Baffinland Iron Mines Corporation

WASTE MANAGEMENT PLAN

BAF-PH1-830-P16-0028

Rev 2

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DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
04/2013	0	A.G	S.P	Approved for Use (Updated to Support 2014 Work Program)
09/2013	1	C.G	S.P	Approved for Use (Updated for Type A Water Licence)
03/25/2014	2	NK	JB/JM	Issued for Use (Updated to Support 2013 Work Program)

A review and update of the Waste Management Plan for Operation, Construction and Closure has been undertaken, with the following salient revisions to the September 2013 version.

Index of Major Changes/Modifications in Revision 2, February 2014:

Item No.	Description of Change	Relevant Section
1	Updated introduction section to consider the 2014 Work Plan	Section 1.1
2	Updated to remove discussion of Steensby and Rail Project infrastructure to Appendix J	Section 1.2
3	Updated water licence conditions to align with conditions outlined in Type 'A' Water Licence (2AM-MRY1325)	Section 1.4
4	Added table describing waste handling and disposal by waste type	Section 4.2
5	Update of waste generation estimate tables	Section 4.2
6	Addition of used oil re-use section	Section 4.4.3
7	Update of incinerator allocation	Section 4.5
8	Addition of oily water section	Section 4.9
9	Addition of open burning section	Section4.10
10	Updated roles and responsibility section (including organizational chart)	Section 5
11	Added open burning monitoring section	Section 7.1.5
12	Removal of Block Flow Diagrams pertaining to Steensby and Rail Project	Appendix A
13	Removal of Drawings and Layouts pertaining to Steensby and Rail Project	Appendix B
14	Incorporation of updated ECO 2TN Mobile Incinerator O&M Manual	Appendix C
15	Inclusion of 2014 Work Plan	Appendix G
16	Update of concordance table references to reflect revision changes	Appendix H
17	Addition of Open Burning of Untreated Wood, Cardboard and Paper Products Procedure	Appendix I
18	Addition of Steensby and Rail Project Information	Appendix J
19	Addition of Drawings and Layouts pertaining to Steensby and Rail Project	Appendix K
20	Addition of examples of 'typical' used oil heaters and boilers	Appendix L

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Abbreviations

Baffinland:	Baffinland Iron Mines Corporation
CCME:	Canadian Council of Ministers of the Environment
EHS:	Environmental, Health and Safety
EIS:	Environmental impact statement
EPCM:	Engineering, Procurement, and Construction Management
EPP:	Environmental Protection Plan
ERCB:	Energy Resources Conservation Board
GN:	Government of Nunavut
HSE:	Health, Safety and Environment
IIBA:	Inuit Impacts Benefits Agreement
the Project:	Mary River Project
NIRB:	Nunavut Impact Review Board
NWB:	Nunavut Water Board
NU:	Nunavut
NWT:	Northwest Territories
QIA:	Qikiqtani Inuit Association
TDG:	Transportation of Dangerous Goods
VEC:	Valued Ecosystem Components
WMP:	Waste Management Plan

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1 INTRODUCTION

Baffinland Iron Mines Corporation is committed to taking the necessary steps to ensure that the collection, handling, storage, transportation and disposal of wastes generated during the construction, operation and closure of the Mary River Project (the Project) is conducted in a safe, efficient and environmentally compliant manner. The preparation of the Waste Management Plan (WMP) for the construction, operation and closure phase of the Project helps to achieve this goal. The WMP establishes the roles and responsibilities of employees, contractors and other site personnel as well as protocols for handling, storing and disposing of all solid wastes generated at the Project site. The intent is to afford a high degree of control over the waste generation while minimizing the adverse environmental effects associated with waste generation.

The basis of a sound waste management program lies in the three R's: reduction, recovery, reuse and recycling of wastes. The main objectives of this WMP are to:

- Create a framework for the proper handling and disposal of wastes.
- Minimize the potential for adverse impacts on the environment.
- Achieve compliance with waste management regulatory requirements.

Waste generation follows the "Cradle to Grave" principle. It is the primary responsibility of all personnel to implement the plan as outlined, in accordance with their contractual and legal obligations, under the supervision of the Operations Manager and Site Services Manager, as assisted by the Environmental Manager and his/her team.

This plan will be reviewed on an annual basis and updated as necessary to accommodate any identified gaps or opportunities to improve. 2014 Work Plan Update

A 2014 Work Plan was submitted to the Nunavut Water Board and other agencies on October 31, 2013 (see Appendix G). Works and activities proposed have been screened by the NIRB, unless noted otherwise, and have been considered in the Project Certificate No. 005 issued by the NIRB on December 28, 2012. The general scope for the 2014 Work Plan includes:

- The development and construction of infrastructure required for site capture at Milne Port and the Mine Site for the launching of the 18 MT Mary River Project.
- Ongoing environmental baseline data collection and geotechnical drilling to support the development of the 18 MT Project. These activities will resume at the Milne Port site, along the Tote Road, at the Mine Site, at numerous quarry sites and at other Project development areas.

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In order to support these activities, Baffinland will have to perform waste management activities and operate waste management infrastructure as described within this Plan. The current Type A Water Licence (2AM-MRY1325) and Type B Water Licence (2BB-MRY1114) authorize Baffinland to perform and operate said activities and infrastructure, respectively, in accordance with the Nunavut Water Board conditions as described in the respective licences.

The Waste Management Plan is an update to the existing plan and supercedes the H349000-1000-07-126-0008, Revision 1, dated September 2013. The waste management infrastructure at Milne Port and Mine Site project sites will continue to be used as approved and designed. For 2014, this plan will be applied as appropriate to all project sites applicable under the existing Type B and Type "A" Water Licences including Milne Port, the Mary River Mine Site, and any authorized exploration camps (e.g., Steensby Inlet camp).

It is noted that the proposed Early Revenue Phase (ERP) is currently under regulatory review, and that any changes to activities not already considered in the document revision, herein, will be considered and captured in subsequent revisions, assuming that approval of the Baffinland ERP is granted.

1.1 PURPOSE

A key aim of the Waste Management Plan is to implement a sound waste minimization program that will focus upon the principles of Reduction/Recovery/Reuse/Recycling. The residual waste generated by the Project activities will then be disposed of in a landfill/landfarm (or other authorized location,), incinerated, or shipped off site to southern Canada for final disposal, treatment, or recycling.

This Waste Management Plan deals with wastes generated by the Mary River Project including, among others, inert and non-hazardous solid wastes, i.e., solids, semi-solid and sludge, construction debris, domestic waste etc. The management of sewage effluent and sludge from the sewage treatment plants is the subject of the Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010). The management of hazardous wastes (used oils, contaminated fuel, and antifreeze, used chemical products, biomedical waste and spills clean-up materials) is the subject of the Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

The Waste Management Plan presents the various disposal methods, the types and expected quantities of waste produced and the ultimate disposal of the waste stream. The Plan also defines the roles and responsibilities, specific requirements, and monitoring controls for managing solid wastes generated by the Project. It also presents the strategy for adaptive management and continuous improvement.

In order to handle, storage, transport and treat/dispose the wastes generated during the construction, operation and closure phases of the Project, several treatment or disposal facilities must be built on site to ensure that the waste management activities are being conducted in a safe, efficient and environmentally -compliant manner. The infrastructure deemed necessary to manage the wastes appropriately are:

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- Long term waste management facilities at the Mine Site.
- Long term landfill and landfarm at the Mine Site.
- Long term landfarm, incinerator, hazardous/medical waste storage facility and waste oil treatment/recovery facility at Milne Port.

All Project activities are regulated and will be performed according to the law and regulations applicable to the Project and procedures developed.

The Waste Management Plan (WMP) presented in this document establishes a management strategy for all the wastes generated during the construction, operation, closure and reclamation of the Project.

1.2 DEFINITIONS

Project: The necessary tasks and work executed during the lifespan of the Project at the Project Site, including the construction, operation, closure and reclamation phases, of the Project.

Site: The areas occupied by the Project facilities (permanent or temporary) during the construction, operation, closure and reclamation phases of the Project.

Contractor: A person or business which provides goods, material, equipment, personnel, and/or services to Baffinland Iron Mines Corporation under terms specified in a contract.

Waste: The residual waste material (hazardous, non-hazardous or Putrescible) generated during the construction, operation, closure and reclamation phases of the Project.

Hazardous Waste: The wastes generated during the lifespan of the Project that present a threat to the human health or the environment because they exhibit one or more of the following characteristics: corrosive, reactive, explosive, toxic, inflammable, or biologically infectious.

Non-Hazardous Waste: The wastes generated during the lifespan of the Project that do not present a threat to human health or the environment.

Putrescible Wastes: The wastes generated during the lifespan of the Project that degrade very rapidly, i.e., plants, food scraps or animal remains.

Incinerator Wastes: Waste identified as suitable for incineration based on incineration technology used on-site, applicable regulations and project approvals. Includes: food waste, domestic waste, packaging waste, wood waste, absorbents, and some types of filters (e.g., air filters)

Clean Wood Products: Clean untreated wood waste including wood or timber, not suitable for recycling or reuse, which is substantially free of glue, petroleum based materials, other chemicals, or contains other non-wood chemical products.

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1.3 REGULATORY REQUIREMENTS

A number of Acts and Regulations provide specific requirements for the management of the different types of waste generated at the Mary River Project. They are the:

- Territorial Lands Act 1985
- Territorial Land Use Regulations
- Nunavut Waters and Nunavut Surface Rights Tribunal Act 2002
- Canadian Environmental Protection Act
- Transportation of Dangerous Goods Act and Regulations
- Safety Act, Occupational Health and Safety Regulations
- Work Site Hazardous Materials Information Systems Regulations
- Export and Import of Hazardous Waste Regulations
- Spill Contingency Planning and Reporting Regulations
- National Fire Code
- Public Health Act
- Explosives Act
- Fisheries Act
- Metal Mining Effluent Regulations
- Petroleum Refining Liquid Effluent Regulation.

Due to the complexities and the number of acts and regulations involved, the Government of Nunavut has published a number of Guidelines to assist waste generators to effectively develop waste management plans for their specific sites. These guidelines are listed as references in Section 10.

The Project is subject to Environmental Terms and Conditions in Baffinland's Commercial Lease with the QIA (Q13C301), a Type 'A' Water Licence as well a Type 'B' Water Licence. Conditions regarding aspects of waste management as outlined in this Plan specified by the Commercial Lease Environmental Terms and Conditions (Schedule F) include:

- The Tenant shall remove all Drill Waste containing poisonous or persistent chemical additives to an approved disposal facility.
- The Tenant shall deposit all non-toxic Drill Waste into a sump or natural depression.
- The Tenant shall not allow any Drill Waste to spread to the surrounding lands or watercourses.

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- The Tenant shall dispose of all combustible waste petroleum products by incineration or removal.
- The Tenant shall dispose of all toxic or persistent substances in a manner as approved in writing by the Landlord.
- The Tenant shall report spills immediately to the Landlord.
- The Tenant shall use food handling and garbage disposal procedures that do not attract wildlife.
- The Tenant shall not feed wildlife.
- The Tenant shall remove all garbage and debris, including plastics, from the land use area to a disposal site as specified in the accepted application.
- The Tenant shall keep all on-site garbage and debris in a secure container that is acceptable to an Inspector until disposed of.

Conditions regarding aspects of waste management as outlined in this Plan specified by the water licence(s) include:

- The Licencee shall prevent any chemicals, fuel or wastes associated with the undertaking from entering any Water body.
- The Licencee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.
- The Licencee shall test the bottom ash generated by all Incinerator Systems, by using the acceptable test procedures for analyzing residuals, prior to being disposed of at any Landfill Facility. If the composition of the ash makes it unsuitable for disposal at the Landfill facilities, the Licencee shall direct the Waste to an appropriate facility for disposal. The records of analysis results and volumes of ash shall be maintained and provided to an Inspector upon request.
- The Licencee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood, to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.
- The Licencee shall submit to the Board and the Inspector, thirty (30) days prior to the removal and transfer of waste, a declaration of authorization from any community receiving waste from the project, which clearly states that authorization has been granted for the deposit by the Licencee at the Hamlet's appropriately licenced facilities.

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- The Licencee shall provide at least ten (10) days' notice to the Inspector prior to planned Discharges from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project. The notice shall include the estimated volume proposed for Discharge and the location and description of the receiving environment.
- The Licencee shall remove any waste generated from temporary and permanent shelters along the tote road and along the railway corridor for treatment at appropriately licenced Waste Management Facilities.
- The Licencee shall maintain records of all Waste backhauled from the Mary River Project and confirmation of proper disposal through the use of Waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records shall be made available upon request, to an Inspector or the Board.

1.4 RELATIONSHIP TO OTHER MANAGEMENT PLANS

This plan is based on the concepts and principles found in the EHS Management System Framework Standard (BAF-PH1-830-STD-0001) and Hazard Identification and Risk Assessment Standard (BAF-PH1-830-PRO-0001). The Plan should be reviewed in concert with the following related plans that have been prepared for the FEIS and in some cases, updated in early 2014:

- Environmental Protection Plan (BAF-PH1-830-P16-0008).
- Surface Water, Aquatic Ecosystems, Fish and Fish Habitat Management Plan (BAF-PH1-830-P16-0026).
- Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010).
- Interim Mine Closure and Reclamation Plan (BAF-PH1-830-P16-0012).
- 2013 Abandonment and Reclamation Plan for Advanced Exploration.
- 2014 Work Plan Marginal Closure Cost Summary.
- Air Quality and Noise Abatement Management Plan (BAF-PH1-830-P16-0002).
- Emergency Response and Spill Protection Plan (BAF-PH1-830-P16-0007).
- Explosives Management Plan (BAF-PH1-830-P16-0009).
- Terrestrial Environmental Management and Monitoring Plan (BAF-PH1-830-P16-0027).
- Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

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1.5 BAFFINLAND'S COMMITMENTS

Baffinland provides adequate resources to implement and maintain the EHS Management System including the necessary human, material and financial resources. Baffinland's Health Safety and Environment (HSE) Policy and Sustainability Policy are presented in Section 2.

1.6 UPDATE OF THIS MANAGEMENT PLAN

The Waste Management Plan is a "living document". It will be regularly updated on the basis of management reviews (as outlined in Section 8), incident investigations, regulatory changes or other Project related changes.

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2 BAFFINLAND POLICY

2.1 HEALTH SAFETY AND ENVIRONMENT (HSE) POLICY

Baffinland
Iron Mines Corporation

Mary River Project
Health, Safety and Environment Policy

The Baffinland Iron Mines Corporation (BIMC) Mary River Project Health, Safety and Environment Policy is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goal.

The Mary River Project implements this Policy through the following commitments:

- Continual improvement of safety, occupational health and environmental performance.
- Meeting or exceeding the requirements of regulations and company policies.
- Integrating sustainable development principles into our decision-making processes.
- Maintaining an effective Health, Safety and Environment Management System.
- Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts.
- Engaging stakeholders through open and transparent communication.
- Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
- Rehabilitation of disturbed lands to a safe, acceptable, and localized state.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution is essential and required.
- Management is responsible for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The Mary River Project has no higher priority than the health and safety of all people working on our behalf and the responsible management of the environment. In ensuring our overall profitability and business success every Baffinland and business partner employee working at one of our work sites is required to adhere to this policy.

Tom Peddon
President and Chief Executive Officer
March 2013

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2.2 BAFFINLAND SUSTAINABLE DEVELOPMENT POLICY

At Baffinland Iron Mines Corporation, we are committed to conducting all aspects of our business in accordance with the principles of sustainable corporate responsibility and always with the needs of future generations in mind. Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and to create authentic relationships. We expect each and every employee, contractor, and visitor to demonstrate a personal commitment to this policy through their actions. We will communicate the Sustainable Corporate Policy to the public, all employees and contractors and it will be reviewed and revised as necessary on an annual basis.

These four pillars form the foundation of our corporate responsibility strategy:

Health and Safety
Environment
Investing in our Communities and People
Transparent Governance

1.0 HEALTH AND SAFETY

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness from the very earliest of planning stages. Why? Because our people are our greatest asset. Nothing is as important as their health and safety.
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents.
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour and awareness. We allow our workers and contractors the right to stop any work if and when they see something that is not safe.

2.0 ENVIRONMENT

- We employ a balance of the best scientific and traditional Inuit knowledge to safeguard the environment.
- We apply the principles of pollution prevention and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation.
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop pioneering new processes and more sustainable practices.
- We understand the importance of closure planning. We ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts.

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3.0 INVESTING IN OUR COMMUNITIES AND PEOPLE

- We respect human rights and the dignity of others. We honour and respect the unique culture, values and traditions of the Inuit people.
- We contribute to the social, cultural and economic development of sustainable communities adjacent to our operations.
- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions.

4.0 TRANSPARENT GOVERNANCE

- We will take steps to understand, evaluate and manage risks on a continuing basis, including those that impact the environment, employees, contractors, local communities, customers and shareholders.
- We ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We measure and review performance with respect to our environmental, safety, health, socio-economic commitments and set annual targets and objectives.
- We conduct all activities in compliance with the highest applicable legal requirements and internal standards

We strive to employ our shareholder's capital effectively and efficiently. We demonstrate honesty and integrity by applying the highest standards of ethical conduct.

Tom Paddon

President and Chief Executive Officer

September 2011

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3 TARGETED VEC'S

Waste will be generated throughout the life cycle of the project. To ensure that wastes are handled, stored and managed in a safe and environmentally acceptable manner, Baffinland will apply best practices for its waste management activities.

Inadequate handling, storage and elimination of waste could impact the following valued ecosystem components (VECs):

- Soils (spills and contamination).
- Water quality (contamination of runoff).
- Fish and fish habitat.
- Permafrost.
- Vegetation (uptake of contaminants or loss of vegetation).
- Birds (exposure and ingestion of contaminants).
- Terrestrial wildlife (exposure and ingestion of contaminants).
- Human health (exposure and ingestion of contaminants).

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4 WASTE MANAGEMENT APPROACH

The aim of the Waste Management Plan is to implement a sound waste minimization program that will focus upon the principles outlined in EHS Management System Framework Standard (BAF-PH1-830-STD-0001). The remaining waste will then be disposed of in a non-hazardous landfill, incinerated or shipped off-site for final disposal/treatment or recycling or disposed of by other approved and permitted means.

4.1 WASTE IDENTIFICATION

A summary of the types of waste expected to be generated by the Project, and disposal method, are presented below. For most of long the term infrastructure, the facilities used during the construction phase will be the same ones used during the operations phase.

TABLE 4-1 and TABLE 4-2 presents an overview of the types of waste generated by the Mary River Project and the general disposal method for each type of waste.

TABLE 4-3, TABLE 4-4, and TABLE 4-5, presents the expected quantities of waste generated for the construction and operation phases, respectively.

4.2 WASTE MANAGEMENT METHODS

Wastes remaining after application of the waste minimization techniques will be managed in a practical and environmentally responsible manner utilizing methods appropriate for each waste type generated. The following methods will be applied at the site:

- Waste sorting at all generation points (see Appendix F).
- Incineration of non-hazardous combustible wastes (see Appendix C).
- Open burning in a burn pit or burn box of untreated wood and cardboard (see Appendix I).
- Land filling of inert non-combustible wastes (see Appendix D).
- Temporary storage and off-site shipping of hazardous and recyclable waste materials (see Hazardous Materials and Hazardous Waste Management Plan, BAF-PH1-830-P16-0011).
- On-site treatment for contaminated soil and oily water from hydrocarbon spills in a landfarm (see Appendix E).

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TABLE 4-1: DISPOSAL BY GENERATION LOCATION

Source	Waste Description	Waste Type	General Disposal Method
Offices	Computers and other electronic wastes, fluorescent lights	Recycle	Off-site recycling or disposal
	Waste paper	Combustible/ non-hazardous	Incineration
Wastewater treatment facility	Biological sludge (dried solids)	Combustible/ non-hazardous	Incineration/Landfilling
Maintenance complex	Used batteries, waste hydrocarbon products, engine oil, oil filters, glycols, aerosol cans, refrigerants, solvents, etc.	Hazardous	Off-site recycling or disposal, possible reuse of fuel and oil for heating and other uses.
	Scrap metal, tires, rubber, plastic	Inert	Inert landfill
Laboratory	Chemical laboratory wastes, toxic substances	Hazardous	Off-site recycling or disposal
Domestic waste from construction camp, accommodation facility and kitchens/canteens	Accommodation facility garbage, food wastes	Combustible/ non-hazardous	Incineration
Inert waste from construction sites and materials from operations	Treated wood, plastics, cement, sand, used construction materials, metal, pipes, glass, insulation, etc.	Inert	Landfill
	Untreated wood/cardboard	Combustible/ non-hazardous	Incineration/open burning
Medical facility	Biomedical wastes	Hazardous	Biomedical off-site disposal
Incinerator	Ash (placed in closed drums)	Inert	Inert Landfill (if non-hazardous)
Fuel spill	Hydrocarbon-contaminated soil	-	On-site treatment using landfarm facility
Fuel spill	Hydrocarbon-contaminated snow/water/ice	-	On-site treatment and reuse of product if practical

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TABLE 4-2: WASTE HANDLING AND DISPOSAL BY WASTE TYPE

Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Absorbents – and other similar spill response material	Petroleum	Hazardous if used for a spill clean-up. Not TDG regulated.	Collect in white Quatrex bags. Store full bags in the waste berm at MR and MI until final disposal.	Offsite disposal
Activated Carbon	Petroleum	Hazardous. Not TDG regulated	Collect in white Quatrex bags. Store in the waste berm at MR and MI until final disposal.	Offsite disposal
Aerosol Cans	HHW	Hazardous. TDG regulated as "Aerosol, Flammable, Class 2.1, UN 1950"	Disposal bins located at various locations inside the main facilities, and at the waste sorting areas. Store full drums in the waste berm in open top drums.	Offsite disposal
Appliances	Inert/ Chemical	May be hazardous.	Appliances may contain ozone depleting substances (refrigerator) or electronic boards. Manage accordingly. Store in contained location until approval by environment office to dispose in landfill.	Landfill
Batteries, wet (lead - acid)	Chemical	Hazardous. TDG regulated as "Batteries, wet, filled with acid, class 8, UN 2794"	Collect in black Quatrex bags in the Waste Sorting Area. Store full bags in the waste berm at MR and MI until final disposal.	Offsite disposal
Batteries, rechargeable (NiCad, Mercury, Lithium, Silver-Oxide)	HHW	Hazardous. Small household-type batteries are generally not TDG regulated.	Disposal bins (same as for alkaline batteries) are located at various locations inside the main facilities. Segregate per type and transfer to different 20L pails. Transfer to 20L pail, then in open top drums. Store in the waste berm. Computer batteries should be brought to the Environment Office.	Offsite disposal
Batteries, dry (alkaline)	HHW	Hazardous. Not TDG regulated.	Disposal bins (same as for rechargeable batteries) are located at various locations inside the main facilities. Transfer to 20L pail, then in open top drums. Store in the waste berm.	Offsite disposal
Biomedical Waste – Sharps, human anatomical, blood, and body fluids	Biomedical	Biomedical hazard.	Contain and store in suitable biohazard container at the medical office until disposal.	Offsite disposal
Calcium Chloride	Chemical	Hazardous. Not TDG regulated.	Collect and store in white Quatrex bags.	Offsite disposal or use as dust suppressant on roads (as authorized)
Cardboard	Inert	Non-hazardous	Suitable for open-burning or disposal in the landfill. Store accordingly in adequate container before final disposal. Incinerate if in contact with food.	Open-burning/ Landfill

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Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Cement	Inert	Non-hazardous, inert waste.	Not generated at the moment. If crushed, cement may be useful as a landfill cover.	Landfill
Chemicals – spent lab reagents	Chemical	Hazardous. Shipping TDG instructions should follow MSDS recommendations.	Management method should follow MSDS recommendations.	Offsite disposal
Cigarette butts	Chemical	Hazardous. Not TDG regulated.	Collect in cigarette butts receptacles outside each main entrance.	Offsite disposal/ Incineration
Compressed gas cylinders	Chemical	Hazardous. TDG regulation varies depending on gas.	Safely empty cylinders of all gases. Store away from sources of heat and ignition. Return containers to manufacturer for reuse following TDG procedures. When not shipped offsite, remove valves and purge cylinder with compressed air or inert gas. Dispose of as metal.	Offsite reuse /Landfill
Contaminated Soils	Petroleum	Hazardous. Not TDG regulated	Store on site in white Quatrex bags. Decontaminated on site in landfarms	Onsite treatment
Contaminated snow, water, ice	Petroleum	Hazardous. Not TDG regulated	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the waste berm until treatment in Oil/Water Separator.	Onsite treatment
Diesel fuel	Petroleum	Hazardous. TDG regulated as “Diesel, Class 3, UN 1202, FP 39°C”	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the waste berm until final disposal. Not a waste unless contaminated by a substance that makes it unusable as a fuel. Diesel not suitable as mobile fuel can be used for heating values.	Offsite disposal/ onsite recovery
Drums – empty	Petroleum	Hazardous. Not TDG regulated	Empty drums frequently contain residuals. Drain content of drum in adequate container. Crush and package drums on pallets.	Offsite disposal
Drums – residuals	Petroleum	Hazardous. Considered the same hazard as original product.	Drum residuals are to be collected in different containers for reuse (fuel, jet A, oil) or disposal (antifreeze or other product). Reuse fuel and oil for heating and other uses.	Onsite recovery/ Offsite disposal
Electronic Equipment	HHW	Hazardous. Not TDG regulated. May contain heavy metals.	Typical electronic wastes consist of used computers, cell phones, cameras, TVs and monitor screens, media players, switches, and testing equipment. Electronic wastes shall be brought to the Environment Office. They are stored in contained location until offsite shipment for recycling. Batteries shall be removed of equipment and managed accordingly.	Offsite recycling
Fluorescent Lamps – bulbs and tubes	HHW	Hazardous in large quantities (trace amount of mercury). Not TDG regulated.	Bulbs disposal bins are located at various locations inside the main facilities. Repack in original or reused boxes. Store tubes in recycling container. Store in designated location until offsite shipment for recycling.	Offsite disposal

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Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Filters – Lube oil	Petroleum	Hazardous. Not TDG regulated.	Drain and crush filters. Collect in open top drums and store in the waste berm.	Offsite disposal
Food Waste/ Putrescibles	Domestic	Non-hazardous	Collect in plastic bags. Store in lidded steel bins outside kitchen. Incinerate each or every other day.	Incineration
Gasoline	Petroleum	Hazardous. TDG regulated as "Gasoline, Class 3, UN 1203, FP -39°C"	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the waste berm until final disposal. Not a waste unless contaminated by a substance that makes it unusable as a fuel.	
Glass	Inert	Non-hazardous, inert waste	Collect and store in landfill bins.	Landfill
Glycol	Chemical	Hazardous. Not TDG regulated.	Collect in trays, drums, or pumped via pipeline. Store in closed top drums or 1000L tote tanks / cubes in the waste berm until final disposal.	Offsite disposal
Grease	Petroleum	Non-hazardous	Store in open top drums in the waste berm until final disposal.	Offsite disposal
Human Waste	Domestic	Hazardous. Not TDG regulated	Store in open top drums in the waste berm until final disposal.	Offsite disposal
Hydraulic fluid	Petroleum	Hazardous. Not TDG regulated.	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the waste berm until final disposal.	Offsite disposal
Incinerator Ash	Inert/ Chemical	Usually inert, if non-hazardous.	Composition of incinerator ash will depend on the wastes that were incinerated. Disposal in open top drums. Suitable for disposal in the landfill.	Landfill
Jet A Fuel	Petroleum	Hazardous. TDG regulated as "Aviation gas, UN 1863, FP 39°C"	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the waste berm until final disposal. Not a waste unless contaminated by a substance that makes it unusable as a fuel. Jet A not suitable as aviation fuel can be used for heating values.	Onsite recovery/ Offsite disposal
Kitchen Grease/Oil	Domestic	Non-hazardous.	Collect in closed-top drums in a seacan outside the kitchen. Transport to Milne Inlet a week before backhaul for final disposal.	Offsite disposal
Lube Oil	Petroleum	Hazardous. Not TDG regulated.	Collect in trays, drums, or pumped via pipeline. Store in 1000L tote tanks / cubes in the waste berm until final disposal. Possible reuse as heating oil or other uses in approved furnaces.	Offsite disposal/ Onsite reuse
Metal	Inert	Non-hazardous, inert waste	Collect and store in landfill bins.	Landfill
Methanol	Chemical	Hazardous. TDG regulated as "Methanol, Class 3, UN 1230, P.G. II"	Collect in UN certified container. Store in the waste berm.	Offsite disposal

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Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Oily rags and similar debris	Petroleum	Not hazardous if used for cleaning. Classified as Absorbent if used to clean-up spills	Suitable for incineration. Collect in drums at workplace sorting area. Bring to incinerator and disperse between waste loads.	Incineration
Ozone Depleting Substances (ODS, i.e. air conditioning and refrigerant gases)	Chemical	Hazardous.	ODS must be removed by certified technician before disposal of unit. ODS must be stored as per instructions from certified technician.	Offsite disposal
Paint	Petroleum	May be hazardous if oil based.	Collect in white Quatrex bags. Store in the waste berm at MR and MI until final disposal.	Offsite disposal
Paper Products	Domestic	Non-hazardous	Collect in garbage bins. If product is cardboard, manage accordingly.	Incineration
Plastics – food packaging, bags, etc	Domestic	Non-hazardous	Collect in garbage bags.	Incineration
Plastics – oil/ hydrocarbon containers, contaminated berm liner	Petroleum	Hazardous. Not TDG regulated.	Drain fluid in appropriate cube or drum. Collect in white Quatrex bags. Store in the waste berm until final disposal.	Offsite disposal
Plastics – bulky	Inert	Non-hazardous	Collect and store clean containers or other clean component in landfill bins.	Landfill
Plastics – PVC	Inert	Non-hazardous	Collect and store in landfill bins.	Landfill
Plastics – styrofoam	Inert	Non-hazardous	Collect in white quatrex bags. Store in landfill bins.	Landfill
Textiles	Inert	Non-hazardous	Collect and store in landfill bins. Incinerate if in contact with food.	Landfill/ Incineration
Tires	Inert	Non-hazardous	Collect and store in laydown. If shredded, tires may be useful as a landfill cover.	Landfill
Unusual waste	To be determined	To be determined	Bring to the Environment Office, if size permits. Proper management and disposal will be determined on a case-by-case basis.	To be determined
Vehicles	Inert/ Petroleum/ Chemical	Non-hazardous if drained of all fluids.	Drain all fluids and dispose appropriately. Store in laydown area until approval to dispose in landfill by environment office.	Landfill
Wood - scraps	Inert	Non-hazardous, inert waste	Collect and store in landfill bins. Suitable for incineration if in small amount.	Landfill/ Incineration
Wood - treated	Inert	Non-hazardous, inert waste	Collect and store in landfill bins.	Landfill
Wood - untreated	Inert	Non-hazardous, inert waste	Collect and store in untreated wood bin.	Open-burning

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TABLE 4-3: NON-HAZARDOUS SOLID WASTE GENERATION ESTIMATE

Project Phase and Location	Time Period	Total Waste Generated (excluding sludge and ash)[2]	Incineration Waste			Inert Landfill Waste			
			Waste Stream - Suitable for Incineration	Sewage Sludge Cakes [6]	Total Waste Incinerated	Waste Stream - Suitable for Landfill	Inert Wastes[6]	Ash[7][9]	Total
		(tonnes)					(m^3)		
2014 WORK PLAN [3]									
Mine Site Camp	Daily (avg)	3.08	1.03	0.20	1.23	2.05	5.13	0.62	5.75
	Annual [6]	1124	375	74.3	449	749	1874	225	2098
Steensby Port Camp	Daily (avg)	0.22	0.07	0.01	0.09	0.15	0.37	0.04	0.42
	Annual [6]	82	27	5.4	33	55	136	16	153
Milne Inlet Camp	Daily (avg)	1.26	0.42	0.08	0.50	0.84	2.10	0.25	2.35
	Annual [6]	460	153	30.4	184	307	767	92	858
Construction Annual Total		**1666**	**555**	**110**	**665**	**1111**	**2776**	**333**	**3109**
ERP OPERATIONS PHASE (incl. 18 Mt/a Construction Phase w/o Rail Camps) [3] [10]									
Mine Site Camp	Daily (avg)	6.72	2.24	0.44	2.68	4.48	11.20	1.34	12.54
	Annual [6]	2453	818	162.1	980	1635	4088	490	4578
Steensby Port Camp	Daily (avg)	6.72	2.24	0.44	2.68	4.48	11.20	1.34	12.54
	Annual [6]	2453	818	162.1	980	1635	4088	490	4578
Milne Inlet Camp	Daily (avg)	0.95	0.32	0.06	0.38	0.63	1.59	0.19	1.78
	Annual [6]	347	116	23.0	139	232	579	69	649
Construction Annual Total		**5253**	**1751**	**347**	**2098**	**3502**	**8755**	**1049**	**9804**

NOTES
(1) Maximum populations were assumed to be carried year round to be conservative
(2) Disposal Rate of 5.6 kg/day - Cold Region Utilities Monograph, 3rd edition, pg 14-16 1996
(3) Assumed 1/3 of waste stream is suitable for incineration, 2/3 suitable for landfill during construction phase due to high amounts of packaging waste during construction
(4) Estimated sewage sludge production at 0.37 kg/person/day based on Seprotech specification
(5) Estimated waste density was assumed as 0.4 tonnes/m3 for moderately compacted solid waste - AMEC Earth & Environmental. Victor Diamond Mine Project Comprehensive Study. Waste Management Addendum Jan 18 2005
(6) Estimated ash density was assumed as 1.0 tonnes/m3 - AMEC Earth & Environmental. Victor Diamond Mine Project Comprehensive Study. Waste Management Addendum Jan 18 2005
(7) Assume all waste suitable for landfill goes to Mine site
(9) Assume 90% volume reduction, 200 kg/m3 density for non-compacted waste
(10) Pending Regulatory Approval

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TABLE 4-4: ESTIMATED DOMESTIC SOLID NON HAZARDOUS WASTE GENERATION

Waste	Waste Source	Disposal Method	Est. Total Annual Production (tonnes)
2014 WORK PLAN			
Organic	Kitchens	Incinerator	439
Paper	Packaging/Offices	Incinerator/On-site landfill	126
Plastic	Offices/Camps	Incinerator[2]/On-site landfill	90
Cardboard	Packaging/Camps	Incinerator	96
Cloth	Camps	Incinerator	29
Multi-Material	Packaging/Camps	Incinerator/On-site landfill	21
Metal	Packaging	On-site landfill	12
Glass	Camps	On-site landfill	12
Wood	Packaging	Incinerator	8
ERP OPERATIONS PHASE (incl. 18 Mt/a Construction Phase w/o Rail Camps)			
Organic	Kitchens	Incinerator	11526
Paper	Packaging/Offices	Incinerator/On-site landfill	3302
Plastic	Offices/Camps	Incinerator[3]/On-site landfill	2362
Cardboard	Packaging/Camps	Incinerator	2515
Cloth	Camps	Incinerator	765
Multi-Material	Packaging/Camps	Incinerator/On-site landfill	547
Metal	Packaging	On-site landfill	328
Glass	Camps	On-site landfill	306
Wood	Packaging	Incinerator	219

NOTES
1. Composition based in part on 2011 Mary River Waste Audit results (Aug 27 - Aug 29), Assume 50% of waste generated to be domestic
2. Poly-chlorinated plastics will be sorted out of waste stream and sent to landfill and will not be incinerated

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TABLE 4-5: ESTIMATED HAZARDOUS WASTE GENERATION

Waste Category	Waste Source	Disposal Method	Estimated Generation (kg/person/day)	Est. Total Annual Production (tonnes)	Est. Total Annual Production with 20% Contingency (tonnes)
2014 Work Plan (without ERP Approval)					
Batteries	Misc.	Shipped off Site	0.125	14.93	17.92
Hydro Carbon Contaminated Material	Sludge, Absorbents, Oil Filters etc	Incinerated/Shipped off Site	0.288	34.30	41.16
Waste Oil	Maintenance	Incinerated/Shipped off Site	1.732	206.30	247.55
Waste Fuels	Maintenance	Incinerated/Shipped off Site	0.129	15.32	18.38
Waste Grease	Domestic/Maintenance	Incinerated/Shipped off Site	0.046	5.42	6.51
Waste Hazardous Liquids	Other, Paint, Oily Water	Shipped off Site	0.561	66.86	80.23
Waste Aerosol Canisters	Misc.	Shipped off Site	0.004	0.43	0.51
Contaminated Containers/Solids	Various	Shipped off Site	0.447	53.25	63.89
Misc Hazardous Materials	Misc.	Shipped off Site	0.350	41.73	50.08
			TOTAL	**438.53**	**526.24**
2014 Work Plan (with ERP Approval)					
Batteries	Misc.	Shipped off Site	0.125	35.48	42.57
Hydro Carbon Contaminated Material	Sludge, Absorbents, Oil Filters etc	Incinerated/Shipped off Site	0.288	81.48	97.77
Waste Oil	Maintenance	Incinerated/Shipped off Site	1.732	490.05	588.06
Waste Fuels	Maintenance	Incinerated/Shipped off Site	0.129	36.38	43.66
Waste Grease	Domestic/Maintenance	Incinerated/Shipped off Site	0.046	12.89	15.46
Waste Hazardous Liquids	Other, Paint, Oily Water	Shipped off Site	0.561	158.82	190.59
Waste Aerosol Canisters	Misc.	Shipped off Site	0.004	1.01	1.21
Contaminated Containers/Solids	Various	Shipped off Site	0.447	126.48	151.78
Misc Hazardous Materials	Misc.	Shipped off Site	0.350	99.13	118.95
			TOTAL	**1,041.71**	**1,250.05**
ERP Operations Phase (incl. 18 Mt/a Construction Phase)					
Batteries	Misc.	Shipped off Site	0.125	62.71	75.26
Hydro Carbon Contaminated Material	Sludge, Absorbents, Oil Filters etc	Incinerated/Shipped off Site	0.288	144.03	172.84
Waste Oil	Maintenance	Incinerated/Shipped off Site	1.732	866.28	1039.53
Waste Fuels	Maintenance	Incinerated/Shipped off Site	0.129	64.31	77.17
Waste Grease	Domestic/Maintenance	Incinerated/Shipped off Site	0.046	22.78	27.34
Waste Hazardous Liquids	Other, Paint, Oily Water	Shipped off Site	0.561	280.76	336.91
Waste Aerosol Canisters	Misc.	Shipped off Site	0.004	1.78	2.14
Contaminated Containers/Solids	Various	Shipped off Site	0.447	223.59	268.31
Misc Hazardous Materials	Misc.	Shipped off Site	0.350	175.23	210.28
			TOTAL	**1,841.48**	**2,209.77**

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4.3 WASTE FLOW

Visual representations of waste flows are presented as block flow diagrams for Milne Port and Mary River Mine Site in Appendix A. Visual representations of waste flows are presented as block flow diagrams for Steensby Port, Mid-Rail Rail Camp, Ravn River Rail Camp and Cockburn Lake Rail Camp Appendix J. Waste streams are described and their respective storage and treatment paths are demonstrated.

