Operation and Maintenance manual (O&M)

Kugaaruk Solid Waste Facility

NWB Licence 3BM-PEL 1419

Aug 20, 2019

Prepared and submitted by

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1.0 INTRODUCTION

1.1 Purpose

This Operation and Maintenance (O & M) manual for Kugaaruk Solid Waste facility is required to fulfill conditions associated with the amendment of current Licence 3BM-PEL 1419 by Nunavut Water Board to meet Conditions of part B through part E. The Kugaaruk Hamlet is currently managing, operating and maintaining the facility as the owner and the Licensee.

The facility has been in operation since 2010 with the improvement completed in 2009 from the previous small facility.

1.2 Site Location

The facility is located about half kilometer north from the community Kugaaruk, in central Nunavut at 68.52° north latitude and 89.9° west longitude, along the east coast of Pelly Bay about 960 km west of Iqaluit. The facility is divided into two main components area:

(i) General solid waste and (ii) Bulk metals dump.

The General solid waste area is located adjacent to the sewage lagoon. The metals dump is located approximately 0.5km south of the general solid waste site. Please refer to Figure 1-1 for the site locations

Figure 1-1: Kugaaruk Solid waste and metal dump site map.

1.3 Solid Waste Treatment

The facility was enhanced from the previous foot print area and improved with addition of cells, fence, and surface drainage from up gradient to down gradient and peripheral fence and posts. The operational practice of the facility has led to organize the site and proper disposal methods of waste as well as to collect samples of leachate runoff from the site. The following sections discuss in further detail the plan that has been implemented to organize, recycle and dispose of waste in the Hamlet of Kugaaruk.

2 BACKGROUND

The community of Kugaaruk formally known as Pelly Bay, Nunavut, has an estimated population of 750, and is located on the Simpson Peninsula south of the Gulf of Boothia at 68° 32' N latitude and 89° 49' W longitude. The community is about 245 air-km east of Gjoa Haven and 1,334 air-km northeast of Yellowknife, NWT. The entire community is serviced by trucked delivery and disposal of solid waste and metal waste into the waste facility.

2.1 Population Projections

Kugaaruk is a fast growing community in Nunavut with average population increase over 5.7% rate, infrastructure development and mining exploration. Beside the regular population in Kugaaruk, tourists, commercial and business people are increasing every year, so that the food, water supply and sewage waste are increasing. The solid waste facility requirements include examining the capability to handle municipal waste for the next 20 years (2019 – 2039). To estimate the amount of waste generated by the community over the next 20 years, solid waste generation rates were determined using population projections obtained from the Nunavut Bureau of Statistics and Statistics Canada. Predicted population until the year 2039 will 1627 person according to Nunavut Bureau of Statistics.

2.2 Solid Waste Generation Rates

Solid waste generation rates were estimated using generation rates of 40 m3 per day, 0.014 m3/c/d and 0.001 m3/c/d for general refuse and school refuse respectively. These rates are accepted by the Department of Municipal and Community Affairs, Government of Northwest Territories for solid waste generation in northern communities. Based on Statistics Canada 2016 census data, the student population estimated 37% of the total community population. Using both residential and school generated waste rates, the estimated amount of refuse produce by the community from 2019 to 2039 is 262,800 m3. Based on available space estimates for the Hamlet, the solid waste facility is able to handle the Hamlet's waste for next 20 years.

3 OPERATIONAL PROCEDURES

3.1 Waste collection and deposition:

Solid waste generated at designated bins, wooden cage or other types of storage devices from household, commercial, institutions or office places will be picked up by hamlet operated cover trucks and operators serving 5 days a week and at least 1-2 times to each collection point per week. In addition to the regular daily operation, solid waste from construction work places will be collecting and depositing into the facility as needed. Most construction wastes include bulk materials, wood components, paints, drums, metal parts, dry wall and debris. The operators will be in contacts before depositing such materials and mostly during their presence. Those wastes coming into the facility will be considered in compliance and acceptable to solid waste facility, where some items will be for temporary storage only to move out in near future. The following sections describe what types of waste are acceptable and what are non-acceptable.

3.2 Acceptable Waste

The solid waste and metal waste facilities were designed and developed for accepting municipal wastes and similar types from Kugaaruk municipality and other agencies working or residing in Kugaaruk with the approval and under the management of the hamlet of Kugaaruk. Collected from the designated bins or boxes, wastes shall to be hauled to the facility using covered truck vehicles or similar means and be dropped off at designated location. Waste segregation must be carried at the drop-off location to properly packing and to accommodate wastes coming into the cell. Any exceptions to the waste type must be reviewed and approved by the authority. Some waste items are considered temporarily depositing inside the facility for transferring later such as waste batteries, waste oil, paints, bulbs, lights of hazardous materials, used tires, plastic bags, electronic panels, monitor, plasma screens etc. These temporary storage items should be secured inside appropriate containment with no leachate on ground or run-off across the open items and labeled with basic information to facilitate shipping out in near future as planned.

3.2.1 Wastes of permanent deposition

The following items are considered acceptable for disposition inside the solid waste facility:

- Regular house wastes not suitable for recycles include food waste, kitchen debris, paper wastes, fruits, vegetables;
- Cardboard, plastic and rubber product, leather and glass products;
- Carpets, rugs, sweeping cottons, fibres, aprons, personal hygiene, facials, toilet towels; shower cloths, bed sheets, clothing, textiles, electronics, utensils, cookeries, cutleries .

The following items are considered acceptable for disposition inside the Metal waste facility:

- Woods and wood products , dry wall, flooring, ceiling and fencing items of commercial residential construction residual;
- House furniture, beds, table chair, range, stoves and major appliances;
- Non-salvageable metals, auto-bodies, scraps, heavy duty plastics, fibre glass and similar;
- Tires, tubes, sheets, plates, pipes, planks, rod bars, metal posts;
- Non-hazardous components and wastes from renovation, construction, demolition works.

3.2.2 Temporary storage only

Some items are not acceptable for life in the facility, but can be stored inside without any major issues. Such these items should be placed with appropriate containment until shipping out in barge to down south or designated recipients. The following items will be on site temporary:

- Waste batteries, waste oil, transmission fluid and other fluids, waste paints , antifreeze ;
- Fuel drums, gasoline products, water filters, Chlorine and chemical empty pails;
- Contaminated soils (in mega bags), spills materials;
- E-wastes, LCD screens, halogen bulbs, transistors, circuit boards, mother boards.

3.3 Non-accepted Waste

Wastes concern to environment and danger to public health or interference with the level of service to the public will require special disposal techniques or are not acceptable for disposal. In some cases, wastes may be acceptable in small quantities with secured location but may not be acceptable in large quantities from a single generator because of danger level and causing handling problems on site and increased environmental liabilities. In circumstances, identified unacceptable wastes would be managed in some alternative ways including hauling back to the owner discretion or as direction by the authority.

All wastes that pose potential safety or environmental problem cannot be listed in their entirety. The hamlet and site personnel in general must be wary of accepting such wastes which could cause future operational problem and they must watch for inclusion unacceptable wastes in regular loads of refuse.

The following items are not acceptable for disposal in the waste facility:

- Surgical, Pathological, Blood collection and Pathogenic wastes
- Radioactive wastes

- Hazardous wastes:
- Asbestos
- Halogen products, led or mercury products

3.3.1 Handling Unacceptable Waste

Unacceptable wastes sometime create additional works and extra responsibilities, hauling and transportation of these wastes from the community to anywhere is not so easy. The only use of annual barges back to down south can move out unacceptable wastes to the recipients. The hamlet (authority) must plan to handle and ship out such wastes that are unacceptable to the waste facility in every couple year frequency or as opportunity comes with available C-cans.

Unacceptable wastes may be non-hazardous or potentially hazardous depending on the time and uses of owners and depositors. Identified hazardous or unacceptable wastes will be either secured onsite in the prescribed process, otherwise, will be removed at the expenses of the owner in accordance to the Solid Waste By-Law.

The hamlet operators must monitor the waste dumped by others and to determine whether acceptable or unacceptable at the waste facility - record those items and quantity brought. Unauthorised or illegal dumping at the facility by any vehicle or person should be recorded and possible tickets with minimum following information:

- Date and time of the incident on site of the waste facility
- Owner and source of the waste
- Type of vehicle used to bring the waste and vehicle license information
- Name of offender, if possible
- Material dumped, or rejected

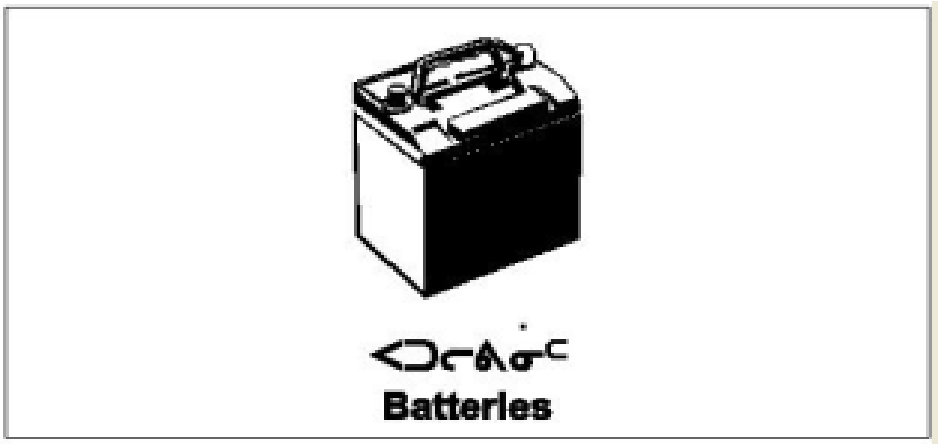
3.4 Managing Wastes

Wastes accepted on site can be either for permanent depositing or temporary storage. Special procedures should be maintained as approved by regulation and receiving authority. Managing such items of temporary storage would be managed by category of waste and causing issues to environment.

3.4.1 Waste Batteries

Waste batteries from truck, car, bus, ATV, snowmobile, water sewage dump trucks, heavy equipment, excavator and other vehicles are to be stored in the location or lined cells as designated in the solid waste facility in accordance to the standard procedure for waste batteries handling and managing. Waste batteries will be stored inside wooden boxes with

plastic sheets on base and sides, fill up in two layers height and sealed with plastic sheet on top before closing the box cover. Batteries boxes will be labelled with type and numbers and will be secured inside the C-can until they can be shipped out to any accredited recipient in southern part. The most effective means of shipping out them to down south will be on the annual barge that arrives in the hamlet each summer or fall. Batteries will be properly crated, labelled, secured and managed by Hamlet crews prior to shipment and therefore, crating material must be brought into Kugaaruk at least in the year before shipping is scheduled to barge out.



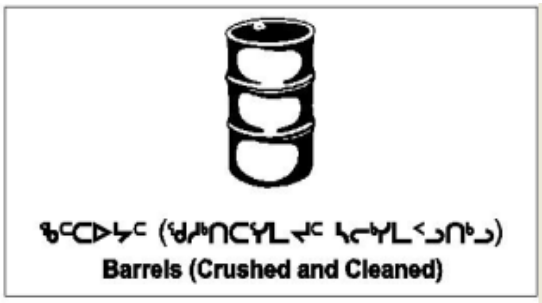
Tips for waste battery storage:

PVC sheets to be laid all around **inside** the wooden box and batteries are to be placed on PVC sheet on the wooden floor. Once filled and covered, the box should be wrapped around outside to seal the box. The whole wooden box is then be placed inside the C- can for shipping out.

Placing batteries inside the box should be maintained more close tight to avoid jerking during shipping and handling.

3.4.2 Waste Barrels:

Waste barrels can be temporarily stored vertically on wooden pallets and closing the cover and by similar ways if missing the cover plate to stop water ingress inside the barrel. The stored barrels from the wooden pallets should be moved into C-can if not empty and not useable with certified to remove from site. Empty barrels could be crushed onsite (using barrel crusher) and put in bundle to ship out or bury inside trench and cover with sand-gravels onsite available.



Waste barrels are to be cleaned and crushed before they are buried in the crushed barrel pile. Barrels that are previously contained hazardous materials shall be cleaned properly by one of the following methods engaged by a professional or cleaning company:

- solvent rinsing,
- steam cleaning or
- high pressure rinsing with the use of the appropriate cleaning solvents.

Crushing and cleaning are to be carried with the requirement set out in the Licence and shall be in accordance with guidelines by Environmental Protection Division, Environment and Natural Resources.

