-law the following terms, phrases and their derivatives shall have the meanings given herein. If or when they are not consistent with the context, words in the present tense shall include the future, words in the plural context include the singular, and words in the singular number include the plural. The word "shall" is always mandatory and not merely directory. Words not defined shall be interpreted in accordance with the *Interpretation Act,* R.S.N.W.T. 1988, c. I-8 and the *Cities, Towns and Villages Act,* S.N.W.T. 2003, c. 22 and if not defined in either of these Acts, they are to be given their common and ordinary meaning.

"Animal Waste"	means all forms of *waste* from animals or the treatment of animals, and includes animal or human excrement, but does not include animal carcasses or parts, or disposable diapers or undergarments;
"*Biomedical Waste*"	means *medical waste* that requires special handling and disposal because of environmental, aesthetic, and health and safety concerns as well as risks to human health and includes: (a) human anatomical waste, (b) infectious human waste, (c) infectious animal waste, (d) microbiological waste, (e) blood and body fluid waste, and (f) medical sharps such as needles, syringes, blades, or other clinical or laboratory materials capable of causing punctures or cuts;
"Burn Permit"	means a permit issued by the *City* Fire Chief or his or her designate pursuant to the Emergency Response and Protection Services By-law in the form prescribed by the *Senior Administrative Officer* from time to time;
"Child"	means a *person* fourteen (14) years of age or younger;
"City"	means the City of Yellowknife, a municipal corporation in the Northwest Territories, and includes the area contained within the boundaries of the City of Yellowknife where the context requires;
"Commercial Premise"	means any *premise* that is not a *residential premise*;

"Commercial Waste"	means all *solid waste* generated by a *commercial premise* except for *special waste*;
"*Compactor*"	means a mechanism capable of reducing the volume of *garbage* by compaction;
"*Construction Site*"	means the location where building erection, renovation, demolition or work is being performed, and/or a location where surface or subsurface pipe work or mechanical work is being performed on any landscape or building where changes are being undertaken by anyone, or a location where excavations are being performed;
"*Construction Waste*"	means any form of *solid waste* material including wood product, concrete, steel, iron, miscellaneous metals, gypsum product, clay product, non-contaminated soil or other granular fill, plastics and insulation that is generated at a *construction site*, but does not include hazardous waste;
"*Container*"	means a dumpster, bin or *compactor* intended or used for the storage of *household waste* at *multi-family unit premises, commercial waste* at *commercial premises,* and *construction waste* at *construction sites*;
"*Council*"	means the Council of the *City*;
"Garbage Bag"	means a sturdy leak-proof plastic bag specifically manufactured and marketed to store *household waste* or *commercial waste* and does not include plastic bags that are intended for other purposes;
"*Garbage Receptacle*"	means a bin intended or used for the storage of *household waste;*

"Garbage Receptacle Limit"	means the number of 77 litre *garbage receptacles* or 77 litre *garbage bags* that can be placed for collection on a weekly basis by a *single family unit premise*;
"General Medical Waste"	means non-hazardous medical waste and includes soiled dressings, sponges, surgery drapes, lavage tubes, casts, catheters, disposable pads, disposable gloves, specimen containers, lab coats and aprons, tubings, filters, towels and disposable sheets, but does not include *biomedical waste;*
"*Hazardous Waste*"	means any *solid waste* presenting an actual or potential danger to human health and safety or to other living organisms in the environment, including, but not limited to any materials requiring placards or labels as identified by Transport Canada under the Transportation of Dangerous Goods Regulations or that is otherwise regulated by the Federal and/or Territorial Governments;
"Household Waste"	means all *solid waste* generated by *residential premises* except for *special waste;*
"*Householder*"	means the occupant of *residential premises,* and where such premises are unoccupied or are within an apartment house means the *owner*, manager or caretaker thereof, but does not include a boarder, roomer or lodger nor the occupant of an apartment house;
"*Inspector*"	means an *Officer* and the *Senior Administrative Officer*;

"Litter Receptacle"	means a receptacle intended for public use for the collection of litter, but in any event excludes a *container;*
"Multi-family Unit"	means five (5) or more individual *residential premises* having common structural elements;
"*Officer*"	means a *person* who is appointed in accordance with the *Cities, Towns and Villages Act* as a By-law Officer to enforce the by-laws of the *City* and any Peace Officer who is entitled by law to enforce the by-laws of the *City*;
"Oversized Load"	means a load that is wider than 3.2 metres or 10 feet and 6 inches;
"*Owner*"	means the holder of title to a piece of property;
"Person"	means an individual human being or a corporation and includes a partnership, society, and an association or a group of persons acting in concert unless the context explicitly or by necessary implication otherwise requires;
"Premise"	means a property or portion thereof capable of being occupied or used for residential or commercial purposes;
"*Public Lands*"	means all lands accessible by the general public including streets, sidewalks and parks but does not include the *Solid Waste Site*;
"*Recyclables"*	means types of *solid waste* designated for disposal at a *recycling depot* or other place designated for the disposal of this waste by either the *Senior Administrative Officer* or another order of government*;*

"Recycling Depot"	means a *City* facility or other place designated by the *Senior Administrative Officer* where segregated recyclables may be disposed of, and can include a Bottle Depot established by another order of government;
"Residential Premise"	means a *premise* or a self-contained part thereof, occupied and used as a dwelling, unless otherwise designated as a *commercial premise* by the *Senior Administrative Officer*;
"*Salvage*"	means reusable *solid waste* that has been deposited at designated areas of a *solid waste site* that are accessible to the general public;
"*Secured Load*"	means a load enclosed in a vehicle or covered with a tarpaulin or similar cover such as a mesh blanket or plywood board that completely and securely encloses the load and that is properly attached to the vehicle or trailer so as to prevent any part of the load from falling off of the vehicle or out of the trailer;
"*Senior Administrative Officer"*	means the Senior Administrative Officer of the *City*, appointed pursuant to the *Cities, Towns and Villages Act,* or his or her designate;
"Single Family Unit"	means a self-contained residential unit with its own entrance that is not accessed through another dwelling unit, but does not include a *multi-family unit premise*;
"Solid Waste"	includes any matter or material that is discarded, or is intended to be discarded*;*

"Solid Waste Contractor"	means the *person* (or *persons)* who has an existing legal right granted by the *City* for the collection, removal and disposal of *household waste* and *commercial waste,* and designated *special waste* from time to time, from *residential premises and commercial premises* in the *City;*
"*Solid Waste Facility Attendant"*	means a *person* employed by the *City* and designated to carry out specific duties by the *Senior Administrative Officer* at any *solid waste site*;

Section 2(1)
as amended by By-law No. 4436, as amended

"Solid Waste Levy"	means the applicable *Single Family Unit Solid Waste Levy* fee, the *Multi-family Unit Solid Waste Levy* fee or the *Commercial Premises Solid Waste Levy* fee as is set out in By-law No. 4436 or any successor by-law;
"*Solid Waste Site*"	means the *City* facility, or facilities, designated for the disposal of *solid waste* by the *Senior Administrative Officer*;
"Special Waste"	means any *solid waste* that exceeds the size or weight restrictions set out in this By-law for *household waste,* or: (a) *yard waste*; (b) *hazardous waste;* (c) *biomedical waste;* (d) *construction waste;* (e) *animal waste;*

(f) and includes any other *solid waste* that requires special handling as designated by the *Senior Administrative Officer* from time to time and/or the payment of specified *tipping fees* as set out in Schedule "A" including:

(i) computers (which includes monitors),
(ii) wet filled lead acid batteries,
(iii) *vehicles* and *vehicle* parts including tires,
(iv) propane tanks,
(v) white goods,
(vi) animal carcasses including parts,
(vii) hydrocarbon contaminated soil,
(viii) non-contaminated soil,
(ix) scrap steel and metal,
(x) tree branches, stumps, roots and logs, and
(xi) cooking grease from *commercial premises;*

"*Tag*" means a *tag* in the form prescribed by the *Senior Administrative Officer;*

"*Tipping Fees*" means the fees levied and collected by the *City*, for *solid waste* deposited at the *Solid Waste Site*;

"*Vehicles*" shall include all registered or unregistered motorized vehicles and any type of water or aircraft whether or not they remain capable of being operated either on a road or off-road, a water way or in the air;

Section 2(1)
as amended by By-law No. 4436, as amended

"Vehicle Charge for the Disposal of Residential Waste"	means the fee set out in By-law No. 4436 or any successor by-law;
"*White Goods*"	means a metal bath tub and any large household appliance including, but not limited to, refrigerators, freezers, stoves, dishwashers, air conditioners, washing machines, clothes dryers and hot water heaters;
"*Yard Waste*"	means *waste* from gardening or horticultural activities and includes grass clippings or cuttings, shrubbery, and hedge prunings (excluding tree branches, stumps, roots and logs) leaves, and weeds, but does not include peels, rinds or other organic material produced as a result of food preparation.

RULES FOR INTERPRETATION

3. (1) This By-law includes the Schedules annexed hereto, and the Schedules form part of this By-law.

(2) The marginal notes and headings in this By-law are for reference purposes only.

(3) Any Act, Regulation or By-law that is referred to in this By-law shall be interpreted as including any successor Act, Regulation or By-law.

(4) Each provision of this By-law is independent of all other provisions. If a Court of competent jurisdiction declares any provision invalid for any reason, all other provisions of this By-law shall remain valid and enforceable, and the By-law shall be interpreted as such.

(5) Nothing in this By-law shall be deemed to nullify, amend, supercede or repeal any provisions of the by-law(s) relating to fires or the provision of emergency services, but in the event of any conflict between such by-laws and this By-law, the provisions of this By-law shall be modified only to the extent necessary to give effect to the fire or other emergency response by-law(s); however the more stringent provisions shall be followed in any event.

PART 2 – ADMINISTRATION

AUTHORITY OF *SENIOR ADMINISTRATIVE OFFICER*

4. (1) The *Senior Administrative Officer* is authorized, at his or her sole discretion, to:

(a) require, in order to maintain the integrity of a *solid waste site* and to otherwise determine compliance with this By-law, pre-testing to be done on, or sampling to be done of, any *solid waste* placed for collection or otherwise presented or proposed for disposal to confirm the acceptability of such solid *waste* and/or to determine its composition;

(b) deny the use of a *solid waste site* and/or collection services, on either a temporary or permanent basis, to any *person* who violates any of the terms of this By-law, including failing to pay the prescribed fees set out in Schedules A & B;

(c) evaluate and certify the acceptability for disposal of any *solid waste* not specifically dealt with in this By-law, but consistent with this By-law, upon receiving a written request by a *person* proposing to use the *Solid Waste Site*;

(d) specify an acceptable time schedule, and pre-disposal conditions for the delivery of *solid waste* that might otherwise cause undue operational difficulties at the *Solid Waste Site*;

(e) reject, in order to maintain the integrity of a *solid waste site*, any *solid waste*, for any reason including, but not limited to, non-segregation of solid *waste* when such segregation is required, volume, source, contents, disposal capability of a *solid waste site* or prevailing weather;

(f) designate materials as *recyclables,* or as *special waste;*

(g) limit, restrict or make conditional back-yard composting when health or wildlife concerns arise;

(h) designate a premise having five (5) or more residential units as a *single family unit* for the purposes of collection, and to designate a premise having four (4) or fewer residential units as a *multi-family unit premise* for the purposes of the orderly collection of *household waste* including the application of the *solid waste levy*;

(i) designate a *premise* falling within the definition of a *residential premise* as a *commercial premise*, and a *commercial premise* as a *residential premise,* for the purpose of the orderly collection of *solid waste* in the *City*;

(j) grant approvals and permissions as set out in this By-law;

(k) determine the time and frequency of solid waste collection;

(l) establish specific dates from time to time when a *householder* may place specifically designated types of *special waste* for collection in a *garbage receptacle* or otherwise;

(m) designate areas at a *solid waste site* for the placement and subsequent removal of *salvage* items, in addition to designating areas at a *solid waste site* as restricted areas that are not to be assessed by unauthorized *persons*; and

(n) make any rules or regulations that he or she may deem necessary concerning the safe use and efficient operation of a *solid waste site* and the general management of solid *waste* in the *City* that do not otherwise contradict the provisions of this By-law.

AUTHORITY OF AN *INSPECTOR*

5. (1) An *Inspector* may inspect any place or thing where *solid waste* is reasonably believed to be present, including *garbage receptacles* and *container*s, and may initiate such remedial action, as deemed necessary in order to achieve compliance with the provisions of this By-law.

(2) An *Inspector* may issue a written order, if he or she finds that a *person* is contravening a provision of this By-law, directing the person to take any action or measure necessary to remedy the contravention and to prevent a reoccurrence of it.

(3) Where this By-law authorizes or requires any thing to be inspected, remedied, or done by the *City*, an *Inspector* may, after giving reasonable notice to the *householder* or *owner* of the land, vehicle or structure affected:

(a) enter the land, vehicle or structure at any reasonable time, and carry out the inspection, remedy, enforcement or action authorized or required by this By-law;

(b) require anything to be produced to assist in the inspection, remedy, enforcement or action; and

(c) make copies of anything related to the inspection, remedy, enforcement or action.

(4) The *Inspector* shall, on request, display or produce identification showing that he or she is authorized to make entry.

(5) The *Inspector* authorized to perform a task under subsection (3) need not give reasonable notice and may enter at any hour and perform a task referred to in sub-section (3) without the consent of the *householder* or *owner*, if the *Inspector* or *Council* is of the opinion that:

(a) there is imminent danger to public health or safety; or

(b) the action is warranted by extraordinary circumstances.

CHARGING BACK REMEDIAL COSTS

6. (1) Where the *householder* or *owner* of any building or *premises* who has been ordered by an *Inspector* to remedy any condition that is contrary to this By-law, and fails to comply with the order within the time specified therein, the *City* may remedy the breach and the *householder or owner* shall be liable for the costs associated with the correction thereof.

(2) Further to subsection (1), all expenses and costs incurred by the *City* in remedying the condition are a debt owing to the City by the *person* that contravened this By-law and may be recovered from the *person* in default by civil action for debt, or by charging it against the real property of which the *person* is the assessed owner in the same manner as arrears of property taxes under the Property Assessment and Taxation Act*;* and lastly they shall be in addition to, and not a substitute for, any fines or penalties to which the *person* may be subject under this By-law.

APPEALS

7. (1) Any *person* served with an order made pursuant to section 5 of this By-law, may appeal the decision to *Council* within fourteen (14) days of the date of such order and the decision of *Council* on such an appeal shall be final subject only to any applicable provision of the *Cities, Towns and Villages Act*.

(2) An appeal made under sub-section (1) shall:

(a) be in writing, stating the reasons for the appeal;

(b) be delivered to the City Clerk; and

(c) be heard by *Council* at a regular or special *Council* meeting within twenty-one (21) days from the date it is received.

(3) Where *Council* or the *Senior Administrative Officer* is of the opinion that there is imminent danger to public health or safety, they may:

(a) specify a shorter appeal period, or

(b) initiate action prior to the appeal being heard by *Council*.

(4) When hearing an appeal, *Council* may dismiss, uphold or vary the decision of the *Inspector*.

(5) Subject to subsection (3), no action on an order shall be taken until:

(a) the period for commencing an appeal has expired and no appeal has been made, or

(b) *Council* has dismissed an appeal.

AUTHORITY OF A *SOLID WASTE CONTRACTOR*

8. (1) The *Solid Waste Contractor*, or its employees or agents, has the authority to:

(a) determine, for the purposes of collection:

(i) whether a *garbage receptacle* meets the criteria established in section 10(11), and

(ii) whether the *garbage receptacle limit* has been exceeded;

(b) inspect waste from *residential* and *commercial premises* placed for collection to determine if it contains *special waste;* and

(c) refuse to collect *solid waste* that:

(i) it reasonably believes to be or contain *special waste,* or

(ii) is *household waste* set out for collection in a *garbage receptacle* or a *garbage bag* that is required to have a *tag* attached to it and does not.

PART 3 – HOUSEHOLD AND COMMERCIAL WASTE COLLECTION, STORAGE, DISPOSAL & FEES

HOUSEHOLD AND *COMMERCIAL WASTE* COLLECTION

Contracting

9. (1) The *City* may contract with any *person* and may grant an exclusive or non-exclusive right to any *person* or *persons* for the collection, removal, disposal and recycling of all or a portion of its *solid waste* on any terms and conditions that it deems to be proper and expedient, and that *person* or *persons* shall be the *City's Solid Waste Contractor(s).*

Section 9(2)
as amended by By-law No. 4436, as amended

Private Collection Contracts

(2) Subject to subsection (3) any *person* may, at their own expense, choose to deliver and dispose of their own *household waste* or *commercial waste* at a *solid waste site* during normal hours of operation; however doing so does not exempt that *person* from paying the *solid waste levy* set out in By-law No. 4436 or any successor by-law where applicable and/or other applicable tipping or other fees set out in By-law No. 4436 or any successor by-law.

(3) No *person* other than the *Solid Waste Contractor shall* directly or indirectly remove, collect and/or dispose of *household waste* or *commercial waste* within the *City* on behalf of any *owner* of a *multi-family unit* or *commercial premise* for compensation unless approved by the *Senior Administrative Officer.*

(4) Nothing in this By-law prohibits any *person* from collecting and disposing of *special waste* or *recyclables* for compensation.

General Provisions Applicable to *Household* and *Commercial Waste*

(5) No *person* shall dispose of or place for collection *household* or *commercial waste* that has not been strained to eliminate excess liquids, and such strained *household* or *commercial waste* shall be placed in a *garbage bag* that completely encloses the contents and prevents any leakage or spillage.

(6) On collection days and prior to collection, every *garbage receptacle* or *container* shall be made readily accessible from, and immediately adjacent to the lane adjoining the property from which it is to be collected and in the absence of such a lane, it shall be made readily accessible from within three (3) meters of the street adjoining such property.

(7) On collection days every *garbage receptacle* or *container* shall be kept at either ground level or at a height of not more than one (1) meter above ground level.

(8) Every person shall, immediately upon discovery or otherwise within twelve (12) hours of it occurring, clean-up and dispose of any *household* or *commercial waste* or other *solid waste* scattered or spilled by animals or whatever other means.

(9) The *City* will not be responsible for damage to *garbage receptacle*s or *containers*.

(10) The *City* will not be responsible for any damage to roads or infrastructure on a private site resulting from the operation of solid *waste* collection vehicles during *solid waste* collection activity at that private site.

(11) Where *household waste* is placed in a receptacle other than a *garbage receptacle* or a *garbage bag,* the receptacle is deemed to be *solid waste* and may be collected as such.

Section 9(12)(a)
as amended by By-law No. 4436, as amended

Provisions specific to *Household Waste* from *Single Family Unit Premises*

(12) (a) Effective January 1, 2006 a *tag* purchased for the fee prescribed in By-law No. 4436 or any successor by-law shall be affixed to residential *garbage receptacles* or *garbage bags* placed by a *householder* for collection by the *Solid Waste Contractor* in excess of the *garbage receptacle limit*.

(b) Any residential g*arbage receptacles* and/or *garbage bags* placed by a *householder* for collection in a *garbage receptacle* in excess of the *garbage receptacle limit* will remain uncollected until a *tag* is placed on it.

(13) No *person* shall place a portable *garbage receptacle* at any front yard or curbside collection location before 6:00 pm on the day prior to the scheduled collection day.

(14) Every *person* who wishes to have their *household waste* collected shall place it for collection in the appropriate location no later than 7:00 a.m. on the scheduled collection day.

(15) No *person* shall leave emptied portable *garbage receptacles,* or *solid waste* that has not been collected for any reason, at a front yard or curbside collection location later than noon of the day following collection.

Provision specific to *Household Waste* from *Multi-Family Unit Premises,* and *Commercial Waste* from *Commercial Premises*

(16) All *owners* of *multi-family unit premises* and *commercial premises* shall ensure that adequate arrangements for the timely removal and disposal of those types of *solid waste* are maintained at all times.

(17) All *owners* of *multi-family unit premises* and *commercial premises* shall ensure that collection occurs at least every two (2) weeks if food product comprises a portion of the *household* or *commercial waste* to be collected.

GARBAGE RECEPTACLES & CONTAINERS

10. (1) Every *householder* and *owner* shall provide, maintain and keep in good order, repair, safe and operable condition, sufficient *garbage receptacles* or *containers* for all *household waste* or *commercial waste* generated upon the *premises* owned or managed by them; and shall only deposit *household waste* or *commercial waste* in the *garbage receptacles* or *containers* respectively and not in any other place.

(2) Every *occupant* of *commercial premises* or *multi-family unit premises* shall dispose of their *commercial waste* or *household waste* in the container provided by the owner for that purpose.

(3) Every *owner* of *commercial premises* or *multi-family unit residential premises* shall provide sufficient *containers* for all *household waste* or *commercial waste* generated upon the *premises* owned or managed by them.

(4) *Recyclables* may be disposed of in a bin approved for this use by the *Senior Administrative Officer.*

(5) No *person* shall, directly or indirectly, place or permit any *person* to place the following types of restricted *solid waste* in their *garbage receptacle* or *container,* or in any other place except in accordance with this By-law:
(a) hot ashes or burning matter;
(b) *waste* liquids or unwrapped wet *household* or *commercial waste*;
(c) sharp objects such as broken glass, nails, knives, metal or wood splinters;
(d) individual items, other than *construction waste* segregated in a container, that are longer than 1.2 metres (4 feet) in any dimension;
(e) *biomedical waste;*
(f) *special waste;*
(g) *general medical waste,* unless it is securely contained in a *garbage bag;* and
(h) *waste* that is otherwise unsafe for the *Solid Waste Contractor* to access or handle.

(6) Notwithstanding section 10(1), a *householder* may place specifically designated types of *special waste* for collection when such an opportunity is advertised, subject to compliance with any conditions in the advertisement.

(7) Every *garbage receptacle* and/or *container* shall be kept within the boundaries of the parcel of lands on which the premises that it is provided for are situated.

(8) *Garbage receptacles* and *containers* shall be stored and maintained so as to not provide harborage for rodents or other animals in or near them. *Garbage receptacles* shall also be placed and kept in an upright condition so as to not be easily toppled and in such a manner that will prevent animals from breaking bags and/or scattering the contents.

(9) Every *householder* and *owner* providing, maintaining or keeping a *garbage receptacle* or *container* required pursuant to section 10(1), shall provide a close-fitting and otherwise good and sufficient cover for such *garbage receptacle* or *container* that is capable of keeping out animals and insects and shall keep such cover secured over the opening except when it is being filled or emptied.

(10) No *person* shall fill or permit to be filled, any *garbage receptacle* or *container* to the point where the lid or cover cannot be properly secured.

(11) (a) Notwithstanding any other provisions of this By-law, a *garbage receptacle s*hall be sufficiently strong to hold the weight of *household waste* contained therein without breaking, have handles for lifting, be constructed of sturdy water-tight material, be loaded to allow for easy and safe removal of the contents by the *Solid Waste Contractor*, be kept both clean and reasonably free of odour; and shall not exceed:

i) 25 kilograms (55 pounds) in weight when full; and

(i) subject to subsection (b), a maximum volume of no more than 77 litres.

(b) A *householder* or *owner* may use a *garbage receptacle* with a volume greater than 77 litres if the *household waste* in it is securely and completely packaged in tied 77 litre *garbage bags* and the *garbage bags* can be easily removed without lifting the *garbage receptacle.*

(12) No *householder* or *owner* shall permit *waste* to unduly accumulate on their premises.

(13) When any *garbage receptacle* or *container* has been condemned by an *Inspector* and written notice to that effect has been given to the *householder* or *owner*, the condemned *garbage receptacle* or *container* shall be removed and disposed of by the *householder* or *owner* and if this is not done by him or her, the *Solid Waste Contractor* may do so at the direction of the *Senior Administrative Officer* and any costs associated with the removal may be charged back against the *householder* or *owner* that failed to effect the removal in a manner consistent with section 6.

SPECIAL WASTE

Section 11(1)
as amended by By-law No. 4436, as amended

Segregation and Disposal

11. (1) Every *person* shall segregate *special waste* by like type and dispose of it in accordance with the terms and provisions of this By-law, and pay the fees set out in By-law No. 4436 or any successor by-law applicable to *special waste*.

Yard Waste

(2) Every *person* generating *yard waste* shall either compost it on their *premises* or shall dispose of it at a *solid waste site* in the area designated for its disposal.

Section 11(3)
as amended by By-law No. 4436, as amended

Hazardous Waste

(3) No *hazardous waste* other than the types listed with specific *tipping fees* as set out in By-law No. 4436 or any successor by-law from *commercial premises* will be accepted at a *solid waste site* without the prior written permission of the *Senior Administrative Officer.*

Biomedical Waste

(4) No *biomedical waste* will be accepted at the *Solid Waste Site*.

Construction Waste

(5) Any *person* carrying out the construction, alteration or demolition of a property or *premise* shall:

(a) remove from any portion of the street and from any other public place, adjacent to such work, all earth, rock, or *construction waste* that have been deposited thereon;

(b) maintain sufficient *garbage receptacles* or other approved *containers* on the construction site, and deposit all *construction waste* into them; and

(c) prevent *construction waste* from blowing onto other property.

(6) *Construction waste* materials shall be separated by like type, in order to be deposited in specific locations within the *Solid Waste Site*.

(7) *Construction waste*, such as asbestos or other *hazardous waste* originating from construction sites shall only be disposed of in accordance with the provisions of this By-law.

Animal Waste

(8) No *animal waste* will be accepted at the *Solid Waste Site*; and it shall be disposed of at the *City* facility designated for its disposal by the *Senior Administrative Officer.*

LITTER

12. (1) No *person* shall litter by depositing, disposing of, or leaving *solid waste* on *public lands* or on private lands within the *City*.

(2) *Litter receptacles* shall only be used for the disposal of litter, and not *household waste*, *commercial waste*, or *special waste*.

(3) No unauthorized *person* shall damage or remove a *litter receptacle*.

(4) (a) Any *person* who directly or indirectly sponsors public events on *public lands* or waters shall:

(i) provide *litter receptacles* within the event confines at the minimum ratio of one (1) – 77 litre capacity *litter receptacle* or an equivalent for every fifty (50) people in attendance;

(ii) have the contents of the *litter receptacles* removed and/or collected as often as required so as to comply with the provisions of this By-law, but in any event no less than once per day;

(iii) have all the *litter* within the site collected as soon as is practicable once the event has ended, but in any instance no longer than four (4) hours after the event has ended; and

(iv) contain and collect any and all litter both on the site and blowing off the site.

(b) Failure to comply with subsection (4)(a) is an offence and in addition to any fine imposed may result in the offender being denied the opportunity of sponsoring a similar event in the future, which decision shall be made by the *Senior Administrative Officer*.

(5) (a) The *owner* of:

(i) a convenience store, a fast food restaurant, a drive-through restaurant, a school, or a gas station,

(ii) any retail outlets in excess of 5000 square feet, and

(iii) any other *commercial premises* that the *Senior Administrative Officer* has directed in writing to maintain *litter receptacles* on the basis that the activities on the *commercial premises* are likely to generate litter;

shall ensure that there are sufficient *litter receptacles* on the *premises* and shall further ensure that they are:

(i) maintained in good condition;

(ii) weighted or anchored so they cannot be inadvertently overturned;

(iii) of suitable size and at sufficient locations to discourage litter; and

(iv) emptied into a *container* when full.

RECYCLABLES AND *RECYCLING DEPOTS*

13. (1) An occupant may deposit *recyclables* in the designated collection areas at a *solid waste site* during the normal hours of operation. Alternatively, a *householder* may deposit recyclable materials at any time in designated *recycling depots* placed at various locations within the *City.*

(2) No *person* other than an occupant of a *residential premise* may deposit *recyclables* in a designated *City recycling depot*. *Recyclables* from a *commercial premise* may be deposited at a *solid waste site* in a designated area other than a *recycling depot* upon payment of the applicable fee as set out in Schedule "A".

(3) *Recyclables* that are deposited at a *recycling depot* shall be separated and disposed of as directed by the *Senior Administrative Officer*.

(4) No *person* shall dispose of any materials in *recycling depots* other than those items for which the *recycling depot* is clearly identified.

(5) No *person* shall enter or access a *recycling depot* or the designated area for *recyclables* at a *solid waste site* for an improper purpose including, but not limited to salvaging, scattering, searching through, or burning *recyclables* or other *solid waste*.

SOLID WASTE SITE

Authority of *Solid Waste Facility Attendants*

14. (1) The *solid waste facility attendants* that are present at a *solid waste site* at any time are deemed to be the designates of the *Senior Administrative Officer* for the purposes of the supervision and control of the *Solid Waste Site*, including conducting inspections and providing directions.

(2) Every *person* utilizing a *solid waste site* shall obey all signs, posted regulations and directions of the *solid waste facility attendants.*

(3) Every *person* seeking to enter the area of a *solid waste site* beyond the scale shall, upon request to do so by a *solid waste facility attendant*, declare the type or types of solid *waste* that constitute their load for disposal.

(4) A *solid waste facility attendant* may inspect any vehicle and/or load arriving at a *solid waste site* for the purpose of ensuring compliance with the provisions of this By-law and such inspection can include automated radiation detection, visual and manual inspection, use of hand held test instruments and the taking of samples for the purpose of laboratory or other further inspection.

(5) When a load is selected for inspection the vehicle operator shall either comply with the directions of a *solid waste facility attendant* or shall immediately remove the load from the *Solid Waste Site*.

(6) A *solid waste facility attendant* may instruct a vehicle operator to deposit the load in a designated holding area, may request information regarding the nature and the source of the load, and may request that the vehicle operator sign a statement confirming the accuracy of the information given.

(7) Where a *solid waste facility attendant* or an *Inspector* determines through inspection and testing that a load of solid *waste* is unsuitable for acceptance at the *Solid Waste Site,* he or she shall inform the vehicle operator or other appropriate *person* of the results and that *person* shall, as soon as it is practicable to do so, transport the load from a *solid waste site* to another *solid waste* processing site that is licensed and otherwise able to accept it.

(8) If the *person* does not comply with the direction to remove and relocate the load as soon as is practicable, the *City* may arrange for the immediate transport and proper disposal of the load and to further assess a penalty pursuant to Part 5 of this By-law.

(9) Where a load is determined by a *solid waste facility attendant* or an *Inspector* to be unsuitable for disposal at a *solid waste site* the *person* attempting to dispose of the load will be liable for all related costs incurred by the City including:

(a) inspection costs;
(b) laboratory analysis costs;
(c) hauling, disposal, and facility decontamination costs where applicable; and
(d) any other related costs.

Non-payment of Fees

(10) The *City* may suspend acceptance of *solid waste* loads from any *person* with outstanding fees, charges or penalties.

Segregation of Waste

(11) Every *person* accessing a *solid waste site* shall segregate their *solid waste* so as to allow for its disposal into the appropriate area designated by the *Senior Administrative Officer*, or as otherwise required by the *Senior Administrative Officer*.

(12) At a *Solid Waste Site*, every *person* shall deposit *solid waste* in the areas designated for that type of solid waste by the *Senior Administrative Officer*.

Supervision of Children

(13) Every *person* that accesses a *solid waste site* and is accompanied by a child shall provide direct supervision for that child, and anyone that fails to do so is both guilty of an offence and may be directed to leave a *solid waste site* by a *solid waste facility attendant.*

Public Access Areas

(14) Public access at a *solid waste site* shall be limited to the *recycling depots*, *salvage* area, designated areas of the building identified as the Baling Facility, and such other areas as may be designated from time to time by the *Senior Administrative Officer*.

Smoking

(15) No *person* shall smoke in the Baling Facility as it is a facility operated by the *City*. Smoking otherwise at a *solid waste site* is only permitted in areas designated as such by the *Senior Administrative Officer*.

Salvage

(16) (a) Salvageable materials shall be separated in order to be deposited in specific designated locations within the *Solid Waste Site*.

(b) Any *person* may retrieve salvageable materials, at their own risk and expense, from the designated *salvage* area at a *solid waste site* during normal hours of operation; but no person shall remove any *solid waste,* whether it is *salvageable* or not, from an area of a *solid waste site* that has not been designated by the *Senior Administrative Officer* as being accessible to the public.

(c) The *City* does not provide an express or implied warranty as to the fitness of salvaged materials for a specific or any purpose.

(d) No *person* shall *salvage* or otherwise remove or attempt to remove a complete or near complete vehicle from a *solid waste site* without first being authorized to do so in writing by the *Senior Administrative Officer*.

FEES

Section 15(1)(2)(3)(4)(5)
as amended by By-law No. 4436, as amended

15. (1) Every *owner* of *residential premises* or *commercial premises,* the *Solid Waste Contractor* and any other person disposing of *solid waste* shall pay the fees and charges applicable to them as set out in By-law No. 4436 or any successor by-law.

(2) The *Solid Waste Levy* fee set out in By-law No. 4436 or any successor by-law covers basic collection and disposal costs.

(3) The *Vehicle Charge for the Disposal of Residential Waste* is applicable to all residential *vehicles* that enter a *solid waste site* for the purpose of disposing of *solid waste*, but does not apply to those residential *vehicles* only containing tagged *household waste* or those entering a *solid waste site* for the purpose of engaging in authorized *salvaging*.

(4) During any period that the weigh scale is inoperable either due to planned maintenance or repair or if otherwise specified as such by the *Senior Administrative Officer,* the Supplementary Tipping Rates established in By-law No. 4436 or any successor by-law shall apply for loads that otherwise would be assessed fees on a weight basis.

(5) Notwithstanding subsection (3), the *Senior Administrative Officer* may suspend the requirement for the payment of the *Vehicle Charge for the Disposal of Residential Waste* fee for a one (1) week period three (3) times each year.

(6) All fees and charges payable by a *person* under this By-law are a debt owing to the City and may be recovered from a *person* in default by civil action for debt.

PART 4 – GENERAL PROVISIONS

BURNING OF *HOUSEHOLD OR COMMERCIAL* OR OTHER *SOLID WASTE* MATERIAL

16. No *person* shall burn any *waste* material in the *City* unless that person has a *burn permit* issued to them authorizing them to do so.

Section 17
as amended by By-law No. 4436, as amended

PROGRAM SOURCE OF FUNDING

17. The source of funding for all costs associated with the *City's solid waste* management system that will be incurred as a result of this By-law are the fees and charges set out in By-law No. 4436 or any successor by-law in addition to transfers from the General Fund, or any other Fund as directed by Council.

LIABILITY WAIVER

18. Any *person* using a *solid waste site* shall do so at their own risk, and neither the *City* nor its *Council*, *officers* or employees shall be liable for any claims for damages for injury or damage to any *persons* or property arising from the operation of the *solid waste* management system.

PART 5 – GENERAL PROHIBITIONS & ENFORCEMENT

GENERAL PROHIBITIONS

19. (1) No *person* shall supply false or misleading information or make inaccurate or untrue statements in any document or information required to be supplied to the *Senior Administrative Officer*, a *solid waste facility attendant* or an *Inspector* pursuant to this By-law.

(2) No *person* shall dispose of solid *waste* at a *solid waste site*, or access a *solid waste site* except during the posted normal hours of operation.

(3) (a) No *person* shall use, or permit to be used, any vehicle or trailer for the conveyance or storage of *solid waste* unless such vehicle or trailer is fitted with a cover such as a tarpaulin, a mesh blanket or plywood board that is secured to the vehicle or trailer and is capable of preventing the dropping, spilling or blowing off of solid *waste* while it is being stored in, or transported by, the vehicle or trailer.

Section 19(3)(b)
as amended by By-law No. 4436, as amended

(b) Without limiting the ability of the *City* to proceed with enforcement action against a *person* transporting solid *waste* that is not covered as per Section 25(4) (a) the fee to be charged for all loads of solid *waste* that are either uncovered or improperly covered that arrive at a *solid waste site* shall be double the fee(s) set out in By-law No. 4436 or any successor by-law.

(4) No *person* other than the *owner* or a *person* with the *owner's* express or implied consent shall pick over, interfere with, disturb, remove or scatter any *household* or *commercial waste* howsoever placed for collection unless authorized to do so by the *Senior Administrative Officer* for the purposes of collection, ensuring compliance with the provisions of this By-law or conducting research on the composition of solid *waste* placed for collection.

(5) No *person* shall fail to comply with the order or direction of an *Inspector,* and nothing in this By-law relieves a *person* from complying with any federal or territorial law or regulation, other by-law or any other requirements of any lawful permit, order, consent or other direction.

(6) No unauthorized *person* shall access any area of a *solid waste site* not designated as being accessible by the general public.

SUMMARY CONVICTION OFFENCE - STRICT LIABILITY OFFENCE

20. (1) Any *person* that contravenes any provision of this By-law by:

(a) doing any act or thing that the *person* is prohibited from doing, or

(b) failing to do any act or thing the *person* is required to do, is guilty of an offence, and any offence created pursuant to this By-law shall be considered to be a strict liability offence.

(2) Any *person* who is convicted of an offence pursuant to sub-section (1) is liable on summary conviction:

(a) in the case of a corporation, to a fine not exceeding $10,000; or

(b) in the case of an individual, to a fine not exceeding $2,000, or to imprisonment for a term of not more than six (6) months in default of payment of the fine.

CONTINUING OFFENCE

21. In the case of an offence that is of a continuing nature, a contravention constitutes a separate offence in respect of each day, or part of a day, on which it continues and a *person* guilty of such an offence is liable to a fine in an amount not less than that established by this By-law for each such day.

JOINT AND SEVERAL LIABILITY OF OWNERS FOR FINES, FEES AND CHARGES

22. Whenever there are fines, fees or charges payable pursuant to this By-law and there is more than one *owner* of the property to which they apply, each shall be jointly and severally liable for their payment.

MINIMUM AND SUBSEQUENT FINES

23. (1) The minimum fine that may be imposed for a contravention of a particular section of this By-law shall be the specified penalty applicable for a first offence against the particular section, as set out in column one of Schedule "C".

(2) Where a *person* is convicted of a second, third, or subsequent offence against a particular section of this By-law, and where those offences have occurred within any twenty-four (24) month period, the specified penalties applicable to the second, third and subsequent offences shall be those amounts set out in columns two and three, respectively, of Schedule "C".

VIOLATION TICKET

24. Where an *Officer* reasonably believes that a *person* has contravened any provision of this By-law, the *Officer* may serve upon the person a violation ticket, in the form provided under the Summary Conviction Procedures Act, and such *person* may, in lieu of prosecution, pay the *City* the voluntary penalty set out in Schedule "C" for the offence, prior to the court date specified on the violation ticket. This section shall not prevent any *Officer* from issuing a violation ticket requiring a court appearance of the defendant, pursuant to the provisions of the Summary Conviction Procedures Act or from laying an Information in lieu of issuing a violation ticket.

OTHER PENALTIES

25. In addition to any fine that may be levied, a court may order a *person* convicted of an offence under this By-law:

(a) to pay any fee or charge that may otherwise be payable by the *person* to the *City* in respect of any licence or permit that should have been obtained by the *person;*

(b) to pay any costs that the *City* is entitled to in respect of the offence; and

(c) to do or refrain from doing any activity that the court may specify.

PART 6 - REPEALS

26. Garbage By-law No. 3761, 3871, 4064, 4099, 4350 and Solid Waste Levy By-law No. 4345 are hereby repealed.

PART 7 – EFFECT

27. Except where otherwise expressly stated in this By-law, this By-law shall come into effect upon receiving Third Reading and otherwise meeting the requirements of Section 75 of the *Cities, Towns and Villages Act*.

CITY OF YELLOWKNIFE
BY-LAW NO. 4376
SCHEDULE “A”

Schedule A
deleted by By-law No. 4436, Feb 12/07

CITY OF YELLOWKNIFE
BY-LAW NO. 4376
SCHEDULE “B”

TAG FEE, GARBAGE RECEPTACLE LIMIT & *SOLID WASTE LEVY*

Schedule B
deleted by By-law No. 4436, Feb 12/07

CITY OF YELLOWKNIFE
BY-LAW NO. 4376
SCHEDULE "C"

VOLUNTARY PENALTIES

Offence	**Section**	**Penalty**		
		1st Offence	**2nd Offence**	**3rd Offence**
Maintaining *garbage receptacles* or *containers*, or the unauthorized disposal of waste	10(1), 10(2) & 10(3)	$300.00	$450.00	$600.00
Disposing of restricted *solid waste* in a *garbage receptacle* or *container*	10(5)	$200.00	$350.00	$500.00
Permitting *solid waste* to unduly accumulate on *premises*	10(12)	$200.00	$350.00	$500.00
Littering	12(1)	$200.00	$350.00	$500.00
Depositing *residential* or *commercial waste* in a *litter receptacle*	12(2)	$200.00	$350.00	$500.00
Damaging or removing a *litter receptacle*	12(3)	$200.00	$350.00	$500.00
Failing to provide sufficient *garbage receptacles* at a public event, collect the *garbage* in them or contain *waste* on the site	12(4)	$500.00	$750.00	$1000.00
Unauthorized use of *recycling depots* or designated recycling areas	13(1) - 13(5)	$200.00	$350.00	$500.00
Unauthorized *salvage* in a restricted area of the *Solid Waste Site*	14(16)(b)	$200.00	$350.00	$500.00

Offence	**Section**	**Penalty**		
		1st Offence	**2nd Offence**	**3rd Offence**
Unauthorized burning of *solid waste*	16	$500.00	$750.00	$1000.00
Providing false or misleading information	19(1)	$200.00	$300.00	$400.00
Accessing or disposing of *waste* at a *solid waste site* outside posted hours of operation	19(2)	$300.00	$450.00	$600.00
Unsecured load	19(3)	$150.00	$250.00	$350.00
Picking over, interfering with, disturbing, removing or scattering any *waste* from/at *residential* or *commercial premises*	19(4)	$200.00	$350.00	$500.00
Failure to comply with the order or direction of an *Inspector*	19(5)	$300.00	$450.00	$600.00
Unauthorized access to a restricted area at the *Solid Waste Site*	19(6)	$200.00	$350.00	$500.00
Doing any other act or thing that the *person* is prohibited from doing or failing to do any act or thing that the person is required to do	20(1)	$100.00	$150.00	$225.00

APPENDIX C

Solid Waste Facility Maintenance Checklists

CITY OF YELLOWKNIFE
SOLID WASTE MANAGEMENT FACILITY
SAFETY INSPECTION

Date: _____

Inspection Team: _____

Instructions

1. Supervisors are to perform inspection in area(s) of responsibility
2. Supervisors must involve workers in the inspection process
3. Inspection items that can not be corrected immediately must be reported in the **Inspection Report**
4. All fields in the **Inspection Report** must be completed
5. Use the **Comment** area to provide positive feedback not only items needing attention (e.g. workers wearing appropriate personal protective equipment or Good housekeeping in the shop area)
6. Incomplete **Inspection Reports** will not be accepted and returned to facility manager to be completed.

Item	Control Room- look for:	Y/N	Location	Action Required
1	– General areas free of excessive storage – Fire extinguishers in good condition			
2	– First aid kit(s) available & stocked; – First aid attendant list is current and posted			
3	Fire extinguishers in good work order and charged			
4	Extension cords are not used			
5	Floors – Free of trip, slip fall hazards – Absent of crack and chips			
6	Aisles and walkways are clear and unobstructed			
7	Exits – Clear and unobstructed – Signs are posted and illuminated			
8	Lighting – Walking/working areas adequately illuminated – Light fixtures working			

Other comments

_____

_____

_____

Item	Exterior/building entrances- look for:	Y/N	Location	Action Required
9	– Sidewalks, entrances are clear of snow/debris – Exterior lights are working			
10	All doors are in working order			
11	Fire hydrants are accessible			
Item	**Furnace/electrical rooms: look for:**	**Y/N**	**Location**	**Action Required**
12	Electrical room – Free of combustible material – Free of flammable liquid			
13	Electrical panel – Clear of obstruction, in good condition – Panel is closed			
14	Furnace room – Free of combustible material – Free of flammable liquid – Heat detector is present			
Item	**Material Storage (Baling floor)- look for:**	**Y/N**	**Location**	**Action Required**
15	Shelving secured and stable			
16	Heavy material is stacked on the bottom shelves			
17	Flammable and combustible materials are stored appropriately			

Other comments

_____

_____

_____

Item	Emergency- look for	Y/N	Location	Action Required
18	Emergency evacuation plan available			
19	Emergency evacuation routes posted			
20	– First aid kit(s) available & stocked; – First aid attendant list is current and posted			
21	– Eyewash solution (i.e. eyewash stations) available – Emergency showers working (if available)			
22	Fire extinguishers in place and inspected monthly; inspected annually; visible and in good condition			
23	Fire drill conducted (when?)			
Item	**Kitchen- look for**	**Y/N**	**Location**	**Action Required**
24	Bulletin board clean and readable			
25	First aid kit stocked First aid list up-to-date			
26	Adequate lighting			

Other comments

_____

_____

_____

Item	Hazardous materials- look for:	Y/N	Location	Action Required
27	Containers are properly labeled; labels are legible			
28	Containers are in good condition			
29	Incompatible materials are stored separately; stored in approved cabinets			
30	Hazardous material are stored below eye level			
31	Unused Compressed gas cylinders restrained and caped			
32	MSDS are available and current			
Item	**Personal protective equipment- look for:**	**Y/N**	**Location**	**Action Required**
33	Employees wearing eye protection, hearing protection, visibility vest, footwear, hardhats, harnesses			
Item	**Log books are up to date- check if inspection books are completed**	**Y/N**	**Location**	**Action Required**
34	Trucks, graders, loaders, dozers, skid steers, etc			

Other comments

_____

_____

_____

Item	Machinery & machine guarding- look for:	Y/N	Location	Action Required
35	Baler fixed guards are secured in position			
36	Dangerous parts are guarded			
37	Defective machine, tools, and guards tagged and put out of service – where applicable			
38	Emergency “STOP” clearly identified and operational			
39	Machinery and guards in good repair			
Item	**Welding- look for:**	**Y/N**	**Location**	**Action Required**
40	Welding tanks are properly secured from tipping			
41	Gauges and tanks visibly in good condition			
42	Hoses and cables neatly coiled and protected			
43	Fire extinguisher immediately available			
44	Hoses, torch tip, and cables are in good condition			
45	Cylinders stored upright and secured against falling over; cylinders are legibly marked; in good condition			
46	Cylinders stored away from heat sources			
47	Unused cylinders: Caps in place and hand tight			

Other comments

_____

_____

_____

SOLID WASTE INSPECTION REPORT

Item	Action Required	Hazard Class* (A, B, C)	Person Responsible	Target Date	Initial & date when Complete (manager)

Item	Action Required	Hazard Class (A, B, C)	Person Responsible	Target Date	Initial & date when Complete (manager)

	Description
A (Major)	Likely to cause permanent disability, loss of life or body part, loss of structure/equipment/material
B (Serious)	Likely to cause serious injury and temporary disability or damage
C (Minor)	Likely to cause minor, non-disabling injury/illness or non-disruptive damage

LIGHT VEHICLES: PICKUPS AND CARS
OPERATOR'S INSPECTION REPORT

UNIT	HOURS	KM	DATE
Last Service off PM Card ☞			

1. Needs Attention
2. Road Worthy
3. Not Applicable

1 2 3	**Inspect Appearance Condition**
❑❑❑	Inspection body for damage
❑❑❑	Check tires for cuts, bruises & pressure
❑❑❑	Check lights/beacon
❑❑❑	Check for indication of oil leaks

Before Starting Engine

❑❑❑	Check oil level (fill as required)
❑❑❑	Check coolant system
❑❑❑	Check hose condition
❑❑❑	Check all drive belts
❑❑❑	Check accessories (as applicable)

Before Operating Vehicle

❑❑❑	Check all gauges
❑❑❑	Check horn
❑❑❑	Check windshield wipers/washers
❑❑❑	Check glass and mirrors
❑❑❑	Check foot/hand brake
❑❑❑	Check PM card for next servicing

1 2 3	**During Operation**
❑❑❑	Check all gauges particularly oil & temperature. Do not operate if temperature is high, oil pressure is low or unusual noise occurs.

At End of Use

Report all irregularities on this form
Turn off all lights and accessories
Check for indication of any leaks
Fuel tank filled
Cab clean

Other Equipment

❑❑❑	Fire extinguisher
❑❑❑	First Aid Kit
❑❑❑	Other:_____
	_____
❑❑❑	Other:_____
	_____

COMMENTS:

Operator: Supervisor:

Complete monthly inspection and return form to the attention of Murray Ryder, Fleet Supervisor, PW-O&M
Fax: 669-3421

DOCS no. 135399

Heavy Duty Equipment Operator's Daily/Shift Inspection Report

Unit No.	Next Service Due	Hours	Kilometers	Date (d/m/y)

❑ Loader ❑ Grader ❑ Sweeper ❑ Excavator ❑ Skid Steer ❑ Dozer ❑ Packer ❑ Forklift

Needs Attention / Road Worthy / Not Applicable

Inspect Appearance Condition

- ❑❑❑ Inspect body for damage or cracks
- ❑❑❑ Check tires for cuts, bruises & pressure
- ❑❑❑ Check rim wheel lugs
- ❑❑❑ Check for indication of oil leaks
- ❑❑❑ Check cutting edge/bucket teeth
- ❑❑❑ Check accessories & tools secure

Before Starting Engine

- ❑❑❑ Check oil levels (fill as required)
- ❑❑❑ Check coolant system
- ❑❑❑ Check hose condition
- ❑❑❑ Check all drive belts
- ❑❑❑ Check air filter restriction indicator & pre-cleaners
- ❑❑❑ Check hydraulic oil/brake/steering fluid
- ❑❑❑ Check fuel
- ❑❑❑ Check accessories (as applicable)

Attachments/Supplies

- ❑❑❑ Grease gun
- ❑❑❑ Cleaning supplies
- ❑❑❑ Adjustment tools
- ❑❑❑ Attachment used:

Inspect Before Operating Vehicle

- ❑❑❑ Grease all hinge points daily
- ❑❑❑ Check moldboard for looseness
- ❑❑❑ Check glass & mirrors
- ❑❑❑ Check windshield wipers/washers
- ❑❑❑ Check Horn

Safety Equipment

- ❑❑❑ Fire extinguisher
- ❑❑❑ First Aid Kit
- ❑❑❑ Operator's Manual
- ❑❑❑ Warning Triangles/Reflectors

Needs Attention / Road Worthy / Not Applicable

After Engine Start Up

- ❑❑❑ Check all gauges
- ❑❑❑ Check safety warning devices/signs
- ❑❑❑ Check foot/hand brake
- ❑❑❑ Check brake operation
- ❑❑❑ Check air system operation & leaks
- ❑❑❑ Check for oil leaks
- ❑❑❑ Check all lights/beacons/light bars
- ❑❑❑ Check broom (burn test)
- ❑❑❑ Broom adjust

At the End of Shift

> Report all irregularities on this form<

- Fill fuel tanks
- Turn off master switch
- Drain air tanks as applicable
- Empty box/hopper
- Clean cab
- Fill water tank

Material/Supplies Used

Parts/materials used: _____

_____

_____

Fuel _____ Liters

Oil added: _____

Hydraulic oil added: _____

Antifreeze added: _____

Other: _____

_____

_____

Comments/Irregularities: _____

_____

_____

_____

_____

Operator (print):	Supervisor (print):

614650/0111

Wire tier & Harris baler Daily / Shift Inspection

Strap cycles:_____ **Bale count:**_____ **Hour reading:**_____ **Date:**_____

Solid waste:_____ **Cardboard:**_____ **Boxboard:**_____ **Tin:**_____

Shred paper:_____ **Plastics:**_____ **White goods:**_____ **News:**_____

Safety statement: Each employee performing preventative, scheduled or repair maintenance on any piece of equipment shall abide by any and all Governmental and company policies relating to the safe operation of this specific unit.

Make sure that equipment is locked out/ tagged out before inspection

Inspect Appearance Condition
Yes / No -Inspect body for damage or cracks
Yes / No -Check for indication of oil leaks
Yes / No -Check for loose bolts
Yes / No -Check limit switches
Yes / No -Check wire (enough to finish shift)
Yes / No -Check track springs and bolts for tightness

Clean / Blowout
Yes / No -Lasers / proximity switches
Yes / No -Feed Wheels
Yes / No -Track / Head (every 4 hours)
Yes / No -Coolant / Radiator
Yes / No -Wire coil
Yes / No -Entire baler/ Motor/ Oil tank

Before Starting
Yes / No -Do not start if oil temp is below 50 F
Yes / No -Check oil level (rams retracted)
Yes / No -Check hose condition
Yes / No -Check all guards and safety covers
Yes / No -Oil twister gear SAE20oil (every 4 hours)
Yes / No -Oil pinion bushing SAE20oil (every 4 hours)

After Starting
Yes / No -Check hydraulic oil filter indicator
Yes / No -Check for oil leaks
Yes / No -Check all gauges
Yes / No -Check safety warning devices
Yes / No -Check emergence stops

End of shift
Yes / No -Empty hopper
Yes / No -Retract all rams
Yes / No -Clean work space
Yes / No -Remove all foreign objects under rams
Yes / No -Lock out
Yes / No -Check oil temp_____F

Material / Supplies Used
Parts/ materials used: _____

_____

_____

Hydraulic oil added: _____

Report any problems that are detected to supervisor immediately

Comments / Irregularities:

_____

_____

_____

_____

_____

_____

_____

Operator (print):

Supervisor (print):

APPENDIX D

Wildlife Management Plan

City of Yellowknife
Solid Waste Facility

Wildlife Management Plan

June 2008

Revised: January 2009
March 2010
March 2011
February 2012
February 2013
February 2014

1.0 Introduction

In 2008, the City of Yellowknife received a "Wildlife Hazard Assessment and Integrated Wildlife Management Plan for the Yellowknife Solid Waste Facility" from Beacon Environmental. A copy of the report is available on the City's website at www.yellowknife.ca.