4.3.1 GENERATION POINTS

Waste will be sorted and collected at all major generation points at each project site according to the Mary River Project Waste Sorting Guidelines (Appendix F). Disposal will occur in appropriately labelled receptacles based on disposal methods and waste sorting guidelines. This will ensure waste types are disposed of in the correct methods as outlined in TABLE 4-1. Waste will be stored indoors or in secure wildlife proof receptacles prior to collection.

4.3.2 WASTE COLLECTION

Waste will be collected from generation points regularly by a waste collection vehicle(s) and taken the appropriate waste handling facility for treatment and/or final disposal as shown in Appendix A and/or Appendix J. Waste will be collected by personnel trained in waste handling guidelines and personnel will use visual inspection to ensure waste types are taken to the appropriate treatment or disposal location.

4.3.3 TEMPORARY WASTE SORTING AND PROCESSING FACILITIES (DURING CONSTRUCTION PHASE ONLY)

Temporary waste management facilities may be constructed at all sites for use only during the construction phase.

These facilities will consist of:

- A secure central depot where waste generated across the site will be managed, properly processed, packaged, labelled, inventoried, secured (e.g., on pallets) and stored for transportation to disposal site as per Block Flow Diagrams in Appendix A and/or Appendix J.
- All wildlife attracting wastes such as organics, sewage waste or petroleum based chemicals will be stored animal proof containers inside a secured area that will be monitored.

As much as possible and practical, the various waste streams will be sorted at the source according to the Mary River Project Waste Sorting Guideline (Appendix F).

All wastes generated during construction, operation and closure will be managed in order to prevent any wastes entering any water body. Thus, area designated as waste disposal will be located at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired.

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Wastes generated from the temporary and permanent shelters along the Tote Road and the Railway Corridor will be temporarily stored in containers and will be removed to be temporarily stored at one of the designated locations on-site.

Baffinland will maintain records of all waste backhauled from the Mary River Project and confirmation of proper disposal through the use of Waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records will be available upon request, to an Inspector or the Board.

4.3.4 PERMANENT WASTE SORTING AND PROCESSING FACILITIES

Permanent waste management facilities will be constructed at the Milne Port and the Mine Site. These facilities will consist of a heated all season building and adjacent laydown areas that provide the following capabilities, functions and/or facilities:

- A central depot where waste generated across the site will be managed, properly processed, packaged, labelled, inventoried, secured (e.g., on pallets) and stored for sealift or reuse on site.
- The waste management facility has a poured concrete floor with large doors for transferring waste in and out plus an adjacent office for the waste management technician.
- Waste oil storage tank adjacent to facility with potential waste oil filtering process inside and temporary storage for filtered or unfiltered oil.
    - The filtered waste oil will be used for waste oil burners used to heat select facilities on site which include the waste management facility itself, truck warming shed, etc. Waste oil can also be blended into fuel for certain operations. See Appendix L for examples of 'typical' used oil heaters and boilers.
- Oil filters draining and crushing facility.
- Drum crushing machine.
- Strapping and plastic wrap capabilities.
- Label making capabilities.

As much as possible and practical, the various waste streams will be sorted at the source according to the Mary River Project Waste Sorting Guideline (Appendix F).

All food waste and other animal attractants (greases, glycol based antifreeze) will be stored in a secure facility prior to incineration to avoid the attraction of wildlife.

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All wastes generated during construction, operation and closure will be managed in order to prevent any wastes entering any water body. Thus, area designated as waste disposal will be located at a minimum distance of thirty-one (31) metres from the ordinary high water mark of any water body such that the quality of water is not impaired.

Prior to a planned discharge from any waste management facility, oily water/wastewater treatment facilities, sewage treatment facilities, and any other relevant facilities associated with the Project, Baffinland will provide at least ten (10) days' notice to the inspector. The notice will include the estimated volume proposed for discharge and the location and description of the receiving environment.

Baffinland will maintain records of all waste backhauled from the Mary River Project and confirmation of proper disposal through the use of waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records will be available upon request, to an Inspector or the NWB.

TABLE 4-6: MARY RIVER PROJECT WASTE MANAGEMENT FACILITY SUMMARY

Location	Facility Type	Components	Function
Milne Port	Permanent - Waste Management Facility	• Secured laydown area • Heated building • Incinerator • secure hazardous waste storage area • Used tire storage area	A central depot where hazardous waste and waste suitable for incineration generated across the site will be managed properly processed, packaged, labeled, inventoried, and treated and/or stored for disposal on site or off site as appropriate.
Milne Port	Landfarm	• Landfarm facility	See Appendix E
Mine Site	Temporary - Waste Management Facility	• Secured laydown area • Secure hazardous waste storage area and containers • Animal proof containers for storage of animal attracting waste • Incinerator	A secure central depot where waste generated across the site will be managed, properly processed, packaged, labeled, inventoried, secured (e.g., on pallets) and stored for transportation to disposal or treatment locations
Mine Site	Landfarm	• Landfarm facility	See Appendix E.
Mine Site	Landfill	• Licenced Landfill facility • Access road • Used tire storage area	Disposal of inert, non-combustible waste and non-hazardous wastes.
Mine Site	Permanent - Waste Management Facility	• Secured area, • heated building, • incinerator, • secure hazardous waste storage area	A central depot where hazardous waste and waste suitable for incineration generated across the site will be managed properly processed, packaged, labeled, inventoried, and treated and/or stored for disposal on site or off site as appropriate.

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4.4 WASTE HANDLING AND MINIMIZATION BY CATEGORY

The Waste Management Plan is designed to ensure that a sound waste management program which focuses on the principles of reduction/recovery/reuse/recycling is implemented. The following are examples of initiatives that the Mary River Project will undertake to minimize the amount of waste being generated on Project sites and ensure proper handling.

4.4.1 GRUBBED ORGANIC SOIL MATERIAL

There will be a need during and at the completion of construction for re-establishment of disturbed areas. There is very little organic soil material and vegetation at the site, but what is available will be stockpiled for future use when re-establishing disturbed areas, including the temporary camp sites and laydown areas.

4.4.2 OTHER SPOILS REMOVED DURING EXCAVATION

Every effort will be made during the design to balance the cut and fill requirements. However most of the fill area has requirements for stability of materials that will preclude the use of some of the excavated materials. Such materials will be disposed of in a designated disposal site or used in other applications as much as possible (e.g., used for landfill cover).

4.4.3 USED OIL RE-USE

Used oil will be generated across the Project from mechanical equipment use and maintenance. Oil will be collected and stored separately in secondary containment. Oil will be potentially used on-site in waste oil burners. Examples of 'typical' used oil heaters and boilers that could be potentially used are shown in Appendix L. Oil that cannot be reused on-site will be shipped off-site as described in the Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011). If waste oil is used for fuel burner feedstock, it will comply with Government of Nunavut , Department of Environment, Environmental Guideline for Used Oil and Waste Fuel (June 2012) and impurity levels outlined in TABLE 4-7.

TABLE 4-7: MAXIMUM LEVELS OF IMPURITIES IN USED OIL/FUEL BURNER FEEDSTOCK

Impurity	Maximum Concentration (ppm)	
	Used Oil	Waste Oil
Cadmium	2	2
Chromium	10	10
Lead	100	100
Total Organic Halogens (as chlorine)	1000	15000
Polychlorinated Biphenyls	2	2
Ash Content	-	0.6% by weight

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4.4.4 NON-HAZARDOUS WASTE MATERIALS GENERATED DURING CONSTRUCTION OPERATIONS

A large amount of material will be generated during the construction operation, including packing materials, containers, temporary supports and general construction debris, used tools and pieces of construction material.

It is anticipated that some of the contractors generating this waste will carry out their own salvage of economically worthwhile recyclables, particularly ferrous metals and copper, where a ready market exists. Typically tires, where the casings are sound, are retreaded for ongoing use, reducing the materials requiring final disposal.

In some cases, large amounts of a single waste product will be produced, that can be readily source separated. Specific items identified at this time include:

- Timber - generated by unpacking, and from the disposal of temporary supports. Where possible shipments will be bought in on pallets that can be returned for reuse, thereby reducing the waste generated. Where timber waste consists of clean timber of useable size it will be stacked and made available for reuse. Timber that is not reusable will be disposed of via open burning (see Appendix I). Note that chemically treated timber shall be separated and, if it cannot be reused, shall be disposed of in the nonhazardous landfill.
- Polyethylene film - film is used in large quantities to wrap and hence protect equipment. It is anticipated that substantial amounts will be generated by unpacking equipment. Opportunities for recycling this material will be explored and if practical the film will be baled and shipped for reuse. Otherwise, it will be disposed of in the non-hazardous landfill on site.
- Steel and other scrap metal waste shall be kept separate from the other solid waste produced during construction. Separation of steel and scrap metal from other solid waste shall be the responsibility of site personnel handling the materials. If economically worthwhile steel and other scrap metal waste will be shipped off site for recycling, otherwise it will be disposed of in the on-site non-hazardous landfill.

During the course of the Project, various opportunities for recycling will be explored, particularly for wastes generated in large quantities. If economically feasible, recyclable materials will be separated and placed in appropriate recycling bins or on laydown pads by site personnel. Containers shall be clearly marked and have signage reminding all workers of what is recyclable and what is not.

All other non-hazardous waste material will be separated at source into categories, based on potential for recycling, such as metal containers, water bottles, corrugated board, and the need for segregation for final disposal, such as tire casings.

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All sites will be provided with, at fixed locations, separate containers/areas for each type of waste to be separated, based on disposal method (hazardous waste facility off-site, landfill, incinerator, etc). The containers will be located in convenient locations to encourage utilization.

Each contractor will be responsible for bringing all of the waste collected on their site to the provided waste containers.

In locations where organic (food) waste will be generated, a separate container will be provided for this waste, secure against animal access. These organic waste containers will be emptied regularly and the waste will be disposed by incineration.

Untreated wood and cardboard will be open burned. Plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood will not be open burned to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters. See Appendix I for more information.

4.4.5 UNSET CONCRETE AND CONCRETE WASH WATER FROM MIXING AND TRANSPORTATION OF CONCRETE

During the major works, concrete will be provided from a batching plant located at a construction laydown area. Waste concrete will arise from off-spec mixes, residual concrete at the end of a pour, and from wash down of the equipment.

A purpose built pond shall be used to receive all of the waste concrete and concrete contaminated wash water. The pond that will receive wash water will be designed to allow for settling of solids and decant; and analysis, and if necessary pH adjustment, prior to discharge will occur.

All fresh concrete and concrete product waste to be disposed of on-site shall be disposed of in the concrete waste pond. No concrete truck shall be cleaned anywhere else on-site. Waste hardened concrete will be either used as fill or disposed of in one of the on-site landfills.

4.4.6 CAMP SITE WASTE

Construction and permanent camps will provide housing for personnel across the Project and provide meals and other domestic support facilities. Wastes generated from this operation will be similar to normal residential domestic garbage, with a higher percentage of organic (food) wastes.

The camp operator will have responsibility for the management, including source separation and disposal, of all waste generated on site. Waste will be transported and disposed of as per Appendix A by the camp operator, using appropriate vehicles, equipped to stop any loss of either liquid or wind-blow during transportation.

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The camp operator will be required to collect all waste in secure containers, and to remove organic (food) waste daily. All containers containing food waste or items potentially contaminated by food shall be secure against animal access.

Sewage Generated at the Various Working Locations Sewage will be generated at all sites, throughout the period of construction and operation. See the Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010) for more information.

4.4.7 HAZARDOUS WASTE

Hazardous Waste handling is described in the Mary River Project Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

4.4.8 OTHER MISCELLANEOUS MATERIALS, OR ITEMS THAT NO LONGER HAVE ECONOMIC VALUE

During the operation miscellaneous tools, used parts, clothing etc. will be discarded. Items requiring special handling should be dealt with by the generator either by disposal or breakdown into readily handled components to be treated in accordance with the previous sections.

Parts shall be drained of oil or other liquids before disposal, with the drained fluids being disposed of as per Mary River Project Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

4.4.9 OFFICE PAPER

All white paper waste generated at the office site shall be collected for disposal. Paper waste generated elsewhere shall be placed in a waste disposal bin by site personnel. To reduce the amount of paper waste generated on site the following list of procedures will be developed and implemented as practically feasible:

- Distribute electronically – Electronic forms increase the amount of desk/shelf space available.
- Double Sided Printing – When practical ensure all documents are double sided.
- Print Only the Pages You Need – Rather than printing the entire document consider saving the file electronically as well as cutting and pasting relevant information. Only reprint pages of documents that have been revised rather than the full document.
- Reuse – Collect single sided paper in a bin so that it could be reused for printing, faxing or scratch pad.
- Route Hardcopy Memos and Newsletters – Instead of making numerous copies, route one copy around the office.
- Copier Maintenance – Only allow qualified personnel to provide maintenance to all copiers and printers.

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4.5 INCINERATORS

The main disposal method for combustible non-hazardous wastes (such as food waste, paper waste and untreated wood products) generated on-site will be incineration. This method will eliminate problems associated with odours attracting wildlife, or the creation of poisonous or flammable gases through the decomposition of putrescible materials.

TABLE 4-8: INCINERATOR ALLOCATION

Site	Incinerable Waste Produced (t/day)	Incinerators Type	Total Capacity
Mine Site	1.23	ECO 2TN Mobile Incinerator	2 tonnes
Steensby Port	0.09	500 lbs/Batch Incinerator	0.5 tonnes
Milne Port	0.50	ECO 2TN Mobile Incinerator	2 tonnes

The locations of the incinerators are shown in Appendix G.

The primary project incinerator model, ECO 2TN Mobile Incinerator, Operating and Maintenance (O&M) Manual is presented in Appendix C

All incinerators will have the option of using a liquid waste system to burn waste petroleum products such as used oil or off-spec fuels, which would decrease diesel requirements but would increase power consumption. Larger or additional incinerators may be brought on-line as required to meet the Project's needs during the construction phase.

Waste that is destined for the incinerator will be segregated as part of operating procedures to ensure that only appropriate materials will be incinerated. Hazardous wastes, non-combustible materials, or treated wood products must not be incinerated. The incineration of plastics will be minimized to the maximum extent practicable. Incineration of some food-related and other plastics is unavoidable; however, best efforts will be made to reduce volumes of potentially dioxin/furan related plastics during the procurement process.

All incinerator systems will operate in accordance with the Environmental Guideline for the Burning and Incineration of Solid Waste by the Department of the Environment, Government of Nunavut, January 2012. This includes all regulatory guidelines, operating procedures and best management practices whenever feasible.

Prior to commencing any incineration of on-site Project wastes, Baffinland will conduct at a stack test immediately following the commissioning of each temporary and permanent incinerator. Stack test results will be reported to the NIRB and Environment Canada annually as required. See Appendix C for more information on incinerator operation.

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4.5.1 PERSONNEL TRAINING PROGRAMS FOR INCINERATOR OPERATION

Only trained personnel will operate the incinerator(s), and the equipment manual will be provided (see Appendix C), including standard operating procedures. The incinerator manufacturer will be requested to provide on-site specialized training as required.

4.5.2 AIR EMISSIONS

Air emission standards establish limits on the levels of contaminants that can be released into the atmosphere. These standards are expressed as a concentration in the exhaust gases leaving the stack and are capable of being achieved using generally available technology or waste diversion practices. The following emission standards apply to solid waste incinerators operating in Nunavut and have been adopted from the Canadian Council of Ministers of the Environment (CCME) Canada Wide Standards for Dioxins and Furans and Mercury Emissions, respectively. Similar standards for the open burning of solid waste and modified burn barrels have not been established.

For existing, new or expanding solid waste incinerators the maximum concentration (corrected to 11% oxygen at stack) of dioxins, furans and mercury in the exhaust gases from the stack are provided in TABLE 4-9.

TABLE 4-9: AIR EMISSION STANDARDS FOR SOLID WASTE INCINERATORS

Parameter	Numeric Standard	Explanation
Dioxins and Furans	80 pg I-TEQ/cubic metre	Unit of measure is picograms of International Toxicity Equivalents per cubic metre of air
Mercury	20 µg/R cubic metre	Unit of measure is micrograms per Reference cubic metre (the volume of gas adjusted to 25oC and 101.3 kilopascals)

Opacity is the degree to which the exhaust gases reduce the transmission of light and obscure the view of any object in the background. It is expressed as a percentage representing the extent to which an object viewed through the gases is obscured. Although not an emission standard, opacity provides an indication of the general performance of the incinerator during normal operation. Opacity in the incinerator stack should not exceed 5%. While it is not anticipated that opacity levels would exceed 1% to 2% under normal operation, values greater than 5% indicate the incinerator is not performing properly and additional performance evaluation and adjustment is required.

Routine inspections and monitoring will be undertaken on incineration facilities as required. Details of the incinerators are provided in Appendix C.

4.5.3 ASH DISPOSAL

The management of bottom ash and other unburned residue is an integral part of sound waste management and the ash will need to be disposed of properly. Extreme care must be exercised when handling ash because of its physical (i.e. glass, nails) and chemical hazards. Closed or covered containers will be used when moving or transporting bottom ash from the incinerator to the final disposal site.

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This will minimize physical contact with the ash and any release of fine ash particles to the environment. Bottom ash will only be handled once completely cooled.

Bottom ash from the open burning of paper, paperboard packing and untreated wood waste or unburned materials from modified burn barrels used to burn paper, paperboard packing, untreated wood, food waste, food packaging and natural fibre textiles is suitable for burial in a designated pit or non-hazardous landfill.

Ashes from the incineration process will be buried within a designated area of the landfill. A Toxicity Characteristic Leaching Procedure (TCLP) analysis will be conducted to ensure that the incinerator ash is suitable for disposal in the landfills. The ash testing protocol shall ensure that an ash sample will be collected at the beginning of operation of the incinerator. The sample will be compared to the Government of Nunavut guidelines for solid waste/process residual concentrations suitable for landfills, as described in the Environmental Guideline for Industrial Waste Discharges and presented in TABLE 4-10.

Following the initial testing, ash samples will be collected and tested periodically and less frequently over time once results indicate consistent levels below appropriate guidelines, or upon a significant change in the source or type of material sent to the incinerator. If monitoring indicates the ash exceeds applicable guidelines and are not suitable for landfilling, an investigation will be undertaken to identify the cause and correct the problem. Ash that does not meet guidelines following TCLP analysis will be reprocessed on site if possible or transported for off-site disposal at an appropriate facility. Records of analytical results and volumes of ash will be maintained on-site, and will be available upon request to inspectors. The TCLP Procedure Test method 1311 (US EPA) will be the preferred method to analyze the residuals as this test is designed to simulate the processes a material would be subjected to if placed in a landfill.

TABLE 4-10: GUIDELINES FOR SOLID WASTE/PROCESS RESIDUALS SUITABLE FOR LANDFILL

Parameter	Concentration maximum (mg/L)
Arsenic	2.5
Barium	100
Cadmium	0.5
Chromium	0.5
Lead	5
Mercury	0.1
Selenium	1
Silver	5
Zinc	500

Source: Guideline for Industrial Waste Discharges in Nunavut, January 2002

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4.5.4 MONITORING DURING OPERATION

Monitoring of the incinerators will be conducted in conjunction with other monitoring programs required for the Project. Specifically, incinerators will be routinely inspected for signs of leakage, corrosion or other physical defects. If defects are identified, an assessment of health, safety, and environment risk must be undertaken prior to further operations and if significant risks are identified repairs must be completed before the equipment is used again. An initial stack test will be conducted upon commissioning to confirm conformance with all applicable regulations based on a 'typical' waste stream. Stack test results will be reported to the NIRB and Environment Canada annually as required.

The operation of incinerators will be monitored using on-line instruments capable of continuously measuring the combustion process and stack emission; this includes temperature in both the primary and secondary burn chambers. Temperature readings outside of the normal range can warn the operator that the system is not working properly.

Each process and in-stack monitor will be equipped with visible and audible alarms to warn operators of poor incinerator operation.

Written records will be kept by incinerator operators of what waste is burned, when and how much.

Other record keeping requirements include:

- Operating data including readings from the process monitoring instruments.
- Repairs and maintenance performed on the incinerator and monitoring instruments.
- Major changes in operation.
- Quantity, condition and disposal location of the collected bottom ash.
- Operator training.

Records will be maintained on-site throughout the operational life of the facility and be made available to Inspectors and other regulatory officials upon request.

4.6 INERT LANDFILL

A central inert landfill has been constructed near the Mine Site. The landfill design was submitted to the NWB for approval before construction, as required by the water licence. The landfill is used for disposal of inert, non-combustible waste only (plastics, cement, sand, used construction materials, scrap metal, pipes, glass, etc.). Non-hazardous waste, including ashes from the incineration process, and waste which cannot be salvaged or incinerated, will be deposited in this site. There will be no disposal of food waste, hazardous materials, paper products or biomedical waste in the landfill. A secondary landfill will be constructed at the Steensby Port site. The locations of these landfills are shown in Appendix B.

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Details of the Landfill design and closure are provided in Appendix E. The quantities of inert waste expected are presented in TABLE 4-3.

4.6.1 LANDFILL OPERATION

The landfill(s) will be operated by trained personnel who will carry out regular inspection and monitoring of the facility. An operation and maintenance manual approved by the NWB will direct landfill operations. This manual includes:

- A general description of how the landfill is to be operated and maintained.
- A proposed schedule for when specific operating and maintenance activities are to be conducted (i.e., seasonal surface water sampling, routine visual inspection, berm inspections, etc.).
- A list of who is responsible for completing each item scheduled.
- Location of the landfill and proximity to receiving waters.
- A description of the cover material to be used as well as the source of the material and how it will be placed.
- Runoff and drainage control within and around the landfill, including erosion and sediment control and proposed restoration measures for erosion which occurs.
- Contingency treatment measures for contaminated drainage (although this is not seen as an issue).
- Prevention of windblown debris (although this is not seen as an issue).
- Method and frequency of site maintenance.

The manual assists landfill site operators in establishing a proper waste management system and in ensuring that the system operates efficiently and in compliance with the permits. See Appendix D for the Mary River Project Landfill Operating Manual.

4.6.2 OPERATING PROCEDURE

Regular cover will be applied to reduce the risk of wind-blown debris, and the landfill will be engineered for closure. Open burning of un-treated wood and cardboard wastes may be conducted at an established location well away from the landfill to reduce volume requirements as permits allow (see Appendix I). Routine inspection and monitoring will be undertaken in terms of waste volume, type, source, water seepage, etc.

4.6.3 PLACEMENT OF WASTE

The area method will be used to place the waste in the landfill. Once the first layer is completed and covered, a second layer will be formed. The following measures will be taken during the landfill operation:

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- Compaction of waste will be undertaken typically once per week or in combination with collection frequency, depending on the nature of the waste and the availability of fill material. Generally the waste will be worked and compacted as they are dumped.
- Operations will be undertaken to minimize close-out requirements.
- Cover material will be placed to a thickness of 0.1 m between cells, 0.3 m on the surface of cells, and, 1.5 m for closure.

4.6.4 MONITORING DURING OPERATION

Monitoring of the landfill will be conducted in conjunction with other monitoring program required for the Project. Specifically, landfill monitoring will include:

4.6.4.1 VOLUME AND WASTE COMPOSITION:

Although records will be kept of waste volume/type and cover material placed in the landfill, the annual volume of waste disposed of in the landfill will be determined by established survey methods.

4.6.4.2 WATER SAMPLING AND SOIL:

The "Guidance Manual on Sampling and Data Management for Contaminated Sites" (CCME 1993) will be followed for all water and soil quality monitoring. Refer to the Site Water Management Plan for surface water sampling locations and procedures. A soil sampling program will be initiated at several locations around the landfill site(s) prior to construction and after the initial perimeter berm.

4.6.4.3 GROUND TEMPERATURE MONITORING:

It is expected that the active layer will a grade into the landfill waste and cover material. Ground temperatures are not expected to increase based on the types of inert wastes to be disposed. During regular landfill inspections, signs of ground warming will be monitored by watching for evidence of soil creep.

4.6.4.4 LEACHATE MONITORING:

Leachate production is not expected based on the relatively dry, inert nature of the waste to be placed in the landfill. However, periodic surface water monitoring will allow for the detection of landfill leachate, in the unlikely event leachate is generated. The water licence(s) provides for monitoring of surface runoff from the facility and provides water quality objectives that must be met.

4.6.4.5 INSPECTION AND MAINTENANCE:

Routine visual inspections will be conducted for various components of the landfill, including the berms, fencing (if installed), etc. If required, maintenance will be completed as soon as a problem is identified. Records will be kept of all inspections and maintenance implemented, and these records will be summarized in the annual report. Annual Report

An annual report will be completed for the overall project and will include the following information on the landfill:

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- Total volume of waste deposited in the landfill site during the previous year.
- Progression of the landfill site development, indicating the landfill site location currently in use and areas that have been closed.
- Monitoring results.
- Remaining life expectancy of the landfill site.
- Details of operational problems encountered during the year and the measures taken to resolve the operational problems.
- Photographs.

4.7 HAZARDOUS WASTE STORAGE AND DISPOSAL

Some of the materials included in the waste streams are classified as hazardous wastes because of the potential risk to human health and safety, property and the environment. Hazardous wastes that will be generated on-site will include, but not be limited to: used oils, solvents and paints, used and/or surplus chemicals, medical wastes, gas cylinders, electronic waste, batteries, light bulbs, and smoke detectors.

Baffinland is responsible for ensuring that all hazardous waste generated on its site will be properly managed from the time it is generated to final disposal. Hazardous waste must be properly stored, transported, treated and disposed. Contractors can manage waste on behalf of Baffinland; however, Baffinland is responsible for ensuring, in advance, that the waste management method is acceptable.

All Hazardous waste will be managed according the Mary River Project Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

4.8 ON-SITE TREATMENT OF HYDROCARBON CONTAMINATED MATERIAL

Soils contaminated by hydrocarbons from spills will be salvaged and deposited within a land farm cell for bioremediation. The cell will be confined within a berm and underlain by an Arctic geomembrane beneath select fill material. The contaminated soils will be placed and spread during summer months for remediation through natural microbiological and evaporative processes. Soil that has reached acceptable levels of hydrocarbon degradation will be removed and transferred to the landfill or other appropriate use. The land farm will be operated in accordance with Nunavut government guidelines and the recommendations of the design engineer. The soil will be turned regularly to provide aeration and promote the remediation process. Periodic inspections and sampling will be conducted to assess the effectiveness of the cell. In the unlikely event that the landfarm is ineffective, Baffinland will source an off-site land farm for disposal. Note, as per New Substances Notification Regulations (Organisms) before importing or using bacteria in landfarming applications Baffinland will notify the Government of Canada if the bacteria used are not listed on Canada's Domestic Substance List and before the bacteria is imported or used at the Mary River Project site. See Appendix E for more information.

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4.9 OILY WATER

Baffinland will generate oily water over the course of the course of the Project lifecycle. Oily water will be managed as per Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010).

4.10 OPEN BURNING

The Mary River Project will use open burning of untreated clean wood waste and cardboard in order to reduce volumes prior to disposal of in the landfill. Open burning will be done in accordance with all regulatory requirements and as outlined in the Appendix I.

4.11 SHIP WASTE MANAGEMENT

Baffinland will not accept hazardous waste originating from a ship and any non-hazardous waste generated during on site activities will be carefully monitored. All vessels will be equipped with a sewage treatment plant and an incinerator for solid and wet wastes.

4.12 USED TIRES

Used tires are a major waste stream for most mining operations. Used tires will be either stockpiled for shipment off site (re -treading, re-use, or disposal) or will be disposed of on site in a segregated area of the landfill, or in a designated location within the footprint of the waste rock pile at a depth that will allow for permafrost aggradations. Options that increase project sustainability will be taken advantage of if used tires can be re-used on site in an environmentally safe manner (e.g. road barriers).

4.13 PROPYLENE GLYCOL

Propylene glycol will be used at site airstrips for plane de-icing and in some scenarios, for winterizing of camps/buildings. Although biodegradable, all storage, handling, use and disposal of propylene glycol will be done in contained areas to avoid spills to the environment and as described by the manufacturer MSDS sheet. Prior to use propylene glycol will be stored in tightly closed containers or tanks in a cool, dry, well-ventilated area away from incompatible substances. Used propylene glycol will be collected, and then stored in the waste management temporary storage facilities on site in secured containers for shipment and off-site disposal.

4.14 EPP PROCEDURES RELEVANT TO THIS WASTE MANAGEMENT PLAN

The following table outlines the EPP procedures that are relevant to the Waste Management Plan. The EPP is a living document and is subject to on-going updates.

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TABLE 4-11: CONTENT OF THE EPP RELATED TO THE WASTE MANAGEMENT PLAN

Section	Title/Description
2.5	Geotechnical Drilling Operations
2.6	Equipment Operations
2.7	Fuel Storage and Handling
2.14	Solid Waste Management
2.15	Sewage Treatment
2.16	Hazardous Waste Management
2.17	Road Construction and Borrow Development
2.19	Road Traffic Management
2.21	Exploration Drilling Operations
3.7	Off-Site Waste Disposal Log

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5 ENVIRONMENTAL RESPONSIBILITIES

5.1 ROLES AND RESPONSIBILITIES

The Baffinland Environmental Team is organised into two parts, on site as well as off site. The organisational structure for the Mary River Project in relation to the environment discipline is shown in the FIGURE 5-1 below. Communication channels are described as liaisons in the tables outlining the responsibilities and accountabilities in the following sections.

5.1.1 ENVIRONMENTAL PROJECT TEAM

5.1.1.1 THE BAFFINLAND ENVIRONMENTAL TEAM

The Baffinland Environmental Team will oversee all environmental and community works on and off site. The Baffinland Corporate Environmental Team responsibilities are summarized in TABLE 5-1.

TABLE 5-1: BAFFINLAND IRON MINES CORPORATION SENIOR MANAGEMENT

Baffinland Iron Mines Corporation Senior Management	
Position	**Responsibilities and Accountabilities**
Project Director	- Reports to Baffinland's CEO - Overall accountability for the Project execution - Allocation of resources (human and financial) for the implementation of Baffinland's commitments and objectives related to health, safety and environment during construction of the Project - Accountable for on-site environmental, health and safety performance during construction of the Project
VP Operations	- Reports to Baffinland's CEO - Overall accountability for the operation of the Project - Allocation of resources (human and financial) for the implementation of Baffinland's commitments and objectives related to health, safety and environment during operation - Accountable for on-site environmental, health and safety performance during operation
VP Sustainable Development, Health, Safety and Environment	- Reports to Baffinland's CEO - Establish corporate environmental policies and objectives - Monitors and reports on Baffinland's performance related to environmental, health and safety policies and objectives - Community liaison - Liaise with regulatory authorities - Obtains necessary permits and authorizations - Monitors compliance with terms and conditions of permits and licences - Routine EHS audit of contractor performance while on site
Manager Purchasing and Contract	- Reports to Baffinland's Project Director - Accountable for procurement and purchasing - Ensure that environmental commitments, policies and objectives are included in all contract documents

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Baffinland Iron Mines Corporation Senior Management	
Position	**Responsibilities and Accountabilities**
VP Corporate Affairs	- Reports to Baffinland's CEO - Accountable for external communication (Governments, media, NGO, others) related to Baffinland's press release and overall communication of site incidents/events

The Baffinland Environmental Team will oversee all environmental activities on site. These responsibilities on site are outlined in TABLE 5-2.