Prior to cleaning the barrels, liquid films within the barrels must be identified by appropriate testing methods. Hazardous liquids must be stored in appropriate containers in the hazardous waste cells of the solid waste facility and crated to be shipped out appropriately.

Environment Canada would be contacted to order the proper storage and crating containers.

3.4.3 Used Oils

Used oils should be placed in approved storage container and placed in the designated area that is determined for hazardous waste materials. Waste oils collected from different sources such as mechanic garage, house maintenance shop, furnace, boiler, seasonal shades for small vehicles such as ATV, snow mobile, four wheeler, bikes and others should be secured in non-

breakable container and hauled to facility for temporary storage in the C-can. Waste oil can be repurposed for home heating, cabins heating, re-uses to vehicles and boats. Non useable waste oils can be reduced fully by control burning using a Cyclonator on site.

3.4.4 Removal of Mercury Switch

Mercury (Hg) is heavier and most widespread and toxic contaminants for the environment. It is available into many products of house hold items, vehicles and electronic products that may end up waste facility with those items. Common items that have Mercury for their manufacture and nature of heavy metals:

- electric fluorescent light and high intensity discharge lights
- thermometers and thermostats
- heat sensors for gas pilot lights
- tilt switches in automobiles and appliances
- silent wall switches and electric relays
- vacuum gauges, barometers and manometers

Procedure to remove Mercury Switch:

While planning for Mercury switches removal from house items or auto body, personal safety must be maintained at all the time and should use appropriate tools. Proper personal protective equipment included safety glasses, gloves, Tyvek suit and in the event of a spill a respirator and mercury cartridges should be used. Always, the spill equipment and storage materials should be on-hand prior to any mercury-added device removal.

All appliances should be unplugged from an electrical outlet prior to any mercury switch removal. Appliances that have had these devices removed should be disabled to prevent future uses or re-purposes. All such appliances that have had their mercury switches removed should be handled as scrap metal and should be crushed and buried with capping materials. All other

hazardous components must be properly removed and disposed including chlorofluorocarbons (CFCs) and polychlorinated biphenyls (PCBs) prior to scrap metal crushing and bury.

In case a switch breaks during the removal process, please follow the mercury spill clean-up instructions on page

Mercury handling and storage and disposal:

Once mercury devices are removed, they should be properly handled, stored and disposed of. The handling, storage and disposal protocols covered below are a best management strategy for individuals or businesses (non-profit and for profit) that generate less than 11,000 pounds of universal waste at any time (all universal wastes combined). Individuals or business owners who will be generating more than 11,000 pounds should refer to Universal Waste Management Standards of Hazardous Waste Management Regulations.

3.4.5 Wood Products

Community has more uses of wood products at residential, institutional and commercial works including new and renovation contracts and summer cabins. Some of these wood products (or wood pieces) are reusable. Wood products also used for heating purposes including outside camping, hunting, fishing and emergency situation of power outage. Wood products are therefore determined to deposit in a location inside the facility that is accessible by the re-user from and residual wood products will be burn inside. Residents will be encouraged to deposit wood products that they do not want, in this area for recycling and reuse by others.

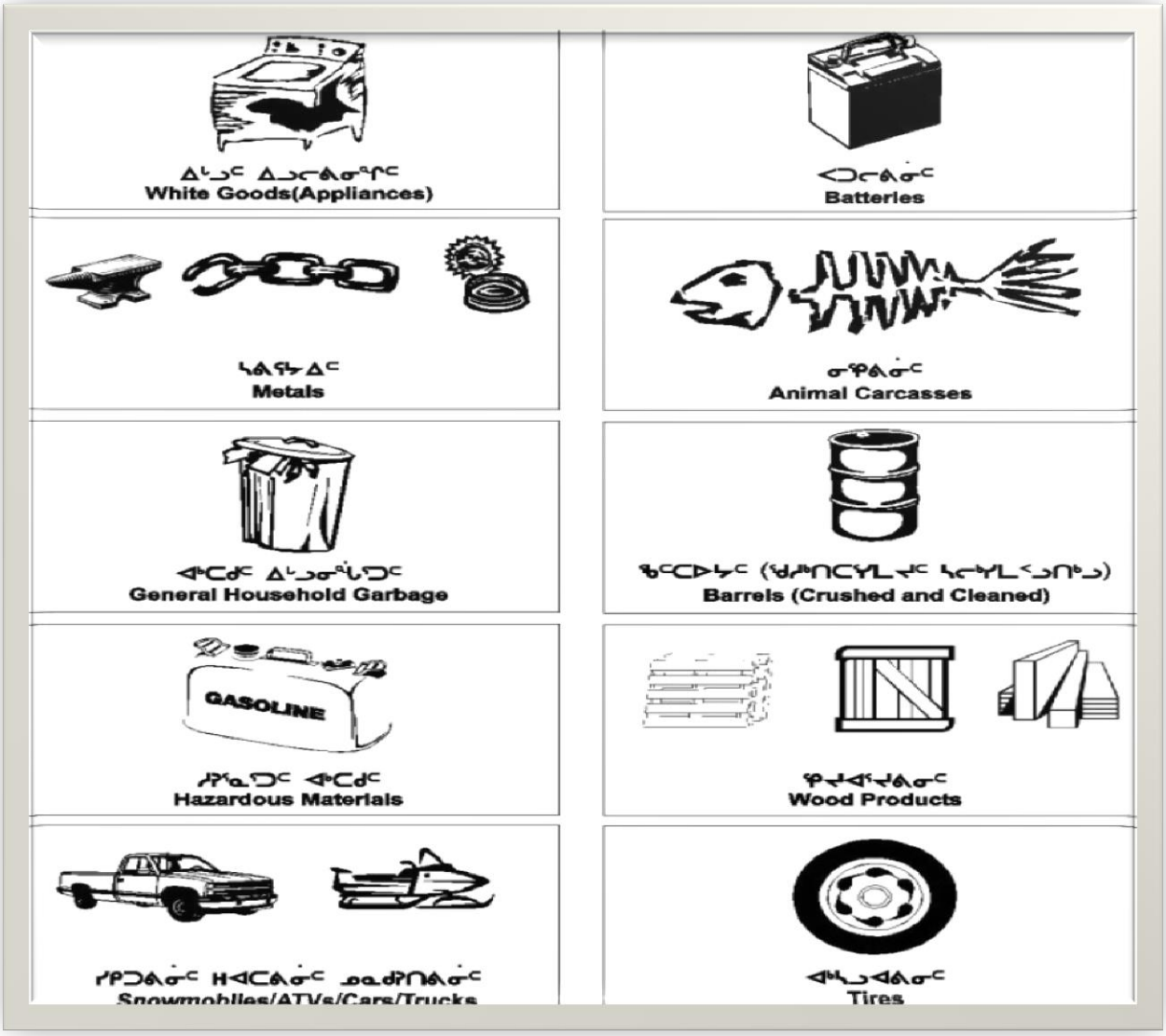
For adequate management and re-using purposes, hamlet operators will be picking-up wood products throughout the summer, fall and as needed.

3.5 Signage

The facility has been developed with some monitoring stations both at up-gradient, down-gradient and inside where run-off water flow has been visible when thaws and leachate water runs. The solid waste facility must have a sign with languages and directions posted at the gate entrance for information with facility uses, operation hours for public and hamlet uses and

awareness to the people. Sampling stations have separate signs at the landfill and the bulky metals with GPS location. The facility sign has following information:

- Title
- Hours of operation and contact information
- Materials accepted for the waste facility and temporary storage purposes
- Materials unaccepted in the facility
- Penalties



3.6 Waste inspection

The work foreman and operators are responsible for inspecting the wastes entering, deposit, storage and removal from the facility. The following methods can be employed to minimize the quantity of unacceptable waste if disposed at the site and to direct the waste hauler to the correct disposal area.

Site operators will be watchful for unacceptable or potentially hazardous wastes during unloading. When suspects any waste depositor in the disposal area, landfilling shall be ceased until the material is segregated and appropriate action is taken for correcting the situation and recorded in site log book.
The site operator or designated person will carry random check to the dump carrying to site. If the hauler refuses, the vehicle will not be permitted entry to the site, and will be selected for a check on its next visit. The site operator /in charge will record these information about the hauler who refuse a random check. The selected hauler will be directed to an area near the active landfill area that is separate from all other incoming waste. Prior to dumping, the driver of the inspected vehicle will confirm the absence of unacceptable materials. The operator will examine the load for hazardous or unacceptable wastes. Completion and results of the inspections shall be noted in the daily checklist.

3.7 Site Personnel

The SAO of the Hamlet of Kugaaruk, Director of Works, Manger, Foreman, supervisor and operators will be considered responsible site personnel with different levels of responsibilities.

3.7.1 Duties and Responsibilities

The Senior Administrative Officer (SAO): is responsible for the overall operation of the facility.

The Public Works Foreman: is responsible for daily operation and maintenance of the facility.

The operators: responsible to operate the garbage collection, hauling garbage vehicle, deposition of waste at designated location inside the facility, segregation of waste, site securement, annual maintenance, access road maintenance and clean up. The operators will be engaged and responsible for samples collection, samples test and follow compliance.

The SAO reports directly to the Mayor and is responsible for the following:

John Ivey: Senior Administrative Officer (SAO)

Bobby Anaittuq : Director of Finance

Gaetan Apsaktaun: Hamlet Forman and Director of works

George kakkianiun: water Treatment Plant Operator

Etienne Kakkianiun: Solid waste and metal dump Foreman

Billy Oksokitok: Water and sewage facilities Operator

The SAO (or representative) shall:

- Perform operations at the facility in accordance with the Operations & Maintenance manual, Engineering drawings, Operating permit issued by Nunavut Water Board.
- Ensure that only acceptable wastes, as indicated on the approved list for disposal, are permitted at the site in consultation with regulatory agencies.
- Prepare facility operating budgets and undertake staffing selections, and or contractors
- Communicate as required with regulatory agencies, forwarding of monitoring results
- Deal directly with the public, agencies and responding to disposal requests.
- Coordinate site visits by inspectors of CIRNAC, GN-Environment, GN-CGS and others
- Maintain the environmental monitoring/sampling program
- Ensure that operators, supervisors, site personnel and contractor receives required training
- Ensure that the site is maintained and operated in a clean and safe manner at all times that include regularly collection of litter and compliance with Nunavut Safety Act & Regulations.
- Coordinate the preparation of landfill areas for operation, and identifying the requirement for the establishment of surface water control measures.

3.7.2 Site Operator:

The Site Operator is responsible for general site operation and maintenance requirements at the facility. The Site Operator reports directly to the SAO and supervises the Full-Time and Part-Time Assistants.

The Site Supervisor is responsible for the following:

- Perform operations at the facility in accordance with the Operations & Maintenance Manual, drawings, and the Operating Permit issued by the Nunavut Water Board;
- In consultation with the SAO or Director to ensure that only acceptable wastes, as indicated on the approved list for disposal, are permitted at the site;
- Prepare regularly scheduled reports (daily, weekly) on progress and planning at the site;

- Provide direction to regular pay staff, casual or temporary hired people on site activities;
- Ensure the work environment and comply Occupation Health and Safety Program and Nunavut Safety Act and Regulations;
- Be responsible for workable status of site machinery, equipment and service vehicles;
- Carry out and guide site staffs for minor repair work as required to site equipment and facility, and recommendation the Director, SAO for any major repair or replacement ;
- Ensure that the facility is maintained and operated in a safe manner at all times and protect any loose debris blown away or wild animal access into the facility;
- Facilitate for loose papers, wood, package and light items reduction through control burn on site, burn ashes or debris compacted into trench or down grade and covered with sand gravel or clay;
- Supervise the facility maintenance, winter clean up including snow removal and general maintenance to access road, gate front, vehicle parking and unloading area if necessary;
- maintain filling the far end cell as priority completed and free from water ponding or debris heal within the completed area, keep warning sign for public and users;
- Perform identification and keep records of incoming vehicles, and depositing waste;
- Coordinate with other departments related to these duties assigned and meeting.

3.8 Operators Personnel Training

Kugaaruk hamlet remains responsible to update knowledge and train staff to maintain the Safe Work Place, environmentally suitable, healthy and non-hazards. Employee has right to refuse any work if not safe to do so. Both the hamlet and employee personnel are to be familiar and abide by the Occupation Health and Safety Program and Nunavut Safety Act and Regulations. The SAO, Director of Works, Supervisor, Operators will play the role as the facility health and safety representative, and health and safety issues will be discussed as part of site meetings.