The Integrated Wildlife Management Plan (IWMP) has a variety of recommendations for operational measures that should be implemented in order to reduce the number of birds at the landfill, thus lowering the wildlife hazards they pose. The City implemented the program using a phased in approach which enabled the more costly recommendations to be implemented into the City's budgeting procedures.

2.0 IWMP Implementation

From 2008 to 2010 the City put into place the operational measures recommended in the IWMP. Once these measures were put into place, they became part of the landfill's Operation and Maintenance Plan. The following list summarizes when the operational measures were implemented.

2008

- Baling facility kept doors closed as often as possible
- Discontinued sending unbaled waste into the landfill on Statutory Holidays
- Covered food waste with intermediate cover
- Implemented scare methods including pyrotechnics, propane cannons and hunter effigies
- IWMP sent to Transport Canada for review and comment
- IWMP sent to GNWT Department of Transportation (airport manager) for review and comment
- Discussed IWMP with airport personnel and began coordination of wildlife management activities

2009

- Honey Bag Pit closed to the public and replaced with a closed bin at the landfill for public use
- Implementation of a 2 year composting pilot project which removes organic items from the general waste stream
- applied for kill permit
- Began work on a 3 cell controlled salvaging system

2010

- Implementation of 3 cell controlled salvaging
- Implementation of cull techniques

3.0 Goals of the IWMP

There are two key aspects of the IWMP that will greatly aid in its effectiveness. The first is limiting the availability of food for birds. The second is active wildlife management which uses scare and cull techniques to make the birds view the SWF as a hazardous area.

In 2012, the City began disposing of waste in the newly constructed second generation landfill cell, located in the quarry north of the existing landfill. Due to the location of this new cell and other activities occurring in the area, active wildlife management has not been a primary source of wildlife control at the new cell. Limiting food availability has been the focus for this cell.

3.1 Limit Food Availability

Most birds currently at the landfill are using it as a feeding ground. In order to change this, it is necessary to make all possible food sources as scarce as possible. By implementing the recommendations from the IWMP, the City has been able to reduce the amount of food available.

The use of the new landfill cell for waste disposal has allowed the use of better bale stacking techniques which limit the size of the active face of the landfill, thus reducing the amount of food available for birds. Bales are also covered as soon as possible. This is the primary method of bird control currently being used at the new landfill cell.

In addition, 2014 will see the beginning of the city-wide curbside composting initiative. This program will be rolled out over the next 4 years and will result in a large percentage of the city's food wastes being diverted from the landfill to the compost facility. This will further reduce the amount of food available for the birds at the landfill site in future years.

3.2 Active Wildlife Management

Active Wildlife Management involves measures to physically or psychologically deter birds from using the landfill. Scaring and culling techniques comprise this aspect of the IWMP.

As outlined in the IWMP there are numerous scaring techniques that can be used in order to deter birds from staying at the landfill. These include the use of pyrotechnics, propane cannons and hunter effigies. The City began implementing scare techniques in fall 2008, closely following the IWMP created by Beacon. Detailed information regarding the kinds of pyrotechnics used can be found in section 10.2.1 of Beacon's report.

The IWMP also recommends the use of culling in order for the scaring techniques to prove continuously effective. While the City is not in favour of this technique, it is recognized that this

is necessary in order to achieve an effective wildlife management program, as has been proven in other areas.

In 2008 and the beginning of 2009, the City solely used scaring techniques to deter birds from staying at the landfill. It became evident by the end of April 2009 that scare techniques were no longer effective in reducing bird numbers. The City applied for and received a cull permit, in June 2009, however, due to unforeseen circumstances, culling was not implemented during the 2009 season. In 2010 the City implemented scaring and culling techniques at the beginning of the season and found it advantageous in deterring birds. In 2011 the City continued using scaring and culling techniques and found the number of juvenile birds at the landfill had reduced significantly when compared with 2010. The number of birds culled at the landfill in 2011 was significantly less than in 2010, proving the implementation of the IWMP in its entirety had a positive effect on the number of gulls at the landfill.

In 2012, with the move to the new landfill cell for disposal of baled waste, active wildlife management for bird control was reduced due to the feasibility of using the techniques. The new cell is located amidst two operating quarries which limits the active wildlife management techniques that can be used. In addition, staffing issues at the Solid Waste Facility resulted in insufficient staff to handle the active management techniques at the old Landfill cell.

In 2013, more staff was available so both active and passive management techniques were employed. In the new landfill cell, due to the proximity to the operating quarries, the main control technique continues to be limiting the available food supply through proper bale stacking methods and applying cover as soon as possible to any exposed surfaces. In the old landfill cell, similar methods were employed along with active techniques including scaring and culling of birds. The City will continue using scare and cull techniques to deter birds from the landfill and will limit the amount of food available to reduce wildlife hazards.

4.0 Public Involvement

The City was in consultation with the public beginning in March 2008 to inform and educate about the wildlife hazards at the landfill and the reasons behind creating the IWMP.

The City has posted signs at the landfill to inform the public of the active wildlife management that is occurring.

5.0 Conclusion

Since the recommendations from the IWMP have been implemented, the City has been able to reduce wildlife hazards at the SWF. Using both passive and active wildlife management techniques, including scaring and culling, is necessary to reduce the wildlife hazards to a level as low as it can possibly be.

APPENDIX E

Landfill Fire Control and Risk Reduction Plan

Yellowknife Landfill
Control & Risk Reduction Plan




PREPARED FOR: YELLOWKNIFE

PREPARED BY: LANDFILL FIRE CONTOL INC.

July 2007

LFCI –PRJ07002

City of Yellowknife
Landfill Fire Control and Risk Reduction Plan

Executive Summary

Introduction and Overview

If not controlled, landfill fires can threaten the health of landfill staff and residents in surrounding neighbourhoods. They can lead to undesirable impacts on the environment in terms of emissions of toxic pollutants to the air and groundwater.

To minimize the risk of a fire occurring at the **Yellowknife Landfill Facility**, and to establish protocols for quick control and extinguishment of any fire that does develop, the City of Yellowknife retained Landfill Fire Control Inc. to prepare a comprehensive **Landfill Fire Control and Risk Reduction Plan**. To ensure that the contents of the plan are effectively communicated to solid waste staff and fire fighters who would be expected to respond in the event of a fire emergency, the project scope also included provisions for a training program.

In recent years the Yellowknife Landfill has been experiencing a landfill fire at least once a year. Since 1993 80% of the disposed waste has been baled and the remaining waste has been landfilled utilizing the area fill method and filling in the seams between the bales. Soil resources are very sparse since most of the region is comprised of barren bedrock. Thus, cover material is sparse and is frozen for 8 months of the year. Therefore, cover material is only applied during the summer months this increases the risk of landfill fire. Additionally, unrestricted salvaging of C&D from the active face is commonly practiced and further increases risks for landfill fires.

In order to be better prepared for a landfill fire, especially if a major landfill fire should occur, and more importantly, to operate the landfill in a manner that will reduce the risk of a fire occurring to the greatest extent possible, The City of Yellowknife retained Landfill Fire Control Inc. to prepare this document and to provide a full day of landfill fire training to YKL staff and all interested fire fighters who may be called upon in the case of a fire emergency.

Landfill Fire Audit

Dr. Tony Sperling and Sharon Tenenbaum of Landfill Fire Control Inc. conducted the Landfill Fire Audit on May 9th and 10th, 2007.

During the Audit, high and moderate fire risk areas were identified. The high fire risk areas include:

- Public Drop-off Bins (reactive loads, hot loads)
- Public Salvaging Area (smoking, hot loads)
- Salvaging C&D Active Face
- MSW Loose Active Face (reactive loads, hot loads, smoking)

Moderate fire risk areas include:

- Baling Facility
- C&D Active Face
- MSW Public Drop Off Facility
- MSW Baled Active Face

Risk Management Plan

Following the Audit, Landfill Fire Control Inc. prepared a Landfill Fire Control and Risk Reduction Plan. The 12 chapter Plan is summarized below:

1. **Introduction and Plan Overview:** This chapter documents the primary objectives of this Fire Plan, outlines the project scope and summarises how the project was initiated.
2. **Site Orientation:** This chapter documents where the landfill is located relative to the City of Yellowknife and within the NWT. A brief overview of the Plan's objective and scope is outlined.
3. **Fire Fighting Resources:** This chapter provides a summary of available resources that can be called upon to control and extinguish a landfill fire. The primary resources include the YKL on-site staff and equipment, and YK Fire Department resources from The Municipality.
4. **Landfill Fire Alert Levels:** In Chapter 4, examples of fires in each alert level are provided and step-by-step checklists of appropriate actions to deal with each type of incident are summarized.
5. **Incident Command Structure:** Effective response to fire emergencies, especially Medium and Large fires, requires a well co-ordinated team effort between landfill staff, fire fighters, regulators and speciality support teams. Chapter 5 presents the Incident Command Structure, which was developed by fire departments to deal with major emergencies, and lends itself to the management of landfill fire emergencies.

6. **Forms and Sample Checklists:** Chapter 6 contains a compilation of action checklists for group leaders and staff involved in a fire emergency. A list of action items is provided for each of the four expected levels of fire alerts.
7. **Evacuation:** Evacuation of landfill staff, nearby residents, even transients travelling past the landfill, may be required under worst-case conditions. The plan identifies three levels of evacuation.
8. **Fire Fighting Methods:** Chapter 8 reviews the ways landfill fires are typically ignited and then discusses methods available to fight landfill fires.
9. **Fire Detection:** Fires eventually occur at most landfills. However, detecting fires quickly and responding to fire emergencies in the correct manner can significantly reduce the risk of major landfill fires costing hundreds of thousands, even millions of dollars to extinguish.
10. **Personal Protective Equipment:** Chapter 10 reviews required personal protective equipment for fire-fighting staff.
11. **Minimizing Fire Risk:** Preventing landfill fires from occurring is the key objective of this Fire Plan and parallel training program. Measures that can be used to reduce the risk of fires are identified. Our recommendations are discussed in detail in various chapters of the Plan. Interested parties who may have limited time to read the plan in detail should focus on Chapter 11 as it contains a summary of all recommendations.
12. **Communications, Security and Contacts:** Effective on-site communications between the various groups in the Incident Command Structure are essential to effectively co-ordinate a response. Hand held radios working on the same frequency should be provided to all commanders and group leaders. A comprehensive contact list of resources is provided.

Summary of Recommendations

Our recommendations are contained in the individual Chapters of this Plan. They are also summarized here for convenience.

- Loose MSW be thoroughly compacted to a depth of about 2 to 3 m on the outside slope of all bale stacks and brought up to a slope of 3H:1V.
- A minimum 300 mm of inert cover soil for all intermediate covers, and preferably that 500 mm of compacted cover be used.
- To be most effective, operational cells of the landfill should be fully compartmentalized with soil cover on all four sides, top and bottom. At LFCI, we recommend that cells not exceed 5,000 m^3.
- Waste disposal services should be provided with only one active face for MSW and one active face for DLC disposal, with the disposal areas supported by a small vehicle transfer station (40 yard bins) and the baling facility tipping floor.

- The public salvage area and the unbaled MSW active face should be decommissioned.
- The public should be allowed to enter only the small vehicle transfer station and a dedicated recycling facility. All other disposal and recyclable storage areas should be closed to public access.
- A stockpile of soil sufficient to fully cover the operating face be maintained near the active face at all times. Based on the recommended active face dimensions, about 200 m^3 of soil should be kept at the active face at all times.
- An on-site tanker truck should be kept full of water at all times.
- Compliant hand held radios working with the YK Fire Department frequencies be available for use in the event of a fire.
- Yellowknife Landfill and Baling Facility implement a strict no-smoking policy at the landfill, except in designated smoking areas.
- The City of Yellowknife appears to have a strong commitment to safety training. Regular fire safety training should continue to be an on-going part of that program. Recommended activities include annual fire drills, possibly including live fire extinguishment exercises.
- The YKL should have 2 SCBA's for staff protection as well as a PID gas detector and hand held infra-red sensor on site for fire detection.

Recommended Fire Control Strategy for the Yellowknife Balefill

Due to limited cover and numerous operating areas at the Yellowknife Balefill, the risk of landfill fire is occurring is high. Although staff operate a quality bale fill operation, we believe there remains a need to modify soil cover strategies to allow for year round placement of inert fire walls. One option used at Hartland Landfill in Victoria would be to use crushed gravel for cover material. Small fires will probably continue to occur unless more frequent cover and more effective waste screening are used. Small fires should be extinguished with water and foam, or they can be suppressed with a soil cover and then overhauled. We recommend keeping a ready supply of soil at the active face for this purpose.

If larger fires do occur, water application will likely not be effective as a result of the good compaction effort achieved in bales and the ability for fire to travel deeper into the landfill in the air space between bales. Stingers may prove effective in some situations. In addition it is likely that due to the method of stacking bales in the fill, short circuiting of water will likely occur between bales and may prevent water from soaking the entire mass of material on fire.

Oxygen suppression will likely be the preferred strategy for fire control on major fires, with overhaul as the fall-back fire fighting strategy. In the event that a major fire does develop, we recommend that landfill fire control experts be consulted to develop an incident specific strategy to fight the fire most effectively. Additional information about the above recommendations may be found in the Plan or by directing questions to Landfill Fire Control Inc..

CITY OF YELLOWKNIFE FIRE CONTROL AND SAFETY PLAN

1. INTRODUCTION AND OVERVIEW

If not controlled, landfill fires can threaten the health of landfill staff and residents in surrounding neighbourhoods, as well as lead to undesirable impacts on the environment in terms of toxic emissions of pollutants to the air and groundwater.

To minimize the risk of a fire occurring at the Yellowknife Landfill (YKL), and to establish protocols for quick control and extinguishment of any fire that does develop, The City of Yellowknife has retained Landfill Fire Control Inc. to prepare a comprehensive Landfill Fire Risk Management Plan. To ensure that the contents of the plan are effectively communicated to Yellowknife staff and fire fighters who would be expected to respond in the event of a fire emergency, the project scope also included provisions for a training program.

1.1 BACKGROUND

The existing Yellowknife Landfill is licensed under Water Licence No. N1L3-0032 (May 30, 2002) granted by the Mackenzie Valley Land and Water Board in accordance with the Northwest Territories Waters Act, The Board approved the renewal of the Water Licence for a period of eight years expiring May 30, 2010.

The Yellowknife Landfill is a municipal landfill site that services residents in Yellowknife, and surrounding area. The landfill is situated along Ingram Trail in the northeast of Yellowknife. The landfill has been operating since 1974. It occupies an area of 17.8 Ha. The average waste thickness is 30 m. The site typically receives approximately 20,000 tons of refuse per year, including about 10,000 tons of municipal solid waste and 10,000 tons of Construction and Demolition (C&D) waste. The YKL is expected to continue landfilling at the existing site for 4-7 years. Expansion options are currently being explored by Dillon Consulting and the City of Yellowknife's Engineering Department to prolong the lifespan of the site. Figure 1-1 provides a site location map of the Yellowknife Landfill.

The landfill has been developed within the east-west trending bedrock valley that was reportedly up to 25 m deep. Bedrock ridges, comprised of coarse granitic bedrock for the north perimeter, as well as the southern property perimeter. The bedrock is typically glacially covered with non to little top soil, except in the valley bottoms where muskeg has accumulated in water filled depressions.

In recent years the Yellowknife Landfill has been experiencing a landfill fire at least once a year. Since 1993 80% of the disposed waste has been baled and the remaining waste has been landfilled utilizing the area fill method and filling in the seams between the bales. Soil resources are very sparse since most of the region is comprised of barren bedrock. Thus, cover material is sparse and is frozen for 8 months of the year. Therefore, cover material is only applied during the summer months this increases the risk of landfill fire. Additionally, unrestricted salvaging of

C&D from the active face is commonly practiced and further increases risks for landfill fires.

In order to be better prepared for a landfill fire, especially if a major landfill fire should occur, and more importantly, to operate the landfill in a manner that will reduce the risk of a fire occurring to the greatest extent possible, The City of Yellowknife retained Landfill Fire Control Inc. to prepare this document and to provide a full day of landfill fire training to YKL staff and all interested fire fighters who may be called upon in the case of a fire emergency.

1.2 PROJECT SCOPE

The project scope involved three specific elements, which are as follows:

1. Completion of a Landfill Fire Audit;
2. Preparation of the Landfill Fire Risk Management Plan; and,
3. Focused Training addressing Landfill Fire Issues and the Yellowknife Landfill Fire Plan.

The Landfill Fire Audit was carried out by Dr. Tony Sperling, P. Eng. and Sharon Tenenbaum, P. Eng of Landfill Fire Control Inc. on May 9th and 10th, 2007. During the two-day visit, they were shown all aspects of landfill operations by Bruce Underhay (Landfill Manager).

Landfill fire training will be conducted on July 30th , 2007 at the YKL. To provide opportunity for the maximum number of landfill staff and fire fighters to participate. The city is encouraged to notify staff resources well in advance and to schedule crews so that the greatest number of potential first responders will be given an opportunity to participate.

1.3 FIRE CONTROL AND RISK MANAGEMENT PLAN OVERVIEW

This plan is divided into 11 topic specific sections, which are as follows:

1. Introduction and Plan Overview
2. Site Orientation
3. Fire Fighting Resources
4. Landfill Fire Alert Levels
5. Incident Command Structure
6. Fire Response Actions and Responsibilities
7. Evacuation
8. Fire Fighting Methods
9. Fire Detection
10. Personal Protective Equipment
11. Contact Information
12. Minimizing Fire Risk

The following paragraphs provide a summary of the key information presented in each section of this plan.

1. **Introduction and Plan Overview:** This chapter documents the primary objectives of this Fire Plan, outlines the project scope and summarizes how the project was initiated. A summary of the key information in each subsequent chapter is also provided.

2. **Site Orientation:** This chapter documents where the landfill is located in Yellowknife and its location relative to the Fire Hall that will provide fire fighting support. A brief history of site development dating back to 1974 is outlined. All major on-site facilities are then listed, including:

    - Scale House and Reception Area
    - Baling Facility (meeting room is Incident Command Centre, Administration Parking Lot is Evacuation Muster Point).
    - Public Drop Off Bins
    - Public Recycling Depot
    - Used Oil Tanks Area
    - MSW Active Face
    - Contaminated Soil Stockpile
    - Public Salvaging Area
    - Baled Tires Area
    - C&D Active Face – Restricted to Public Access
    - C&D Active Face – Open to Public Access

    Operational procedures of the various waste handling areas that are pertinent to developing fire control strategy at each facility are then reviewed.

    High and moderate fire risk areas are identified. The high fire risk areas include:
    - Public Drop-off Bins (reactive loads, hot loads)
    - Public Salvaging Area (smoking, hot loads)
    - Salvaging C&D Active Face
    - MSW Active Face (reactive loads, hot loads, smoking)

    Moderate fire risk areas include:
    - Baling Facility
    - C&D Active Face
    - MSW Public Drop Off Facility
    - MSW Active Face

    Water supply points are then identified. The primary source of fire fighting water at the

landfill is obtained from the Fire Department water truck. There are no water hydrants on site; the nearest hydrant is approximately 2.4 kilometres down the road near the Explorer Hotel. Additional supply can be provided by the Airport fire trucks for a major fire on site. Additionally, the pond (Slough) located southwest portion of the site with the approximate capacity of 12,000 m^3 of water can be utilized. A high pressure trash pump, with sufficient hose to deliver the water to any location on the landfill crest should be available for quick set up by the fire department.

Potentially hazardous areas include:

- Active Face: puncture and pathogen hazard, traffic area.
- Compactor Working Floor. Trip hazard, fire and smoking hazard
- Oil and Chemical Barrel Disposal Area. Potential for reactive chemicals.
- Asbestos Disposal Area: air-borne asbestos hazard.
- Petroleum Contaminated Soils Area: high levels of volatile organic compounds.
- Refuelling Area: potential for fuel spills.
- Equipment Maintenance Facility: potential for fuel spills, solvent vapours.
- Landfill Side Slopes: roll-over hazard.

3. **Fire Fighting Resources:** This chapter provides a summary of available resources that can be called upon to control and extinguish a landfill fire. The primary resources include YKL's on-site staff and equipment and the local Fire Department of the City of Yellowknife. In total, approximately 20 fire fighters and, 2 pumper trucks and assorted support equipment such as ambulances, HAZMAT teams, attack trucks, air filling stations, light plants could be mobilized, if required. Based on our experience on major fire projects, we anticipate that maximum resource demand would likely be 2 pumpers and 20 fire fighters. Table 3-1 presents a summary of Primary Fire Fighting Resources.

Contractor resources would likely be called in only during Level 3 and Level 4 Alerts to provide additional heavy equipment support, to install gas monitoring wells, thermistors and/or water injection stingers and to provide long term SCBA trained fire fighters during a protracted fire fight. Security could also be contracted in a long-term fire situation.

Supplier resources are required to replenish safety supplies, to provide Class-A foam and to provide catering services. Air quality testing is another resource that is often required during a larger fire situation to determine whether use of SCBA equipment is necessary. Air Quality testing by the Dept. Of Energy and Natural Resources or the WCB air quality hygienist will provide initial testing.

4. Landfill Fire Alert Levels

This plan distinguishes four levels of fires at landfill sites, including:

Level 1 Alerts: Small fires occurring on landfill property but not actually involving landfilled refuse, wood waste or stockpiled recyclables, e.g. car fires, bin fires, equipment fires, office fires.

Level 2 Alerts: Small refuse fires that can be contained by on-site resources within 24 hours and fully extinguished within 48 hours. Level 2 fires will typically involve less than 200 m^3 of burning material.

Level 3 Alerts: Medium size refuse fires or large fires at compost facilities that can be contained in less than one week and that can be fully extinguished in less than two weeks. Typically, 500 to 2,500 m^3. of waste material are involved.

Level 4 Alerts: Large or deep seated landfill fires that require more than two weeks to contain, typically involving more than 2,500 m^3 of burning refuse.

In Chapter 4, examples of fires in each alert level are provided and step-by-step check lists of appropriate actions to deal with each type of incident are summarized. In particular, the following safety precautions are emphasized.

- ❑ DO NOT PANIC.
- ❑ Safety comes first.
- ❑ Evacuate all public and workers from the danger zone.
- ❑ Report the incident, call 873-2222.
- ❑ Do not fight a fire alone, always use the buddy system.
- ❑ Never risk personal injury or death attempting to save a machine or building.
- ❑ Wear safety equipment (boots, gloves, glasses, high visibility clothing, helmet; refer to Chapter 10).
- ❑ Be aware of possible toxicity of smoke. As a minimum, use recommended, fit tested half face respirator (Refer to Chapter 10).
- ❑ When operating a piece of heavy equipment, work with a spotter in radio communication, especially when visibility is limited.

5. Incident Command Structure

Effective response to fire emergencies, especially Level 3 and Level 4 fires requires a well-coordinated team effort between landfill staff, fire-fighters, regulators and speciality

support teams. The Incident Command Structure developed by fire departments to deal with major emergencies lends itself to the management of landfill fire emergencies. The Incident Command Structure developed for the YKL is described in Chapter 5 and conveniently summarized in Figure 5-1.

Key elements of the Incident Command Structure and the designated group leaders include:

• Incident Commander	Darcy Hernblad
• Site Commander	On Duty Deputy Fire Cheif
• Fire Fighting Group	Darcy Hernblad
• Landfill Staff and Equipment Group	Ross Torraville / Bruce Underhay
• Health and Safety Group	Chucker Dewar
• Logistics Support Group	Ross Torraville
• Finance Support Group	Director of Corporate Services
• Public Relations Support Group	Greg Kehoe
• Regulatory Support Group	Doug Gillard
• Engineering Support Group	Dennis Kafalas (City of YK Engineering Department)

To control and extinguish any fire at YKL quickly and safely, it is vital that all participants in the landfill fire-fighting team work together in a co-operative manner, and focus on doing the best possible job in the duties that they are assigned as part of the fire-fighting team. For, example, the entire fire fighting effort can come to a grinding halt if the Logistics Coordinator fails to ensure sufficient fuel is on hand to run equipment.

6. Fire Response Actions and Responsibilities

Chapter 6 contains a compilation of action checklists for group leaders and staff involved in a fire emergency. A list of action items is provided for each of the four expected levels of fire alerts.

7. Evacuation

Evacuation of landfill staff, nearby residents, even transients travelling past the landfill may be required under worst-case conditions. This plan identifies three levels of evacuation, as follows:

1. Local hazard evacuation (e.g. fire in a building, fire at refuelling area, fire at active face);
2. Landfill site evacuation (intense smoke from a fire situation) and

3. Regional evacuation of residents and transients if smoke plume or fire presents a hazard to residents in down-wind direction.

In a Level 1 (Local) evacuation, protocols in the YK evacuation plan should be followed.

In a Level 2 (Landfill Site) evacuation, landfill gates should be closed to non-essential traffic, all public should be escorted from the landfill property and all staff should muster at the Administration Office parking lot for a "head count".

In a Level 3 (Regional) evacuation, the City of Yellowknife Evacuation Plan should be implemented under direction of the Incident Commander, and with support from the Municipal Enforcement Division.

8. Fire Fighting Methods

Chapter 8 reviews the ways landfill fires are typically ignited and then discusses methods available to fight landfill fires. The basic fire fighting methods discussed include:

- Oxygen Suppression (suffocating fire with dirt)
- Water Extinguishment (cooling fire with water)
- Overhaul (excavating burning material, then extinguishing in safe area)

The advantages and disadvantages of each approach are explored, and suggestions are made as to when each type of fire fighting method is most likely to be successful.

9. Fire Detection

Fires occur at landfills. However, detecting fires quickly and responding to fire emergencies in the correct manner can significantly reduce the risk of major landfill fires costing hundreds of thousands, even millions of dollars to extinguish. Chapter 9 describes the methods that can be used to provide the earliest possible warning of the possible presence of a fire situation, including:

- Recognizing visual signs
- Temperature monitoring
- Landfill gas composition monitoring
- Landfill settlement

10. Personal Protective Equipment

Chapter 10 reviews required personal protective equipment for fire-fighting staff. Basic requirements for field staff working in the fire zone are:

- Fire Resistant Overalls
- Bunkering Gear (for those working near flames and hot spots)
- Safety Footwear
- Fire Resistant Work Gloves
- Helmet or Hard Hat
- Eye Protection (Safety Visor or Safety Glasses)
- Respiratory Protection (Half Face Respirator, Full Face Respirator, or SCBA)

The issue of appropriate respiratory protection is explored in detail. First, the parameters of concern are summarized. These include carbon monoxide (CO), hydrogen sulphide (H_2S), methane (CH_4), organic vapours, fine particulate matter and dioxins, amongst others. Basic procedures for assessing air quality are then reviewed. In a fire emergency, a trained occupational hygienist should be retained to test air quality and to assess the appropriate level of respiratory protection. At minimum, all staff should wear half face respirators with appropriate filters (see Chapter 10). Every attempt should be made to stay up-wind of the fire zone. If eyes, throat or lungs become irritated or a headache develops, then the affected workers should clear the area immediately.

11. Minimizing Fire Risk

Preventing landfill fires from occurring is a key objective of this Fire Plan and parallel training program. Measures that can be used to reduce the risk of fires include:

- Waste screening for potential hot loads at the scale, and inspection for hot loads at the active face;
- Proper compaction of waste to limit oxygen entry;
- Implementation of progressive closure and good cover maintenance;
- Compartmentalization of waste, using adequate daily and intermediate cover comprised of inert mineral soil;
- Maintaining adequate soil resources near the active face to fight a fire;
- Maintaining sufficient water resources available to fight a fire;
- A smoking ban, especially at the refuelling area, baler building, landfill active face, wood waste, public salvage and propane container disposal areas;
- Periodic testing of landfill gas monitoring wells for oxygen entry, elevated temperatures and presence of carbon monoxide;

- Good site security to prevent arson; and
- An ongoing commitment to training all landfill staff and fire fighters in fire safety awareness.

12. Communications, Security and Contacts

Effective on-site communications between the various groups in the Incident Command Structure are essential to effectively coordinate a response. Hand held radios working on the same frequency must be provided to all commanders and group leaders.

As well, in the initial stages of a fire fight heavy equipment should work with spotters who are in continuous radio contact with the operators.

Off-site communications will be achieved via telephone, with e-mail as back up. A comprehensive contact list of resources is presented in Table 12-1.

1.4 Distribution List

Copies of the YK Landfill Fire Risk Management Plan will be distributed on to landfill staff, fire-fighters, regulators and others attending the one day Landfill Fire Training Course. The following is a partial distribution list. An updated list will be prepared by Landfill Fire Control Inc. on completion of the training program.

1. Incident Commander	Darcy Hernblad	YK Fire Department
2. Site Commander	On- Duty Deputy Fire Chief	YK Fire Dept.
3. Fire Fighting Group	Darcy Hernblad	YK Fire Department
4. Landfill Staff and Equipment Group	Ross Torraville / Bruce Underhay	
5. Health and Safety Group	Merlin Klassin	City of YK
6. Logistics Support Group	Ross Torraville	City of YK
7. Finance Support Group	Director of Corporate Services	City of YK
8. Public Relations Support Group	Greg Kehoe	City of YK
9. Regulatory Support Group	Doug Gillard	City of YK
10. Engineering Support Group	Dennis Kefalas	City of YK
11. Landfill Fire Specialist	Dr. Tony Sperling	LFCI
12. Landfill Fire Specialist	Jarvis Jackson	LFCI
13. Yellowknife Fire Dept.	Darcy Hernblad / Reid Douglas	
14. Yellowknife Police Office	Doug Gillard	City of YK Enforcement Division
15. Air Quality – City of Yellowknife		Air Quality Engineer
16. YK Dept. of Natural Resources Supervisor	James Sticker	Field Office
17. Yellowknife Office Copy 1		

18. Yellowknife Office Copy 2
19. Yellowknife Office Copy 3
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30. _____
31. _____

Landfill Fire Control Inc.
#8 - 1225 East Keith Road
North Vancouver, B.C. V7J 1J3
Phone: (604) 986-7723
Fax: (604) 986-7734

CLIENT:

CITY OF YELLOWKNIFE

PROJECT:

YELLOWKNIFE LANDFILL FIRE CONTROL AND RISK REDUCTION PLAN

TITLE:

YELLOWKNIFE LANDFILL SITE LOCATION PLAN

SCALE:	DATE:	PROJECT NO:
N.T.S.	2007/06/21 yyyy/mm/dd	LFCI 07002
DESIGNED	ST	DRAWING NO:
DRAWN	ST	**FIGURE 1-1**
CHECKED	TS	

10. PERSONAL PROTECTIVE EQUIPMENT

Safety of all fire-fighting staff is paramount during a fire emergency. The objective of this chapter is to provide basic recommendations for protective equipment, particularly respiratory protection. The following is a suggested list of protective equipment for field staff involved in a fire-fight.

- Fire Resistant Overalls
- Bunkering Gear (for those working near flames and hot spots)
- Safety Footwear
- Fire Resistant Work Gloves
- Helmet or Hard Hat
- Eye Protection (Safety Visor or Safety Glasses)
- Respiratory Protection (Half Face Respirator, Full Face Respirator, or SCBA)
- Hearing Protection (for those working in or near equipment)
- High Visibility Safety Vest
- Personal Flashing Strobe Lights for All Staff (when working in dark)

10.1 Fire Resistant Overalls

Equipment operators and landfill staff assisting in the fire fight are not expected to work in areas where exposure to flame or intense heat is likely. Therefore, wearing of bunkering gear is not considered essential. Nevertheless, some protection from fire is recommended. We have found that a reasonable compromise is to provide flame retardant overalls, either Nomex or less expensive treated cotton (e.g. Indura) for equipment operators and field staff.

Photo 10-1 Tony Sperling of Landfill Fire Control Inc. Measuring Gas Composition In Israel, Note Overalls

10.2 Bunkering Gear

For staff working close to the active fire, or in areas where there may be a risk of underground fire collapse (where numerous vents, fissures or collapse features are already present) fire resistant bunkering gear should be worn. Bunkering gear shall meet the requirements of NFPA 1971-1975 "Protective Clothing for Structural Fire Fighting". The clothing shall be tear resistant and withstand temperatures up to 500°F for five minutes. We recommend that YK Landfill obtain four complete sets of bunkering gear. The opportunity to obtain used bunkering gear from a front line fire department such as Yellowknife fire department should be explored.

Photo 10-2 Jarvis Jackson of Landfill Fire Control Inc.Wearing Bunkering Gear While Using Thermister

10.3 Footwear

Protective footwear shall be worn by all field staff. Equipment operators and those not walking directly in the fire area may wear approved safety boots or shoes with steel toes, steel shanks and heavy weight, puncture resistant soles. Those working in the fire zone shall wear protective footwear shall meet requirements of OSHA 1910.136 for Class 75 footwear, and providing protection from fire, puncture and abrasion.

10.4 Gloves

Hand protection shall be provided to staff working in the fire zone. The protective glove or glove system shall meet the requirements of the National Institute for Occupational Health (NIOSH) 1976 publication "The Development of Criteria for Fire Fighter's Gloves; Vol. 2 Test Methods" and shall meet the stated criteria for cut, puncture and heat penetration and fire resistance. Equipment operators shall wear heavy duty industrial leather gloves, or better.

10.5 Head, Eye And Face Protection

Fire-fighters and other staff working directly in the fire zone or with pressurized hoses, pumps shall wear approved head and face protection systems which meet Model Performance Criteria for Structural Fire Fighters' Helmets, as specified in OSHA §1910.6 and protective eye and face devices which comply with OSHA §1910.133. Full face pieces, helmets or hoods of breathing apparatus which meet §1910.134 are also acceptable.

Equipment operators and support staff not working directly in the fire zone shall wear approved hard hats, together with safety glasses or helmet mounted visors at all times.

Photo 10-3 Jarvis Jackson of Landfill Fire Control Inc. with Proper Head and Eye Protection

10.6 High Visibility Safety Vests

Visibility in a fire situation can be very limited, especially at night. This is condition is made even more hazardous with irregular, unstable footing. High visibility safety vests or turnout gear with safety reflective striping shall be worn by all staff involved in the fire-fight. Landfill Fire Control Inc. recommends that as extra protection staff working outside of heavy equipment be equipped with high intensity personal strobes such as are provided with marine survival suits.

Photo 10-4 Weyerhaeuser Employee Demonstrating Fire Equip. Note Safety Vest

10.7 Respiratory Protection

The appropriate level of respiratory protection shall be provided to all staff responding to a landfill fire. The level of protection will depend on the chemical composition of smoke being generated by the fire; the distance work is being conducted relative to fire, and wind direction. We recommend that a determination of appropriate respiratory protection shall be made by a qualified Industrial Hygiene Specialist experienced with air quality in landfill fire situations and that the specialist assess air quality on a priority basis.

Photo 10-5 Cat Operator Wearing SCBA

As a minimum, Landfill Fire Control Inc. staff test air quality to ensure that sufficient oxygen is available and that hydrogen sulphide (H_2S), carbon monoxide (CO) and methane (CH_4) are not present in hazardous concentrations. These tests can be conducted with a standard PID detector.

In addition, we conduct air quality testing using an Organic Vapour Analyser (OVA) to ensure that excessive levels of airborne organic compounds are not present.

Photo 10-6 Tony Sperling of Landfill Fire Control Inc. Wearing North Half Face Respirator

If conditions are acceptable for their use, Landfill Fire Control Inc. staff typically utilize half face respirators using NORTH Defender TM cartridges Part No. 75SCP100 meeting NIOSH - AM/CD/CL/FM/HC/HS(esc.)/MA /OV/SD/P100.

If the user experiences the odor, taste or any irritation from a contaminant while wearing a half face respirator, the user must immediately leave the contaminated area and change cartridges before continuing work. If symptoms continue or if air quality testing establishes that contaminant concentrations are outside performance levels of the half face respirator filters being worn then full self contained breathing apparatus protection (SCBA) shall be required for

all fire-fighters and equipment operators working in the fire zone. It is Landfill Fire Control Inc.'s recommendation that there be at least 2 SCBA's on site. It has been the experience of Landfill Fire Control Inc. staff that SCBA protection has not been required in most MSW and C&D fire situations once the fire is knocked down.

10.7.1 Methane

Methane is produced as a by-product of MSW and C&D decomposition. Methane is an odourless, tasteless gas that is highly combustible and explosive at concentrations of 5 to 15% (volume basis) in air. Workers fighting a landfill fire should be aware of the hazards associated with ignition of methane. Work areas should always be scanned to ensure that methane concentrations are less than 5%, the lower explosive limit (LEL).

10.7.2 Hydrogen Sulphide

Hydrogen Sulphide is a strongly toxic gas that is dangerous at concentrations as low as 10 ppm. At very low concentrations H_2S is associated with a "rotten eggs odor"; however, human olfactory senses are overcome at concentrations above 100 ppm. H_2S causes headaches above 10 ppm, eye injury above 50 ppm and a serious life threat above 300 ppm. Additional details are provided in Table 10-1. Workers should always scan work areas for H_2S, especially in any confined spaces and monitoring wells.

10.7.3 Carbon Monoxide

Carbon Monoxide (CO) is produced during combustion in atmospheres deficient in oxygen. CO is a toxic gas that causes headaches at concentrations above 100 ppm, and dizziness, nausea, collapse and possible death at concentrations above 500 ppm. The stronger the CO concentrations, the more rapid the above symptoms as the ability of hemoglobin to absorb oxygen becomes depleted. Additional details are provided in Table 10-2. Workers should always scan work areas for CO, especially near active burn areas, in any confined spaces and monitoring wells.

Photo 10-7 Automatic Alarm Sensors for Toxic Gases

10.7.4 Dioxins

Dioxins, more correctly known as polychlorinated dibenzo para-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are organic chemicals that are highly toxic and cause serious health effects such as cancer, birth defects, reproductive and developmental problems. Dioxins are extremely long lasting molecules that remain in the environment and bio-accumulate in the fatty tissue of humans as well as other life forms. Dioxins can travel great distances in air currents.

Dioxins are produced when organic materials are burnt in the presence of chlorine. For example, PVC, is a common plastic found in MSW and C&D waste that contains both organic materials and chlorine. Dioxins are known to be produced through low temperature chemical processes, including disposal of MSW. Dioxins can also be produced by thermal processes including MSW combustion or incineration. Although typically generated at combustion above 800°C (1472°F) dioxins can be produced at lower combustion temperatures.

Dioxins occur at extremely low concentrations are very difficult and expensive to analyse. Rather than testing for dioxins, Landfill Fire Control Inc. staff assume that dioxins may be present and wear respiratory protections at all times when working a landfill fire, except when there is a need to communicate.

The recommended respirator to provide protection from low level dioxin exposure is a NIOSH approved half face respirator equipped with a combination filter cartridge for organic vapour. acid gas, HCl, SO_2 and a high efficiency particulate filter. The above referenced NORTH cartridge used by Landfill Fire Control Inc. meets the recommended performance standard.

10.7.5 Respiratory Protection Summary

It has been the experience of Landfill Fire Control Inc. staff that air quality in the work areas generally does not contain life threatening concentrations of toxic gases, except in landfill vents, gas wells and confined spaces. Nevertheless, we recommend that caution always be exercised to confirm that air quality is acceptable and that a qualified Industrial Hygiene Specialist assess air quality on a priority basis.

10.8 Hearing Protection

Approved hearing protection shall be worn by all equipment operators and fire-fighters working near heavy equipment and diesel pumps.

11. MINIMIZING FIRE RISK

Although the majority of this Fire Risk Management Plan focuses on responding to actual landfill fires, a key objective of this report is to provide the City of Yellowknife Landfill staff with a good understanding of landfill fire mechanics so that fire prevention and fire risk reduction will become second nature and part of the day-to-day operations at the Yellowknife Landfill. Activities such as waste screening, minimizing number of active face areas, thorough compaction, application of intermediate cover, progressive closure with final cover, site security enforcement, enforcement of a no-smoking policy and a quality training program already go a long way to preventing a FIRE ALERT situation at the Yellowknife Landfill.

Photo 11-1, Major Fire at Yellowknife Landfill

In the opinion of Landfill Fire Control Inc. (LFCI), the Yellowknife Landfill Facility has several areas that are at high risk of experiencing a fire, including the public drop-off bins (to be installed), public salvaging area, and the MSW loose active face. A large stockpile of tires posed a very high risk of fire. After a major fire in the facility tires are now baled and distributed around the site (see Photo 11-1). Facilities that are considered moderate risk include the bailing facility, C&D active face (Photo 11-2) and the MSW baled active face.

Only safety awareness, diligent screening and prompt well coordinated response will ensure that the risk of fire at these facilities will be maintained as low as possible.

Photo 11-2 Bulldozer Compacting C&D Waste

11.1 Waste Screening

Waste screening for fire risk should start as soon as a haul truck or car enters the landfill. The scale attendant should be observant of any loads from which smoke is emanating. They should also keep an eye out for drums, canisters or bags of chemical powders and containers that have WHMIS decals. These containers may contain chemicals that could potentially react, resulting in spontaneous combustion of the refuse after burial. Asking the driver about the source of his waste may also be beneficial in identifying potential problems; for example, ash from a recently cleaned out incinerator or burn barrel, demolition waste from a house fire, and chemicals such as spent bleaching earth, linseed oil, etc. could potentially contain hot embers or reactive materials that could spark a new fire.

Spotters at the MSW active face need to be observant when identifying loads at the active face.

When a load is questionable:

- The load should be sent to designated waste screening area at which the contents can be dumped and inspected. Typically a lined structure complete with leachate collection pit so that it can be used for hazardous waste screening as well.
- Any hot material should be thoroughly wetted until all of the material is less than 50°C (122°F) before it is pushed onto the active face.

Spotters and equipment operators in the baling facility should also be on the lookout for the same indicators. In the event that questionable material is dumped in a bin or on the tipping floor, then the entire contents of the bin should be immediately moved to the designated waste screening area. At the active face, the material should be unloaded on inert soil, spread out and checked for reactive chemicals and elevated temperatures before it is pushed onto the active face and compacted.

11.2 Compaction

By ensuring that the waste is thoroughly compacted, and that large bulky items are removed or thoroughly compacted, the void ratio in the waste can be dramatically reduced. As the void ratio decreases, the amount of air trapped in the waste, and the ability of additional air to migrate through the waste, is dramatically reduced. Remember back to the fire triangle, without oxygen, a fire cannot exist. Four photographs below illustrate the difference between poorly compacted C&D and MSW waste that poses a fire hazard and properly compacted waste.

Photo 11-3 Old Days at Burns Lake B.C.

Photo 11-4 MSW Active Face at Metro Park East

Photo 11-5 Active Face at Delta Shake Before Fire

Photo 11-6 C & D Active Face at MPE

The majority of waste disposed of at the Yellowknife landfill is compacted to a high density in the baling facility. Because oxygen entry into the bales is limited, the bales themselves are at low risk of ignition; however, voids between bales provide an opportunity for air to intrude deep into the fill and initiate a spontaneous combustion fire. Also, uncovered bales, as illustrated in Photo 11-7 pose a high risk of a surface fire quickly spreading.

Photo 11-7. MSW Bales stacked without proper cover at Yellowknife

To reduce the risk of fire within the baled facility, LFCI recommends that loose MSW be thoroughly compacted to a depth of about 2 to 3 m on the outside slope of all bale stacks and brought up to a slope of 3H:1V. The smooth, well compacted outside surface should then be covered with 300 mm of inert intermediate cover soil, as discussed below.

11.3 Intermediate Cover And Cell Compartmentalization

It has been the experience of LFCI staff that internal firebreaks of inert soil are effective in preventing the spread of landfill fire. To be effective, the firebreaks must be of sufficient thickness to insulate overlying refuse and prevent it's combustion and to prevent rapid migration of hot combustion gases into adjacent cells. Although no published research has been conducted on this topic to our knowledge, at this time we recommend a minimum 300 mm of inert cover soil for all intermediate covers, and preferably that 500 mm of compacted cover be used.

Photo 11-8 Encapsulated Cell Under Construction at Delta Shake

Either clay, silt or sand can be used for intermediate cover. Clay is most effective at inhibiting air entry when first compacted; but it is prone to cracking, which could reduce its effectiveness once waste settles. Sand on the other hand is somewhat more pervious to air intrusion, but is less prone to cracking and self-healing. Since Yellowknife has limited on-site soil reserves, mostly originating from contaminated soil brought to the landfill site, cover materials must be used wisely for maximum benefit.

When placing intermediate cover it is important that it be placed in uniform lifts, and that organic material such as refuse, wood chips, tire shreds, etc. not be mixed into the cover.

To be most effective, operational cells of the landfill should be fully compartmentalized with soil cover on all four sides, top and bottom. At LFCI, we recommend that cells not exceed 5,000 m^3.

Currently, soil cover at Yellowknife landfill is placed only on outside side slopes and as a cover on top of each completed lift (typically 3 to 4 bales high). LFCI recommends that soil cover be placed progressively on the top surface and side walls of a cell as it is constructed. To achieve the recommended cell volume of 5,000 m^3, cell dimensions should be roughly 3 m high by 50 m long and 40 m wide. Photo 11-9 illustrates the progressive placement of soil cover on the side slope of a cell at Colchester Bale Fill in Nova Scotia.

IMPORTANT!! An important consideration in constructing cells is to ensure that full compartmentalization of every cell is achieved. This means continuous soil cover must be placed on the outside slope and front face of every cell. If good cover is not achieved, it renders the entire firebreak concept much less effective.

Photo 11-9 Intermediate Cover Fire Wall being placed at Colechester Bale Fill, N.S.

11.4 Reducing Number of Active Face Areas

During our audit, we noted that the other active face areas, including the MSW salvage area, the C&D active face and the unbaled MSW active face were exposed with little or no soil cover. The large number of operational areas with uncovered refuse raises the risk of fire ignition dramatically. LFCI recommends that the City of Yellowknife re-evaulate their operating strategy to reduce the number of operating areas. We believe that waste disposal services can be provided with only one active face for MSW and one active face for DLC disposal, with the disposal areas supported by a small vehicle transfer station (40 yard bins) and the baling facility tipping floor. We recommend that the public salvage area, and the unbaled MSW active face be decommissioned.

To reduce the risk of ignition, public access to the landfill operating areas should be strictly controlled. The public should be allowed to enter only the small vehicle transfer station and a dedicated recycling facility. All other disposal and recyclable storage areas should be closed to public access.

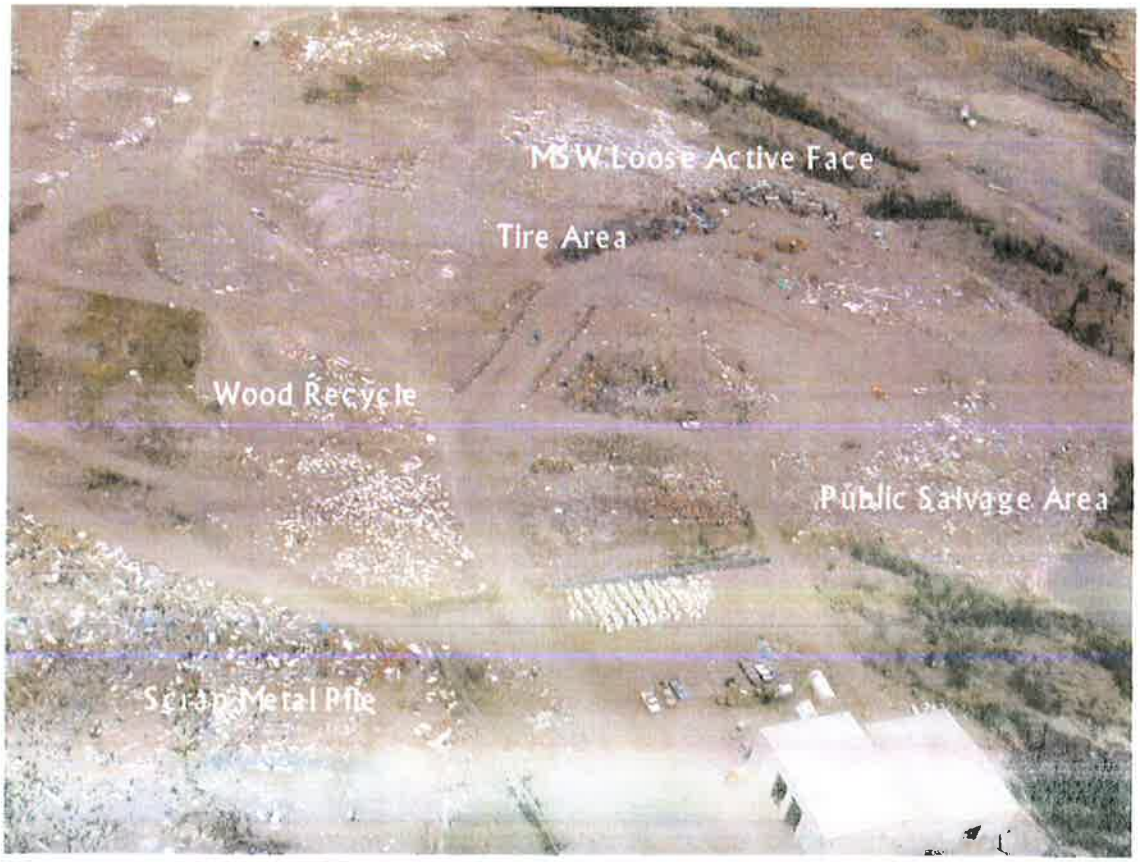


Photo 11-10 Yellowknife Operating Areas

11.5 Maintaining Adequate Soil Resources at the Active Face

As mentioned in Chapter 8, use of soil to suffocate a fire through oxygen control is one of the most powerful methods of landfill fire containment. LFCI recommends that a stockpile of soil sufficient to fully cover the operating face be maintained near the active face at all times, and that the stock-pile be re-established each time the soil cover is applied (i.e. once per week). Based on the recommended active face dimensions, about 200 m^3 of soil should be kept at the active face at all times.

11.6 Maintaining Sufficient Water Resources

As described in Section 2.7, the landfill currently does not have an on-site water supply. Fire fighting water has to be trucked in from a hydrant 2.4 km away. For immediate response, LFCI recommends that the on-site tanker truck be kept full of water at all times. The tanker should be

equipped with fittings that match those of the fire department pumpers. As well, the tanker should be equipped with an onboard Wajax or Honda high pressure pump so that it can be used to initiate an attack on active face fires before the fire department arrives.

To further improve on this supply, we recommend that:

- ❑ The hardware connections on the water tanker be tested to ensure that they can be connected to the water truck;
- ❑ The water truck be kept full of water at all times so that it can be deployed rapidly to a fire without spending 10 minutes to fill up;
- ❑ A pipe line, pump and hydrants should be installed so that water can be sourced from the nearby slough in the event a large amount of fire fighting water is ever required.

11.7 No Smoking Policy

Heat from discarded or dropped cigarettes can trigger fires. Numerous people are badly burned each year, some die, when they fall asleep while smoking in bed. Cigarettes can ignite tender dry material at the active face, at the yard waste receiving area and at the refuelling area just as easily. For this reason, we recommend that the Yellowknife Landfill and Baling Facility implement a strict no-smoking policy at the landfill, except in designated smoking areas. We believe it is vital that smoking not be permitted in any of the operating areas identified as high fire risk or moderate fire risk, as listed in Section 2.6 of this plan.

To be effective, the No Smoking policy must include the following three elements:

- Signs that clearly indicate where smoking is not permitted;
- The signs need to be clearly visible and easily readable; and
- Spotters at the active face / transfer station and other risk areas need to enforce the ban.

11.8 Progressive Closure and Good Cover Maintenance

By limiting oxygen entry and allowing methanogenic conditions to develop more quickly, implementation of progressive closure reduces the risk of fire, particularly of spontaneous combustion. The Yellowknife landfill currently lacks progressive final cover. Side slopes are presently covered only with intermediate cover and cracks, exposed waste are visible in some locations.

11.9 Site Security

In terms of Fire Risk Management, the objective of good site security is to prevent arson. There are several instances where several small fires have erupted at more than one location on the same landfill during the course of one evening for no explained reason.

Since vandalism in most cases is initiated by juveniles, perimeter fencing should be maintained along all access routes to the site. The sturdy perimeter fence along Ingraham Trail and the perimeter electric fence provide a reasonable deterent. Should vandalism problems develop, then a full perimeter fence and/or after hours security may need to be implemented.

11.10 Equipment Maintenance

Heavy equipment fires occur from time to time if refuse such as blowing litter and plastic is allowed to accumulate near hot components such as the exhaust manifold. The equipment operator on a daily basis should conduct a thorough inspection and cleaning of equipment.

11.11 On-going Commitment to Fire Safety Training

The City of Yellowknife appears to have a strong commitment to safety training. Regular fire safety training should continue to be an on-going part of that program. Recommended activities include annual fire drills, possibly including live fire extinguishment exercises. These drills should be conducted in cooperation with the fire department and in areas well away from the landfill footprint. Both oxygen suppression and water/foam application methods of fire control should be practised.