TABLE 5-2: BAFFINLAND IRON MINES CORPORATION ON-SITE MANAGEMENT TEAM

Baffinland Iron Mines Corporation On-Site Management Team	
Position	**Responsibilities and Accountabilities**
Environmental Manager	- Reports to VP Sustainable Development, Health, Safety and Environment - Liaises with the Project Director, Construction Manager and the Emergency Response Team - Monitors environmental performance of contractors on site - Monitors compliance with permits, licences and authorizations - Regulatory environmental monitoring and reporting (monthly, annual) - Routine audit of contractor's environmental performance on-site - Initiate/supervise environmental studies - Investigate and reports on accidents and incidents when they occur - Review and update environmental management plans
Environmental Coordinator/Superintendent	- Reports to Environmental Manager - Specific accountabilities for environmental monitoring and reporting - Provides induction and environmental awareness training to new employees and contract workers
Environmental Support Groups	- Reports to the Environmental Manager - Environmental database management - Various sampling, monitoring and reporting activities as required by permits, licences and environmental management plans - Prepare updates to environmental protection plan and management plans
Environmental Monitors	- Reports to the Environmental Manager - Conduct monitoring activities as per the Environmental Management Plans
QIA Monitors	- Various monitoring and follow up activities - Roles will be defined in the IIBA agreement

5.1.2 MARY RIVER PROJECT ORGANIZATIONAL CHARTS

For further information regarding the Mary River Projects organizational structure in relation to the environment discipline, please refer to the FIGURE 5-1 below:

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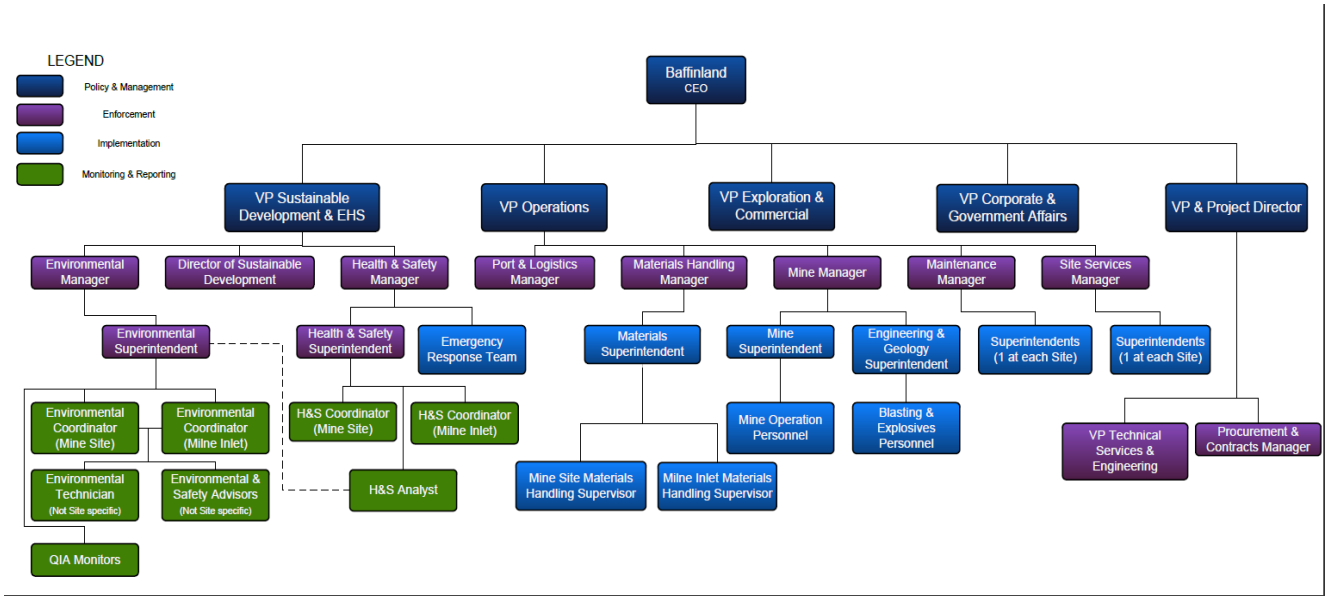

FIGURE 5-1: MARY RIVER ORGANIZATIONAL CHART

5.2 TRAINING AND AWARENESS

Staff and sub-contractors working on site will receive environmental training as part of the Site Orientation, to achieve a basic level of environmental awareness understanding of their obligations regarding compliance with regulatory requirements, commitments and best practices.

Operations superintendents and contractor supervisors will be provided with this Management Plan, and will receive additional orientation with respect to the requirements outlined in this Plan. In addition, all supervising level staff and sub-contractors will be provided with the Operational Standards (found in the Environmental Protection Plan) as a written guidance for their work.

Targeted environmental awareness training will be provided to both individuals and groups of workers assuming a specific authority or responsibility for environmental management or those undertaking an activity with an elevated high risk of environmental impact. These will be delivered in the form of toolbox/tailgate meetings or other means as appropriate.

The content of the environmental component of the site induction will include at a minimum:

a) Location of environmental sensitivities.

b) Location of additional information on environmental matters.

c) Due diligence responsibilities.

d) Responsibilities related to waste management, minimizing noise as necessary, road traffic rules, etc.

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e) Principles and necessary steps to avoid encounters with bears or other wildlife and what to do if one such encounter occurs.

With respect to hazardous materials management, Baffinland will have a training and awareness plan which will consider:

- The differing level of risks and potential consequences associated with different types of hazardous materials.
- The different responsibilities, abilities, and literacy of employees.
- The culture of the employees.
- Contractors involved and their relevant experience/expertise.
- The trainers, training methods, and settings.
- Training frequency.
- Documentation of training and evaluation of training.

Baffinland will regularly review and update the training and awareness plan based on changes in training needs and regulatory required training.

5.3 COMMUNICATION

The types of communications for which members of the team will participate include the following:

a) Formal written correspondence and meetings with stakeholders.

b) Site visits by community representatives.

c) Design, construction and planning meetings.

d) Field inspections and monitoring reports disseminated by the Environmental Manager.

e) Electronic communications.

f) Tailgate/toolbox meetings.

g) Formal written correspondence and meetings with government regulatory bodies.

h) Formal environmental awareness training.

Communications will be appropriately recorded and filed for future reference. Where appropriate, the copies of communications will be forwarded to the Operations Manager(s), and Environmental Manager.

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5.4 EXTERNAL COMMUNICATIONS

Effective forms of communication include the proactive notification to external stakeholders of Project activity. Project activity updates will be provided to the communities of North Baffin through various means including regular meetings, public notices and radio announcements as appropriate. Baffinland will maintain Community Liaison Offices to assist in this regard.

5.5 CONSTRUCTION

During the construction phase of the Project, the Baffinland Environmental Manager and EPCM (Engineering Procurement and Construction Management) contractor will be responsible for implementing this Plan.

This Management Plan will be updated to take into account the numerous construction sites, and types of construction equipment utilized. The organizational structure of the EPCM contractor will reflect the complexity of the construction phase.

5.6 OPERATION AND CLOSURE

For the operations and closure phases, Baffinland will revise its organizational structure to reflect the realities of the operation. The Environmental Manager will be responsible for subsequent updates and implementation of the Plan.

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6 PERFORMANCE INDICATORS, THRESHOLDS, AND INCIDENT RESPONSE

Periodic inspections of waste management facilities will ensure compliance with this waste management plan. The EPP and associated operations procedures/work instructions outline detailed procedures for handling and storage of fuel, lubricants and other waste materials. These procedures are in place and training will be provided to all employees and contractors on waste handling. Accidental spills are the most likely type of environmental incident to occur while conducting the above mentioned activities. Response procedures, documented in the EPP and the Emergency Response and Spill Protection Plan (BAF-PH1-830-P16-0007), are in place to deal with these occurrences.

The ultimate performance indicator for hazardous materials management is the number of incidents of non compliance reported on a daily or monthly basis. Incidents of non-compliance are classified by type and each type entails remedial actions as outlined in Hazard Identification and Risk Assessment Procedure (BAF-PH1-830-PRO-0001).

Where an investigation triggers a review and update of established EPP procedures, these reviews and update will be carried out in accordance the procedures established by Baffinland`s EHS Framework Standard (BAF-PH1-830-STD-0001).

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7 MONITORING AND REPORTING REQUIREMENTS

7.1 WASTE MONITORING

Waste monitoring includes the visual inspection of the main components of the waste management system (described below) and the measurement and recording of all wastes taken off site. The following information will be reported on an annual basis as currently is the practice:

a) The quantities hazardous waste transported off-site for disposal.

b) The location and name of the disposal facility for each waste type.

c) The date that each was hauled off-site for disposal, for each occasion that these are removed from the site.

d) Quantities of non-hazardous inert solid wastes disposed in the landfill.

e) Quantities of hydrocarbon contaminated soils and water processed in treatment facilities.

Inert solid wastes will be stored and disposed in a manner that minimizes the opportunity for windblown debris and animal attraction. Any wastes that are shipped off site will be recorded using an Off-Site Waste Disposal Log or equivalent developed from the EPP.

Regular visual inspection of waste management facilities will be conducted by the Environmental Manager to ensure proper operation and adequate environmental/health and safety controls are in place.

Waste audits will be undertaken periodically generation points to ensure waste streams are properly segregated

7.1.1 INCINERATOR MONITORING

Monitoring of the incinerator operation involves ensuring proper operation and that appropriate wastes are incinerated as well as those described in Section 4.1.

7.1.2 LANDFILL MONITORING

Monitoring of the inert landfill, involves visual inspections to ensure that only inert wastes are deposited in the landfill, and that adequate cover is provided so that wastes are contained and are not being dispersed by the wind. The Waste Disposal Facility (Landfill) Inspection Form is included in the EPP and landfill operating procedures. Wastes will be managed and monitored for compatibility with landfill disposal prior to disposal in the landfill. Also Waste audits will be undertaken periodically at generation points to ensure waste streams are properly segregated and that potential wildlife attractants are diverted from landfill.

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A written operations manual has been developed and submitted to the Water Board as part of the landfill design and commissioning process. This form may be revised and improved over time. The operations manual provides the following information:

- A description of the facility and the design.
- The maintenance schedule, frequency of inspection of dams, dykes and drainage works.
- The operation schedule.
- Identify the personnel responsible for completion of operations.
- The runoff and drainage control within and around the facility and restoration of erosion.
- Treatment option for contaminated drainage.
- The control of effluent discharge and effluent quality.
- Prevention measures for windblown debris.
- Management procedures for sorting of waste, along with management of hazardous waste and recyclable materials.

See Appendix E for the Mary River Project Landfill Operating Manual.

7.1.3 HAZARDOUS WASTE MONITORING

All Hazardous waste will be monitored according the Mary River Project Hazardous Material and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

7.1.4 LANDFARM MONITORING

Landfarm activity will be monitored according the Hydrocarbon Impacted Soils Storage and Landfarm Facility Operations Maintenance and Monitoring Plan (EBA, 2010) as presented in Appendix E.

7.1.5 OPEN BURNING MONITORING

Open burn activities will be monitored based on the Open Burning of Untreated Wood, Cardboard and Paper Products Procedure presented in Appendix I.

7.2 OPERATIONS MONITORING

In addition to specific monitoring and reporting requirements under the regulatory approvals such as the water licence, QIA land lease, land use permits, and fisheries authorization as well as monitoring of project effects, the Environmental Manager will coordinate routine inspections of various aspects of the operations. Routine inspections are conducted to confirm overall conformance with the requirements of the Waste Management Plan, companion EPP, and operating procedures/work instructions, and will include inspections of site-based waste management activities.

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Compliance Monitoring Forms are used to document the findings and required actions. These reports are generated as an internal operational management tool to promote continuous improvement in environmental performance and stewardship. Checklists are used as internal operational monitoring and compliance tools. These checklists are integrated into the EPP and other operating procedures/work instructions.

7.3 DATA MANAGEMENT

The Environmental Manager is responsible for data management and reporting related to waste management. The data management system includes conducting routine inspections and monitoring, and providing these results to appropriate parties as required.

7.4 WATER LICENCE REPORTING

Since waste disposal is regulated by the Nunavut Water Board (NWB) through the water licensing process, there will be monthly water licence reporting requirements. An annual Project report will be prepared that addresses requirements specified by the water licence, the Nunavut Impact Review Board (NIRB), and the landowners. Information likely to be included in reporting regarding waste disposal includes:

- GPS coordinates and photographic records of waste disposal facilities and status.
- Annual geotechnical inspection recommendations from a geotechnical engineer concerning the performance of lined and bermed waste containment structures.
- Quantities and fate of various types of waste on and off site
- Other details on waste disposal requested by the NWB.

Records of waste disposal activities will be available upon request to NWB and landowner's inspectors.

7.5 STAKEHOLDER REPORTING

Future arrangements regarding reporting could be made through the Inuit Impact Benefits Agreement (IIBA) or other mechanisms; this will be incorporated in future Plan updates.

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8 ADAPTIVE STRATEGIES

Baffinland is committed to continual improvement in its work activities with the aim of reducing risks to the environment and improving operational effectiveness. The strategy employed at Baffinland is regular monitoring supported by operational change and adoption of other mitigating measures if warranted.

Housekeeping and operational measures have been instituted. As part of the EPP, work procedures will continuously be adapted with the goal to reduce, recover, reuse and recycle waste. Regular scheduled inspections of waste management facilities along with the non-compliance reporting system described in Section 9 will ensure continual improvement and adaptation of waste management strategies throughout the life cycle of the Project.

As per the requirements of Baffinland`s EHS Management Framework Standard (BAF-PH1-830-STD-0001), the company will conduct and document management reviews of its Waste Management Plan on a regular basis. Such reviews will ensure the integration of monitoring results for the waste management plan are integrated with other aspects of the Project and that necessary adjustments are implemented as required. These reviews also provide a formal mechanism to assess the effectiveness of the management in achieving the company's objectives and maintaining on-going compliance with Project permits and authorizations.

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9 QA/QC

As per the requirements of Baffinland`s EHS Framework Standard (BAF-PH1-830-STD-0001), regular audits will be undertaken to ensure compliance with the current Waste Management Plan and that best management practices are implemented for waste management. The result of these audits will form the basis for an annual written statement of assurance by management on the effectiveness of its Waste Management Plan.

9.1 INCINERATORS

Camp incinerators are installed at camps associated with the Mary River Project. Each of these incinerators utilizes dual chamber, variable air flow design technology and is specifically designed for remote camp operations. QA/QC procedures for air emission monitoring are outlined in the Air Quality and Noise Abatement Management Plan (BAF-PH1-830-P16-0002).

9.2 OPEN BURNING

Only appropriate material, such untreated wood and cardboards, will be open burn in order to prevent the release of dangerous toxins and/or emissions. Regular audits to ensure compliance with the current Waste Management Plan. The type and quantities of materials being burnt will be recorded. Records of open burn wastes will be available upon request to NWB and inspectors.

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Appendix A -
Block Waste Flow Diagrams

- H337697-7000-07-002-0001 Milne Port - Mary River Project Block Flow Diagram for Construction Solid Waste
- H337697-4210-07-002-0001 Mine Site - Mary River Project Block Flow Diagram for Construction Solid Waste

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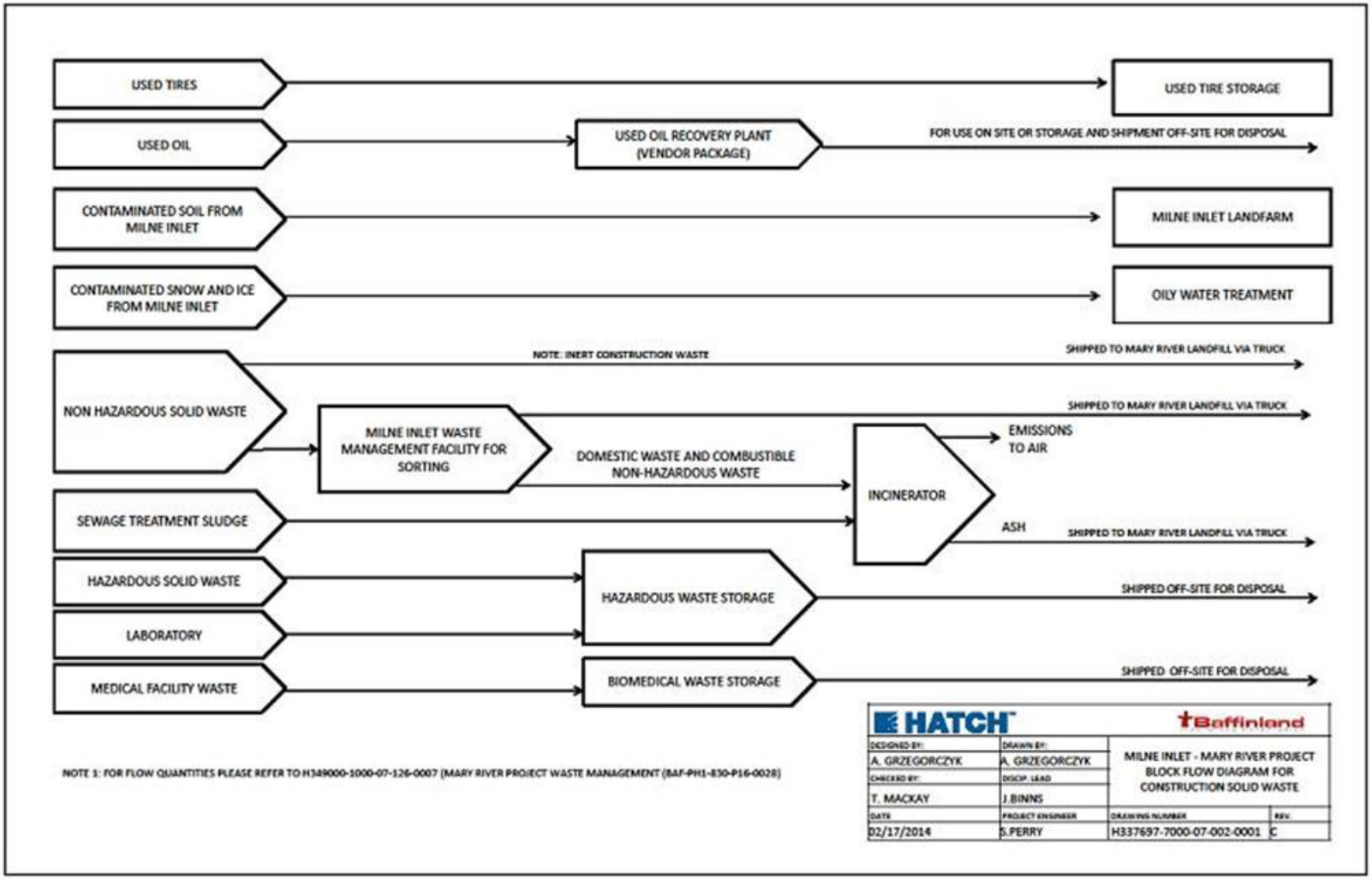
A.1 H334697-7000-07-0002-0001: Milne Port – Mary River Project Block Flow Diagram for Construction Solid Waste



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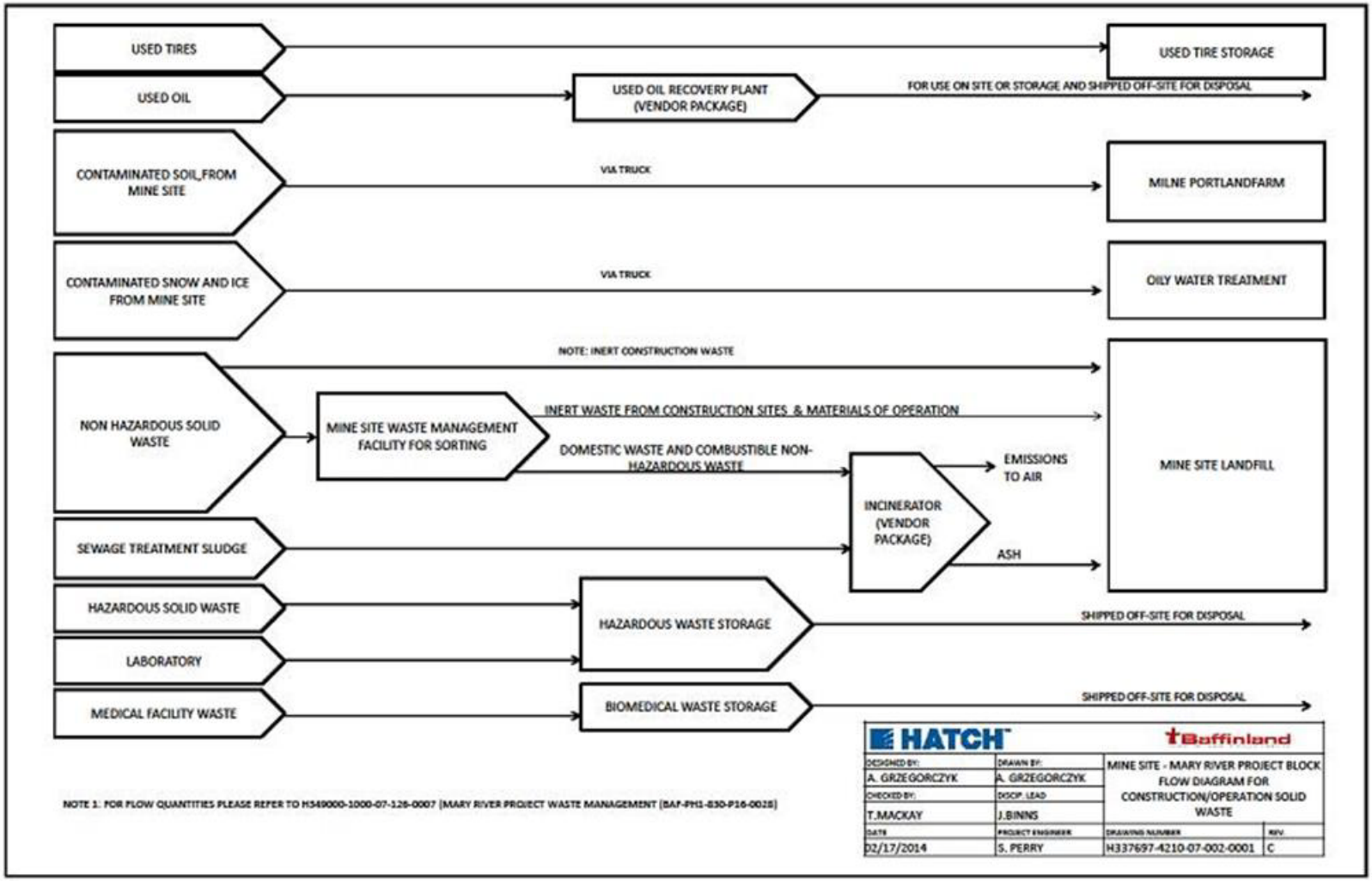
A.2 H337697-4210-07-002-0001: Mine Site – Mary River Project Block Flow Diagram for Construction Solid Waste



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Appendix B - Locations and Layouts of Waste Management Facilities

- H349000-2540-50-042-0001 Milne Port Waste Management Building General Arrangement
- H349000-4540-50-042-0001 Mine Site Waste Management Building General Arrangement
- E337697-0000-10-042-0001 General Arrangement of Typical Landfarm
- H337697-7000-10-042-0007 Milne Inlet Environmental Waste Management Facility
- H337697-4350-10-042-0001 Mine Site Environmental Waste Management Facility

Please refer to Appendix G for Milne Port and Mine Site Waste Facility Locations and Site Layouts

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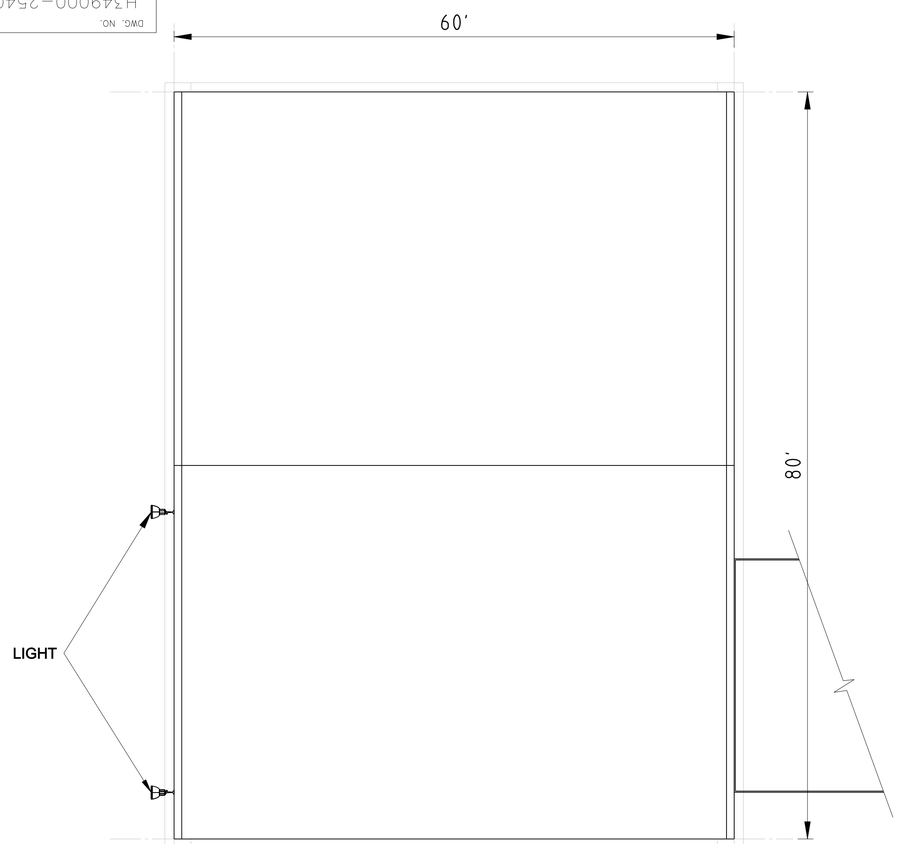
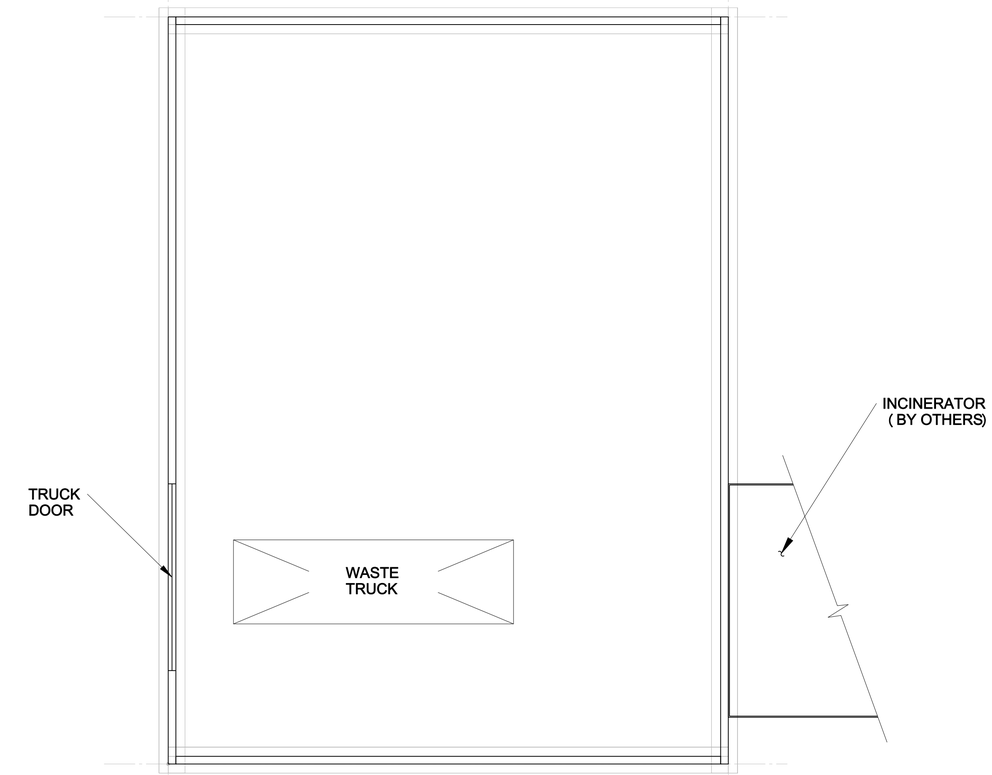
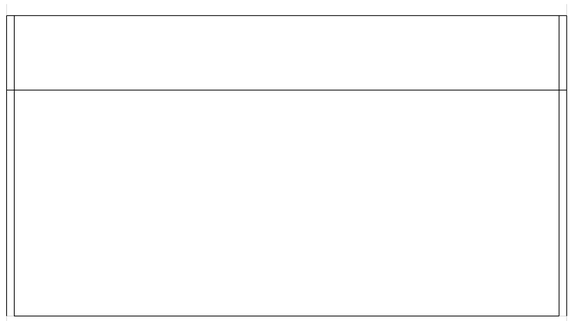


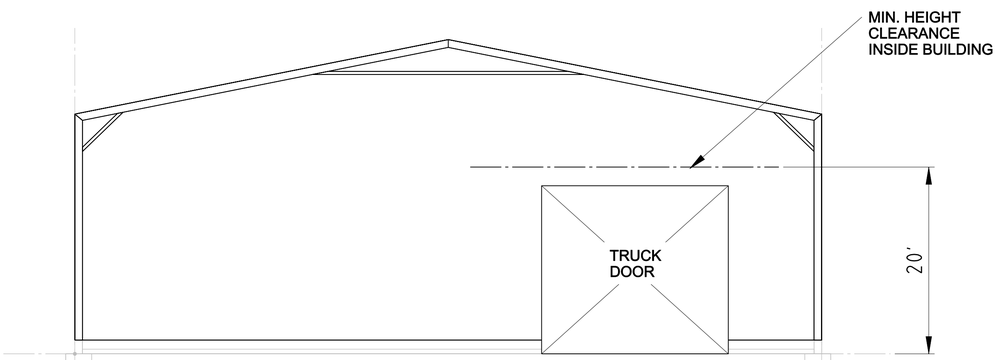
TOP VIEW



FLOOR PLAN



SIDE VIEW



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Baffinland Iron Mines Corporation

MARY RIVER PROJECT – ERP

MILNE PORT
WASTE MANAGEMENT BUILDING
GENERAL ARRANGEMENT

SCALE 1:100 OR AS NOTED

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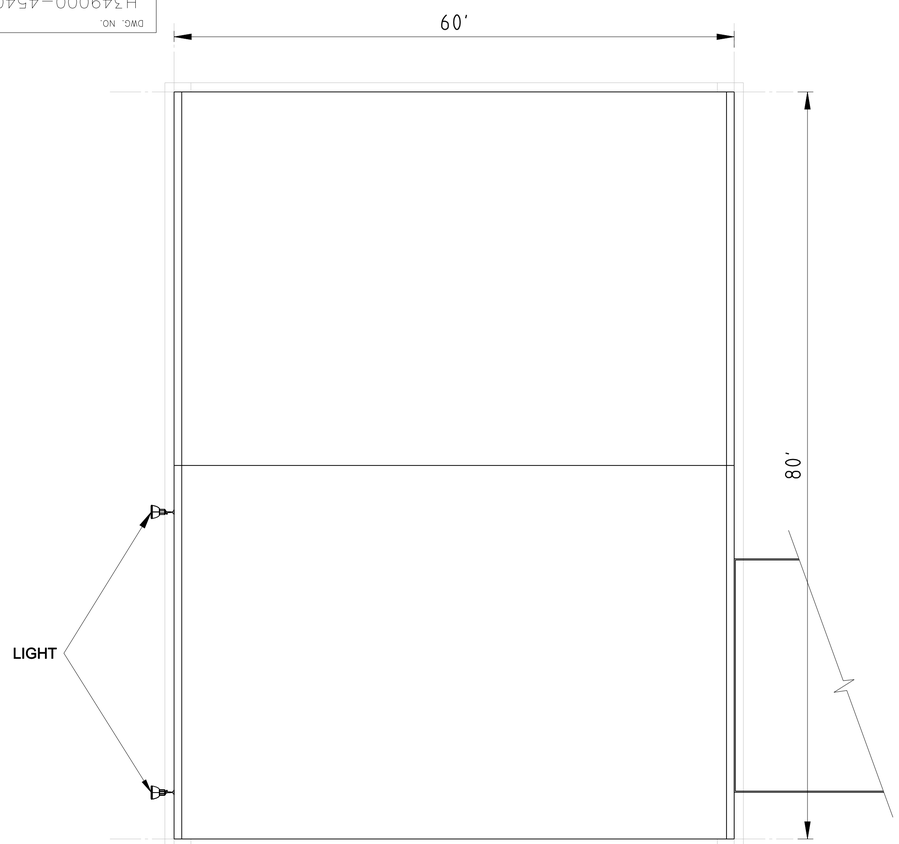
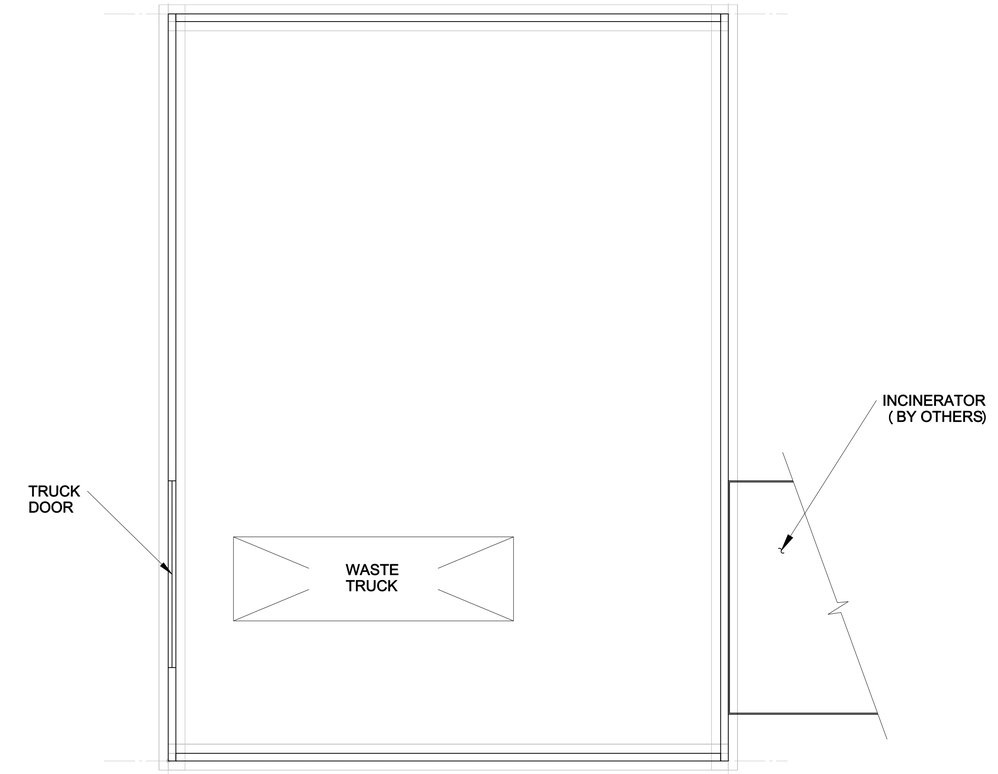
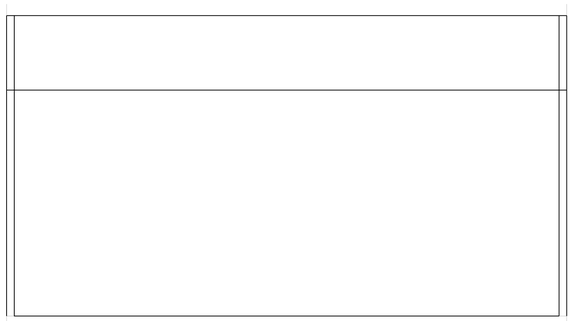