A review of this Operations and Maintenance manual will be a prerequisite for any employee, operators and 3rd party contractor before being declared eligible for work at the solid waste and metal facilities. Contractor or private owner is required to comply with laws & regulations affecting the execution of the work at the waste facility, including all applicable Federal, Territorial and By Laws and regulations of Population Health, safety, cultural, social and economic and environmental.

Operators will be required to update their knowledge, ability and understanding of the facility operation training to required levels, technical matters, equipment uses, assets protection and on-going issues and requirements.

4.0 MAINTENANCE PROCEDURES

The waste facility maintenance is crucial to ensuring efficient operation of all the components. Activities can be divided into two categories:

I. Collection maintenance and
II. Facility site and storage cells maintenance.

4.1 Collection Maintenance:

The waste collection vehicle should be maintained in good operating condition to ensure the collection service is not interrupted for extended periods. Other maintenance considerations include the following:

- Waste collection vehicle should be equipped with a shovel to clean up accidental spills during collection,
- The collection vehicle should be cleaned periodically.

4.2 Storage maintenance

The waste collection process, residential and commercial storage containers should be adequately maintained. The following points should be considered:

- Private burning of wastes within the community boundaries should be discouraged as the smoke and fire hazards generally outweigh any benefit from reducing the volume of waste
- While collecting and hauling waste, containers should be covered to prevent wind- blown debris from littering the community and to prevent animals from getting into the garbage
- Bulky wastes should not be left open long time and be collected from the area due to aesthetic and safety concerns.

4.3 Berm, peripheral fence and access road maintenance:

The waste facility is enclosed with wired fence ties with metal posts about 6-8 ft high in places on natural stony gravel land along the perimeter. The fence serves dual purpose of capturing wind-blown litter and restricting wildlife access to the facility. The fence must be regularly inspected and repaired as necessary to ensure that the fence remains in good condition.

Large boulders placed along the front of the metals dump to delineate the start of the metal dump area. This area should be inspected regularly to ensure that all metals waste is being disposed of in the designated area.

The access road made with gravel and sand is approximately 500-600 m long from main road and gate. Basic road maintenance is to be conducted at least twice per year, graded to smooth and reshape the surface. During the winter, snow is to be removed to ensure unrestricted access to the site for the garbage collection vehicles.

4.4 Gate and front Fence:

Gate and front fence shall be inspected and maintained as needed and especially spring-fall. Evidence of deterioration or damage shall be noted and reported to the Municipal Services Manager or the supervisor or SAO. Sometimes term contractor also involved hired to manage these items. Hamlet of Kugaaruk has own employees and part time worker to do these works. All activities need to be keep recorded with the Municipal Director and manager of Works.

4.5 Surface Drainage

Surface drainage at the primary area from northeast upgraded area is directed to the south and southwest downgraded area of grass-gravel ditches across the road and culverts. A shallow drainage across the inside north side to the south side with some shallow control ditches was constructed to collect surface runoff. The ditches and control sumps shall be maintained so they continue to serve their intended purpose.

4.6 Waste hauling road from community

The roadway from community to waste site should be maintained including snow ploughing, grading and dust control (by watering or by using a dust suppressant). Occasionally the road will require re-shaping, grading and leveling with granular and pit soil surfacing material.

4.7 Equipment Maintenance

Regular vehicle maintenance is to be performed on all hamlet-owned equipment. This should include but is not limited to regular:

- oil changes, fluid changes, checking of tire pressure, greasing
- brake pad replacement, cleaning
- periodic maintenance requirements as set out by the equipment manufacturer

4.8 Nuisance Control

4.8.1 Litter Control

Accumulation of litters, windblown papers, and plastic bags can be a significant problem to solid waste sites - not only esthetic view but also functional problems to facility management. Litter control is best accomplished by a combination of proper disposal, deposition, operation, retaining fence, litter picking program on site and source control on garbage collection. A clean, esthetic litter-free appearance can to be maintained at the site at all times with combined helps from litter owners and facility operators for efficient operation of the waste facility. Poor litter control attracts unwanted scavengers and contributes to surface drainage problems by blocking water flow through ditches and culverts.

Litter control measures shall include:

- Regular time to time covering of wastes in the active disposal area;
- Litter collection fencing around the active fill area to catch blowing litter;
- A litter collection schedule directed by the SAO and Site Operators;
- Litter on fencing, on site roadways, in ditches and adjacent properties shall be monitored and collected on a minimum monthly basis;
- Where possible, vegetation can be used as a screen to block wind.

4.8.2 Bird Control

Solid waste disposal facilities attract birds due to the availability of food. Kugaaruk solid waste site is close near to airport buffer zone and therefore bird control measure is important. The facility operators should make notes of how many bird populations and to determine whether the number of birds in and around the solid waste is increasing and when. Control measures to minimize the presence of birds shall include:

- Covering of compacted waste daily;
- Collecting litters;
- Possible nose creating devices such as propane cannons, and screeches to discourage birds sitting in and around the facility.

4.8.3 Odour Control

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

- Daily granular 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

4.8.4 Fire control

Light weight wastes, papers and wood products reduction may be required through controlled burning on site. A steel tank type incinerator is available at the solid waste facility for control burning of light weight wastes. Ashes from this burn pit would be required to remove time to time and bury them in trenches with covered and graded with sand-gravels. The site operators need to monitor the burning process and prepare for fire protection at any time if unexpected. Usually, standby water trucks are standby in access of the fire truck. The SAO and site operators must keep updated the Fire hall staff about the control burning schedule. Burning should be during regular working hours and when wind flow is minimum or calm.

No burning program after hours, week end and high wind flow duration.

5 SAMPLING AND MONITORING PROGRAM

As per the conditions set out in the Hamlet's water licence, runoff from the solid waste facility as well as groundwater upstream and downstream of the facility and metals dump must be monitored each year during the spring and summer. The following sections describe in detail how the program must be completed.

5.1 Program Description

Figures below show the locations of the original sampling points for the solid waste and metal dump sites- where some of the stations are amended or eliminated by the inspector. Samples should be taken at least once per year in the spring or early summer from the amended stations once thawed and groundwater is flowing steadily. Sampling locations are marked on-site with signs stating the numbering code of the location.

Table 5.1: GPS Locations of Sampling Points

Station Latitude Longitude

PEL-6 :	68° 31' 14.01", N	89° 49' 43.67" W
PEL-7 :	68° 31' 03.65" N	89° 49' 03.14" W
PEL-8-1 :	68° 31' 08.93" N	89° 49' 31.79" W
PEL-8-2 :	68° 31' 13.30" N	89° 49' 23.75" W
PEL-9-1 :	68° 30' 58.76" N	89° 49' 24.04" W
PEL-9-2 :	68° 30' 59.94" N	89° 49' 26.21" W
PEL-10-1:	68° 31' 13.50" N	89° 49' 42.05" W
PEL-10-2:	68° 31' 09.61" N	89° 49' 41.99" W

The runoff from the solid waste facility must be tested each year during the spring and summer. Runoff should be tested at least once during this period; however, the Water Board may request for further sampling be completed. Runoff samples will be collected from sampling station PEL-6. The following is a list of parameters to be analyzed for the runoff sample

Table 5.2 Parameters to be analyzed at Station PEL-6

BOD (Biochemical Oxygen Demand)
pH
Total Suspended Solids
Nitrate-Nitrite
Total Phenols
Total Hardness
Magnesium
Sodium
Total Arsenic
Total Copper
Total Iron
Total Mercury
Fecal Coliforms
Conductivity
Oil and Grease
Ammonia Nitrogen
Total Alkalinity
Calcium
Potassium
Sulphate
Total Cadmium
Total Chromium
Total Lead
Total Nickel
TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

The Water Board has also requested before for groundwater monitoring wells to be installed to measure the contaminants in the groundwater upstream and downstream of the solid waste facilities. Two monitoring wells were installed upstream of the general solid waste site and two were at downstream of the facility. These stations were labeled PEL-8-1, PEL-8-2, PEL-10-1 and PEL-10-2 respectively. At the metals dump site, one monitoring well was installed upstream of the site and two wells were installed downstream of the site. These stations are labeled PEL-7, PEL-9-1 and PEL-9-2 respectively. Currently, the upstream wells are not effective, no effective ground water now flowing towards upstream. But since runoff water not flows to some of the upstream stations, samples are currently taking from some active stations at upstream and downstream as seen in the tabular form.

Kugaaruk Water Licence: 3BM-PEL 1419 Monitoring Stations (Recommended)

Station	Station	Description of station/well uses	Station coordinates		Sampling and duration	Status and
(current)	(new)		Latitude	Longitude	Frequency	Quality Control
PEL-1	**PEL-1**	Water intake point from Kugajuk River			Daily	Active (Volume)
PEL-2	**PEL-2**	Raw Sewage drop-off station at lagoon	68°31'13.66 N	89°49'49.25"W	Daily	Active (Volume)
PEL 3-1	**PEL 3-1**	Effluent decanting station from lagoon	68°31'16.2"N	89°50'02.2"W	Prior to decanting	Active (Quality)
PEL 3-2	**PEL 3-2**	Effluent discharge from waiting cell	68°31'17.91"N	89°50'03.19"W	During decanting	Active (Quality)
PEL- 4	**PEL-4**	Effluent Final discharge to Ocean	68°31'21.38"N	89°50'16.06"W	Monthly (Jun-Sep)	Active (Quality)
PEL-5	**x**	Effluent mixing 5m water in Ocean				Not required
PEL-6	**PEL -6**	Station for run-off from Solid Waste	68°31'14.01"N	89°49'43.67"W	Monthly (Jun-Sep)	Active (Quality)
PEL -7	**PEL-7**	Well at Up-gradient of Metal Dump	68°31'03.65"N	89°49'03.14"W	Once, during ground thaws	Active (Quality)
PEL 8-1	**x**					Not required
PEL 8-2	**x**					Not required
PEL 9-1	**PEL 8-1**	Well at Down gradient of Metal Dump	68°30'58.76"N	89°49'24.04"W	Once, during ground thaws	Active (Quality)
PEL 9-2	**PEL-5**	Station for Run-off from Metal Dump	68°30'59.94"N	89°49'26.21"W	Monthly (Jun-Sep)	Active (Quality)
PEL 10-1	**x**					Not required
PEL 10-2	**PEL 8-2**	Well at Down gradient of Solid Waste	68°31'09.61"N	89°49'41.99"W	Once during ground thaws	Active (Quality)

Samples should be collected at a minimum of once per year or as directed by the Water Board. The above table is a list of parameters to be analyzed from each sampling site.

All sampling, sample preservation and analysis is to be performed in accordance with methods approved by the Nunavut Water Board. All analysis must be completed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Certified Laboratory.

5.2 Record of Sampling Events

It is the responsibility of the Hamlet to file an Annual Report to the Nunavut Water Board no later than March 31st following the reported year. Appendix D contains a **Sampling Form** pertaining to the monitoring program of the solid waste and metal dump facilities. This form is to be filled out and included in the Annual Report as documented in the Operation and Maintenance Manual for the Kugaaruk Sewage Treatment Facility.

5.2.1 Daily Log

The facility operators shall maintain a record of daily operating activities. The log shall be maintained at site office and submitted to the MSM at the end of the month. Daily records shall include, but not be limited to:

- Weather conditions (i.e. precipitation, wind speed and direction, temperature)
- List of operating staff
- List of equipment operating
- Description of activities (controlled slow burning, compaction, grading, site clean-up)
- Visual inspections and environmental monitoring activities undertaken
- Issues encountered and response or corrective action taken
- Estimated volume reduction achieved by compaction.

5.2 .2 Waste Screening / Load Records

The Hamlet shall estimate the monthly and annual quantity of waste accepted at the Solid Waste and Metal Dump facilities and include this information in the Annual Report to the NWB.

Load records are maintained at the site and submitted on a monthly basis and kept on file at the Hamlet of Kugaaruk Office. Local records generally include:

- Time and date of delivery
- Waste hauler and/or customer
- Volume of waste
- Type of waste

5.2.3 Monthly Reports

The solid waste and metal dump maintaining requires operator willingness and motivation to work as needed. Working in these facilities are not the similar of other infrastructure, but some expertise is useful to serve the job efficient way. The facility status and activities at the solid waste shall be recorded on a monthly basis for the purpose of providing a record of their rate of development. Monthly reports shall provide an overview of activities that have occurred during the month, including:

- Location of solid waste area and metal dump activities related to the area
- Quantities of wastes and types of wastes received
- General weather conditions
- Maintenance, including litter control activities
- List of infractions and issues, including the measures undertaken to resolve them
- Monitoring Program sampling data

Monthly reports can be a summary of the daily logs for the month, with information and observations added to complete the list above.