Provision of new staff with the same fire safety training by LFCI, as covered in this program is not practical. However, at a minimum staff should read through the Fire Safety Plan and view the Powerpoint lesson summaries. LFCI also works with SWANA to deliver training courses using web based delivery. The next landfill fire course is scheduled for mid November. As well, LFCI will be delivering a full day training course in Palm Springs in July of 2008. LFCI would also be pleased to arrange for new staff to sit in on future training programs at other landfills, as opportunities arise.

12. COMMUNICATIONS AND SECURITY

Effective communications strategies are vital in order to ensure the safety of all members of the fire fighting team and to allow the team to control and extinguish a fire quickly and efficiently. During a fire emergency, communications can be divided into two elements, on-site communications and off-site communications. On-site communications involves communicating between the Incident Commander, Group Leaders and key fire fighting staff. On-site communications are best achieved by a system of intrinsically safe handheld radio, backed up by cell-phones. Off-site communications involve contacting support resources such as regulators, contractors, labs, etc. Off-site communications are best achieved by telephone, backed up by e-mail.

12.1 Contact Information

It is vital that key personnel be reached quickly during the onset of a fire, and that the same personnel remain available to respond to emergency situations during Level 3 and Level 4 fires. Table 12-1 provides a list of Contact Numbers for all parties expected to play a major role during a landfill fire situation, including Incident Commanders, Group Leaders, Fire Departments and Emergency Services, Government Agencies and Support Services.

The contact information listed in Table 12-1 is current as of July 6th, 2007. At a minimum, the contact information should be updated annually. A master list maintained by YKL's Health and Safety Officer should be updated as staff and contact numbers change. The updated list should be printed out and provided to all staff should a fire emergency occur.

The contact information in Table 12-1 includes:

- Contact Position or Role in Command Structure
- Contact Name
- Emergency Number (911 or 24 hour contact number, if available)
- Office Number
- Cell-phone Number
- Pager Number (if carried)
- Fax Number
- E-mail Address (if available)

12.2 On-Site Communication Systems

Currently, the YKL communicates internally by a radio system that does not operate on the same frequency of the Fire Department radio system. When a landfill fire has occurred in the past, communications between landfill staff and the Fire Department where conducted through cell

phones.

It is Landfill Fire Control Inc.'s recommendation that a compliant radio system network be obtained that will allow radio communication between landfill staff and the Fire Department.

The primary system of on-site communications shall be the Motorola hand held radios that are used by YKL during routine operations. These radios should be stored in a charging station at maintenance facility. The radios should operate on the same frequency as permanently mounted radios in YKL's compactors, dozers and other heavy equipment. During a fire incident, it shall be the responsibility of the Logistics Group Leader to allocate radios and to keep them fully charged and ready for use. Radios shall be numbered sequentially. Each unit shall be signed in and signed out by the Logistics Group Leader. Additional radios operating on the same frequency shall be obtained by the Logistics Group Leader as required.

The working frequency for YK's Fire Department is: Transmitting: 150.78 and Receiving: 151.505. In the event of a fire incident , the YK Fire Department will distribute hand held radios programmed to this frequency to the key group commander personnel.

In situations where frequent communications are required between fire team members, support radio services can be provided quickly and at low cost by purchasing a number of Personal Communication System (PCS) hand held, (also known as family radios), such as the Motorola Talk About. These radios have a range of about 2 miles and do not require an FCC license. They can be ordered online from http://commerce.motorola.com or purchased from a number of retail stores.

12.3 Radio Distribution List

The following list details the distribution of radios during an emergency situation.

Radios should be distributed to:

1. Incident Commander (if on site)
2. Site Commander
3. Incident Command Post (base station)
4. Fire Fighting Group Leader
5. Landfill Staff and Equipment Group Leader
6. Health and Safety Group Leader
7. Logistics Support Group Leader
8. Engineering Support Group Leader (if on site)
9. Spotters working with heavy equipment (or PCS radios can be used)

Photo 12-1 Engineering Group Leader with Hand Held VHF Radio.

All heavy equipment working in the fire zone should be equipped with permanently mounted radios, or hand-held radios that can be heard by the equipment operator when the equipment is running. Operators shall be in direct radio contact with spotters working with their equipment.

12.4 Incident Command Post

The Incident Command Post shall be established in the control room at the Yellowknife Landfill Baling Building. The Site Commander, Logistics Group Leader and Health and Safety Group Leader shall operate from desks established in the Command Post. The Incident Command Post can be reached at (867) 669-3404.

To provide continuous radio communication, a radio base station or dedicated hand held shall be maintained in the Incident Command Post.

In the event of a major fire, there may be a need to relocate the Incident Command Post to larger facilities.

Photo 12-2 Incident Command Post at Delta Shake and Shingle Level 4 Alert.

12.5 Off-Site Communications

Off-site communications shall be channelled through the Incident Command Post. All telephone calls related to the Fire Emergency should be logged. Information that should be recorded includes:

- Call To I.D.
- Call From I.D.
- Phone # Being Called
- Time
- Purpose of Call
- Pertinent Comments

A log is particularly useful to review actions that had been taken and for commanders / group leaders to follow up if certain actions had not occurred.

12.6 Site Security

Site Security shall be organized and supervised by the Health and Safety Group Leader. The level of security response will depend on the Level and location of the Fire Emergency. The primary objectives of Site Security are to restrict access to the Fire Incident to authorized personnel only and to track the whereabouts of all fire-fighting personnel.

The following bullets provide a summary of security objectives.

Level 1 Alert (equipment and structure fire)

- Evacuate fire zone
- Check that all landfill staff and potential involved customers are accounted for
- Establish security guard around perimeter using landfill staff
- Log in all responding personnel at Incident Command Post.

Level 2 Alert (small landfill fire)

- Evacuate fire zone, e.g. active face,
- Check that all landfill staff and potential involved customers are accounted for,
- Close fire zone to traffic, divert traffic to alternate active face if feasible,
- Establish security guard around perimeter using landfill staff
- Log in all responding personnel at Incident Command Post.

Level 3 Alert (medium landfill fire)

- Evacuate fire zone, e.g. active face;
- Check that all landfill staff and potential involved customers are accounted for;
- Close landfill footprint to traffic, divert traffic to alternate emergency landfill area if feasible or alternate disposal facility;
- Continued operation of other facilities (e.g. composting, bin area, recycling) to be assessed by Health and Safety Officer;
- Establish security guard around perimeter using landfill staff;
- Establish security gate and office staffed 24 hours at Scale House;
- Log in all responding personnel at Security Gate.

Level 4 Alert (large landfill fire)

- Evacuate fire zone, e.g. landfill surface;
- Check that all landfill staff and potential involved customers are accounted for;
- Close landfill and all associated facilities to all public traffic;
- Divert YKL traffic only to alternate emergency landfill area on site or if feasible, to alternate disposal facility;
- Establish security guard around perimeter using landfill staff;

- Establish security gate and office staffed 24 hours at Scale House;
- Log in all responding personnel at Security Gate.

12.7 Public and Media Liaison

Ensuring that factual and consistent information is released to the public and to the media in a timely fashion is vital. Communication with the public and media shall be conducted exclusively by the designated Media Liaison Spokesperson assigned by YKL. **No NEWS RELEASE, written or otherwise, shall be released by any other field personnel, including the Incident Commander, Group Leaders and Fire Fighting staff,** unless authorized by the Incident Commander and coordinated by the Media Liaison Spokesperson. Channelling all public communications though the Media Liaison Spokesperson is vital to ensure that consistent information is being presented.

Should other field staff be requested for information, they should promptly and courteously direct the enquiring party to the Media Liaison Spokesperson and to facilitate the establishment of communications through on-site resources if necessary.

Table 12-1 Yellowknife Landfill Fire Plan Contact List

CONTACTS	Position	Emergency	Office	Cell	Home	Fax	E-Mail
FIRE DEPARTMENT/INCIDENT LEADERS							
On Duty Fire Crew	The City of Yellowknife Fire Department	873-2222	766-5500			766-5509	
Reid Douglas - Fire Chief	The City of Yellowknife Fire Department	873-2222	766-5501	445-3196		766-5509	fire@yellowknife.ca
Darcy Hernblad	Deputy Fire Chief of Operations	873-2222	766-5503	445-1022		766-5509	dhernblad@yellowknife.ca
Chucker Dewar	Deputy Fire Chief of Life Safety & Prevention	873-2222	766-5502	445-1053		766-5509	cdewar@yellowknife.ca
Merlin Klassen	Deputy Fire Chief Safety & Training	873-2222	766-5504	445-4675		766-5509	mklassen@yellowknife.ca
Barb Watson	Administrative/Program Assistant	872-2222	766-5500			766-5509	bwatson@yellowknife.ca
Rotating Basis	MED #2	872-2222	766-5500	445-1019		766-5509	
Rotating Basis	MED #4	872-2222	766-5500	445-1021		766-5509	
Rotating Basis	Engine #8	872-2222	766-5500	445-1023		766-5509	
Rotating Basis	Rescue Truck	872-2222	766-5500	445-1020		766-5509	
CITY OF YELLOWKNIFE CONTACTS							
Greg Kehoe	Director, Public Works		920-5638	445-1038		920-5668	gkehoe@yellowknife.ca
Bruce Underhay	Manager, Solid Waste Facility		669-3404	445-1012		669-9688	bunderhay@yellowknife.ca
Ross Torraville	Foreman, Solid Waste Facility		669-3406	445-1055		669-9688	rtorraville@yellowknife.ca
Dave Devana	Director of Finance		920-5666	445-1017		920-5649	ddevana@yellowknife.ca
Dennis Kefalas	Manager, Public Works (Eng. Department)		920-5639	445-1037		920-5668	dkefalas@yellowknife.ca
Max Hall	Senior Administrative Officer		920-5632	445-1011		920-5649	mhall@yellowknife.ca
Jim Mercereau	Assistant superintendant R&S office		766-6514	445-1040		669-3421	jmercereau @yellowknife.ca
EMERGENCY SERVICES							
Rotating Basis	Pumphouse Dispatch	920-5699					
Rotating Basis	Ambulance	873-2222					
Rotating Basis	Hospitals	873-2222					
Rotating Basis	By-Law	920-5630					
Doug Gillard	Manager, Municipal Enforcement	920-5630	920-5687	445-1031			
Rotating Basis	RCMP	873-2222					
GOVERNMENT AGENCIES							
Department of Resources, Wildlife, & Economic Dev.	Don Helfrick-Hazardous Waste Specialist		873-7674			873-0221	don_helfrick@gov.nt.ca
Worker's Compensation Board	Employee Safety		1-800-661-0792				
SUPPORT SERVICES							
Dennis Althouse - Superintendant	City of YK, Roads and Sidewalks Division		766-5512	445-1039		669-3421	dalthouse@yellowknife.ca
Claude Mailoux	Camco Construction		873-8522	873-1200			
Dr. Tony Sperling	Landfill Fire Control Inc.	604-220-4862	604-986-7723	604-220-4862			
Trevor Roddick	Acklands Grainger - H&S Equipment Supplier		873-4100				
Alan Rosignol	Ace Construction		920-2082	445-9300			
Lee Storman	YK Airport Fire Department	873-2191	873-2191				
SPILL-LINE SERVICES							
24 hours Hotline for Emergency Spills		867-920-8130	920-8130			873-8924	spills@gov.nt.ca

NOTE: Dialing Area Code for Yellowknife: 867

2. SITE ORIENTATION

This section of the Fire Control and Safety Plan contains background information that should be reviewed by Fire Fighters, regulators and others who may need to work at the Yellowknife Landfill during a fire emergency. This information should be reviewed thoroughly during pre-fire training so that only minimal refreshment will be required during an actual emergency.

The Yellowknife Landfill is open 7 days a week.

- Monday and Friday 3:45 – 5:45 pm
- Tuesday to Thursday 8:00 am – 5:45 pm
- Saturday, Sunday and Holidays 10:00 am – 5:45 pm

The landfill receives approximately 20,000 tonnes of refuse per year. It is estimated that about half of the incoming total waste is comprised of household and business waste and half is construction and demolition waste. Beyond the organized city disposal system, the landfill receives waste from the general public. In the summer season there is an average traffic of about 700 cars per day and about 300 cars per day during the winter.

2.1 Site Location

The Yellowknife Landfill is located in the jurisdiction of the City of Yellowknife and is located approximately 2 kilometres outside the downtown core. It is situated in the northeast of the city along the western side of Ingraham Trail, approximately 0.5 kilometres north of the intersection with Highway No. 3 and about 3 kilometres southeast of the Yellowknife Airport. Figure 2-1 outlines the major development areas (in orange) and active industrial areas (mine leases and airport, in yellow).

Figure 2-2 presents an aerial photograph that identifies the major site leases in the area of the landfill, including the landfill lease and several rock quarry leases further to the north.

In emergencies, the Yellowknife Fire Department responds to incidents. The location of the two responding fire halls in relation to the landfill is shown on Figure 2-1. Initial response comes from the main Fire Hall on off Franklin Avenue. If additional water supply is required, tankers from the Airport Fire Station are also brought in. A trained HAZMAT team is also available to respond to emergencies.

2.2 Site Access

Primary access to the site is off Ingraham Trail, about 200 m north of the intersection with Highway 3. The main entrance gate to the landfill property is located near the western corner of the landfill footprint. The entrance is controlled by a scale clerk during operating hours. After hours, the gate is kept locked, but can be opened by entering the appropriate numeric code on the

keypad just outside the gate. The YK fire chief and site contractors have been provided with the code.

Figure 2-3 identifies the location of various operational areas on the landfill site and the network of access roads. As shown, primary access route into the landfill is in the west and runs through the centre of the landfill branching off to the various areas. There is no secondary access in the event of an emergency.

North of the existing landfill footprint is an active quarry pit operated by NWT Construction Limited. Current engineering assessments are being conducted to explore expansion of the landfill into this area in four to seven years into the future when capacity of the existing landfill is exhausted. Continued use of the site as a rock quarry during this time is expected to provide an additional 7.5 years of quarry operations and expand the lifespan of the new landfill site to approximately 40 years.

There is one body of water within the site footprint which is a Slough located in the southwest corner.

2.3 Site History

The Yellowknife Landfill (YKL) is a municipal landfill site that services residents in Yellowknife, and surrounding area. The landfill is situated along Ingram Trail in the northeast of Yellowknife. The landfill has been operating since 1974. The footprint covers an area of 17.8 Ha and the landfill rises about 30 m above original ground to a maximum elevation of 213 m ASL. In Figure 2-3, the maximum extent of waste placed on the landfill footprint is outlined using a yellow-black dashed line. Figure 2-4 presents a topographic map of the landfill site recently surveyed by Sub-Arctic Surveyors in July, 2005.

The site typically receives approximately 20,000 tons of refuse per year, including about 10,000 tons of municipal solid waste and 10,000 tons of Construction and Demolition (C&D) waste. The YK Landfill is expected to reach final capacity in 3-4 years.

Since 1993 80% of the disposed waste has been baled and the remaining waste has been landfilled utilizing the area fill method. Lesser amounts of loose waste have been used to fill in the seams between the bales and to smooth out the outside landfill slopes prior to placement of cover.

2.4 On-Site Facilities

Key on-site facilities are identified in Figure 2-3 and briefly described below.

Waste Receiving and Processing Areas:

Scale House and Reception A functional single deck scale facility is used to weigh in all inbound traffic. The scale attendant directs traffic to the designated area facility. The weigh area can accommodate a 27.5 metre long truck. A by-pass lane for both incoming and outgoing traffic enables traffic to be diverted around the scales if required.

Photo 2-1. Scale House and Reception

Baling Facility: The baling facility is a 12,000 sq. ft. building located north of the entry road leading to the main landfilling area. It features a two level design with the tipping floor on the upper floor and the baler/shipping area below. A chute drops the garbage to the baler below. The baling facility is also used to process recyclable materials. The high capacity hydraulic operated baler is located on the lower floor. The baling facility is equipped with an automated fire sprinkling system on the upper floor only.

A small drop chute located outside the facility is used for the drop off of household waste by the public.

Photo 2-2. Baling Facility – Upper Floor Tipping Area

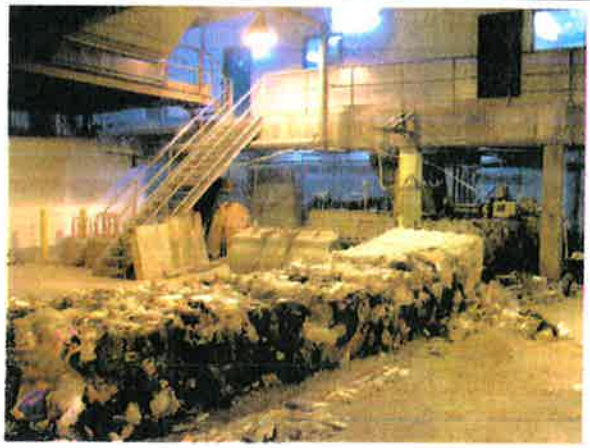


Photo 2-3. Baling Facility – Lower Floor Baler/Shipper Area

Key infrastructure found on the lower level of the baling facility building include the electrical room that is in the east side of the building, and the furnace room in the west side. The furnace room also contains two very large water tanks. A workshop, located in the southwest side of the building, contains a flammable materials locker.

Household Drop Off: An external down-chute located on the western wall of the baling facility provides the general public means to dispose their loos household waste. This then ends up on the upper floor tipping area and is occasionally loaded into the chute by the loader.

Photo 2-4. Household Garbage Down-Chute

Photo 2-5. Furnace Room

Recycling Areas:

Designated public recycling areas are located in various locations on the landfill.

Public Drop Off Bins: The public has access to the recycling area which consists of a collection of four bins for temporary store of items such as paper, aluminium, plastic jugs and cardboard.

Public Recycling Depot: A series of bins for recyclable materials are located in front of (southwest of) the baling building. The bins are used to store items such as batteries, glass bottles and containers, white goods, HDPE #2 (milk jugs). Once the recyclables are collected they are processed and baled. Old tires are baled for transport convenience and placed as barricades between active and non active face areas. Glass is crushed and stockpiled for future use. Paper is shredded and baled together with cardboard. The materials are stockpiled east of the baling facility.

An additional recycling area that is open to the public is the C&D pile consisting mainly of salvageable wood waste. The public is allowed to salvage material from the scrap wood pile. This area is free for public access and is not monitored for safety precautions such as children, smoking and steel sole shoes.

Used Oil Tanks: Of particular importance in this Fire Plan are two motor oil recycling tanks and one furnace oil tank that are located behind (west of) the baling facility. Oils fall under two categories, hazardous waste and recycling materials.

Used Barrels, Propane Bottles: Small and large propane bottles and used barrels are stored on pads near the battery area for drop off. The propane tanks have the valves removed, filled with water and then placed to freeze and crack over the winter. Some barrels contain hydrocarbons and other chemicals. Some of these products are leaking onto the ground. LFCI recommends that these materials be drained into new drums and shipped to an approved hazardous waste disposal facility.

Photo 2-6. Used Oil Tanks

Photo 2-7. Public Drop Off Bins

Photo 2-8. Recycling Depot Signage

Photo 2-9. Pain Exchange Area Signage

Photo 2-10. D&C Salvaging Stockpile

Photo 2-11. Empty Barrels

Note: Barrels containing unknown liquids have recently been tested and moved to a staging area awaiting shipping for disposal during summer 2007.

Photo 2-12. Baled Tires

Photo 2-13. Baled Paper Products

Landfilling Areas:

MSW Active Face MSW collected by the City is baled in placed in the landfill in 1-4 bale lifts. On Holidays or other occasions, loose waste deposited by the public is accumulated in the upper drop off area of the baling building. It is then used to fill in the seams of the bales at the active face. Since cover soil is sparse and predominantly frozen throughout the winter months, a cover layer of 6 inches is placed during the summer season over a 1-4 bale lift. LFCI recommends that the City of Yellowknife commence producing crushed aggregate or possibly crushed concrete from demo projects currently stockpiled on site for cover material. This approach is currently being used at Hartland Landfill in Victoria and is proving very successful. The aggregate makes a good traffic surface and inert fire break. At the same time, extra air space within the quarry area will be created for future landfill.

Typical MSW waste is a mix of organics (about 40%), paper (about 30%) and plastics (about 10%). Metals, wood and composite materials and fines make up the balance in smaller quantities. The typical energy content of MSW is 7,500 BTU per lb, about 55% of the energy value of gasoline. From a visual observation of the comprising waste of the existing bales, there is noticeably high percentage of plastic packaging in the waste from Yellowknife. It is estimated that the in-situ bales have about 30 to 40% plastics which contribute excellent high calorific value fuel to a landfill fire.

Photo 2-14 MSW Active Face, 4 bale high lift.

C&D Active Face: The YKL operates two C&D disposal areas. The first was mentioned in the recyclables/scavenging area, the second is in the west end of the landfill. The C&D waste is placed on the active face using an area fill method and covered with approximately 300 mm soil.

Typical C&D waste is a mix of wood, paper and plastic packaging, tar shingles and other roofing material, dry-wall, and metal sheeting. Due to the rigid nature of most constituents, C&D waste does not compact as well as MSW waste and contains more air voids. The typical energy content of C&D waste is 8,000 BTU per lb, about 60% of the energy value of gasoline.

It is the experience of Landfill Fire Control Inc. staff that large fires are much more likely to occur in the C&D portion of a landfill than at the MSW active face. Therefore, the C&D active face is a high risk area for landfill fire.

Contaminated Soil:
The Baling Facility only accepts soils contaminated with petroleum hydrocarbons. The City of Yellowknife has entered an agreement with Biogenie S.R.D.C. Inc. for the management and treatment of the hydrocarbon contaminated soil currently stockpiled as well as for any soil accepted in the future. Currently there is approximately 9,000 tonnes of remediated soil stockpiled on site. This soil will be used as cover material on the active face.

Public Salvaging Area: A designated area at the site has been set aside for salvaging materials. This area is kept open to the public during operation hours.

Photo 2-15 Contaminated Soil Stockpile.

Photo 2-16 Public Salvaging Area.

2.5 Operations Overview

Scale Facility: All vehicles entering the landfill pass across the scale. The scale attendant establishes the type of waste carried, the vehicle tonnage and verbally screens the operator to establish if any hazardous materials are carried in the load. The employee than directs the load to the appropriate unloading facility.

Tipping Pad: Commercial and municipal garbage trucks unload their loads on the tipping floor of the four bay baling facility. The waste is then pushed into the feeder chute of the baler with a skidsteer wheel loader. Small public loads are unloaded onto the floor through a small down chute.

Bailing: The refuse is progressively baled with the large hydraulic ram baler. The dimension of each bale is 2.5 ft. high, 4 ft. wide and 5 ft. long. The estimated compaction of the waste in a bale state is 750 kg/m^3. The bales are loaded into a dump truck or hauled directly by the loader to the MSW active face.

MSW Active Face: Baled refuse is stacked at the active face with the loader. Lifts vary between 2 and 4 bales high to create a continuous plateau. Land filling of MSW is in accordance with the filling plan provided by Dillon Consulting to achieve final contours for the proposed closure of the existing filling area in 3-4 years. Maximum grades will reach 213 m. Side slopes are at a maximum grade of 3H:1V and at 3% on the crest and 10% between the toe and fence line.

Due to the lack of cover soil and strong winds during the winter months, refuse is scattered randomly in all areas of the landfill which creates an evident vector and sanitation problem. Additionally, from a landfill fire perspective, application of an innert cover soil layer creates a

barrier layer to control the spread of fire and to reduce the entry of oxygen into the waste. Use of cover to compartmentalize waste into cells reduces the risk of spontaneous combustion and helps to reduce the size and severity of a fire.

Soil cover resources at the landfill are generally limited. At this time there is a large stockpile of treated contaminated soil available, but this will not always be the case. Therefore, LFCI recommends that the YKL produce cover material by quarrying and crushing rock. This approach will provide excellent operational cover while at the same time increasing landfill air space in the future expansion area. Besides dramatically reducing the risk of fire, proper cover will improve trafficability, litter problems and site aesthetics.

C&D Active Face: The C&D waste is not baled. It is either landfilled and covered or placed in the designated public C&D salvaging area.

In summary there are six waste disposal areas as listed below:

1. Public Drop-Off Area (Tipping Area).
2. Bale Active Face (MSW landfilling).
3. Inside Tipping Pad (Upper Level of Baling Facility).
4. Public Down-Chute
5. C&D Active Face
6. C&D Stockpile for Public Salvaging.

2.6 Fire Risk Area

Although some landfill areas are more prone to landfill fire than others, there also exists the human ignition factor that can eliminated with proper supervision, attention and reinforcement. These include a No Smoking policy on site for staff and public and prevention of public access to the active face.

Areas considered a high fire risk are listed below:

Baler Work Area: This area is considered a high fire risk zone due to the potential presence of flammable fluids and reactive substances dumped in loads and equipment maintenance activities that use open flame and/or generate sparks.

C & D Open Stockpile: This area is considered a high risk fire zone due to the presence of dry wood waste and dry dimensional lumber that can ignite rapidly when exposed to spark or flame, especially during the warm summer season. Public access to this area increases risk.
C & D Active Face: This area is considered a moderate risk zone for fires due to the potential for receipt of hot loads and due to the potential for spontaneous combustion of C&D wastes.

Public Tipping Pad / Salvage Area: Lack of cover, mixed with large volumes of flammable waste products and public access make this a high risk area for fire ignition.

MSW Public Drop Off Facility: This area is considered a moderate risk zone for fires due to potential for hot loads such as ashes dropped into the bins by the public.

MSW Active Face: This area is considered a moderate risk zone for fires due to the potential for ignition from hot loads, careless smoking, and reactive chemicals that could potentially lead to spontaneous combustion.

Tire Piles and Storage Areas: Tires are highly flammable when ignited. Although the risk of ignition is low, once ignited by fire spreading from another area, the ignition of tires would lead to a major, very smoky and hot fire. Overall risk assessment in this area is moderate.

Any Landfill Side Slope That is Disturbed or Lacks Cover: Due to the intrusion of air, spontaneous combustion can be triggered and ignite a landfill fire.

2.7 Water Supply Areas

The primary source of fire fighting water at the landfill has been provided by the Fire Department tanker trucks. There are no water hydrants on site; the nearest hydrant is approximately 2.4 kilometres down the road near the Explorer Hotel. When required, additional water resources have been provided by the Airport fire trucks.

LFCI recommends that an on-site water supply and filling station or fire hydrants be established. A large slough (pond) is present at the landfill toe, as can be seen clearly in Figure 2-3. The slough is 100 m long and 40 m wide. It is estimated that it averages 2 m in depth. Total water capacity is estimated at more than 8,000 m^3 of water, enough water to extinguish all but the largest landfill fires, especially if water is recirculated.

The proposed layout of an emergency water supply using a drafting hydrant is presented in Figure 2-5. This concept The pumping system should be designed so that it can deliver a steady flow of 1,000 GPM of water at pressure up to the landfill crest.

This concept can provide a year round water supply that can be included to improve the Fire Safety Rating at the landfill. The drafting hydrant should include a submerged intake screen located at the deepest point in the lake (below ice level) so that water can be obtained during winter time. The hard suction pipe should be extended below frost level to a dry hydrant. It is imperative that the dry hydrant be established no higher than 5 m above water level to allow self priming of the hydrant from the Fire Department's pumper trucks in an emergency situation. The installation has to be in a location that can be accessed by Fire Engines and provide turn

around capability for Water Tenders. The cost of a Draft Hydrant can run $7,000.00 to $10,000.00. A permit for the installation on the slough may be required

2.8 Soil Supply

As discussed in the Fire Fighting Methods Section of this plan, using dirt to suffocate a fire is often the most effective means of fire control. Sufficient dirt should always be available in a nearby stockpile to fully cover the active face with a 2' thick lift of soil.
At YKL the large stockpile of treated contaminated soil that is on site could be used for fire suppression purposes once it is certified that it has been properly treated. YKL should have discussion with the local Environmental Protection Officer to determine if the soil could be used even before treatment is completed in the event that no other soil supply is available.

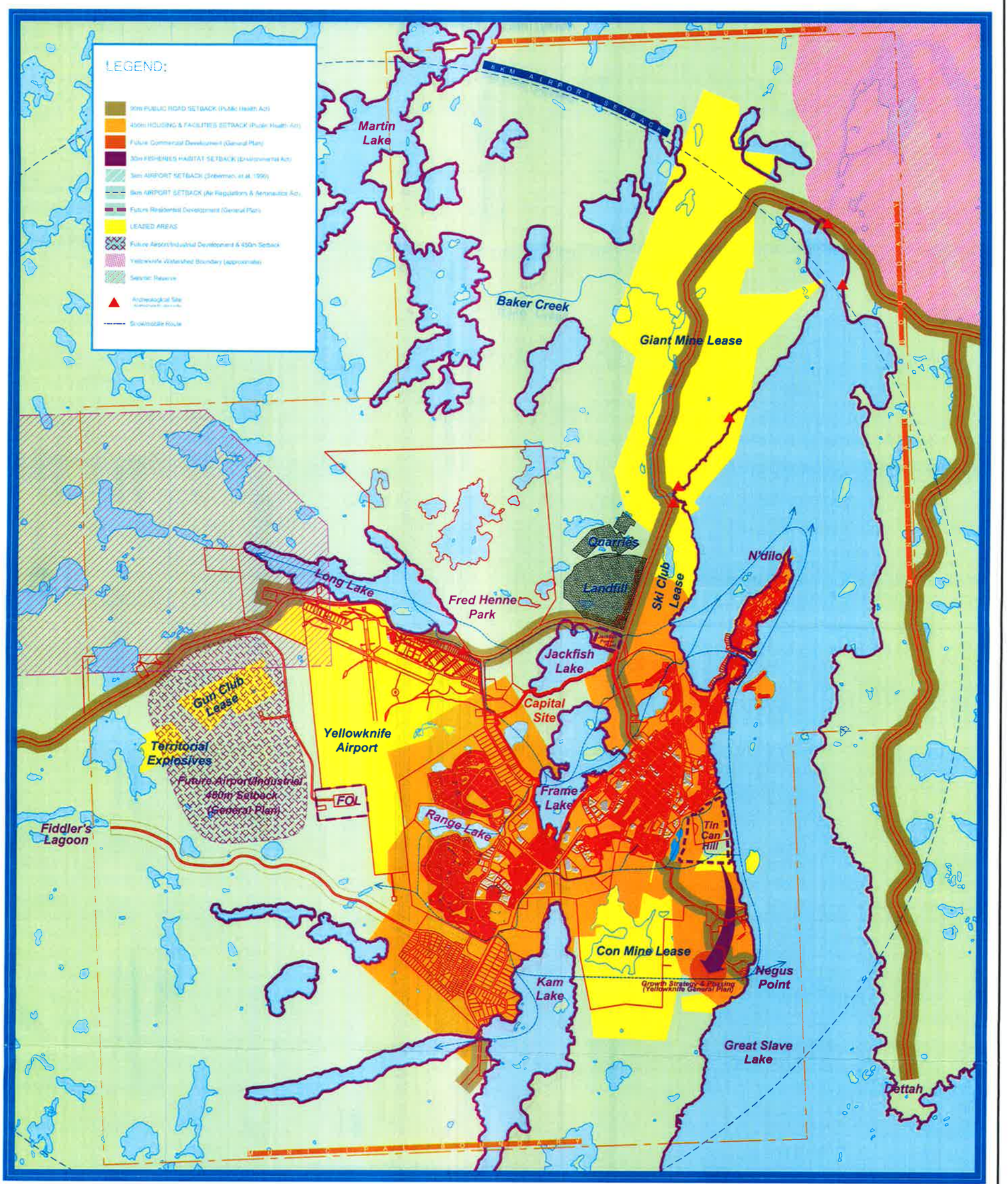
The YKL should make plans to quickly mobilize rock trucks and excavators so that the soil can be delivered and applied on a fire within two hours of initiation should the need arise. This means that service agreements and call-out procedures should be put in place so that a fast response can be initiated, if required.

2.9 Potentially Hazardous Areas

Potentially hazardous areas at Yellowknife Landfill Site include:

- **Active Face**: puncture hazard, pathogen hazard (Hepatitis C, AIDS). High-risk traffic area. Wear approved safety footwear and gloves. Wear high visibility safety vest. Do not smoke.
- **Propane Container Storage Area:** explosive hazard, flammable hazard, Use PID to test for propane. Do not smoke.
- **Manholes, Vaults Confined Spaces:** Potential for explosive, flammable, toxic and oxygen deficient environment. Use confined space entry procedures. Do not smoke.
- **Asbestos Disposal Area:** air-borne friable asbestos fibres. Wear approved respiratory protection.
- **Petroleum Contaminated Soil Area**: potential hazard of elevated air-borne concentrations of petroleum hydrocarbons. Wear approved respiratory protection. Do not smoke.
- **Used Oil Recycling Area**: potential hazard of elevated air-borne concentrations of petroleum hydrocarbons. Wear approved respiratory protection. Do not smoke.
- **Refuelling Area:** Potential for fuel spills. Do not smoke; avoid activities that could produce sparks.

- **Equipment Maintenance Facility:** Potential for fuel spills and solvent vapours. Do not smoke.
- **Landfill Side Slopes:** Rollover hazard for heavy equipment and vehicles. Operate only equipment with ROPS structure. Wear your safety belt at all times.



Landfill Fire Control Inc.
#8 - 1225 East Keith Road
North Vancouver, B.C. V7J 1J3
Phone: (604) 986-7729
Fax: (604) 986-7734

CLIENT:

CITY OF YELLOWKNIFE

PROJECT:

YELLOWKNIFE LANDFILL
FIRE CONTROL AND
RISK REDUCTION PLAN

TITLE:

LAND USE AROUND YELLOWKNIFE LANDFILL AND LOCATION OF FIRE AND RESCUE SERVICES

SCALE:	DATE:	PROJECT NO:
N.T.S.	2007/07/09 yyyy/mm/dd	LFCI 07002
DESIGNED	ST	DRAWING NO:
DRAWN	BR	**FIGURE 2-1**
CHECKED	TS	

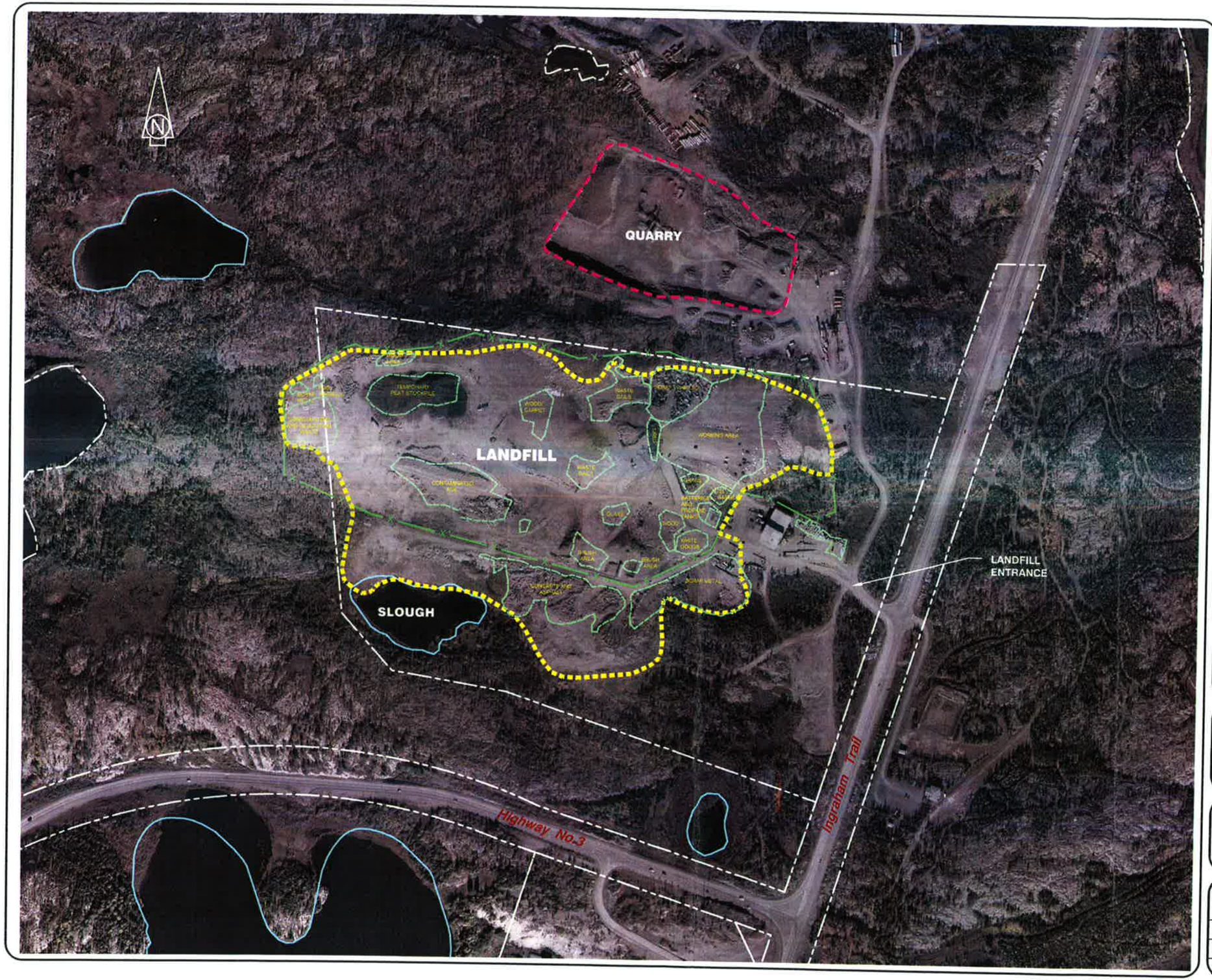
Landfill Fire Control Inc.
#8 - 1225 East Keith Road
North Vancouver, B.C. V7J 1J3
Phone: (604) 986-7723
Fax: (604) 986-7734

CLIENT:
CITY OF YELLOWKNIFE

PROJECT:
YELLOWKNIFE LANDFILL
FIRE CONTROL AND
RISK REDUCTION PLAN

TITLE:
EXISTING LEASES

SCALE:	DATE: yyyy/mm/dd	PROJECT NO:
N.T.S.	2007/07/09	LFCI 07002
DESIGNED	ST	DRAWING NO:
DRAWN	BR	FIGURE 2-2
CHECKED	TS	



Landfill Fire Control Inc.

#8 - 1225 East Keith Road
North Vancouver, B.C. V7J 1J3
Phone: (604) 986-7723
Fax: (604) 986-7734

LEGEND:

- PROPERTY LINE
- LANDFILL FOOTPRINT
- QUARRY
- WATER BODY
- ELECTRIC FENCE

CLIENT: CITY OF YELLOWKNIFE

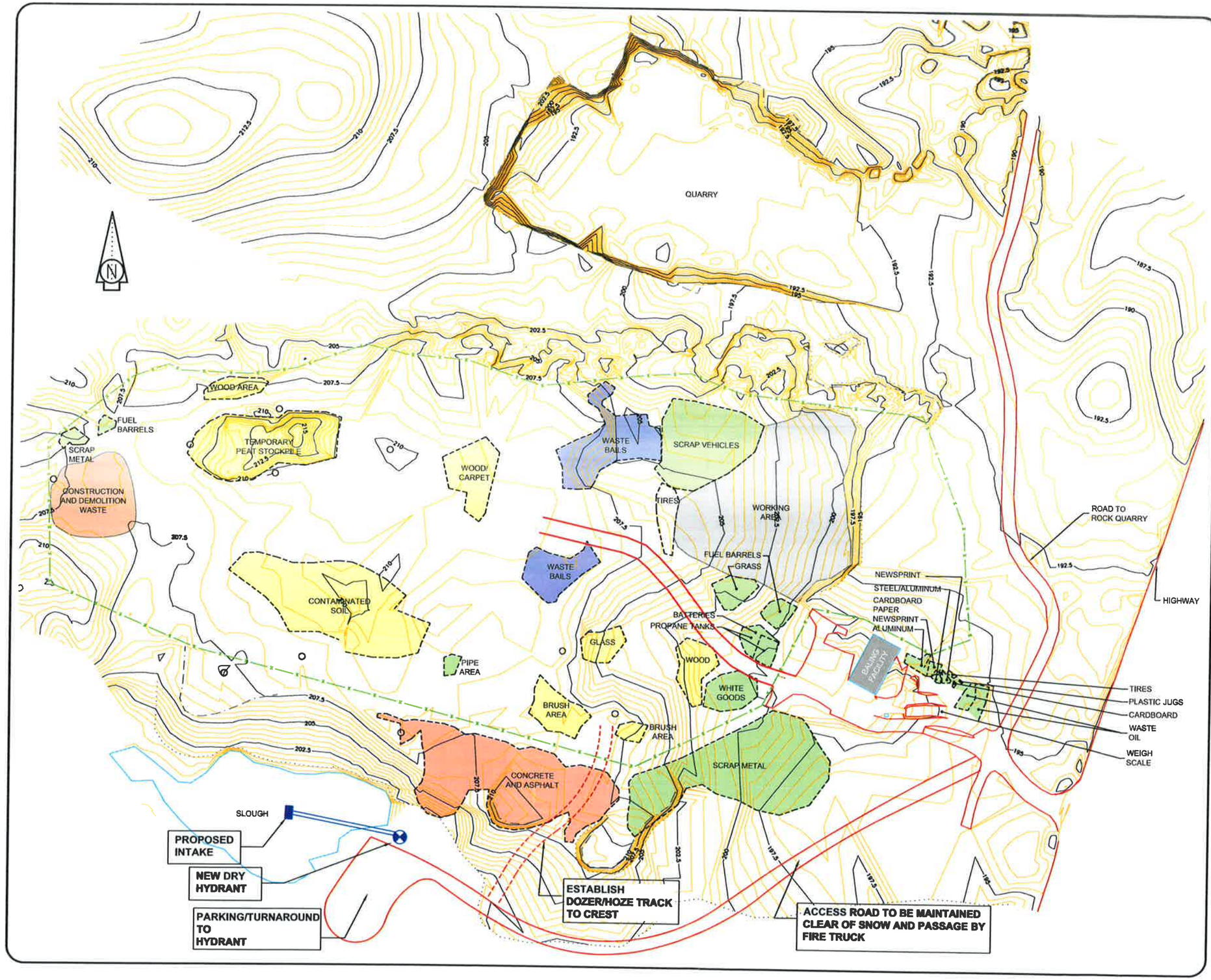
PROJECT:

YELLOWKNIFE LANDFILL
LANDFILL FIRE CONTROL AND RISK REDUCTION PLAN

TITLE:

AERIAL PHOTO SHOWING LANDFILL FACILITIES

SCALE:	DATE:	PROJECT NO:
1:5,000	2007/06/29 yyyy/mm/dd	LFCI 07002
DESIGNED	ST	DRAWING NO:
DRAWN	BR	**FIGURE 2-3**
CHECKED	TS	



Landfill Fire Control Inc.

#8 - 1225 East Keith Road
North Vancouver, B.C. V7J 1J3
Phone: (604) 986-7723
Fax: (604) 986-7734

LEGEND:

- ELECTRIC FENCE
- CREST
- TOE OF SLOPE
- 122.0 MAJOR CONTOUR
- MINOR CONTOUR
- LANDFILL GAS WELL

SIGNIFICANT AREAS
- RECYCLABLES
- BALED WASTE
- CONSTRUCTION & DEMOLITION
- SPECIAL WASTE (LAND FILLED)
- RESIDENTIAL WASTE LOADS (SALVAGABLE)

CLIENT: CITY OF YELLOWKNIFE

PROJECT:
YELLOWKNIFE LANDFILL LANDFILL FIRE CONTROL AND RISK REDUCTION PLAN

TITLE:
SITE TOPOGRAPHY AND DRAFT HYDRANT DESIGN

SCALE:	DATE:	PROJECT NO:
1:3000	2007/06/29 yyyy/mm/dd	LFCI 07002
DESIGNED	ST	DRAWING NO:
DRAWN	ST	**FIGURE 2-4**
CHECKED	TS	

Figure 2-5. On Site Water Supply

3. FIRE FIGHTING RESOURCES

In order to respond to a fire emergency promptly and effectively, Yellowknife Landfill staff must be aware of the fire fighting resources that are available and when they should be brought in. The resources include Yellowknife Landfill staff and equipment (on-site resources), resources from surrounding fire stations, regulators and support groups. This chapter summarizes the resources that are available, both on-site and from local support organizations. The resource information is summarized on Table 3-1.

3.1 On-Site Resources

The Yellowknife Landfill is typically operated with a staff compliment of 7 on-site staff during working hours. Landfill staff will likely be the first to detect a fire situation, and will be the front line staff involved in evacuating the hazard area and in initiating notification procedures outlined in Chapter 6 of this Fire Plan.

YKL staff will play key roles in any fire emergency, as outlined in Chapter 5, including leadership roles as Site Commander and support group leaders in the areas of heavy equipment operation, equipment maintenance, site security, health and safety, logistics, public relations and finance. Staff may be required to participate in a fire emergency after hours, on night-shift and on weekends.

YKL Equipment that would potentially be used in a fire fight includes the on-site water tanker, one D5 bulldozers, one tandem truck and one loader. In larger Level 2, Level 3 and Level 4 Alerts, the second water truck normally maintained at the YK Fire Department would also be transferred to the YK landfill site.

A summary of the heavy equipment available on-site is presented in Table 3-1.

Water Truck: The water truck, which is shown on Photo 3-1, can supply up to 2,000 gallons of water per load to extinguish Level 1 Alert fires (garbage bins, vehicles, etc.) and small landfill fires (defined as "Level 2 Alerts"). A second 2,500 gallon water truck can be transferred from YK's Fire Department.

Photo 3-1 YKL 2,000 Gallon Tanker

In some situations usefulness of the water truck may be limited depending on accessibility to the fire, especially in wet weather conditions. The on-site water truck should maintain 50 m. of fire hose on board and should be equipped

with a Wajax type fire pump. An additional 100 m of fire hose and 10 m of suction hose should be kept at the equipment maintenance facility to facilitate water delivery at sites away from road access.

As part of fire pre-planning, landfill staff should confirm that water truck hose fittings are fully compatible with the water truck fittings so that the water truck can provide a water supply to fire department pumper trucks.

As the water truck requires 10 minutes to fill at the on-site filling station[b1], we recommend that the water truck be kept full at all times so that it can respond immediately to a fire incident, should one occur.

Bulldozers: Bulldozers are one of the most useful tools for fighting landfill fires. Foremost, they can be used to contain small fires and to push burning material onto inert cover soils before the fires get out of control. In larger fire situations, they can be used to apply soil cover to suffocate the fire. In some situations, they can be used to knock down out of control fires by burying the burning refuse with a thick layer of unburned waste.

Photo 3-3 Bulldozer Knocking Down Fire

Photo 3-4 Fire Under Control in 24 Hours

Earth Moving Equipment: It has been recommended in Chapter 2 that sufficient soil be kept near the MSW active face to fully cover the active face with 600 mm of dirt. Should additional soil need to be brought to the active face, or should a fire break out at the C&D area where the active face may be larger at times, articulated off-road dump trucks should be mobilized to transport dirt from the contaminated soil stock pile to the fire area.

3.2 Fire Department Resources

Fire suppression services in Yellowknife are provided by the Yellowknife Fire Division (YKFD). YKFD operates the city's ambulance service and responds to fire, rescue and hazardous material incidents. They are also equipped with open water rescue apparatus to protect the public on the city's many lakes. The YKFD works out of one centrally located fire station at the corner of Franklin Avenue and Taylor Road.

The YKFD is staffed with one Fire Chief, three Deputy Fire Chiefs, one Administrative/Program Assistant, 20 Career Fire Fighters and a compliment of 16 Paid-on-Call Fire-fighters. The YKFD operates on a four platoon staffing system for the Career Firelighters. Platoons Alpha, Bravo, Charlie and Delta each have five fulltime staff members and work a four fire fighter operating minimum to ensure quality service for the City's 18,000+ residents.

The shift structure is based on 24 hour a day coverage. The duty crews work an eight day rotation; four days on and four days off. Two daytime shifts of ten hours (08:00 to 18:00) are followed by two night-time shifts of fourteen hours (18:00 to 08:00).

Most of the career staff are trained to NFPA Standard for Professional Fire-fighters Qualifications (1001, 1002 and above for the Fire Officer levels). Each platoon employs five FF/EMT-A's. The YKFD is a progressive department dedicated to keeping staff trained and educated while maintaining full 24/7 emergency response services.

Fire & Rescue Services:

The Fire and Rescue services are under the direction of Fire Chief Reid Douglas. The YKFD conducts regular training to keep it's staff up to date and ready to respond efficiently and effectively at a moments notice. The services offered by the YKFD include: Fire Prevention Programs (under the direction of DFC - Public Safety & Prevention), Building Inspections (under direction of the GNWT Fire Marshals Office and the Fire Chief), fire suppression services, motor vehicle incidents, open water incidents, confined space incidents, as well as any other emergency that may occur.

The YKFD employs standing agreements with other emergency departments to handle special situations that may occur. An example of this would be an agreement with the Department of Transportation - Airports; should an incident occur at the airport the Airport Fire Department can call for additional resources from the YKFD to assist with resolving the situation.

The YKFD's primary mission is to provide Fire, Rescue and Ambulance services for the City of Yellowknife and it's 18,000+ residents. Should a situation occur outside city limits they would

respond provided the minimum coverage for the city is met.

Figure 2-1 identified the location of Yellowknife's Fire Station in relation to the landfill. The fire department has a response time of 10 to 15 minutes to the landfill site.

The fire department is able to immediately mobilize a pumper with four fire fighters. Additional resources can be called in from the Fire Division, if required. The Fire Department operates two water tankers with 2,500 gallon capacity as well as three pumpers with 1050 to 1,500 gallon tanks. A heavy rescue truck can also be mobilized, if required. A summary of available resources and response times for the Fire Department is presented in Table 3-1.

In addition, if required, mutual aid can be obtained from the Airport Fire Department to respond during Level 3 and Level 4 Alerts.

YKFD can also provide highly trained paramedics who attend with their fleet of three ambulances.

Yellowknife Fire Department Water Tanker

Yellowknife Fire Department Versatile Rescue Truck

Photo 3-9 Typical Attack Truck

Yellowknife Fire Department Rescue/Hazmat

3.3 Contractor Resources

Level 1 and Level 2 Alerts can generally be handled by on-site resources and fire department support. Outside Contractor resources are generally required on large fires that may require several weeks or more to fully extinguish. On protracted fires Contractor resources may be required in the following areas:

- water tankers,
- earth moving equipment,
- Professional fire fighters, SCBA certified
- drilling,
- security

As the need for contractor resources is generally not apparent in the initial stages of a fire response, an exhaustive list of contractor resources is not provided in Table 11-1. Local Yellow Pages provide several listings under each resource heading above. Senior YKL staff will likely be able to select the best-qualified and most reputable companies for each task based on experience. The Logistics group leader should consult with the Incident Commander, Site Commander and Fire Fighting Coordinator to select the most appropriate contractors.

Photo 3-11 Earth Moving and Drilling Contractors in Action

For earth moving assignments, Camco Construction and Ace Construction have a long history of doing work at the YKL and should be considered for any emergency response assignments if their resources are available.

Professional fire fighters fully trained in SCBA use and landfill fire fighting methods can be provided by Key Safety and Blowout Control of Red Deer, Alberta. Their staff has participated in the extinguishment of numerous landfill fires, as well as a large number of oil and gas well fires world wide, including the Fires of Kuwait.

3.4 Supplier and Lab Resources

On-site supplies of certain materials, particularly safety supplies, get depleted quickly during a firefight. In order to replenish supplies of basic items such as work gloves, safety vests, respirators, etc. contact numbers for one or two safety supply stores should be maintained on file. There are several safety suppliers available to the YKL such as Acklands Grainer Safety Supplies.

Acklands-Grainger Inc. 324 Old Airport Road
Yellowknife, North West Territories, X1A 3T3
Tel:(867) 873-4100
Fax:(867) 873-4106
Contact:Trevor Roddick

Class A Foam is a surfactant chemical typically added to fire fighting water at a mix of 0.5% or less. Because the foam reduces surface tension, it allows water to penetrate more effectively into the burning material. A large amount of Class-A foam can be used up during a Level 3 or Level 4 firefight. Therefore, a local supplier of Class-A foam should be identified in consultation with the YKFD.

Fire fighters cannot function on empty stomachs. A catering company should be mobilized to provide hot food to all on-site crews for the duration of any fire emergency. Currently, the catering company of choice at YKL is Contemporary Catering.

In the event of a landfill fire, determining the level of pollution in the smoke and establishing the appropriate level of respiratory protection is a key priority. YKFD should conduct the initial air quality assessment based on fire history and

Photo 3-12 Air Quality Testing

screening with a PID for methane, carbon monoxide and hydrogen sulphide. Prior contact with an air quality testing Lab should be initiated as part of pre-planning in order for the agencies to have on hand the proper and adequate number of detector tubes available on emergency notice. The lab service provider will also need some lead time to prepare and equip a van or trailer to take to the incident. An occupational hygienist from the NWT's Occupational Safety and Health team should be consulted to evaluate the level of pollution and to recommend appropriate respiratory protection[TS2][b3].

Assessing the impact of leachate migration is generally a lesser priority. Large volumes of leachate are generally not released from a landfill until water is applied for several days or longer. Prior to leachate becoming an issue, the Northwest Territories Spill Report Line should be contacted (24 hour report line tel: 867-920-8130). A monitoring program should be developed by City of YK Engineering staff in consultation with provincial regulators. If possible, the same environmental laboratory that conducts routine water quality testing at the landfill should be retained to conduct any additional leachate and stream quality testing deemed necessary by the environmental group.