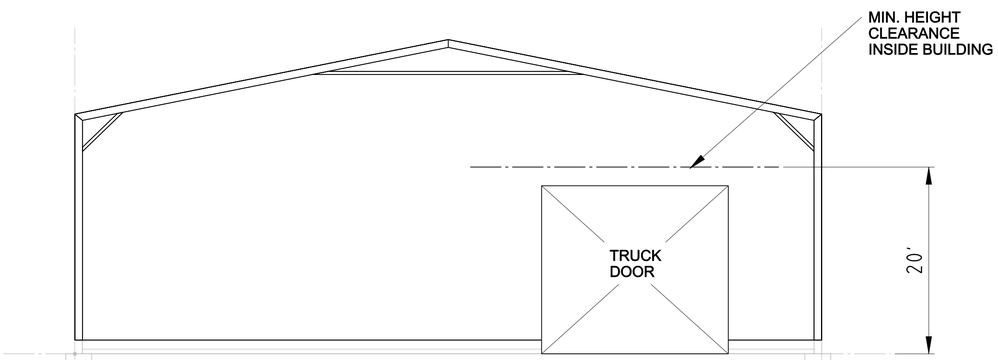
TOP VIEW



FLOOR PLAN



SIDE VIEW



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NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
REVISIONS					

REV.	ISSUE FOR	AUTH. BY	DATE
A	FOR INFORMATION	TT	2013-04-03
ISSUE AUTHORIZATION			

HATCH™

DESIGNED BY T. THERTELL DATE 2013-04-03	DRAWN BY D. KARUNAKARAN DATE 2013-04-03
CHECKED BY DATE	DISCIP. ENGR. DATE
PROJ. DES. COORD. DATE	PROJ. ENGR. DATE
PROJ. MGR. DATE	

Baffinland Iron Mines Corporation

MARY RIVER PROJECT – ERP

MINE SITE
WASTE MANAGEMENT BUILDING
GENERAL ARRANGEMENT

SCALE 1:100 OR AS NOTED

DWG. NO. H349000-4540-50-042-0001

REV. A

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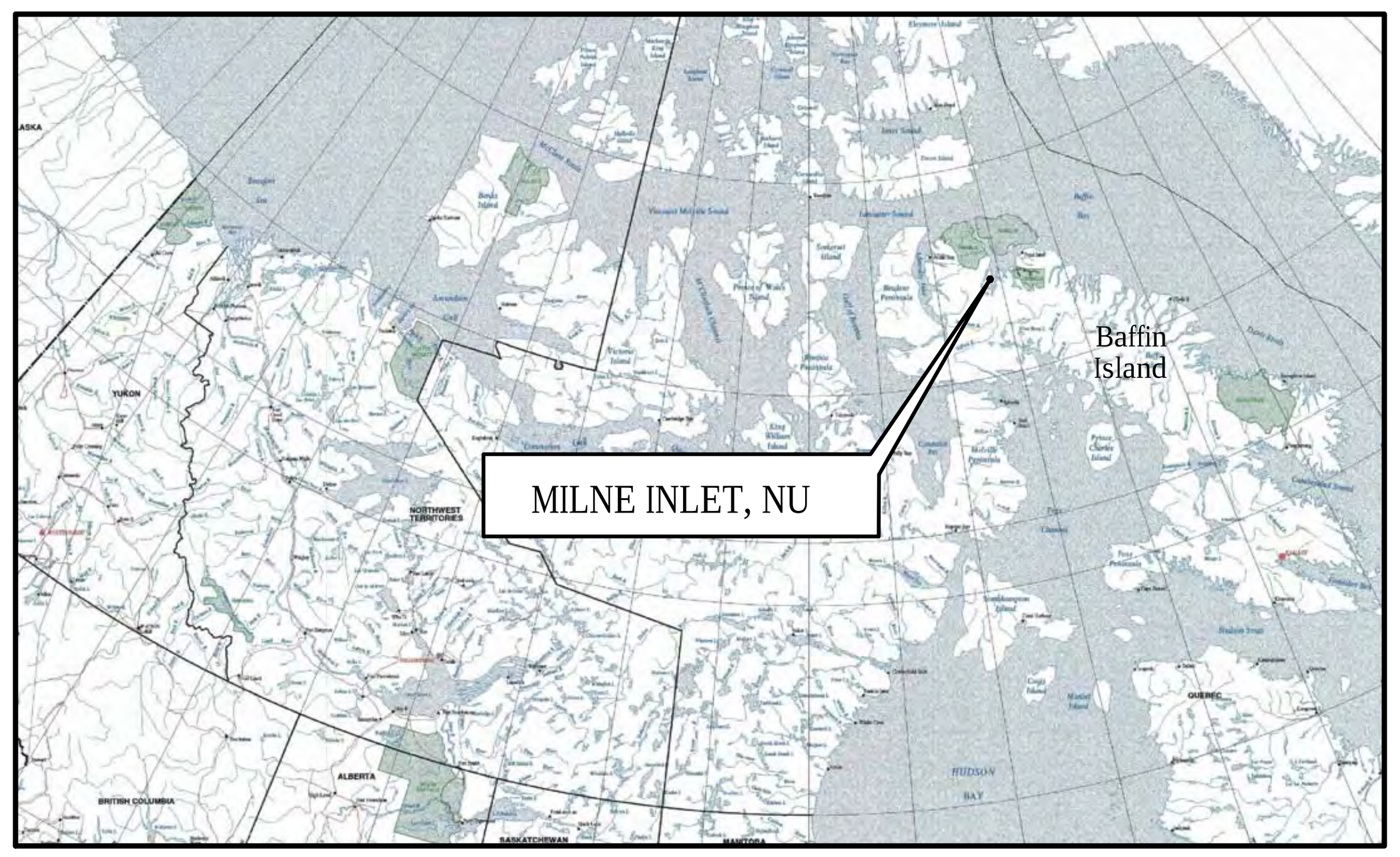
karu60388

DRAWING INDEX

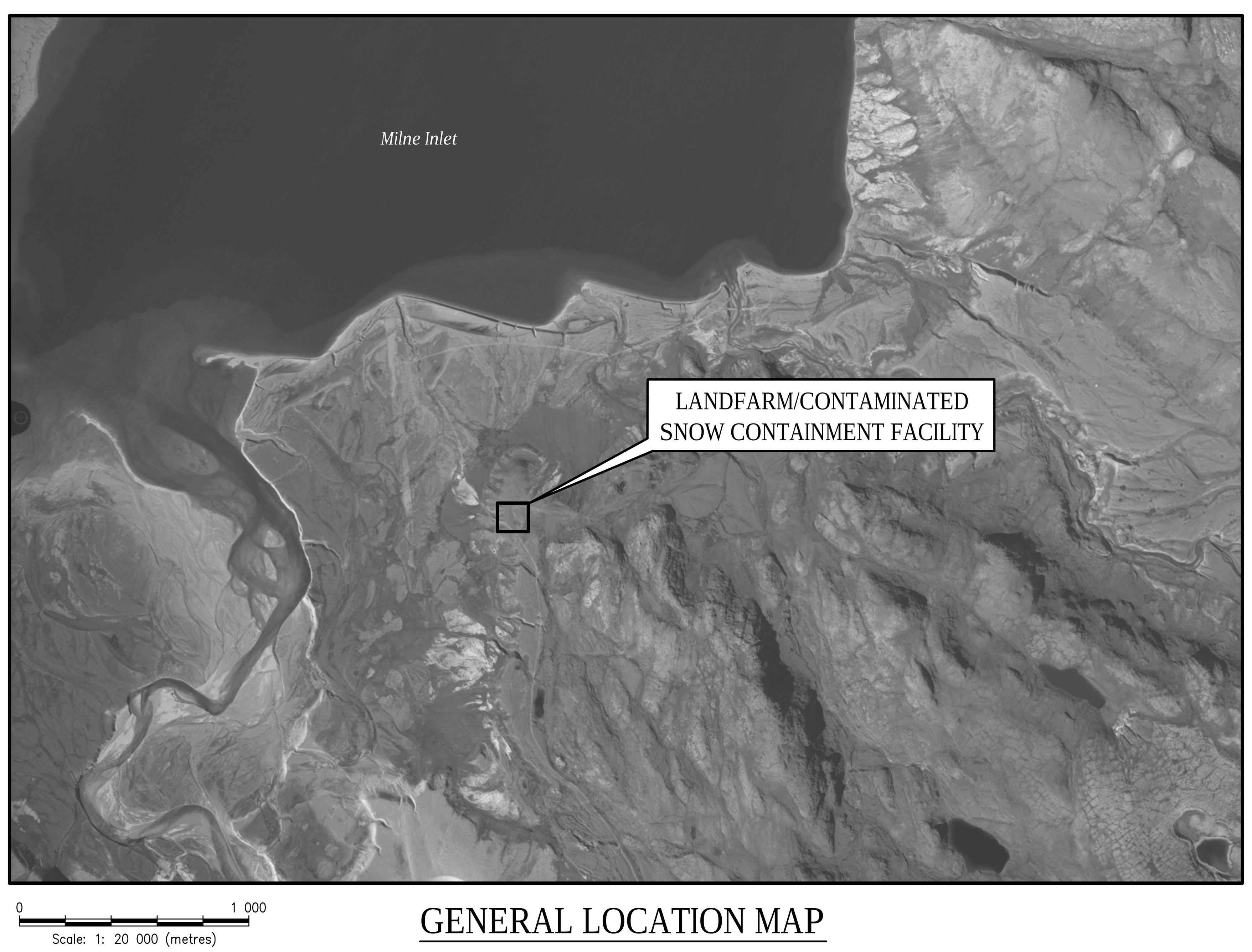
GENERAL ARRANGEMENTS

DRWG #	TITLE
C101	(GENERAL SITE) SITE LOCATION AND IDENTIFICATION OF MAJOR FEATURES
C102	PLAN AND LAYOUT
C103	CROSS-SECTIONS AND DETAILS



KEY MAP

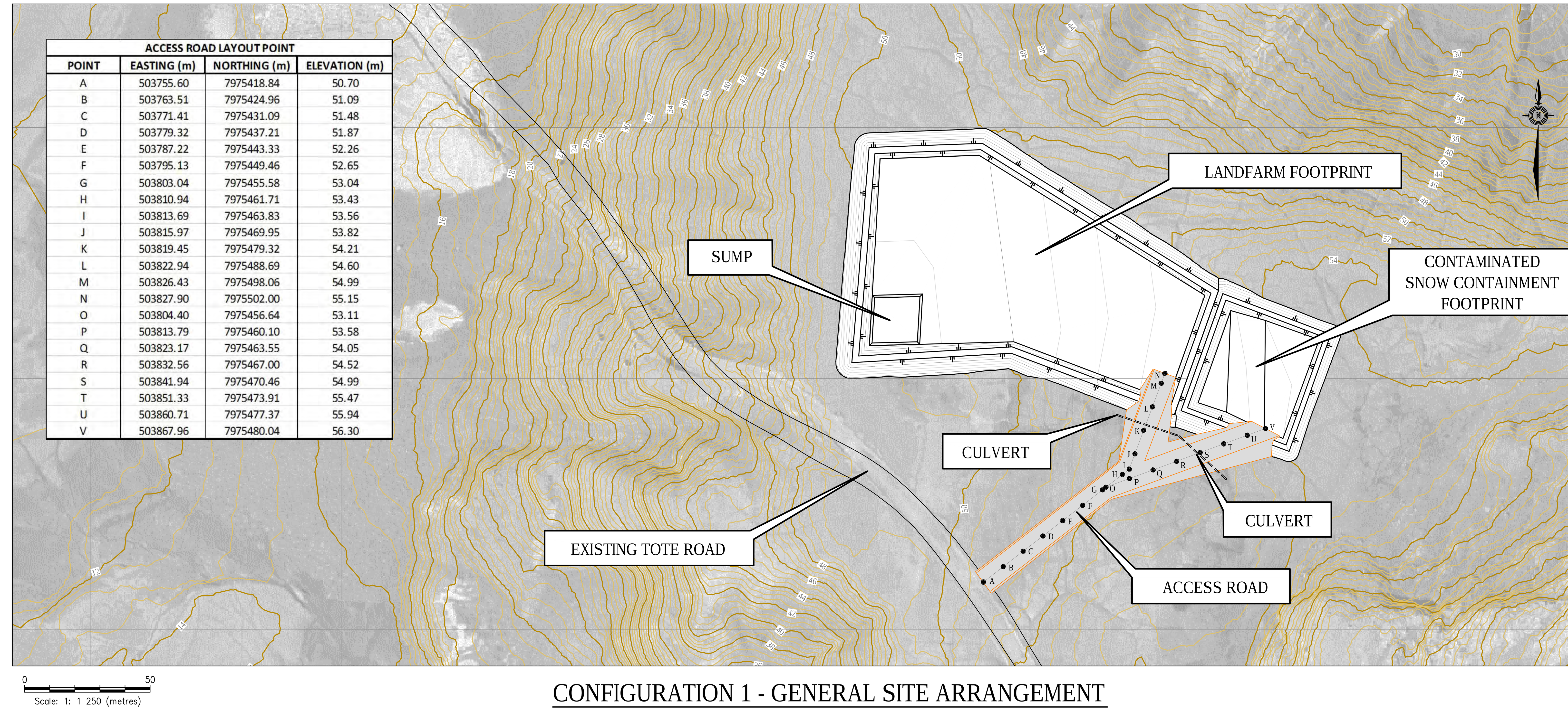
SCALE: NTS



GENERAL LOCATION MAP

SCALE: NTS

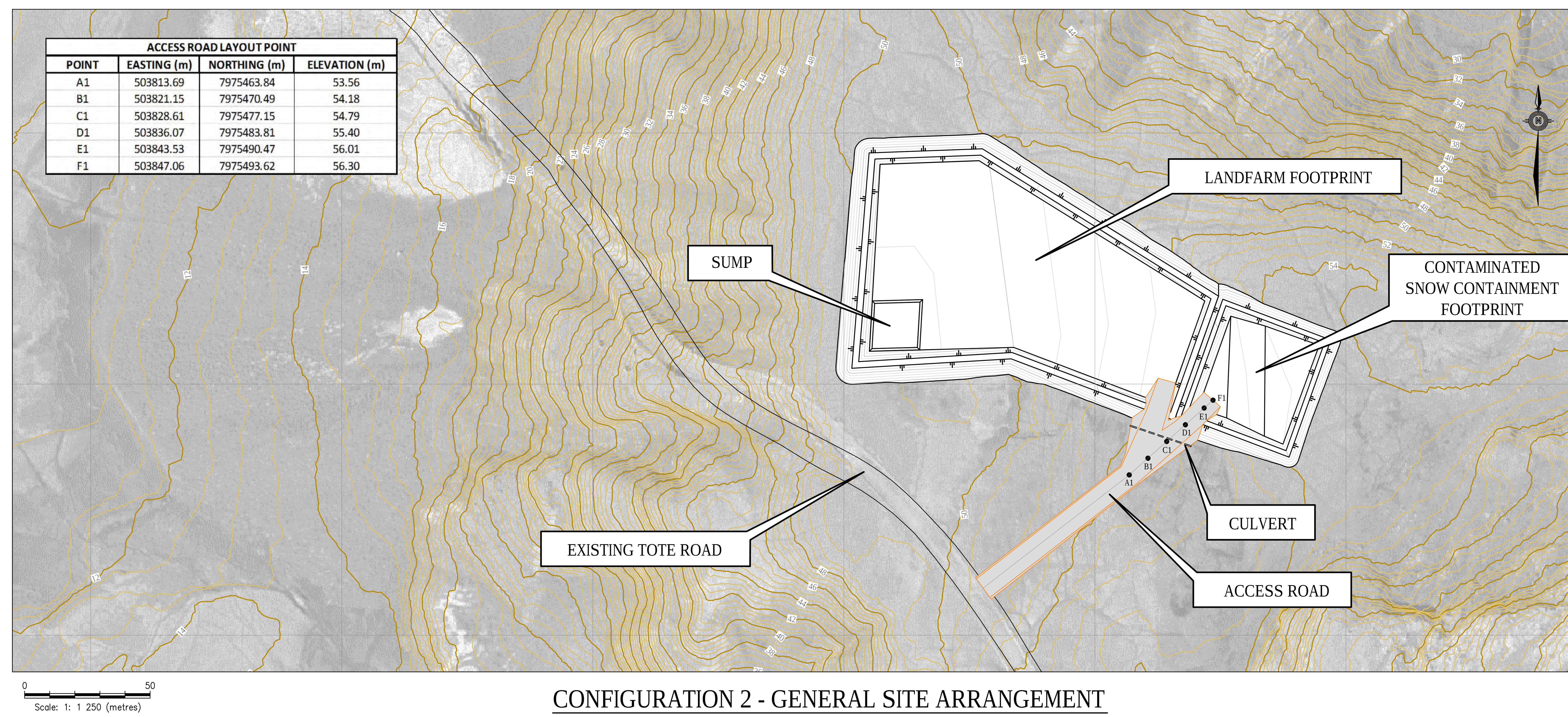
ACCESS ROAD LAYOUT POINT			
POINT	EASTING (m)	NORTHING (m)	ELEVATION (m)
A	503755.60	7975418.84	50.70
B	503763.51	7975424.96	51.09
C	503771.41	7975431.09	51.48
D	503779.32	7975437.21	51.87
E	503787.22	7975443.33	52.26
F	503795.13	7975449.46	52.65
G	503803.04	7975455.58	53.04
H	503810.94	7975461.71	53.43
I	503813.69	7975463.83	53.56
J	503815.97	7975469.95	53.82
K	503819.45	7975479.32	54.21
L	503822.94	7975488.69	54.60
M	503826.43	7975498.06	54.99
N	503827.90	7975502.00	55.15
O	503804.40	7975456.64	53.11
P	503813.79	7975460.10	53.58
Q	503823.17	7975463.55	54.05
R	503832.56	7975467.00	54.52
S	503841.94	7975470.46	54.99
T	503851.33	7975473.91	55.47
U	503860.71	7975477.37	55.94
V	503867.96	7975480.04	56.30



CONFIGURATION 1 - GENERAL SITE ARRANGEMENT

SCALE: 1: 1,250

ACCESS ROAD LAYOUT POINT			
POINT	EASTING (m)	NORTHING (m)	ELEVATION (m)
A1	503813.69	7975463.84	53.56
B1	503821.15	7975470.49	54.18
C1	503828.61	7975477.15	54.79
D1	503836.07	7975483.81	55.40
E1	503843.53	7975490.47	56.01
F1	503847.06	7975493.62	56.30



CONFIGURATION 2 - GENERAL SITE ARRANGEMENT

SCALE: 1: 1,250

NOTE:

ELEVATIONS FOR ACCESS ROAD ARE ESTIMATED BASED ON LIDAR ELEVATIONS.
THE ACCESS ROAD WAS NOT DESIGNED.

REVISIONS

NUM	DATE	DWN	CKD	APR	DESCRIPTION

DRAWING STATUS

NUM	DATE		DESCRIPTION
B	Mar. 20/2014	GDK	ISSUED FOR REVIEW
A	Mar. 18/2014	GDK	ISSUED FOR REVIEW

PERMIT

PROFESSIONAL SEAL

CLIENT

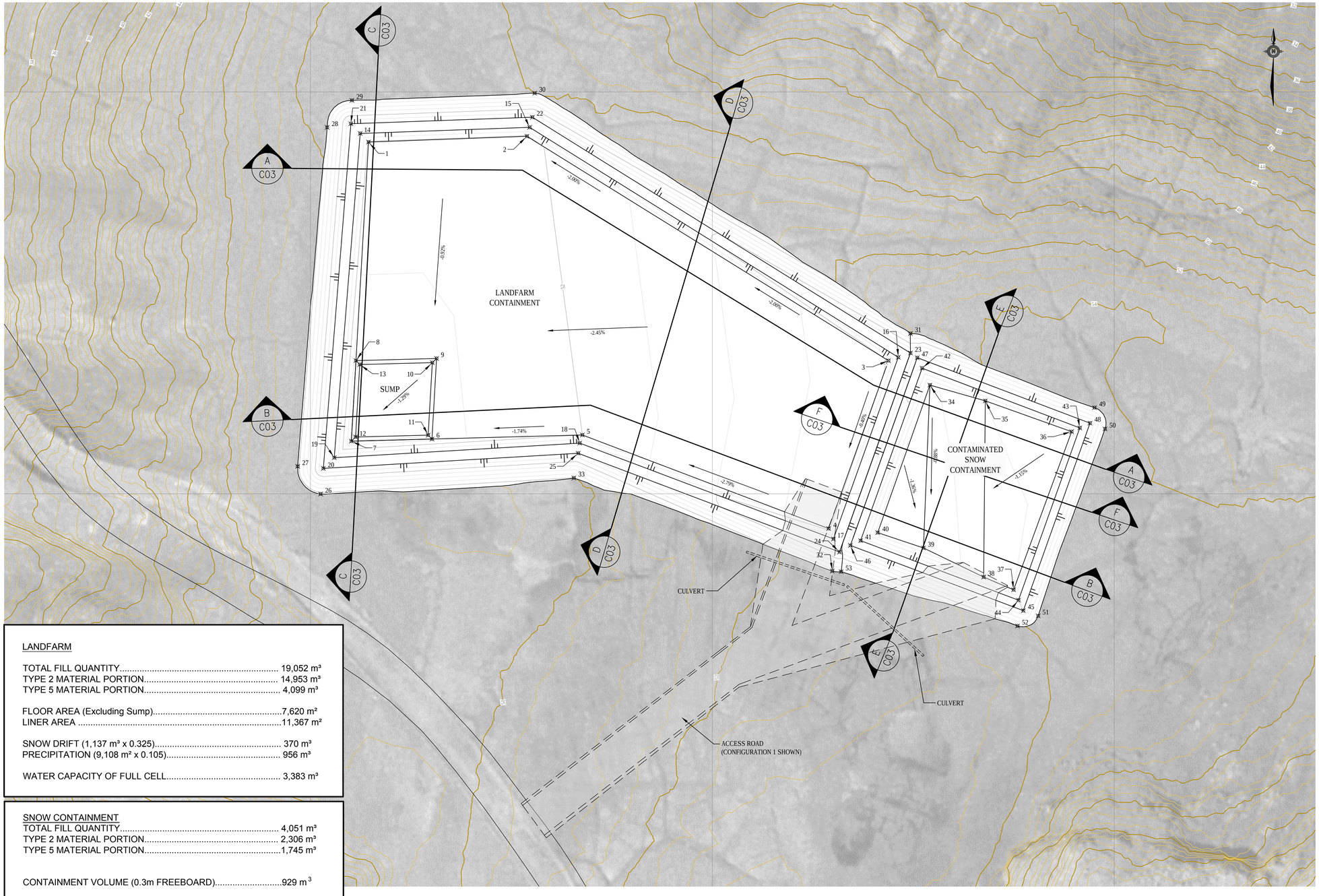
Baffinland Iron Mines Corporation

TETRA TECH EBA

MILINE INLET LANDFARM DESIGN
MILINE INLET, NU

SITE LOCATION AND IDENTIFICATION OF MAJOR FEATURES

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
E14103075-01	EDM	DRG	EG	0	C01
DATE:	SHEET No.	DWN	APP	STATUS	
March 20, 2014	1 of 3	DRG/DBD	GDK	B	



LANDFARM LAYOUT POINTS			
POINT #	NORTHING	EASTING	ELEVATION
1	7975587.511	503714.454	51.900
2	7975588.943	503753.860	51.900
3	7975533.109	503843.833	54.017
4	7975491.339	503828.939	53.826
5	7975514.617	503767.660	52.000
6	7975513.616	503730.232	51.349
7	7975513.079	503710.168	51.000
8	7975533.117	503711.322	51.242
9	7975533.654	503731.386	51.405
10	7975532.625	503730.325	50.905
11	7975514.591	503729.286	50.849
12	7975514.108	503711.228	50.500
13	7975532.142	503712.267	50.742
14	7975589.637	503712.373	53.001
15	7975591.169	503754.535	53.001
16	7975533.954	503846.258	55.035
17	7975488.747	503830.139	54.850
18	7975512.598	503767.006	53.001
19	7975508.964	503705.924	53.001
20	7975506.298	503703.203	53.001
21	7975592.054	503710.058	53.001
22	7975593.695	503755.209	53.001
23	7975535.010	503849.289	55.035
24	7975485.508	503831.638	54.850
25	7975510.071	503766.622	53.001
26	7975499.931	503702.536	49.800
27	7975506.808	503696.821	49.800
28	7975591.157	503704.166	50.100
29	7975597.870	503710.330	50.100
30	7975599.676	503755.799	49.996
31	7975539.868	503849.301	52.924
32	7975480.761	503829.844	52.313
33	7975503.940	503765.540	49.973

SNOW CONTAINMENT LAYOUT POINTS			
POINT #	NORTHING	EASTING	ELEVATION
34	7975527.021	503854.129	54.400
35	7975523.112	503867.909	55.000
36	7975515.446	503889.390	55.200
37	7975476.097	503874.955	55.000
38	7975479.275	503867.509	54.800
39	7975486.515	503852.529	54.000
40	7975490.322	503841.148	54.200
41	7975488.331	503836.891	55.858
42	7975531.243	503852.192	56.034
43	7975516.390	503891.423	56.000
44	7975473.512	503876.182	56.000
45	7975470.921	503877.383	56.000
46	7975487.153	503834.348	55.858
47	7975533.835	503850.993	56.034
48	7975517.567	503893.964	56.000
49	7975521.416	503895.096	54.000
50	7975516.128	503897.698	54.000
51	7975469.610	503881.071	54.043
52	7975467.106	503875.944	53.961
53	7975480.601	503832.038	52.386

LANDFARM

TOTAL FILL QUANTITY..... 19,052 m³
TYPE 2 MATERIAL PORTION..... 14,953 m³
TYPE 5 MATERIAL PORTION..... 4,099 m³

FLOOR AREA (Excluding Sump).....7,620 m²
LINER AREA .....11,367 m²

SNOW DRIFT (1,137 m³ x 0.325)..... 370 m³
PRECIPITATION (9,108 m² x 0.105)..... 956 m³

WATER CAPACITY OF FULL CELL..... 3,383 m³

SNOW CONTAINMENT

TOTAL FILL QUANTITY..... 4,051 m³
TYPE 2 MATERIAL PORTION..... 2,306 m³
TYPE 5 MATERIAL PORTION.....1,745 m³

CONTAINMENT VOLUME (0.3m FREEBOARD).....929 m ^{3}

LINER AREA .....2,716 m²

NOTE:

WATER CAPACITY OF THE LANDFARM AND CONTAINMENT AREA
ASSUMES 0.3 m FREEBOARD

0 25
Scale: 1: 500 (metres)

NUM	DATE	DWN	CKD	APR	DESCRIPTION
REVISIONS					

NUM	DATE	APR	DESCRIPTION
B	Mar. 20/2014	GDK	ISSUED FOR REVIEW
A	Mar. 18/2014	GDK	ISSUED FOR REVIEW
DRAWING STATUS			

PERMIT

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Baffinland Iron Mines Corporation

TETRA TECH EBA

MILNE INLET LANDFARM DESIGN
MILNE INLET, NU

PLAN AND LAYOUT

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
E14103075-01	EDM	DRG	EG	0	C02
DATE:	SHEET No.	DWN	APP	STATUS	
March 20, 2014	2 of 3	DRG/DBD	GDK	B	

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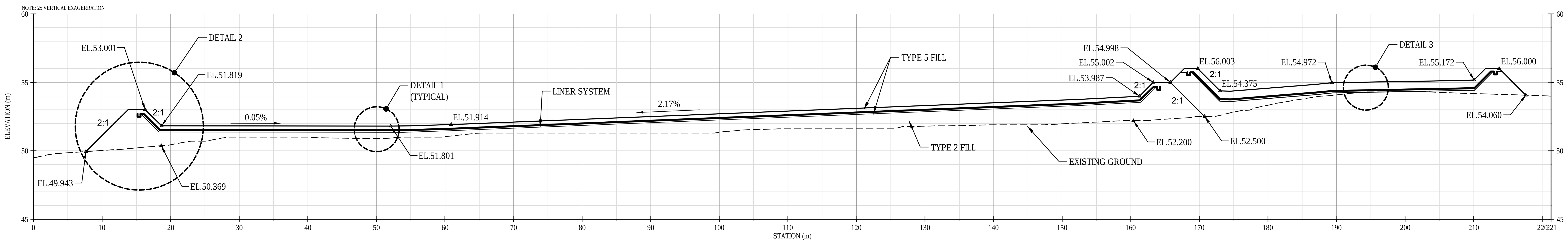

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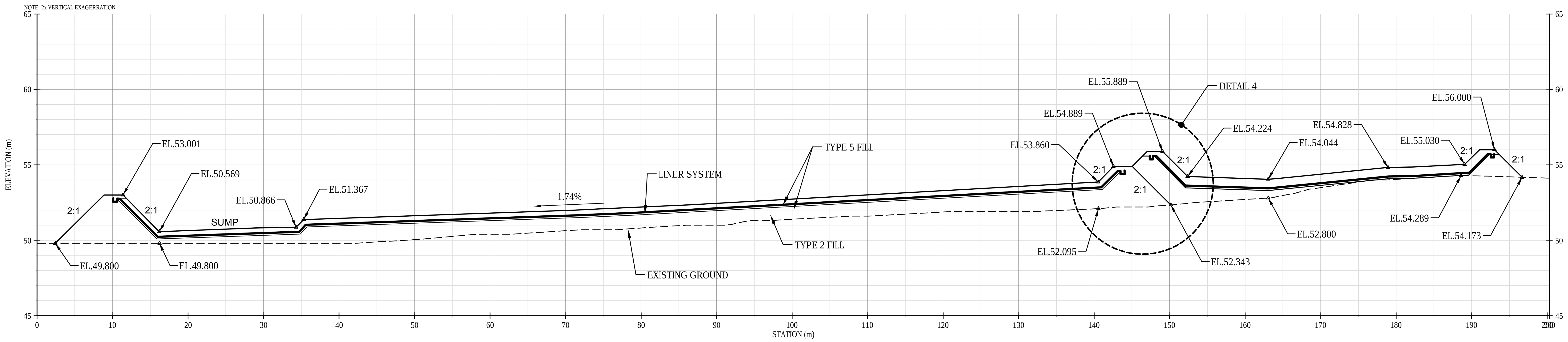

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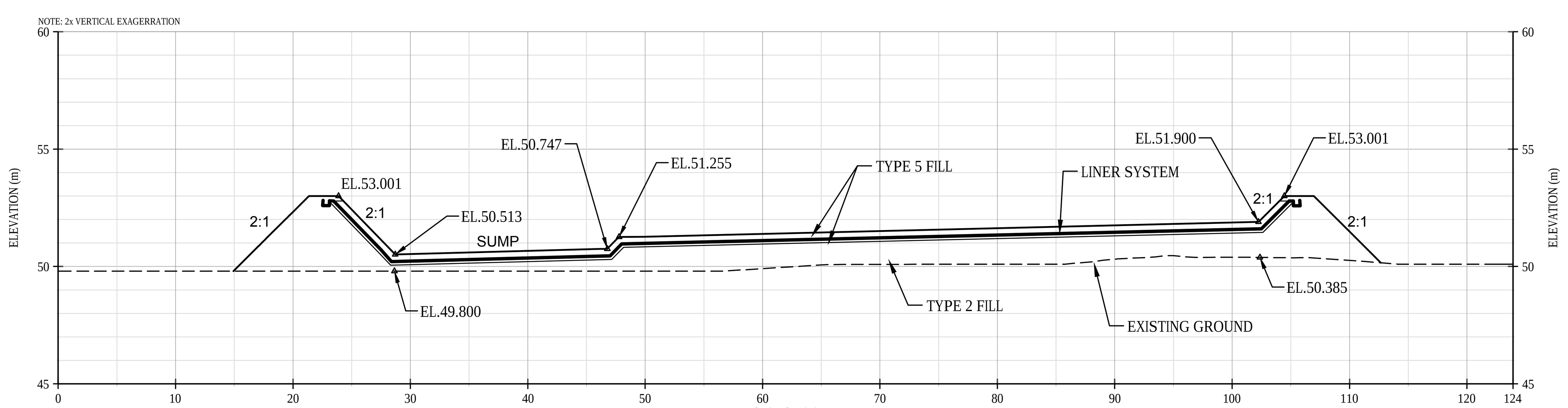