5.2.4 Annual Report

The Hamlet of Kugaaruk must file an Annual Report to the NWB no later than March 31st of the year following the calendar year reported. The information required in the report is described in Part B of the water license. The Annual Report shall include:

- Tabular summaries of all samples results generated under the Monitoring Program
- The monthly and annual quantities (cubic metres) of all waste discharged
- Summary of modifications and/or major maintenance work carried out on the facilities
- A list of unauthorized discharged and summary of follow-up action taken
- A summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for next year
- Any addendum with updates or revisions for manuals and plans as required by changes in operation and/or technology
- A summary of any studies or reports requested by the Board that relate to water use and waste disposal or restoration, and a brief description of any future studies planned.

In addition for the report to the NWB, an annual operations summary shall be prepared and shall include:

- A record of the types of wastes received, amount stored and the amount diverted into designated cells for storage
- Major incidents and corrective actions taken, if applicable
- Record of public complaints and response actions
- Annual environmental compliance inspections
- Current operations in relation to design plans

6.0 Quality Assurance/Quality Control Plan for Solid Waste Monitoring Program

The Quality Assurance/Quality Control (QA/QC) Plan for sampling of the Solid Waste Treatment Facility has been developed using general QA/QC procedures. The plan includes water samples collection procedures for grab samples from surface run-off and from sub-surface leachate water wells. Further detailed instruction may be required from the laboratory selected to perform analysis on the samples.

Hamlet personnel responsible for sample collection are also responsible for contacting the lab prior to sample collection to ensure they have the proper instructions. They must also obtain a certificate from the lab stating that the lab is certified as a CAEAL Laboratory. Information in developing this plan was taken from *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan (*Water Resource Division of Crown-Indigenous Relations and Northern Affairs Canada, CIRNAC); *Wastewater Sampling Instructions*, *Kitikmeot Region*; and *Groundwater Well Sampling* (United States Environmental Protection Agency, January 1995).

6.1 Sample Collection

Please refer to **Appendix C** for instructions on collecting solid waste run-off water samples.

6.2 Lab Analysis

Once the lab has received the samples, they will begin processing them. A report stating all results as well as the detection limits will be produced and sent to the Hamlet Office. The report will also state any problems that may have occurred during analysis of the samples.

6.3 SITE RECORDS

Copies of records pertaining to operation and maintenance of the solid waste and metals dump facilities should be kept at both the Hamlet Office and the Hamlet's Maintenance Garage. Information that must be included in these records are:

- Volumes of any run-off or leachate discharged to the environment through an accidental spill;
- Estimated volume of waste collected and the generator of the waste (monthly and annually);
- Details of any maintenance undertaken at site;
- Record sheets;
- Visits by regulatory authorities;
- Copies of sampling and analysis reports of the monitoring wells and runoff from solid waste;
- Copies of annual reports submitted to the NWB;
- Copy of the Hamlet's water licence;
- Copies of all manuals pertaining to the operation and maintenance and QA/QC Plan, Spill Contingency Plan, Abandonment and Restoration Plan; and
- Copies of spill reports and related regulations

7.0 SAFETY PROCEDURES

The following safety procedures should be obeyed in order to minimize health risks to personnel working in and around the wastewater and solid waste facilities:

- Equipment is to be kept clean;
- Wear protective clothing such as gloves and boots at all times;
- 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;
- Hands 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

All **accidents, injuries,** or **near misses** shall be reported to the solid waste facility Operator, the Municipal Foreman and the appropriate safety official at the Hamlet and the following steps shall be taken:

- Investigate the incident immediately
- Find out the cause
- Make a complete incident report
- Take immediate measures to correct the cause and prevent it from reoccurring
- Have a safety meeting with employees as soon as possible after the incident

7.1 Traffic Accidents

Traffic accidents occurring at the site shall be reported to the RCMP and investigated by the Landfill Operator who shall also complete an Accident Report Form.

7.2 Medical Emergencies

All injuries, even minor injuries, should be considered important and should be reported as a safety incident to the MSM or Hamlet Safety Officer.

First Aid should be applied in a manner that is appropriate to the nature of the injury. If the injury requires medical assistance, the individual should be taken to a medical emergency centre or an ambulance service contacted.

A medical doctor or duty nurse should be consulted for all injuries that may result in infections as a result of working with waste materials. This includes injuries such as cuts and scrapes, skin punctures with sharp items, and fire or chemical burns.
If the person injured on-site is a customer or visitor, the solid waste operator and employees shall provide any assistance necessary and administer appropriate First Aid.

7.3 Bear Safety

Solid Waste Facilities are an attractant for a number of wildlife species, especially bears. For this reason, it is imperative that all personnel working in and around the solid waste site be properly trained in bear safety. Please refer to **Appendix E** for documents relating to bear safety

7.4 Fire Response Plan

The Fire Department is responsible for creating a contingency plan to deal with fires in the Hamlet. As burning of waste may produce harmful gases, special precautions should be taken when responding to fires in and around the solid waste facility. In the event of an uncontrolled fire in the waste facility or inside Hamlet, the following steps should be taken:

- Immediately evacuate the area and go to the Hamlet's meeting place;
- Keep everyone including Hamlet personnel up-wind from the source; and
- Contact the Hamlet Fire Department at (867) 769-7222

General Fire-Fighting Procedures

- Cover the burning material with gravel
- Dig out the burning debris and let it burn in a controlled manner away from other combustible materials
- Use water if available using water truck (normally two trucks are kept standby)

8.0 Site Access control

Access to the solid waste and metal dump facilities will be open year round to the public. The solid waste facility is enclosed with a fence and an unlocked gate. This is to prevent wildlife from entering the site, however allows access for residents to drop off waste that is not picked up on a regular basis by the Hamlet. A watchman fence will be constructed at the entrance to the metals dump facility to mark the starting location of the facility. There will not be a gate so access will be available to the public at all times. The purpose of this is to encourage residents to bring their waste to the site as well as to recycle items from the facility that may be of use.

8.1 Contact Numbers

Contact responsible persons for overseeing operation and maintenance of waste facility as follows:

- Senior Administrative Officer: (867) 769-6281
- Public Works Foreman: (867) 769-6160

9.0 EMERGENCY RESPONSE

The Hamlet must be able to respond efficiently and effectively to all possible emergencies that may be encountered in the operation of the Hamlet's facilities. These include, but not limited to fuel, chemical and waste spills as well as fires. Due to the nature of the facilities, burning or spillage of unknown or hazardous materials may occur. Only personnel who are properly trained to deal with these situations should respond to such emergencies. Personnel must familiarize themselves with the emergency preparedness plans before an accident or emergency occurs.

Copies of these plans must be kept in all sewage waste, metal dump and solid waste disposal vehicles as well as 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:
Fire Department: (867) 769-7222
RCMP Detachment: (867) 769-1111
24 Hour Spill Response Line: (867) 920-8130

9.2 Spill Contingency Plan

A spill contingency plan has been created for activities associated with Hamlet operations including the solid waste, metal dump facilities and storage handling of hazardous materials. A copy of the plan may be found in the Hamlet office and the hamlet Garage where operators keep office documents and contacts.

Hamlet personnel must familiarize themselves with the plan in order to respond quickly and effectively in the event of a spill.

10 REFERENCES

1. Department of Environmental Conservation, Vermont. “Household Appliance Mercury Switch Removal Manual”, Spring 2008. http://www.mercvt.org/PDF/appman.pdf

2. Department of Indian and Northern Affairs Canada, Water Resources Division & The Northwest Territories Water Board. “Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class “B” Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan”, July 1996

3. Dillon Consulting Limited. “Sewage and Solid Waste Sites, Kugaaruk, NU, Phase II Pre-Design Report”, Prepared for Public Works & Services, Government of Nunavut, February 2006

4. Environmental Protection Division, Department of Environment and Natural Resources, GNWT. “Drum Disposal Protocol for Municipal Landfill, Drum and Tank Cleaning for Municipal Disposal”, Government of the Northwest Territories, 2008.
http://www.enr.gov.nt.ca/eps/pdf/Drum_Disposal_Protocol.pdf

5. Nunavut Water Board. “Hamlet of Kugaaruk Water Licence, Licence Number: 3BM-PEL0712”, September 2007.

6.Wildlife Division, Department of Environment and Natural Resources. “Safety in Grizzly and Black Bear Country”, Obtained November 2008.
http://www.nwtwildlife.com/Publications/safetyinbearcountry/safety.htm

Kugaaruk Solid Waste Facility

APPENDIX - A

Annual Reporting

ANNUAL REPORT

YEAR BEING REPORTED:_____

The following information is compiled pursuant to the requirements of Part B, Item 1 of Water Licence **3BM-PEL 1419** issued to the **Hamlet of Kugaaruk**
.

i) - iii) tabular summaries of all data generated under the “Monitoring Program”; monthly and annual quantities in cubic metres of freshwater obtained from all sources; monthly and annual quantities in cubic metres of each and all wastes discharged;

Attached are quantities of water used as reported in our On Tap Water Delivery System and the estimated discharge of sewage waste based on quantities used.

Month Reported	Quantity of Water Obtained from all sources (litres)	Quantity of Sewage Waste Discharged
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		
ANNUAL TOTAL		

iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;

v. a list of unauthorized discharges and summary of follow-up action taken;

vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

vii. a summary of any studies requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;

viii. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported; and

ix. updates or revisions to the approved Operation and Maintenance Plans.

ADDITIONAL INFORMATION THAT THE LICENSEE DEEMS USEFUL:

FOLLOW-UP REGARDING INSPECTION/COMPLIANCE CONCERNS:

Kugaaruk Solid Waste Facility

APPENDIX - B

Monitoring Locations

Department of Community and Government Services
Nunalingni Kavamatkunnilu Pivikhaqautikkut
Ministère des Services Communautaires et gouvernementaux

Kugaaruk Water Licence: 3BM-PEL 1419 — **Monitoring Stations** (recommended)

Station (current)	Station (new)	Description of station/well uses	Station coordinates		Sampling and duration	Status and
			Latitude	Longitude	Frequency	Quality Control
PEL-1	**PEL-1**	Water intake point from Kugajuk River			Daily	Active (Volume)
PEL-2	**PEL-2**	Raw Sewage drop-off station at lagoon	68°31'13.66 N	89°49'49.25"W	Daily	Active (Volume)
PEL 3-1	**PEL 3-1**	Effluent decanting station from lagoon	68°31'16.2"N	89°50'02.2"W	Prior to decanting	Active (Quality)
PEL 3-2	**PEL 3-2**	Effluent discharge from waiting cell	68°31'17.91"N	89°50'03.19"W	During decanting	Active (Quality)
PEL- 4	**PEL-4**	Effluent Final discharge to Ocean	68°31'21.38"N	89°50'16.06"W	Monthly (Jun-Sep)	Active (Quality)
PEL-5	**x**	Effluent mixing 5m water in Ocean				Not required
PEL-6	**PEL -6**	Station for run-off from Solid Waste	68°31'14.01"N	89°49'43.67"W	Monthly (Jun-Sep)	Active (Quality)
PEL -7	**PEL-7**	Well at Up-gradient of Metal Dump	68°31'03.65"N	89°49'03.14"W	Once, during ground thaws	Active (Quality)
PEL 8-1	**x**					Not required
PEL 8-2	**x**					Not required
PEL 9-1	**PEL 8-1**	Well at Down gradient of Metal Dump	68°30'58.76"N	89°49'24.04"W	Once, during ground thaws	Active (Quality)
PEL 9-2	**PEL-5**	Station for Run-off from Metal Dump	68°30'59.94"N	89°49'26.21"W	Monthly (Jun-Sep)	Active (Quality)
PEL 10-1	**x**					Not required
PEL 10-2	**PEL 8-2**	Well at Down gradient of Solid Waste	68°31'09.61"N	89°49'41.99"W	Once during ground thaws	Active (Quality)


PEL-7

Kugaaruk Solid Waste Facility

APPENDIX - C

Sampling Instructions

Sample Collection

1.1 Preparing for Sample Collection

Samples are to be collected from the marked Surveillance Network Program (SNP) locations. Each location has been marked with a sign and location number as well as located with GPS coordinates.
It is the responsibility of the Hamlet to maintain these marked locations in good condition and visible for public and inspector. Before collecting samples, follow the list of instructions below:

- Contact the lab and ask where their lab is located. Tell them the number of sets of sampling bottles and equipment are required to test the list of parameters. As well ask for field blanks. These are jars of deionized water that travel with the field samples to determine if there is any possible contamination from traveling and handling methods. Also ask them for an instruction sheet for collecting the samples

- Contact the airport and find out what time the samples must be dropped off in order to make the flight to the city where they are being sent. The samples should be collected shortly before they are shipped. For example, if the samples must be at the airport by 2:00pm, the samples should be collected that morning. Make sure that there is enough time to collect and package all samples for transport. This is important because the samples must be at the lab within 24 hours from the time they are collected, otherwise they are no longer good for analysis.
- The sampler should familiarize themselves with the locations and walk to each location prior to sampling to ensure the samples are taken from the correct locations

Once the sampling bottles and equipment have been received from the lab, gather the following items prior to sample collection:
1. Sample bottles;
2. Preservatives;
3. Coolers that the bottles and preservatives were sent in;
4. Field blanks;
5. Disposable bailers for sampling in groundwater monitoring wells;
6. Nylon line to tie to bailers;
7. Cloth rope and weight (such as a plumb bob);
8. Plastic sheeting to protect sample bottles and equipment from ground contamination;
9. Clean 5 gallon bucket, marked with measuring gradations;
10. Chain of custody forms (also called COCs);
11. Permanent marker to mark on bottles;
12. Pen to fill out chain of custody forms;
13. Nitrile gloves;
14. Packing tape;
15. Ice packs;
16. Shipping label to send samples back to the lab.