Table 3-1 Fire Fighting Resources

Source	Response Time	Equipment	Water Supply (Gallons)	Associated Crew #	Main Control Person
Yellowknife Landfill	0-5 min.	1 D5 Regular Dozer 1 Tandom I Loader 1 Old Water Tanker	2,000	7 Staff Members 6 Operators	Bruce Underhay (Director of Operations)
Yellowknife Fire Dept.	10-12 min.	2 (2500 Gallon) Tankers 2 (1500 Gallon p/m) Pumpers 1 (1050 Gallon p/m) Pumpers 1 Heavey Rescue c/w/ Various Tools 3 Ambulances 2 Command Vehicles	2,500	20 Full Time Fire Fighters 16 POC Firefighters 4 Chief Officers	Darcey Hernblad (Deputy Fire Chief of Operations)

4. LANDFILL FIRE ALERT LEVELS

At landfill sites fires can occur in a number of ways, with each type of fire requiring a different level of response and fire fighting strategy. In this plan, we distinguish four basic Alert Levels as outlined below.

Level 1 Alerts: Small fires occurring on landfill property but not actually involving landfilled refuse, compost or stockpiled recyclables, e.g. car fires, bin fires, equipment fires, office fires.

Level 2 Alerts: Small refuse fires that can be contained by on-site resources within 24 hours and fully extinguished within 48 hours. Level 2 fires will typically involve less than 200 m^3 of burning material.

Level 3 Alerts: Medium size refuse fires or large fires at compost facilities that can be contained in less than one week and that can be fully extinguished in less than two weeks. Typically, 200 to 2,000 m^3 of waste material are involved.

Level 4 Alerts: Large or Deep Seated Landfill Fires that require more than two weeks to contain, typically involving more than 2,000 m^3 of burning refuse.

4.1 Level 1 Alerts

Level 1 Alerts are fires that can typically be contained in a few hours by Fire Departments, with support from on-site staff. Level 1 fires include shop fires, office fires, fuel tank fires, vehicle fires and bin fires. As fire departments are equipped and trained to respond to these types of fires, the recommended general response strategy for Level 1 fires is:

4.1.1 General Level 1 Fire Procedures

- ❑ DO NOT PANIC!
- ❑ Evacuate all public and non-essential personnel from fire zone. Alert other employees in the area and active the fire alarm (pull alarm on wall or via radio to administration).
- ❑ Assess fire, if fire cannot be managed safely call 873-2222 and follow YKL major fire/explosion emergency plan.
- ❑ When reporting the fire to the Fire Department, tell them the location and type of fire and whether it looks like it will spread out of the immediate area.
- ❑ Notify the Site Commander (Bruce Underhay) or in his absence, the Incident Commander (Darcy Hernblad) by radio or telephone.
- ❑ Do not fight a fire alone!
- ❑ Do not place yourself or others in danger while fighting a fire.

- ❑ If fire is electrical, disconnect from power source.
- ❑ If safe to do so, extinguish fire with a suitable fire extinguisher while maintaining a clear path of escape.
- ❑ When the Fire Department arrives, follow their instructions.
- ❑ Prepare an incident report and submit the completed report to the Health and Safety Officer.

Photo 4-1 Garbage Truck on Fire

Photo 4-2 Structure Fire

4.1.2 Proper Use of Fire Extinguishers

There are four classes of fires. All fire extinguishers are labeled, using standard symbols, for the classes of fires on which they can be used. A red slash through any of the symbols tells you the extinguisher cannot be used on that class of fire. A missing symbol tells you only that the extinguisher has not been tested for a given class of fire, but may be used if an extinguisher labeled for that class of fire is not available.

Class A: Ordinary combustibles such as wood, cloth, and paper

Class B: Flammable liquids such as gasoline, oil, and oil-based paint

Class C: Energized electrical equipment, including wiring, fuse boxes, circuit breakers, machinery and

appliances

Class D: Combustible metals such as magnesium or sodium

Remember that the extinguisher must be appropriate for the type of fire being fought. Multipurpose fire extinguishers, labeled ABC, may be used on all three classes of fire. If you use the wrong type of extinguisher, you can endanger yourself and make the fire worse. It is also very dangerous to use water or an extinguisher labeled only for Class A fires on a cooking-grease or electrical fire. Additional details on fire extinguisher use are presented in Appendix B.

4.1.3 Baling Facility Fire

- ❑ Follow GENERAL PROCEDURES outlined above.
- ❑ Stay upwind of the fire.
- ❑ Activate automatic sprinkler system if it has not activated automatically.
- ❑ Make sure that all unauthorized persons are evacuated from the area.
- ❑ If it can be done safely, remove all vehicles and flammable materials (i.e. drums of oil, batteries) from the building.
- ❑ Turn off the main electrical breaker to the facility.
- ❑ Use Type ABC fire extinguishers to fight electrical fires.

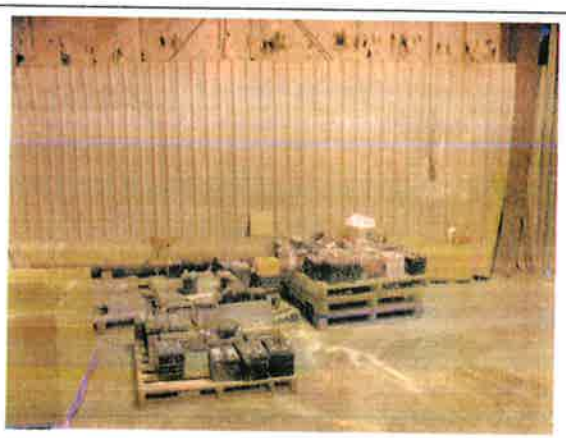


Photo 4-3 Flammable Materials in Baling Facility.

- ❑ Don't waste time trying to fight a large fire with a fire extinguisher.
- ❑ Do not approach any fuel fire without the approval of the fire department.
- ❑ Do not enter any burning structure without the approval of the fire department.
- ❑ From a safe distance, spray fuel tanks exposed to fire with water. This helps to keep them cool.
- ❑ Be careful not to wash fuel off-site. It could spread the fire.
- ❑ Fight fires in buildings with water from water truck and/or pressurized water supply system. Clear the area if there is any danger of explosion.

4.1.4 Office Fire

- ❑ Assess safety of entry (smoke, visibility). If in doubt, wait for fire department.

- ❑ Make sure that all unauthorized persons are evacuated from the area.
- ❑ If it can be done safely, remove all important files and equipment from the office.
- ❑ Turn off main electrical breaker to the office.
- ❑ Use Type ABC fire extinguishers to fight electrical fires.
- ❑ Don't waste time trying to fight a large fire with a fire extinguisher.
- ❑ Do not enter any burning structure without the approval of the fire department.
- ❑ Fight fires in buildings with water from water truck and/or pressurized water supply system. Clear the area if there is any danger of explosion.

4.1.5 Refuelling Area Fire

- ❑ Stay upwind of the fire.
- ❑ Make sure that all unauthorized persons are evacuated from the area.
- ❑ If it can be done safely, remove all vehicles and flammable materials (i.e. fuel truck) from the area.
- ❑ Turn off main electrical breaker to the tanks.
- ❑ Use Type ABC fire extinguishers to fight electrical fires.
- ❑ Don't waste time trying to fight a large fire with a fire extinguisher.
- ❑ Do not approach any fuel fire without the approval of the fire department.
- ❑ Do not enter any structure without the approval of the fire department.
- ❑ From a safe distance, spray fuel tanks exposed to fire with water. This helps to keep them cool.
- ❑ Be careful not to wash fuel off-site. It could spread the fire.
- ❑ Erect soil berms as needed to contain spilled fuel.
- ❑ Clear the area if there is any danger of explosion.

4.1.6 Vehicle Fire

Photo 4-4 Vehicle Fire

- ❑ Stay upwind of the fire.
- ❑ Assist occupants in evacuation, if safe to do so.
- ❑ Make sure that all public is kept well back from the area.
- ❑ If it can be done safely, tow the vehicle to a secure location so that the fire does not spread.
- ❑ Use Type ABC fire extinguishers to fight electrical fires.
- ❑ Don't try to fight a fully involved vehicle fire with a fire extinguisher.
- ❑ Mobilize on-site water truck for larger vehicle fire.
- ❑ Do not approach any fuel fire without the approval of the fire department.
- ❑ From a safe distance, spray fuel, hydraulic or oil tanks, which are exposed to fire with water. This helps to keep them cool.

- ❑ Be careful not to wash fuel off-site. It could spread the fire.
- ❑ Clear the area if there is any danger of explosion.

4.2 Level 2 Alerts (Small Landfill Fires)

Level 2 Alerts are small refuse fires that can be contained by on-site resources within 24 hours and fully extinguished within 48 hours. Level 2 fires will typically involve less than 200 m^3 of burning material. Level 2 fires can also occur at the wood waste and yard waste stockpiles of raw material and within compost windrows.

The primary fire fighting objective of Level 2 fires is containment, i.e. to prevent the fire from spreading into the refuse and creating a bigger fire problem. Once contained, the fire can be thoroughly extinguished, usually in a co-operative response by on-site staff and fire department resources.

Photo 4-5 Small Fire at Active Face Intentionally Set

Photo 4-6 Level 2 Spontaneous Combustion Fire

4.2.1 General Procedures for Level 2 Alert at Active Face

- ❑ Follow General Level 1 Fire Procedures for reporting and evacuation. Call 911.
- ❑ Initiate Incident Command Structure Protocols in Chapter 6 of this plan.
- ❑ Put on approved half face respirators (see Chapter 10).
- ❑ Stay upwind of the fire.
- ❑ Assess toxicity of the smoke. If eyes, throat or lungs become irritated clear area immediately.
- ❑ If it can be done safely, remove all vehicles, landfill equipment from the area.
- ❑ If it can be done safely, use the dozer(s) to construct a firebreak around the fire using soil from the stockpile.
- ❑ If it can be done safely, cover all refuse that is not on fire with 2' of inert soil.
- ❑ Never drive a bulldozer onto burning material.
- ❑ If two or more water trucks are being used, try to use them in shifts so that at least one

water truck is at the fire at all times.

- ❑ Do not overuse water. Remember, most landfill fires can be controlled with a relatively small amount of water. In most cases, soil is more effective than water.
- ❑ Don't waste time trying to fight a large fire with a fire extinguisher.
- ❑ Commence application of water with Class A Foam (typically at 0.5%) on the fire in-situ or dig out burning material, and soak or smother once placed on inert soil surface.
- ❑ Notify the surrounding landowners if there is a chance that the fire could spread beyond the landfill.

4.3 Level 3 Alerts (Medium Landfill Fires)

Level 3 Alerts involve medium size refuse fires or large fires at compost facilities that can be contained in less than one week and that can be fully extinguished in less than two weeks. Typically, 200 m^3 to 2,000 m^3 of waste material are involved.

Photo 4-7 Level 3 Active Face Fire

Photo 4-8 Level 3 Fire in Yellowknife Landfill

In dealing with Level 3 Alerts, it is important to recognize that the fire will not be extinguished immediately; therefore, it is important to get properly organized and to implement the Incident Command Structure. Once the commanders and group leaders are in place, a unified strategy for controlling and extinguishing the fire can be developed.

The methods of fighting a Level 3 fire will depend on the nature of the fire. Some basic guidelines are presented in Chapter 8; however, we have found that each landfill fire worked on to date has had unique characteristics that dictated the most appropriate fire control strategy. Key issues to consider when planning strategy are:

- Is there a risk of the fire escalating to Level 4?
- Are good fireguards in place?
- Is the fire burning vigorously or smouldering?
- Can oxygen entry to the fire zone be limited?
- Is there lots of dirt available?

- Is the fire near surface (i.e. that it can be contained with excavator, about 6 m.) or deep-seated?
- Is there lots of smoke?
- Will smoke impact a lot of off site residents, workers, and transients?
- Are there any sensitive receptors in the air shed?
- Is there any sensitive infrastructure in danger (i.e. gas mains, water mains, liners, gas wells, etc.)?
- Is there a risk of initiating a wild-land fire?

Once the Incident Command Structure is in place, financial resources are confirmed and an extinguishment strategy is established, forces can be mobilized to commence extinguishment.

4.3.1 General Procedures for Level 3 Alert at Landfill

- ❑ Follow General Level 1 Fire Procedures for reporting and evacuation. Call 911.
- ❑ Mobilize Incident Command Team as per Chapter 5 of this plan.
- ❑ Initiate Incident Command Structure Protocols in Chapter 6 of this plan.
- ❑ Assess fire situation.
- ❑ Develop fire fighting strategy (water, oxygen control, overhaul, or combination)
- ❑ Assess appropriate level of respiratory protection & health and safety issues, ensure all staff wear required level of personal protection.
- ❑ Notify regulatory agencies.
- ❑ Implement fire fighting strategy.
- ❑ Establish Command Post.
- ❑ Implement security protocols, especially sign-in/sign-out.
- ❑ Implement financial control protocols.
- ❑ Install monitoring equipment to assess progress (gases, temperature)
- ❑ Review strategy on a daily basis, adjust as necessary. Consult with specialist staff from Landfill Fire Control Inc. as required.

4.4 Level 4 Alerts (Large Landfill Fires)

Level 4 Alerts involve large, often deep-seated landfill fires that require more than two weeks to contain, typically involving more than 2,000 m^3 of burning refuse. Level 4 fires typically do not breakout overnight. Our experience is that Level 4 fires occur through escalation of Level 2 and Level 3 fires, particularly if aggressive action is not taken to extinguish the fire as quickly as possible.

Level 4 fires invariably become large earth moving projects that require many weeks to achieve full extinguishment. Due to the volume of flammable material involved, straight application of water and/or foam is typically not a feasible fire fighting strategy. Recognizing that a Level 4

fire fight will be a long-term effort, it is extra important to properly implement the Incident Command Structure, to establish an effective strategy to fight the fire, and to work steadily toward extinguishment. We recommend technical assistance from Landfill Fire Control Inc. be retained in forming fire fighting strategy for Level 4 Alert fires.

As with Level 3 fires, the methods of fighting a Level 4 fire will depend on a wide range of parameters. However, the common thread in all Level 4 fires is that extinguishment will be expensive. Ensuring that sufficient financial resources are available to fund the fire fighting effort is a key element of any Level 4 fire fight.

Due to large volume of fuel being combusted, off-site air quality impacts may become an issue in Level 4 fires under certain climatic conditions. Tracking wind direction and preparing for possible evacuation of residents, workers and transients should be considered. In particular, travel on Highway No. 4 (Ingraham Trail) may become hazardous due to poor visibility. In that case, traffic may have to be diverted, or a pilot car program for routing traffic through the smoke at slow speed may need to be initiated. Both elements of the program should be under the direction of the Yellowknife Police Department.

Photo 4-9 Level 4 Alert at Delta Shake (British Columbia)

Photo 4-10 Level 4 Alert in California

4.4.1 General Procedures for Level 4 Alert at Landfill

- ❑ Follow General Level 1 Fire Procedures for reporting and evacuation. Call 911.
- ❑ Mobilize Incident Command Team as per Chapter 5 of this plan.
- ❑ Initiate Incident Command Structure Protocols in Chapter 6 of this plan.
- ❑ Assess fire situation.
- ❑ Establish Command Post.
- ❑ Implement security protocols, especially sign-in/sign-out.

- ❑ Notify regulatory agencies.
- ❑ Initiate public relations program.
- ❑ Initiate planning for evacuation of on-site staff and potentially affected residents, if there is potential for air quality hazard.
- ❑ Develop fire fighting strategy (water, oxygen control, overhaul, or combination). Review strategy with technical staff from Landfill Fire Control Inc.
- ❑ Assess appropriate level of respiratory protection & health and safety issues; ensure all staff wears required level of personal protection.
- ❑ Implement fire fighting strategy.
- ❑ Implement financial control protocols.
- ❑ Install monitoring equipment to assess progress (gases, temperature)
- ❑ Review strategy on a daily basis, adjust as necessary.

4.5 General Safety Procedures

- ❑ DO NOT PANIC.
- ❑ Safety comes first.
- ❑ Evacuate all public and workers from the danger zone.
- ❑ Report the incident, call 911.
- ❑ Do not fight a fire alone, always use the buddy system.
- ❑ Never risk personal injury or death attempting to save a machine or building.
- ❑ Wear safety equipment (boots, gloves, glasses, high visibility clothing, helmet; refer to Chapter 10).
- ❑ Be aware of possible toxicity of smoke. As a minimum, use recommended, fit tested half face respirator (Refer to Chapter 10).
- ❑ When operating a piece of heavy equipment, work with a spotter in radio communication, especially is visibility is limited.

The above actions lists were developed by Landfill Fire Control Inc. based on an initial template contained in Neil Bolton's textbook "The Handbook of Landfill Operations". The check list has been updated from time to time based on LFCI's own fire fighting experience.

5. INCIDENT COMMAND STRUCTURE

5.1 Incident Command Structure Elements

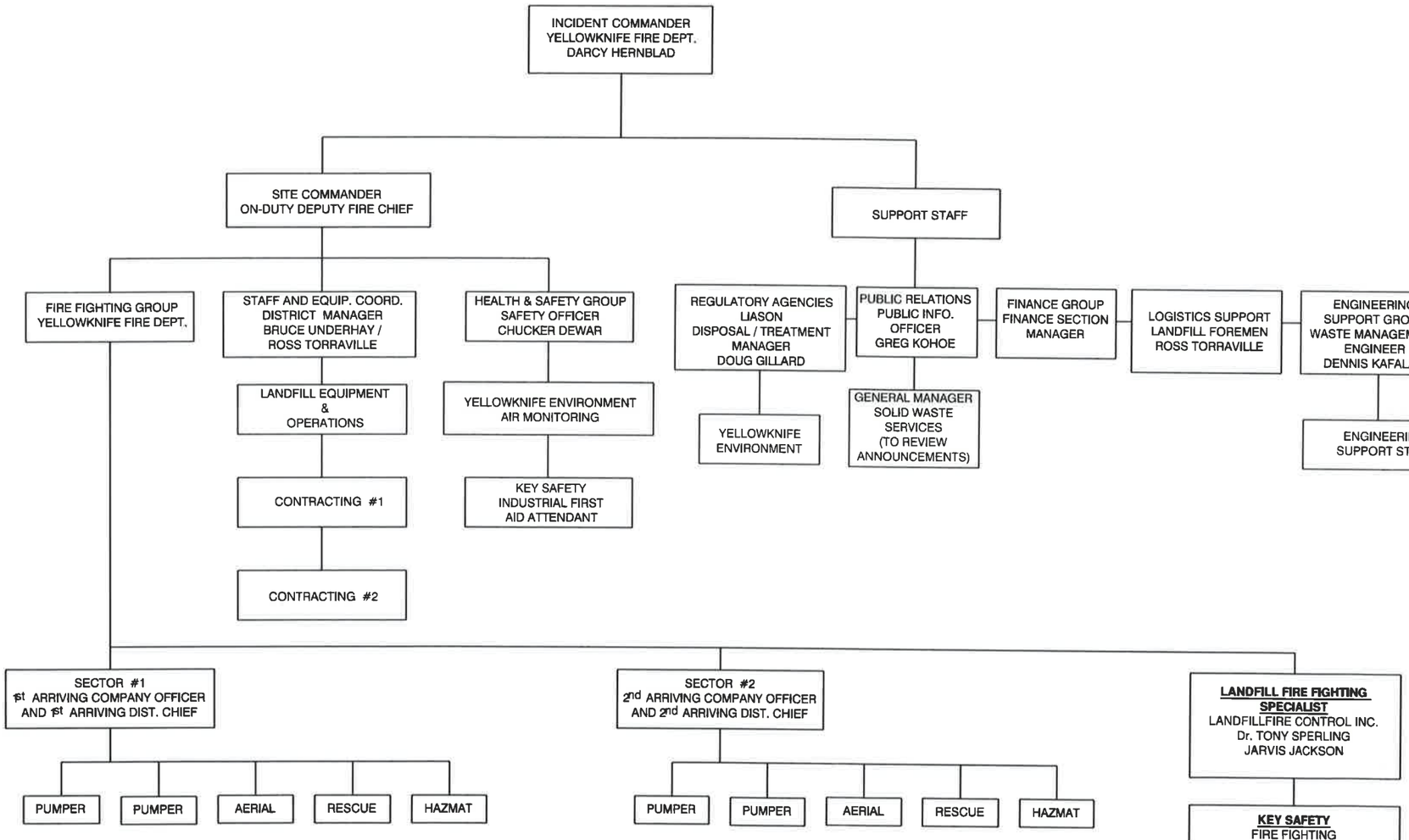
Although small "Incipient Stage" fires can often be controlled and extinguished by landfill staff, it has been our experience that major landfill fires invariably require external resources and expertise. Furthermore, coordinating all available resources into a cohesive fire fighting team that is focused and works together toward a common goal is paramount if a fire is to be extinguished efficiently, and with minimum risk to all fire fighting staff involved.

The Incident Command structure, developed by Emergency Response Personnel to deal with major emergencies has been successfully adapted to manage landfill fire emergencies. Typically, the Incident Command structure for a Landfill Fire emergency requires the following team elements:

- Incident Commander
- Site Commander
- Fire Fighting Group
- Landfill Staff and Equipment Group
- Health and Safety Group
- Logistics Support Group
- Finance Support Group
- Public Relations Support Group
- Regulatory Support Group
- Engineering Support Group

Figure 5-1 presents a flow chart that identifies the key elements of the Incident Command Structure for a Landfill Fire Emergency at the landfill. The chart also identifies the people who will be carrying out the many commander and group leader duties should a fire incident occur. The reporting hierarchy is also shown.

It is our experience that the successful control and extinguishment of a landfill fire requires that each group leader and his group recognize that they have been selected to carry out a specific function based on their capabilities, training and knowledge. During the onset of a fire fight, some individuals will be keen to jump right in and take care of whatever they feel needs doing. At such times, the Incident Commander and Site Commander must step in to ensure that the Incident Command Structure is understood and maintained. For the system to work properly, tasks must be carried out only within the defined structure and under the direction and control of designated group leaders.



#8 - 1225 East Keith Road
North Vancouver, B.C. V7J 1J3
Phone: (604) 986-7723
Fax: (604) 986-7734

LEGEND:

CLIENT:

CITY OF YELLOWKNIFE

PROJECT:

YELLOWKNIFE LANDFILL
LANDFILL FIRE CONTROL AND
RISK REDUCTION PLAN

TITLE:

AFIRE INCIDENT
COMMAND STRUCTURE

SCALE:	DATE: 2007/06/29 yyyy/mm/dd	PROJECT NO: LFCI 07002
DESIGNED	ST	DRAWING NO: **FIGURE 5-1**
DRAWN	ST	
CHECKED	TS	

Small fires may require only one or two team elements to deal with the fire situation, whereas major landfill fires require one or more personnel in each of the above roles.

5.2 Roles of Leaders and Groups in Incident Command Structure

5.2.1 Incident Commander

The primary functions of the Incident Commander are to put in place and then coordinate the fire fighting efforts of all groups under his command. A second, equally important function is to ensure that sufficient financial resources are available to pay for fighting efforts at all times, at times necessitating liaison with owners, politicians, municipal and provincial / territorial regulators. Therefore, it is imperative that the Incident Commander possesses excellent leadership and delegation skills.

The Incident Commander need not attend at the fire site around the clock. In fact, much of his work is achieved more efficiently at the administrative office. Provided capable group leaders are put in charge of the various fire fighting groups, the role of the Incident Commander need not be a full time job either, but he or his assigned alternate must be on call at all times to respond to situations as they develop.

Photo 5-1 Incident Commander, Site Commander and Fire Fighting Specialist From Landfill Fire Control Inc. Reviewing Strategy

Darcy Hernblad, the YK Deputy Fire Chief shall serve as the Incident Commander. Deputy IC shall be Reid Douglas. His alternates shall be Bruce Underhay, YK Landfill Operations Manager.

5.2.2 Site Commander

The Site Commander is responsible for directing and coordinating all aspects of the fire fight, including the cohesive operation of the fire fighting and heavy equipment teams. The Site Commander develops hour-to-hour and day-to-day strategy for fighting the fire in consultation with group leaders and specialist advisors and then provides direction to the various group leaders so that their groups can quickly execute the desired actions.

The Site Commander must constantly be aware of the "big picture" in a fire emergency, and to re-assess strategy as conditions change. Strategy and safety review meetings at the start of each shift are a good way to ensure that the site commander, group leaders and fire fighting personnel are all aware of the objectives to be achieved, the current hazards and safety issues and any potential conflicts that could arise between the various work groups during planned fire fighting activities.

Photo 5-2 Site Commander Directing Fire Fighting Activity.

On major fire projects that require days, weeks even months to extinguish, one or more Deputy Site Commanders need be identified to take over from the Site Commander when he is off duty.

While on site, the Site Commander should wear a fluorescent green safety vest that clearly identifies him as the person in charge of the fire fight. Also, the Site Commander should always carry a radio so that he can quickly respond to situations as they develop.

The on-duty Deputy Fire Chief shall be the Site Commander. In a large Level 3 or Level 4 Fire, YKFD shall allocate a full time Site Commander to the project. On some projects, specialists from LFCI are retained by municipalities to oversee operations so that Fire Dept. staff can be freed up for regular duties.

5.2.3 Fire Fighting Group

The Fire Fighting Group is typically comprised of trained fire fighters, working under the direction of a Fire Fighting Coordinator. The role of the Fire Fighting Group is to provide fire fighting support to the Landfill Fire Fighting Team. It is important to note that most Landfill Fires cannot be effectively extinguished by conventional fire fighting equipment alone (pumper trucks, hoses and monitors). A joint team effort between heavy equipment (excavators, bulldozers, loaders) and fire fighting resources is generally required to extinguish a fire, especially if the fire occurs at depth.

In the early stages of major landfill fire fights, heavy equipment must be used to control smoke and flame, application of water will not do the job. A vital role of the Fire Fighting Group during this initial response is to provide spotters, fire fighters with hoses and monitor operators to assist the heavy equipment operators in doing their jobs safely, and to effect a rescue should

the heavy equipment get stuck or be involved in a collapse. Spotters are especially important. Their job is to assess ground conditions in which the heavy equipment is working, watching out for hazards such as large cracks, potential sinkholes, unstable slopes, propane canisters, etc. If visibility is limited, then each piece of heavy equipment should work with a spotter. The spotter should be in continuous radio communication with the heavy equipment operator.

The Fire Fighting Group shall work under the direction of the Fire Fighting Coordinator (FCC). It is the responsibility of the FCC to liase with the Site Commander and Incident Commander to establish fire fighting strategy, and then to direct fire fighters under his command to implement the strategy selected. Responsible for the safety of fire fighters under his command, and for the fire exposure safety of all other workers involved in the fire fight, it is paramount that the FCC be a seasoned fire fighting veteran.

Photo 5-3 Fire Department Spotter Working with Excavator

A senior member of the YKFD who is allocated to the fire project full time shall be assigned to the role of FCC. He shall work closely with the Site Commander and the Landfill Staff team leader to execute the selected fire suppression strategy and direct fire fighters accordingly.

5.3 Landfill Staff and Equipment Group

Invariably landfill staff and heavy equipment play a major role in the successful control and extinguishment of landfill fires. Typically, landfill staff is the first to detect the presence of a fire and can take action to secure the fire site and initiate fire containment before fire crews arrive.

During a fire fight, heavy equipment including bulldozers, excavators, scrapers, trucks and loaders are used to establish fire guards, to contain the fire by excavating or pushing the burning material onto an inert soil surface, or in the case of a large fire, by applying soil to limit oxygen entry and to smother the fire.

Staff from the maintenance shop will service and fuel equipment, including heavy equipment, fire trucks, water pumps and light plants. Equipment support may be required around the clock.

Spotters and staff from administration will be required to provide site security during a landfill fire emergency. The security objectives will be to keep the public away from the fire and smoke

zone, to ensure that only authorized fire fighting personnel are allowed on site, and that all fire fighting personnel are logged in and logged out. Landfill staff may be relieved of the security duty in the event that the fire fight becomes a protracted project, requiring more than one week of time to extinguish.

To work safely during a fire situation, it is vital that landfill staff is properly trained and that they are provided with the necessary protective equipment that may include properly fitted respirators, and in some cases, self contained breathing apparatus (SCBA). On major fires, the Yellowknife Air Quality shall be called in to assess air quality and determine whether air quality in the fire zone requires the use of SCBA equipment.

In a Level 3 or Level 4 Alert, additional equipment resources, particularly off-road trucks, excavators and bulldozers, may be required. A determination of heavy equipment needs shall be made by the Site Commander and authorized by the Incident Commander. Several heavy equipment contractors are identified in Section 11 of this plan.

All landfill staff shall work under the direction of the YK Staff and Equipment Coordinator. Bruce Underhay shall act in this capacity. In his absence, Ross Torraville shall serve as the Deputy Staff and Equipment Coordinator.

5.4 Health and Safety Group

The primary purpose of the Health and Safety Group shall be to protect the health and safety of all landfill staff, fire fighters and contractors working on the fire. As well, the Health and Safety Group shall be responsible for protecting the health and welfare of landfill customers, residents and transients in the affected area. Should an evacuation be necessary, the Health and Safety Group will work with the Yellowknife Police Department to initiate the evacuation.

Photo 5-4 Contractors Being Fit Tested for Respirators by Safety Officer

A key function of the Health and Safety Group is to assess air quality in the fire zone and off-site at all times during the fire fight. Specialized resources shall be mobilized to test air quality and to determine the appropriate level of respiratory protection (none, half face respirator, full face respirator, SCBA). It is imperative that all workers are fully trained and in the use of the respiratory protective equipment being used.

The Health and Safety Group Leader shall ensure that qualified and fully equipped First Aid Attendants are on-site whenever fire personnel are working. During the initial response phase of a fire, the first aid service shall be provided by mobilizing a rescue truck or ambulance from the Yellowknife Fire Department.

The Health and Safety Group Leader shall also be responsible for organizing and overseeing site security.

Chucker Dewar, the Yellowknife Deputy Fire Chief of Life Safety and Prevention shall be the Safety Group Leader. In a protracted fire, Mr. Dewar can call on trained first aid attendants from Key Safety and Blow-out Control Inc.

5.5 Logistics Support Group

As outlined in Section 6 of this plan, it is the goal of the YKL to have sufficient safety equipment and supplies on hand to initiate response to small fires (Level 1 and Level 2 Alerts). The YK Fire Department will also be called to respond to these and larger incidents.

Should a fire escalate to Level 3 or Level 4, then additional resources will be required. It will be the responsibility of the Logistics Group to organize the supply of any required resources, and to liaison with the Finance Group to ensure that ordering of these resources is carried out within the approved level of funding.

Tasks carried out by the Logistics Group include arranging the supply of equipment and manpower, safety equipment (respirators, fire resistant clothing, boots, gloves, etc.), food and hot drinks, communications equipment, sanitary facilities, etc.

The Logistics Group Leader shall be the Foreman of the YK Landfill Facility, Ross Torraville. On a major fire project; Mr. Torraville may need to secure additional staff from within YKL or external contractors to ensure that all necessary logistics support is provided.

5.6 Finance Support Group

Expenses on a Level 3 or Level 4 fire can add up rapidly. Expenditures of $20,000 to $50,000 per day are not uncommon. To avoid financial problems it is imperative that the level of spending relative to approved funding available to fight the fire be known by the Incident Commander and the Site Commander at all times. The role of the Finance Support Group is to track the cost information, including staff hours, equipment ordered, etc. To maintain financial control, it is important that administrative systems be put in place quickly to track time for workers and equipment and to issue purchase orders for all equipment and supplies ordered for the fire fight.

The Finance Group Leader shall be Dave Devana, the City of Yellowknife's Director of Finance. On a major fire project, Mr. Devana may need to secure additional administrative staff from within City of YK or external contractors to ensure that all necessary accounting support is provided.

5.7 Public Relations Support Group

Poorly managed public relations can lead to bad press and to reflect negatively on YKL staff and elected municipal officials. Therefore, it is imperative that the media obtain cohesive, factual information quickly from an authorized and knowledgeable source.

Greg Kehoe, YK's Director of Public Works shall be the designated Media Liaison spokesperson for any landfill fire emergency. All fire fighting staff, including the Incident Commander and Site Commander shall channel media and public information requests to Mr. Kehoe.

In most situations, information can be effectively distributed via timely press releases. In a Level 3 or Level 4 Alert situation, it may be necessary to initiate a press conference to efficiently distribute vital public information regarding the fire, environmental impacts, health hazards, expected duration of the fire fight, pending landfill closure, etc.

5.8 Regulatory Support Group

Regulatory Agencies need to be involved in major fire incidents, including any Level 3 and Level 4 fires. These agencies include the Government of the Northwest Territories, Department of Environment and Natural Resources. Contact Emergency Paquin, Director of Environmental Protection (867) 873-7654 or EMERY_PAQUIN@gov.nt.ca. Additionally, the Indian and Northern Affairs, Department of Fisheries and Oceans, and Coast guard should be notified in the event of containment where a large amount of water put on a landfill fire that drained off into Great Slave Lake.

Doug Gillard, the Manager of Municipal Enforcement shall act as the Regulatory Liaison. Coordinating with the Incident Commander, Mr. Gillard shall promptly notify the appropriate contacts in the various Regulatory Agencies, and shall facilitate their requests for information and/or participation in the process. YK's policy concerning confidential information and release of information to regulatory agencies shall be clearly defined and reviewed by the Incident Commander and the Regulatory Liaison before a fire incident occurs so that the Regulatory Liaison will have a clear understanding of how information should be released to regulators in emergency situations. It has been our experience that the most effective method of dealing with regulators is complete disclosure; however, some clients, particularly in the private sector prefer to limit the release of non-essential information to state regulatory officials.

5.9 Engineering Support Group

Engineering input may be urgently required in a Level 3 or Level 4 Alert situation to develop soil borrow areas, to stockpile overhauled refuse, or to identify a contingency disposal area in the event that the active face is closed due to hazardous conditions.

Engineering at the Landfill Site is currently conducted by City of Yellowknife Engineering Department with assistance from Dillon Consulting Limited As these engineers have access to pertinent background information, site history and a detailed site knowledge, their project manager and support staff should be brought in on retainer to manage all engineering and environmental data management requests that cannot be handled internally by YKL.

Mr. Dennis Kefalas, from the City of YK Engineering Department, who will act as the Engineering Group Leader. Mr. Kefalas should be contacted by the YKL Staff and Equipment Coordinator and requested to place Dillon Consulting engineering forces on stand-by if a Level 3 or Level 4 Alert has occurred or is expected to occur.

TABLE 6.1 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - INCIDENT COMMANDER (IC)

Incident Commander Yellowknife Fire Depatment

Varies by Alarm Level

1st Alarm 1st Arriving Company Officer

2nd Alarm and Higher Deputy Chief

NON-REFUSE FIRE
(fire not involving landfill or recycling area)

INCIDENT COMMANDER (IC)

		CHECK
	ONSET OF NON-REFUSE FIRE	
1	Establish exact location of incident.	
2	Ensure Fire Dept. resources being mobilized.	
3	Ensure safety off all personnel and patrons.	
4	Determine risk of hazardous/toxic/ explosive materials involved.	
5	Designate Site Manager.	
6	Designate Health and Safety Group Leader.	
7	Verify non-essential staff and patrons have been evacuated.	
8	Establish Accountability Log and Command Post sign-in.	
9	Log in all landfill staff working fire.	
10	Log in arriving Fire Dept. staff.	
11	Designate Fire Fighting Coordinator.	
12	Establish communications system. Ensure all Group Leaders have radios.	
13	Establish Command Post at office.	
14	Establish events log.	
15	Establish communications log.	
16	Identify staff / patrons who noted fire or involved in fire.	
	DURING NON-REFUSE FIRE	
1	Coordinate fire fighting effort.	
2	Review fire fighting strategy with Fire Fighting Coordinator & Site Commander.	
3	Mobilize additional resources, if required.	
4	Update accountability log on ongoing basis.	
5	Re-assess safety of all personnel and patrons.	
6	Ensure traffic control in place.	
7	Assess need for closure/evacuation of impacted structures/facilities.	
8	Notify City of YK Head Office.	
9	Notify Health and Safety Group Leader	
10	Notify City of YK Public Relations.	
11	Notify NWT Ministry of Environment.	
12	Update events log on ongoing basis.	
13	Update communications log on ongoing basis.	
14	Photograph fire scene thoroughly.	
	AFTER NON-REFUSE FIRE EXTINGUISHED	
1	Log out fire fighters / landfill staff not required for debriefing. Update accountability log.	
2	Check all fire fighters, staff others accounted for and logged out with SC.	
3	Check all radios returned, signed in with SC.	
4	Ensure fire scene secure, flag off as required.	
5	Initiate 24 hour fire watch, if required.	
6	Initiate debriefing of staff involved.	
7	Close off accountability log, events log and communications log.	
8	Fill out Incident Report.	

SMALL LANDFILL FIRE
(small refuse fire contained in 24 hrs).

INCIDENT COMMANDER(IC)

		CHECK
	ONSET OF SMALL LANDFILL FIRE	
1	Establish exact location of incident.	
2	Ensure Fire Dept. resources being mobilized.	
3	Ensure safety off all personnel and patrons.	
4	Determine risk of hazardous/toxic/ explosive materials involved.	
5	Ensure all staff wearing half face respirators.	
6	Designate Site Manager.	
7	Designate Health and Safety Group Leader.	
8	Verify non-essential staff and patrons have been evacuated.	
9	Establish Accountability Log and Command Post sign-in.	
10	Log in all landfill staff working fire.	
11	Log in arriving Fire Dept. staff.	
12	Designate Fire Fighting Coordinator.	
13	Establish communications system. Ensure all Group Leaders have radios.	
14	Establish Command Post at office.	
15	Establish events log.	
16	Establish communications log.	
17	Identify staff / patrons who noted fire or involved in fire.	
	DURING SMALL LANDFILL FIRE	
1	Coordinate fire fighting effort.	
2	Review fire fighting strategy with Fire Fighting Coordinator & Site Commander.	
3	Mobilize additional resources, if required.	
4	Update accountability log on ongoing basis.	
5	Re-assess safety of all personnel and patrons.	
6	Ensure traffic control in place.	
7	Assess need for closure/evacuation of impacted structures/facilities.	
8	Notify City of YK Head Office.	
9	Notify Health and Safety Group Leader	
10	Notify City of YK Public Relations.	
11	Notify NWT Ministry of Environment.	
12	Update events log on ongoing basis.	
13	Update communications log on ongoing basis.	
14	Photograph fire scene thoroughly.	
	AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1	Log out fire fighters / landfill staff not required for debriefing. Update accountability log.	
2	Check all fire fighters, staff others accounted for and logged out with SC.	
3	Check all radios returned, signed in.	
4	Ensure fire scene secure, flag off as required.	
5	Initiate 24 hour fire watch, if required.	
6	Initiate debriefing of staff involved.	
7	Close off accountability log, events log and communications log.	
8	Fill out Incident Report.	

MEDIUM REFUSE
(medium refuse fire contained in 1 week).

INCIDENT COMMANDER (IC)

		CHECK
	ONSET OF MEDIUM REFUSE FIRE	
1	Establish exact location of incident.	
2	Ensure Fire Dept. resources being mobilized.	
3	Ensure safety off all personnel and patrons.	
4	Determine risk of hazardous/toxic/ explosive materials involved.	
5	Ensure all staff wearing half face respirators.	
6	Designate Site Manager.	
7	Designate Health and Safety Group Leader.	
8	Verify non-essential staff and patrons have been evacuated.	
9	Establish Accountability Log and Command Post sign-in.	
10	Log in all landfill staff working fire.	
11	Log in arriving Fire Dept. staff.	
12	Designate Fire Fighting Coordinator.	
13	Establish communications system. Ensure all Group Leaders have radios.	
14	Designate Health and Safety Group Leader.	
15	Ensure air quality being assessed by Fire Dept or NWT MOE.	
16	Ensure appropriate respiratory protection being warn by all staff, fire fighters and contractors.	
17	Assess need for evacuation. If evacuation required delegate task to Health & Safety Officer.	
18	Establish Command Post in mobile facility.	
19	Establish events log.	
20	Establish communications log.	
21	Identify staff / patrons who noted fire or involved in fire.	
22	Designate Logistics Support Group Leader. Review Logistics Group Tasks with LGL.	
23	Mobilize Engineering Support Group Leader. Review Engineering Tasks with ESGL.	
24	Notify City of YK Head Office.	
25	Notify City of YK Public Relations.	
26	Designate Regulatory Agencies Liason. Review Regulatory Liason tasks with RAL.	
	DURING MEDIUM REFUSE FIRE	
1	Coordinate fire fighting effort.	
2	Review fire fighting strategy with Fire Fighting Coordinator & Site Commander. Establish written action plan.	
3	Establish working budget for fire fight. Review actual expenses daily with Finance Dept.	
4	Mobilize additional resources, if required.	
5	Update accountability log on ongoing basis.	
6	Re-assess safety of all personnel and patrons.	
7	Ensure traffic control in place.	
8	Assess need for closure/evacuation of impacted structures/facilities.	
9	Ensure NWT MOE notified.	
10	Update events log on ongoing basis.	
11	Update communications log on ongoing basis.	
12	Photograph fire scene thoroughly.	
13	Initiate Safety and Strategy meetings each morn.	
14	Review progress with group leaders daily.	
15	Review site security with SGL, upgrade as required.	
	AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1	Log out fire fighters / landfill staff not required for debriefing. Update accountability log.	
2	Check all fire fighters, staff others accounted for and logged out with SC.	
3	Check all radios returned, signed in.	
4	Ensure fire scene secure, flag off as required.	
5	Initiate 24 hour fire watch, if required.	
6	Initiate debriefing of staff involved.	
7	Close off accountability log, events log and communications log.	
8	Fill out Incident Report.	
9	Initiate investigation of why fire occurred, and effectiveness of fire fighting methods used.	

LARGE REFUSE
(major refuse fire requiring > 2 weeks).

INCIDENT COMMANDER (IC)

		CHECK
	ONSET OF LARGE REFUSE FIRE	
1	Establish exact location of incident.	
2	Ensure Fire Dept. resources being mobilized.	
3	Ensure safety off all personnel and patrons.	
4	Determine risk of hazardous/toxic/ explosive materials involved.	
5	Mobilize LANDFILLFIRE.com support team.	
6	Ensure all staff wearing half face respirators.	
7	Designate Site Manager.	
8	Designate Health and Safety Group Leader.	
9	Verify non-essential staff and patrons have been evacuated.	
10	Establish IC Accountability Log and Command Post sign-in.	
11	Log in all landfill staff working fire.	
12	Log in arriving Fire Dept. staff.	
13	Designate Fire Fighting Coordinator.	
14	Establish communications system. Ensure all Group Leaders have radios.	
15	Designate Health and Safety Group Leader.	
16	Ensure NWT MOE and WCB Work Place Health & Safety notified.	
17	Ensure appropriate respiratory protection being warn by all staff, fire fighters and contractors.	
18	Assess need for evacuation. If evacuation required delegate task to Health & Safety Officer.	
19	Assess need for evacuation. If evacuation required delegate task to Health & Safety Officer.	
20	Establish Command Post at office.	
21	Establish events log.	
22	Establish communications log.	
23	Identify staff / patrons who noted fire or involved in fire.	
24	Designate Logistics Support Group Leader. Review Logistics Group Tasks with LGL.	
25	Mobilize Engineering Support Group Leader. Review Engineering Tasks with ESGL.	
26	Notify City of YK Head Office.	
27	Notify City of YK Public Relations.	
28	Designate Regulatory Agencies Liason. Review Regulatory Liason tasks with RAL.	
	DURING LARGE REFUSE FIRE	
1	Coordinate fire fighting effort.	
2	Review fire fighting strategy with Fire Fighting Coordinator & Site Commander and LANDFILL FIRE.com specialist. Establish written action plan.	
3	Initiate monitoring of temperature and gas composition at surface and in landfill core.	
4	Establish working budget for fire fight. Review actual expenses vs. budget daily with Finance Dept.	
5	Mobilize additional resources, if required.	
6	Update accountability log on ongoing basis.	
7	Re-assess safety of all personnel and patrons.	
8	Ensure traffic control in place.	
9	Assess need for closure/evacuation of impacted structures/facilities.	
10	Ensure NWT MOE notified.	
11	Update events log on ongoing basis.	
12	Update communications log on ongoing basis.	
13	Photograph fire scene thoroughly.	
14	Initiate Safety and Strategy meetings each morn.	
15	Review progress with group leaders daily.	
16	Review site security with SGL, upgrade as required.	
17	Establish public information program with ML. Frequent news releases, briefings as warranted.	
	AFTER LARGE REFUSE FIRE EXTINGUISHED	
1	Log out fire fighters / landfill staff not required for debriefing. Update accountability log.	
2	Check all fire fighters, staff others accounted for and logged out with SC.	
3	Check all radios returned, signed in.	
4	Ensure fire scene secure, flag off as required.	
5	Initiate 24 hour fire watch, if required.	
6	Initiate debriefing of staff involved.	
7	Close off accountability log, events log and communications log.	
8	Fill out Incident Report.	
9	Initiate investigation of why fire occurred, and effectiveness of fire fighting methods used.	

TABLE 6.2 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - SITE COMMANDER (SC)

Site Commander Yellowknife Fire Depatment

To be assigned by Incident Commander

Sector #1 Command

	NON-REFUSE (fire not involving landfill or recycling area) SITE COMMANDER (SC)	CHECK
	ONSET OF NON-REFUSE FIRE	
1	Travel to Fire (with 2 radios and camera).	
2	Ensure landfill staff responding. Contact SEC.	
3	Request SEC to open gate and guide fire crews.	
4	Request SEC to Dispatch Landfill Water Truck.	
5	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
6	Evacuate all non-essential personnel.	
7	Ensure safety of all remaining personnel. Log into SC accountability log.	
8	Check with SEC to ensure all landfill staff are accounted for.	
9	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
10	Designate Fire Fighting Coordinator. Update him on situation and resources.	
11	Review safety of all Fire Dept. and landfill staff crews with FFC, SEC and SGL. Ensure all staff are logged in are directly accountable and reporting to appropriate group leaders.	
12	Establish fire fighting strategy with FFC.	
13	Brief IC on situation and strategy. Update logs.	
	DURING NON-REFUSE FIRE	
1	Assist FCC and Fire Depts. in extinguishing fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with FCC and IC.	
4	Request additional resources from IC, if required.	
5	Update SC accountability log on ongoing basis.	
6	Re-assess safety of all personnel and patrons.	
7	Establish traffic control. Delegate staff.	
8	Assess need for closure/evacuation of impacted structures/facilities.	
9	Photograph fire scene thoroughly.	
10	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
11	Update IC periodically.	
	AFTER NON-REFUSE FIRE EXTINGUISHED	
1	Ensure all fire fighters logged out with FCC and Command Post sign-in.	
2	Check all radios returned, signed in.	
3	Secure fire scene, flag off as required.	
4	Assign 24 hour fire watch, if required.	
5	Take additional photographs.	
6	Participate in debriefing of staff involved.	
7	Close off SC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Initiate recovery of operations back to normal.	

	SMALL LANDFILL (small refuse fire contained in 24 hrs). SITE COMMANDER (SC)	CHECK
	ONSET OF SMALL LANDFILL FIRE	
1	Travel to Fire (with 2 radios and camera).	
2	Ensure landfill staff responding. Contact SEC.	
3	Request SEC to open gate and guide fire crews.	
4	Request SEC to Dispatch Landfill Water Truck.	
5	Request SEC to Dispatch available bulldozers and excavators to fire.	
6	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
7	Evacuate all non-essential personnel.	
8	Ensure safety of all remaining personnel. Log all staff into SC accountability log.	
9	Check with SEC to ensure all landfill staff are accounted for.	
10	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
11	Assess toxicity of smoke. Keep staff upwind.	
12	Ensure all staff are equipped with appropriate safety equiptment, especially respirators.	
13	Ensure all non-essential equipment is removed from fire area.	
14	Designate Fire Fighting Coordinator. Update him on strategy and resources.	
15	Review safety of all Fire Dept. and landfill staff crews with FFC, SEC and SGL. Ensure all staff are logged in are directly accountable and reporting to appropriate group leaders.	
16	Establish fire fighting strategy with FFC.	
17	Brief IC on situation and strategy. Update logs.	
	DURING SMALL LANDFILL FIRE	
1	Work with FCC and Fire Depts. to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with FCC and IC.	
4	Establish fire break around fire with soil from stockpile.	
5	If practical, push or dig fire out with dozer or excavator. Place burning material on inert soil.	
6	Soak down burning material with Class A foam.	
7	Shut down methane extraction wells within 100 m. of fire zone if gas wells on site.	
8	Request additional resources from IC, if required.	
9	Update SC accountability log on ongoing basis.	
10	Re-assess safety of all personnel and patrons.	
11	Establish traffic control. Delegate staff.	
12	Assess need for closure/evacuation of impacted structures/facilities.	
13	Photograph fire scene thoroughly.	
14	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
15	Update IC periodically.	
	AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1	Ensure all fire fighters logged out SC accountability log and Command Post sign-in.	
2	Check all radios returned, signed in.	
3	Secure fire scene, flag off as required.	
4	Assign 24 hour fire watch.	
5	Take additional photographs.	
6	Participate in debriefing of staff involved.	
7	Close off SC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Initiate recovery of operations back to normal.	

	MEDIUM REFUSE (medium refuse fire contained in 1 week). SITE COMMANDER (SC)	CHECK
	ONSET OF MEDIUM REFUSE FIRE	
1	Travel to Fire (with 2 radios and camera).	
2	Ensure landfill staff responding. Contact SEC.	
3	Request SEC to open gate and guide fire crews.	
4	Request SEC to Dispatch Landfill Water Truck.	
5	Request SEC to Dispatch available bulldozers and excavators to fire.	
6	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
7	Evacuate all non-essential personnel.	
8	Ensure safety of all remaining personnel. Log into SC accountability log.	
9	Check with SEC to ensure all landfill staff are accounted for.	
10	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
11	Assess toxicity of smoke. Keep staff upwind.	
12	Ensure all staff are equipped with appropriate safety equiptment, especially respirators.	
13	Ensure all non-essential equipment is removed from fire area.	
14	Identify Fire Fighting Coordinator when Fire Dept. arrives. Update him on situation and resources.	
15	Review safety of all Fire Dept. and landfill staff crews with FFC, SEC and SGL. Ensure all staff are logged in are directly accountable and reporting to appropriate group leaders.	
16	Establish fire fighting strategy with FFC.	
17	Brief IC on situation and strategy. Update logs.	
	DURING MEDIUM REFUSE FIRE	
1	Work with FCC and Fire Depts. to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with FCC and IC. (water application, oxygen control or overhaul).	
4	Establish fire break around fire with soil from stockpile.	
5	If practical, isolate fire with excavated trenches down to inert material, side walls covered with soil. Do not open fire up to air!!	
6	Soak down burning material with Class A foam.	
7	Shut down methane extraction wells within 100 m of fire zone if gas wells on site.	
8	Arrange for adequate soil and water supplies. Request equipment from contractors as needed.	
9	Request additional resources from IC, if required.	
10	Update SC accountability log on ongoing basis.	
11	Re-assess safety of all personnel and patrons.	
12	Establish traffic control. Delegate staff.	
13	Assess need for closure/evacuation of impacted structures/facilities.	
14	Photograph fire scene thoroughly.	
15	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
16	Initiate monitoring of gases and temperatures at surface and bar hole punch.	
17	Lead Safety and Strategy meetings each morning.	
18	Update IC periodically.	
	AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1	Ensure all fire fighters logged out from accountability log and Command Post sign-in.	
2	Check all radios returned, signed in.	
3	Secure fire scene, flag off as required.	
4	Assign 24 hour fire watch.	
5	Take additional photographs.	
6	Participate in debriefing of staff involved.	
7	Close off SC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Initiate recovery of operations back to normal.	

	LARGE REFUSE (major refuse fire requiring > 2 weeks). SITE COMMANDER (SC)	CHECK
	ONSET OF LARGE REFUSE FIRE	
1	Travel to Fire (with 2 radios and camera).	
2	Ensure landfill staff responding. Contact SEC.	
3	Request SEC to open gate and guide fire crews.	
4	Request SEC to Dispatch Landfill Water Truck.	
5	Request SEC to Dispatch available bulldozers and excavators to fire.	
6	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
7	Evacuate all non-essential personnel.	
8	Ensure safety of all remaining personnel. Log into SC accountability log.	
9	Check with SEC to ensure all landfill staff are accounted for.	
10	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
11	Assess toxicity of smoke. Keep staff upwind.	
12	Ensure all staff are equipped with appropriate safety equiptment, especially respirators.	
13	Ensure all non-essential equipment is removed from fire area.	
14	Identify Fire Fighting Coordinator when Fire Dept. arrives. Update him on situation and resources.	
15	Review safety of all Fire Dept. and landfill staff crews with FFC, SEC and SGL. Ensure all staff are logged in are directly accountable and reporting to appropriate group leaders.	
16	Establish fire fighting strategy with FFC.	
17	Brief IC on situation and strategy. Update logs.	
	DURING LARGE REFUSE FIRE	
1	Work with FCC and Fire Depts. to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with FCC and IC. (water application, oxygen control or overhaul).	
4	Establish fire break around fire with soil from stockpile.	
5	If practical, isolate fire with excavated trenches down to inert material, side walls covered with soil. Do not open fire up to air!!	
6	Soak down burning material with Class A foam.	
7	Shut down methane extraction wells within 100 m of fire zone if gas wells on site.	
8	Arrange for adequate soil and water supplies. Request equipment from contractors as needed.	
9	Request additional resources from IC, if required.	
10	Update SC accountability log on ongoing basis.	
11	Re-assess safety of all personnel and patrons.	
12	Establish traffic control. Delegate staff.	
13	Assess need for closure/evacuation of impacted structures/facilities.	
14	Photograph fire scene thoroughly.	
15	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
16	Initiate monitoring of gases and temperatures at surface and bar hole punch.	
17	Lead Safety and Strategy meetings each morning.	
18	Update IC periodically.	
	AFTER LARGE REFUSE FIRE EXT INGUISHED	
1	Ensure all fire fighters logged out from accountability log and Command Post sign-in.	
2	Check all radios returned, signed in.	
3	Secure fire scene, flag off as required.	
4	Assign 24 hour fire watch.	
5	Take additional photographs.	
6	Participate in debriefing of staff involved.	
7	Close off SC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Initiate recovery of operations back to normal.	