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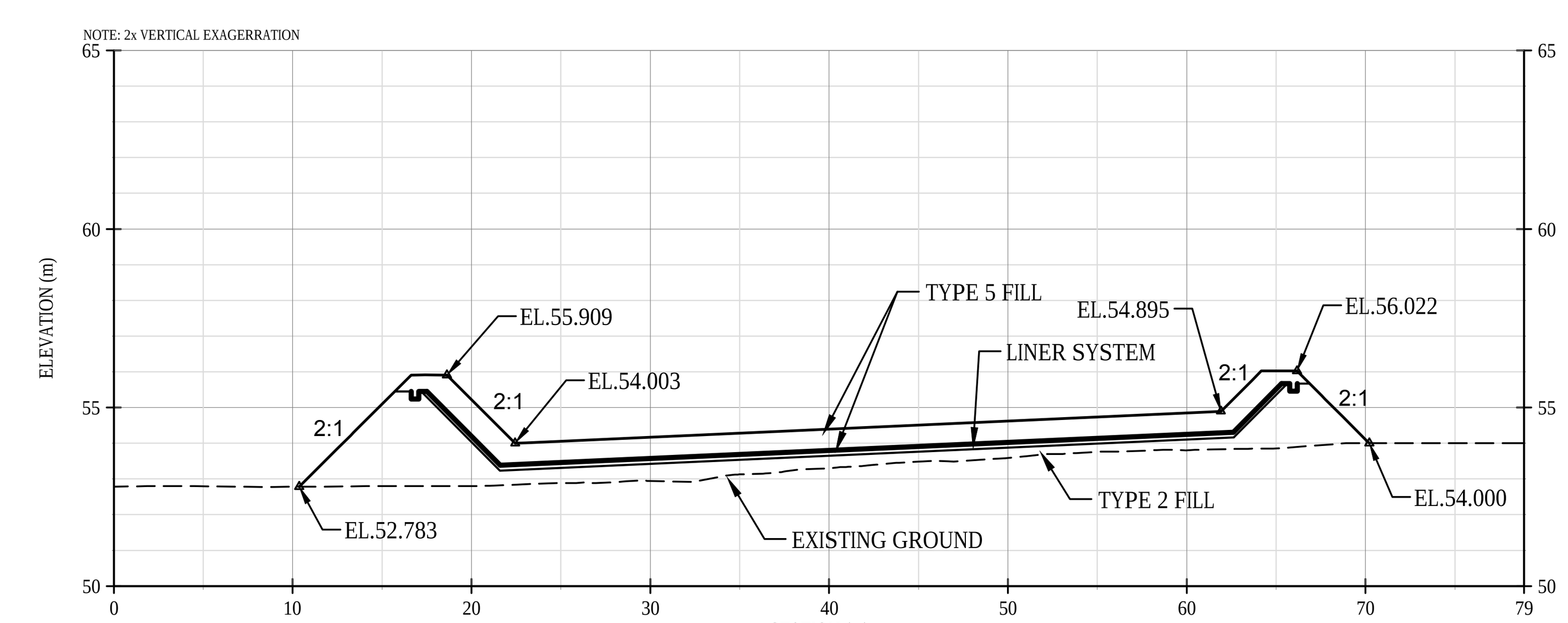

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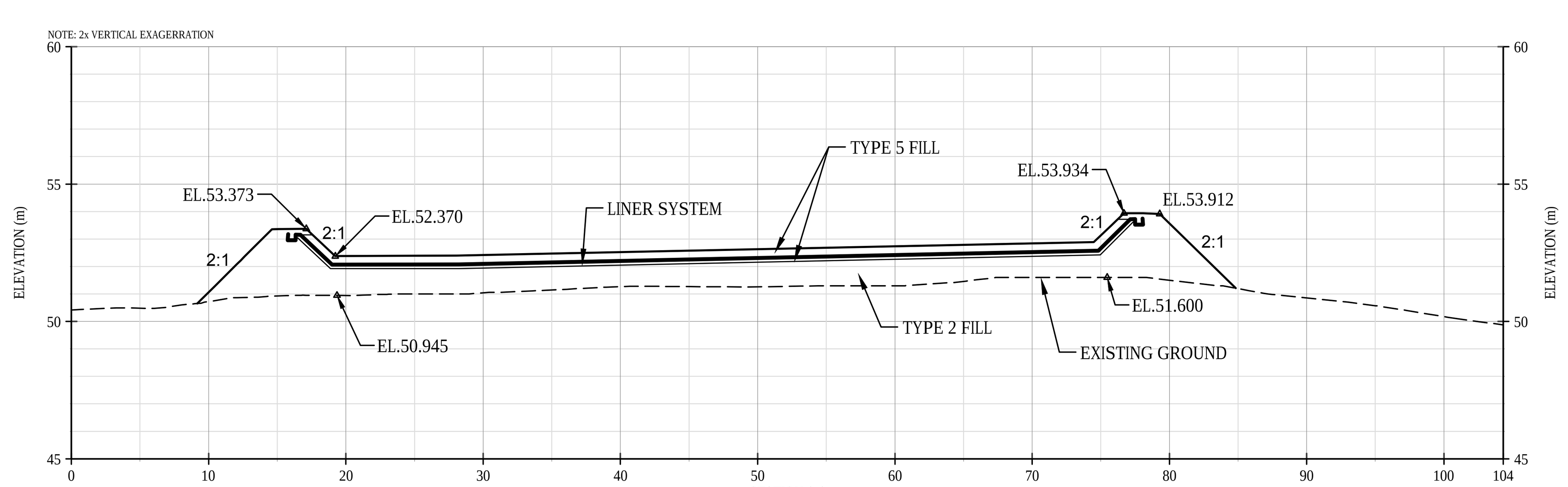

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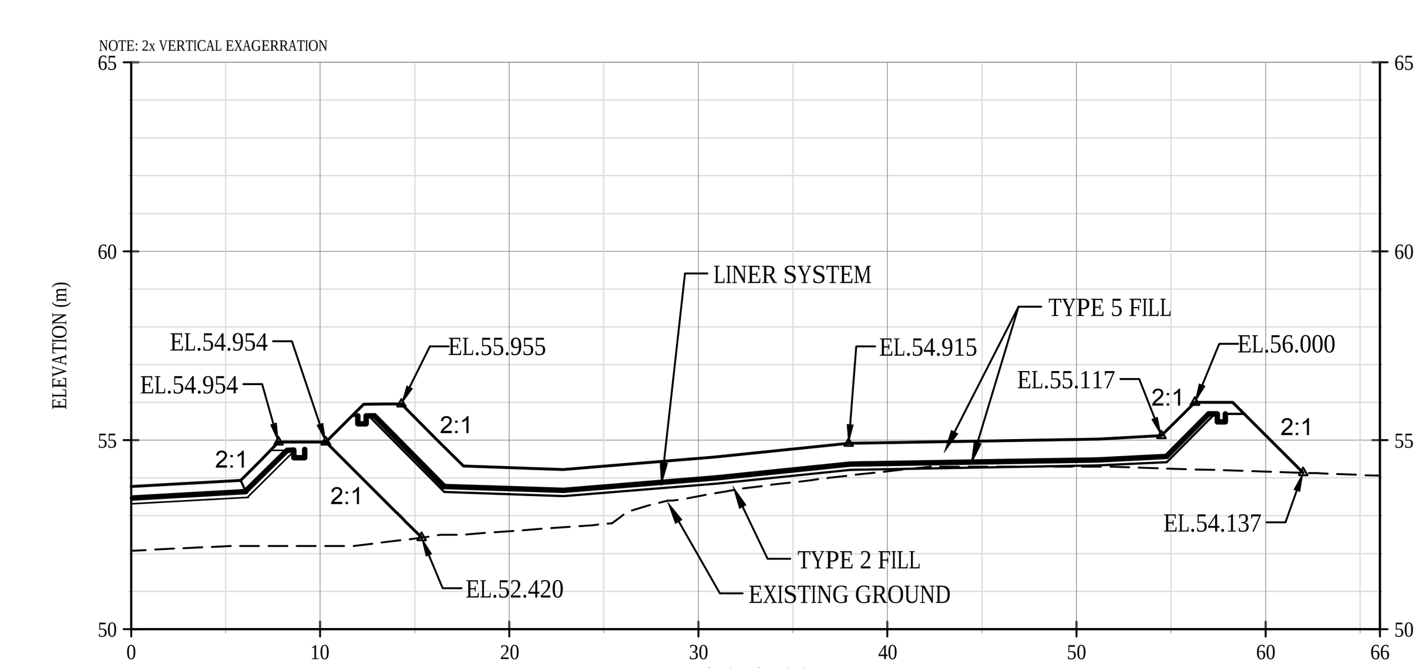

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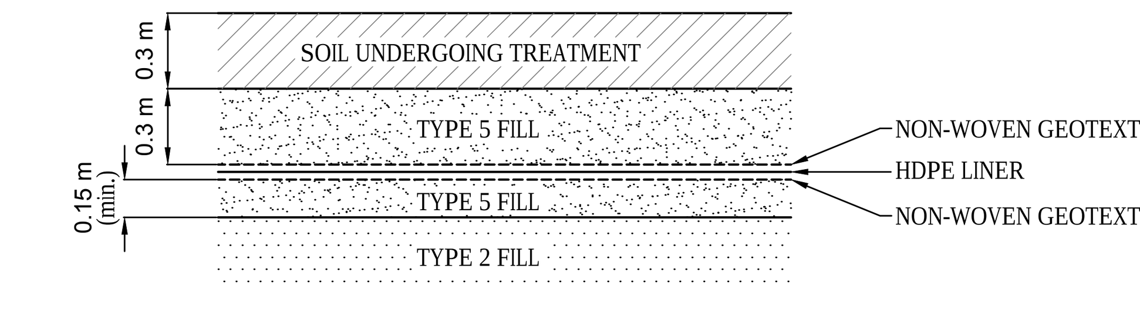
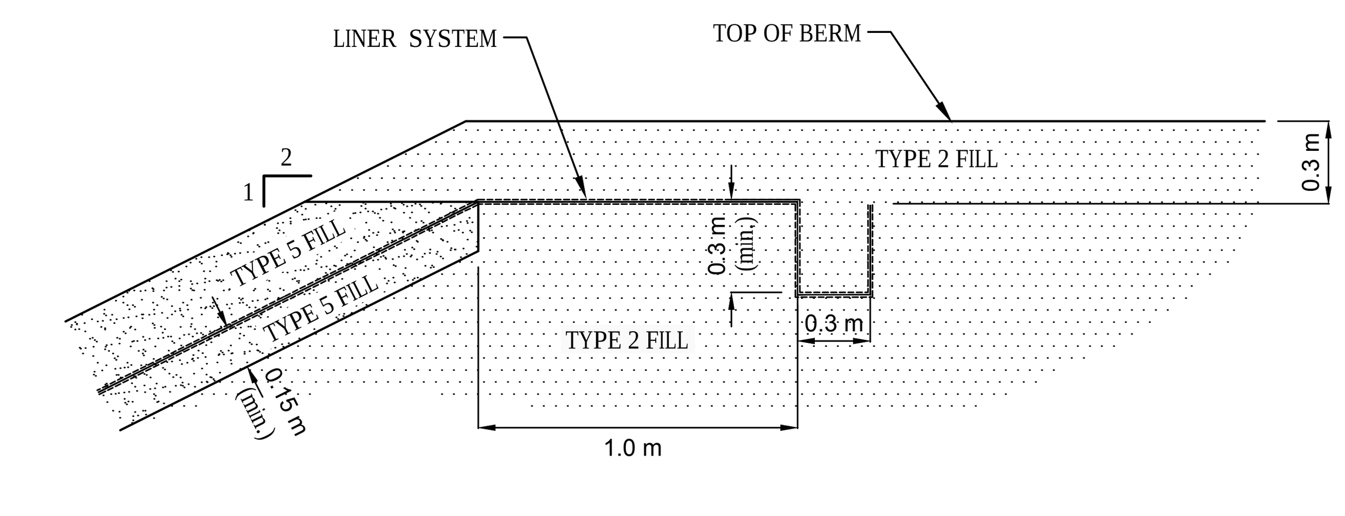
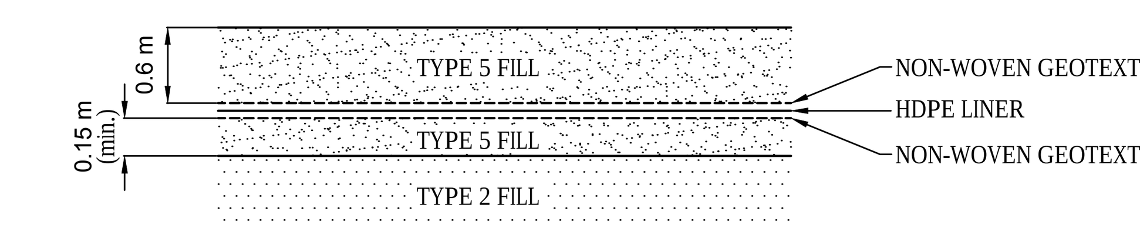


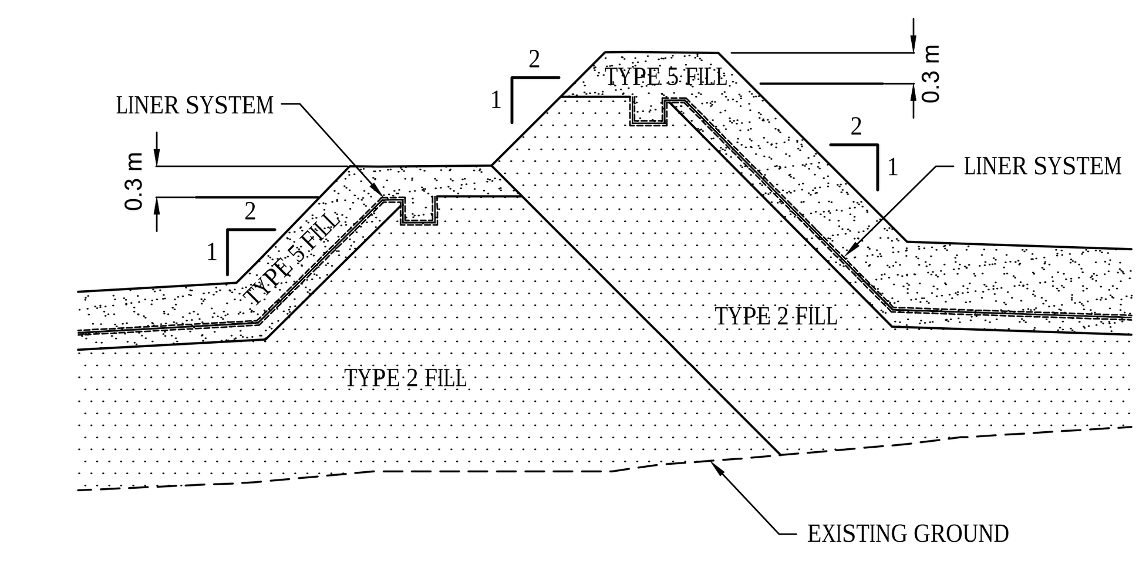
DETAIL - LINER SYSTEM (1/C03) N.T.S.



DETAIL - LINER ANCHORING (2/C03) N.T.S.



DETAIL - LINER SYSTEM (3/C03) N.T.S.



DETAIL - LINER ANCHORING (4/C03) N.T.S.

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES.
2. COVER OVER LINER ALONG CREST OF SNOW CONTAINMENT FACILITY BERM IS 0.3 m

Scale: 1: 400 (metres) 0 — 20

REVISIONS

NUM	DATE	DWN	CKD	APR	DESCRIPTION

DRAWING STATUS

NUM	DATE	APR	DESCRIPTION
B	Mar. 20/2014	GDK	ISSUED FOR REVIEW
A	Mar. 18/2014	GDK	ISSUED FOR REVIEW

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CLIENT

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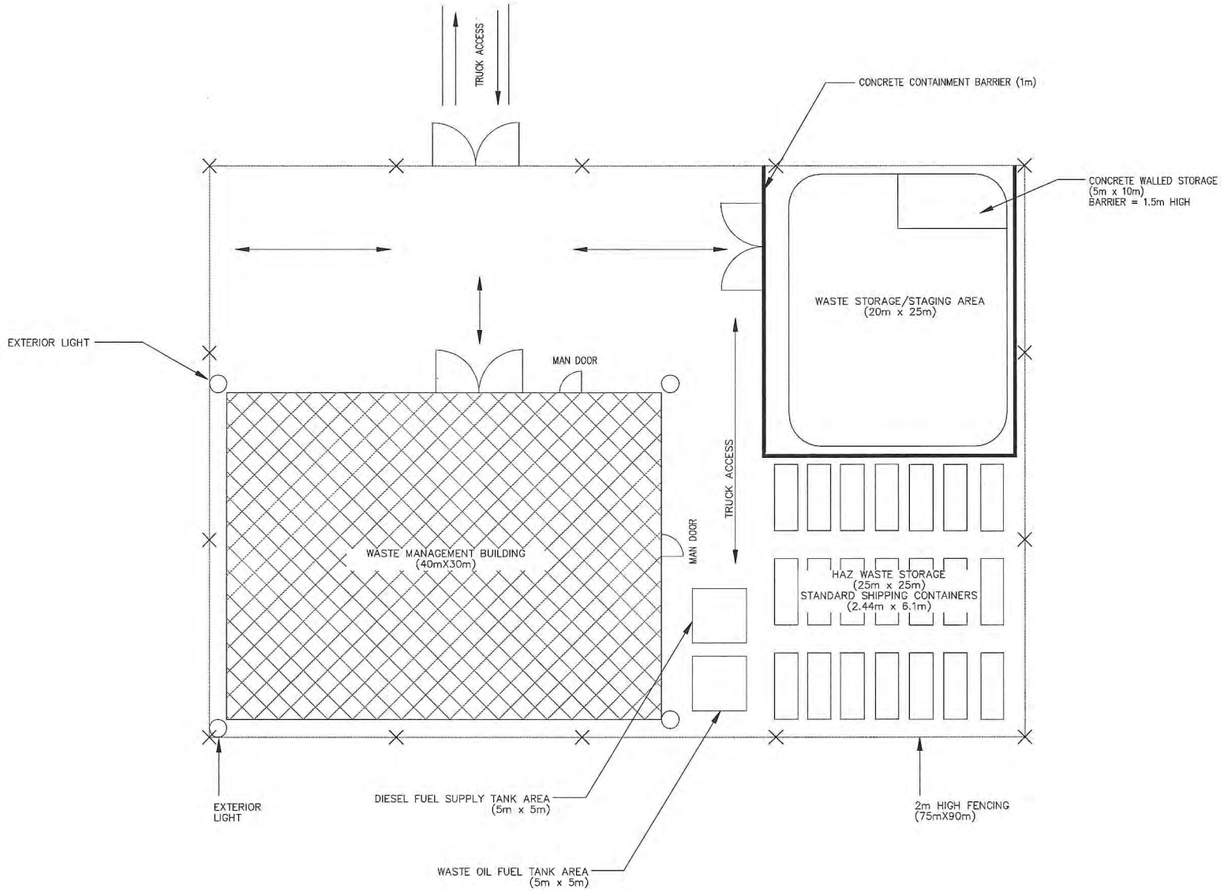
TETRA TECH EBA

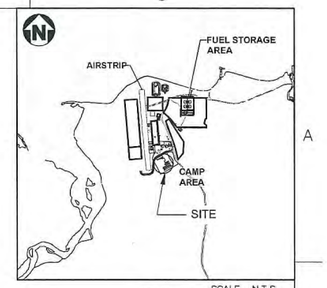
MILNE INLET LANDFARM DESIGN
MILNE INLET, NU

SECTIONS

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
E14103075-01	EDM	DRG	EG	0	C03
DATE: March 20, 2014	SHEET No. 3 of 3	DWN DRG/DBD	APP GDK	STATUS A	

DWG. NO. H337697-7000-10-042-0007





KEY PLAN
MILNE SITE

SCALE N.T.S.

LEGENDS

- WATER
- RIVER/STREAM/DRAINAGE
- FENCE

NOTES:

ALL BUILDING AND FACILITIES TO HAVE INTERIOR AND EXTERIOR LIGHTING.

SCALE 5 2.5 0 5 10 15 20 25 m

SCALE 1:250

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Drawing Name: P:\2899180 - Mary River\CAD\Can\Roads\Environmental Dwg\Waste Management Facilities\H337397-7000-10-042-0007.dwg

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

REGISTERED PROFESSIONAL ENGINEER
J.V. CASSON
LICENSEE
29/11

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR INTERNAL REVIEW				
REVISIONS					

REV.	ISSUE FOR	AUTH. BY	DATE
A	ENVIRONMENTAL PERMIT		
ISSUE AUTHORIZATION			

HATCH™

DESIGNED BY / DATE	DRAWN BY D.F. / DATE
CHECKED BY R.L. / DATE	DISCIP. ENGR. / DATE
PROJ. DES. COORD. / DATE	PROJ. ENGR. / DATE
PROJ. MGR. / DATE	

Baffinland Iron Mines Corporation

MARY RIVER PROJECT

MILNE INLET
ENVIRONMENTAL
WASTE MANAGEMENT FACILITIES

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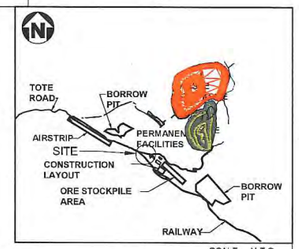
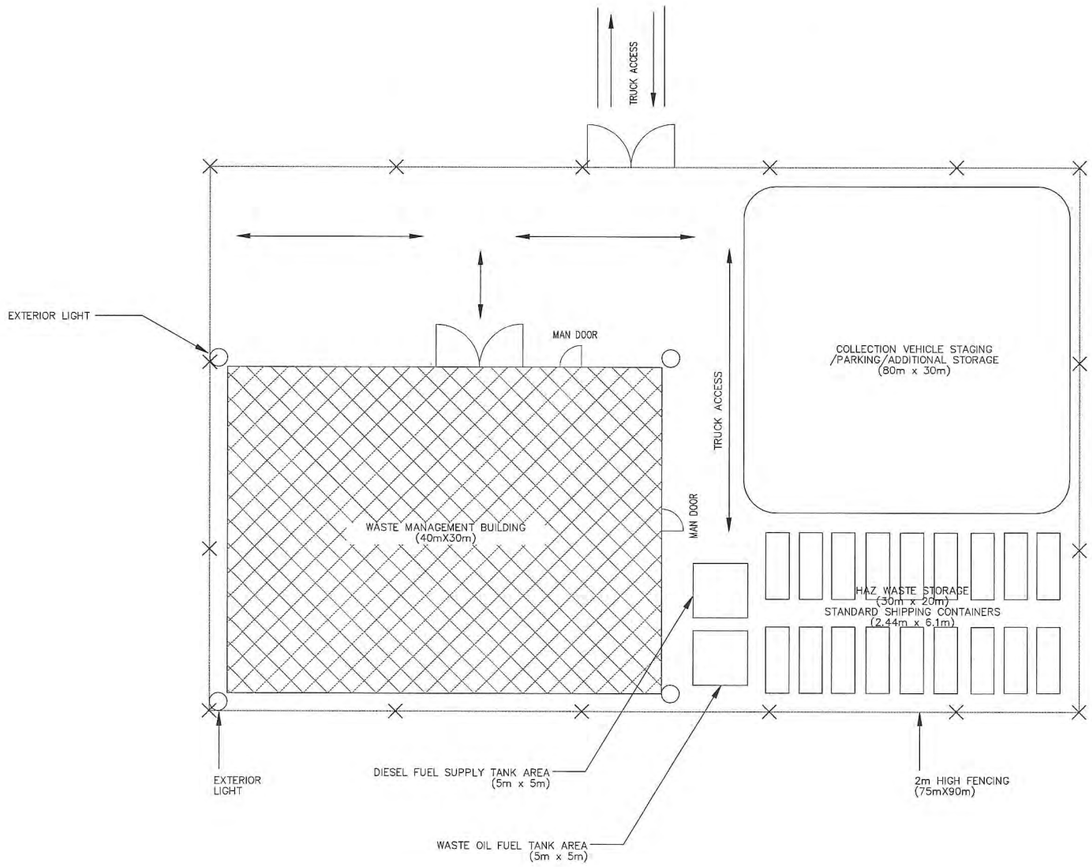
DR AS NOTED	H337697-7000-10-042-0007	A

DWG. NO. H337697-4350-10-042-0001



SCALE N.T.S.

KEY PLAN
MINE SITE



LEGENDS

- WATER
- RIVER/STREAM/DRAINAGE
- FENCE

NOTES:

ALL BUILDING AND FACILITIES TO HAVE INTERIOR AND EXTERIOR LIGHTING.

SCALE 5 2.5 0 5 10 15 20 25 m

SCALE 1:250

REGISTERED PROFESSIONAL ENGINEER
J.V. CASSON
LICENSEE
NT/NU
Sept 29/11

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR INTERNAL REVIEW				
REVISIONS					

REV.	ISSUE FOR	AUTH. BY	DATE
A	ENVIRONMENTAL PERMIT		
ISSUE AUTHORIZATION			

HATCH

DESIGNED BY / DATE	DRAWN BY D.F. / DATE
CHECKED BY R.L. / DATE	DISCIP. ENGR. / DATE
PROJ. DES. COORD. / DATE	PROJ. ENGR. / DATE
PROJ. MGR. / DATE	

Baffinland Iron Mines Corporation

MARY RIVER PROJECT

MINE SITE
ENVIRONMENTAL
WASTE MANAGEMENT FACILITIES

SCALE	DWG. NO.	REV.
OR AS NOTED	H337697-4350-10-042-0001	A

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Appendix C -
Incinerator Manual and Standard Operating Procedure

- ECO M2TN Mobile Incinerator Operating and Maintenance Manual
- Baffinland Iron Mines Incinerator Operating Procedure

The information contained herein is proprietary to Baffinland Iron Mines Corporation and is used solely for the purpose for which it is supplied.
It shall not be disclosed in whole or in part, to any other party, without the express permission in writing by Baffinland Iron Mines Corporation.

Note: This is an UNCONTROLLED COPY. All staff members are responsible to ensure the latest revision is used.

EQUIPMENT MANUAL

EWS Mobile Incinerator: ECO M2TN

AUGUST 2013

TABLE OF CONTENTS

1.0 GENERAL INFORMATION

1.1 COMMON ACRONYMS

Acronym	Full Name
AC	Air Conditioning
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
Cd	Cadmium
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSA	Canadian Standards Association
DCH0	Default Channel Zero
DP	Delta Pressure (amount of pressure change)
EPC	Electronic Proportional Control
ESC key	Escape Key
EWS	Eco Waste Solutions
EWS Mobile	EWS Mobile Incinerator
H20	Water
HCl	Hydrochloric Acid
HCL	Hydrogen chloride
Hg	Mercury
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
ISO	International Organization for Standards
KPa	Kilopascals
LCD	Liquid Crystal Display
LED	Light-emitting Diode
MCR	Master Control Relay
ME	Mist Eliminator
MPCB	Motor Protection Circuit Breaker
N.C.	Normally Closed
N.O.	Normally Open
NO_x	Oxides of Nitrogen
O_2	Oxygen
Pb	Lead
PCCD/PCCF	Dioxins & Furans
PDT	Pole Double Throw
PET	Polyethylene Terephthalate
pH meter	pH meter
P&ID	Process & Instrumentation Diagram
PLC	Programmable Logic Controller
PM	Particulate Matter

Acronym	Full Name
PPM	Parts Per Million
SPDT	Single Pole Double Throw
SCFM	Standard Cubic Feet Meter
SO2	Sulphur Dioxide
SOC	Southern Operational Command
SOW	Statement of Work
SO_x	Oxides of Sulphur
SP	Static Pressure
TEFC	Totally Enclosed, Fan-Cooled
THC	Total Hydrocarbon
USB key	Universal Serial Bus
VDC	Volts Direct Current
VFD	Variable Frequency Drive
W.C.	Water Column

1.2 EWS CONTACT INFORMATION

	CONTACT INFORMATION	
Eco Waste Solutions	5195 Harvester Road, Unit 14	
	Burlington, Ontario, Canada	
	L7L 6E9	
Phone	905-634-7022	
Toll Free	1-866-326-2876	
Fax	905-634-0831	
email	info@ecosolutions.com	
Ask for/Address to	Customer Service Manager	

1.3 HEALTH & SAFETY PRECAUTION

1.3.1 Health and Safety Precautions

PLEASE READ THIS SECTION BEFORE READING THE REST OF THE MANUAL

1.3.2 Safety Warnings

 The **EWS Mobile Incinerator** has a number of safety related hazards that need to be recognized by all operators:

- Electricity
- Heavy mechanical parts which may move due to gravity
- High Temperature
- Explosive Gases
- Flammable Liquids

IMPORTANT POINTS TO FOLLOW

THE EWS MOBILE INCINERATOR CAN CAUSE SERIOUS INJURY OR DEATH, please follow these points below:

1.3.2.1 KEEP CLEAR OF ANY MOVING PARTS AT ALL TIMES.

1.3.2.2 BEFORE STARTING THE CYCLE OF THE SYSTEM ENSURE THAT ALL PERSONNEL ARE CLEAR OF THE EWS MOBILE INCINERATOR.

1.3.2.3 DO NOT ATTEMPT TO START OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL IS READ THOROUGHLY AND IS UNDERSTOOD

1.3.2.4 RESPONSIBILITY FOR THE SAFE OPERATION AND MAINTENANCE OF THE EQUIPMENT SUPPLIED REST SOLELY ON THOSE OPERATION IT.

1.3.2.5 OBEY THE FOLLOWING GENERAL SAFETY INSTRUCTIONS AT ALL TIMES.

NOTA

A qualified operator is a person whom the owner of the equipment deems as having the required experience, training and skills to perform the required work and shall be limited to Construction Engineering trades only.

1.3.3 General Safety Instructions

1.3.3.1 Keep the electrical panel doors closed at all times except when performing electrical maintenance or troubleshooting.

1.3.3.2 Allow only qualified operators to perform maintenance and troubleshooting on the machine.

1.3.3.3 Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.

1.3.3.4 Do not bypass or tie down any of the door safety limit switches.

1.3.3.5 Do not open any of the doors while the Primary or Secondary Chambers are above 200°F (93 °C).

1.3.3.6 Do not enter the Primary Chamber unless the Emergency Stop Button is pushed

1.3.3.7 When opening or closing the Primary Chamber door keep clear of the door and ensure that the path for the door is clear.

1.3.3.8 Secure the Primary Chamber door when it is open so it cannot move accidentally.

1.3.3.9 Immediately correct any fuel leaks.

1.3.3.10 Do not fill the Primary Chamber above the breech opening. Overfilling can result in poor burning and damage to the **EWS Mobile Incinerator.**

1.3.3.11 Use proper tools; wear impact resistant, CSA certified industrial goggles, full face dust mask (such as Advantage 3000 Respirator) and industrial leather gloves while loading and cleaning the **EWS Mobile Incinerator.**

1.3.3.12 Be aware of component-specific safety hazards listed within each section of this manual.

1.3.4 General Operating and Maintenance Safety Instructions

Proper operating and maintenance procedures must be followed in order for the **EWS Mobile Incinerator** to perform at maximum efficiency. Do not attempt to start or operate this equipment until this manual is read thoroughly and is understood.

The equipment has been designed with many safety features, however, like all thermal processes; this equipment is not free from the inherent hazards of high temperature processes. Safety procedures and precautions must be followed at ALL times during operation.

There are component-specific safety procedures outlined in this manual, however, no amount of written instruction can replace good judgment and safe operating practices.

NOTA

Responsibility for the safe operation and maintenance of the equipment supplied rests solely on those operating it.

There are many engineered features incorporated into the **EWS Mobile Incinerator** to free the operator of repetitive chores. They do not, however, relieve the operator of maintenance responsibilities. In order to maximize the operating life of the equipment, it is strongly recommended that the maintenance schedule be followed diligently (please refer to the Incinerator Maintenance Plan). It is advisable to keep an equipment log) for recording maintenance activities along with unusual operation. In the event that the equipment is not operating in the normal manner contact Eco Waste Solutions immediately (please refer to *Section 1.2 EWS Contact Information*). It is important to report problems as soon as they are noticed to minimize damage that faulty operation could cause.

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the **EWS Mobile Incinerator**. The preventive maintenance procedures outlined in Section 4 of this manual should be adhered to strictly for best service life.

The warranty will become void if proper maintenance is not performed as instructed.

Please note that some of the diagrams and/or photos in this EQUIPMENT MANUAL are conceptual in nature and may not be exact representations of equipment purchased.

2.0 OVERVIEW OF TECHNOLOGY

2.1 INTRODUCTION TO WASTE INCINERATION

2.1.1 Protecting the Environment

2.1.1.1 Why Incinerate?

An advanced technology incinerator like the **EWS Mobile Incinerator** is the basis of a pollution prevention approach to waste management for camp operations. Having an incinerator that can be transported to the point-of-need provides immediate and complete control over the disposal of camp waste.

Incineration is considered to be a sustainable waste management practice because it deals with the waste on-site and as it's generated. Landfills operate on the premise that once it is buried the problem is eliminated. However even landfills with the most advanced engineering can fail. The very fact that a landfill is forever predicts the deterioration and failure of landfill safety systems. The creation of a well-designed landfill has a high upfront capital cost, takes many months to build and requires on-going maintenance in perpetuity making them a poor fit for a mobile camp.

Often camps consider using open air burning to deal with waste. This may involve simply setting fire to the waste pile or the use of a barrel or pit to contain the waste while burning. Open air burning creates air pollution and can lead to damaging health effects for the operator and those living and or working nearby.

By contrast, modern advanced incineration with air pollution control allows for the complete destruction of domestic waste without polluting the air, land or water. The waste material is completely converted to a non-toxic ash that does not attract wildlife.

The primary advantages of incineration are:

- **REDUCTION** of the weight and volume of waste material that must be disposed of using landfills or other means
- **DESTRUCTION** of materials that may be an attractant to wildlife and any pathogenic agents that may be contained within waste materials

2.1.1.2 The Operator – Your Role

As the Operator of the incinerator you have an extremely important role in protecting the environment through the correct operation of this equipment. It is the operator's role and responsibility to protect the environment by:

1. Ensuring that no inappropriate materials are processed and that each batch contains an average mix of waste that resembles the design waste characteristics (particularly volume/weight per batch, average density, and overall heat value). See Waste Table in Section 2.4.2 for details.

2. Understanding the environmental operating permits and commitments made by your employer to regulatory bodies and other stakeholders. This includes the emission targets, monitoring and recording requirements. Understanding the wastes that can and cannot be processed in the equipment as specified by the manufacturer as well as applicable regulatory permits or

other commitments. Undertaking all necessary operational and maintenance practices to ensure compliance with applicable emission limits and operating requirements.

3. Ensuring the burn cycle is long enough to allow for thorough burn-out and the generation of high quality ash residual that is safe for disposal

4. Minimizing particulate matter (dust) emissions during ash removal and handling

5. Disposing of ash properly by sending it to appropriate disposal sites

6. Taking responsibility for regular maintenance inspections and ensuring the appropriate attention is given to any problems immediately.

2.1.1.3 Air Pollutants of Concern

All combustion processes produce an exhaust emission. The **EWS Mobile Incinerator** is technologically advanced and designed to thoroughly combust the waste while producing minimal emissions.

Correct operation and rigorous attention to maintenance will ensure that the **EWS Mobile Incinerator** operates with the least possible impact on the environment.

It is recommended that incinerator operators understand the potential for the creation of pollution from incorrect operation. The following table lists the pollutants that can occur in incinerator exhaust emissions.