Once everything has been gathered, determine which day the samples will be collected. Be sure to check the flight schedule for that day and call the lab to ask if they are able to pick up the samples at the airport when they arrive.

1.2 Instructions for Sample Collection

Follow these instructions to collect samples from the solid waste treatment facility:

- Place ice packs in freezer the night before sampling.
- In the morning, place ice packs and other equipment into coolers and load into vehicle. Make sure that the field blanks are in the cooler as well.
- Drive to site and park in a safe spot away from traffic and samples stations.

1.2.1 Groundwater Monitoring Well Sampling

- Take coolers and equipment to sample location PEL-7 at metal dump
- Put on a pair of nitrile gloves.
- Place a plastic sheet on the ground around the monitoring well.
- Record in field book the date, time, sampling location and note any other information.
- Remove the well cap and place beside the well.
- Measure the depth of water in the well:
- Tie the weight to the end of the cloth rope;
- Lower weight and rope into the well until the weight just touches the bottom of the well;
- Pull the weight and rope out of the well and measure the distance of the rope that is wet;
- This is the water depth in the well.
- Calculate the volume of water in the well:

As part of QA/QC testing, a second set of samples should be taken from one of the sampling points. This means filling two sets of sampling bottles from the same location. This second set of samples is to verify that sample results are accurate and that sampling methods are consistent. It may be difficult to obtain enough water from the monitoring wells to fill two complete sets of sample jars. Therefore a second set should be taken at PEL-6 where this is not an issue. If it is determined that enough water can be obtained from one of the monitoring wells, a second sample set may be taken from that well.

TAIGA ENVIRONMENTAL LABORATORY

Bottle &/or Preservative Order Form

Date Ordered: 201_	Date Required: 201_	
Name:	Company:	**Project name or Location**
Address:		
Phone:	Fax:	

Pick up:	Ship by Air:	Pack as TDG :	Cooler required:
❒ Yes	❒ Yes	❒ Yes	❒ Yes
❒ No	❒ No	❒ No	❒ No

Date Filled: 201_	Filled By:

NOTE: Bottles and preservatives are provided free of charge for analysis carried out at Taiga. Bottles, preservatives and laboratory supplies for other use, may be subject to additional charges. Unused bottles and preservative cannot be returned to the laboratory for reuse.

Parameter Type	**No. of Field Blanks**	**No. of Travel Blanks**	**No. of Bottles for Samples**	**QC Batch # of Bottles Sent**	**Number of Preservatives**	**QC Batch # of Pres. Sent**
Routine (Green)					Not Required	
Nutrients (Black)					Not Required	
Bacti (Sterile sealed)	Not Required	Not Required			Not Required	
BOD (Purple)	Not Required	Not Required			Not Required	
Total Metals (Red)						
Dissolved Metals (Red) *see note 1*						
Arsenic Speciation Bottle	Not Required	Not Required			Not Required	
Cyanide (Blue)						
Thiocyanate (Orange)						
Hexane Extractable Material (Oil & Grease) (Brown glass, wide or narrow-mouth)						
(P) Phenol (Brown glass, narrow-mouth)						
(S) Sulphide						
(R) Radionuclide						
Chlorophyll A	Not Required	Not Required			Not Required	
Extractable Hydrocarbons (Brown glass) *see note 2*					Not Required	
BTEX/Purgeable HC *see notes 2 and 3*					Not Required	
THM (Glass vial 40mL) *see note 3*					Not Required	
Metals or Hydrocarbons in sediment (500mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (250mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (125mL jar)	Not Required	Not Required			Not Required	
Metals or Hydrocarbons in sediment (60mL jar or Whirl Pak Bag)	Not Required	Not Required			Not Required	
Other:						

Other Field Supplies: (e.g. Type I UV^+ water)

Notes:

1- Dissolved metals bottles will be preserved at the laboratory if the sample is not filtered in the field. The filtering and addition of preservative is $20.00/sample.
2- For TPH requests, both the extractable hydrocarbons (brown glass bottle) and the BTEX/Purgeable HC (40mL vial) have to be submitted.
3- For BTEX/Purgeable HC and THM, please submit two vials for each sample (in the event air bubbles occur in the vials, a back-up sample can be analyzed)

Shaded areas are for laboratory use only.

TAIGA ENVIRONMENTAL LABORATORY
LABORATOIRE ENVIRONNEMENTAL TAIGA
4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3
Tel: (867) 669-2788 • Fax: (867) 669-2718
www.taiga.gc.ca

FIELD SHEET

Batch No.:

Send Results & Invoice to:
(Please notify if results or invoice are to be sent to different locations)

Company/Agency: _____

Address: _____

_____

City/Town: _____ Province/Territory: _____

Postal Code: _____

Phone: _____ Fax: _____

E-mail: _____

Signature : _____

Client Project No: _____

Date collected: _____

Time collected: _____

Sampler: _____

Location: _____

Rush Required: ❑Yes ❑No

Note: *Analysis may be subcontracted without prior notice.*
See reverse for how to complete form and sampling protocols.

Date Received: _____ Received By: _____

Comments: _____

(Laboratory use only)

-WATER SAMPLES –

Sample Type (freshwater, sewage, wastewater, potable , groundwater, salt water, *etc*)			
Client Sample ID (As it should appear on final report)			
Taiga Sample ID (Laboratory use only)			

Bottle Type and Parameter

[√] PLEASE CHECK PARAMETERS REQUESTED BELOW:

Routine	pH, Conductivity, Alkalinity	pH | Cond | Alk	pH | Cond | Alk	pH | Cond | Alk
	Individual Anions Suite ☐	Cl | SO_4 | F | NO_2-N | NO_3-N	Cl | SO_4 | F | NO_2-N | NO_3-N	Cl | SO_4 | F | NO_2-N | NO_3-N
	Total Nitrite (NO_2) + Nitrate (NO_3)	NO_2 + NO_3-N	NO_2 + NO_3-N	NO_2 + NO_3-N
	Individual Cations Suite ☐	Ca | Mg | Na | K	Ca | Mg | Na | K	Ca | Mg | Na | K
	Hardness (Calculated)	Hardness	Hardness	Hardness
	Reactive Silica	SiO_2	SiO_2	SiO_2
	Laboratory use only	Rec'd: Y N	Rec'd: Y N	Rec'd: Y N
Nutrients	Chlorine: Total, Residual	T. Cl | R. Cl	T. Cl | R. Cl	T. Cl | R. Cl
	Chemical Oxygen Demand	COD	COD	COD
	Color	Apparent | True	Apparent | True	Apparent | True
	Turbidity	Turbidity	Turbidity	Turbidity
	Total Suspended Solids, Dissolved Solids	TSS | TDS	TSS | TDS	TSS | TDS
	Ammonia	NH_3	NH_3	NH_3-N
	Phosphorus: Total, Dissolved, Ortho	TP | DP | OP	TP | DP | OP	TP | DP | OP
	Carbon: Total, Dissolved	TOC | DOC	TOC | DOC	TOC | DOC
	Nitrogen: Total, Dissolved	TN | DN	TN | DN	TN | DN
	Visible Oil and Grease	Visible	Visible	Visible
	Laboratory use only	Received : Y N	Received : Y N	Received : Y N
Sterile	Fecal Coliforms (FC)	FC	FC	FC
	Total Coliforms (TC), E. Coli (EC)	TC | EC	TC | EC	TC | EC
	Fecal Streptococcus (FS)	FS	FS	FS
	Laboratory use only	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N
	Biological Oxygen Demand	BOD	BOD	BOD
	Carbonaceous BOD	CBOD	CBOD	CBOD
	Laboratory use only	Received: Y N T: ____°C	Received: Y N T: ____°C	Received: Y N T: ____°C
Metals	Please indicate if sample is preserved and/or filtered	Pres ☐ | Filt ☐ Pres ☐	Pres ☐ | Filt ☐ Pres ☐	Pres ☐ | Filt ☐ Pres ☐
	ICP-MS(1): Cd, Cr, Cu, Co, Mn, Ni, Pb, Zn, Fe	Total | Dissolved	Total | Dissolved	Total | Dissolved
	ICP-MS(2): 25 element scan includes As (not included: B, Bi, Hg, Sn)	Total | Dissolved	Total | Dissolved	Total | Dissolved
	Individual Metals by ICP-MS (please circle each metal): Ag, Al, As, B, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Hg, Li, Mn, Mo, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn	Total | Dissolved	Total | Dissolved	Total | Dissolved
	Laboratory use only	TM rec'd: Y N | DM rec'd: Y N	TM rec'd: Y N | DM rec'd: Y N	TM rec'd: Y N | DM rec'd: Y N
	Hexane Extractable Material (O&G)	HEM	HEM	HEM
	Laboratory use only	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N
	BTEX, Purgeable HC (40mL x 2 vials)	BTEX | Purg HC	BTEX | Purg HC	BTEX | Purg HC
	Extractable HC (1L amber glass bottle)	Ext HC	Ext HC	Ext HC
	Trihalomethanes (40 mL x 2 vials)	THM	THM	THM
	Laboratory use only	Vial rec'd: Y N | Ext rec'd: Y N	Vial rec'd: Y N | Ext rec'd: Y N	Vial rec'd: Y N | Ext rec'd: Y N
	Other: *see special request form*			

For safety purposes, please disclose any contaminants (e.g. heavy metals, cyanide, etc.) that may be present at high levels and pose a risk to human health:

HOW TO FILL OUT THIS FORM

Company/Agency	The full, legal company name.
Address	Full street address including suite or unit number, if applicable. Final reports will be sent to this address.
City/Town	City or Town
Province/Territory	Province or Territory
Postal Code	Postal Code
Phone	Full telephone number, including area code and extension, if applicable
Fax	Facsimile number
E-mail	E-mail address, if available
Signature	Signature of the individual filling out the form
Client Project No	This information will appear on the final analytical report
Date Collected	Enter the date(s) that the samples were collected
Time Collected	Enter the time(s) the sample(s) were collected in military time or note if it is a.m or p.m
Sampler	The name of the individual who collected the sample
Location	The general location of where the samples were collected
Rush Required	Indicate if regular or Rush turnaround time is required. Check yes only if Rush is required, no if not.
Sample Type	Identify the sample matrix (freshwater, drinking water, soil, etc)
Client Sample ID	Identify each submitted sample. This identification will appear on the analytical report.
Test Column	Check off the tests you require for each sample submitted.

IMPORTANT INFORMATION

Turnaround time
Standard turnaround time is 10 business days. Please note that turnaround time delays may occur if the *Field Sheet* is incomplete or incorrectly filled out.