TABLE 6.3 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - FIRE FIGHTING GROUP COORDINATOR (FFC)

	NON-REFUSE (fire not involving landfill or recycling area) FIRE FIGHTING COORDINATOR (FFC)	CHECK
	ONSET OF NON-REFUSE FIRE	
1	Respond to 9-1-1 call.	
2	Establish location, bring key for gate or key box if after hours.	
3	Contact IC if on-site. Log fire crews with IC.	
4	Log fire crews in on SC accountability log.	
5	Travel to fire, assess hazards and fire magnitude call additional resources as required.	
6	Check all non-essential personnel evacuated.	
7	Ensure safety of all remaining personnel. Check all landfill staff logged in on SC log.	
8	Obtain radio on landfill frequency from SEC.	
9	Review risk of hazardous/toxic/ explosive materials involved with SEC, SC and IC.	
10	Review strategy and resources. Develop joint action plan with IC, SC and SEC.	
11	Brief IC on situation and strategy. Update logs.	
	DURING NON-REFUSE FIRE	
1	Work with SC and landfill team to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with SC and IC.	
4	Request additional resources from participating fire departments, as required.	
5	Update FFC accountability log on ongoing basis.	
6	Re-assess safety of all personnel and patrons.	
7	Assess need for closure/evacuation of impacted structures/facilities.	
8	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
9	Update IC and SC periodically.	
	AFTER NON-REFUSE FIRE EXTINGUISHED	
1	Log out fire dept. staff not required for debriefing. Update FCC accountability log.	
2	Ensure all fire fighters logged out at and Command Post sign-in.	
3	Check all radios returned, signed in.	
4	Review securing fire scene, flag off as required.	
5	Assist in 24 hour fire watch, if required.	
6	Participate in debriefing of staff involved.	
7	Close off FCC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Oversee demobilization of Fire Dept. resources.	

	SMALL LANDFILL (small refuse fire contained in 24 hrs). FIRE FIGHTING COORDINATOR (FFC)	CHECK
	ONSET OF SMALL LANDFILL FIRE	
1	Respond to 9-1-1 call.	
2	Establish location, bring key for gate or key box if after hours.	
3	Contact IC if on-site. Log fire crews with IC.	
4	Log fire crews in on SC accountability log.	
5	Travel to fire, assess hazards and fire magnitude call additional resources as required.	
6	Check all non-essential personnel evacuated.	
7	Ensure safety of all remaining personnel. Check all landfill staff logged in on SC log.	
8	Obtain radio on landfill frequency from SEC.	
9	Review risk of hazardous/toxic/ explosive materials involved with SEC, SC and IC.	
10	Review strategy and resources. Develop joint action plan with IC, SC and SEC.	
11	Brief IC on situation and strategy. Update logs.	
	DURING SMALL LANDFILL FIRE	
1	Work with SC and landfill team to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with SC and IC.	
4	Request additional resources from participating fire departments, as required.	
5	Update FFC accountability log on ongoing basis.	
6	Re-assess safety of all personnel and patrons.	
7	Assess need for closure/evacuation of impacted structures/facilities.	
8	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
9	Update IC and SC periodically.	
	AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1	Log out fire dept. staff not required for debriefing. Update FCC accountability log.	
2	Ensure all fire fighters logged out at and Command Post sign-in.	
3	Check all radios returned, signed in.	
4	Review securing fire scene, flag off as required.	
5	Assist in 24 hour fire watch, if required.	
6	Participate in debriefing of staff involved.	
7	Close off FCC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Oversee demobilization of Fire Dept. resources.	

	MEDIUM REFUSE (medium refuse fire contained in 1 week). FIRE FIGHTING COORDINATOR (FFC)	CHECK
	ONSET OF MEDIUM REFUSE FIRE	
1	Respond to 9-1-1 call.	
2	Establish location, bring key for gate or key box if after hours.	
3	Contact IC if on-site. Log fire crews with IC.	
4	Log fire crews in on SC accountability log.	
5	Travel to fire, assess hazards and fire magnitude call additional resources as required.	
6	Check all non-essential personnel evacuated.	
7	Ensure safety of all remaining personnel. Check all landfill staff logged in on SC log.	
8	Obtain radio on landfill frequency from SEC.	
9	Review risk of hazardous/toxic/ explosive materials involved with SEC, SC and IC.	
10	Review strategy and resources. Develop joint action plan with IC, SC and SEC.	
11	Brief IC on situation and strategy. Update logs.	
	DURING MEDIUM REFUSE FIRE	
1	Work with SC and landfill team to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with SC and IC.	
4	Request additional resources from participating fire departments, as required.	
5	Update FFC accountability log on ongoing basis.	
6	Re-assess safety of all personnel and patrons.	
7	Assess need for closure/evacuation of impacted structures/facilities.	
8	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
9	Update IC and SC periodically.	
	AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1	Log out fire dept. staff not required for debriefing. Update FCC accountability log.	
2	Ensure all fire fighters logged out at and Command Post sign-in.	
3	Check all radios returned, signed in.	
4	Review securing fire scene, flag off as required.	
5	Assist in 24 hour fire watch, if required.	
6	Participate in debriefing of staff involved.	
7	Close off FCC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Oversee demobilization of Fire Dept. resources.	

	LARGE REFUSE (major refuse fire requiring > 2 weeks). FIRE FIGHTING COORDINATOR (FFC)	CHECK
	ONSET OF LARGE REFUSE FIRE	
1	Respond to 9-1-1 call.	
2	Establish location, bring key for gate or key box if after hours.	
3	Contact IC if on-site. Log fire crews with IC.	
4	Log fire crews in on SC accountability log.	
5	Travel to fire, assess hazards and fire magnitude call additional resources as required.	
6	Check all non-essential personnel evacuated.	
7	Ensure safety of all remaining personnel. Check all landfill staff logged in on SC log.	
8	Obtain radio on landfill frequency from SEC.	
9	Review risk of hazardous/toxic/ explosive materials involved with SEC, SC and IC.	
10	Review strategy and resources. Develop joint action plan with IC, SC and SEC.	
11	Brief IC on situation and strategy. Update logs.	
	DURING LARGE REFUSE FIRE	
1	Work with SC and landfill team to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with SC and IC.	
4	Request additional resources from participating fire departments, as required.	
5	Update FFC accountability log on ongoing basis.	
6	Re-assess safety of all personnel and patrons.	
7	Assess need for closure/evacuation of impacted structures/facilities.	
8	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
9	Update IC and SC periodically.	
	AFTER LARGE REFUSE FIRE EXTINGUISHED	
1	Log out fire dept. staff not required for debriefing. Update FCC accountability log.	
2	Ensure all fire fighters logged out at and Command Post sign-in.	
3	Check all radios returned, signed in.	
4	Review securing fire scene, flag off as required.	
5	Assist in 24 hour fire watch, if required.	
6	Participate in debriefing of staff involved.	
7	Close off FCC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Oversee demobilization of Fire Dept. resources.	

TABLE 6.4 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - STAFF AND EQUIPMENT COORDINATOR (SEC)

Staff & Equipment Coordinator Waste and Recycling Services

Mananager Landfill and Operations

or in his absence Landfill Foreman on Duty

	NON-REFUSE (fire not involving landfill or recycling area) STAFF AND EQUIPMENT COORDINATOR (SEC)	CHECK
	ONSET OF NON-REFUSE FIRE	
1	Travel to Fire (with 3 landfill radios and camera).	
2	Ensure landfill staff responding.	
3	Arrange to open gate and guide fire crews.	
4	Dispatch Landfill Water Truck to fire.	
5	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
6	Evacuate all non-essential personnel.	
7	Ensure safety of all remaining personnel. Have all landfill staff log in into accountability log.	
8	Ensure all landfill staff are accounted for.	
9	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
10	Contact IC and SM. Update them on fire situation and available resources.	
11	Review status of all landfill staff crews with IC, SM and SGL. Ensure all staff are logged in and reporting to appropriate group leaders.	
12	Provide IC and SM with Radios.	
13	Input to fire fighting strategy with IC and SC.	
14	Brief IC on situation and strategy. Update logs.	
	DURING NON-REFUSE FIRE	
1	Assist IC and Fire Dept. in extinguishing fire.	
2	Ensure respirators being used by staff.	
3	Review fire fighting strategy with SC and IC.	
4	Arrange for additional resources if required by IC.	
5	Re-assess safety of all landfill staff and patrons.	
6	Establish traffic control. Delegate staff.	
7	Assess need for evacuation of impacted facilities with IC and SGL.	
8	Photograph fire scene thoroughly.	
9	Update IC periodically.	
	AFTER NON-REFUSE FIRE EXTINGUISHED	
1	Log out landfill staff not required for debriefing. Update accountability log.	
2	Ensure all landfill staff logged out with with IC and Command Post sign-in.	
3	Check all radios returned, signed in.	
5	Assign 24 hour fire watch, if required.	
6	Take additional photographs.	
7	Participate in debriefing of staff involved.	
9	Participate in filling out Incident Report.	
10	Initiate recovery of operations back to normal.	

	SMALL LANDFILL (small refuse fire contained in 24 hrs). STAFF AND EQUIPMENT COORDINATOR (SEC)	CHECK
	ONSET OF SMALL LANDFILL FIRE	
1	Travel to Fire (with 3 landfill radios and camera).	
2	Ensure landfill staff responding.	
3	Arrange to open gate and guide fire crews.	
4	Dispatch Landfill Water Truck to fire.	
5	Dispatch available bulldozers and excavators to fire location.	
6	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
7	Evacuate all non-essential personnel.	
8	Ensure safety of all remaining personnel. Have all landfill staff log in into accountability log.	
9	Ensure all landfill staff are accounted for.	
10	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
11	Assess toxicity of smoke. Keep staff upwind.	
12	Ensure all landfill staff are equipped with safety equiptment, especially respirators.	
13	Ensure all non-essential equipment is removed from fire area.	
14	Contact IC and SC. Update them on fire situation and available resources.	
15	Review status of all landfill staff crews with IC, SM and SGL. Ensure all staff are logged in and reporting to appropriate group leaders.	
16	Provide IC and SM with Radios.	
17	Input to fire fighting strategy with IC and SM.	
18	Brief IC on situation and strategy. Update logs.	
	DURING SMALL LANDFILL FIRE	
1	Work with IC and Fire Dept. to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with IC and SC.	
4	Establish fire break around fire with soil from stockpile.	
5	If practical, push or dig fire out with dozer or excavator. Place burning material on inert soil.	
6	Shut down methane extraction wells within 100 m of fire zone.	
7	Arrange additional resources as required by IC.	
8	Update accountability log on ongoing basis.	
9	Re-assess safety of all personnel and patrons.	
10	Establish traffic control. Delegate staff.	
11	Assess need for closure/evacuation of impacted structures/facilities.	
12	Photograph fire scene thoroughly.	
13	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
14	Update IC periodically.	
	AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1	Dismiss landfill staff not required for debriefing. Ensure they sign-out from accountability log.	
2	Check all radios returned, signed in.	
3	Secure fire scene, flag off as required.	
4	Assign 24 hour fire watch.	
5	Take additional photographs.	
6	Participate in debriefing of staff involved.	
7	Close off SEC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Initiate recovery of operations back to normal.	

	MEDIUM REFUSE (medium refuse fire contained in 1 week). STAFF AND EQUIPMENT COORDINATOR (SEC)	CHECK
	ONSET OF MEDIUM REFUSE FIRE	
1	Travel to Fire (with 3 landfill radios and camera).	
2	Ensure landfill staff responding.	
3	Arrange to open gate and guide fire crews.	
4	Dispatch Landfill Water Truck to fire.	
5	Dispatch available bulldozers and excavators to fire location.	
6	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
7	Evacuate all non-essential personnel.	
8	Ensure safety of all remaining personnel. Have all landfill staff log in into accountability log.	
9	Ensure all landfill staff are accounted for.	
10	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
11	Assess toxicity of smoke. Keep staff upwind.	
12	Ensure all landfill staff are equipped with safety equiptment, especially respirators.	
13	Ensure all non-essential equipment is removed from fire area.	
14	Contact IC and SC. Update them on fire situation and available resources.	
15	Review status of all landfill staff crews with IC, SM and SGL. Ensure all staff are logged in and reporting to appropriate group leaders.	
16	Provide IC and SM with Radios.	
17	Input to fire fighting strategy with IC and SM.	
18	Brief IC on situation and strategy. Update logs.	
	DURING MEDIUM REFUSE FIRE	
1	Work with IC and Fire Dept. to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with IC and SC.	
4	Establish fire break around fire with soil from stockpile.	
5	If practical, push or dig fire out with dozer or excavator. Place burning material on inert soil.	
6	Shut down methane extraction wells within 100 m of fire zone.	
7	Arrange additional resources as required by IC.	
8	Update accountability log on ongoing basis.	
9	Re-assess safety of all personnel and patrons.	
10	Establish traffic control. Delegate staff.	
11	Assess need for closure/evacuation of impacted structures/facilities.	
12	Photograph fire scene thoroughly.	
13	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
14	Update IC periodically.	
	AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1	Dismiss landfill staff not required for debriefing. Ensure they sign-out from accountability log.	
2	Check all radios returned, signed in.	
3	Secure fire scene, flag off as required.	
4	Assign 24 hour fire watch.	
5	Take additional photographs.	
6	Participate in debriefing of staff involved.	
7	Close off SEC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Initiate recovery of operations back to normal.	

	LARGE REFUSE (major refuse fire requiring > 2 weeks). STAFF AND EQUIPMENT COORDINATOR (SEC)	CHECK
	ONSET OF LARGE REFUSE FIRE	
1	Travel to Fire (with 3 landfill radios and camera).	
2	Ensure landfill staff responding.	
3	Arrange to open gate and guide fire crews.	
4	Dispatch Landfill Water Truck to fire.	
5	Dispatch available bulldozers and excavators to fire location.	
6	Evacuate all patrons to site office. Identify and record names of any patrons involved in incident.	
7	Evacuate all non-essential personnel.	
8	Ensure safety of all remaining personnel. Have all landfill staff log in into accountability log.	
9	Ensure all landfill staff are accounted for.	
10	Determine risk of hazardous/toxic/ explosive materials involved. Report to IC.	
11	Assess toxicity of smoke. Keep staff upwind.	
12	Ensure all landfill staff are equipped with safety equiptment, especially respirators.	
13	Ensure all non-essential equipment is removed from fire area.	
14	Contact IC and SC. Update them on fire situation and available resources.	
15	Review status of all landfill staff crews with IC, SM and SGL. Ensure all staff are logged in and reporting to appropriate group leaders.	
16	Provide IC and SM with Radios.	
17	Input to fire fighting strategy with IC and SM.	
18	Brief IC on situation and strategy. Update logs.	
	DURING LARGE REFUSE FIRE	
1	Work with IC and Fire Dept. to extinguish fire.	
2	Ensure respirators or SCBA being used by staff.	
3	Review fire fighting strategy with IC and SC.	
4	Establish fire break around fire with soil from stockpile.	
5	If practical, push or dig fire out with dozer or excavator. Place burning material on inert soil.	
6	Shut down methane extraction wells within 100 m of fire zone.	
7	Arrange additional resources as required by IC.	
8	Update accountability log on ongoing basis.	
9	Re-assess safety of all personnel and patrons.	
10	Establish traffic control. Delegate staff.	
11	Assess need for closure/evacuation of impacted structures/facilities.	
12	Photograph fire scene thoroughly.	
13	Inspect water supplies. Confirm sufficient resources. Order extra tankers if necessary.	
14	Update IC periodically.	
	AFTER LARGE REFUSE FIRE EXTINGUISHED	
1	Dismiss landfill staff not required for debriefing. Ensure they sign-out from accountability log.	
2	Check all radios returned, signed in.	
3	Secure fire scene, flag off as required.	
4	Assign 24 hour fire watch.	
5	Take additional photographs.	
6	Participate in debriefing of staff involved.	
7	Close off SEC accountability log, report to IC.	
8	Participate in filling out Incident Report.	
9	Initiate recovery of operations back to normal.	

TABLE 6.5 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - SAFETY GROUP LEADER (SGL)

Health & Safety Group Leader

Waste and Recycling Services

Safety Officer

	NON-REFUSE (fire not involving landfill or recycling area) HEALTH AND SAFETY GROUP LEADER (SGL)	CHECK
	BEFORE NON-REFUSE FIRE	
1	Ensure all staff have half face respirator, properly fit tested and trained in use.	
2	Ensure staff trained in first aid.	
3	Ensure all staff trained on use of fire extinguisher and know where closest fire extinguisher located.	
4	Ensure fire extinguishers inspected annually.	
5	Enforce smoking in designated areas policy.	
6	Ensure staff trained in detecting fires.	
	ONSET OF NON-REFUSE FIRE	
1	Mobilize to site when notified.	
2	Log in at Command Post and report to IC. Obtain radio.	
3	Proceed to fire site. Log in with SC.	
4	Ensure all patrons and non-essential staff have been evacuated.	
5	Review risk assessment of hazardous/toxic/ explosive materials involved. Report to SM.	
6	Ensure all staff wearing appropriate respiratory protection and other safety equipment.	
7	Assess need for air quality testing. Initiate calls to NWT MOE and YK Fire Dept. air quality testing to stand-by.	
8	Review need for evacuation.	
9	Ensure site manned by qualified first aid attendant at all times.	
10	Initiate fire site security procedures.	
11	Update SC and IC on health and safety issues.	
	DURING NON-REFUSE FIRE	
1	Log in/sign in at Command Post.	
2	Ensure staff following accountability log-in procedures.	
3	Ensure staff wearing appropriate safety wear including respiratory protection.	
4	Assess air quality with four gas PID. Review air quality with NWT Environment if on-site.	
5	Assess site for health / safety hazards. Take appropriate steps to secure fire area.	
6	Update SC and IC on hazards as identified. Jointly agree on risk management plan.	
7	Log out / sign out at Command Post when leaving site.	
	AFTER NON-REFUSE FIRE EXTINGUISHED	
1	Return radios and tools to proper location.	
2	Log out with SC when leaving fire zone.	
3	Participate with IC and SC in preparing Incident Report and debriefing.	
4	Log out / sign out at command post when leaving site.	
5	Initiate recharging of all fire extinguishers, and reactivation of all alarm systems.	
6	Evaluate fire response, update procedures as required based on experience gained.	

	SMALL LANDFILL (small refuse fire contained in 24 hrs). HEALTH AND SAFETY GROUP LEADER (SGL)	CHECK
	BEFORE SMALL LANDFILL FIRE	
1	Ensure all staff have half face respirator, properly fit tested and trained in use.	
2	Ensure staff trained in first aid.	
3	Ensure all staff trained on use of fire extinguisher and know where closest fire extinguisher located.	
4	Ensure fire extinguishers inspected annually.	
5	Enforce smoking in designated areas policy.	
6	Ensure staff trained in detecting fires.	
	ONSET OF SMALL LANDFILL FIRE	
1	Mobilize to site when notified.	
2	Log in at Command Post and report to IC. Obtain radio.	
3	Proceed to fire site. Log in with SC.	
4	Ensure all patrons and non-essential staff have been evacuated.	
5	Review risk assessment of hazardous/toxic/ explosive materials involved. Report to SM.	
6	Ensure all staff wearing appropriate respiratory protection and other safety equipment.	
7	Assess need for air quality testing. Initiate calls to NWT MOE and YK Fire Dept. air quality testing to stand-by.	
8	Review need for evacuation.	
9	Ensure site manned by qualified first aid attendant at all times.	
10	Initiate fire site security procedures.	
11	Update SC and IC on health and safety issues.	
	DURING SMALL LANDFILL FIRE	
1	Log in/sign in at Command Post.	
2	Ensure staff following accountability log-in procedures.	
3	Ensure staff wearing appropriate safety wear including respiratory protection.	
4	Assess air quality with four gas PID. Review air quality with NWT Environment if on-site.	
5	Assess site for health / safety hazards. Take appropriate steps to secure fire area.	
6	Update SC and IC on hazards as identified. Jointly agree on risk management plan.	
7	Log out / sign out at Command Post when leaving site.	
	AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1	Return radios and tools to proper location.	
2	Log out with SC when leaving fire zone.	
3	Participate with IC and SC in preparing Incident Report and debriefing.	
4	Log out / sign out at command post when leaving site.	
5	Initiate recharging of all fire extinguishers, and reactivation of all alarm systems.	
6	Evaluate fire response, update procedures as required based on experience gained.	

	MEDIUM REFUSE (medium refuse fire contained in 1 week). HEALTH AND SAFETY GROUP LEADER (SGL)	CHECK
	BEFORE MEDIUM REFUSE FIRE	
1	Ensure all staff have half face respirator, properly fit tested and trained in use.	
2	Ensure staff trained in first aid.	
3	Ensure all staff trained on use of fire extinguisher and know where closest fire extinguisher located.	
4	Ensure fire extinguishers inspected annually.	
5	Enforce smoking in designated areas policy.	
6	Ensure staff trained in detecting fires.	
	ONSET OF MEDIUM REFUSE FIRE	
1	Mobilize to site when notified.	
2	Log in at Command Post and report to IC. Obtain radio.	
3	Proceed to fire site. Log in with SC.	
4	Ensure all patrons and non-essential staff have been evacuated.	
5	Review risk assessment of hazardous/toxic/ explosive materials involved. Report to SM.	
6	Ensure all staff wearing appropriate respiratory protection and other safety equipment.	
7	Assess need for air quality testing. Mobilize NWT MOE and/or YK Fire Dept. air quality testing equipment to site.	
8	Review need for evacuation. Notify City of YK Police Services Department.	
9	Follow Evacuation Plan in Chapter 7 if initiated by IC. Coordinate evacuation, count heads and log in.	
10	Ensure site manned by qualified first aid attendant at all times.	
11	Initiate fire site security procedures.	
12	Update SC and IC on health and safety issues.	
	DURING MEDIUM REFUSE FIRE	
1	Log in/sign in at Command Post.	
2	Ensure staff following accountability log-in procedures.	
3	Ensure staff wearing appropriate safety wear including respiratory protection.	
4	Assess air quality with four gas PID. Review air quality with NWT Environment if on-site.	
5	Assess site for health / safety hazards. Take appropriate steps to secure fire area.	
6	Update SC and IC on hazards as identified. Jointly agree on risk management plan.	
7	Log out / sign out at Command Post when leaving site.	
	AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1	Return radios and tools to proper location.	
2	Log out with SC when leaving fire zone.	
3	Participate with IC and SC in preparing Incident Report and debriefing.	
4	Log out / sign out at command post when leaving site.	
5	Initiate recharging of all fire extinguishers, and reactivation of all alarm systems.	
6	Evaluate fire response, update procedures as required based on experience gained.	

	LARGE REFUSE (major refuse fire requiring > 2 weeks). HEALTH AND SAFETY GROUP LEADER (SGL)	CHECK
	BEFORE LARGE REFUSE FIRE	
1	Ensure all staff have half face respirator, properly fit tested and trained in use.	
2	Ensure staff trained in first aid.	
3	Ensure all staff trained on use of fire extinguisher and know where closest fire extinguisher located.	
4	Ensure fire extinguishers inspected annually.	
5	Enforce smoking in designated areas policy.	
6	Ensure staff trained in detecting fires.	
	ONSET OF LARGE REFUSE FIRE	
1	Mobilize to site when notified.	
2	Log in at Command Post and report to IC. Obtain radio.	
3	Proceed to fire site. Log in with SC.	
4	Ensure all patrons and non-essential staff have been evacuated.	
5	Review risk assessment of hazardous/toxic/ explosive materials involved. Report to SM.	
6	Ensure all staff wearing appropriate respiratory protection and other safety equipment.	
7	Assess need for air quality testing. Mobilize NWT MOE and/or YK Fire Dept. air quality testing equipment to site.	
8	Review need for evacuation. Notify City of YK Police Services Department.	
9	Follow Evacuation Plan in Chapter 7 if initiated by IC. Coordinate evacuation, count heads and log in.	
10	Ensure site manned by qualified first aid attendant at all times.	
11	Initiate fire site security procedures.	
12	Update SC and IC on health and safety issues.	
	DURING LARGE REFUSE FIRE	
1	Log in/sign in at Command Post.	
2	Ensure staff following accountability log-in procedures.	
3	Ensure staff wearing appropriate safety wear including respiratory protection.	
4	Assess air quality with four gas PID. Review air quality with NWT Environment if on-site.	
5	Assess site for health / safety hazards. Take appropriate steps to secure fire area.	
6	Update SC and IC on hazards as identified. Jointly agree on risk management plan.	
7	Log out / sign out at Command Post when leaving site.	
	AFTER LARGE REFUSE FIRE EXTINGUISHED	
1	Return radios and tools to proper location.	
2	Log out with SC when leaving fire zone.	
3	Participate with IC and SC in preparing Incident Report and debriefing.	
4	Log out / sign out at command post when leaving site.	
5	Initiate recharging of all fire extinguishers, and reactivation of all alarm systems.	
6	Evaluate fire response, update procedures as required based on experience gained.	

TABLE 6.6 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - LOGISTICS GROUP LEADER (LGL)

Logistics Group Leader

Waste and Recycling Services

Landfill Foreman on Duty

	NON-REFUSE (fire not involving landfill or recycling area) — LOGISTICS GROUP LEADER (LGL)	CHECK
	BEFORE NON-REFUSE FIRE	
1	Work with SGL to ensure fire extinguishers provided in all buildings, vehicles, high risk areas.	
2	Maintain supply of respirators and safety equipment listed in Chapter 9 in various sizes.	
3	Prepare and update list of safety supply, fire equipment suppliers and contractors.	
4	Ensure sufficient number of operational hand held radios always on-site and fully charged.	
	ONSET OF NON-REFUSE FIRE	
1	Contact IC, determine whether need to stand by.	
2	Establish Logistics supply base if required.	
3	Provide safety equipment, fire fighting supplies as required. Track all materials issued.	
4	Allocate radios to designated group leaders. Ensure sufficient radios available. Rent more radios if needed or purchase PCS handhelds.	
5	Establish need for food, hot/cold drinks. Order supplies or caterer as required.	
6	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
	DURING NON-REFUSE FIRE	
1	Provide supplies as required.	
2	Provide food/drinks as required.	
3	Issue purchase orders, track expenditures.	
4	Open lines of communication with Finance. Establish Purchase Order number for project.	
5	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
	AFTER NON-REFUSE FIRE EXTINGUISHED	
1	Ensure radios and equipment returned, signed in.	
2	Compile list of all equipment/supplies used.	
3	Compile summary of costs with Finance.	
4	Restock supplies as required.	
5	Review defficiencies in inventory with IC, SC and SGL. Order those supplies in.	

	SMALL LANDFILL (small refuse fire contained in 24 hrs). — LOGISTICS GROUP LEADER (LGL)	CHECK
	BEFORE SMALL LANDFILL FIRE	
1	Work with SGL to ensure fire extinguishers provided in all buildings, vehicles, high risk areas.	
2	Maintain supply of respirators and safety equipment listed in Chapter 9 in various sizes.	
3	Prepare and update list of safety supply, fire equipment suppliers and contractors.	
4	Ensure sufficient number of operational hand held radios always on-site and fully charged.	
	ONSET OF SMALL LANDFILL FIRE	
1	Contact IC, determine whether need to stand by.	
2	Establish Logistics supply base if required.	
3	Provide safety equipment, fire fighting supplies as required. Track all materials issued.	
4	Allocate radios to designated group leaders. Ensure sufficient radios available. Rent more radios if needed or purchase PCS handhelds.	
5	Establish need for food, hot/cold drinks. Order supplies or caterer as required.	
6	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
	DURING SMALL LANDFILL FIRE	
1	Provide supplies as required.	
2	Provide food/drinks as required.	
3	Issue purchase orders, track expenditures.	
4	Open lines of communication with Finance. Establish Purchase Order number for project.	
5	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
	AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1	Ensure radios and equipment returned, signed in.	
2	Compile list of all equipment/supplies used.	
3	Compile summary of costs with Finance.	
4	Restock supplies as required.	
5	Review defficiencies in inventory with IC, SC and SGL. Order those supplies in.	

	MEDIUM REFUSE (medium refuse fire contained in 1 week). — LOGISTICS GROUP LEADER (LGL)	CHECK
	BEFORE MEDIUM REFUSE FIRE	
1	Work with SGL to ensure fire extinguishers provided in all buildings, vehicles, high risk areas.	
2	Maintain supply of respirators and safety equipment listed in Chapter 9 in various sizes.	
3	Prepare and update list of safety supply, fire equipment suppliers and contractors.	
4	Ensure sufficient number of operational hand held radios always on-site and fully charged.	
	ONSET OF MEDIUM REFUSE FIRE	
1	Establish Logistics supply base.	
2	Provide safety equipment, fire fighting supplies as required. Track all materials issued.	
3	Allocate radios to designated group leaders. Ensure sufficient radios available. Rent more radios if needed or purchase PCS handhelds.	
4	Establish need for food, hot/cold drinks. Order supplies or caterer as required.	
5	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
6	Supply transportation equipment for fire crews, (e.g. Gators, quads and/or 4x4 pick-ups)	
7	Prepare daily summary of equipment used, forward to Finance.	
	DURING MEDIUM REFUSE FIRE	
1	Provide supplies as required.	
2	Provide food/drinks as required.	
3	Issue purchase orders, track expenditures.	
4	Open lines of communication with Finance. Establish Purchase Order number for project.	
5	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
6	Prepare daily summary of equipment used, forward to Finance.	
	AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1	Ensure radios and equipment returned, signed in.	
2	Compile list of all equipment/supplies used.	
3	Compile summary of costs with Finance.	
4	Restock supplies as required.	
5	Review defficiencies in inventory with IC, SC and SGL. Order those supplies in.	

	LARGE REFUSE (major refuse fire requiring > 2 weeks). — LOGISTICS GROUP LEADER (LGL)	CHECK
	BEFORE LARGE REFUSE FIRE	
1	Work with SGL to ensure fire extinguishers provided in all buildings, vehicles, high risk areas.	
2	Maintain supply of respirators and safety equipment listed in Chapter 9 in various sizes.	
3	Prepare and update list of safety supply, fire equipment suppliers and contractors.	
4	Ensure sufficient number of operational hand held radios always on-site and fully charged.	
	ONSET OF LARGE REFUSE FIRE	
1	Establish Logistics supply base.	
2	Provide safety equipment, fire fighting supplies as required. Track all materials issued.	
3	Allocate radios to designated group leaders. Ensure sufficient radios available. Rent more radios if needed or purchase PCS handhelds.	
4	Establish need for food, hot/cold drinks. Order supplies or caterer as required.	
5	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
6	Supply transportation equipment for fire crews, (e.g. Gators, quads and/or 4x4 pick-ups)	
7	Prepare daily summary of equipment used, forward to Finance.	
	DURING LARGE REFUSE FIRE	
1	Provide supplies as required.	
2	Provide food/drinks as required.	
3	Issue purchase orders, track expenditures.	
4	Open lines of communication with Finance. Establish Purchase Order number for project.	
5	Review equipment & supply needs with IC, SC and SGL. Order supplies as required.	
6	Prepare daily summary of equipment used, forward to Finance.	
	AFTER LARGE REFUSE FIRE EXTINGUISHED	
1	Ensure radios and equipment returned, signed in.	
2	Compile list of all equipment/supplies used.	
3	Compile summary of costs with Finance.	
4	Restock supplies as required.	
5	Review defficiencies in inventory with IC, SC and SGL. Order those supplies in.	

TABLE 6.7 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - FINANCE SUPPORT GROUP LEADER (FSGL)

Finance Support Group Leader

Waste and Recycling Services

Finance Section Manager

NON-REFUSE (fire not involving landfill or recycling area) — FINANCE SUPPORT GROUP LEADER (FSGL)	CHECK
BEFORE NON-REFUSE FIRE	
1 Review City of YK's financial resources and spending authority for IC and SC.	
2 Establish range of anticipated expenditures for Level 1 to 4 alerts.	
3 Establish how funding will be secured to pay for fire extinguishment services, should they be required.	
4 Communicate spending authority and procedures to IC and SC.	
5 Develop tracking system and forms for tracking expenditures with LGL.	
ONSET OF NON-REFUSE FIRE	
1 Contact IC re need to track expenses.	
2 Assess financial risk of incident with IC, SC, and SGL.	
DURING NON-REFUSE FIRE	
1 Continue tracking expenses, if significant.	
2 Update risk assessment as conditions change.	
AFTER NON-REFUSE FIRE EXTINGUISHED	
1 Compile total costs of response.	
2 Review reporting policy, upgrade as needed.	

SMALL LANDFILL (small refuse fire contained in 24 hrs). — FINANCE SUPPORT GROUP LEADER (FSGL)	CHECK
BEFORE SMALL LANDFILL FIRE	
1 Review City of YK's financial resources and spending authority for IC and SC.	
2 Establish range of anticipated expenditures for Level 1 to 4 alerts.	
3 Establish how funding will be secured to pay for fire extinguishment services, should they be required.	
4 Communicate spending authority and procedures to IC and SC.	
5 Develop tracking system and forms for tracking expenditures with LGL.	
ONSET OF SMALL LANDFILL FIRE	
1 Contact IC re need to track expenses.	
2 Assess financial risk of incident with IC, SC, and SGL.	
DURING SMALL LANDFILL FIRE	
1 Continue tracking expenses, if significant.	
2 Update risk assessment as conditions change.	
AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1 Compile total costs of response.	
2 Review reporting policy, upgrade as needed.	

MEDIUM REFUSE (medium refuse fire contained in 1 week). — FINANCE SUPPORT GROUP LEADER (FSGL)	CHECK
BEFORE MEDIUM REFUSE FIRE	
1 Review City of YK's financial resources and spending authority for IC and SC.	
2 Establish range of anticipated expenditures for Level 1 to 4 alerts.	
3 Establish how funding will be secured to pay for fire extinguishment services, should they be required.	
4 Communicate spending authority and procedures to IC and SC.	
5 Develop tracking system and forms for tracking expenditures with LSGL.	
ONSET OF MEDIUM REFUSE FIRE	
1 Coordinate with LSGL re tracking expenses.	
2 Assess financial risk of incident with IC, SC, and SGL.	
DURING MEDIUM REFUSE FIRE	
1 Continue tracking expenses.	
2 Update risk assessment as conditions change.	
3 Review expenses vs. available budget with IC on daily basis.	
4 Establish management team for financial tracking of project, as required.	
AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1 Compile total costs of response.	
2 Review reporting policy, upgrade as needed.	

LARGE REFUSE (major refuse fire requiring > 2 weeks). — FINANCE SUPPORT GROUP LEADER (FSGL)	CHECK
BEFORE LARGE REFUSE FIRE	
1 Review City of YK's financial resources and spending authority for IC and SC.	
2 Establish range of anticipated expenditures for Level 1 to 4 alerts.	
3 Establish how funding will be secured to pay for fire extinguishment services, should they be required.	
4 Communicate spending authority and procedures to IC and SC.	
5 Develop tracking system and forms for tracking expenditures with LGL.	
ONSET OF LARGE REFUSE FIRE	
1 Coordinate with LSGL re tracking expenses.	
2 Assess financial risk of incident with IC, SC, and SGL.	
DURING LARGE REFUSE FIRE	
1 Continue tracking expenses.	
2 Update risk assessment as conditions change.	
3 Review expenses vs. available budget with IC on daily basis.	
4 Establish management team for financial tracking of project, as required.	
AFTER LARGE REFUSE FIRE EXTINGUISHED	
1 Compile total costs of response.	
2 Review reporting policy, upgrade as needed.	

TABLE 6.8 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - MEDIA LIASON (ML)

Media Liaison	NON-REFUSE (fire not involving landfill or recycling area) MEDIA LIASON (ML)	CHECK	SMALL LANDFILL (small refuse fire contained in 24 hrs). MEDIA LIASON (ML)	CHECK	MEDIUM REFUSE (medium refuse fire contained in 1 week). MEDIA LIASON (ML)	CHECK	LARGE REFUSE (major refuse fire requiring > 2 weeks). MEDIA LIASON (ML)	CHECK
Yellowknife Fire Depatment	**BEFORE NON-REFUSE FIRE**		**BEFORE SMALL LANDFILL FIRE**		**BEFORE MEDIUM REFUSE FIRE**		**BEFORE LARGE REFUSE FIRE**	
Public Information Officer	**1** Prepare public relations policy with regard to release of information. Review Chapter 10.7.		**1** Prepare public relations policy with regard to release of information. Review Chapter 10.7.		**1** Prepare public relations policy with regard to release of information. Review Chapter 10.7.		**1** Prepare public relations policy with regard to release of information. Review Chapter 10.7.	
	2 Ensure all landfill staff are familiarized with policy.		**2** Ensure all landfill staff are familiarized with policy.		**2** Ensure all landfill staff are familiarized with policy.		**2** Ensure all landfill staff are familiarized with policy.	
	3 Put in place strategy for quickly communicating same policy to responding fire fighters.		**3** Put in place strategy for quickly communicating same policy to responding fire fighters.		**3** Put in place strategy for quickly communicating same policy to responding fire fighters.		**3** Put in place strategy for quickly communicating same policy to responding fire fighters.	
	4 Identify channels for releasing public information to radio, newspapers, TV, if required.		**4** Identify channels for releasing public information to radio, newspapers, TV, if required.		**4** Identify channels for releasing public information to radio, newspapers, TV, if required.		**4** Identify channels for releasing public information to radio, newspapers, TV, if required.	
	ONSET OF NON-REFUSE FIRE		**ONSET OF SMALL LANDFILL FIRE**		**ONSET OF MEDIUM REFUSE FIRE**		**ONSET OF LARGE REFUSE FIRE**	
	1 IC to contact PR if required.		**1** IC to contact PR if required.		**1** IC to contact PR if required.		**1** IC to contact PR if required.	
	2 Respond to incident needs as directed by IC.		**2** Respond to incident needs as directed by IC.		**2** Respond to incident needs as directed by IC.		**2** Respond to incident needs as directed by IC.	
	3 Prepare news releases for local papers, radio and TV. Have IC and Manager of Waste and Recycling Services review before release.		**3** Prepare news releases for local papers, radio and TV. Have IC and Manager of Waste and Recycling Services review before release.		**3** Prepare news releases for local papers, radio and TV. Have IC and Manager of Waste and Recycling Services review before release.		**3** Prepare news releases for local papers, radio and TV. Have IC and Manager of Waste and Recycling Services review before release.	
	4 In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.		**4** In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.		**4** In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.		**4** In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.	
	DURING NON-REFUSE FIRE		**DURING SMALL LANDFILL FIRE**		**DURING MEDIUM REFUSE FIRE**		**DURING LARGE REFUSE FIRE**	
	1 Follow up with IC to establish PR requirements.		**1** Follow up with IC to establish PR requirements.		**1** Follow up with IC to establish PR requirements.		**1** Follow up with IC to establish PR requirements.	
	2 Respond to incident needs as directed by IC.		**2** Respond to incident needs as directed by IC.		**2** Respond to incident needs as directed by IC.		**2** Respond to incident needs as directed by IC.	
	3 Prepare news releases for local papers, radio and TV. Have IC review.		**3** Prepare news releases for local papers, radio and TV. Have IC review.		**3** Prepare news releases for local papers, radio and TV. Have IC review.		**3** Prepare news releases for local papers, radio and TV. Have IC review.	
	4 In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.		**4** In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.		**4** In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.		**4** In event of evacuation, work with SGL and evacuation team to broadcast instructions through media as needed.	
	AFTER NON-REFUSE FIRE EXTINGUISHED		**AFTER SMALL LANDFILL FIRE EXTINGUISHED**		**AFTER MEDIUM REFUSE FIRE EXTINGUISHED**		**AFTER LARGE REFUSE FIRE EXTINGUISHED**	
	1 Prepare summary news release, assist in returning landfill operations to normal.		**1** Prepare summary news release, assist in returning landfill operations to normal.		**1** Prepare summary news release, assist in returning landfill operations to normal.		**1** Prepare summary news release, assist in returning landfill operations to normal.	

TABLE 6.9 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - REGULATORY AGENCY LIAISON (RAL)

Regulatory Agency Liaison

Waste and Recycling Services

Disposal Treatment Manager

	NON-REFUSE (fire not involving landfill or recycling area) — REGULATORY AGENCY LIAISON (RAL)	CHECK
	BEFORE NON-REFUSE FIRE	
1	Establish contact names and numbers for regulators to be contacted during fire emergency.	
2	Follow up with phone call introductions and advise when contact will be made in emergency.	
3	Prepare environmental monitoring action plan that outlines sampling strategy and locations.	
4	Establish source for climate data and forecasts. Verify that data available on 24/7/365 basis.	
5	Review policy for release of sensitive information to regulators with IC.	
	ONSET OF NON-REFUSE FIRE	
1	Contact IC to determine if any regulatory contact required.	
2	Log in with IC. Pick up radio.	
3	Make regulatory contact calls if required.	
4	Travel to fire site if requested by IC.	
5	Log in with SC.	
6	Initiate monitoring of potential contaminants, especially if any spills or water discharge involved.	
	DURING NON-REFUSE FIRE	
1	Follow up with regulators if requested by IC.	
2	Review monitoring program.	
3	Carry out additional sampling, as required.	
4	Tabulate data on computer. Forward information to appropriate regulatory agencies.	
5	Review significance of sampling results with SGL and engineering team.	
	AFTER NON-REFUSE FIRE EXTINGUISHED	
1	Establish post fire monitoring plan.	
2	Follow up with regulators, report status, monitoring results and plan. Confirm strategy.	
3	Carry out follow up monitoring program, as needed.	

	SMALL LANDFILL (small refuse fire contained in 24 hrs). — REGULATORY AGENCY LIAISON (RAL)	CHECK
	BEFORE SMALL LANDFILL FIRE	
1	Establish contact names and numbers for regulators to be contacted during fire emergency.	
2	Follow up with phone call introductions and advise when contact will be made in emergency.	
3	Prepare environmental monitoring action plan that outlines sampling strategy and locations.	
4	Establish source for climate data and forecasts. Verify that data available on 24/7/365 basis.	
5	Review policy for release of sensitive information to regulators with IC.	
	ONSET OF SMALL LANDFILL FIRE	
1	Contact IC to determine if any regulatory contact required.	
2	Log in with IC. Pick up radio.	
3	Make regulatory contact calls if required.	
4	Travel to fire site if requested by IC.	
5	Log in with SC.	
6	Initiate monitoring of potential contaminants, especially if any spills or water discharge involved.	
	DURING SMALL LANDFILL FIRE	
1	Follow up with regulators if requested by IC.	
2	Review monitoring program.	
3	Carry out additional sampling, as required.	
4	Tabulate data on computer. Forward information to appropriate regulatory agencies.	
5	Review significance of sampling results with SGL and engineering team.	
	AFTERSMALL LANDFILL FIRE EXTINGUISHED	
1	Establish post fire monitoring plan.	
2	Follow up with regulators, report status, monitoring results and plan. Confirm strategy.	
3	Carry out follow up monitoring program, as needed.	

	MEDIUM REFUSE (medium refuse fire contained in 1 week). — REGULATORY AGENCY LIAISON (RAL)	CHECK
	BEFORE MEDIUM REFUSE FIRE	
1	Establish contact names and numbers for regulators to be contacted during fire emergency.	
2	Follow up with phone call introductions and advise when contact will be made in emergency.	
3	Prepare environmental monitoring action plan that outlines sampling strategy and locations.	
4	Establish source for climate data and forecasts. Verify that data available on 24/7/365 basis.	
5	Review policy for release of sensitive information to regulators with IC.	
	ONSET OF MEDIUM REFUSE FIRE	
1	Contact IC to determine if any regulatory contact required.	
2	Log in with IC. Pick up radio.	
3	Make regulatory contact calls if required. Contact DNR Field Office Supervisor Contact YK Air Quality Coordinate with SGL in contacts.	
4	Travel to fire site if requested by IC.	
5	Log in with SC.	
6	Initiate monitoring of potential contaminants, especially if any spills or water discharge involved.	
	DURING MEDIUM REFUSE FIRE	
1	Follow up with regulators if requested by IC.	
2	Review monitoring program.	
3	Carry out additional sampling, as required.	
4	Tabulate data on computer. Forward information to appropriate regulatory agencies.	
5	Review significance of sampling results with SGL and engineering team.	
	AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1	Establish post fire monitoring plan.	
2	Follow up with regulators, report status, monitoring results and plan. Confirm strategy.	
3	Carry out follow up monitoring program, as needed.	

	LARGE REFUSE (major refuse fire requiring > 2 weeks). — REGULATORY AGENCY LIAISON (RAL)	CHECK
	BEFORE LARGE REFUSE FIRE	
1	Establish contact names and numbers for regulators to be contacted during fire emergency.	
2	Follow up with phone call introductions and advise when contact will be made in emergency.	
3	Prepare environmental monitoring action plan that outlines sampling strategy and locations.	
4	Establish source for climate data and forecasts. Verify that data available on 24/7/365 basis.	
5	Review policy for release of sensitive information to regulators with IC.	
	ONSET OF LARGE REFUSE FIRE	
1	Contact IC to determine if any regulatory contact required.	
2	Log in with IC. Pick up radio.	
3	Make regulatory contact calls if required. Contact DNR Field Office Supervisor Contact Air Quality Polk County Coordinate with SGL in contacts.	
4	Travel to fire site if requested by IC.	
5	Log in with SC.	
6	Initiate monitoring of potential contaminants, especially if any spills or water discharge involved.	
	DURING LARGE REFUSE FIRE	
1	Follow up with regulators if requested by IC.	
2	Review monitoring program.	
3	Carry out additional sampling, as required.	
4	Tabulate data on computer. Forward information to appropriate regulatory agencies.	
5	Review significance of sampling results with SGL and engineering team.	
	AFTER LARGE REFUSE FIRE EXTINGUISHED	
1	Establish post fire monitoring plan.	
2	Follow up with regulators, report status, monitoring results and plan. Confirm strategy.	
3	Carry out follow up monitoring program, as needed.	

TABLE 6.10 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - ENGINEERING SUPPORT GROUP LEADER (ESGL)

Engineering Support Group Leader

Waste and Recycling Services

Waste

Managemenent Engineer

NON-REFUSE (fire not involving landfill or recycling area) ENG. SUPPORT GROUP LEADER (ESGL)	CHECK
BEFORE NON-REFUSE FIRE	
1 Obtain digital fire plan and mapping from LFCI. Review all files for accessibility.	
2 Be prepared to generate specific site maps, etc. during emergency as required.	
3 Review technology for installing bar-hole punch and bore-hole thermisters.	
4 Organize in-house fire response strategy identify project staff.	
ONSET OF NON-REFUSE FIRE	
1 IC to contact ESGL if any engineering support required.	
2 Respond to requests as needed.	
DURING NON-REFUSE FIRE	
1 Follow up with IC and Incindent Command team.	
2 Review engineering support needs, if any.	
AFTER NON-REFUSE FIRE EXTINGUISHED	
1 Summarize engineering support work provided.	
2 Review systems to establish whether better fire extinguishment/fire proofing can be realized.	

SMALL LANDFILL (small refuse fire contained in 24 hrs). ENG. SUPPORT GROUP LEADER (ESGL)	CHECK
BEFORE SMALL LANDFILL FIRE	
1 Obtain digital fire plan and mapping from LFCI. Review all files for accessibility.	
2 Be prepared to generate specific site maps, etc. during emergency as required.	
3 Review technology for installing bar-hole punch and bore-hole thermisters.	
4 Organize in-house fire response strategy identify project staff.	
ONSET OF SMALL LANDFILL FIRE	
1 IC to contact ESGL if any engineering support required.	
2 Respond to requests as needed.	
DURING SMALL LANDFILL FIRE	
1 Follow up with IC and Incindent Command team.	
2 Review engineering support needs, if any.	
AFTER SMALL LANDFILL FIRE EXTINGUISHED	
1 Summarize engineering support work provided.	
2 Review systems to establish whether better fire extinguishment/fire proofing can be realized.	

MEDIUM REFUSE (medium refuse fire contained in 1 week). ENG. SUPPORT GROUP LEADER (ESGL)	CHECK
BEFORE MEDIUM REFUSE FIRE	
1 Obtain digital fire plan and mapping from LFCI. Review all files for accessibility.	
2 Be prepared to generate specific site maps, etc. during emergency as required.	
3 Review technology for installing bar-hole punch and bore-hole thermisters.	
4 Organize in-house fire response strategy identify project staff.	
ONSET OF MEDIUM REFUSE FIRE	
1 IC to contact ESGL if any engineering support required.	
2 Respond to requests as needed.	
DURING MEDIUM REFUSE FIRE	
1 Follow up with IC and Incindent Command team.	
2 Review engineering support needs, if any.	
3 Assess fire water leachate imacts on leachate treatment system. Take action as required.	
4 Review data management with RAL.	
5 Initiate bar-hole punch and sub-surface gas and temperature monitoring.	
6 Review soil supply needs and availability. Update plans as required.	
AFTER MEDIUM REFUSE FIRE EXTINGUISHED	
1 Summarize engineering support work provided.	
2 Review systems to establish whether better fire extinguishment/fire proofing can be realized.	

LARGE REFUSE (major refuse fire requiring > 2 weeks). ENG. SUPPORT GROUP LEADER (ESGL)	CHECK
BEFORE LEVEL 4 FIRE	
1 Obtain digital fire plan and mapping from LFCI. Review all files for accessibility.	
2 Be prepared to generate specific site maps, etc. during emergency as required.	
3 Review technology for installing bar-hole punch and bore-hole thermisters.	
4 Organize in-house fire response strategy identify project staff.	
ONSET OF LARGE REFUSE FIRE	
1 IC to contact ESGL if any engineering support required.	
2 Respond to requests as needed.	
DURING LARGE REFUSE FIRE	
1 Follow up with IC and Incindent Command team.	
2 Review engineering support needs, if any.	
3 Assess fire water leachate imacts on leachate treatment system. Take action as required.	
4 Review data management with RAL.	
5 Initiate bar-hole punch and sub-surface gas and temperature monitoring.	
6 Review soil supply needs and availability. Update plans as required.	
AFTER LARGE REFUSE FIRE EXTINGUISHED	
1 Summarize engineering support work provided.	
2 Review systems to establish whether better fire extinguishment/fire proofing can be realized.	