POLLUTANT	CONCERN	SOURCE OR CAUSE
CO (Carbon Monoxide)	Combustion Indicator	High levels of CO indicates poor quality combustion
SOx (Oxides of Sulphur)	Contributes to acid rain, respiratory irritant	High sulphur content fuels
NOx (Oxides of Nitrogen)	Contributes to acid rain, respiratory irritant	Incorrect air input, too high operating temperatures
HCl (Hydrochloric Acid)	Contributes to acid rain, corrosive, respiratory irritant	Primarily from the burning of PVC (polyvinyl chloride) plastics
PM (Particulate Matter)	Respiratory effects	Incomplete combustion, rich fuel to air ratio, dust-laden waste stream
PCCD/PCCF (Dioxins & Furans)	Persistent organic compound known to bioaccumulate	Incomplete combustion due to overloading, air ingress, improper waste mix
Heavy Metals including: Pb (Lead), Hg (Mercury), Cd (Cadmium), etc.	Toxic and known to be hazardous to human health and living ecosystems	Presence of heavy metals in the waste stream will lead to appearance in the exhaust gases

2.1.2 Basic Combustion Principles

Combustion is a rapid chemical reaction between oxygen and combustible elements such as carbon or hydrogen. Combustion uses the oxygen in air to react with the combustible materials producing heat which continues the process. Most of the products of combustion are gases. Good combustion produces clean gases that are invisible. Poor combustion will create smoke.

2.1.2.1 Products of Combustion Reaction (Ideal Combustion)

The ideal combustion reaction is often used to explain combustion. In the ideal reaction a completely combustible material - a compound of carbon, hydrogen and oxygen is heated and allowed to react with oxygen. As it is heated water is vaporized and the carbon bonds with the oxygen and heat is released.

Carbon, Hydrogen, Oxygen + Oxygen + $\longrightarrow$ Heat Carbon Dioxide + Water and Heat

2.1.2.2 Incomplete Combustion

This ideal reaction is theoretical and does not occur in waste combustion systems. Factors that lead to a less than ideal reaction are poor mixing, too little combustion air, and low temperatures. Under those conditions products of incomplete combustion are emitted with the stack gases or system exhaust. The products of incomplete combustion are typically elemental carbon (or soot) and carbon monoxide (CO). Soot particles are very fine and generally result in high opacity (smoke) at the combustion stack. Other products of incomplete combustion that cause concern are hazardous organic compounds such as benzene, dioxins, and furans. Although these compounds are not found in the waste, under incomplete combustion conditions they can be formed as intermediate combustion products.

The waste feed also includes inorganic materials; generally, they are not involved in the combustion reaction. The inorganic materials in the waste feed (ash) are either retained in the ash or are emitted as particulate matter in the combustion gas. Air velocities in the combustion chamber are controlled to reduce the amount of inorganic material entrained (picked up by) the combustion gas and emitted with the combustion gas. If combustion is not complete, organics will remain in the ash.

2.1.2.3 Combustion Indicators

One of the most obvious combustion indicators is the presence of a visible exhaust emission or smoke.

2.1.2.4 Stack Gas Oxygen and Carbon Monoxide

More reliable indicators that can be used to monitor combustion quality are the concentrations of key compounds in the stack gas.

2.1.2.5 Stack Gas: O_2 (Oxygen) concentration

The stack gas O_2 concentration provides a measure of excess air. Waste incinerators typically operate at 140 to 200 percent excess air, which roughly corresponds to 12 to 14 percent O_2 in the stack gas.

- High O_2 means too much excess air (cools gases).
- Low O_2 means insufficient air (incomplete combustion).

2.1.2.6 Stack Gas: Carbon Monoxide (CO) concentration

Each combustion system has a "typical operating range" for CO. If the stack gas, CO concentration goes above this typical range, combustion problems are likely. With a waste incinerator this is typically <100 ppm.

2.1.2.7 Waste Characteristics

Different waste types have different heating values, densities and moisture contents. These primary characteristics of the waste will affect the combustion process.

The **HEATING VALUE** of waste is a measure of the energy released when the waste is burned. It is measured in units of joules per kilogram (j/kg). The heating value is proportional to the energy released when burned. A heating value of about 11.6 MJ/kg or greater is needed to sustain combustion. Wastes with lower heating values can be burned but they will not maintain adequate temperature without the addition of auxiliary fuel.

The **MOISTURE CONTENT** of waste is a measure of the quantity of water contained or saturated in solid dry waste material. It is measured by a ratio or a percentage. The wetter the waste, the higher the moisture content and the longer it will take the waste to burn. As a result, a longer burn time requires more fuel while operating the incinerator. On the contrary, drier waste has lower moisture content. This dry waste requires a shorter burn time which results in less fuel being required.

2.1.2.8 Ash Quality

Visual appearance of the ash can be an indicator of combustion problems. If an incinerator is operating properly, little organic material will remain in the ash. Whitish gray ash indicates better burnout and less carbon than black. The extent of organics combustion can be measured by the quantity of combustible materials remaining in the ash. A noted increase in ash combustibles indicates a combustion problem which may include temperatures that are too low, improper distribution of combustion air in the chamber (plugged air inlets), or burn cycle time is too short.

2.1.2.9 Summary of Key Operation Factors Affecting Combustion

2.1.2.9.1 Combustion Air supply
- i. Sufficient air for complete reaction
- ii. Distributed to promote mixing

2.1.2.9.2 Mixing/Turbulence
- i. Assure contact of oxygen and organics

2.1.2.9.3 Temperature
- i. High enough to sustain combustion
- ii. High enough to complete reaction

2.1.2.9.4 Residence time/Retention time
- i. Sufficient time to allow reaction to complete

2.1.2.9.5 Waste Feed Characteristics

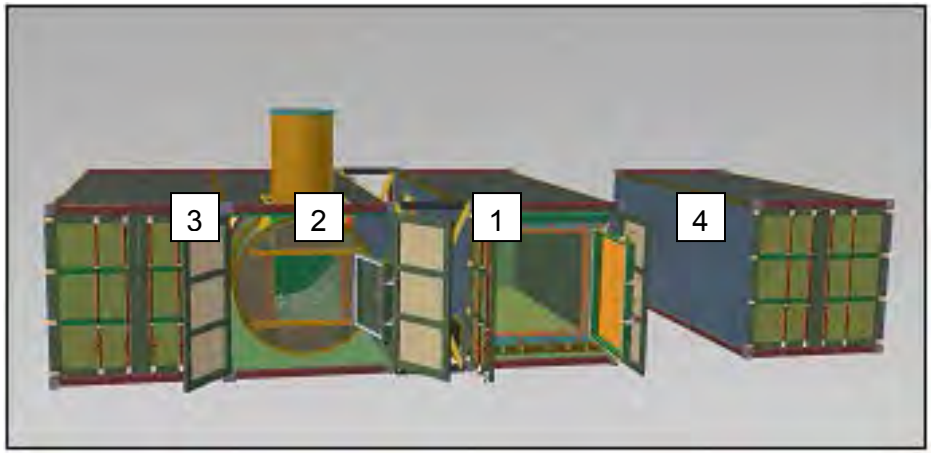
i. Waste feed must be representative of the waste feed assumptions used for the design of the incinerator

All of these key factors are interrelated.

2.1.3 Technology Overview

2.1.3.1 System Description

The **EWS Mobile Incinerator** is a fully containerized transportable waste incinerator system designed to meet the strictest environmental standards. The EWS Mobile Incinerator is comprised of 3 containerized modules and additional shipping container shown below.



View of the EWS Mobile Incinerator Containers

(Left to right: Container 3 - Controls Container, Container 2 - Secondary Chamber Container, Container 1 - Primary Chamber Container, Container 4 – Shipping Container)

2.1.3.2 System Process

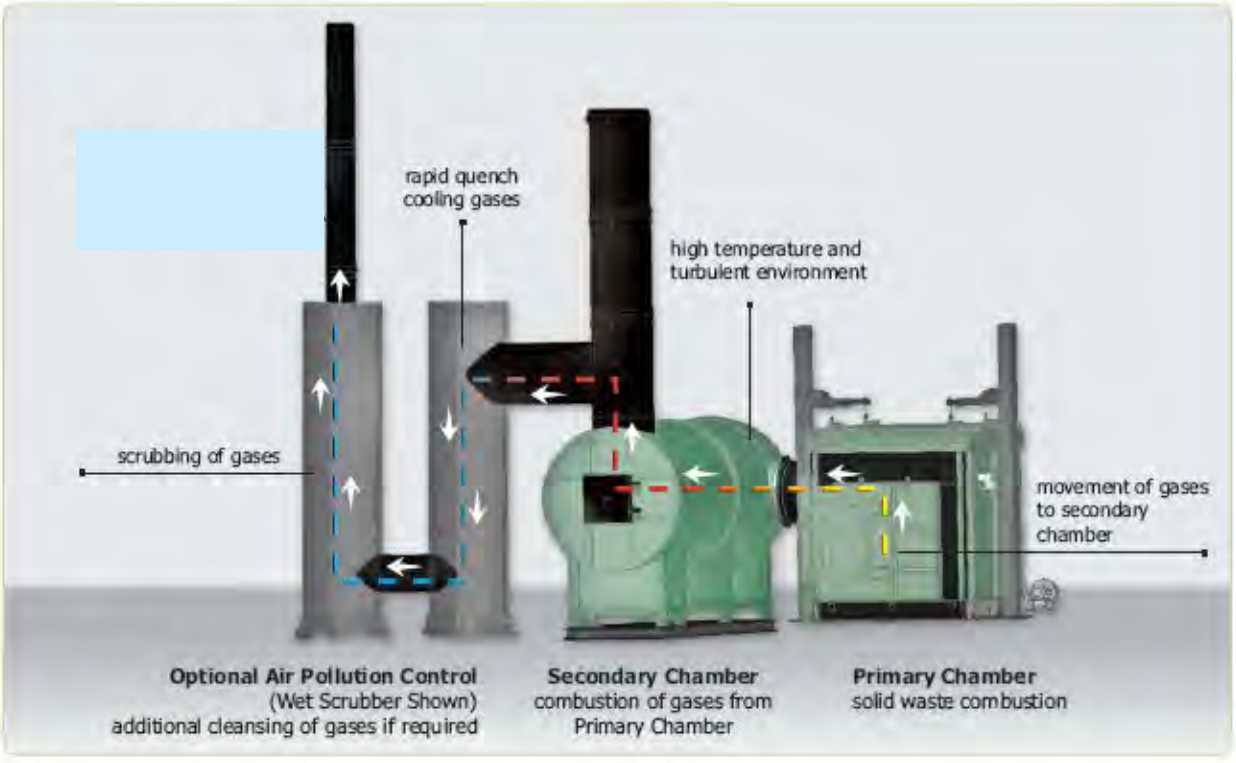
Stage One (Container 1 in diagram)
This container houses the incinerator's **Primary Chamber**. Waste is placed into the chamber until it is full, then the door is sealed shut and the system can be started. The waste will remain in this chamber, for the entire cycle, where it will be burned down to ash.

Stage Two (Container 2 in diagram)
This container houses the Incinerator's **Secondary Chamber** which burns the off-gases coming from the Primary Chamber that are continually formed as the waste is burned.

2.1.3.3 Process Overview

The following illustration depicts the process flow described previously and provides a schematic representation of the creation of gases and their flow through the system.

The system shown below is a graphic representation of the process and does not show the modules housed in ISO containers.



2.1.3.4 Functional Description of Major Components

The components within the Mobile Incinerator package that involve combustion are referred to as the incinerator. The main modules of the incinerator are the Primary Chamber and the Secondary Chamber. Both Chambers are large vessels constructed of steel with a special insulating liner known as refractory. The Primary and Secondary Chambers are described in detail below.

2.1.3.4.1 Primary Chamber

The **Primary Chamber** has a large front-opening door for loading of solid waste and removal of the ash residuals. Waste is loaded using a small skid-steer loader. The waste is dumped into the front of the chamber then pushed towards the back until full. Once the chamber is full, the door is closed and sealed shut using the toggle clamps. The operator will then use the control panel located in the Control Container to start the system. The Secondary Chamber must be at operating temperature before the Primary Chamber can activate.

To begin the process of burning the solid waste the **Primary Chamber Burner** is used to elevate the temperature of the Primary Chamber to ignite the waste. The burner package has a single motor that operates both the diesel fuel pump and combustion air supply fan of the burner. The burner ignites the fuel and supplies combustion air to create heat.

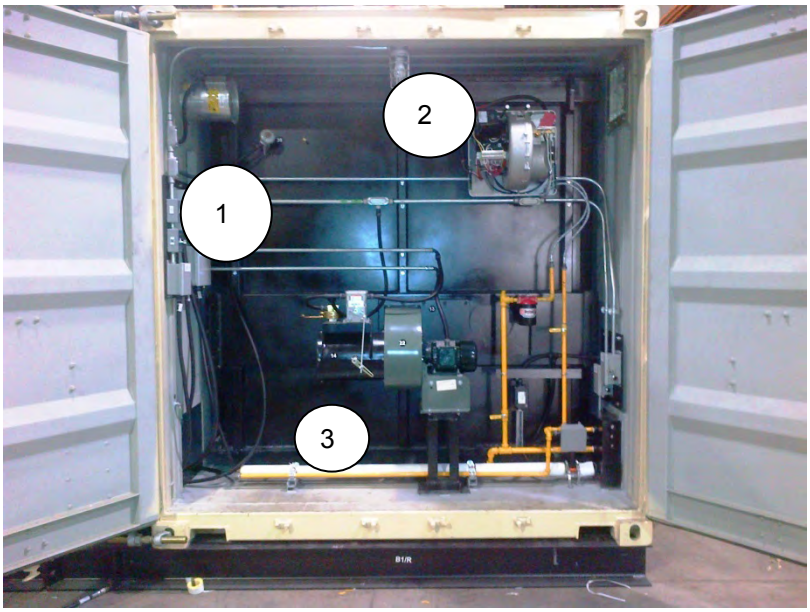
1. Louver
2. Container door
3. Opening for loading
4. Base frame
5. Toggle clamps

Front View: Primary Chamber Container (Chamber open)

A **Thermocouple** is used to measure the temperature of the Chamber. Once the Chamber reaches a temperature of approximately 650-850°C, the burn process becomes self-fuelling and the burner will shut off. To save fuel and control temperatures, only when the energy contained within the waste is depleted will the burner periodically turn on.

The amount of heat released from the oxidation of the waste, is controlled by limiting the air into the Primary Chamber to less than what is required for complete combustion. This is described as *starved air* conditions. With controlled air and temperature the waste is dried, heated and oxidized thereby releasing moisture and volatile components. The non-volatile, combustible portion of the waste is burned to provide heat while the non-combustible portion accumulates as residual. These conditions ensure that the waste is allowed to fully combust and is rendered sterile. Waste volume is reduced by over 90%. After enduring the combustion process, metals and glass remain intact. Preservation of metals and glass protects the refractory lining from damage caused by melted and fused metals and glass, but also allows for post-combustion recycling where possible.

This chamber also has a small **cooling fan**, typically referred to as the **Primary Chamber Blower**. The blower does not operate during the burn cycle but will activate automatically once the burn is complete and the system goes into cool down phase. The blower then cools the chamber for a period of 12 hours so that the chamber will be sufficiently cool for the Operator to safely remove the ash and begin to load a new batch of waste.



1. Thermocouple
2. Burner (Diesel-fired)
3. Primary Chamber Blower/Cooling Fan

Primary Chamber Container

2.1.3.4.2 Secondary Chamber

As waste burns in the Primary Chamber, gases containing the products of combustion are pulled continuously into the high temperature zone of the **Secondary Chamber** where the oxidation reaction of the combustible products is completed.

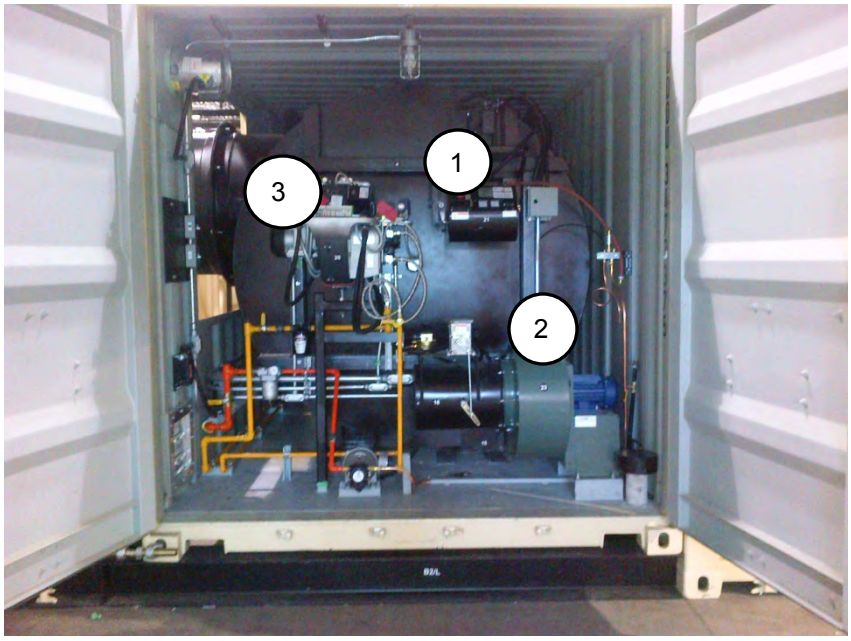
To accomplish this, the Secondary Chamber controls the temperature at 1000°C using a thermocouple to constantly measure the temperature inside the chamber. The temperature readings are monitored by the system's PLC and the PLC will initiate operational changes such as increasing or decreasing the speed of the **Secondary Chamber Blower** and the output of the **Secondary Chamber Burner (Diesel-fired).**

The **Secondary Chamber Blower** air is introduced into the chamber by an air ring manifold that surrounds the Secondary Chamber. The manifold has small air jets called tweers that open into the chamber at the side walls and create a powerful vortex of excess air to mix the incoming gases and ensure complete combustion. The flow of air is tightly managed by the control system using a Variable Frequency Drive (VFD) to control the speed of the fan and modulating motors on the blower inlet dampers.

The blower is extremely important as it creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour. It also acts to cool the chamber and prevent temperature overruns.

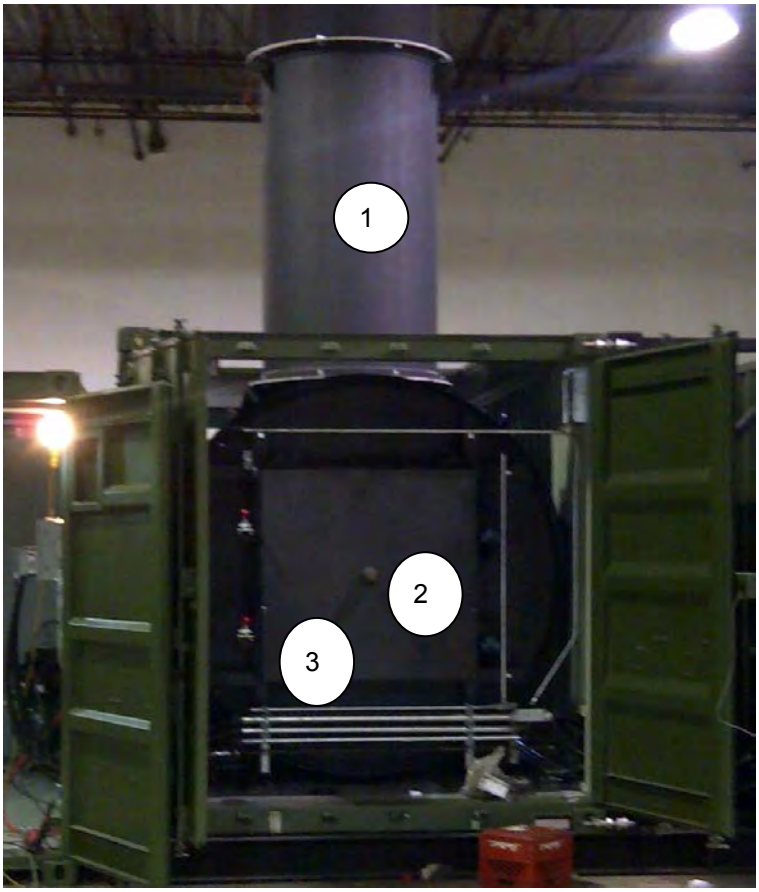
Secondary Chamber Burner (Diesel-fired) is similar to the burner used in the Primary Chamber except that it is a much higher output burner and its output is self-modulated over a broad range for very precise temperature control.

The Secondary Chamber is sized to allow two seconds of retention time. This is the time that the gases from the Primary Chamber are retained in the Secondary Chamber before they exit to the next stage. Two seconds of retention is considered to be ideal to destroy any harmful organic hydrocarbons produced from the Primary Chamber.



1. Waste Oil Burner
2. Secondary Chamber Blower/Fan
3. Secondary Chamber Burner (Diesel-fired)

Front View: Secondary Chamber Container



1. Stack
2. Secondary Chamber View Port
3. Secondary Chamber Access Door

Sample Rear View: Secondary Chamber Container

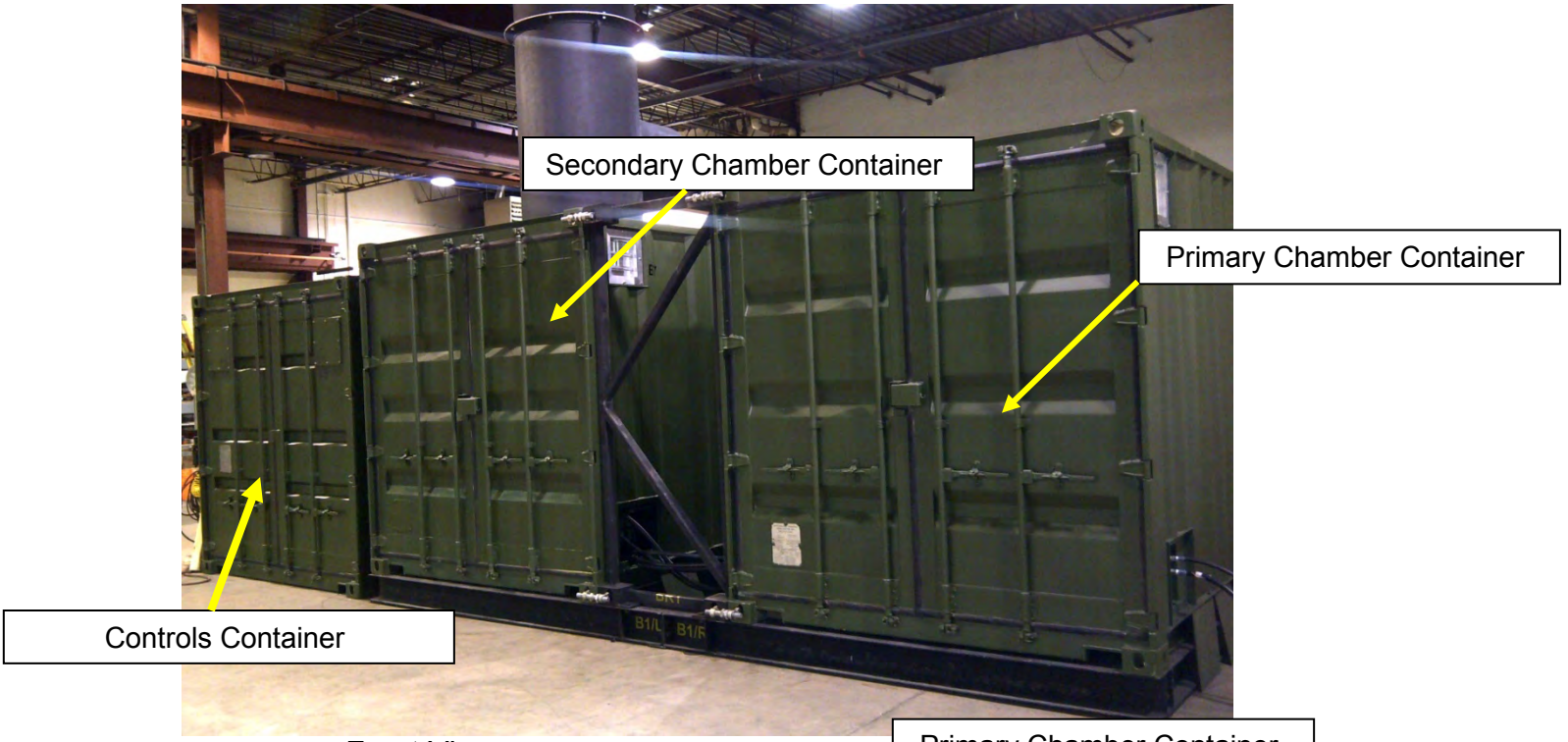
2.1.3.4.3 Main Control Panel

There is one Main Control Panel that controls all of the interconnecting modules. The Operator has one simple interface to start the equipment, view system status and change control settings if required. The entire process is managed using a **PLC** (programmable logic controller) to automate the operation. The critical process parameters such as temperature, combustion airflow and burner output are operated using EWS' patented system control program to maintain optimal combustion.

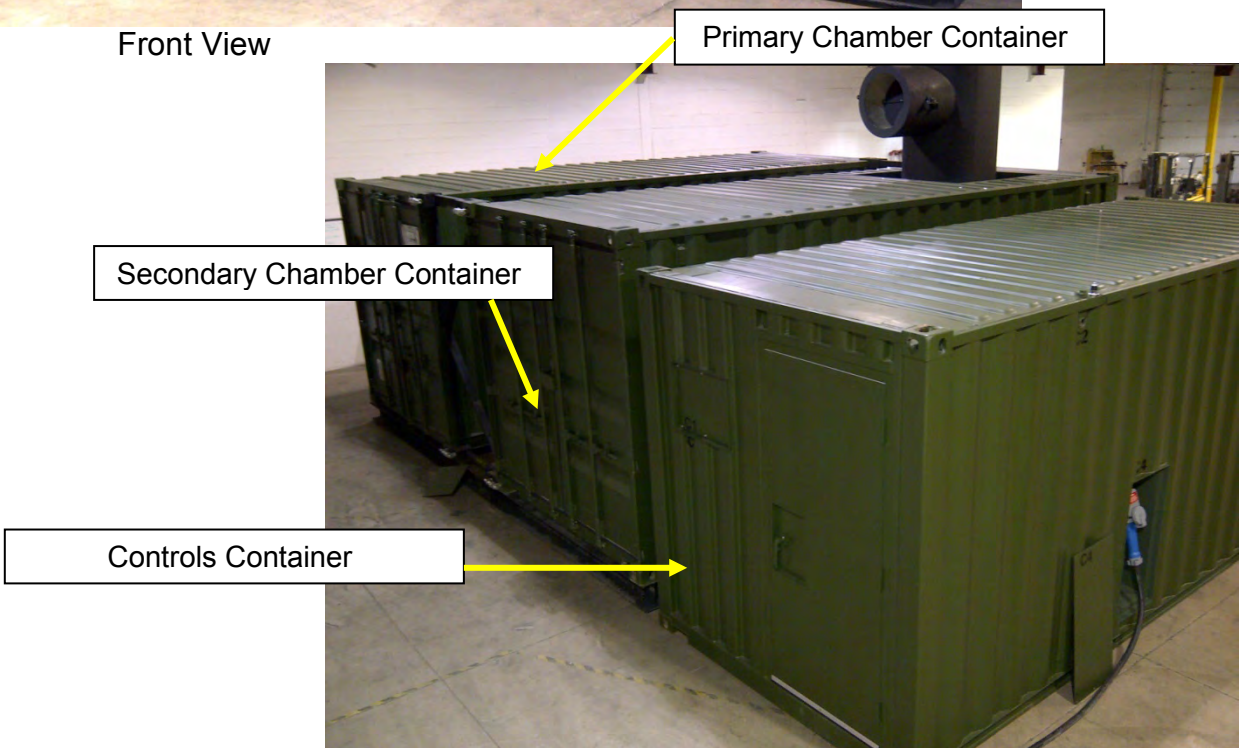
Front View: Main Control Panel

2.2 DESCRIPTION OF EWS MOBILE INCINERATOR

2.2.1 EWS Mobile Incinerator Containers



Front View



Rear View

The **EWS Mobile Incinerator** consists of the following containers as depicted in the drawing.

2.2.1.1 **Primary Chamber Container:** containing the Primary Chamber and diesel oil connectors

2.2.1.2 **Secondary Chamber Container:** containing the Secondary Chamber

2.2.1.3 **Controls Container:** containing the Main Control Panel (Monitoring and Control Centre) as well as the electrical hook-ups and Air Compressor

2.2.1.4 **Shipping Container:** Container to hold components during transportation (Not Shown)

EWS Mobile Incinerator: Description of each Container

2.2.1.1 #1 Primary Chamber Container

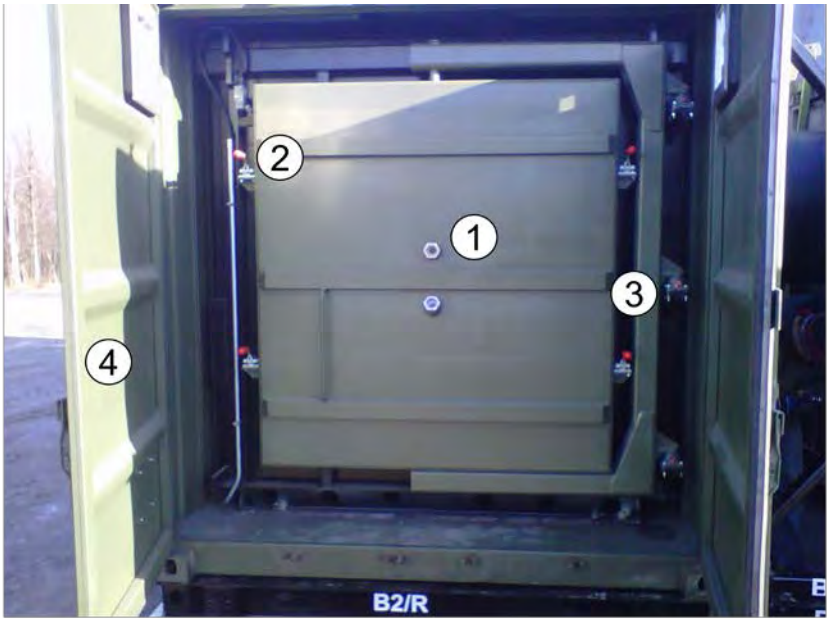
a. This standard 20' ISO shipping container permanently encloses the **Primary Chamber.**

b. At one end of the container the operator can open the container and gain access to the large front-loading primary chamber door. The Primary Chamber door will pivot on its hinge to allow for an opening of 90°.

c. At the other end of the container the doors will allow for unencumbered access to the auxiliary fuel (diesel) burner. Also located at this end is the Primary Chamber cooling fan. Other than during periodic maintenance and installation and disassembly, there is no need to regularly access these components and therefore these doors will be kept closed.
   i. The Primary Chamber including all of its major components and plumbing will be shipped fully assembled within the container, with minimal assembly of interconnections required in the field.

d. This container includes its own air handling system.

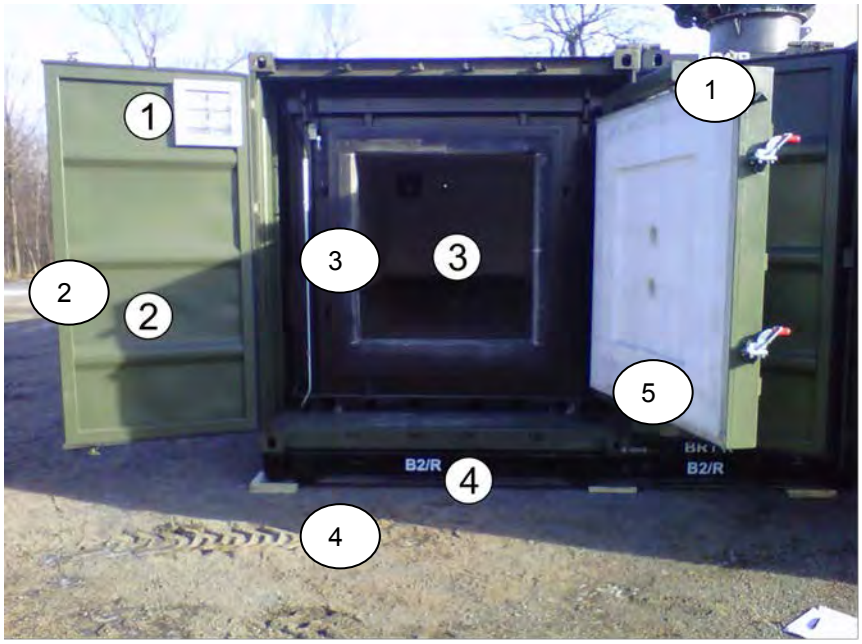
e. This container is modified to allow interconnections to the other containers:
   i. Hatch opening for interconnecting duct Breech between Primary and Secondary Chamber Containers
   ii. Utility Bridge for fuel in, fuel return line out, electrical power in and instrument cables out



1. Primary Chamber View ports (2)
2. Toggle Clamps (4)
3. Door Bearings (3)
4. Primary Chamber Container Door

Front View: Primary Chamber Container

(with Primary Chamber Door Closed)



1. Container Louver
2. Primary Chamber Container Door
3. Opening into Primary Chamber (loading area)
4. Base frame
5. Toggle Clamps

Front View: Primary Chamber Container

(with Primary Chamber Door Open)

1. **Thermocouple**
2. **Burner (Diesel-fired)**
3. **Primary Chamber Blower/Cooling Fan**

Rear View: Primary Chamber Container

2.2.1.2 #2 Secondary Chamber Container

a. This standard 20' ISO shipping container permanently encloses the **Secondary Chamber.**

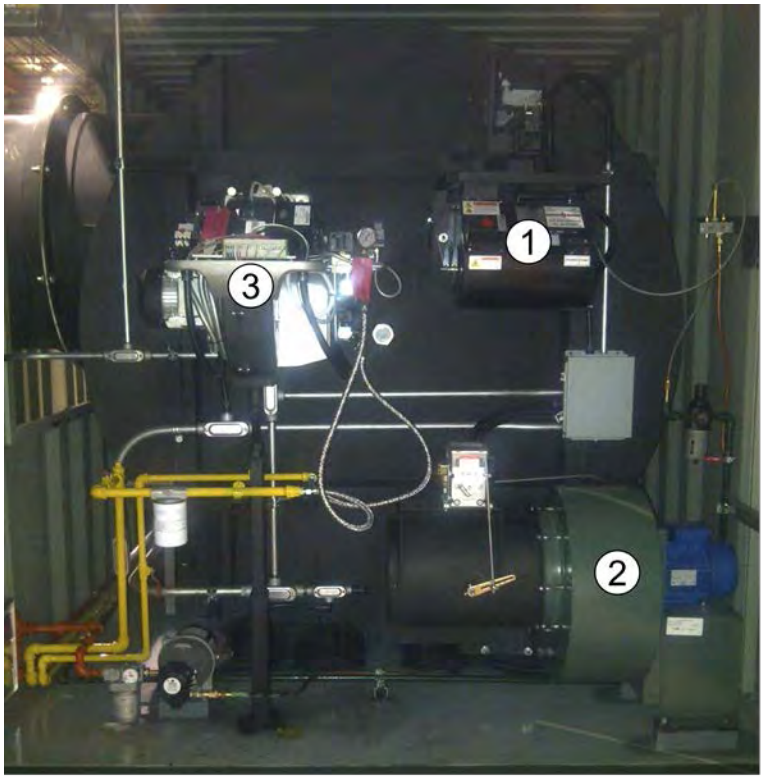
b. This container will be accessed by the Operator on a daily basis. The doors provide access for periodic maintenance and for access during installation and disassembly.

c. The Secondary Chamber including all of its major components and plumbing will be shipped fully assembled within the container, with minimal assembly of interconnections required in the field.

d. The Secondary Chamber includes an access door for inspection and maintenance access for the Secondary Burner

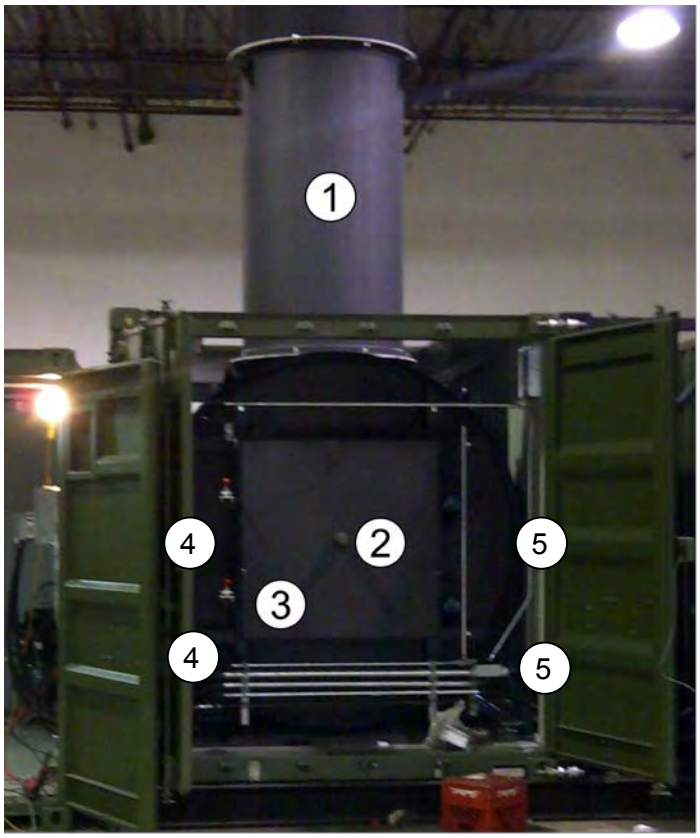
e. This container includes its own air handling system.

f. This container is modified to allow inter connections to the other containers.
   i. Hatch opening for interconnecting duct, Breech between Primary and Secondary Chamber Containers
   ii. Utility Bridge (Secondary Chamber to Primary Chamber) Interface for fuel in, fuel return line out, electrical power in and instrument cables out.
   iii. Utility Bridge (Secondary Chamber to Controls Container) fuel, electrical, instrument and air.