RUSH analysis
Rush turnaround time is 5 business days. All samples received at the lab are analyzed on a 'first come, first serve' basis unless otherwise specified as Rush. Rush samples will be place in the front of the line and analyzed prior to routine samples. A premium charge of 100% shall be charged for the analysis. Rush services depend on staff availability, analysis required, and capabilities of the lab. Please contact the lab prior to requesting this service.

Sample Receipt, Custody, and Storage
All submitted samples remain the sole property of the client and may be returned to the client for appropriate storage or disposal at the discretion of Taiga Environmental Laboratory.

All submitted samples will be stored for 30 days from the date the final report is printed. Arrangements can be made to hold the samples for an extended time at a nominal fee.

Sampling Supplies
Sample bottles, preservatives, labels, and forms are available at no cost when requesting services. To place a bottle order, please submit a *Bottle & or Preservative Order Form* a minimum of 48 hours in advance. Please note the shipment of Dangerous Goods may be delayed due to availability of qualified airline agents to process the paperwork.

Shipping Charges
All shipping costs are the responsibility of the client.

Confidentiality
All data and reports are considered confidential and the property of the client. No information shall be released to others without documented approval from the client.

Limit of Liability
Although every care and precaution is taken in the performance of our services, our liability for loss or damage in all circumstances is limited to re-analysis of the sample(s) at our expense or the cancellation of charges.

Taiga Environmental Laboratory reserves the right to refuse to proceed with an analysis if the lab does not have the capability and /or resources to meet analysis requirements, including facilities and equipment, scientific expertise, analytical capabilities, staff scheduling, Quality Assurance/Quality Control specifications, and report.

Parameter Group		Marking	Preservative	Instructions
●	Routine	GREEN	Keep Cool at 4°C	1. Rinse bottle three (3) times with sample. 2. Fill to top and cap bottle
●	Nutrients	BLACK	Keep Cool at 4°C	
●	Biochemical Oxygen Demand (BOD)/Carbonaceous BOD (CBOD)	PURPLE	Keep Cool at 4°C	1. Rinse bottle three (3) times with sample. 2. Fill to top and cap bottle. 3. Sample must be sent to the lab within 24 hours of collection.
▒	Microbiological	STERILE	Sodium Thiosulphate Keep Cool at 4°C	**1. DO NOT RINSE BOTTLE.** 2. Fill to top and cap. 3. Sample must be sent to the lab within 24 hours of collection.
●	Total Metals	RED	5mL of 1:3 nitric acid in Red-dot vial	1. Rinse bottle three (3) times with sample. 2. Fill to near the top. 3. Add contents of preservative vial. 4. Cap bottle and mix.
●	Dissolved Metals	RED	5mL of 1:3 nitric acid in Red-dot vial	**1. Filter sample with 0.45um Cellulose Acetate filter.** 2. Rinse bottle three (3) times with filtrate. 3. Fill to near the top. 4. Add contents of preservative vial. 5. Cap bottle and mix.
●	Hexane Extractable Material (HEM)	YELLOW	4mL of 1:3 sulphuric acid in Yellow Dot vial	**1. DO NOT RINSE BOTTLE.** 2. Fill to shoulder of bottle. 3. Add contents of preservative vial. 4. Cap bottle and mix.
▬	BTEX, THM & Purgeable Hydrocarbons	40 mL CLEAR GLASS W/WHITE LID	Keep Cool at 4°C	**1. DO NOT RINSE BOTTLE.** 2. Fill vials completely leaving NO air bubbles.
	Extractable Hydrocarbons	1L AMBER GLASS WITH WHITE LID	Keep Cool at 4°C	**1. DO NOT RINSE BOTTLE** 2. Fill to top and cap.
●	Cyanide, Total and WAD	BLUE	1mL of 6N sodium hydroxide solution	1. Rinse bottle three (3) times with sample. 2. Fill to near the top of container. 3. Add contents of preservative vial. 4. Cap bottle and mix.
●	Thiocyanate	ORANGE	2mL 25% sulphuric acid; or keep cool At 4°C	
●	Phenol	YELLOW with P	2mL of 20% sulphuric acid	

Taiga Environmental Laboratory
4601 52nd Avenue – Yellowknife, NT X1A 2R3
Phone: (867) 669-2788 Fax: (867) 669-2718 Email: taiga@inac-ainc.gc.ca

Water Sampling Instructions

Collecting the Sample

Step One: Prior to sampling, ensure you have obtained all the sampling equipment you require, such as the proper bottles, filtration devices, *etc.* Refer to Taiga's Field Sheet and Bottle &/or Preservation Order Form. If there are any questions or concerns, do not hesitate to contact the laboratory. Please have your water license (if applicable) available before contacting the laboratory to ensure proper bottles are ordered. **Note: you may need more than one bottle per sampling site.**

Step Two: Check your local departure flight schedule to Yellowknife for the day you plan to take your samples. Samples should be shipped to the Laboratory **as soon as possible** after collection. Time your sampling so that the samples can be shipped out by plane as soon as possible.

Step Three: Follow the sampling instructions on the back of this sheet for each bottle type. Package bottles in a cooler and send to the laboratory. If you require microbiological tests, such as Total Coliforms, E. coli., Fecal Coliforms, BOD, *etc*., please contact the laboratory with the collection date and time, the Airline name, the waybill number and the expected time of arrival.

Safety Issues: Wear appropriate gloves when collecting any sample to avoid contamination and possible exposure to unhealthy substances. The sample preservatives provided by the Laboratory are corrosive and will cause a burning sensation on the skin. If you should spill any on your skin or clothes, rinse the area **immediately** with lots of cool water. Call a doctor should the burning sensation continue.

Taiga Environmental Laboratory

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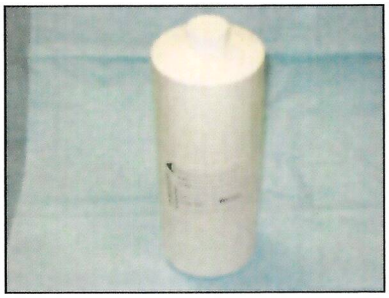
Water Sampling Instructions

Collecting the Sample

Parameter Group		Marking	Preservative	Instructions
	Routine	GREEN	Keep cool at 4°C	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle.
	Nutrients	BLACK	Keep cool at 4°C	
	Biochemical Oxygen Demand (BOD)/Carbonaceous BOD (CBOD)	PURPLE	Keep cool at 4°C	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle. 3. Sample must be sent to laboratory within 24 hours
	Microbiological	STERILE	Sodium thiosulphate and Keep cool at 4°C	1. **DO NOT RINSE BOTTLE** 2. Fill to top and cap bottle. 3. Sample must be sent to laboratory within 24 hours
	Total Metals	RED	5mL of 1:3 nitric acid in RED-dot vials	1. Rinse bottle three (3) times with sample 2. Fill to near the top. 3. Add contents of preservative vial 4. Cap bottle and mix.
	Dissolved Metals	RED	5mL of 1:3 nitric acid in RED-dot vials	1. **Filter Sample with 0.45 µm Cellulose Acetate filter** 2. Rinse bottle three (3) times with **filtrate** 3. Fill to near the top. 4. Add contents of preservative vial 5. Cap bottle and mix.
	Hexane Extractable Material (HEM) (also known as Oil and Grease)	YELLOW	4mL 1:1 sulphuric acid in YELLOW-dot vial	1. **DO NOT RINSE BOTTLE** 2. Fill to shoulder of bottle. 3. Add contents of preservative vial 4. Cap bottle and mix
	BTEX, THM & Purgeable Hydrocarbons	40 mL CLEAR GLASS W/ WHITE LID	Keep cool at 4°C	1. **DO NOT RINSE BOTTLE** 2. Fill bottle completely leaving **NO** air bubbles
	Extractable Hydrocarbons	1 L AMBER GLASS W/ WHITE LID	Keep cool at 4°C	1. **DO NOT RINSE BOTTLE** 2. Fill to top and cap bottle.
	Cyanide	BLUE	1mL of 6N sodium hydroxide	1. Rinse bottle three (3) times with sample 2. Fill to near the top. 3. Add contents of preservative vial 4. Cap bottle and mix.
	Thiocyanate	ORANGE	2ml of 25% sulphuric acid or keep cool at 4°C	
P	Phenol	YELLOW with P	2mL of 20% sulphuric acid	
S	Sulphide	ORANGE with S	2mL of 25% zinc acetate	
R	Radionuclide	No Markings	10mL of 17.5% nitric acid per 1L sample	
	Chlorophyll A	1L PLASTIC BOTTLE	Keep cool at 4°C and keep in dark	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle. 3. Sample must be sent to laboratory within 24 hours

Unit 12 – 1329 Niakwa Road
Winnipeg, Manitoba, R2J 3T4
Tel: (204) 255-9720
Fax: (204) 255-9721
Toll Free: 1-800-607-7555

Wastewater Sampling Guide



1. **BOD / CBOD (Biochemical Oxygen Demand), Solids and Nutrient Analysis (Chloride, Sulphate, Nitrates and Nitrites)**
   - Use the 1L plastic bottle.
   - Fill to 95% capacity
   - No preservatives required
   - Keep samples cool, and return to lab as soon as practical. Hold times range from 48 hours to 28 days (i.e., analysis should begin within 48 hours of sampling)

2. **Ammonia Analysis**
   - Use the 250 mL plastic bottle
   - Fill to 95% capacity
   - Add preservative found in plastic vial.
     CAUTION: Preservative is a strong acid (1 mL of 1:1 Sulphuric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Maximum hold time is 28 days.

3. **Metals Analysis (Total Metals)**
   - Use the 250 mL plastic bottle
   - Fill to near capacity
   - Add preservative found in the blue-taped plastic vial.
     CAUTION: Preservative is a strong acid (3 mL of 20% Nitric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Maximum hold time is 6 months.

4. **Fecal Coliforms**
   - This procedure is used for wastewaters and dirty surface waters
   - Use one 100 mL sterile plastic container. Bottles already contain a powder preservative (sodium thiosulphate).
   - Uncap bottle (inside of cap must not come into contact with any surfaces)
   - Fill bottle to the mark. Cap bottle tightly and invert to mix.
   - Keep cool and return to the laboratory as soon as possible
   - Maximum hold time is 48 hours (i.e., analysis should be started within 48 hours).

5. **Oil and Grease as Total Recoverable**
   - Use a one litre (1 L) glass amber bottle
   - Fill to greater than 95% capacity
   - Add preservative found in the yellow-taped plastic vial. **CAUTION:** Preservative is a strong acid (2 mL of 1:1 Hydrochloric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Keep cool, return to lab as soon as possible
   - Maximum hold time is 28 days.

6. **Colourmetric Phenols (Total Phenols)**
   - Use the 250 mL glass amber bottle
   - Fill to 90% capacity
   - Add preservative found in the orange-taped plastic vial. **CAUTION:** Preservative is a strong acid (1 mL of 1:1 Sulphuric acid). Add entire contents of the vial to the sample.
   - Cap bottle tightly and invert to mix.
   - Maximum hold time is 30 days.

7. **BTEX / Volatile Organic Compounds (benzene, ethylbenzene, toluene, xylenes, and fraction one (F1) / total volatile hydrocarbons)**
   - Use three 40 mL clear glass vials for each sample.
   - There is a white powder preservative (sodium bisulfite) in each of the vials.
   - Completely fill the sample vial. There should be no head space (i.e., no bubbles) at the top of the vial. This is best done by carefully overfilling the bottle, then capping it.
   - Invert the vial to verify no air space left in the vial
   - If air spaces (bubbles) are present, uncap the bottle and add more of the sample water. Recap and recheck to verify no air space.
   - Kepp samples cool and return to laboratory as soon as possible.
   - Maximum hold time is 5 days.

8. Total Extractable Hydrocarbons

- Use two 250 mL glass amber bottles for each sample. Bottles already contain preservative (sodium bisulfite)
- Fill to greater than 95% capacity
- Cap bottle tightly and invert to mix.
- Keep cool and return to the laboratory as soon as possible.
- Maximum hold time is 14 days.

9. Polycyclic Aromatic Hydrocarbons (PAHs)

- Use the 1 L glass amber bottle. Bottles already contain preservative (sodium bisulfite)
- Fill to greater than 95% capacity
- Cap bottle tightly and invert to mix.
- Keep cool and return to the laboratory as soon as possible.
- Maximum hold time is 14 days.