TABLE 6.11 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - OUTSIDE STAFF (OS)

	NON-REFUSE (fire not involving landfill or recycling area) 40	CHECK	SMALL LANDFILL (small refuse fire contained in 24 hrs). OUTSIDE STAFF (OS)	CHECK	MEDIUM REFUSE (medium refuse fire contained in 1 week). OUTSIDE STAFF (OS)	CHECK	LARGE REFUSE (major refuse fire requiring > 2 weeks). OUTSIDE STAFF (OS)	CHECK
	BEFORE NON-REFUSE FIRE		**BEFORE SMALL LANDFILL FIRE**		**BEFORE MEDIUM REFUSE FIRE**		**BEFORE LARGE REFUSE FIRE**	
1	Obtain fit tested half face respirator, keep in place of work in plastic bag.		Obtain fit tested half face respirator, keep in place of work in plastic bag.		Obtain fit tested half face respirator, keep in place of work in plastic bag.		Obtain fit tested half face respirator, keep in place of work in plastic bag.	
2	Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.		Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.		Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.		Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.	
3	Do not smoke, except in designated areas.		Do not smoke, except in designated areas.		Do not smoke, except in designated areas.		Do not smoke, except in designated areas.	
4	Watch out for signs of fire (see Chap. 9)		Watch out for signs of fire (see Chap. 9)		Watch out for signs of fire (see Chap. 9)		Watch out for signs of fire (see Chap. 9)	
	ONSET OF NON-REFUSE FIRE		**ONSET OF SMALL LANDFILL FIRE**		**ONSET OF MEDIUM REFUSE FIRE**		**ONSET OF LARGE REFUSE FIRE**	
1	Evacuate building or equipment. Assist any injured to muster point. Close all doors on exit.		Evacuate building or equipment. Assist any injured to muster point. Close all doors on exit.		Evacuate building or equipment. Assist any injured to muster point. Close all doors on exit.		Evacuate building or equipment. Assist any injured to muster point. Close all doors on exit.	
2	Activate fire alarm if close. Alert all staff in area.		Activate fire alarm if close. Alert all staff in area.		Activate fire alarm if close. Alert all staff in area.		Activate fire alarm if close. Alert all staff in area.	
3	Report fire to office via radio. Indicate exact location of fire. Ask office to call 9-1-1.		Report fire to office via radio. Indicate exact location of fire. Ask office to call 9-1-1.		Report fire to office via radio. Indicate exact location of fire. Ask office to call 9-1-1.		Report fire to office via radio. Indicate exact location of fire. Ask office to call 9-1-1.	
4	Call 9-1-1 on Cell Phone if office cannot be contacted.		Call 9-1-1 on Cell Phone if office cannot be contacted.		Call 9-1-1 on Cell Phone if office cannot be contacted.		Call 9-1-1 on Cell Phone if office cannot be contacted.	
5	Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.		Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.		Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.		Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.	
6	Assess risk of hazardous/toxic/explosive materials involved. Report to SC.		Assess risk of hazardous/toxic/explosive materials involved. Report to SC.		Assess risk of hazardous/toxic/explosive materials involved. Report to SC.		Assess risk of hazardous/toxic/explosive materials involved. Report to SC.	
7	Put on half face respirator.		Put on half face respirator.		Put on half face respirator.		Put on half face respirator.	
8	If electrical fire, disconnect appliance or turn-off master breaker if safe to do so.		If electrical fire, disconnect appliance or turn-off master breaker if safe to do so.		If electrical fire, disconnect appliance or turn-off master breaker if safe to do so.		If electrical fire, disconnect appliance or turn-off master breaker if safe to do so.	
9	Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.		Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.		Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.		Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.	
10	Maintain clear path of escape.		Maintain clear path of escape.		Maintain clear path of escape.		Maintain clear path of escape.	
11	Keep upwind of fire if possible.		Keep upwind of fire if possible.		Keep upwind of fire if possible.		Keep upwind of fire if possible.	
12	Log in with SC when he arrives on scene.		Log in with SC when he arrives on scene.		Log in with SC when he arrives on scene.		Log in with SC when he arrives on scene.	
13	Update SC on situation and hazards.		Update SC on situation and hazards.		Update SC on situation and hazards.		Update SC on situation and hazards.	
14	Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SM to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SM to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.	
	DURING NON-REFUSE FIRE		**DURING SMALL LANDFILL FIRE**		**DURING MEDIUM REFUSE FIRE**		**DURING LARGE REFUSE FIRE**	
1	Log in/sign in at Command Post.		Log in/sign in at Command Post.		Log in/sign in at Command Post.		Log in/sign in at Command Post.	
2	Ensure you are logged in with SC.		Ensure you are logged in with SC.		Ensure you are logged in with SC.		Ensure you are logged in with SC.	
3	Wear appropriate safety wear (See Chap. 10).		Wear appropriate safety wear (See Chap. 10).		Wear appropriate safety wear (See Chap. 10).		Wear appropriate safety wear (See Chap. 10).	
4	Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.	
5	Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.	
6	Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.	
7	Work as team member with staff and Fire Dept.		Work as team member with staff and Fire Dept.		Work as team member with staff and Fire Dept.		Work as team member with staff and Fire Dept.	
8	Keep your senses tuned for hazards. Report all hazards to SC.		Keep your senses tuned for hazards. Report all hazards to SC.		Keep your senses tuned for hazards. Report all hazards to SC.		Keep your senses tuned for hazards. Report all hazards to SC.	
	AFTER NON-REFUSE FIRE EXTINGUISHED		**AFTER SMALL LANDFILL FIRE EXTINGUISHED**		**AFTER MEDIUM REFUSE FIRE EXTINGUISHED**		**AFTER LARGE REFUSE FIRE EXTINGUISHED**	
1	Return radios and tools to proper location.		Return radios and tools to proper location.		Return radios and tools to proper location.		Return radios and tools to proper location.	
2	Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.	
3	Determine with IC whether you should participate in Incident Report and debriefing.		Determine with IC whether you should participate in Incident Report and debriefing.		Determine with IC whether you should participate in Incident Report and debriefing.		Determine with IC whether you should participate in Incident Report and debriefing.	
4	Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.	

TABLE 6.12 FIRE RESPONSE ACTIONS AND RESPONSIBILITIES - INSIDE STAFF (IS)

	NON-REFUSE (fire not involving landfill or recycling area) INSIDE STAFF (IS)	CHECK	SMALL LANDFILL (small refuse fire contained in 24 hrs). INSIDE STAFF (IS)	CHECK	MEDIUM REFUSE (medium refuse fire contained in 1 week). INSIDE STAFF (IS)	CHECK	LARGE REFUSE (major refuse fire requiring > 2 weeks). INSIDE STAFF (IS)	CHECK
	BEFORE NON-REFUSE FIRE		**BEFORE SMALL LANDFILL FIRE**		**BEFORE MEDIUM REFUSE FIRE**		**BEFORE LARGE REFUSE FIRE**	
1	Obtain fit tested half face respirator, keep in locker or desk in plastic bag.		Obtain fit tested half face respirator, keep in locker or desk in plastic bag.		Obtain fit tested half face respirator, keep in locker or desk in plastic bag.		Obtain fit tested half face respirator, keep in locker or desk in plastic bag.	
2	Check where closest fire alarm and phone are located at your place of work.		Check where closest fire alarm and phone are located at your place of work.		Check where closest fire alarm and phone are located at your place of work.		Check where closest fire alarm and phone are located at your place of work.	
3	Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.		Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.		Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.		Obtain training on use of fire extinguisher. Know where closest fire extinguisher located.	
4	Do not smoke, except in designated areas.		Do not smoke, except in designated areas.		Do not smoke, except in designated areas.		Do not smoke, except in designated areas.	
5	Watch out for signs of fire (see Chap. 9)		Watch out for signs of fire (see Chap. 9)		Watch out for signs of fire (see Chap. 9)		Watch out for signs of fire (see Chap. 9)	
	ONSET OF NON-REFUSE FIRE		**ONSET OF SMALL LANDFILL FIRE**		**ONSET OF MEDIUM REFUSE FIRE**		**ONSET OF LARGE REFUSE FIRE**	
1	Evacuate building or equipment. Assist any injured to escape. Close all doors on exit.		Evacuate building or equipment. Assist any injured to escape. Close all doors on exit.		Evacuate building or equipment. Assist any injured to escape. Close all doors on exit.		Evacuate building or equipment. Assist any injured to escape. Close all doors on exit.	
2	Activate fire alarm. Alert all staff in area.		Activate fire alarm. Alert all staff in area.		Activate fire alarm. Alert all staff in area.		Activate fire alarm. Alert all staff in area.	
3	Report fire to office via telephone. Indicate exact location of fire. Ask office to call 9-1-1.		Report fire to office via telephone. Indicate exact location of fire. Ask office to call 9-1-1.		Report fire to office via telephone. Indicate exact location of fire. Ask office to call 9-1-1.		Report fire to office via telephone. Indicate exact location of fire. Ask office to call 9-1-1.	
4	Call 9-1-1 if office cannot be contacted and safe to do so.		Call 9-1-1 if office cannot be contacted and safe to do so.		Call 9-1-1 if office cannot be contacted and safe to do so.		Call 9-1-1 if office cannot be contacted and safe to do so.	
5	Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.		Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.		Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.		Move back all patrons and employees under direction of foreman or supervisor. Record names of any patrons involved in incident.	
6	Provide first aid to any injured (if trained).		Provide first aid to any injured (if trained).		Provide first aid to any injured (if trained).		Provide first aid to any injured (if trained).	
7	Check that building is fully evacuated, if safe to do so.		Check that building is fully evacuated, if safe to do so.		Check that building is fully evacuated, if safe to do so.		Check that building is fully evacuated, if safe to do so.	
8	Assess risk of hazardous/toxic/explosive materials involved. Report to SC.		Assess risk of hazardous/toxic/explosive materials involved. Report to SC.		Assess risk of hazardous/toxic/explosive materials involved. Report to SC.		Assess risk of hazardous/toxic/explosive materials involved. Report to SC.	
9	Put on half face respirator.		Put on half face respirator.		Put on half face respirator.		Put on half face respirator.	
10	Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.		Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.		Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.		Attempt to extinguish small fire with fire extinguisher, but only if safe to do so and only if you are not working alone.	
11	Maintain clear path of escape.		Maintain clear path of escape.		Maintain clear path of escape.		Maintain clear path of escape.	
12	Keep upwind of fire if possible.		Keep upwind of fire if possible.		Keep upwind of fire if possible.		Keep upwind of fire if possible.	
13	Log in with SC when he arrives on scene.		Log in with SC when he arrives on scene.		Log in with SC when he arrives on scene.		Log in with SC when he arrives on scene.	
14	Update SC on situation and hazards.		Update SC on situation and hazards.		Update SC on situation and hazards.		Update SC on situation and hazards.	
15	Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.	
	DURING NON-REFUSE FIRE		**DURING SMALL LANDFILL FIRE**		**DURING MEDIUM REFUSE FIRE**		**DURING LARGE REFUSE FIRE**	
1	Log in/sign in at Command Post.		Log in/sign in at Command Post.		Log in/sign in at Command Post.		Log in/sign in at Command Post.	
2	Ensure you are logged in with SC.		Ensure you are logged in with SC.		Ensure you are logged in with SC.		Ensure you are logged in with SC.	
3	Wear appropriate safety wear (See Chap. 10).		Wear appropriate safety wear (See Chap. 10).		Wear appropriate safety wear (See Chap. 10).		Wear appropriate safety wear (See Chap. 10).	
4	Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.		Follow SC's directions. Do only work you are qualified, comfortable and safe in doing. Otherwise, inform SC to select other staff.	
5	Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.	
6	Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.	
7	Work as team member with staff and Fire Dept.		Work as team member with staff and Fire Dept.		Work as team member with staff and Fire Dept.		Work as team member with staff and Fire Dept.	
8	Keep your senses tuned for hazards. Report all hazards to SC.		Keep your senses tuned for hazards. Report all hazards to SC.		Keep your senses tuned for hazards. Report all hazards to SC.		Keep your senses tuned for hazards. Report all hazards to SC.	
	AFTER NON-REFUSE FIRE EXTINGUISHED		**AFTER SMALL LANDFILL FIRE EXTINGUISHED**		**AFTER MEDIUM REFUSE FIRE EXTINGUISHED**		**AFTER LARGE REFUSE FIRE EXTINGUISHED**	
1	Return radios and tools to proper location.		Return radios and tools to proper location.		Return radios and tools to proper location.		Return radios and tools to proper location.	
2	Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.		Log out with SC when leaving fire zone.	
3	Determine with IC whether you should participate in Incident Report and debriefing.		Determine with IC whether you should participate in Incident Report and debriefing.		Determine with IC whether you should participate in Incident Report and debriefing.		Determine with IC whether you should participate in Incident Report and debriefing.	
4	Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.		Log out / sign out at command post when leaving site.	

7. EVACUATION

Evacuation of on-site staff, near-by residents and/or transients may be required during a fire emergency. Three levels of evacuation can be anticipated during a fire:

1. Local hazard evacuation (e.g. fire in a building, fire at refuelling area, fire at active face);
2. Landfill site evacuation (intense smoke from a fire situation) and
3. Regional evacuation of residents and transients if smoke plume or fire presents a hazard to residents in down-wind direction.

People that could be affected by an accident at the Yellowknife Landfill include:

- Staff and contractors working at the landfill.
- Public users of the landfill.
- Residents in the area of the landfill.
- Transients along Highway No. 4 (Ingraham Trail).
- Users of park facilities and ski trails east of landfill.

7.1 Level 1 Evacuation (Local Fire Emergency)

The decision to evacuate a hazardous area involving a fire should be made by landfill staff in any situation where a potential hazard is noted (e.g. fire at refuelling area, danger of explosion, fire in building, thick smoke developing).

In the event of a Level 1 evacuation, the YKL evacuation plan for the site should be followed.

During a Level 1 evacuation, a mustering point must be defined. It is the responsibility of the senior staff member working in the area to ensure that all staff and public have been evacuated from the hazard area and to "count heads" to ensure that they are present and accounted for.

The decision regarding when to step-down from an evacuation shall be made by the Incident Commander responding to the fire situation once it is established that it is safe to return to normal.

7.1.1 Active Face Evacuation

An active face evacuation shall occur whenever fire is identified at the active face. Although there may not be any immediate risk to the staff or public, clearing the area of unnecessary people and equipment will be very beneficial. Traffic should be diverted to an alternate operating area (e.g. wet weather area).

If personnel or the public may be at risk, the instruction to evacuate shall be made by the senior staff at the active face. Otherwise, the decision shall be made by the responding Incident Commander, or in his absence, the Site Commander. Instruction for evacuation of the active face will be using two-way radios or in person.

All non-essential personnel shall escort any members of the general public in the area of the active face to the established gathering point following the designated emergency escape way. Designated emergency escape way will change as the location of the active face changes; as such, staff working in the area of the active face will need to be regularly updated to ensure that there is no confusion. A gathering point for an active face evacuation shall be established. The current designated gathering point is _____(intentionally blank).

Essential staff at the active face shall ensure that, if safe to do so, any unnecessary equipment in the area of the active face is removed. This shall be done not only to save the equipment from possible harm, but also to clear the area for fire fighting efforts. Once equipment is removed, essential staff shall also assemble at the gathering point.

Once everyone is at the gathering point, the emergency coordinator at the active face shall "count heads" to account for all personnel. He shall then relegate further responsibility to the responding Incident Commander or Site Commander.

7.2 Level 2 Evacuation (Evacuation of Landfill Site)

In the event of a large fire or toxic smoke conditions, it may be necessary to evacuate all non-essential and unprotected staff (not wearing proper respiratory protection) from the landfill property. A decision to evacuate the landfill shall be made by the Incident Commander in charge of the fire and coordinated by the Health and Safety Group Leader.

A landfill site evacuation will be required whenever there is a possibility of the designated emergency escape way being blocked, be it from smoke, fire fighting efforts or the actual fire itself. Site evacuation may also be called if there is a risk of explosion (e.g. fire in the refuelling area, or when a large prairie fire is approaching.

During a Level 2 Evacuation:

- ❑ Secure the main entrance; prevent any further traffic from entering the property.
- ❑ Notify all staff that Level 2 evacuation is in process.
- ❑ Landfill staff shall escort any members of the general public from the landfill site following the designated emergency escape way.
- ❑ All staff shall then assemble at the established muster area (Baling Facility parking lot).
- ❑ If the Baling Facility parking lot is affected by smoke or other hazard an alternate, safe muster area shall be specified.
- ❑ The Health and Safety Group Leader (or her designated assistant) shall "Count Heads",

using a sign-in form.

- ❑ All parties shall be required to remain at the evacuation assembly point until everyone is accounted for.

7.3 Level 3 Evacuation (Regional Evacuation)

Although the need for an off-site evacuation at the Yellowknife Landfill site is considered small, due to the large buffer areas that are in place around the landfill, it is prudent to plan for a regional evacuation in the event atmospheric conditions limit smoke dispersal and create a respiratory hazard for residents / transients down-wind of the landfill site.

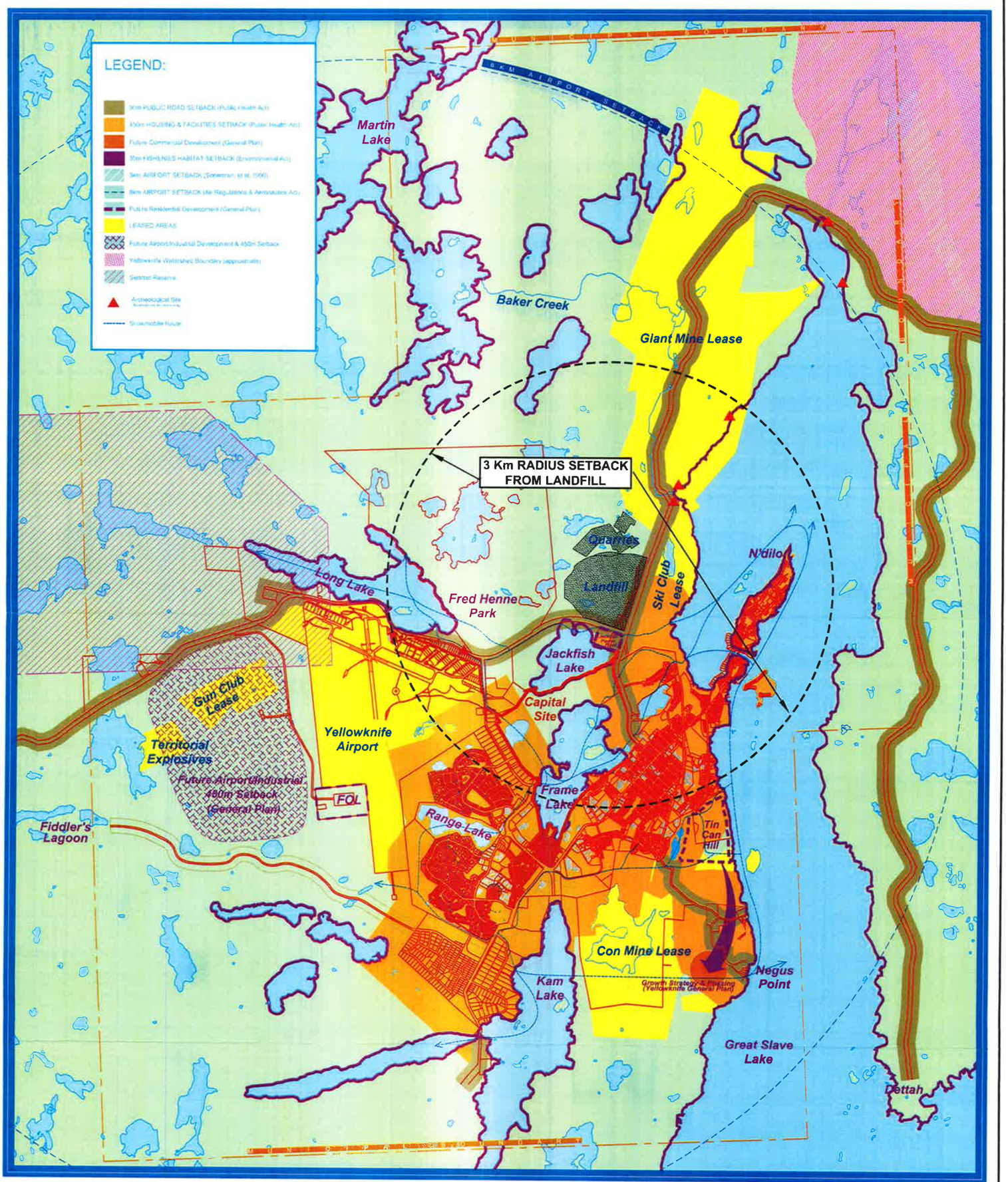
A decision for any Regional Evacuation shall be made by the Incident Commander in consultation with appropriate regulatory officers if air quality monitoring suggests that there may be a risk to the public beyond the landfill property boundary. According to the City of Yellowknife Plan, the "on-scene command authority can make a decision to evacuate when there is an immediate need in order to protect lives and provide for public safety".

Regional Evacuation shall follow the established protocols developed by the City of Yellowknife Emergency Plan. Details of the Evacuation Plan can be accessed on the internet at: http://www.maca.gov.nt.ca/emergency_management/resource/emergency_plan/Emergency4.pdf.

In the event that smoke or fumes produced by the landfill fire are determined to pose a health risk to the surrounding properties, it may be necessary to initiate the evacuation. Evacuation of the landfill site shall be conducted as outlined in Section 7.2 above, while evacuation of neighbouring properties shall be conducted in cooperation with the Yellowknife Police Department and other agencies.

Word of the evacuation will need to be spread door-to-door to ensure that everyone is notified. Figure 7-1 provides a map of residences and structures where people may be working. The map of Yellowknife, based on an evacuation plan for the Yellowknife Airport provides an indication of highly populated areas.

It is important to remember that smoke will travel down wind. Since the prevailing wind direction at Yellowknife Landfill is south, the residences and businesses at highest risk from smoke impact are located south of the landfill site in the 3 Km radius shown on Figure 7-1. Ingraham Trail and the quarry operations north of the landfilll could be impacted due to their proximity, and may require traffic controls / evacuation should a large fire occur.



Landfill Fire Control Inc.
#8 - 1225 East Keith Road
North Vancouver, B.C. V7J 1J3
Phone: (604) 986-7723
Fax: (604) 986-7734

CLIENT:
CITY OF YELLOWKNIFE

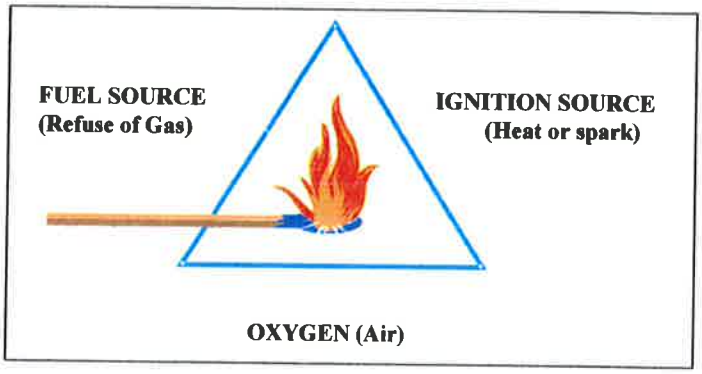
PROJECT:
YELLOWKNIFE LANDFILL
FIRE CONTROL AND
RISK REDUCTION PLAN

TITLE:
MAP OF RESIDENCES AND
STRUCTURES IN 3 Km
RADIUS OF LANDFILL

SCALE:	DATE: yyyy/mm/dd	PROJECT NO:
N.T.S.	2007/07/09	LFCI 07002
DESIGNED	ST	DRAWING NO:
DRAWN	BR	FIGURE 7-1
CHECKED	TS	

8. FIRE FIGHTING METHODS

Three basic ingredients are required for a fire to burn. The three ingredients: 1) fuel, 2) an ignition source and 3) sustained heat form the fire triangle. To prevent a fire from occurring, or to control a fire that is already burning it is necessary to remove at least one of the three fire triangle ingredients.



Fire prevention, discussed in Chapter 11 focuses on elimination of all potential ignition sources from the landfill, including burning cigarettes, hot loads and conditions that increase the risk of spontaneous combustion. Once a fire starts, the ignition source has been introduced. Therefore, to achieve extinguishment one must remove the heat source or cut off the oxygen supply.

There are three principal methods of fighting landfill fires. They include:

- Water Extinguishment Method
- Oxygen Suppression Method
- Excavate and Overhaul Method

A fourth method, which involves isolating the fire and allowing it to burn itself out, is generally undesirable due to associated air pollution impacts arising from particulate matter and contaminants contained in the smoke. Open combustion of refuse is also contrary to U.S. EPA Regulations and contrary to the Northwest Territories Environmental Protection Act.

Selection of the preferred method of fire extinguishment is dependant upon many variables, including but not necessarily limited to:

- Size and intensity of the fire;
- Depth of the fire (surface fire versus deep fire);
- Material fuelling the fire (MSW, C&D waste, clean wood waste, tires, etc.);
- Compaction of refuse in place;
- Size of cells in which refuse is contained;

- Thickness and continuity of intermediate cover fire breaks;
- Material used for intermediate cover (clay, sand, inert soil, wood waste);
- Availability of inert cover soil (preferably clay);
- Availability and delivery of pressure of water for fire fighting purposes;
- Population density and sensitivity of people down wind of the fire zone;
- Sensitivity of other receptors in the terrestrial and aquatic environment;
- Proximity of sensitive infrastructure (e.g. gas pipelines, utilities, fuel tanks, etc.)
- Risk of the fire spreading off-site (e.g. a prairie fire); and
- Availability of fire fighting resources

8.1 Ignition Methods

Common methods of igniting MSW and C&D wastes at landfill sites include:

- Hot loads containing burning embers;
- Reactive loads containing materials that will generate heat (e.g. spent bleaching earth);
- Careless use of matches or careless disposal of cigarette butts;
- Lightning;
- Arson;
- Natural Spontaneous Combustion, and
- Overdrawing of landfill gas wells

Hot Loads: It is our experience that the majority of fires at the active face are caused by hot loads containing ash from barbecues, stove ash, etc. A smaller number are probably initiated by careless smoking. In Chapter 12 we recommend that smoking be banned at the landfill active face.

Photo 8-1 Hot Coals Ignited Active Face Keremeos Landfill

Photo 8-2 Mopping Up Fare After Soaking with Foam

Spontaneous Combustion: The majority of large, deep-seated fires are caused by spontaneous combustion. Spontaneous combustion is a progressive bio-chemical oxidation process that typically occurs on exposed side slopes of landfill facilities, particularly at C&D landfills. Spontaneous combustion is the outbreak of fire without application of heat from an external source. Spontaneous combustion may occur through the storage of organic materials such as wood waste, coal, tire chips, compost or hay, as well as MSW and C&D waste.

Photo 8-3 Spontaneous Combustion, Closed Landfill in Delta

Photo 8-4 Spontaneous Combustion, Closed Landfill in Israel

In organic materials, spontaneous combustion occurs when heat initially produced through biological degradation is not allowed to dissipate thus raising the temperature of the material. Biological degradation will generally cause temperatures to increase to approximately 60°C (140 °F) under anaerobic conditions and 75°C (167°F) under aerobic conditions. At temperatures much higher than 80°C (176 °F) microorganisms die. Temperatures beyond 93°C (200°F) are associated with chemical oxidation of organic materials in the presence of oxygen. For wood, exothermic oxidation of wood commences around 149°C (300°F) and combustion with open flame commences around 315°C (600°F) (National Fire Protection Association, 1976). Following is a practical reference summary for evaluating landfill fire temperatures based on our experience on six major landfill fire projects. Temperature scales in Celsius degrees and Fahrenheit degrees are presented.

<60°C 1(40°F)	Anaerobic Decomposition
<75°C (167°F)	Aerobic Decomposition
80°C (176°F)	Microbes Die-off
93°C (200°F)	Pyrolysis Starts
149°C (300°F)	Exothermic Oxidation of Wood Starts

315°C (600°F) Wood Ignites Spontaneously (Combustion)

For spontaneous combustion to occur, conditions must be ideal. The following conditions may lead to spontaneous combustion:

Photo 8-5 Checking Temperature with Infra-Red Gun

- A pile of sufficient size to retain heat (the Ontario Fire Marshall's office recommends that woodchip piles be stored in piles less than 4 metres high, 8 metres wide and overall volume of 1,000 cubic metres to avoid spontaneous combustion (Government of Ontario, 1998))
- Moisture content around 25% on a wet basis (House, 1998) (dryer conditions prevent biological activity, wetter conditions reduce porosity and prevent temperatures increasing beyond biological levels)
- Supply of oxygen (many spontaneous combustion fires occur near the windward edge of a pile of material during windy conditions)
- Sufficient insulating capabilities to retain heat in the pile (Swedish researchers found that uncovered loosely packed piles of demolition material piled up to 5 metres high did not spontaneously combust whereas compacted piles regularly spontaneously ignited (Hogland et. al., 1996))
- Prolonged storage of organic materials (the Ontario Fire Marshall's office recommends storage of wood chips for less than 3 months (Government of Ontario, 1998).

Overdrawing Gas Wells: A smaller number of landfill fires have been initiated by overdrawing landfill gas production wells; thereby drawing oxygen into the waste at depth. The oxygen rich temperatures can accelerate aerobic biological activity, creating temperatures high enough to trigger a landfill fire.

8.2 Water Extinguishment Method

The water extinguishment method is a traditional method of fire control whereby water is applied directly to the burning material until the fuel is cooled sufficiently to prevent further chemical oxidation (when the fire is quenched). The key to the successful application of this approach is to have sufficient hauling / pumping capacity to quickly deliver a large volume of water to the fire zone. As a rule of thumb, 500 to 1,000 litres of water are required for every 1.0 m^3 of refuse

on fire. Depending on the size of the fire, a large water reservoir or a municipal water supply may be needed to provide the large volume of water required to fully extinguish the fire.

For watering to be effective, it is necessary for the water to fully penetrate into the burning refuse mass in order to dissipate the heat. Therefore, watering is most effective when the burning waste is at or near the surface. Water application is typically more effective on C&D waste, which is more pervious than MSW.

Photo 8-6 Applying Water with Water Hose

Photo 8-7 Applying Water from Monitor

Watering becomes less effective when the burning waste is at depth. At refuse depths below 6 m (20'), the direct application of water at surface becomes questionable. The reasons are:

- As water travels through the waste material, flow channels may develop. Over time, the amount of water travelling down the channels will increase, and the amount of water coming into contact with the burning material will decrease. This process is called short-circuiting. On the Delta Shake and Shingle C&D landfill fire we experienced a tremendous amount of short-circuiting. Water application was ultimately abandoned in favour of a complete overhaul.

- When burning material such a molten plastic is quickly cooled, the outer surface may crust over preventing water penetration into the centre of the burning mass. Thus complete extinguishment of the material may not be realized.

In order to prevent short-circuiting and crusting, wetting agents such as Class A foam can be added to the water. Wetting agents reduce the surface tension of natural water and thereby allow for better penetration of the waste. Class-A foam is typically applied at concentrations of 0.5%.

Another approach involves installing stingers or drilled wells into the body of the landfill through which water can be pumped. This is a viable option when the exact location of the fire is known, and the area is relatively small. To ensure that the water being injected is distributed throughout the fire zone, it is essential to develop some shallow stingers as well as some deep stingers.

Photo 8-8 Deploying Water at Vancouver Landfill, 3,000 Gallons Per Load

Photo 8-9 Water Truck Injecting Into Stinger

A third alternative is to dump copious quantities of water on the fire area in an attempt to fully saturate the refuse mass, thus overcoming the complications with short-circuiting. At the recent Vancouver Landfill Fire as an example, a fleet of three large off-road haul trucks were used to dump upwards of 12,400 litres (3,300 gallons) of water on the suspected fire area per load. Due to the large volume of water required, this approach is not recommended at sites where the water supply is limited nor in areas where leachate control cannot be reliably achieved.

Invariably, application of fire control water will generate large volumes of leachate. To minimize leachate impacts, Landfill Fire Control Inc. staff recommends recirculating fire water such that the amount of leachate being produced can be minimized. To ensure that recirculated water will not wear out pumps, it is desirable to establish a large sedimentation pond that will provide at least several hours of retention time.

8.3 Oxygen Suppression Method

For a fire to continue burning, a sufficient amount of oxygen must be present in the atmosphere. For example, if you cover a burning candle with a glass, soon the fire will go out as all oxygen in the air space is consumed. The same principle works with landfill fires as well. The objective of the oxygen suppression method of fire-fighting is to cut off the oxygen supply, thereby smothering the burning material.

On small Level 2 surface fires oxygen suppression can be accomplished by dumping one or more buckets of impervious clay soil directly on top of the burning material. Once the fire is "snuffed" out, the charred remains and embers should be thoroughly quenched with water to prevent the fire from re-igniting.

Photo 8-10 Suppressing Oxygen with Dirt. C & D Fire in Minnesota

Photo 8-11 Placing Soil on C & D Cell

On larger Level 3 and Level 4 underground fires, oxygen suppression can be accomplished in some situations by placing a low permeability barrier (cover layer) on the surface of the landfill. Over time, the landfill fire will consume any remaining atmospheric oxygen within the body of the landfill (contained in the air voids in the garbage) and starve itself out. This may take six months or longer to occur. The preferred material to achieve an impervious oxygen cover is clay soil. Geomembranes should not be used as they melt if the temperature of the membrane gets too high. Granular soils such as sands and gravels should not be used because they are air permeable, thus oxygen can enter the waste column through the cover soil.

Photo 8-12 Melted HDPE Membrane in Israel

Photo 8-13 Topsoil placed on clay barrier to prevent desiccation cracking, Penticton B.C Fire.

The effectiveness of oxygen suppression on deep seated fires will depend on how effectively the clay final cap can be maintained free of settlement cracks, collapse holes and desiccation cracking. It has been the experience of Landfill Fire Control Inc. staff that a 3.6 m (12") layer of compost or biosolids does a good job in keeping moisture in the clay and preventing cracking.

Keep in mind that a fire may remain smouldering for several months before temperatures drop sufficiently and all oxygen supplies are used up. If air leaks develop in the cover material during this critical time (desiccation cracks in clay material or tears/holes in geomembranes), then air could potentially re-enter the landfill and possibly re-ignite the fire. Fortunately, this has not been the case on projects where Landfill Fire Control Inc. used the oxygen suppression method in the past. Because the landfill cap traps landfill gases generated as part of decomposition, positive gas pressures are typically generated. Instead of venting atmospheric gas in through the cracks, landfill gas including methane and CO_2 is vented out.

Oxygen suppression should not be considered on landfills with side slopes steeper than 2.5H:1V due to the difficulties in constructing a reliable clay cover cap.

The main disadvantage of this approach is it may take months, if not years, for all the oxygen to be consumed and the fire to be fully extinguished. During this entire time, the cover system has to be carefully monitored and maintained to prevent leaks.

Also, combustion gases trapped beneath the cover can pose a health risk if penetrations exist through the cover system (e.g. gas monitoring wells, temperature probes etc.) or if fumaroles develop. Foremost, elevated carbon monoxide (CO) levels can be expected due to the incomplete combustion that occurs in an oxygen starved state. We have measured CO levels as high as 10,000 ppm. Elevated quantities of Hydrogen Sulphide (H_2S) can also build up, especially at C&D landfills or cells. Gas concentrations at such elevated levels are frequently encountered in landfill fires and can be fatal when inhaled. Please see Chapter 10 for more details.

Sealing off the entire landfill can also be very difficult (and costly) in certain instances. At a landfill fire in Hawaii as an example, oxygen suppression was the selected method of extinguishment until it was determined that there were large lava tubes allowing air penetration from the underside of the landfill. Similarly, at a site in Penticton, British Columbia, fractured bedrock along the edges of the landfill had to grouted to prevent airflow into the underside of the fill area.

8.4 Excavate And Overhaul Method

The basis of the "excavate and overhaul method" is the removal of the burning material from the core of the landfill and the subsequent extinguishment of said material under controlled conditions. In our experience, this method is the most effective, but also the most costly

alternative for dealing with deep-set fires.

The key to the success of this method is planning a method of excavation that will not cause the fire to spread beyond its present location. Creation of air channels into the heart of the landfill that will allow the fire to move even deeper or further into the body of the site must be prevented at all costs. Otherwise, the excavation efforts will simply continue chasing the fire deeper and deeper into the fill. To ensure success, it is best to start the excavation outside the burn zone and to establish fireguards down to inert soil or rock. Excavation of the burning material can then proceed once the perimeters are secure and the fire has nowhere to go.

Photo 8-14 Excavating C & D Waste at Delta

Photo 8-15 Foaming Hot Material on Hot Pad

To minimize costs during an overhaul, we have found it useful to measure the temperature of each bucket load of material excavated from the landfill to determine if the material is "hot" or "cold". "Hot" material is sent to a specified area for controlled extinguishment, while "cold" material can merely be stored in a stockpile until put back or deposited in another part of the landfill. We generally use 50°C (122°F) as the threshold temperature to differentiate between hot material and cold material.

Photo 8-16 Scanning for Hot Loads

8.5 Recommended Fire Control Strategy for Yellowknife Landfill

The Yellowknife Landfill is atypical of most municipal landfills in that refuse is baled. We believe this increases the risk of fire in that the gaps between bales provide a pathway for air to enter deeper into the landfill. As a result, it appears that a larger portion of the landfill exists in an aerobic state and LFG production appears to be quite limited.

Although there is a risk of landfill fire in the baled MSW disposal area, we believe the highest risks of landfill fire occur in the wood and demolition waste areas and the uncontrolled tipping pad. Fires in these areas could spread quickly and could grow quite large.

To control fires in these areas it will be critical to knock them down quickly. This should be done with mass water and/or foam application. Heavy equipment can then be used to open up the burned mass so that it can be overhauled and fully extinguished. If available, dirt can also be used to quickly smother an emerging fire by cutting off the oxygen supply. A layer of low permeability soil (e.g. silt, clay or till) at least 300 mm thick should be deployed over the fire to limit oxygen entry and to extinguish the fire.

Small Level 2 fires should be extinguished with water and foam, or they can be suppressed with a soil cover and then overhauled. Since the availability of cover soil is sparse, we recommend keeping a ready supply of soil at the active face for this purpose.

Since baling of waste achieves relatively good compaction rates, if larger fires do occur, application of water alone will likely not be effective as a result of the good compaction. Stingers may prove effective in some situations

Oxygen suppression will likely be the preferred strategy for fire control on major fires, with overhaul as the fall-back fire fighting strategy. In the event that a major fire does develop, we recommend that technical staff at Landfill Fire Inc. be retained to develop an incident specific strategy to fight the fire most effectively.

9. FIRE DETECTION

A key element of fire risk management is detecting a potential underground fire early enough to minimize the problem. Although the fire may be smouldering or even burning underground for days, if not weeks, there are quite often indicators of the fire lurking below the surface. It is through the identification of the indicators that early action can be taken.

9.1 Visual Signs Of Fire

Flame: The most obvious indicator of a fire is open flame, especially at night. Flame can be an indication of a surface fire that has just started, most likely at the active face, or possibly an underground fire that has risen to the surface, most likely away from the active face. When approaching flame to assess the fire, be extremely cautious. There is no way of knowing how big the fire may be. Individuals and equipment have been known to break through the surface into underground caverns that develop as material burns up.

Photo 9-1 Flame at Active Face

Photo 9-2 Flame in Old Burn Pit Terrace, B.C.

Smoke: Another visual sign of fire is smoke. However, when observing venting of smoke like gases from the landfill, use care in your assessment before concluding that the landfill is on fire. It is critical to differentiate between true smoke from a fire and condensed water vapour or steam from biological activity during waste decomposition. Smoke can usually be identified by a greyer colour, higher opacity, and a distinct "burnt garbage odour". As well, the chemical composition of it is likely to include carbon monoxide (CO) whereas landfill gas is more likely to include only methane and carbon dioxide. Finally, smoking vents are likely to have higher gas temperatures, typically above 65°C; but this is not always the case.

Photo 9-3 Smoke and Cracking in Soil Cover Terrace, B.C.

Photo 9-4 Smoke From Spontaneous Combustion. Hiria Landfill, Israel

Warning: When assessing smoke odour do not smell the gas coming up from a vent or well directly. One deep sniff could potentially kill you. Always use a PID gas detector first to check for the presence of CO and H_2S. Then smell the smoke, but only from a sufficient distance that has allowed the gas to mix with atmospheric air to provide some dilution. Always have a second person present who can call for help via cell phone or radio.

Vents: Also referenced as fumaroles, only indicate the presence of a fire. They do not provide a good reference for the location of the fire. This is because venting smoke will tend the path of least resistance to surface, which can be very convoluted within refuse, especially C&D waste. As such, the surface vent could pop up a significant distance from the actual location of the fire.

One indicator of smoke and sub-surface fire that we have noted while observing vents is the accumulation of carbon (black soot residue) around the vent edges. Steamers do not have such accumulations.

Photo 9-5 Typical Vent Terrace, B.C.

Photo 9-6 Fumarole with Carbon Soot, Penticton, B.C.

Sink Holes: Sinkholes or collapse features are an excellent indicator of underground fires. See the section Settlement below for more details.

9.2 Gas Monitoring

9.2.1 Phases of Landfill Gas Composition

Typically, landfill gas is thought of being composed of 50% methane and 50% carbon dioxide. It is important to note that this is a very simplified definition based on a single (but most common) phase of decomposition. There are actually four phases of landfill gas production associated with landfills, with different gases being predominant by-products in each phase. The four phases of decomposition are shown on Figure 9-1.

1. **Aerobic Decomposition Phase:** takes place as long as atmospheric air (which consists of 21% oxygen and 79% Nitrogen) remains within the waste void space.

2. **Acidic Phase:** Once the oxygen is depleted through biological activity, facultative micro-organisms (those that can tolerate oxygen but are not dependant on it being present) take over (Phase 2). During this stage, degradable waste is converted into carbon dioxide. hydrogen and organic acids, creating acidic conditions in the landfill. The landfill gas produced also forces out any atmospheric air (nitrogen) remaining in the landfill voids.

3. **Pre-Methanogenic Phase:** Once oxygen becomes fully depleted methanogenic bacteria that are oxygen intolerant take over as the dominant organisms. By-products of their activity include a combination of methane and carbon dioxide.

4. **Methanogenic Phase:** In time, methanogenic decomposition prevails and gas production rates steady out with methane concentrations stabilizing between 50 and 70% by volume and carbon dioxide concentrations trending between 30 and 50% by volume. Phase 4 continues until the organic material in the landfill is used up.

5. **Return to Atmospheric Air**: Once all organic material is decomposed and methane production stops, atmospheric air will once again infiltrate the waste. It is at this point that the landfill is said to be "stabilized". However, from an environmental perspective, it is important to recognize that even though the organic materials have been decomposed, metals and organic decomposition products may continue to leach out of the landfill for decades.

9.2.2 Interpretation of Landfill Gas Composition Data

When conducting landfill gas monitoring with the intent of determining the presence of a landfill fire, the four parameters that should be considered are oxygen content, methane content, carbon dioxide content and carbon monoxide content. Hydrogen Sulphide concentrations should also be tested for safety reasons.

The oxygen, methane and carbon dioxide concentrations results, taken together, will provide an indication of what stage of decomposition the waste is at in the area of the probe. If the results indicate anything other than Phase 1 conditions, an active fire is unlikely because of the lack of oxygen. This is not to say that a smouldering mass is not present, just that an active fire cannot exist.

Landfill gas composition data is also useful for assessing the risk of conditions suited to spontaneous combustion. It has been our experience that spontaneous combustion is typically initiated at a relatively shallow depth if oxygen is allowed to enter into the waste mass. Good intermediate soil cover prevents the entry of atmospheric air (which contains about 21% oxygen) and reduces the risk of spontaneous combustion. Ideally, landfills should be brought up to the Phase 4 methanogenic stage as quickly as possible to avoid the risk of fire.

Photo 9-7 Measuring Gas Composition with Bar Hole Punch

9.2.3 Interpreting Carbon Monoxide Data

It has been the experience of Landfill Fire Control Inc. that carbon monoxide (CO) concentrations have often proved to be an effective indicator of landfill fire. Elevated CO concentrations are often an indicator of sub-surface combustion. As a fire is brought under control CO concentrations typically decline.

Based on observations of CO levels on numerous landfill fire projects, Landfill Fire Control Inc. has developed the following empirical scale that we now use routinely to assess fire conditions in construction demolition landfills.

Fire Level:	Carbon Monoxide Concentration (ppm)		
No Fire Indication	0	-	25
Possible Fire in Area	25	-	100
Potential Smouldering Nearby	100	-	500
Fire or Exothermic Reaction Likely	500	-	1,000
Fire in Area		>1,000	

However, it is important to note that CO alone should not be used as a definitive indicator that fire is present. Some CO can be created by the catabolism (biochemical consumption by a cell)

of lignin. However, based on our experience, CO concentrations associated with this process usually do not exceed 100 ppm. With an active landfill fire on the other hand, CO concentrations typically exceed 1000 ppm. The elevated CO is due to the limited amount of oxygen available in the waste mass for combustion. Thus CO is produced as the combustion product instead of CO_2.

Warning: When assessing for CO, remember it is a gas that can kill you. As discussed in more detail in Chapter 10, the permissible long-term exposure level for CO is 50 ppm. Exposure to CO concentrations above 200 ppm is unhealthy and exposure to CO concentrations above 1,000 ppm can kill you.

Also, note that CO sensors on some PID detectors are cross impacted by H_2S, resulting in an artificially high CO reading when H_2S is present.

9.3 Temperature Monitoring

Although temperatures at ground surface reflect atmospheric temperature conditions, in the core of a landfill temperatures are typically elevated due to biological processes that produce heat. During anaerobic decomposition (Phase 4) temperatures in the range of 38 ^{O}C to 60 ^{O}C (100 to 140 ^{O}F) are maintained. Temperatures can reach as high as 75 ^{O}C (167 ^{O}F) during aerobic (Phase 1) decomposition. At temperatures above 80 ^{O}C (176 ^{O}F) however, all microbes die off. With this in mind, temperatures above 80 ^{O}C (176 ^{O}F) are an indication of thermo-chemical sources of heat, including Pyrolysis, exothermic oxidation and ultimately, fire.

Landfill Fire Control Inc. uses the temperature scale presented below when conducting landfill fire assessments.

<60 ^{O}C (140°F)	Anaerobic Decomposition
<75 ^{O}C (167°F)	Aerobic Decomposition
80 ^{O}C (176°F)	Microbes Die-off
93 ^{O}C (200°F)	Pyrolysis Starts
149 ^{O}C (300°F)	Exothermic Oxidation of Wood Starts
315 ^{O}C (600°F)	Wood Ignites Spontaneously (Combustion)

It has been our experience that in landfill fire situations temperatures can be measured effectively in one of two ways: 1) hand held infra-red sensor, and 2) down-hole thermistors.

Hand held infra-red heat sensors provide an excellent indication of temperature emanating from vents, collapse features, even monitoring wells. It has been our experience that temperatures at the ground surface in excess of 75 ^{O}C (167°F) provide cause for alarm, and temperatures above 93 ^{O}C (200°F) provide a very strong indication that there is a landfill fire.

Remember, temperatures at the ground surface are likely cooler than temperatures at depth. It is Landfill Fire Inc.'s recommendation that the YK Landfill should have a PID gas detector and a hand held infra-red sensor on site.

Photo 9-8 Using IR Heat Sensor at Delta

Photo 9-9 Installing Thermistor String in Delta

Thermistors are essentially strain gauges that stretch and contract in response to temperature changes, much like mercury in a thermometer. The wire deformations affect the electrical conductivity and this is measured at surface in a read out box. When measuring temperatures below the ground surface, thermistors should be installed at a number of locations in the wells, e.g. 5 m, 10 m, 15 m etc. (15', 30', 45' etc.)

When installing thermistors, slotted steel casing should be used. Plastic casing will melt in a fire situation, rendering the monitor worthless. Also, it is vital to ensure that convection currents do not distort temperature readings.

Air Borne Infra-red Sensors: We have found that air-borne infra-red sensors have not been useful for locating vents, hot spots, etc. Instead, we recommend walking the landfill surface on a grid pattern with a hand held infra-red gun.

Snow Melt Patterns: In winter, snowmelt can provide an excellent indicator of landfill hot spots. Landfill staff should be aware of this and do a proper thermal and gas composition assessment in all areas where snow seems to melt fast.

At the YKL there are nine active gas monitoring wells which are monitored once a year. Although during the site audit on May 9th, 2007, no presence of methane was detected with a hand held gas detector at open surface cracks and shallow bore holes (approx. 0.3 m deep); monitoring data from October 2006 show that gas collected from three wells is above the Lower

Explosive Limit (LEL).

9.4 Settlement

As refuse burns up, the solids volume is significantly reduced as solid fuel is turned to smoke and ash. As a result, a cavity will form in the refuse. Often, the inert soil cover will bridge this cavity, creating a cavern. When the cavity gets sufficiently large, the soil cover will collapse, resulting in a sinkhole.

Cracks in the soil cover are also an indication of sub-surface settlement and possible fire.

Photo 9-10 Minor Cracking & Smoke, Thornhill

Photo 9-11 Major Settlement crack Due to Fire

Photo 9-12 Sink Hole at Penticton Landfill

Photo 9-13 Major Sink Hole, Carmon Landfill, Israel

Warning: When approaching sinkholes or walking on a landfill surface where cracks are visible be extremely cautious as the edge of the soil cover may be overhanging. It is usually at the edge of sinkholes where combustion is still ongoing and the refuse will be hottest. As a safety precaution, Landfill Fire Control Inc. recommends placing a long stepladder on the ground to

distribute the person's weight. Again, having a buddy standing by is essential, as is checking for gas composition and wearing appropriate respiratory protection. Also, bunkering gear should be worn to provide limited protection in the event of a collapse. To facilitate rescue, consideration should be given to wearing a harness and safety line. Fire fighters have been known to fall into caverns and suffer serious burns as a result.

APPENDICES

APPENDIX A
Ventus Geospatial Thermal Imaging Results
January and April 2019

APPENDIX A

APPENDIX A
Ventus Geospatial Thermal Imaging Results
January and April 2019

LANDFILLFIRE CONTROL Inc. FIRE SAFETY AUDIT

Background Information		
Landfill Name		Yellowknife Landfill
Landfill Owner		The City of Yellowknife
Address:		approximately 2 kilometres outside the downtown core. It is situated in the northeast of the city along the western side of Ingraham Trail, approximately 0.5 kilometres north of the intersection with Highway No. 3 and about 3 kilometres southeast of the Yellowknife Airport.
Contacts	Commissioner	Greg Kehoe
	Phone	(867) 920-5638
	E-mail	gkehoe@yellowknife.ca
	FAX	
	Home #	
Manager	Name	Bruce Underhay
	Phone	(867) 669-3404
	E-mail	bunderhay@yellowknife.ca
	Cell #	
	Home #	
Alternate	Name	Darcey Hernblad - Deputy Fire Chief of Operations
	Phone	(867) 766-5503
	E-mail	
	Cell #	
	Home #	
Environmental Control Engineer		Dennis Kefalas - Manager of Public Works (City of YK Engineering Department)
	Phone	(867) 920-5639
	E-mail	dkefalas@yellowknife.ca
	FAX	
Safety Advisor		Pioneer Safety Supply and Fire Department
	Phone	(867) 766-5504
	E-mail	
	Cell #	
	Radio Call #	

Hazard Assessment	
Hazardous Chemicals On-Site	barrels, Tire Bales
Highly Combustible Fuels On Site	Wood Waste, Tire
Asbestos Disposal Areas	Burried under bales - Random
Unstable Ground - Settlement	Fire burnouts
Unstable Ground - Slope Stability	Slopes stable
Zones of Active Fire	none
Undergound Utilities	At compound
Overhead Powerlines	yes - power lines from road
Off-Site Hazards	gravel pit
Off-Site Sensititve Receptors	Slough part of utility co. zR.O.W
Airports in Proximity	3 Km
Sensitive Environmental Areas	no creeks between landfill and quarry

Landfill Geometry	
Landfill Footprint Area (Ha)	17.8
Dimensions (width / lenghth)	740m X 290m
Landfill Height	213 max design elev.
Total Tonnage in Place	approx. 660,000 tonnes (20,000 tonnes per year X 33 years of operations)
GPS Datum Used	
GPS Northing of Benchmark	
GPS Easting of Benchmark	
GPS Elevation of Benchmark	
Grid Northing of Benchmark	
Grid Easting of Benchmark	
Grid Elevation of Benchmark	
AutoCad Base Map on File / Date	yes - Jully 26,27 2005
Recent Digital Air Photo on File / Date	

Waste Characterization	
Total Annual Tonnage	20,000 tonnes (30,000 m^3)
Tonnes MSW	10,000 (15,000 m3)
Tonnes DLC	10,000 (15,000 m3)
Tonnes Other	Dry Wall
Waste Segregation?	lots
Moisture Content of Waste	25%
Compaction Density Achieved	750 kg/m3
Compaction Equipment Used	Bailer 2.5 x 4 x 5 1.4m3
Oxygen Intrusion Potential	some
Climate Information	
Total Precip	
Monthly Precip and Snow Fall Distribution	Jan: Per: 14.9 mm S.F.: 18.8 mm July: P: 35.2 mm S.F.: 0.0 mm
Snow Cover Duration	Oct.- May
Monthly Temperatures (Celsius)	Jan: -27.9, July: 16.2
Wind Direction	South
Wind Intensity	@ 30m 4.37 m/s
Soil Cover	
Waste to Soil Ratio	6" layer of cover every 2 bales
Lift Height	10' lift height
Daily Cover Soil Type	clay soil - recycles contaminates
Daily Cover Frequency	seasonal - summer only
Cell Construction Adopted	not really
Typical Cell Size	no cells
Active Face Width	varies lots of active face
Intermediate Cover Type	clayey soil 200mm
Intermediate Cover Thickness	200mm - 150mm
Fire Break Effectiveness (inert)	Good when in place
Closure	
Phased Development Used	no
Progressive Closure Adopted	no - approvals process
Final Cover Type	GCL or clay
Oxygen Intrusion Barrier Effective	Only on capped areas, not in bale filled areas at back end of the site.
Susceptibility to Cracking	yes lots of cracking
Fire Breaks	
Type of Vegetation Around Landfill	tundra- cornefers
Type of Vegetation on Landfill	no - some grass
Height of Vegetation	8 - 10'
Mowing / Weed Control	
Fire Break Present	no, not a high risk
Other Resources Threatened	
Earth Moving Equipment	
No. of Bulldozers On Site	1 dozer D5 regular
Size of Bulldozers	D5
No. of Excavators	no - only if needed city has 3
Type and Size of Excavators	
No. of Compactors	baler
Size of Compactors	
No. of Off-Road Trucks	1 tandem
Size of Off-Road Trucks	12 tonnes
Loaders	1 loader

LANDFILLFIRE CONTROL Inc. FIRE SAFETY AUDIT

Water Supply	
No. of Hydrants	none on site
Hydrant Location	1.5 miles down the road - Explorer
Hydrant Size	
Hydrant Capacity	
Maximum Distance	fairly close
Frequency of Testing	regular maintenance
Reservoir Size	oin site pond, 200m x 100m
Distance to Active Face	
Loading Facility	
Maximum Head to Overcome	
Capacity of Water Supply Tankers	Airport fire trucks
Pumping	
Large Capacity Trash Pumps	some in town - city has some pumper sewer
Large Capacity Pipe	
Pressure Pumps	
Length of Hose	
Pumps Tested	
Water Trucks	
No. of Trucks Available on-site	1 old tanker (2,000 Gallon)+ streets + airport Fire Department
Truck Capacity	
Off-Road Capability	no
Load Time	
Unload Time	
Connectivity to Fire Dept. Pumpers	yes
No. of Trucks Available off-site	
Supplier	
Contact Number	
Time Required to Mobilize	
Foam Induction Capacity	
Foam on Site	No
Site Access (Highway, Off Road, ATV, Foot, None)	
Perimeter Accessible	no, crest is well accessible - planned upgrade
Crest Accessible	yes
Side Slopes	3H:1V or less 3% on top 10% on toe 15m from fence
Roads Mapped	
Roads Named	no
Site Orientation Map Available	yes
Fire Dept. Orientation	no orientation other than when occurs
After Hours Emergency Access Possible	Locked box at gate & building
Site Security	
Gate	yes
Perimeter Exclusion Fence	chain link at front
Electric Wildlife Control Fence	yes 8,000 - 10,000 volt
After Hours Security	no security - occasional Bylaw
Video Monitoring	will get after hours intrusion
Fire Dept. After Hours Access	Lock out boxes
Safety Equipment	
Fire Extinguisher Locations	Fire Extinguishers in each vehicle
Number of Fire Extinguishers	Sprinklers automated
Personnel Trained In Use	Annually - Infra-red sensors 24hr alarm
Halon System on Compactors	no
Halon System on Dozers	no
First Aid Equipment	First aid training Fire Department
First Aid Attendants	First Aid & CPR All staff have training
Communications	Each Equip has radio + 1-2 handhelds
Radios	Site radios don't work with Fire Department
Emergency Contact Number List	No list in place. (867) 872-2222
Fit Tested Respiralors (suitable type)	Landfill staff have respirators
SCBA Available	No
Notes:	2 firefighters died City getting more radios should work on
	frequency Dispatch is pump house manned 24-7

LANDFILLFIRE CONTROL Inc. FIRE SAFETY AUDIT

Fire Response Plan	
Plan In Place	No plan
Plan Up to Date	NA
Command Team Identified	On-Duty Deputy Fire Chief
Key People Familiar with Plan	Darcy Hernblad, Chucker Dewar, Merlin Klassen
Note:	City has health and safety committee safety person - Merlin Klassen
Fire Monitoring Equipment	
Personal Ionization Detectors (PID)	no - fire dept check
Methane / CO2 Analyzer	no - fire dept check
Backup Methane / CO2 Analyzer	no - fire dept check
Temperature Monitoring Guns	no - fire dept check
Fire Department Support	
No. Pumper Trucks	3
Capacity of Pumper Trucks	2 (1500 Galon p/m) + 1 (1050 Gallon p/m)
Short Term Resources (no. of men)	20
Day Time Fire Fighters	40
Night Time Firefighters	
Maximum Duration of Resource Availability	
Transition Time to Emerg. Stand-down	10-12 minutes
Costs of Support Services	
Tankers	2 (2500 Gallon)
Financial Resources	
Fire Insurance	Fire comes out of O & M budget
Type of Insurance (commercial or self insured)	
Funding Available for Emergency Response	look into
Access to Authorize Spending 24/365	
Funding Available for Short Term Action(1 Week)	
Funding Available for Major Fire Fight & Clean Up	
Previous Fire History	
Number of Fires Experienced	1 major fire / year - Spring
No. Shallow Fires	3-4 small fires
No. of Deep Fires	in salvage area
Size of Fires (m3 or cu.yd.)	usually near surface. Never below top layer
Extinguishment Methods Used	bury fire with dirt. Contain with water
Time Required to Extinguish	6-8 hours on avg. under control + mop up in 1-2 days
Methods Used to Extinguish	burry
Amount of Water	Ask Darcy
Signs of Fire	
Steam Vents Observed	flames - or smoke
Cracking Observed	steam
Sink Holes Observed	where stacking fresh
Burn Odour Observed	no
Elevated Surface Temperatures	
Landfill Gas Extraction	
Gas Extraction System	no
No. of Gas Wells	9 gas monitoring wells outside + 2 Indoor Air
Volume of Gas Extracted (CFM)	0
Methane Composition at Blower	0
Oxygen Monitoring at Blower	n/a
Methane Concentration at Wells	Varies - 3 wells are above the LEL (2006 monitoring)
Oxygen Concentration at Wells	no measuring for LFG
Temperature at Wells	not measured
Frequency of Well Monitoring	1 per year
CO Monitoring	
Gas Migration Monitoring	yes
Gas Monitoring On-Site Structures	* no gas, except 1 time
Comments:	Typically fire dept would take control. Darcy is deputy Fire Chief Operations.
	Bruce co-ordinates heavy equipment. Ross Torraville does logistics
	Yellowknife has Engineering Dept. 3 engineers on staff

Leachate Management	
Bottom Liner Present / Type	no - fractures rock
Leachate Collection System / Type	no
Leachate Production Rate (annual GPM)	
Leachate Production Rate (peak monthly)	Just this year - heavy snow pack
Leachate Storage Capacity (U.S. Gallons)	n/a
Leachate Recirculation Capacity	n/a
	big swampy area
Public Communications	
Communications Policy	See Chapter 5 Command Structure
Media Liaison	Greg Kehoe
News Release Policy	
Evacuation Policy	

FIRE SAFETY AUDIT COMPLETED BY:

Dr. Tony Sperling, P. Eng.
Sharon Tenenbaum, P. Eng.