1. Waste Oil Burner
2. Secondary Chamber Blower/Fan
3. Secondary Chamber Burner (Diesel-fired)

Front View: Secondary Chamber Container



1. Stack
2. Secondary Chamber View Port
3. Secondary Chamber Access Door
4. Toggle Clamps (2)
5. Door Bearings

Rear View: Secondary Chamber Container

2.2.1.3 #3 Controls Container

a. This standard 20' ISO shipping container houses the Main Control Panel for the entire **EWS Mobile Incinerator** package.

b. This container will be the main point of operations and control for the entire **EWS Mobile Incinerator** package.

c. This container is modified to allow inter connections to the other containers.
   i. Utility Bridge Interface with Secondary Chamber, fuel, electrical, instrument and air.
   ii. Main power supply connection

1. Main Power Supply Connection 2" (power supply cable and coupling to be supplied by customer)

2. Control Room Door

2.3 SPECIFICATIONS & MATERIALS OF CONSTRUCTION

2.3.1 EWS Mobile Incinerator: Operating Parameters

Operational Parameter	Rating
Incinerator Type	Controlled-air, two-stage
Fuel Type	Main: Diesel; Auxiliary: Waste Oil
Waste load capacity	2000 kg
Batch cycle time	8-10 hours estimate
Factory Pre-set minimum burn time	480 minutes
Cool down cycle	10-12 hours
Pre-set automated cool down cycle operation time	720 minutes

2.3.2 EWS Mobile Incinerator: Technical Specifications

2.3.2.1 Incinerator: Materials of Construction

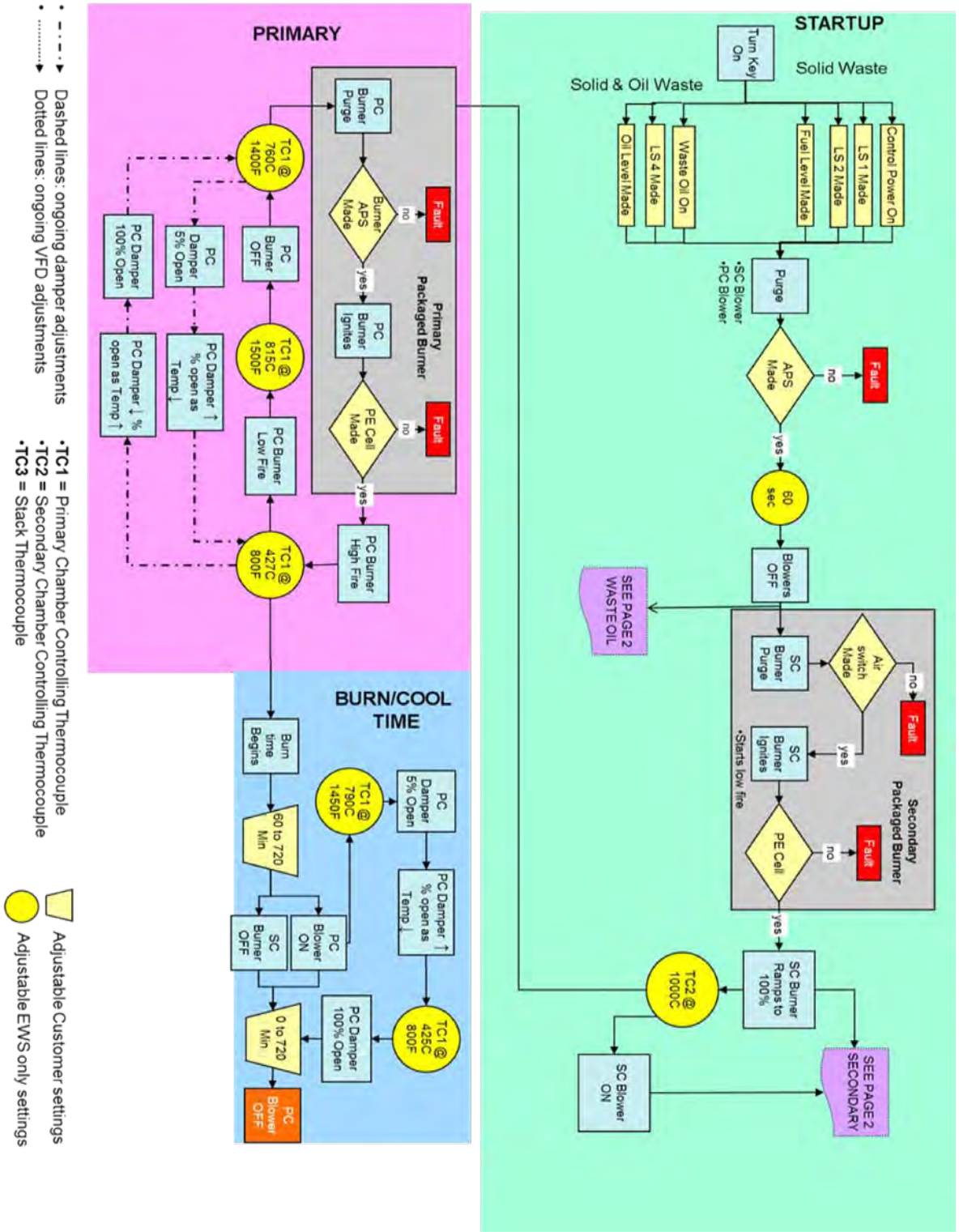
Component	Material of Construction
Incinerator Shell	¼" thick mild steel, welded with continuous bead welds Sand-blasted and painted with rust-inhibiting, high temperature paint
Incinerator Lining – Primary Chamber Floor	Factory cured, reinforced castable monolithic refractory, 6" thick Rated to 1760°C
Incinerator Lining – Primary Chamber walls and roof, Secondary Chamber interior	Ceramic fibre modules, 6" thick Rated to 1200°C Modules are lightweight and are individually anchored to the shell (Heavy, high-strength material not required or desirable in these areas) Highly reflective, does not retain heat against shell Immune to thermal shock from temperature cycling inherent in batch operation
Incinerator Lining – Door jambs, lintels, breech openings, and other penetrations	Factory cured, formed, reinforced castable refractory, 6" thick Rated to 1200°C High-strength, erosion and abrasion resistant material required in the susceptible areas
Fuel Oil Tanks (Diesel & Waste Oil)	Mild steel tank, sand-blasted and coated with corrosion resistant paint. Double-wall construction.

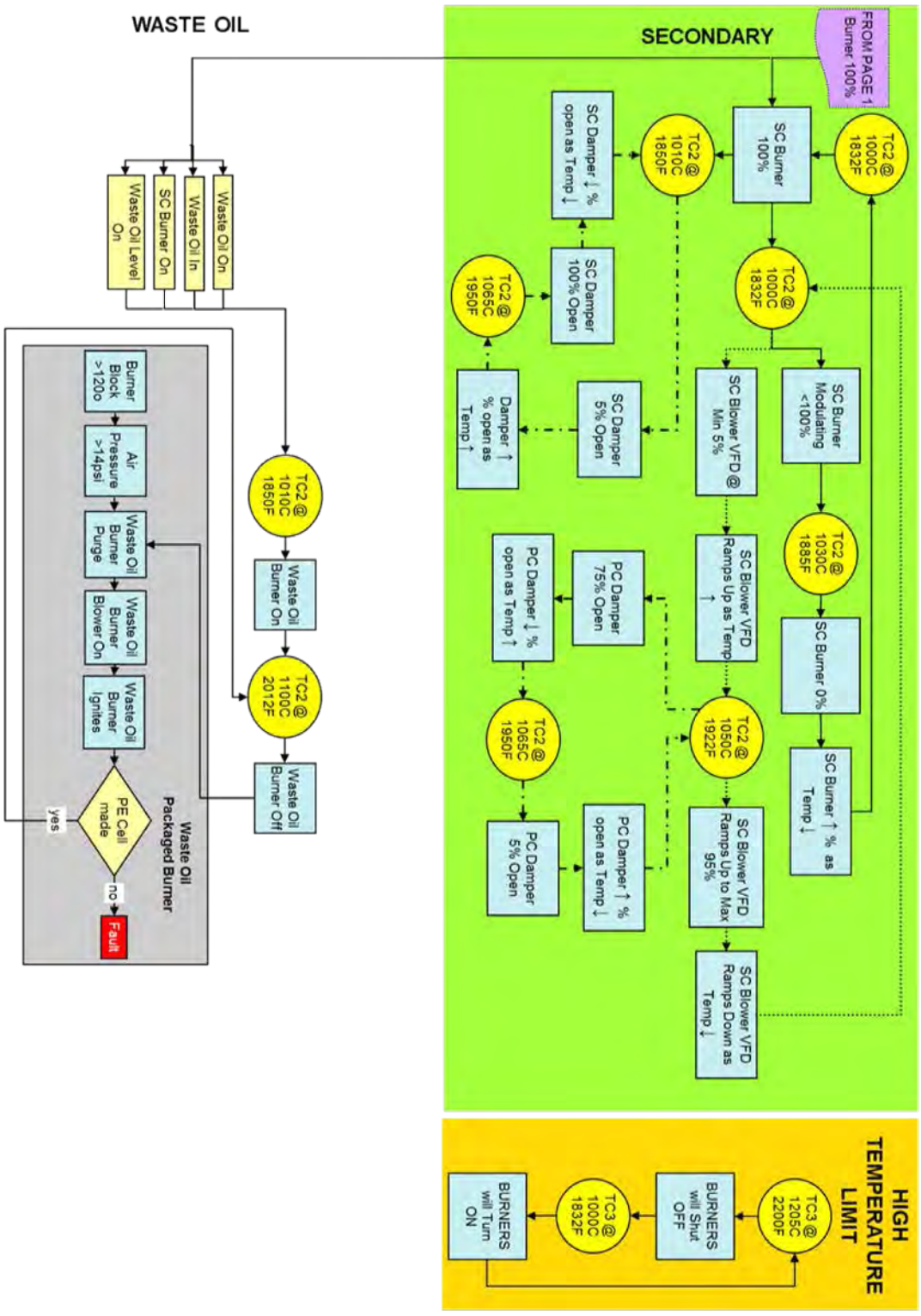
2.3.2.2 Incinerator: Major Components Specifications

Component	Description	Size/Rating
Control System	Single main control cabinet houses all motor starters, breakers and overloads. PLC process controller, Variable Frequency Drive (VFDs) to control Secondary Blower. LCD Operator Interface.	Electrical Power Design Input: 600V, 60 A
Packaged Diesel Fired Burners	Industrial burners each with built-in blower to supply combustion air, oil pump driven by same motor. Burner complete with integral relief valve and filter, fuel pressure gauge, air proving switch and igniters.	Primary Burner Rating: 97/154-395 kW **Motor: 0.7 kW** Secondary Burner Rating: 332/711-1482 kW **Motor: 2.1 kW**
Blowers	Factory run tested packaged design. Fan construction able to withstand high heat environment.	Primary Blower: Flow rate:1700 m^3/h Standard Static Pressure (SP): 31.5 mmH_2O **Motor: 1.12 kW (1.5 HP)** Secondary Blower: Flow Rate:4247 m^3/h Standard SP: 61 mmH_2O **Motor: 1.5 kW (2 HP)** Note: Standard Air, 70°F, 0.075IB/CF (21°C, 1.20 kg/m^3)
Diesel Fuel Tank	Includes all required accessories: vent, drain, level sensor and lifting lugs.	Volume: 2200 litres
Waste Oil Tank	Includes all required accessories: vent, drain, level sensors, heater and lifting lugs.	Volume: 500 litres

2.3.3 EWS Mobile Incinerator: Controls Philosophy

2.3.3.1 EWS Mobile Incinerator Package Central Control System




WASTE OIL
SECONDARY
FROM PAGE 1 Burner 100%
TC2 @ 1000C 1832F
SC Burner 100%
TC2 @ 1010C 1850F
SC Damper ↓ % open as Temp ↓
TC2 @ 1065C 1950F
SC Damper 100% Open
TC2 @ 1000C 1832F
SC Blower VFD @ Min 5%
SC Burner Modulating <100%
Damper ↑ % open as Temp ↑
SC Damper 5% Open
TC2 @ 1030C 1885F
SC Blower VFD Ramps Up as Temp ↑
SC Burner 0%
PC Damper ↓ % open as Temp ↑
PC Damper 75% Open
TC2 @ 1050C 1922F
SC Burner ↑ % as Temp ↓
TC2 @ 1065C 1950F
SC Blower VFD Ramps Up to Max 95%
PC Damper 5% Open
PC Damper ↑ % open as Temp ↓
SC Blower VFD Ramps Down as Temp ↓
HIGH TEMPERATURE LIMIT
TC3 @ 1205C 2200F
BURNERS will Shut OFF
TC3 @ 1000C 1832F
BURNERS will Turn ON
Waste Oil Level On
SC Burner On
Waste Oil In
Waste Oil On
TC2 @ 1010C 1850F
Waste Oil Burner On
TC2 @ 1100C 2012F
Waste Oil Burner Off
Waste Oil Packaged Burner
Burner Block >120o
Air Pressure >14psi
Waste Oil Burner Purge
Waste Oil Burner Blower On
Waste Oil Burner Ignites
PE Cell made
yes
no
Fault

2.4 WASTE PROCESSING CAPABILITIES

2.4.1 EWS Mobile Incinerator Waste Description

The waste types to be processed include: personal domestic waste, kitchen waste, dewatered sewage sludge, paper, packaging, lumber and textiles, documents, occasional tires and clinical medical waste (only gauze and needles). Furthermore, the specification indicates that hazardous materials including batteries will be eliminated from the incinerator waste stream.

2.4.2 Design Waste Assumptions

Quantity	**2000 kg/day**
Density	**160-240 kg/m^3**
Higher Heat Value	**15,150 KJ/kg**
Moisture Content	**Up to 40%**

System capacity of 2000 kg per day is based on the above waste mix assumptions. Waste will be loose, as received and not compacted prior to loading. If high volumes of PET (clear plastic) water bottles are received some compaction is recommended to ensure that the waste mix characteristics are representative of materials presented in the quote AMR-ECO M 2TN.

NOTA

2.4.2.1 Higher heat value materials should be mixed with lower heat value materials to ensure that the average heat value of the batch load is approximately that listed above. Overloading the system with high heat value materials can cause uncontrolled combustion leading to pollution and/or damage to the incinerator system.

2.4.2.2 A batch system capacity is closely related to the waste density. If a large amount of very low density, low weight materials are loaded into the system at one time the volume of the Primary Chamber may limit the capacity to much less than it is rated for. Care should be taken to mix waste materials to ensure the correct density range. Also, materials containing large air spaces such as empty plastic bottles, and cardboard boxes should be flattened before loading.

2.4.2.3 When processing batches of very wet materials the burn cycle time should be increased to accommodate the additional time required to dry the waste before it can combust.

2.4.2.4 Do not load the system with more than 25% by volume of extremely wet materials such as grey water or wet garbage.

2.4.2.5 When possible layer the materials so that the load is a mix of wet and dry, and/or high and low heat value materials.

2.4.2.6 Never load more than approximately 20 litres of high heat value waste such as kitchen grease or used cooking oil as this can lead to an uncontrolled burn.

2.4.2.7 See the list in Section 2.4.4 "Unacceptable Waste Materials" for items that should not be processed in the **EWS Mobile Incinerator**.

2.4.3 Waste Materials Suitable for Processing

Waste Materials Suitable for Processing in the EWS Mobile Incinerator

The following table is a generic description of waste materials that can be processed effectively using this equipment.

Solid Waste	Description	Origin
Food Waste	Food, food packaging and containers, plastic and paper waste from food preparation	Kitchen and dining areas
Domestic waste	General refuse such as paper, plastics, cans, bottles, cardboard, newsprint	Dormitory areas, recreation facilities, office areas, warehouse, plant and production facilities
Packaging	Cardboard boxes, paper, plastic containers, plastic film, styrofoam, poly-weave bags	Inbound supplies to all work areas
Wood waste	Skids, pallets, crates	Construction activity, inbound supplies
Absorbents	Rags, wipes, spill cleanup materials	From all work areas
Filters – Air and Fluid	Filters coated with fine particles and trapped solids, saturated with water or fluids (glycol, lube oils, fuel)	From water treatment facility, or generated at point of maintenance of vehicles, machinery and equipment
Clinical Waste	Bandages, dressings, gloves, swabs, syringes, sharps	Medical clinic or first aid centre
Tires & Rubbers	Tires (only 1 at a time), belts, hoses	From vehicles and equipment maintenance shop
Semi-solid Waste	Description	Origin
Kitchen grease, oils	Solid kitchen fats, grease, used cooking oil in small pails (maximum volume 10 litres per burn)	Kitchen grease traps, fryers

2.4.4 Waste Materials NOT Suitable for Processing

Unacceptable Waste Materials

Waste Type	Examples
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils
Radioactive Materials	Smoke detectors, laboratory wastes
Potentially Explosive Materials	Pressurized vessels including, but not limited to propane tanks, aerosol cans (deodorant, shaving, cleaning, etc) and the like. Actual explosives.
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels.
Solvents	Solvents such as acetone, xylene, methanol

NOTA

All materials of these types are strictly forbidden from processing. It is very important that all materials in these categories are diverted away from the incinerator in-feed. The examples provided are not an exhaustive list of all possible forms of these waste types.

A waste and procurement audit is highly recommended and encouraged to ensure that all sources of heavy metals (especially mercury) are identified and diverted from the incinerator.

2.5 REGULATORY COMPLIANCE

2.5.1 Environmental Regulatory Compliance

The Mobile Incinerator Package is required to operate with air emissions that comply with the regulations as set out by the CCME Canada Wide Standard for Dioxin and Furans.

EWS guarantees compliance of the **EWS Mobile Incinerator** with the stated limits in the CCME Canada Wide Standard for Dioxin and Furans, subject to the conditions outlined below (see Performance Criteria Conditions).

3.0 ASSEMBLY & INSTALLATION INSTRUCTIONS

3.1 GENERAL ASSEMBLY & INSTALLATION INFORMATION

The **EWS Mobile Incinerator** is largely assembled with interconnections and external components to be mounted as required.

3.1.1 Customer Responsibility

3.1.1.1 Provide all foundation work of concrete blocks for the ends of the containers and packed gravel under the frame and tanks

NOTA

a. **Fuel tanks should be out of the way and protected using bollards against accidental impact of mobile equipment (e.g. trucks, etc.)**

b. Foundation requirements between pads to be determined by customer

c. Specific locations to be determined by customer and site restrictions

3.1.1.2 Install I-beams, spacers and equipment using a crane, forklift, come-alongs, hydraulic jacks/hand-pumps, etc.

3.1.1.3 Provide all utility services including connections to the equipment including fuel, electrical, water, air, etc. using basic hand tools.

3.1.1.4 Provide all external thermal insulation and heat tracing when required on incoming and outgoing utilities.

3.1.1.5 Provide proper protection of all equipment from accidental damage or vandalism (bollards, exterior lighting, etc).

3.1.1.6 Perform any touch up painting and cleanup of equipment after assembly.

3.1.1.7 Locate the fuel tank at the specified distances to ensure maximum positive supply pressure on the suction side.

3.1.1.8 Obtain any and all construction, operating and environmental permits and other approvals as may be required in the area of jurisdiction where the equipment is being deployed and operated. EWS will assist in supplying technical information required for these permits to the customer as it relates to EWS equipment.

3.1.1.9 Maintain ample space around all equipment for maintenance, cleaning and safety considerations. A suggested provision would be to provide a minimum of 1.83 meters from all major equipment surfaces and edges. Always allow proper space for the swing radius of the chamber doors including vehicular traffic.

NOTA

Do not scale drawings: If certain dimensions are required which are not shown on drawings, EWS should be contacted for the required dimension. EWS will not be

responsible for any dimensional conflicts resulting from dimensions not shown on a certified drawing. Do not use general sales literature or other general equipment submittals for construction, assembly and/or erection, unless so indicated.

Please note that some of the diagrams and/or photos in this MANUAL are conceptual in nature and may not be exact representations of the equipment purchased.

3.1.2 Preparation Prior to Assembly & Installation

3.1.2.1 Electrical & Fuel Availability

The electrical supply must be the Canadian supply of 600 V 60 Hz, 3 phases. There is one main electrical hook-up opening 2" located on the side of the Controls Container. All electrical connections are distributed from the Controls Container to the Primary Chamber Container and the Secondary Chamber Container.

DO NOT CONNECT THE EXTERNAL POWER SUPPLY TO THE EWS MOBILE INCINERATOR UNTIL ALL INTERNAL ELECTRICAL CONNECTIONS ARE COMPLETE AND THE SYSTEM IS COMPLETELY ASSEMBLED.

The fuel supply connections are located on the Primary Chamber Container and connect the fuel supply to the fuel tank located externally. There are fuel lines between the containers for fuel distribution which are to be connected before the external hook-ups and connections are made.

DO NOT CONNECT THE EXTERNAL FUEL SUPPLY TO THE EWS MOBILE INCINERATOR UNTIL ALL INTERNAL FUEL CONNECTIONS ARE COMPLETE AND THE SYSTEM IS COMPLETELY ASSEMBLED.

3.1.3 Assembly & Installation Overview

3.1.3.1 Specialized Tools and Equipment for Assembly and Installation

The complete assembly of the **EWS Mobile Incinerator** will require 2-3 full time personnel for 2 days. The following list identifies the tools and equipment required to be supplied by the customer in order to proceed with the assembly:

a. Crane
b. Forklift
c. Boom Lift, Scissor Lift and/or Scaffolding
d. Steel Shims
e. Ladder (12')
f. Come-along
g. Hydraulic Jack/pump
h. Level
i. Erection Wrench / Alignment bar
j. Container Clamp 2"-Wrench

k. Sling
l. I-beam Clamp

The following list identifies the consumable items to proceed with the assembly:

a. Anti-Seize Compound (Generic Graphite-Based Anti-Seize Compound)
b. Gasket Spray-on Adhesive (Generic Spray-On Contact Cement)

3.1.3.2 Assembly Overview

The following general steps are the order in which the **EWS Mobile Incinerator** Package needs to be installed. Each step is detailed in the subsequent section.

ORDER OF ASSEMBLY (and detailed in Section 3.1.4)

1) I-Beam & Spacer Base Structure (Base Frame Structure)
2) Connections Between Primary and Secondary Chamber Containers
3) T-Stack Section on Secondary Chamber Container
4) Stacks and opacity monitor
5) Internal Component Connections
6) Internal Connections
7) External Connections

NOTA

Important Notes to Consider Prior to and During Assembly

a. Lifting lugs are provided on the stacks, and major accessories, and should be used in setting these units into position.

b. Do not allow lifting chains or cables to put loads on piping, or mounting flanges as they may be damaged.

c. Avoid dragging lifting gear across painted surfaces.

d. When placing the system into position, be careful not to subject the refractory to mechanical shock, which may result in refractory damage.

3.1.4 Assembly Instructions

3.1.4.1 I-BEAM & SPACER BASE STRUCTURE (Base Frame Structure)

NOTA

For <u>all</u> fasteners used in assembly use regular-grade anti-seize spray to ensure that fasteners will be easily removed when disassembly is required.

NOTA

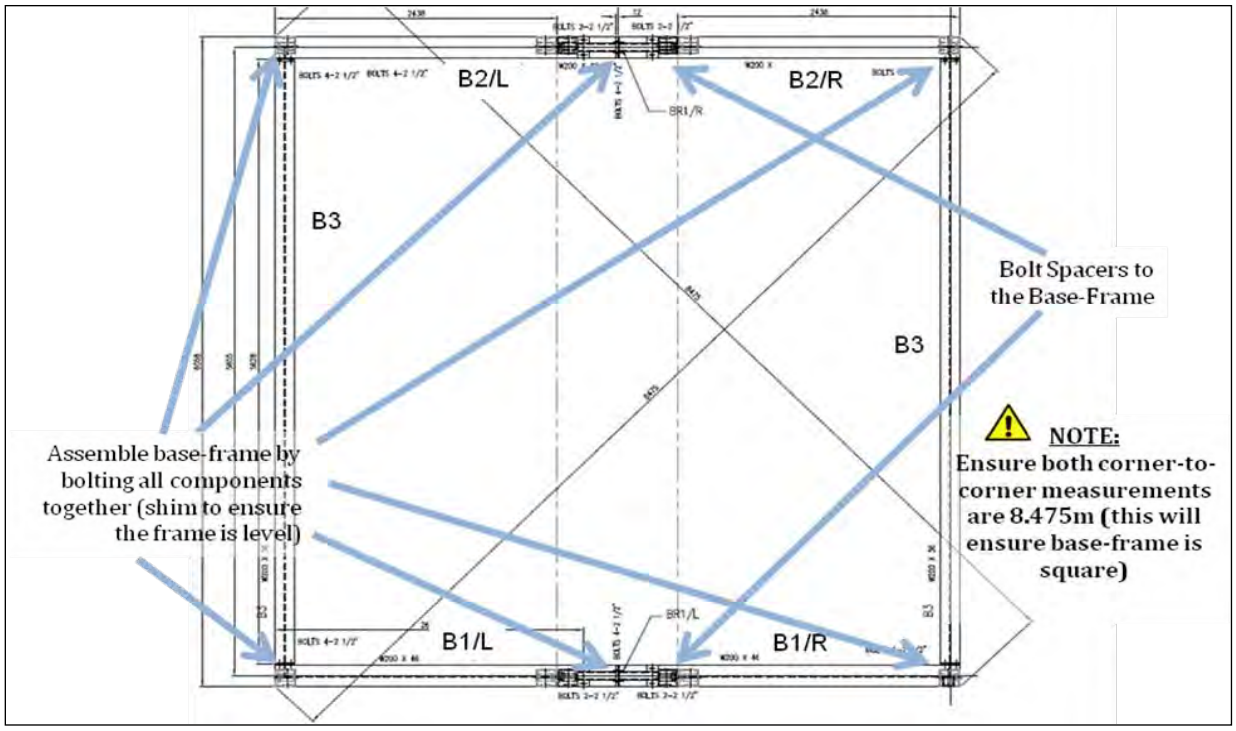
Do not fully torque bolts during initial assembly.

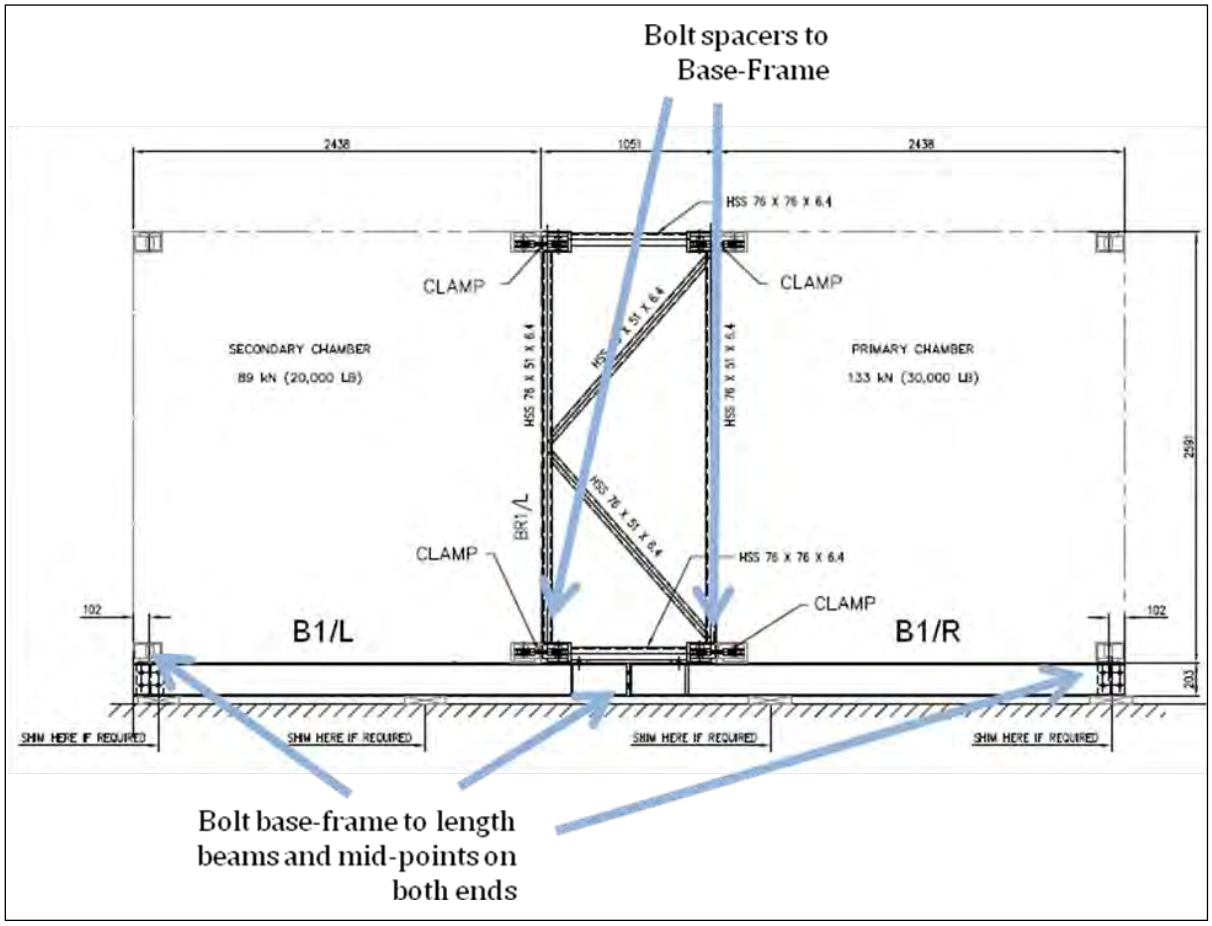
<u>Correct Clamp Installation</u>

When installing the clamps, install in such a manner that the installer pulls back on the

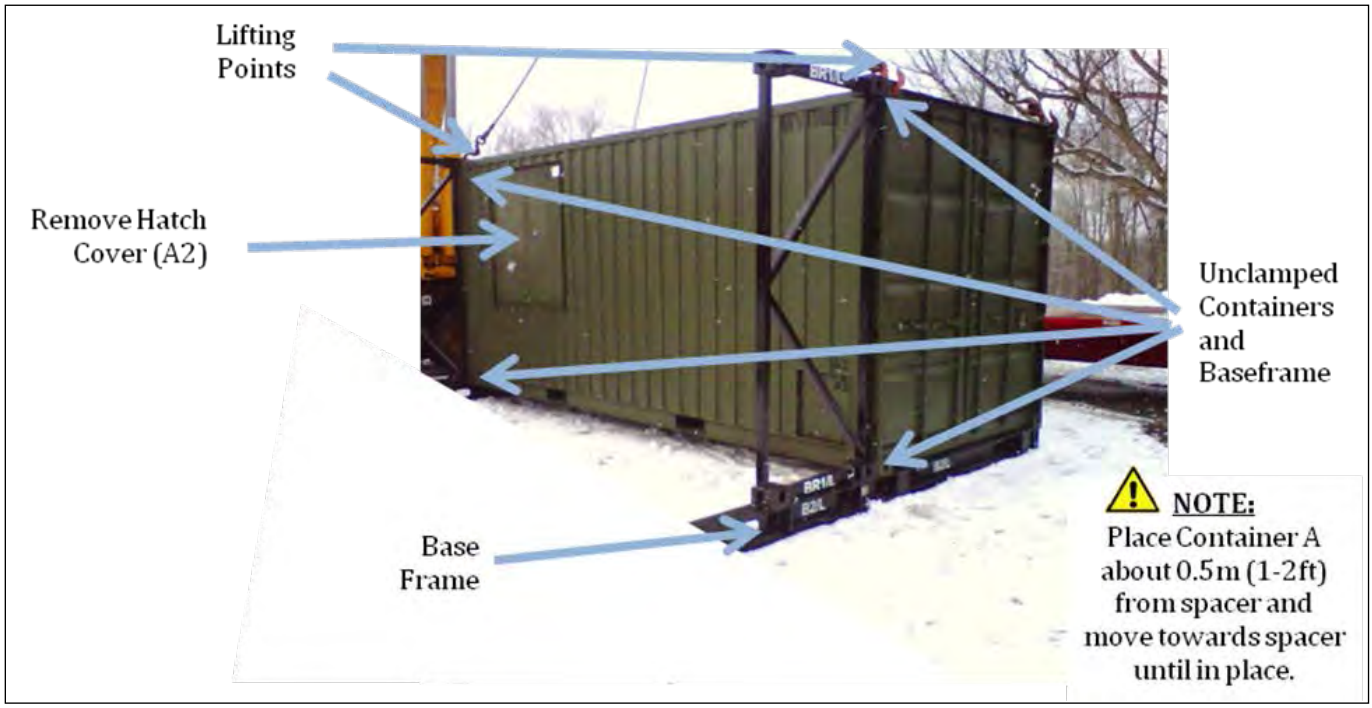
wrench when tightening the clamp. From the installer's perspective, the smaller nut would then be located on the right of the large nut. If it is installed the other way, or during removal, a lift-truck or other lifting device will need to be employed for safety reasons.