Kugaaruk Solid Waste Facility

APPENDIX - D

Sample parameters Test

Appendix D

Record of Sampling Data for Kugaaruk Solid Waste and Metals Dump facilities:
Reporting Year:
Estimated amount of solid waste deposited in the facility over the year (m3):

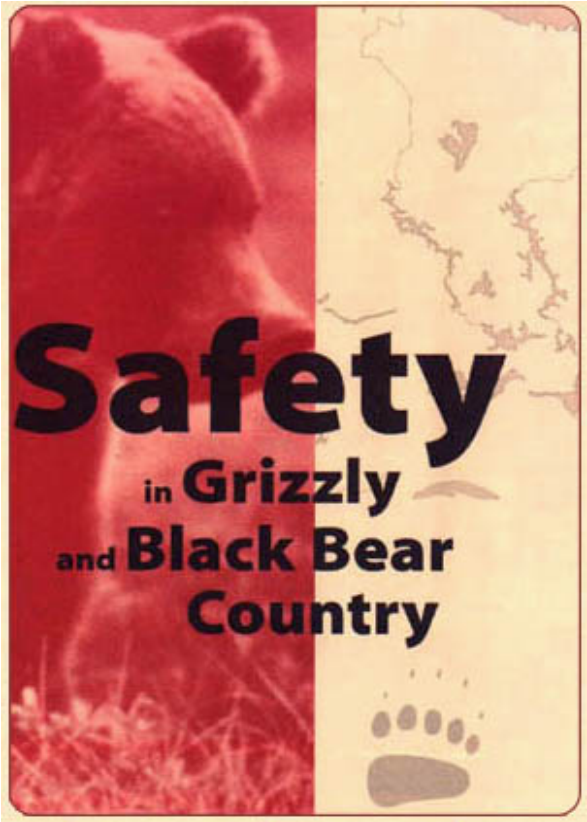
Parameters	units	PEL-6	PEL-7	PEL - 8.1	PEL- 8.2	PEL- 9.1	PEL-9.2	PEL-10
BOD	mg/L							
P^H	number							
TSS	mg/L							
Ammonia Nitrogen	mg/L							
Nitrate-Nitrite	mg/L							
Total Phenols	mg/L							
Total Hardness	mg/L							
Magnesium	mg/L							
Fecal Coliforms	CFU/100mL							
Conductivity	µS/cm							
Oil and Grease	visibility							
Total Alkalinity	mg/L							
Calcium	mg/L							
Potassium	mg/L							
Sodium	mg/L							
Total Arsenic	mg/L							
Total Copper	mg/L							
Total Iron	mg/L							
Total Mercury	mg/L							
Sulphate	mg/L							
Total Cadmium	mg/L							
Total Chromium	mg/L							
Total Lead	mg/L							
Total Nickel	mg/L							
TPH (Total Petroleum Hydrocarbons)	mg/L							
PAH (Polycyclic Aromatic Hydrocarbons)	mg/L							
BTEX (Benzene, Toluene, Ethlybenzene, Xylene)	mg/L							

Kugaaruk Solid Waste Facility

APPENDIX - E

Bear Safety

Safety in Grizzly and Black Bear Country



Residents and visitors to the Northwest Territories are very fortunate to be able to share the land with an abundance of wildlife in one of the most undisturbed natural settings in the country.

Bears, like all wildlife resources, are not only an important part of our northern ecosystems; they are also an essential part of the cultural and economic well-being of northern residents. For many people, seeing a bear is a highlight of their wilderness experience. However, as long as people and bears occupy the same land, there will be unplanned encounters.

This document contains basic precautions and safety tips to keep in mind while you are in bear country. Be aware that varying geographic conditions may limit the actions you are able to take.

The Nature of Bears

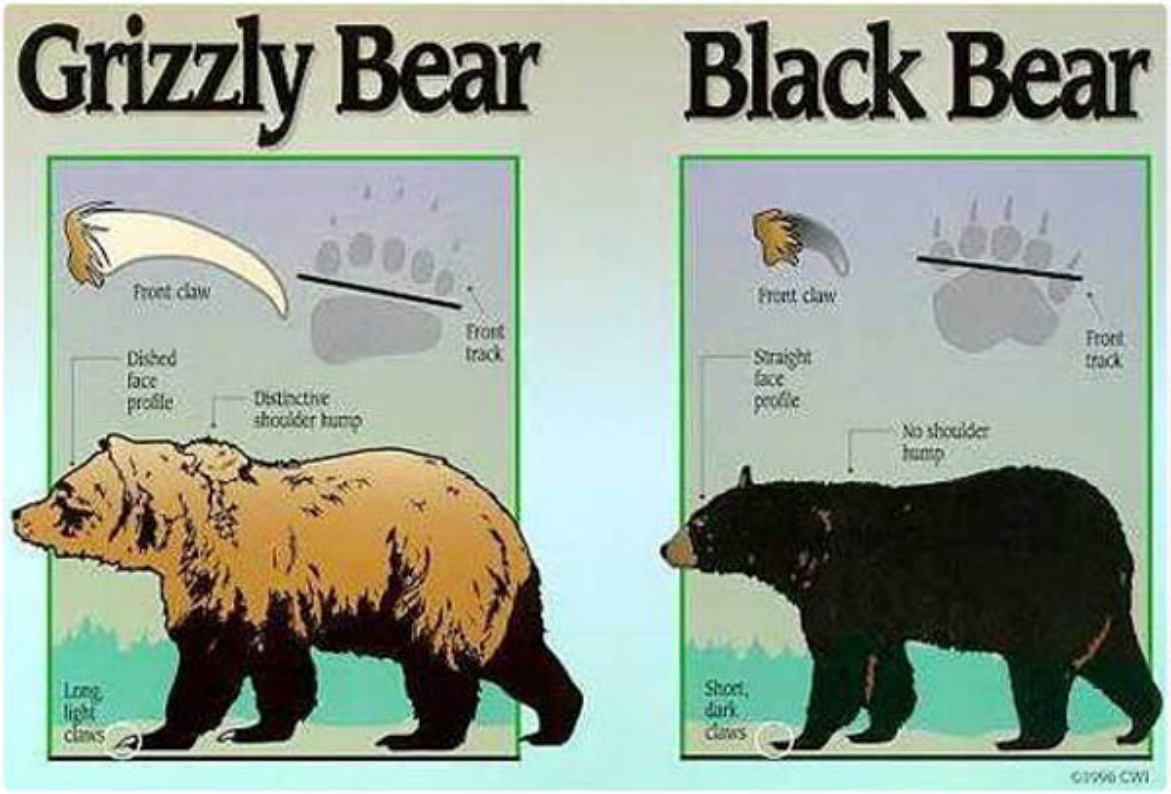
Description

Black bears are sometimes confused with grizzly bears because the two species may appear similar in size, and both vary in colour from black to brown, cinnamon or blond. The two species can be distinguished by several physical features.

Grizzlies have a stout, chunky build, a prominent shoulder hump, a massive head with an upturned muzzle or "dishface," and long claws (about 6-8 cm). Adult male grizzlies average 150-215 kg in the Mackenzie Mountains, but can weigh more than 300 kg in areas of the NWT where the growing season is longer and food supplies more abundant.

Black bears have a smaller, less robust build, flat or straight shoulders, a straight muzzle, and short, curved claws. Adult males average 100-150 kg, but can weigh more than 275 kg. In both species, females are smaller than males.

The typical lumbering gait and occasionally comic antics of bears are deceptive: they are capable of enormous feats of strength and they can run much faster than people can. Both species also swim well. Black bears and young grizzlies can climb trees, but adult grizzlies usually will not. All bears rely on their excellent sense of smell to find food and identify danger. They rely less on hearing and eyesight, although those senses are also well-developed.



Habits

Grizzly bears and black bears are both omnivorous. That is, they eat whatever is available. They rely mainly on vegetation, such as roots, grass and berries, but also eat fish, remains of dead animals, insects, small mammals such as ground squirrels, prey on moose, muskox and caribou.

Food availability influences the seasonal distribution of grizzly and black bears. Bears use different habitats at different times of the year to take advantage of abundant, energy-rich food supplies as they become available. In the mountains, for instance, grizzlies move to different elevations as new vegetation emerges. Grizzlies and black bears are generally dormant during the winter months. They usually enter dens in October or November, and emerge in April or May. However, a bear may leave its den early during warm winters or if it is disturbed. Up to four (but usually two) squirrel-size cubs are born in the den in midwinter.

Avoiding Problems

Problem Bears

Problems can occur whenever bears and people occupy the same area. You can encounter a bear by chance, or because the bear is attracted to your activity. Bears are curious, and often investigate a strange object, smell, or noise. They also have a tremendous and constant drive to find as much nutritious food as they can during their time out of the den. These two traits, coupled with a bear's remarkable sense of smell, often lead bears to areas of human activity. The outcome of a bear's visit to a camp or community will influence its future behavior. If it does not find food, it may not return once its curiosity has been satisfied. If it successfully obtains food from a human source - such as a garbage dump, backpack, or unclean camp - it begins to associate food with anything human, and investigate areas used by humans whether or not food is actually

detected. A bear will gradually lose its tendency to avoid people as it learns to associate them with food. It may become bold and aggressive.

Once started, the habits of problem bears are difficult to break. It is your responsibility as a visitor in bear country to ensure that your actions do not encourage those habits. It is unfortunate, but a problem bear is often destroyed.

General Conduct

Safety is everyone's responsibility - it is not a job that can be delegated to someone else and then forgotten about. The actions of each individual affect the safety of everyone else.

Remember these simple rules:

1. **Be alert at all times.**
2. **Respect all bears - they can be dangerous.**
3. **Never approach a bear for any reason.**
4. **Never feed bears or other wildlife.**
5. **Have a plan of action for dealing with bears and be sure everyone understands it.**

You can reduce your chances of encountering a bear by taking these precautions:

- Travel in groups and only during daylight hours.
- Tell someone where you are going and when you expect to return.
- Know the types of areas bears use at different times of the year. Avoid those areas or be very cautious when traveling through them.
- Be alert and aware of your surroundings. Think ahead and be prepared. In open terrain, use binoculars to look ahead for bears. If you see a bear at a distance, take action to avoid surprising it.
- Watch for bear signs such as: tracks; droppings which contain vegetation, berries, or hair; claw marks or stripped bark on trees; torn up stumps or rotten logs; and upturned earth.
- Never approach a fresh kill. Be cautious of loose piles of dirt, branches and vegetation. They may hide a carcass which a bear has cached, and the bear may be resting nearby to protect it.
- Carry food in airtight or bear-proof containers and avoid carrying foods with strong smells.
- Make noise where visibility is limited. Announcing your presence may help you avoid surprising a bear. You can sing, shout or talk loudly. Some people carry noisemakers such as bells or air horns. However, do not become overconfident - noise may be masked by sounds such as wind or water, or may go unnoticed by a bear that is busy eating.
- Avoid taking a pet dog. If you must take your dog, keep it on a leash at all times.
- Do not carry articles that have a strong artificial smell and avoid wearing scented cosmetics.
- Menstruating women should try to minimize odours through careful personal hygiene, use of internal sanitary protection and burning sanitary materials in a hot fire.
- Carry bear deterrents. A 12-gauge shotgun is recommended - it can fire some deterrents as well as slugs and buckshot (SSG).

Warning Systems

Surprise is a common factor in bear encounters, and can result in property damage, human injury and bear deaths. It is difficult to act calmly if you are awakened by a bear's growl. Such close encounters can be prevented by using a warning system which will sound an alarm when a bear enters camp.

Trip-wire Fence

A trip-wire system is ideal for small camps, and is especially useful for camps which must be frequently moved. It is lightweight, portable, inexpensive, easy to use, and effective. It consists of a fence of electrical wire around the camp perimeter, and an alarm system which wounds when the fence is broken. The wire may be strung through any convenient support, such as extra tent poles, gas cans, trees, or makeshift posts.

Dogs

A dog can be an effective means of preventing surprise encounters with bears, provided care is taken in choosing and handling the dog. Be sure to use dogs which are alert, experienced with bears, and known to bark at the sight or scent of bears. An inexperienced dog (which includes most pets) that does not warn of a bear's approach is a hazard. A dog should be tied up - a roaming dog may attract a bear and run back to your site with the bear in pursuit. A dog must be responsive to its master or handler at all times, even when excited.

There are some risks involved in using dogs. Even experienced dogs have been known to sleep through a bear's approach and awaken too late to give warning. Some dogs seem to attract or enrage some bears. Any dog used to detect bears risks being mauled.