Date Survey Completed ####################

FIRE SAFETY AUDIT REVIEWED AND ACCEPTED BY:

Landfill Manager Bruce Underhay

Date Survey Accepted

APPENDIX B

APPENDIX A
Ventus Geospatial Thermal Imaging Results
January and April 2019

City of Sausalito Fire Department

Other Fire Department Links of Interest:

Fire Dept Gen'l Info

Fire Inspection Program

General Fire Safety

Seasonal Fire Safety

Defensible Space

Address Numbers

Fire Extinguishers in the Home

Fire Extinguishers in the Workplace

Residential Fires

Residential Fire Sprinklers

Smoke Detectors

Questions?

E-mail our Fire Prevention Officer

E-mail

FIRE PREVENTION

Fire Extinguishers in the Workplace

CONTENTS

WHAT IS FIRE?

In order to have a **fire**, there must be three elements:

Fuel -- something which will burn

Heat -- enough to make the fuel burn

Oxygen -- air

Usually these three elements are expressed as a triangle, called the

Fire Triangle.

FIRE TRIANGLE

All three elements must be present at the same time to have a fire. **Fire will burn until one or more of the elements is removed, then will go out.**

FIGHTING SMALL FIRES ON THE JOB

Federal regulations require that employers who provide portable fire extinguishers in the workplace also provide training for their use. Used properly, portable fire extinguishers can save lives and property by putting out a small fire in the workplace or containing one until the fire department arrives.

It is essential that all employees be familiar with the proper use of portable extinguishers and know when and when not to use them. In the event of a fire, employees should respond in accordance with their company's fire-emergency plan. Most employees will evacuate. Certain trained and designated employees will evaluate the fire scene and, if the fire is small and conditions are reasonably safe, use a fire extinguisher to fight the fire. If the fire is large or conditions are unsafe, all employees will evacuate.

FIRE EXTINGUISHERS HAVE LIMITS

Portable extinguishers are not designed to fight large or spreading fires. Even against small fires, they are useful only under certain conditions.

- The operator must know how to use the extinguisher
- The extinguisher must be within easy reach, in working order, and fully charged
- The operator must have a clear escape route that will not be blocked by fire
- The extinguisher must match the type of fire being fought. (Extinguishers containing water are unsuitable for use on grease or electrical fires.)

- The extinguisher must be large enough to put out the fire. Many portable extinguishers discharge completely in as few as eight to ten seconds.

And remember, always be sure the fire department inspects the fire site, even if you think you've extinguished the fire.

FIRE EXTINGUISHER LOCATION

Fire extinguishers in the workplace should be placed conspicuously and within easy reach so they can be accessed quickly while a fire is still small.

THE PROPER FIRE EXTINGUISHER

Select only fire extinguishers that have been tested by an independent laboratory and labeled for the type and size of fire they can extinguish. Use the labels below as a guide to purchase the kind of extinguisher that suits your needs.

Classes of Fires:

There are four classes of fires. All fire extinguishers are labeled, using standard symbols, for the classes of fires on which they can be used. A red slash through any of the symbols tells you the extinguisher cannot be used on that class of fire. A missing symbol tells you only that the extinguisher has not been tested for a given class of fire, but may be used if an extinguisher labeled for that class of fire is not available.

Class A: Ordinary combustibles such as wood, cloth, and paper

Class B: Flammable liquids such as gasoline, oil, and oil-based paint

Class C: Energized electrical equiptment, including wiring, fuse boxes, circuit breakers, machinery and appliances

Class D: Combustible metals such as

magnesium or sodium

Remember that the extinguisher must be appropriate for the type of fire being fought. Multipurpose fire extinguishers, labeled ABC, may be used on all three classes of fire. If you use the wrong type of extinguisher, you can endanger yourself and make the fire worse. It is also very dangerous to use water or an extinguisher labeled only for Class A fires on a cooking-grease or electrical fire.

Fire Extinguisher Sizes:

Portable extinguishers are also rated for the size of fire they can handle. This rating is expressed as a number from 1 to 40 for Class A fires and from 1 to 640 for Class B fires. This rating will appear on the label --- 2A:10B:C, for example. The larger the numbers, the larger the fire of a specific class on which the extinguisher can be used (but higher-rated models are often heavier - make sure you can hold and operate an extinguisher before you buy it). No number accompanies an extinguisher's Class C rating. The C on the label indicates only that the extinguisher is safe to use on electrical fires.

Extinguishers for Class D fires must match the type of metal that is burning. These extinguishers do not use numerical ratings. Extinguishers for Class D fires are labeled with a list detailing the metals that match the unit's extinguishing agent.

Types of Fire Extinguishers:

Depending on their intended use, portable extinguishers store specific "extinguishing agents," which are expelled onto the fire.

- **Pressurized water models** are appropriate for use on Class A fires only. These must never be used on electrical or flammable-liquid fires.
- **Carbon dioxide** extinguishers contain pressurized liquid carbon dioxide, which turns to a gas when expelled. These models are rated for use on Class B and C fires, but can be used on a Class A fire. Carbon dioxide does not leave a residue.
- **Dry-chemical extinguishers** are either stored-pressure models or cartridge-operated models. The stored-pressure models have a lever above the handle for operation. The cartridge-operated models require two steps: Depress the cartridge lever, and then squeeze the nozzle at the end of the hose. The dry chemicals leave a residue that must be cleaned up after use.
- **Ammonium phosphate** dry chemical can be used on Class

A, B, and C fires, but should never be used on a fire in a commercial grease fryer because of the possibility of reflash and because it will render the fryer's automatic fire-protection system less effective.

- **Sodium bicarbonate** dry chemical, suitable for fighting Class B and C fires, is preferred over other dry-chemical extinguishers for fighting grease fires. Where provided, always use the extinguishing system first. This also shuts off the heat to the appliance.
- **Potassium bicarbonate, urea-base potassium bicarbonate, and potassium chloride** dry chemical are more effective and use less agent than sodium bicarbonate on the same fire.
- **Foam (or AFFF and FFFP) extinguishers** coat the surface of a burning flammable liquid with a chemical foam. When using a foam extinguisher, blanket the entire surface of the liquid to exclude the air.

REMEMBER THE PASS-WORD

Keep your back to an unobstructed exit and stand six to eight feet away from the fire.

Follow the four-step procedure:

Pull, Aim, Squeeze, and Sweep

PULL the pin: This unlocks the operating lever and allows you to discharge the extinguisher. Some extinguishers may have other lever-release mechanisms.

AIM low: Point the extinguisher nozzle (or hose) at the base of the fire.

SQUEEZE the lever above the handle: This discharges the extinguishing agent. Releasing the lever will stop the discharge. (Some extinguishers have a button instead of a lever.)

SWEEP from side to side: Moving carefully toward the fire, keep the extinguisher aimed at the base of the fire and sweep back and forth until the flames

appear to be out. Watch the fire area. If the fire re-ignites, repeat the process.

SHOULD YOU FIGHT THE FIRE?

BEFORE you consider fighting a fire . . . .

- Call the Fire Department (**Dial 911**).
- Make sure the building is being evacuated.
- Determine whether the fire is small and is not spreading.
- Confirm you have a safe path to an exit not threatened by the fire.
- Know how to use a fire extinguisher.

NEVER fight a fire if *even one* of the following is true:

- The fire is spreading beyond the immediate area in which it started or is already a large fire.
- The fire could block your escape route.
- You are unsure of the proper operation of the extinguisher.
- You doubt that the extinguisher you are holding is designed for the type of fire at hand or is large enough to fight the fire.

some of the above information obtained from NFPA pamphlet #BR-35B

Use these links to return / move on to:

Homepage | City Hall Business | Phone Rosters | Resident Info | Visitor Info | New Additions | Community Calendar | History | Featured Artist | Emergency Info | Photo Tour

APPENDIX F

List of Safe Work Practices

CITY OF YELLOWKNIFE

SAFE WORK PRACTICE INDEX

Reference Number	Task	Applicable Legislation, Policy or Procedure (See SWP #75 for Definitions)			DM#
5	Air Compressor				135870
10	Battery Charging & Servicing	**Highway Act**			135871
15	Brake Lathe				135872
20	Brush Chipper				135873
25	Cell Phone Use (while driving)	**1000.13**			135874
30	Chain Saw	**WSCC**			135875
35	Chemical handling (WHMIS)	**WSCC**			135876
40	Chlorine handling – Gas	Chlorine & Fluoride Safety Procedure manual			135877
41	Chlorine handling – Shipping, receiving and unloading at PH#1	**Highway Act**	Chlorine & Fluoride Safety Procedure Manual		137694
45	Chlorine handling – Sodium Hypochlorite	Chlorine & Fluoride Safety Procedure manual			135878
50	Compactor – Hand Operated				135879
55	Confined space – General Policy	**1000.12**			135880
75	Definitions				135881
80	Dog Bite & Animal Attack				135882
85	Electrical Worker's Safety	**1020.01**	**WSCC**		135883
90	Emergency Response Plan	**1000.04**	**1000.03**	**WSCC**	135884
95	Entrances, Walkways, Stairways	**WSCC**			135885
100	Equipment – Skid Steer Loader	**Highway Act**	**WSCC**		135886
101	Equipment – Line Painter	**Highway Act**	**WSCC**		493418
102	Equipment – Tar Pot	**Highway Act**	**WSCC**		494209
105	Equipment – Compactors	**Highway Act**	**WSCC**		135887
110	Equipment – Crane Truck	**Highway Act**	**WSCC**		135888

Reference Number	Task	Applicable Legislation, Policy or Procedure (See SWP #75 for Definitions)			DM#
115	Equipment – Diesel and Gas Driven Pumps	**Highway Act**	**WSCC**		135889
120	Equipment – Employees (working around equipment)	**Highway Act**	**WSCC**		135890
125	Equipment – Excavator	**Highway Act**	**WSCC**		135891
130	Equipment – Forklift	**Highway Act**	**WSCC**		135892
135	Equipment – Gen Set Operation	**CSA Standard**	**WSCC**		135893
140	Equipment – Grader (Change blades and ripper teeth)	**Highway Act**	**WSCC**		135894
145	Equipment – Gravel/Snow Haul	**Highway Act**	**WSCC**		135895
150	Equipment – Loader	**Highway Act**	**WSCC**		135896
155	Equipment – Portable Steam Boiler	**Highway Act**	**WSCC**	**Pressure Vessel Act**	135897
156	Equipment – Pressure Washer / Culvert Thaw	**WSCC**			183470
157	Equipment – Sander Truck With Belly Blade	**Highway Act**	**WSCC**		178442
160	Equipment – Street Sweeper	**Highway Act**	**WSCC**		135898
165	Equipment – Tilt Bed Trailers	**Highway Act**	**WSCC**		135899
170	Equipment – Tractors	**Highway Act**	**WSCC**		
175	Equipment – Trucks	**Highway Act**	**WSCC**		135900
180	Equipment – Vactor Truck LS & MH Maintenance.	**Highway Act**	**WSCC**		135901
185	Equipment – Vactor Truck Sewer Flushing	**Highway Act**	**WSCC**		135903
186	Exposing High Voltage Power Lines with Vactor Trucks				297991
190	Equipment Safeguards	**WSCC**			135904
195	Fence Repair				135905

Reference Number	Task	Applicable Legislation, Policy or Procedure (See SWP #75 for Definitions)			DM#
200	Frost Bite, Hypothermia & Heat Stress	**WSCC**			135906
205	Fueling Vehicles	**WSCC**			135907
210	General Operating Procedures	**WSCC**			135908
215	Guard Rail Repair	**WSCC**			135912
220	Hand Tool Safety	**WSCC**			135913
225	Handling Customer Complaints	**1000.11**	**1020.06**		135914
230	Hazardous Space Entry	Chlorine & Fluoride Safety Procedure manual			135915
233	Heating Fuel Spill Response				359180
235	Helicopter Safety				135916
240	Honey Bag & Sewage Handling	**Health Act**	**WSCC**		135917
245	Housekeeping	**WSCC**			135919
250	Hydraulic Press	**WSCC**			135920
255	Job Site Inspections	**WSCC**			135921
258	Land Fill -- Baler	**WSCC**			135922
260	Land Fill – Crawler Tractor Operation	**WSCC**	**Highway Act**		135924
265	Land Fill – Dump Truck Operation	**WSCC**	**Highway Act**		135925
270	Land Fill – General Safety	**WSCC**	**Health Act**	**Environmental Act**	135926
275	Land Fill – Hazardous or Unknown Chemical Handling	**WSCC**	**Environmental Act**		135927
280	Land fill – Loader Operation	**WSCC**	**Highway Act**		135928
285	Land Fill – Skid Steer Operation	**WSCC**	**Highway Act**		135929
288	Land Fill – Wire Fence	**1020.01**			135930
290	Lift Gates (Power Tail Gates)	**WSCC**			135931

Reference Number	Task	Applicable Legislation, Policy or Procedure (See SWP #75 for Definitions)			DM#
295	Lock Out	**1020.01**	**WSCC**		135932
300	New & Inexperienced Employees	**1020.02**	**WSCC**		135933
305	Noise Exposure	**1020.03**	**WSCC**	**Health Act**	135934
310	Occupational Health & Safety	**1010.01 to 1010.04**	**1000.01**	**1000.06 to 1000.09**	135935
315	Office Safety	**1020.08**			135936
320	Overhead Crane	**WSCC**			135937
325	Oxy-Acetylene Torch Use **See #465**	**WSCC**			138913
330	Painting	**WSCC**			135938
335	Pothole Patching	**Traffic Act**	**WSCC**		135939
340	PPE Personal Protective Equipment	**WSCC**			135940
345	Pressure Washers	**WSCC**			135941
350	Reporting Unsafe Acts	**WSCC**			135942
355	Rigging	**WSCC**			135943
360	Safe Driving	**Traffic Act**	**WSCC**		135944
362	Safe Handling of Dust Suppressant or Road Spit	**Traffic Act**	**WSCC**		137631
365	Safe Lifting (Manual)	**WSCC**			135945
370	Safety Procedure to Discuss Non-Typical Tasks	**WSCC**			135946
375	Scaffolds, Man Lifts & Fall Protection	**1000.10**	**WSCC**		135947
380	Shop Rules (Fleet)				135948
381	Shop Rules – After Hours Use				135949
390	Snow Removal				135950
395	Tail Gate Meetings	**1000.05**	**WSCC**		135951
400	Thaw Frozen Sewer Lines				135952

Reference Number	Task	Applicable Legislation, Policy or Procedure (See SWP #75 for Definitions)			DM#
405	Thaw Frozen Water Lines -- Energizer				135953
406	Thaw Frozen Water lines – Water Pick				135954
410	Thaw Frozen Ground				135955
415	Tire Repair				135956
420	Towing Vehicles	**Highway Act**			135957
425	Traffic Control & Flagging	**Highway Act**	**WSCC**		135958
430	Tree Care Operations	**WSCC**			135959
435	Trenches & Excavations	**WSCC**			135960
440	Use and Care of Respiratory Equipment	**1020.02**			135961
445	Use of Fire Extinguishers				135962
450	Use of Hydrants				135963
455	Use of Lawn Mowers				
460	Vehicle Hoists				135964
463	Vehicle Idling	**WSCC**			141194
464	Vehicle Inspections	**WSCC**	**Traffic Act**		192047
465	Welding, Cutting and Grinding (Plus Fire Safety)	**WSCC**			135965
470	Work Refusal	**1020.07**	**1000.09**		135966
475	Working Alone	**1000.14**			135967
480	Working Around Utility Lines	**WSCC**			135968
481	Working with Street Signs	**Traffic Act**	**WSCC**		137807
482	Working Safely with Ladders	**WSCC**			138907

APPENDIX G

Bear Safety

If You Encounter a Bear...

- Remember the 3 S's... Stop, Stand still, Stay calm.
- Ensure others know that a bear is in the vicinity.
- Do not run.
- Leave the bear an open avenue of escape.

...at a DISTANCE

- Alert the bear to your presence - speak in low tones, slowly wave your arms.
- Quietly walk back the way you came or make a wide detour.
- Keep an eye on the bear.
- Stay downwind.
- Consider using warning shots, noisemakers.

...that is NEARBY

- Do not shout or make sudden movements.
- Avoid direct eye contact.
- Back away slowly.
- Climb at least four metres up a tree to escape a grizzly. (Ineffective against black bears).

Deterrents...

- Include... 12 gauge cracker shells, air horns, flares, and chemical repellents such as pepper spray.
- Are not completely effective against every bear in every situation.
- Should not make you less careful to avoid bear conflicts.
- Are potentially dangerous - use with extreme caution.

If a Bear Charges...

- Many charge are bluffs - the bear will often veer to the side at the last minute.
- Use a chemical repellent only at close range.
- If you have a firearm and contact appears unavoidable, shoot to kill.
- Play dead only during a grizzly bear attack (lie on your side, curl into a ball with your legs tight to your chest, hands clasped behind your neck).

If you must shoot a bear in self-defense, report the kill to a Renewable Resource Officer as soon as possible. If an Officer is not immediately available, skin the bear and preserve the hide. The hide must be turned in to an Officer. You may not keep any part of a bear killed in self-defense.

For Further Information...

For further information, contact any Environment and Natural Resources Office:

Area Code (867)

Aklavik	978-2248
Deline	589-3421
Fort Good Hope	598-2271
Fort Liard	770-4311
Fort McPherson	952-2200
Fort Providence	669-3002
Fort Resolution	394-4596
Fort Simpson	695-7433
Fort Smith	872-6400
Hay River	875-5554
Inuvik	678-6670
Lutsel K'e	370-3141
Norman Wells	587-3500
Behchokǫ̀	392-6511
Tsiigehtchic	953-3605
Tulita	588-3441
Tuktoyaktuk	977-2350
Ulukhaktok	396-4505
Yellowknife	873-7181

Northwest Territories Environment and Natural Resources

May 2009

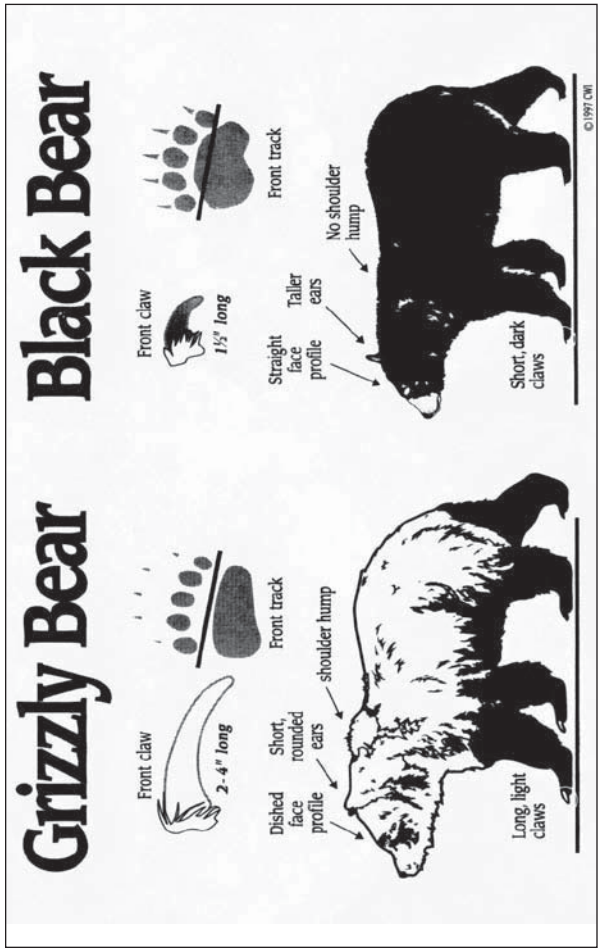
Safety in Grizzly and Black Bear Country

Black Bear

Welcome to Bear Country

Grizzly and black bears can be found throughout the Northwest Territories. They are an important part of the northern ecosystem. Northerners are committed to maintaining healthy populations of all wildlife, including grizzly and black bears. Treat them with respect. Remember that you are in a bear's territory.

What's the Difference Between...?



While You are Travelling...

- Always be alert.
- Travel in groups.
- Travel only during daylight.
- Avoid carrying strong smelling foods.
- Make noise where visibility is limited.
- Avoid bear feeding areas such as flood plains, berry patches and areas rich in horsetails and other grasses.
- Avoid bear travel areas like shorelines, trails along the water or near berry patches.
- Watch for fresh bear droppings and tracks.
- Carry bear deterrents.

If You are Camping...

- Avoid camping in areas frequented by bears.
- Always sleep inside a shelter (tent, cabin, etc.).
- Don't keep food in tents or areas of camp other than the cook tent.
- Keep a clean camp - wash all dishes and utensils after every meal.
- Avoid cooking greasy foods.
- Burn all garbage every day or take it to a bearproof disposal site. Burying garbage does not eliminate odors.
- If you're going to leave the campsite:
  - bearproof your camp – store food and other attractants (dish detergent, toothpaste, etc.) in an inaccessible place.
  - let someone know where you are going.
  - take a partner and bear deterrents with you.

Grizzly Bears

If You are Fishing...

- Be cautious near streams or lakes - bears frequent these areas.
- Clean fish away from camp and store them underwater.
- Burn fish guts away from camp.
- Store fish-cleaning knifes away from camp.
- Don't wear clothes that smell like fish to bed.

If You are Hunting...

- Avoid hunting late in the day and returning to camp in the dark.
- Stay alert when dressing game or handling meat and only do so away from camp.
- Avoid shooting more than your party can pack out in a single load.
- If you must leave meat in the field, leave it near a visible landmark with a clear approach route and cover it with a tarp to discourage scavengers.
- Don't keep bloodied clothes in your tent.

DRAWING LIST	
Sheet Number	**Sheet Title**
	Cover
200	Existing Site Conditions
201	General Site Design
202	Top of Rough Graded Site
203	Top of Leak Detection Geomembrane
204	Top Of Liner System
205	Leachate Collection System
206	West Spine Profile of Site Liner System
207	Center Spine Profile of Liner System
208	Center Spine Cross Sections
209	Liner System Profile along Anchor Trench
210	Geomembrane Site Sections
211	Top of Liner System Sections
212	Liner System Berm Sections
213	Liner Details
214	Miscellaneous Details
215	Leachate Collection Details

CITY OF YELLOWKNIFE

SOLID WASTE FACILITY

CONTRACT 2 - SITEWORKS AND GEOMEMBRANE LINER INSTALL

RECORD DRAWINGS

APRIL, 2012

CITY PROJECT No.
DILLON PROJECT No. 103478

DILLON CONSULTING

4920 47TH STREET, YELLOWKNIFE NT, X1A 2P1, PHONE 867.920.4555

DRAWING REDUCED
NOT TO SCALE

APPROXIMATE
LEASE LIMITS

EXTENT OF CELL 1
LINER SYSTEM

NWT CONSTRUCTION

NWT CONSTRUCTION

LEGEND:
MAJOR CONTOUR - EXISTING
MINOR CONTOUR - EXISTING
CONTOURS .2m INTERVALS

635150mE
635200mE
635250mE
635300mE
635350mE
635400mE
635450mE
635500mE
635550mE
635600mE

6930400mN
6930350mN
6930300mN
6930250mN
6930200mN

DILLON CONSULTING LIMITED 4918 47TH STREET, YELLOWKNIFE NT, X1A 2P1, PHONE 867.920.4555

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 0107
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER
G. STRONG
April 26/12
N.W.T.

RECORD DRAWING
APPROVED April 25/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	26	11	GS
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN TPW | REVIEWED BY GS
DRAWN TPW | CHECKED BY GS
DATE: APRIL 2012
SCALE: AS SHOWN

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER: 10-3478-1000

EXISTING SITE CONDITIONS

SHEET NUMBER: 200

DRAWING REDUCED NOT TO SCALE

TOP EDGE OF RECORD PERIMETER BERM

TOE OF RECORD PERIMETER BERM

APPROXIMATE LEASE LIMITS

ROCK BLASTING AREAS
SITE FILL AREAS
APPROXIMATE PERIMETER DITCHING/DRAINAGE

LEACHATE COLLECTION PIPE LAYOUT (NOT FULLY SHOWN FOR CLARITY)

LEACHATE COLLECTION HEADER PIPE (NOT FULLY SHOWN FOR CLARITY)

CELL 1

TOP EDGE OF RECORD PERIMETER BERM

TOE OF RECORD PERIMETER BERM

TOP EDGE OF RECORD PERMANENT CELL SEPARATION BERM

TOE OF RECORD PERMANENT CELL SEPARATION BERM

FUTURE CELL

LEACHATE COLLECTION SUMP AND ACCESS MANHOLE LOCATION

NEW CSP CULVERT

635150mE 635200mE 635250mE 635300mE 635350mE 635400mE

6930400mN 6930350mN 6930300mN 6930250mN 6930200mN

DILLON CONSULTING LIMITED 4924 47TH STREET, YELLOWKNIFE NT, X1A 2P1, PHONE 867.920.4555

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 0107
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG N.W.T.

RECORD DRAWING
APPROVED April 25/12

DILLON CONSULTING

No	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	26	11	GS
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN	TPW
REVIEWED BY	GS
DRAWN	TPW
CHECKED BY	GS
DATE	APRIL 2012
SCALE	AS SHOWN

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER 10-3478-1000

GENERAL SITE DESIGN

SHEET NUMBER 201

DRAWING REDUCED NOT TO SCALE

SCALE 1:500

LEGEND:
- APPROXIMATE LEASE LIMITS
- TOP OF ROUGH GRADED BERM
- TOE OF BERM
- ANCHOR TRENCH
- SITE DRAINAGE
- 1m DITCH EXCAVATIONS
- MAJOR CONTOUR - ROUGH GRADE
- MINOR CONTOUR - ROUGH GRADE
- MAJOR CONTOUR - EXISTING
- MINOR CONTOUR - EXISTING
- CONTOURS .2m INTERVALS
- FILL SLOPE
- CUT SLOPE

635150mE 635200mE 635250mE 635300mE 635350mE 635400mE

6930350mN 6930300mN 6930250mN 6930200mN

SEE PERIMETER BERM DETAIL 11 / 213

18 / 214 1m WIDE CUT AREAS FOR DRAINAGE DITCH (TYPICAL)

2 / 207 SEE ROUGH GRADED SITE PROFILE OF CENTER SPINE

1 / 206 SEE ROUGH GRADED SITE PROFILE OF WEST SPINE

TOE OF SLOPE

TOP OF BERM

TOP OF BERM (WIDTH VARIES TO ACCOMODATE TIE IN WITHIN SITE LIMITS)

11 / 213 SEE PERIMETER BERM DETAIL

PERMANENT CELL SEPARATION BERM 12 / 213

SEE LINER CONNECTION DETAIL 13 / 213

SEE LINER SYSTEM SECTION 14 / 213

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 0107
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG NWT

RECORD DRAWING
April 25/12

DILLON CONSULTING

No.	ISSUED FOR	BY	DAY	MO	YR
3	RECORD DRAWING	GS	25	04	12
2	ISSUED FOR TENDER	GS	11	04	12
1	ISSUED FOR REVIEW	GS/MM	11	12	11

DESIGN TPW | REVIEWED BY GS
DRAWN TPW | CHECKED BY GS
DATE APRIL 2012
SCALE AS SHOWN

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER 10-3478-1000

TOP OF ROUGH GRADED SITE

SHEET NUMBER 202

DILLON CONSULTING LIMITED 4904 49TH STREET, YELLOWKNIFE NT, X1A 3P4, PHONE (867) 873-4596

DRAWING REDUCED NOT TO SCALE

635150mE 635200mE 635250mE 635300mE 635350mE 635400mE

6930350mN 6930300mN 6930250mN 6930200mN

SEE PERIMETER BERM DETAIL 11 213

LEGEND:
- APPROXIMATE LEASE LIMITS
- TOP OF ROUGH GRADED BERM
- TOE OF BERM
- ANCHOR TRENCH
- GCL AND HDPE LINER LIMITS
- MAJOR CONTOUR - ROUGH GRADE
- MINOR CONTOUR - ROUGH GRADE
- MAJOR CONTOUR - EXISTING
- MINOR CONTOUR - EXISTING
- CONTOURS .2m INTERVALS
- FILL SLOPE
- CUT SLOPE

HDPE LINER AND GEOSYNTHETIC LINER ≈19400m² REQUIRED

PERMANENT CELL SEPARATION BERM 12 213

SEE LINER CONNECTION DETAIL 13 213

SEE LINER SYSTEM SECTION 14 213

SEE PERIMETER BERM DETAIL 11 213

LIMITS OF LINER INSTALLATIONS

ANCHOR TRENCH

TOP OF ROUGH GRADED BERM

DILLON CONSULTING LIMITED 4905 47TH STREET, YELLOWKNIFE NT, X1A 2P4, PHONE 867.920.4555

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THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 010
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG NWT

RECORD DRAWING
April 25/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	01	25	11	GS
1	ISSUED FOR REVIEW	02	11	11	SMM

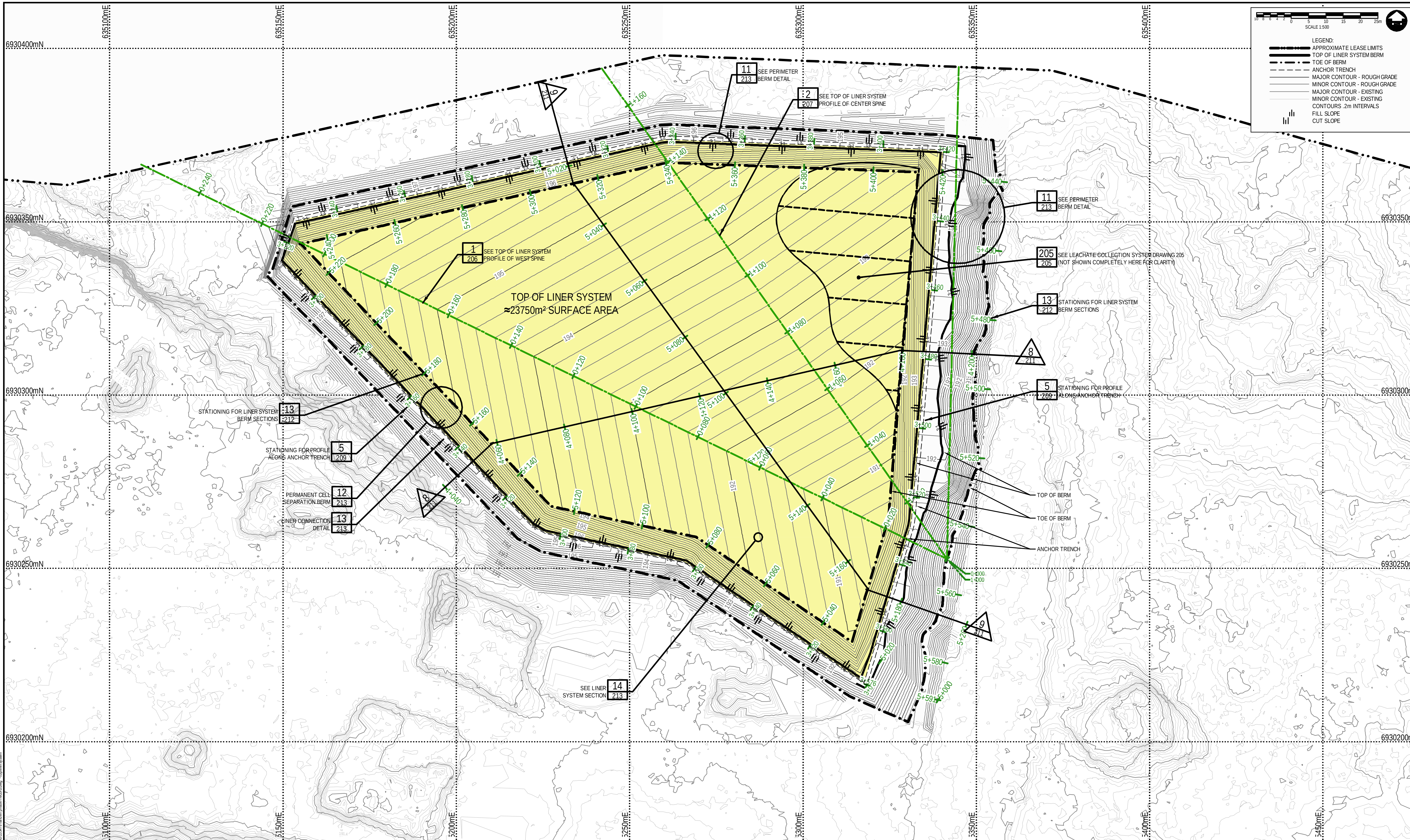
DESIGN TPW | REVIEWED BY GS
DRAWN TPW | CHECKED BY GS
DATE APRIL 2012
SCALE AS SHOWN

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER 10-3478-1000

TOP OF LEAK DETECTION GEOMEMBRANE

SHEET NUMBER 203



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THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 010
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG N.W.T.

RECORD DRAWING April 25/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	26	11	GS
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN: TPW	REVIEWED BY: GS
DRAWN: TPW	CHECKED BY: GS
DATE: APRIL 2012	
SCALE: 1:500	

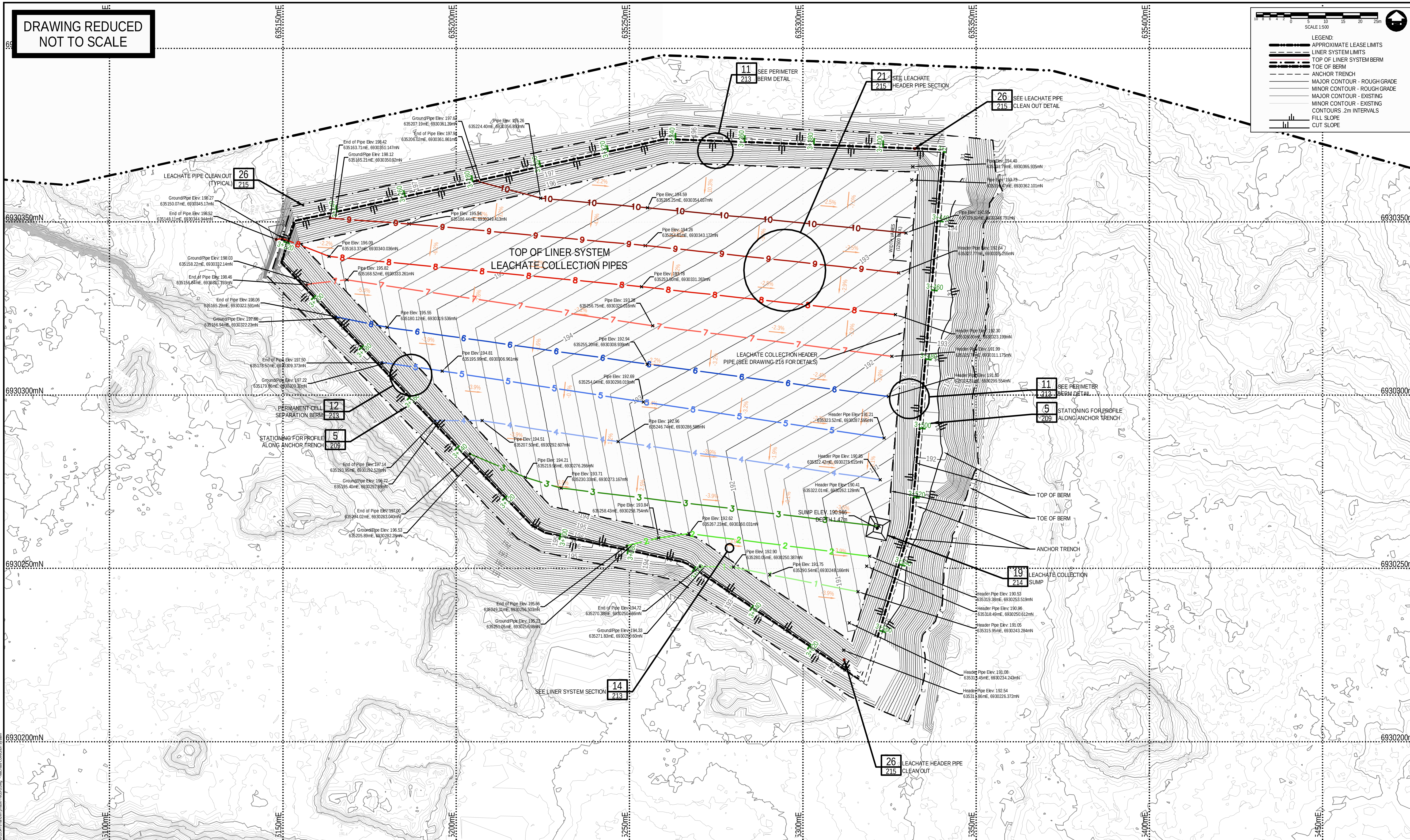
CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

TOP OF LINER SYSTEM

PROJECT NUMBER 10-3478-1000

SHEET NUMBER 204

DRAWING REDUCED
NOT TO SCALE



DILLON CONSULTING LIMITED 4920 47TH STREET, YELLOWKNIFE NT, X1A 2P1, PHONE 867.920.4555

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PERMIT NUMBER P 070
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG N.W.T.

RECORD DRAWING April 24/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	26	11	GS
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN: TPW
REVIEWED BY: GS
DRAWN: TPW
CHECKED BY: GS
DATE: APRIL 2012
SCALE: 1:500

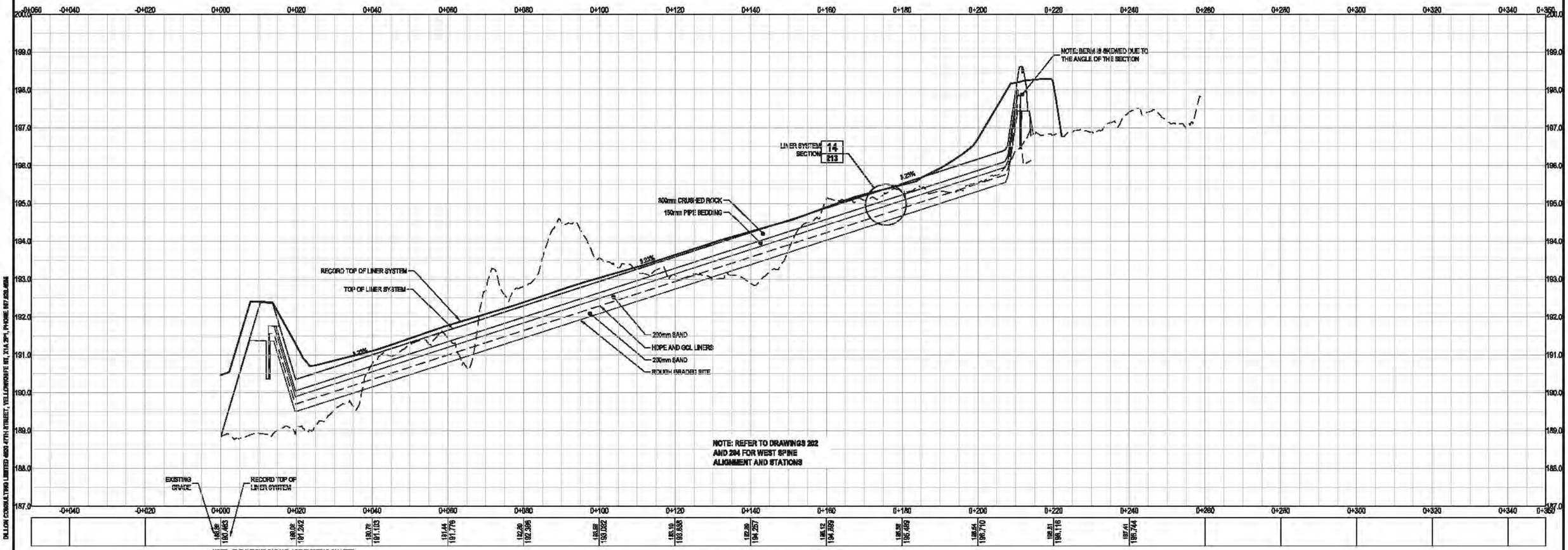
CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

LEACHATE COLLECTION SYSTEM

PROJECT NUMBER: 10-3478-1000
SHEET NUMBER: 205

DRAWING REDUCED NOT TO SCALE

LEGEND:
- EXISTING GROUND
- ROUGH GRADED SITE
- GCL AND HDPE ON TOP
- TOP OF LINER SYSTEM
- RECORD TOP OF LINER SYSTEM



NOTE: ELEVATIONS IN BAND ARE EXISTING ON LEFT AND RECORD TOP OF LINER SYSTEM ON RIGHT

WEST SPINE PROFILE (1)
SCALE: 1:500h 1:50v

RECORD DRAWING
April 21/12

DILLON CONSULTING

No.	ISSUED FOR	BY	DAY	MO	YR
3	RECORD DRAWING	DR	12	04	
2	ISSUED FOR TENDER	DR	11	04	
1	ISSUED FOR REVIEW	RWB	11	02	

DESIGN TPW | REVIEWED BY EWM
DRAWN TPW | CHECKED BY EWM
DATE APRIL 2012
SCALE AS SHOWN

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER 10-3478-1000

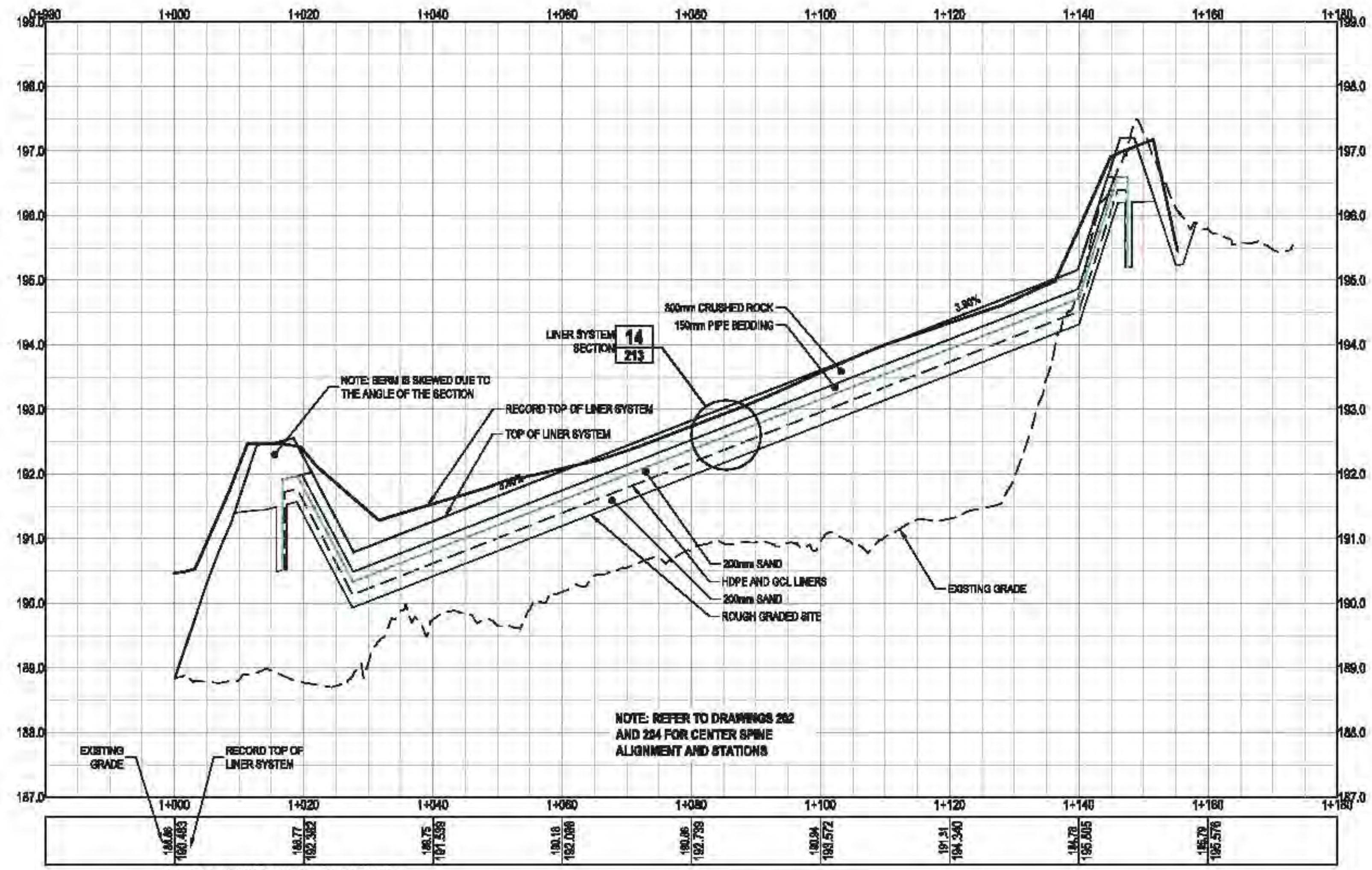
WEST SPINE PROFILE OF SITE LINER SYSTEM

SHEET NUMBER 206

DILLON CONSULTING LIMITED 4905 47TH STREET, YELLOWKNIFE NT, X1A 3P1, PHONE 867.873.4656

DRAWING REDUCED NOT TO SCALE

LEGEND:
EXISTING GROUND
ROUGH GRADED SITE
GCL AND HDPE
TOP OF LINER SYSTEM
RECORD TOP OF LINER SYSTEM



NOTE: ELEVATIONS IN BAND ARE EXISTING ON LEFT AND RECORD TOP OF LINER SYSTEM ON RIGHT

CENTER SPINE PROFILE (2)
SCALE: 1:500h 1:50v

DILLON CONSULTING LIMITED 4920 47TH STREET, YELLOWKNIFE NT, X1A 2P1, PHONE 867.920.4555

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THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 010
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG N.W.T. April 26/12

RECORD DRAWING
April 27/12

DILLON CONSULTING

NO.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	30	12	CW
2	ISSUED FOR TENDER	04	30	11	CW
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN	REVIEWED BY
TPW	BWM
DRAWN	CHECKED BY
TPW	BWM

DATE: APRIL 2012
SCALE: AS SHOWN

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

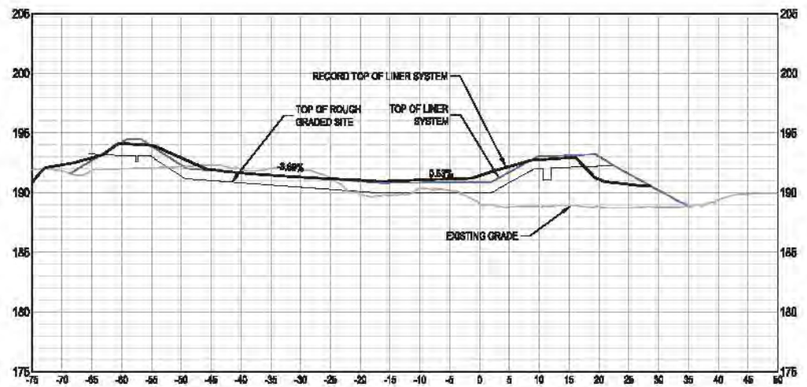
CENTER SPINE PROFILE OF LINER SYSTEM

PROJECT NUMBER: 10-3479-1000
SHEET NUMBER: 207

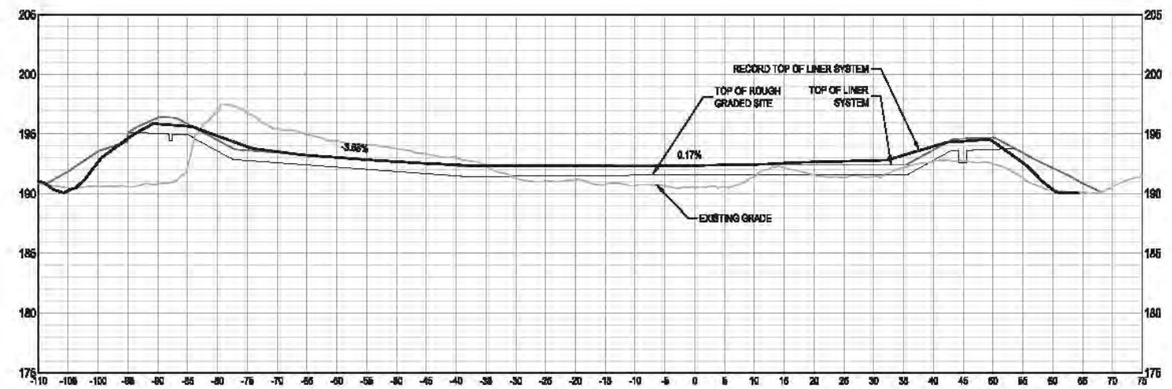
DRAWING REDUCED NOT TO SCALE

LEGEND:
EXISTING GROUND
ROUGH GRADED SITE
TOP OF LINER SYSTEM
RECORD TOP OF LINER SYSTEM

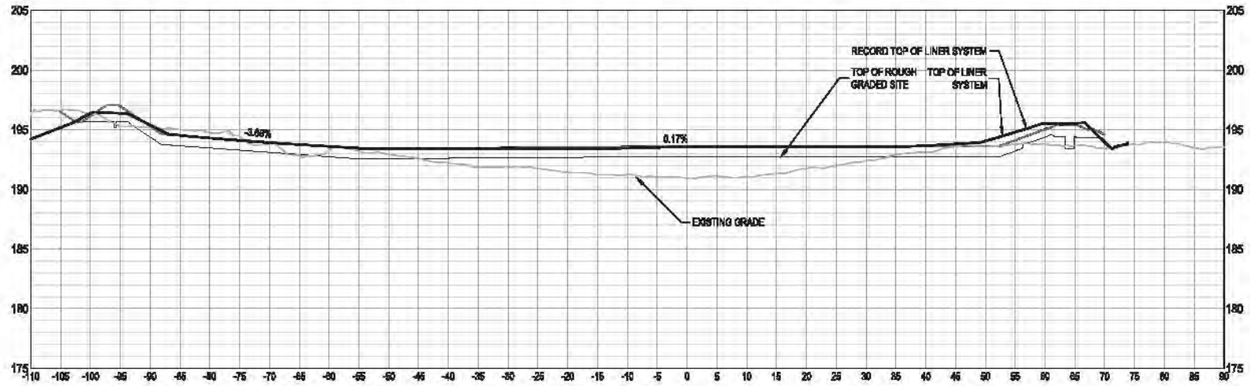
NOTE: REFER TO DRAWING 222 FOR SECTION MARKERS ALONG CENTER SPINE



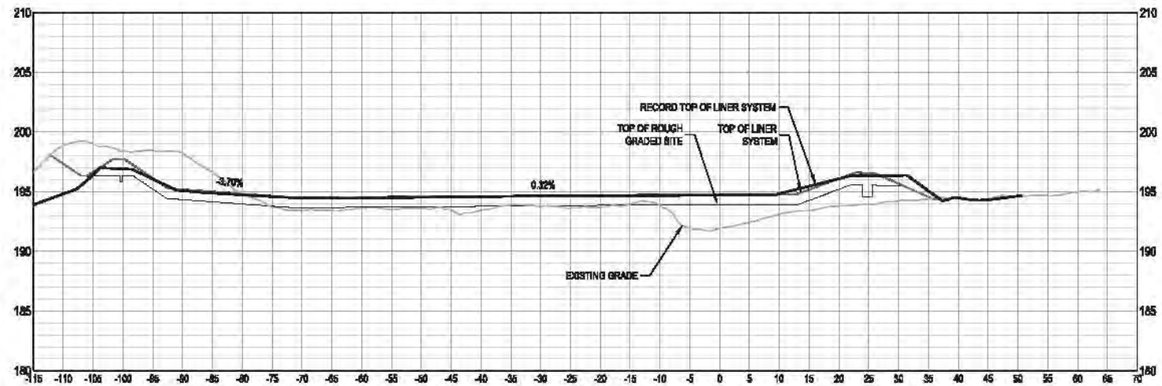
CENTER SPINE CROSS SECTION STATION 1+030 4A
SCALE: 1:500h 1:250v



CENTER SPINE CROSS SECTION STATION 1+070 4B
SCALE: 1:500h 1:250v



CENTER SPINE CROSS SECTION STATION 1+100 4C
SCALE: 1:500h 1:250v



CENTER SPINE CROSS SECTION STATION 1+130 4D
SCALE: 1:500h 1:250v

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 0107
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG APR 24/12 N.W.T.

RECORD DRAWING
April 24/12

DILLON CONSULTING

No.	ISSUED FOR	BY	YR	MO	DD
2	RECORD DRAWING	GS	12	04	24
1	ISSUED FOR TENDER	GS	11	04	25
	ISSUED FOR REVIEW	SWMS	11	02	02

DESIGN	TPW
REVIEWED BY	GS
DRAWN	TPW
CHECKED BY	GS
DATE	APRIL 2012
SCALE	AS SHOWN

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

CENTER SPINE CROSS SECTIONS

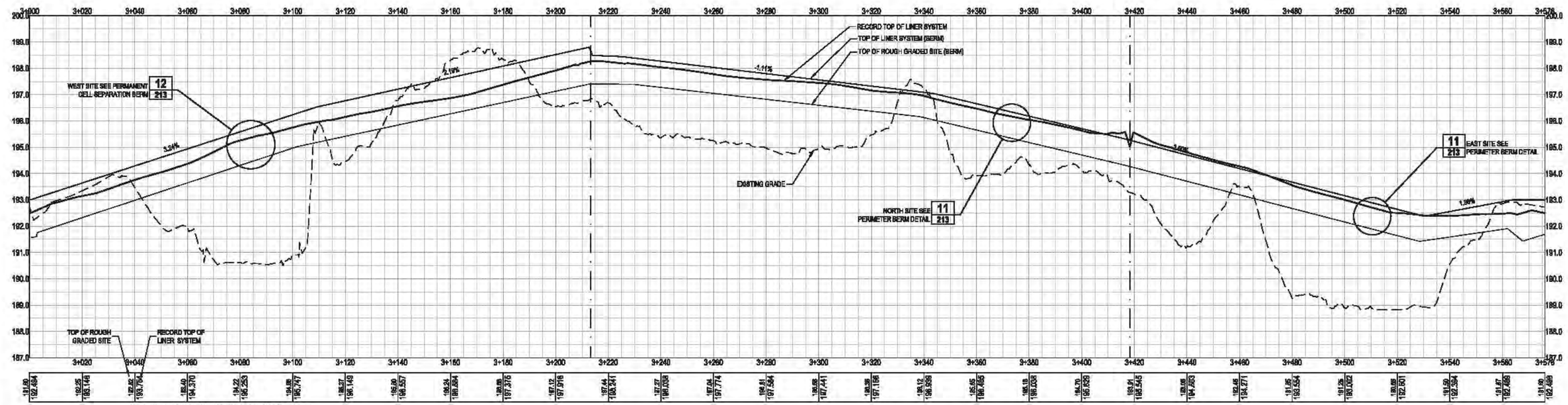
PROJECT NUMBER 10-3478-1000

SHEET NUMBER 208

DILLON CONSULTING LIMITED 4904 47TH STREET, YELLOWKNIFE NT, X1A 3P4, PHONE (867) 920-4556

DRAWING REDUCED NOT TO SCALE

LEGEND:
EXISTING GROUND
ROUGH GRADED SITE
TOP OF LINER SYSTEM



NOTE: ELEVATIONS IN SAND ARE TOP OF ROUGH GRADED SITE ON LEFT AND RECORD TOP OF LINER SYSTEM ON RIGHT

LINER SYSTEM PROFILE ALONG ANCHOR TRENCH (5)
SCALE: 1:750h 1:75v

DILLON CONSULTING LIMITED 4905 47TH STREET, YELLOWKNIFE NT, X1A 3P4, PHONE 867.669.8666

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 010 11
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG April 2/12 N.W.T.

RECORD DRAWING
April 2/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	28	12	GB
2	ISSUED FOR TENDER	04	30	11	DN
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN TPW | REVIEWED BY BWM
DRAWN TPW | CHECKED BY BWM
DATE APRIL 2012
SCALE AS SHOWN

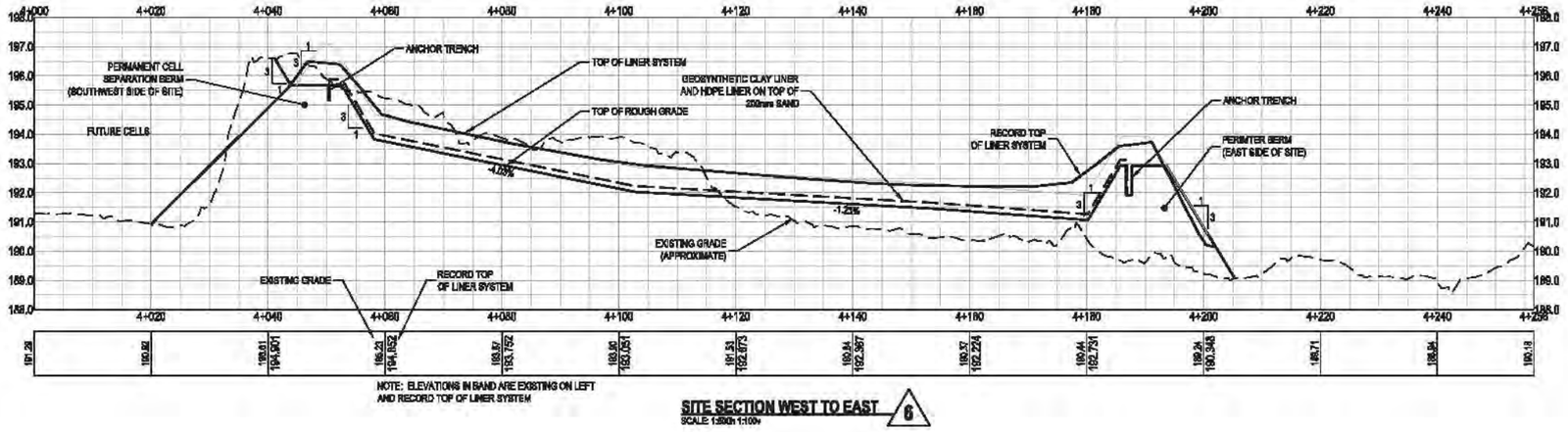
CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER 10-3478-1000

LINER SYSTEM PROFILE ALONG ANCHOR TRENCH

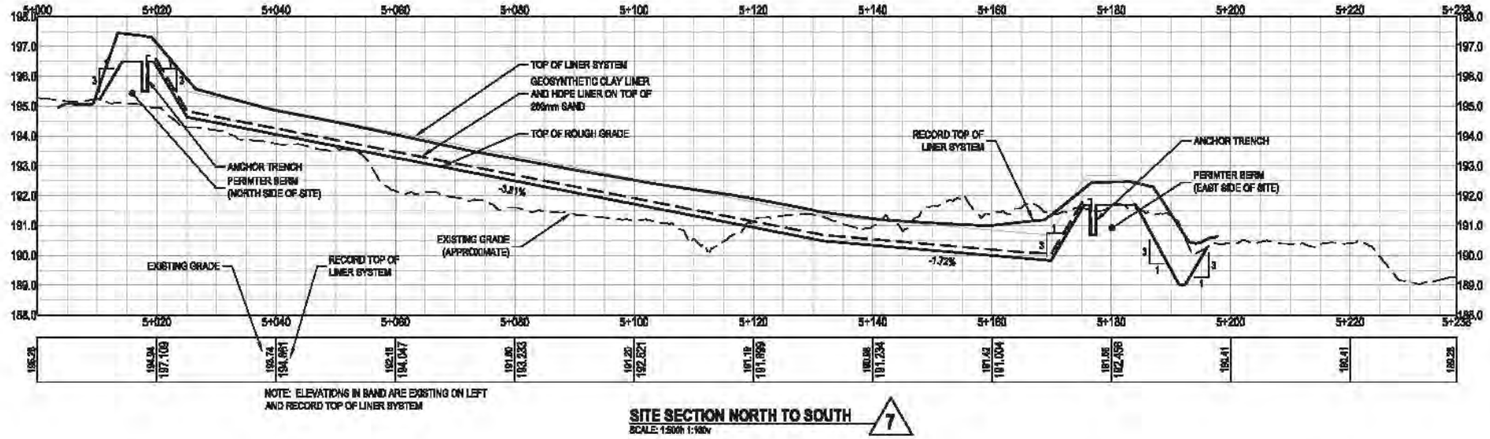
DRAWING NUMBER 209

DRAWING REDUCED NOT TO SCALE



NOTE: ELEVATIONS IN BAND ARE EXISTING ON LEFT AND RECORD TOP OF LINER SYSTEM

SITE SECTION WEST TO EAST 6
SCALE: 1:500h 1:100v



NOTE: ELEVATIONS IN BAND ARE EXISTING ON LEFT AND RECORD TOP OF LINER SYSTEM

SITE SECTION NORTH TO SOUTH 7
SCALE: 1:500h 1:100v

RECORD DRAWING
April 21/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	20	12	GS
2	ISSUED FOR TENDER	04	20	11	DN
1	ISSUED FOR REVIEW	02	11	11	SHAS

DESIGN TPW | REVIEWED BY GS
DRAWN TPW | CHECKED BY GS
DATE APRIL 2012
SCALE AS SHOWN

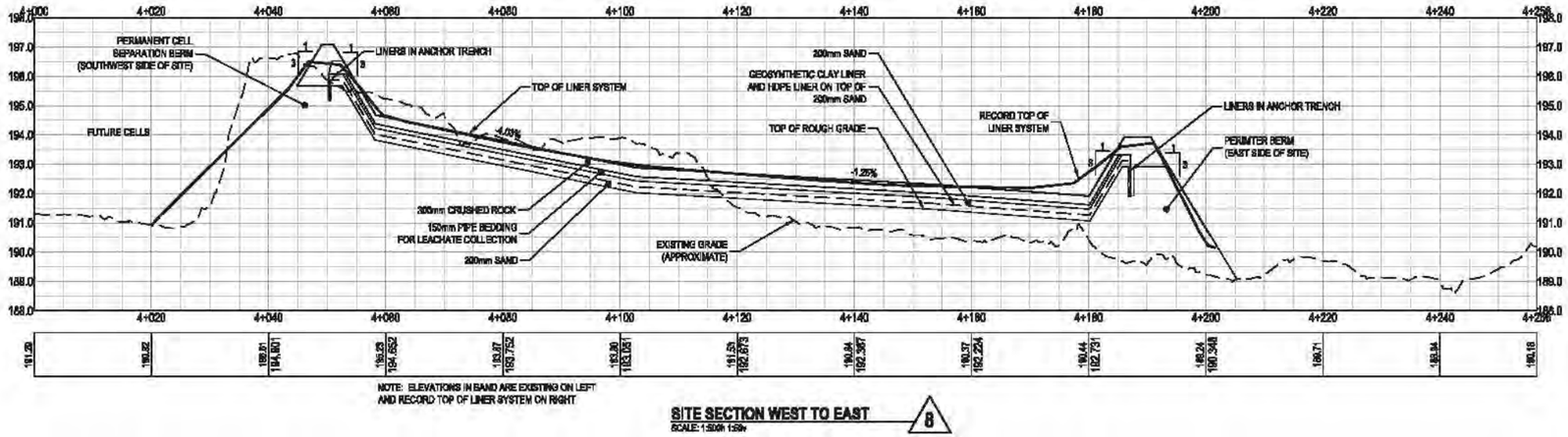
CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER 10-3478-1000

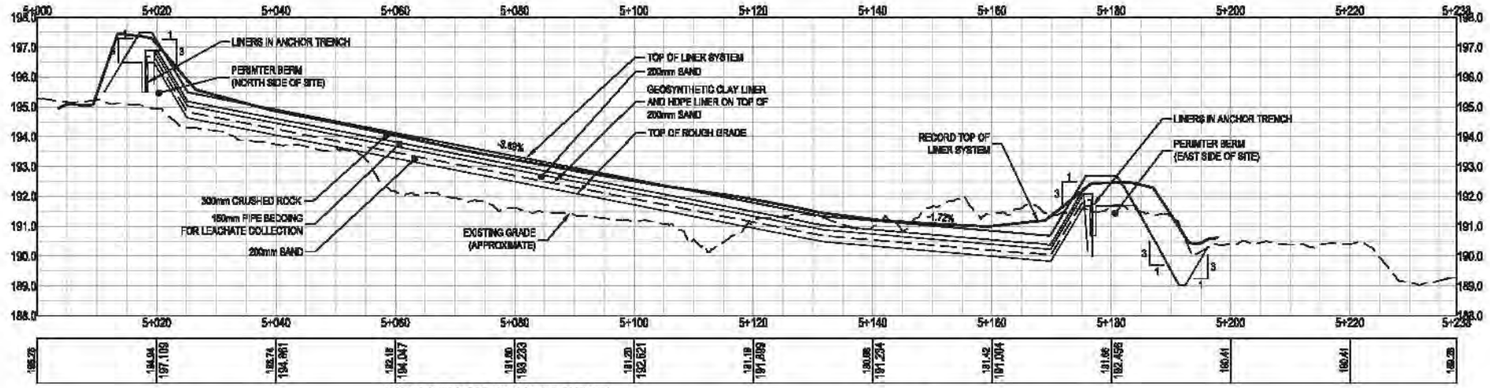
GEOMEMBRANE SITE SECTIONS

SHEET NUMBER 210

DRAWING REDUCED NOT TO SCALE



SITE SECTION WEST TO EAST — 8
SCALE: 1:500H 1:50V



SITE SECTION NORTH TO SOUTH — 9
SCALE: 1:500H 1:50V

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 0107
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG NWT.

RECORD DRAWING
April 27/12

DILLON CONSULTING

No.	Issued For	Yy	Mm	Dd	By
2	RECORD DRAWING	04	05	12	GS
1	ISSUED FOR TENDER	04	05	11	GS
A	ISSUED FOR REVIEW	02	11	11	SWM

DESIGN	REVIEWED BY
TPW	GS
DRAWN	CHECKED BY
TPW	GS
DATE: APRIL 2012	
SCALE 1:500 1:100	

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER: 10-3478-1000

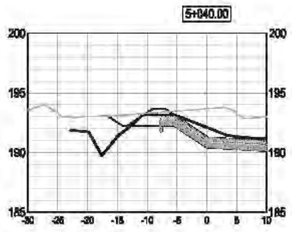
TOP OF LINER SYSTEM SECTIONS

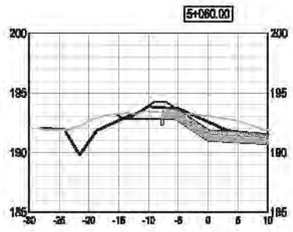
SHEET NUMBER: 211

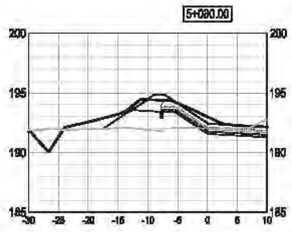
DILLON CONSULTING LIMITED 4905 47TH STREET, YELLOWKNIFE NT, X1A 3P5, PHONE (867) 920-4555

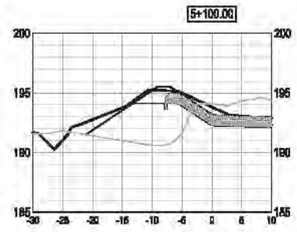
DRAWING REDUCED NOT TO SCALE

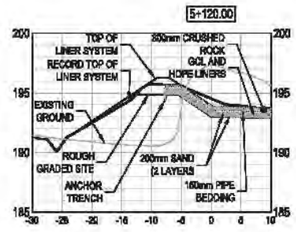
LEGEND:
- RECORD TOP OF LINER SYSTEM
- EXISTING GROUND
- ROUGH GRADED SITE
- GCL AND HDPE ON TOP OF 200mm SAND
- 200mm SAND ABOVE GCL AND HDPE
- 150mm PIPE BEDDING
- 300mm CRUSHED ROCK
- TOP OF LINER SYSTEM

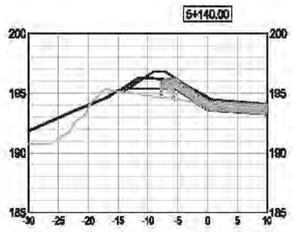


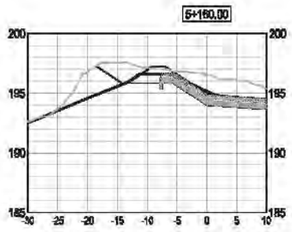


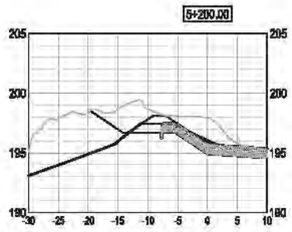


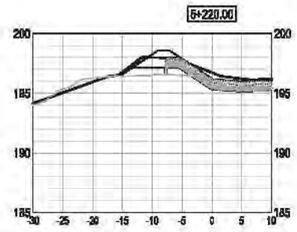


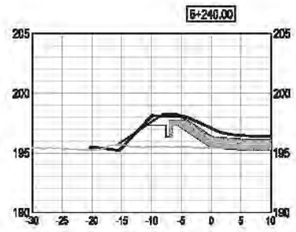


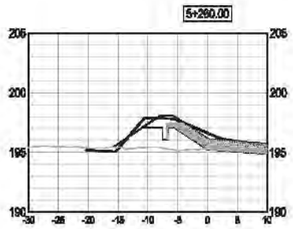


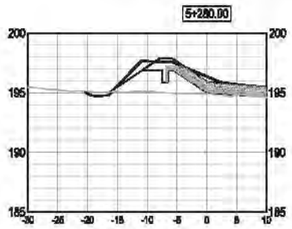


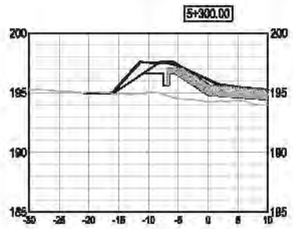


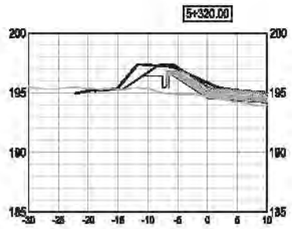


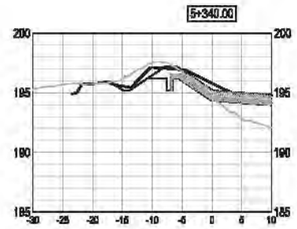


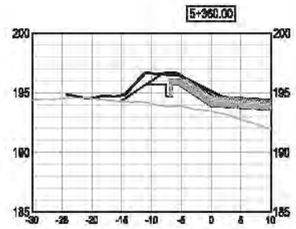


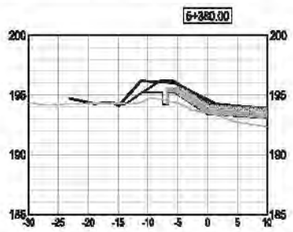


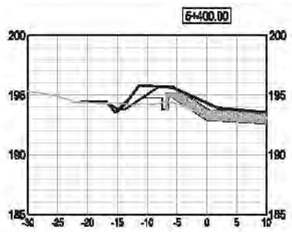


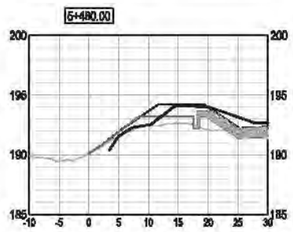


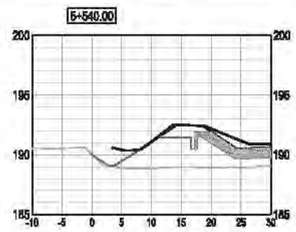












PERMANENT CELL SEPARATION BERM DETAIL 10
SCALE: 1:50(H) 1:25(V)

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 010
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG April 26/12 NWT.

RECORD DRAWING
April 26/12

DILLON CONSULTING

No.	Issued For	Mo	Day	Yr	By
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	25	11	GS
1	ISSUED FOR REVIEW	02	11	11	EMM

DESIGN: TPW | REVIEWED BY: GS
DRAWN: TPW | CHECKED BY: GS
DATE: APRIL 2012
SCALE: 1:500 1:250

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

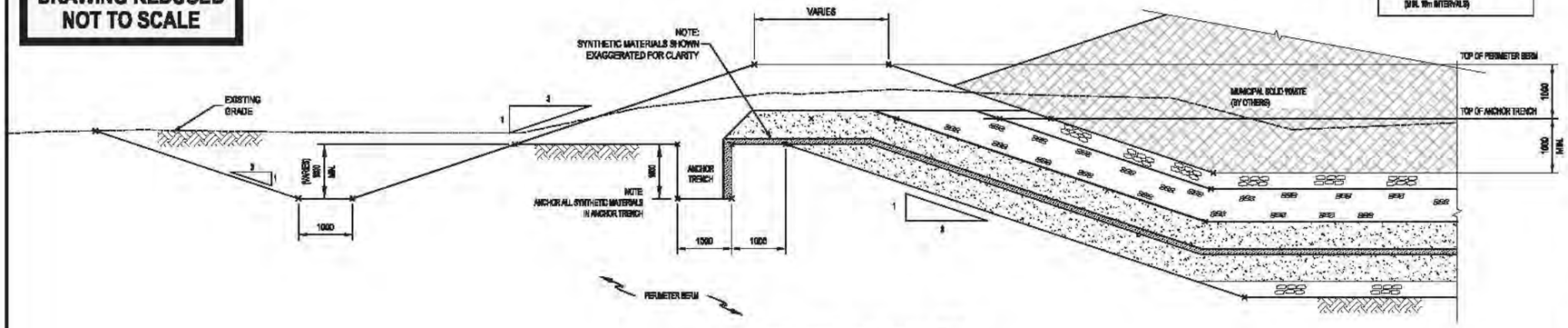
PROJECT NUMBER: 10-3478-1000

LINER SYSTEM BERM SECTIONS

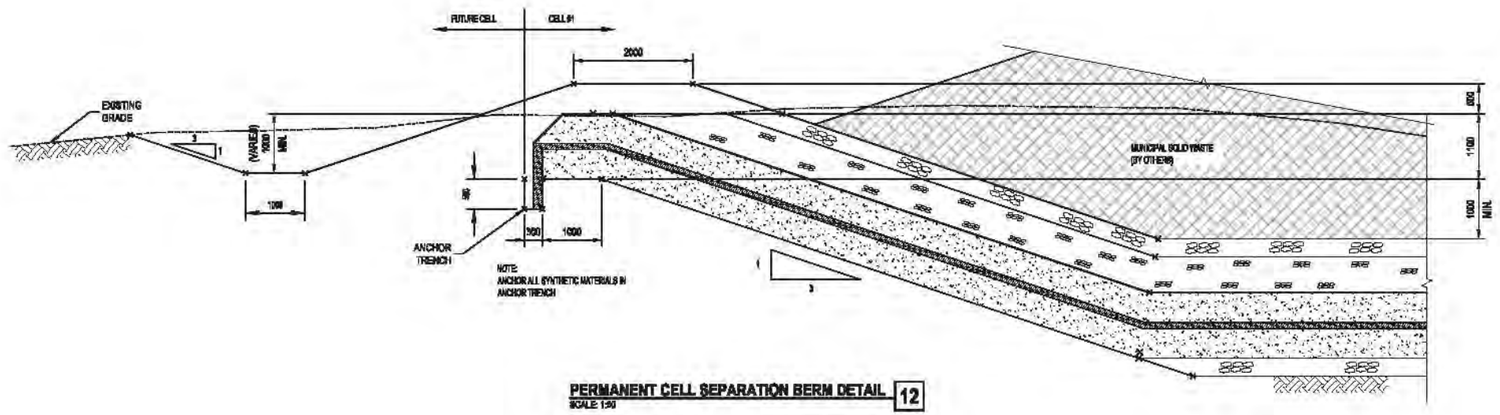
SHEET NUMBER: 212

DRAWING REDUCED NOT TO SCALE

DENOTES REQUIRED RECORD DRAWING SURVEY INFORMATION (MIN. 10m INTERVALS)



PERIMETER BERM DETAIL 11
SCALE 1:50



PERMANENT CELL SEPARATION BERM DETAIL 12
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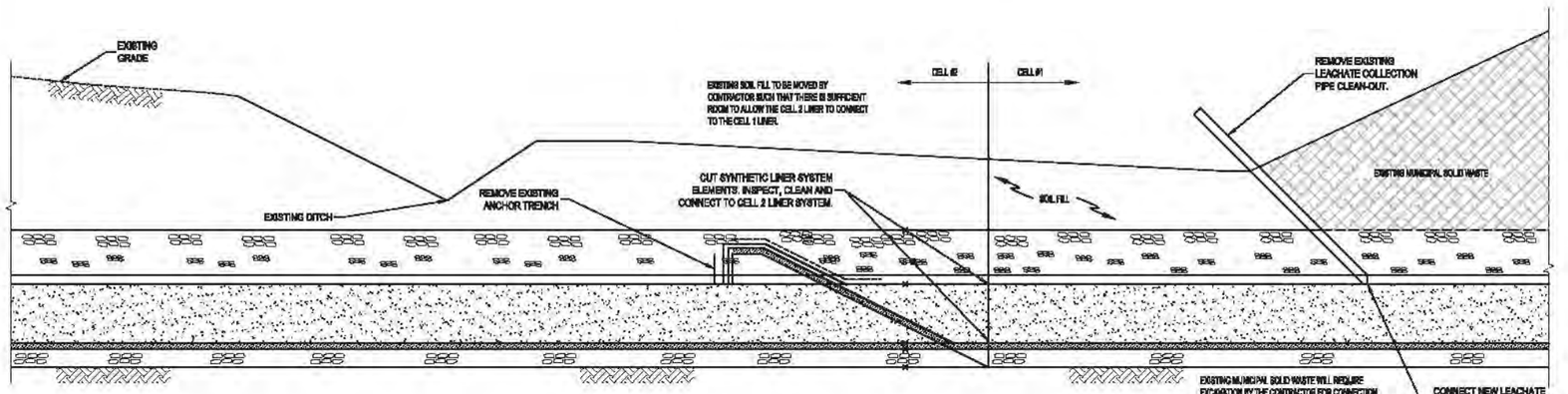
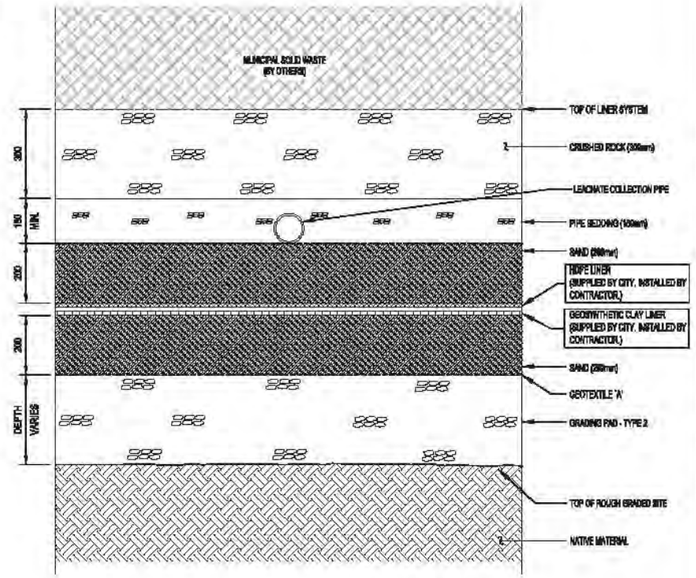


LINER CONNECTION DETAIL 13
SCALE 1:50



LINER SYSTEM SECTION 14
SCALE: N.T.S.

NOTE:
SYNTHETIC MATERIALS SHOWN EXAGGERATED FOR CLARITY

DILLON CONSULTING LIMITED 4600 47TH STREET, YELLOWKNIFE NT, X1A 2P4, PHONE (867) 920-4555

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 0100 11
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER G. STRONG April 24/12 N.W.T.

RECORD DRAWING April 24/12

DILLON CONSULTING

NO.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	25	11	GS
1	ISSUED FOR REVIEW	02	11	11	SMS

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DESIGN: TPW | CHECKED BY: SWM
DATE: APRIL 2012
SCALE: AS SHOWN

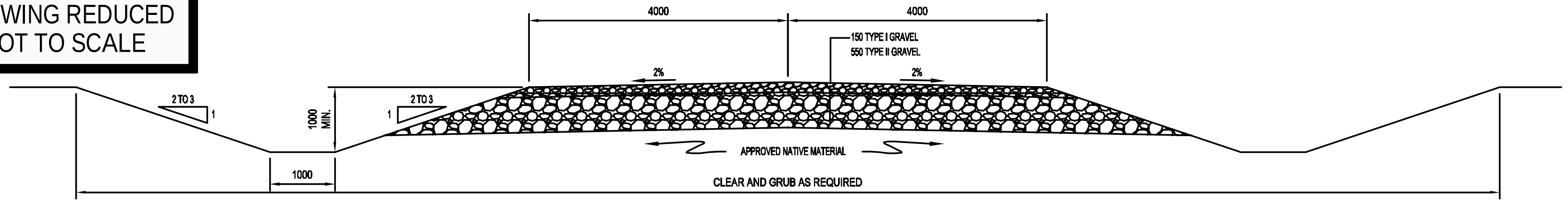
CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

PROJECT NUMBER: 10-3478-1000

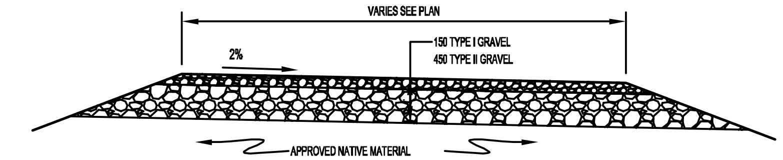
LINER DETAILS

SHEET NUMBER: 213

DRAWING REDUCED
NOT TO SCALE



GRAVEL PERIMETER ROAD 15
SCALE: 1:50



CELL ACCESS RAMP 16
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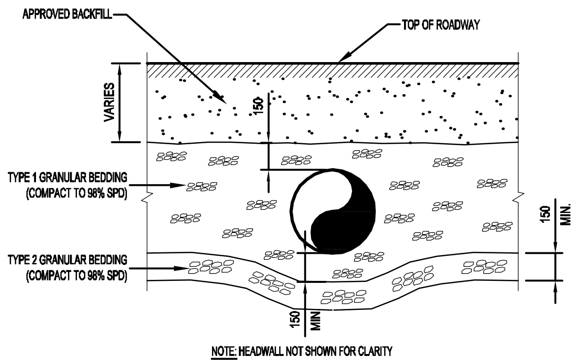

TYPICAL CULVERT 17
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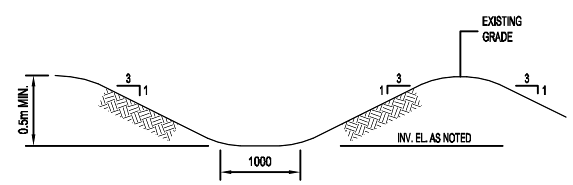
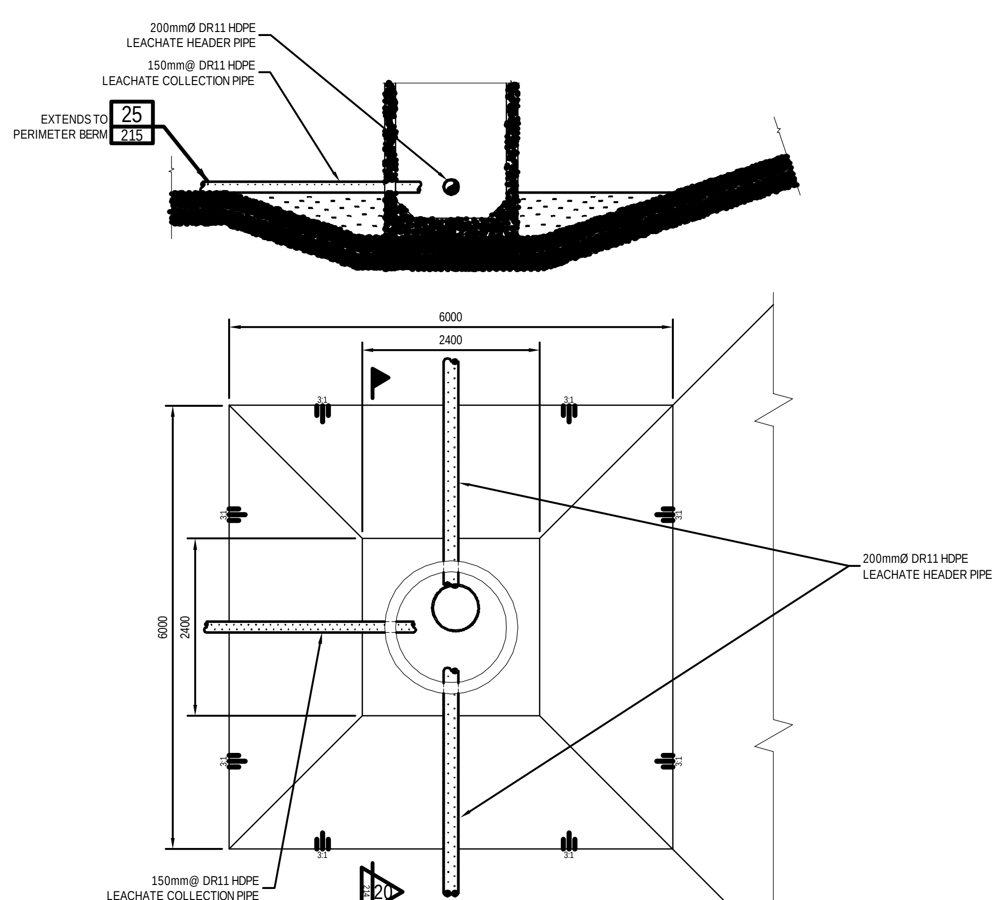
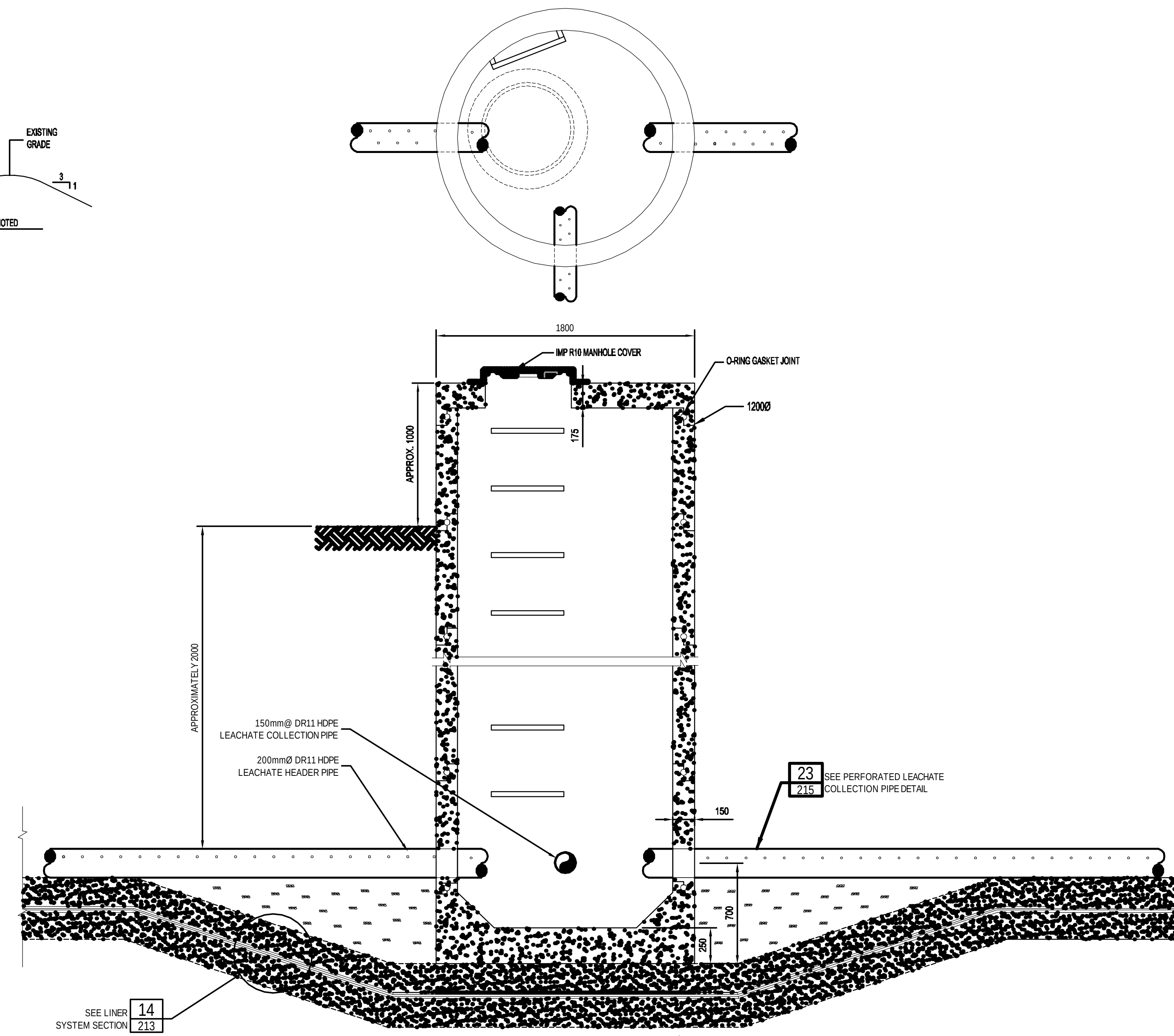


TYPICAL DRAINAGE DITCH 18
SCALE: N.T.S.



LEACHATE COLLECTION SUMP 19
SCALE: N.T.S.



LEACHATE COLLECTION MANHOLE 20
SCALE: 1:25

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PERMIT NUMBER
P 010
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER
G. STRONG
N.W.T.

RECORD DRAWING
April 24/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	26	11	GS
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN: CLH	REVIEWED BY: BWM
DRAWN: TPW	CHECKED BY: BWM
DATE: APRIL 2012	
SCALE: AS SHOWN	

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

MISCELLANEOUS DETAILS

PROJECT NUMBER: 10-3478-1000

SHEET NUMBER: 214

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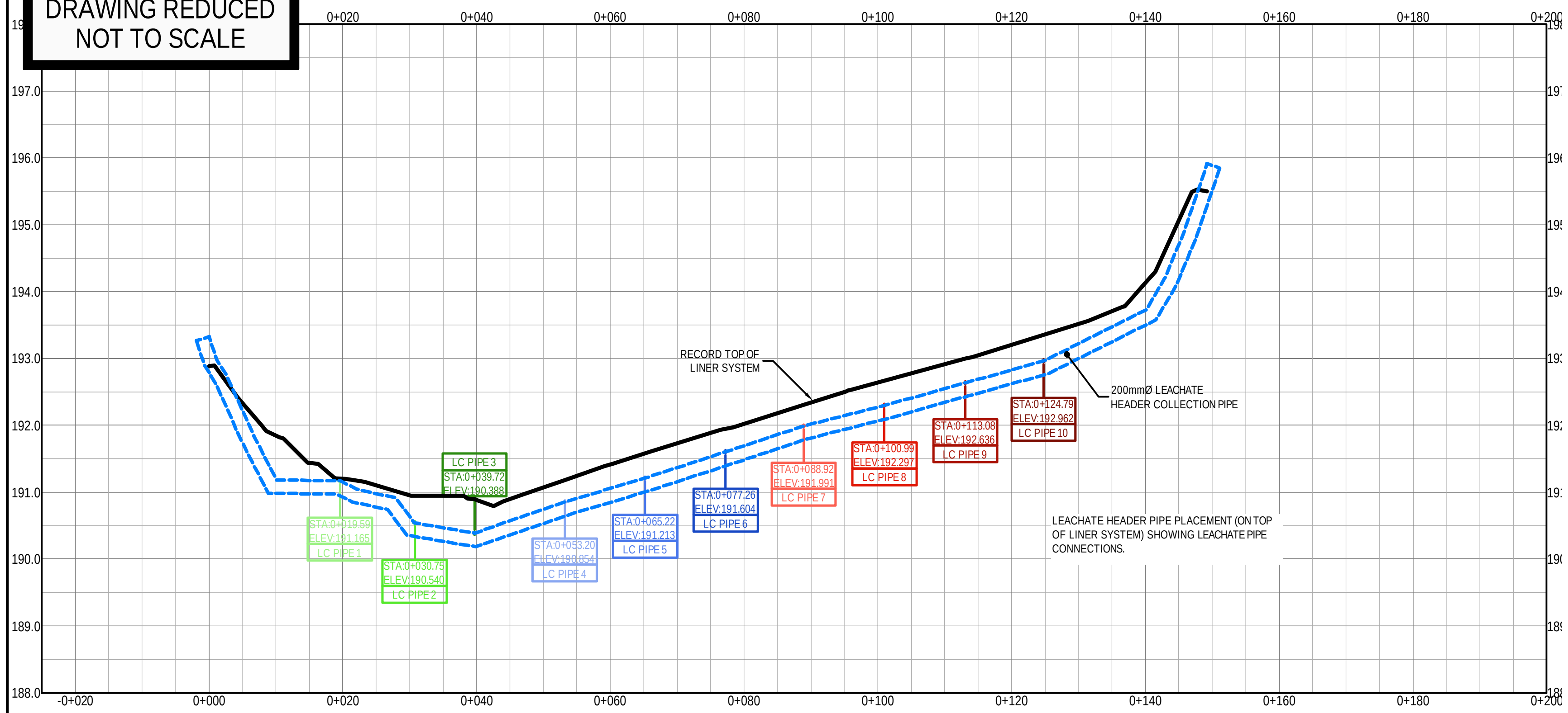
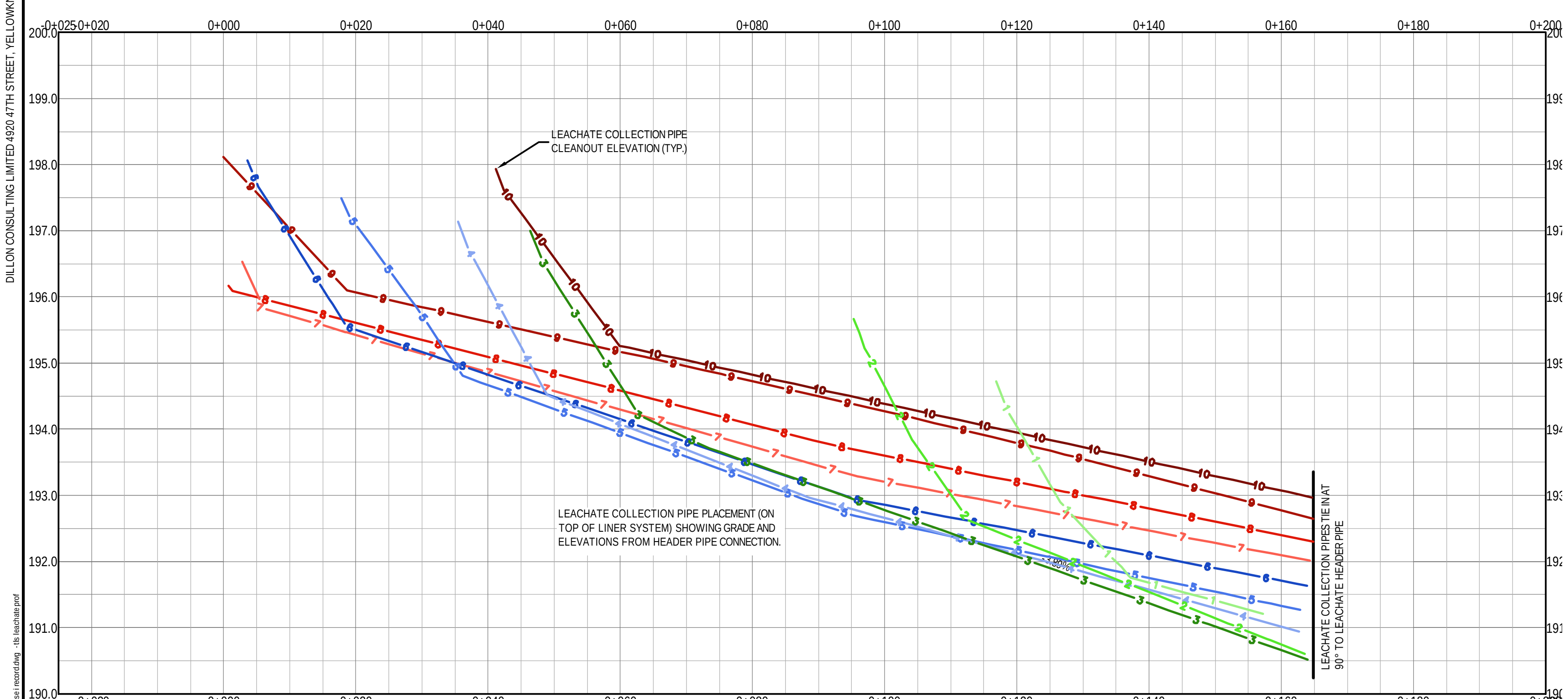
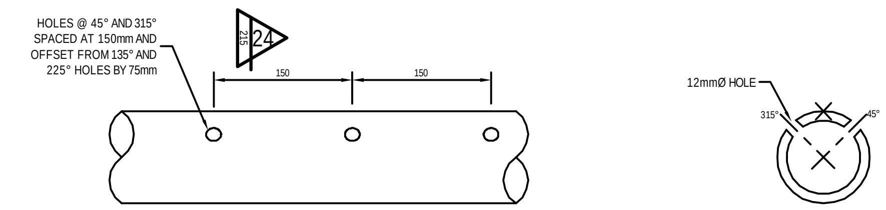


LEACHATE HEADER PIPE SECTION 21
SCALE: 1:500h 1:50v



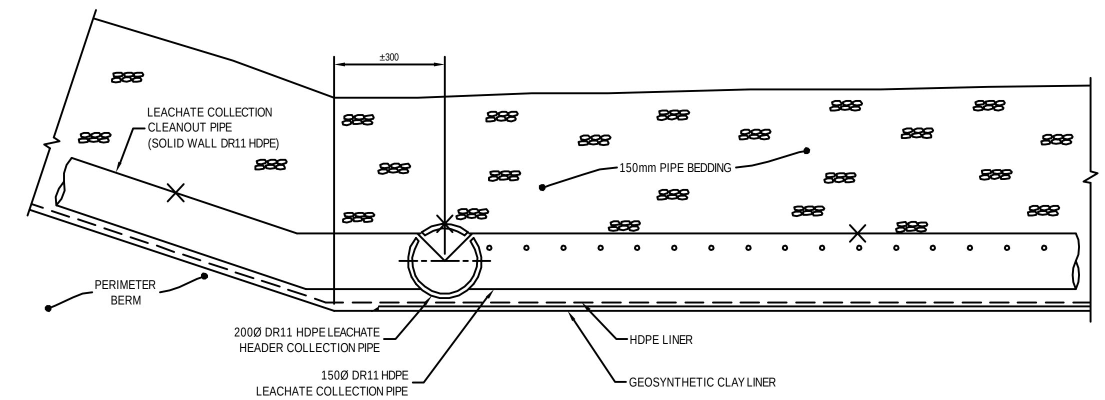
LEACHATE COLLECTION PIPES SECTION 22
SCALE: 1:500h 1:50v



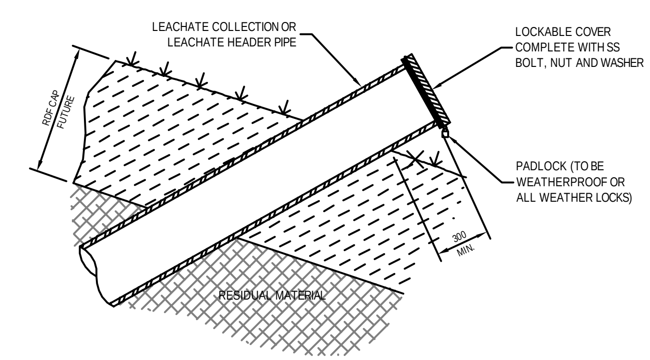
PERFORATED LEACHATE COLLECTION PIPE DETAIL 23

SECTION 24

NOTE: DIMENSIONS IN mm.



LEACHATE COLLECTION PIPE AT TOE OF PERIMETER BERM 25



LEACHATE PIPE CLEANOUT DETAIL 26

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THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 010
DILLON CONSULTING LIMITED

REGISTERED PROFESSIONAL ENGINEER
G. STRONG
N.W.T.

RECORD DRAWING
April 25/12

DILLON CONSULTING

No.	ISSUED FOR	MO	DAY	YR	BY
3	RECORD DRAWING	04	25	12	GS
2	ISSUED FOR TENDER	04	26	11	GS
1	ISSUED FOR REVIEW	02	11	11	BWM

DESIGN: TPW	REVIEWED BY: BWM
DRAWN: TPW	CHECKED BY: BWM
DATE: APRIL 2012	
SCALE: AS SHOWN	

CITY OF YELLOWKNIFE WASTE MANAGEMENT SITE - CONTRACT 2
SITEWORKS AND GEOMEMBRANE LINER INSTALLATION - RECORD DRAWINGS

LEACHATE COLLECTION DETAILS

PROJECT NUMBER: 10-3478-1000

SHEET NUMBER: 215

FileName: 41 c:\users\41ch\desktop\city landfill revised\103478 landfill phase i record.dwg