Limitations

Keep in mind that warning systems are effective only if properly cared for, and any system can unexpectedly fail. You should never become unconcerned about bears or reduce efforts to prevent attracting them, even with a proven system in place. Also, remember that a warning system is not likely to chase away a bear. It will improve your safety only if you respond to every warning.

Deterrents

Every person who works or travels in bear country should have ready access to some means of deterring or chasing away a bear. However, do not let access to deterrents make you overconfident. No deterrent is completely effective against every bear in every situation. Carry a backup firearm just in case. Use deterrents with caution, as many are potentially dangerous.

Chemical Repellents

(Commonly referred to as "pepper spray.") Tests have shown these will stop a charging bear if sprayed into the bear's eyes, nose and mouth. Chemical repellents have limitations - short range, difficulty of accurate delivery if a person is excited, and their potential for abuse. Practice with the particular type you are using so that you are familiar with its characteristics.

Noise

Warning shots and noisemakers are commonly-used deterrents. However, they are not always effective. They scare some bears, but other bears ignore them. Noisemakers include: cracker shells (fired from a 12-gauge shotgun); Thunderflashes (hand-thrown); and air horns. Never fire a warning shot or cracker shell directly at a bear. Shoot in the air to the side of the animal. A wounded bear is very dangerous. Place cracker shells and Thunderflashes between you and the bear. An explosion behind the bear may scare it toward you. Bird-scaring/flare cartridges are fired from a flare pistol, and explode with a bright flash as well as loud noise. They are inexpensive, portable, and generally more reliable than other noisemakers.

Vehicles

Trucks, snowmobiles, ATV's, and helicopters have been used to chase away bears. Sometimes, starting and revving the engine is enough. Do not chase a bear with a vehicle for any reason other than personal protection, and do not overdo it. Allow the bear to maintain a steady trot. If the bear is stumbling or crashing through bushes, you are too close.

Electric Fences

If your camp will be located in one place for a period of time, consider setting up an electric fence. It can deliver a high-power jolt to any bear that touches it. Electric fences have been used effectively to keep black and grizzly bears out of garbage dumps, construction camps, outfitting and exploration camps.

An electric fence intended for protection against bears must meet certain construction specifications in order to be effective. It also requires regular and careful maintenance.

Rubber Bullets

These are fired from a 12-gauge shotgun. Renewable Resource Officers can provide information on where to obtain them and their proper use.

Firearms

It's advisable to have ready access to a firearm in camp, and to carry one when you travel in bear country. A 12-gauge shotgun, or a rifle of .30-06 caliber or comparable power, are suitable weapons for protection against bears. Rubber bullets or cracker shells should be fired before resorting to the use of rifled slugs or large buckshot (SSG). Remember, only shoot a bear as a last resort.

It is very important to be able to handle and shoot your weapon, and be able to use it under pressure. Practice regularly and know the rules of firearm safety.

If you lack skills or confidence, check with local wildlife or law enforcement agencies about the availability of firearms training courses.

Keep the gun or rifle clean and guard against condensation, which may cause rust, freeze the mechanism, or form an ice plug in the barrel. In low temperatures, avoid storing a firearm in a heated location. Keep it in a canvas (not vinyl) case in an unheated porch or within easy reach outside a building or tent. Make sure everyone knows where it is and when and how to use it.

Firearm Safety

Each year, there are firearm accidents in the Northwest Territories as a result of ignorance, carelessness, or both. **TREAT ALL FIREARMS WITH RESPECT!**
All firearms can be deadly when handled carelessly.

REMEMBER THE TEN COMMANDMENTS OF FIREARM SAFETY:

1. Treat every firearm as though it is loaded.
2. Always control the muzzle of your firearm.
3. Be sure of your target and beyond.
4. Never shoot at a hard surface, including water.
5. Never point a firearm at anything you don't want to shoot.
6. Never climb, run or jump with a loaded firearm.
7. Lock up firearms and ammunition separately.
8. Be sure the barrel is clear of obstructions.
9. Unload firearms when not in use.
10. Avoid alcohol before and during a hunt.

Encountering a Bear

The Bear's Behavior

A bear's reaction to you will be influenced by many factors, and is therefore never entirely predictable. Given the opportunity, bears usually avoid people. Some bears are more dangerous or aggressive than others. Old or wounded bears may be in pain or starving. They may aggressively seek food from people if they are unable to obtain enough on their own. Any bear that has become accustomed to people and shows no fear of them is dangerous.

Every bear defends a critical space. The size of the space varies with each bear and each situation: it may be a few metres or a hundred metres. Intrusion into this space is considered a threat and may provoke an attack. All female bears aggressively defend their cubs. If a female with cubs is surprised at close range, or separated from her cubs she is likely to charge.

Bears also aggressively defend their food, and are often reluctant to leave it until it is all eaten.
In some cases, a bear that is threatened may engage in displays intended to scare away an opponent. These may include huffing, panting, hissing or growling; looking directly at you, sometimes with lowered head or ears laid back; slapping one or both feet on the ground; jawpopping; or charging to within several metres, then stopping suddenly or veering to the side. Threat displays may be followed by an attack, but may end with the bear walking or running away.

A bear standing on its hind legs is probably trying to pick up your scent and figure out what you are. It may sniff the air or swing its head from side to side. Bears do not charge on their hind legs.

Most grizzlies avoid contact with humans if possible. However, there is good reason for their reputation for ferocity. If cornered, threatened, or surprised, the grizzly can be very aggressive, and will usually stand its ground or charge.

Black bears are often less aggressive and flee from danger. However, because they are more curious and adaptable than grizzlies, they quickly become accustomed to human activity, and may develop aggressive food-seeking habits which make them dangerous. Therefore, treat all black bears with caution. In a very few cases, a bear has stalked a person that it apparently considered potential prey. Although such incidents are rare, you should know the difference between the behavior of a hunting bear, and the behavior of a threatened bear.

A hunting bear does not bother with displays and shows no signs of annoyance or fear. It may approach you directly at a fast walk or turn, follow you, or circle carefully, making cautious approaches.

Your Behavior

The thought of facing a bear can be frightening. However, bears rarely attack a person on sight, and only a very small percentage of charges result in serious injury or death. You are more likely to be injured in a car accident than by a bear.

There is always a possibility you may surprise a bear at close range, or encounter a problem bear which is not afraid of people. There is no guaranteed formula for reacting to a bear encounter because every encounter is unique. There are, however, guidelines which may help. Most are based on good judgment, common sense, and familiarity with bear behavior.

Guidelines when Encountering a Bear

- Stop, stand still, and stay calm.
- If the bear is aware of you, help it identify you as a person. It may leave. Staying upwind will help it to smell you. Talk in low tones and slowly wave your arms.
- Do not run from a bear unless you are sure you can reach a safe place before the bear catches up. Running may cause the bear to chase you, and a bear is faster than you are.
- Always leave a bear an open avenue of escape.
- If you see a bear at a distance, alert the bear to your presence. Quietly walk back the way you came or make a wide detour around the bear. Do not come between a bear and its cubs.
- If time, distance and circumstances permit, try to scare the bear away by firing warning shots, flare cartridges or noisemakers.
- In a close encounter, stand still and assess the situation. Do not shout or make sudden movements which might provoke the bear, and avoid direct eye contact. At 50 metres, even if the bear is displaying threat behavior, there is probably still time for you to avoid an encounter.
- Back away slowly. Only leave behind an article of clothing or gear if the bear is still trying to identify you. This will not work if the bear is following you. Leave food or an article of clothing only as a last resort.
- Climb a tree if one is available. You will have to climb higher than four metres - grizzlies can reach that high. Remember that black bears can also climb trees.
- If the bear is very close (30 metres), it is usually best to stand your ground. Be prepared to shoot if you are carrying a firearm.

If a Bear Charges

A bear charges at high speed on all four legs. Many charges are bluffs. Bears often stop or veer to the side at the last minute. However, if contact appears unavoidable, you have three options: shoot to kill if you have a gun; play dead if you are attacked by a grizzly; or fight back if attacked by a black bear.

Shooting a Bear

The right moment to squeeze the trigger depends on your nerve, experience with a firearm, and how fast the bear is approaching. The decision can be made only by the person facing the bear, and must be made quickly.

An accurate shot fired at close range has a greater chance of killing a bear than one fired from farther away. The first shot is the most important. If you must kill a bear, aim for the shoulder if the bear is broadside, or the back of the neck between the shoulders if the bear is facing you. Avoid head shots - they often do not kill a bear. Do not stop to check the results of your shot. Keep firing until the bear is still. Try to kill the bear cleanly and quickly - a wounded bear is very dangerous.

Playing Dead

Playing dead may prevent serious injury if you are attacked by a grizzly bear. Do not play dead during a black bear attack or if a grizzly bear is treating you as prey. Playing dead will help protect your vital areas, and the bear may leave if you appear harmless. There are two recommended positions:

lie on your side, curled into a ball, legs drawn tightly to your chest, hands clasped behind your neck;

lie flat on the ground, face down, fingers intertwined behind your neck.

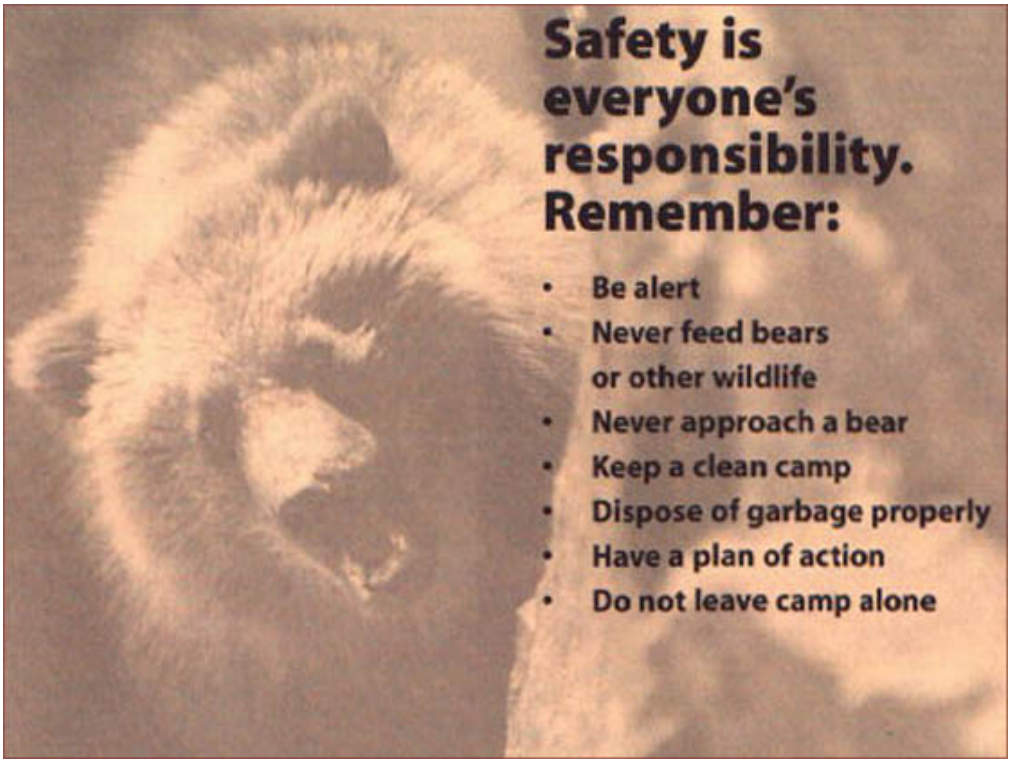
Stay in these positions even if moved. Do not resist or struggle - it may intensify the attack. Look around cautiously, and be sure the bear is gone before moving.

Fighting Back

If a black bear attacks you or a grizzly bear shows signs that it considers you prey, and you do not have a firearm, do not play dead. Act aggressively. Defend yourself with whatever means are available. You want to appear dominant and frighten the bear. Jump up and down, shout, and wave your arms. It may help to raise your jacket or pack to make you look bigger.

The Law

If you kill a bear in self-defense, you must report the kill to the nearest Renewable Resource Officer as soon as possible. In most cases, an Officer will come to the site and take possession of the bear. If an Officer is not immediately available, you should skin the bear, leaving the claws attached. Preserve the hide by salting it and storing it in a cool dry place, or freezing it. It is an offence to allow the hide to spoil. The hide becomes the property of the government and must be turned in, along with the skull (or lower jaw), to a Renewable Resource Officer at the first opportunity. Proof of sex should be turned in, especially for grizzly bears. You may not keep any part of a bear killed in self-defense.



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