Failure to follow the above instructions poses a safety hazard to an installer situated on top of the Primary Container as they would need to push forward to tighten or loosen the clamp.



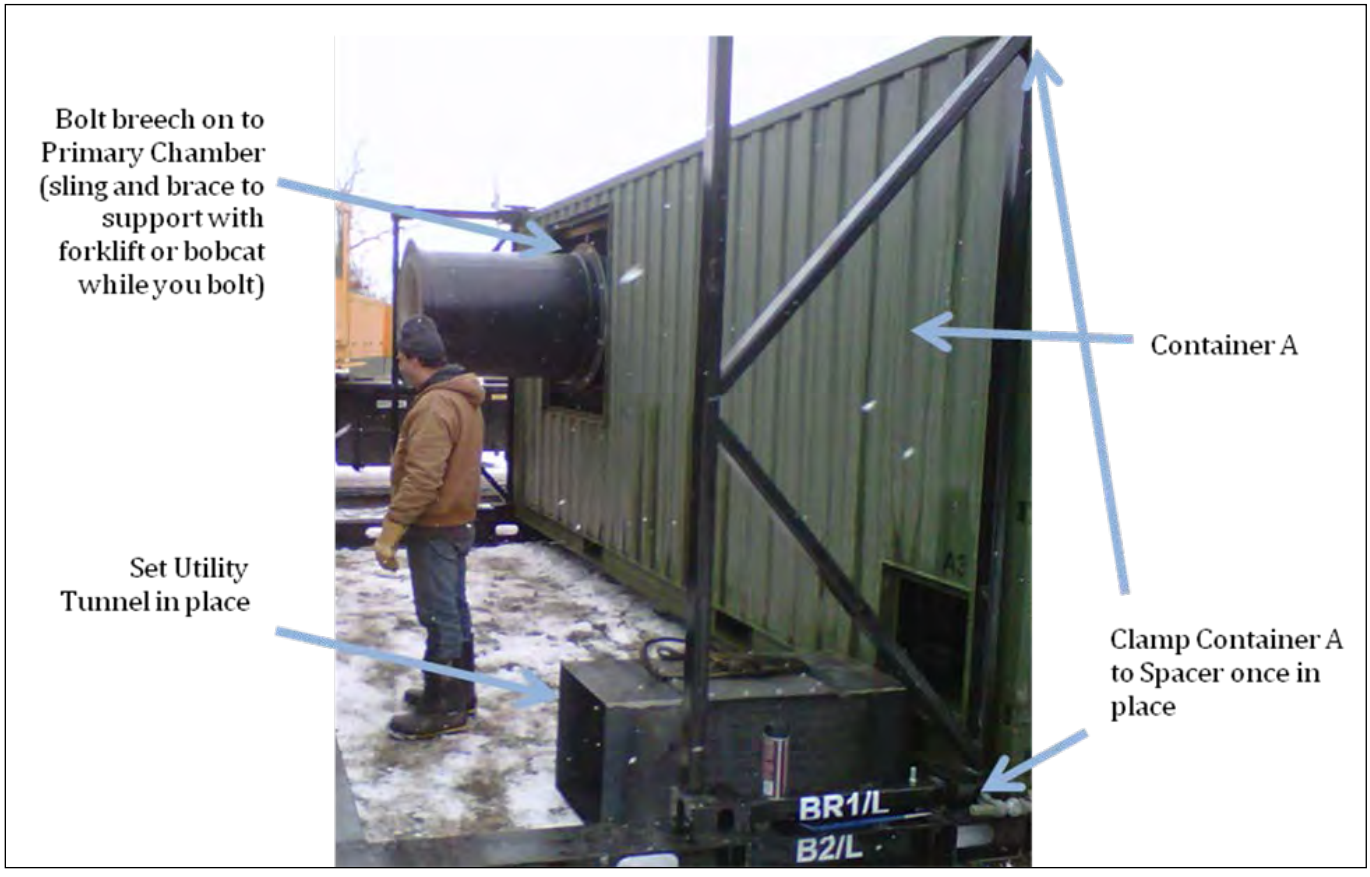


3.1.4.2 CONNECTIONS BETWEEN PRIMARY AND SECONDARY CHAMBER CONTAINERS



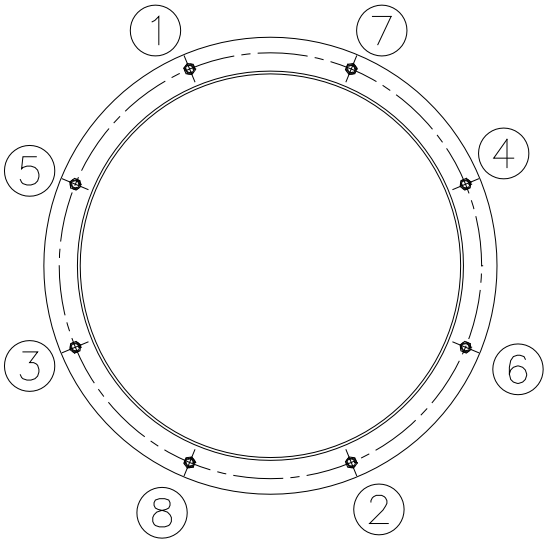
Gasket adhesive spray being applied

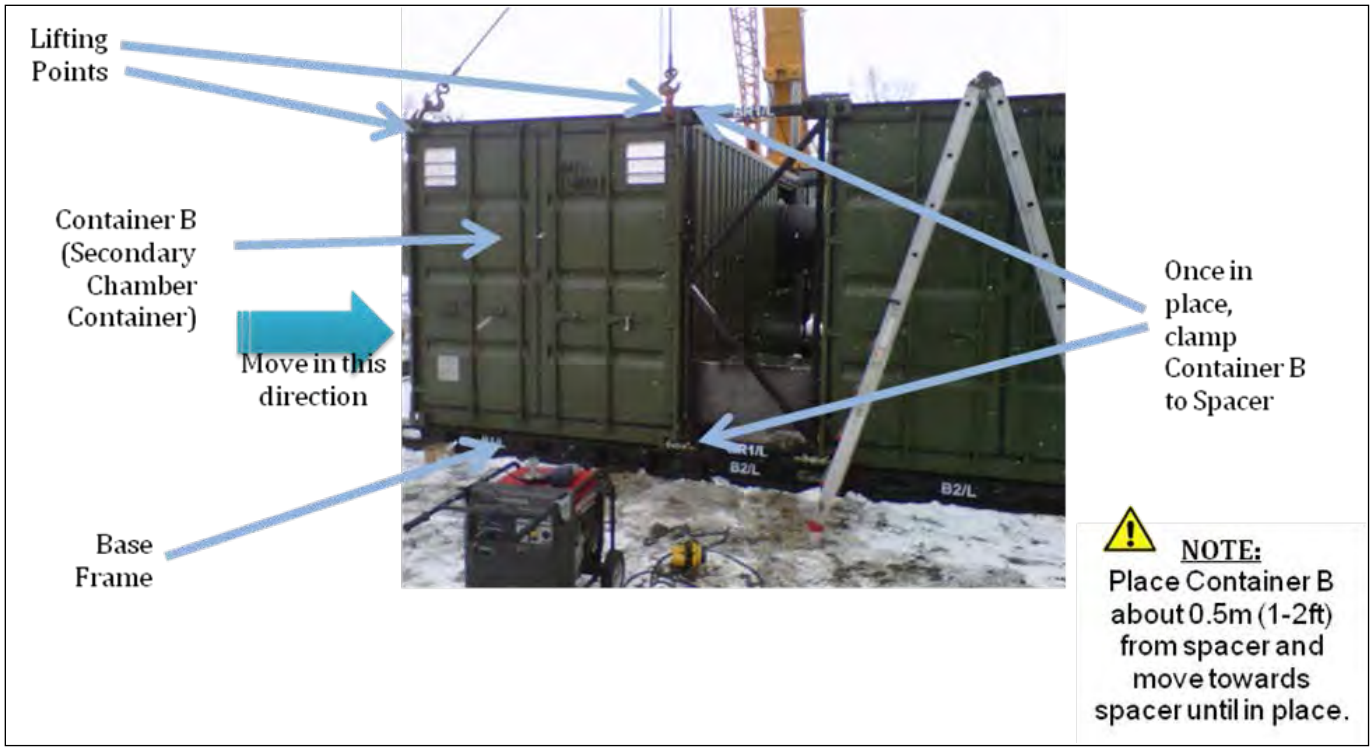
Correctly Installed Gasket

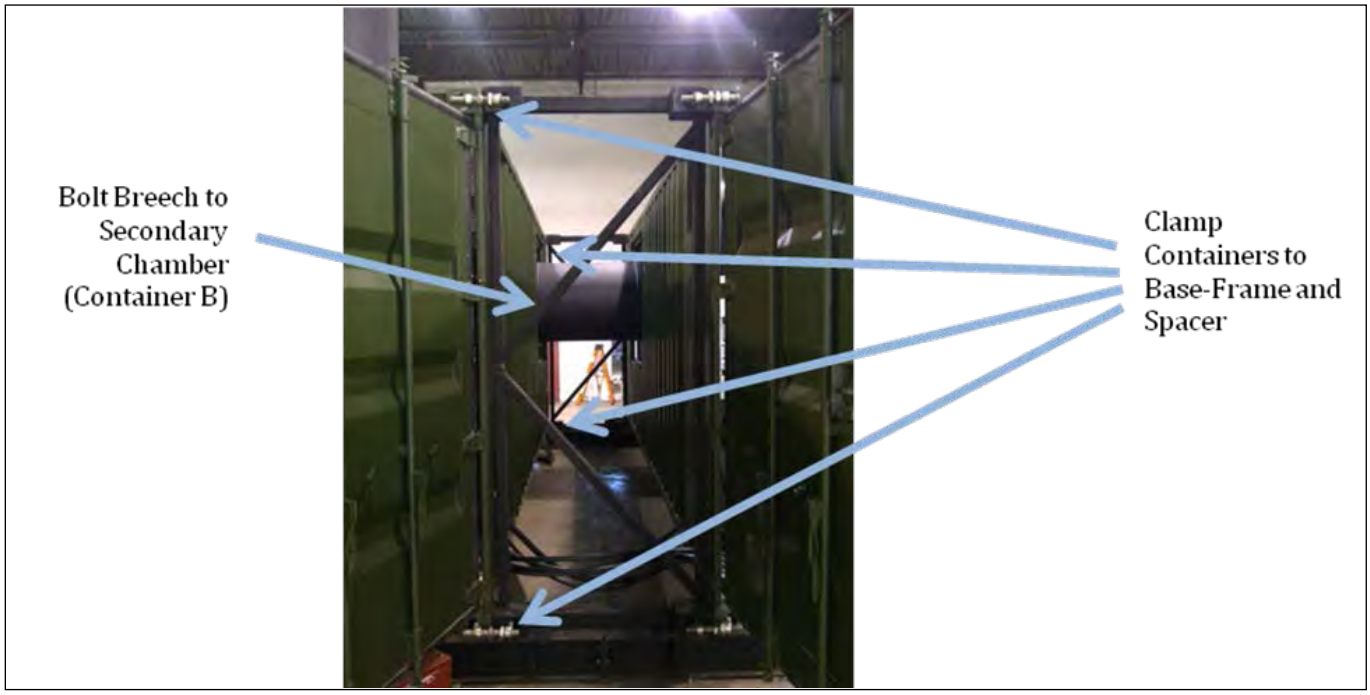


NOTA

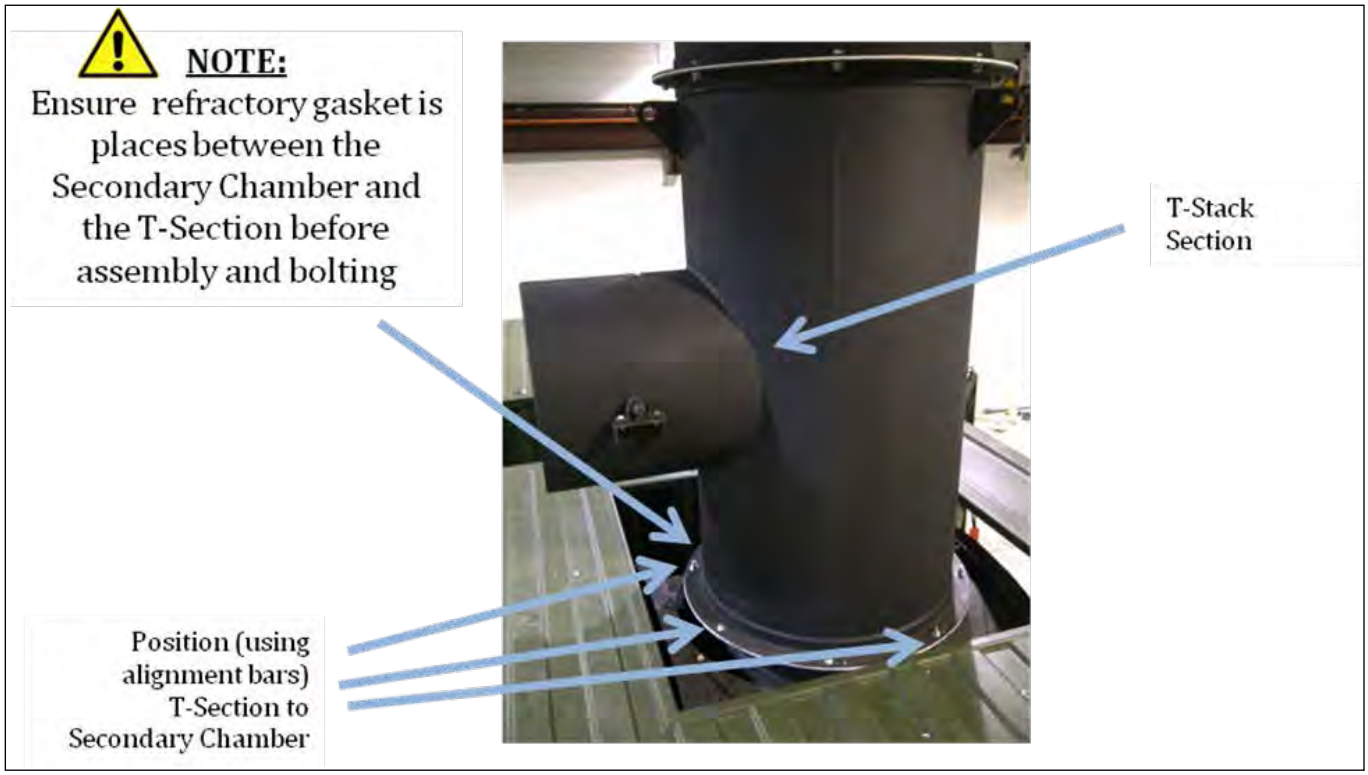
Once breech flanges are aligned and together bolt flanges together using the numerical order described in the pattern below.

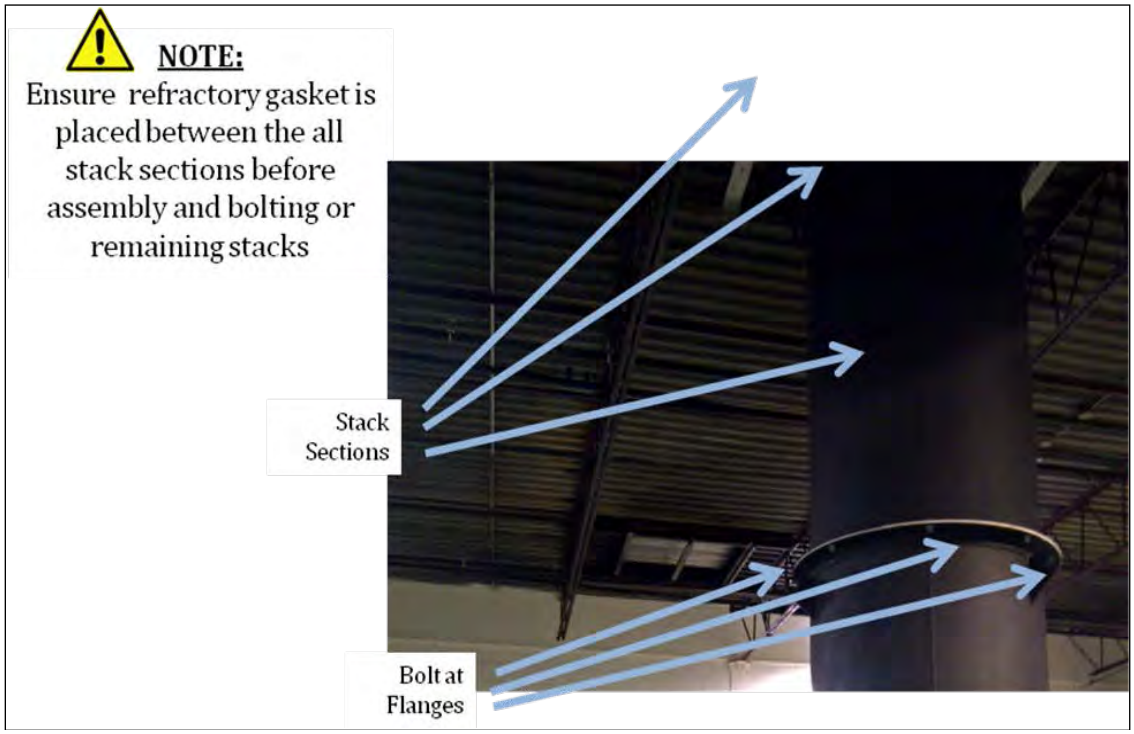

1
7
5
4
3
6
8
2


Lifting Points
Container B (Secondary Chamber Container)
Move in this direction
Base Frame
Once in place, clamp Container B to Spacer
NOTE:
Place Container B about 0.5m (1-2ft) from spacer and move towards spacer until in place.



3.1.4.3 T-STACK SECTION AND SECONDARY CHAMBER CONTAINER





NOTA

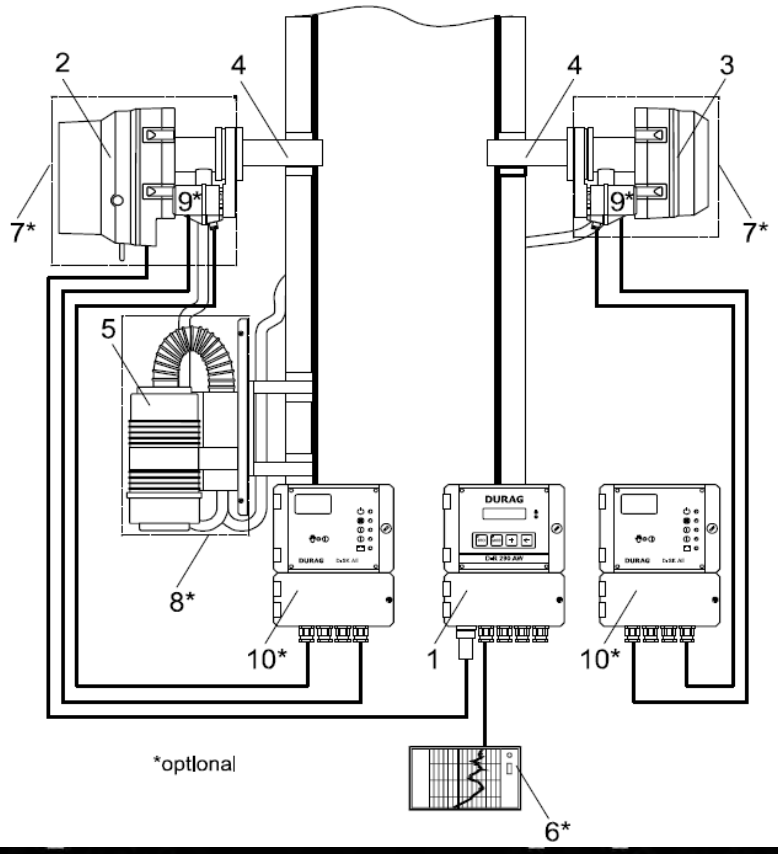
One of the washers must be a lock washer.

3.1.4.4 OPACITY MONITOR

The sensors and purge air unit of the opacity monitor are shipped unassembled and in boxes.

The sensor's mounting flanges are pre-installed in the stack section and the bracket for the purge air unit are installed in the T –stack.

The Control Unit D-R 290 AW is installed inside the Secondary chamber container and pre-wired to the PLC



	Standard		* Optional
1	Control unit, D-R 290 AZ (stack display) Or D-R 290 AW (evaluation unit)	6	Customer supplied recorder or data logging system
2	Transceiver, D-R 290 MK	7 & 8	Weather Hood, US built systems use one
3	Reflector, D-R 290 R1 or R2		Large weather hood for blower and optics
4	Mounting flange, D-R 280 E	9	Fail-safe shutters
5	Purge air unit	10	Fail-safe shutter control electronics

Install the Transceiver and Reflector in the flanges provided in the stack section

Install the Purge Air Unit in the bracket provided in the T-Stack

Connect the Transceiver to the Control unit

Connect power to the Purge Air Unit

3.1.4.5 INTERNAL COMPONENT CONNECTIONS

Flexible conduit in Container 2 (secondary chamber)

Feed flexible conduit from container 2 to containers 1 and 3 through the openings connecting the containers

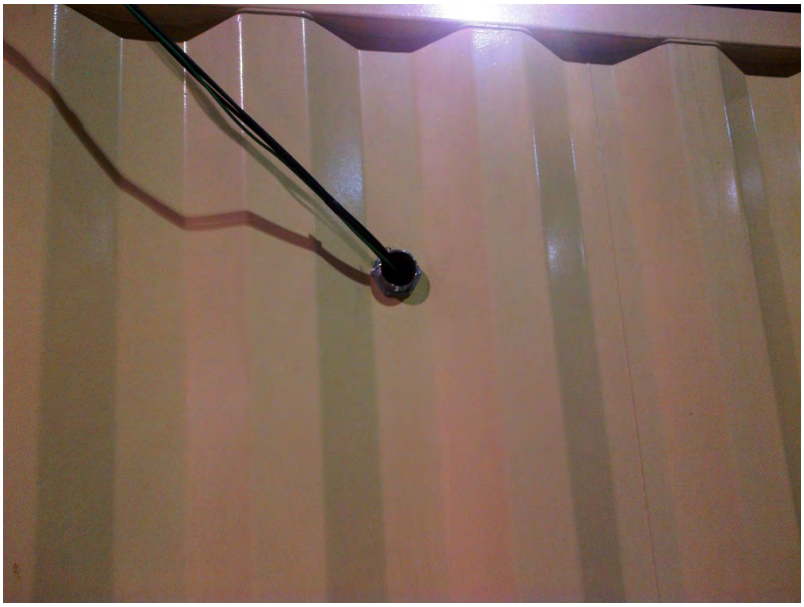
Junction Boxes in container 3 (control container)

Connect each flexible conduit to the correspondent Junction Box (i.e. JB1 conduit with JB1 box) wire the terminal block inside the junction box following the labels on both the wires and the terminal block

Junction Boxes in container 1 (primary chamber)

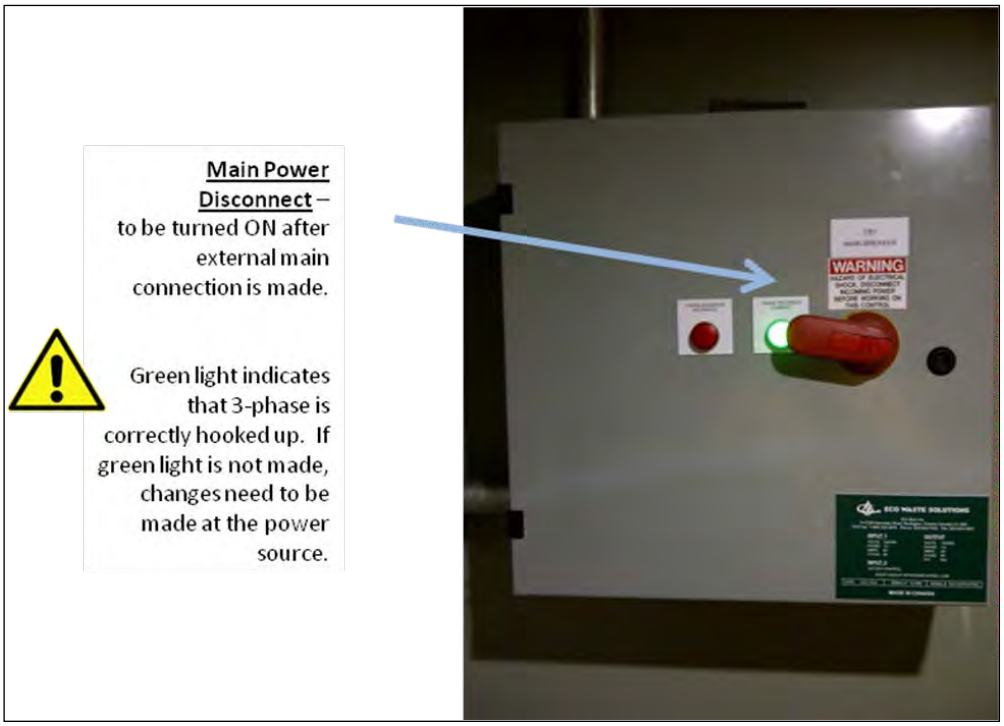
Complete all Junction boxes in both Container 3 and Container 1

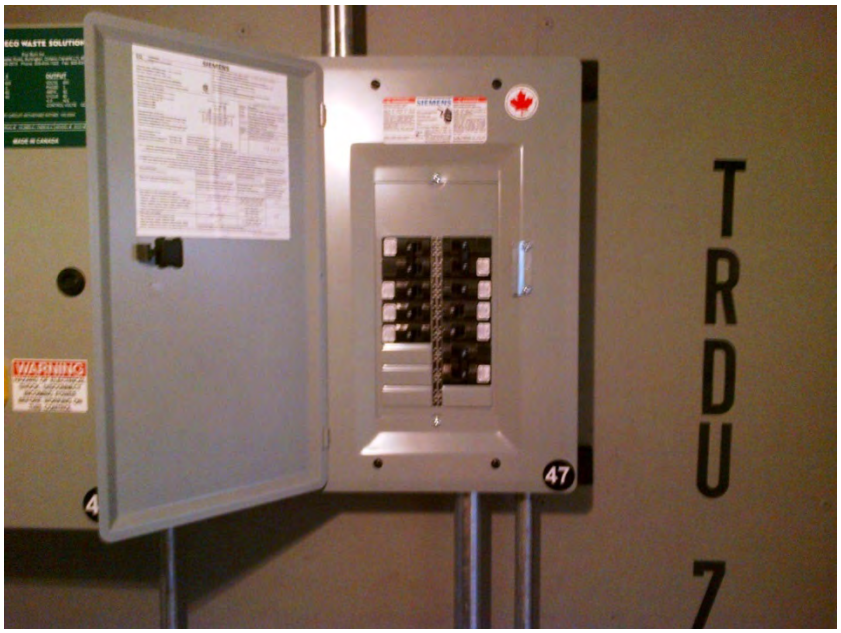
DO NOT CONNECT THE ELECTRICAL UNLESS THE MAIN SUPPLY FROM THE SITE HAS BEEN INTERRUPTED AND THE INCINERATOR BREAKERS ARE IN THE OFF POSITION



2” opening for power supply in container 3

Feed the 600v 40Amp 60Hz power through the 2” opening in container 3 (power supply cable and 2“coupling to be provided by the customer) and connect the wires to the Main Disconnect. The main supply from the site can be turned on now.





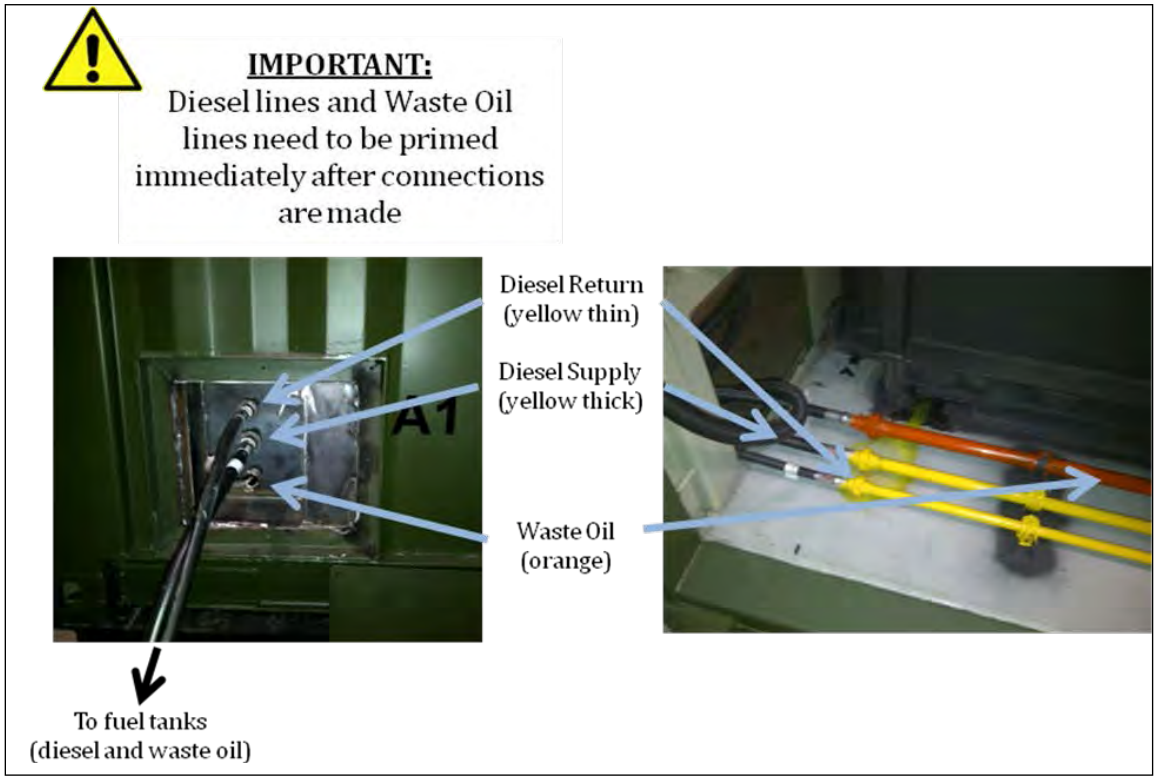
Switch on all incinerator breakers in the Breaker Panel

Control Panel Power On– turn on the power to the Control Panel.

3.1.4.6 INTERNAL CONNECTIONS

Compressed air quick connect for Waste Oil Burner

Connect the air hose from the Waste oil Burner to the quick connect fitting



Feed wires for the tanks' level sensors and waste oil tank heater from the tanks through the opening beside the hose adaptors and connect to the junction boxes

3.2 DISASSEMBLY INSTRUCTIONS

3.2.1 General Disassembly Information

The customer's personnel and/or contractors are responsible to:

3.2.1.1 Perform disassembly according to instructions provided by EWS in this *Manual*.

3.2.1.2 Disassemble I-beams, spacers and all incinerator component equipment using a crane, forklift, come-alongs, hydraulic jacks/hand-pumps, etc…

3.2.1.3 Disconnect all utility services including connections to the equipment including fuel, electrical, water, air, etc. using basic hand tools prior to disassembly

NOTA
Do not scale drawings: If certain dimensions are required which are not shown on drawings, EWS should be contacted for the required dimension. EWS will not be responsible for any dimensional conflicts resulting from dimensions not shown on a certified drawing. Do not use general sales literature or other general equipment submittals for construction, assembly and/or erection, unless so indicated.

Please note that some of the diagrams and/or photos in this FACILITY MANUAL are conceptual in nature and may not be exact representation of equipment purchased.

3.2.2 Preparation Prior to Disassembly

NOTA
DO NOT DISCONNECT THE INTERNAL ELECTRICAL CONNECTIONS UNTIL THE EXTERNAL POWER SUPPLY TO THE MOBILE INCINERATOR HAS BEEN SAFELY DISCONNECTED.

NOTA
TURN POWER OFF AT CUSTOMER SUPPLIED GENERATORS

The fuel supply connections (diesel and waste-oil) are located on the Primary Chamber Container and disconnect the fuel supply from the fuel tanks located externally. There are fuel lines between the containers for fuel distribution which are to be disconnected after the external hook-ups and connections have been disconnected.

NOTA
DO NOT DISCONNECT THE INTERNAL FUEL CONNECTIONS UNTIL THE EXTERNAL FUEL SUPPLY TO THE MOBILE INCINERATOR HAS BEEN DISCONNECTED.

3.2.3 Disassembly Overview

3.2.3.1 Specialized Tools and Equipment for Disassembly

The complete disassembly of the **EWS Mobile Incinerator** will require 2-3 full time personnel for 2 days. The following list identifies the equipment required to be supplied by the customer in order to proceed with the disassembly:

a. Crane
b. Forklift
c. Scissor Lift
d. Shims
e. Ladder (12')
f. Come-along
g. Hydraulic Jack/pump
h. Level
i. Erection Wrench / Alignment bar
j. Container Clamp 2-Wrench
k. Sling
l. I-beam Clamp

3.2.3.1 Disassembly Overview

The following general steps are the order in which the **EWS Mobile Incinerator** Package needs to be disassembled. Each step is detailed in the subsequent section.

ORDER OF DISASSEMBLY (as detailed in Section 3.2.4)

3.2.4.1 External Disconnections
3.2.4.2 Internal Disconnections
3.2.4.3 Internal Component Disconnections
3.2.4.4 Removal of opacity monitor
3.2.4.5 Removal of Stack Sections
3.2.4.6 Disassembly and Removal of Containers from Base Frame Structure
3.2.4.7 Disassembly of Base Frame Structure

NOTA

Important Notes to Consider Prior to and during Disassembly

a. Lifting lugs are provided on the stacks, and major accessories, and should be used when disassembling the incinerator

b. Do not allow lifting chains or cables to put loads on piping, or mounting flanges as they may be damaged.

c. Avoid dragging lifting gear across painted surfaces.

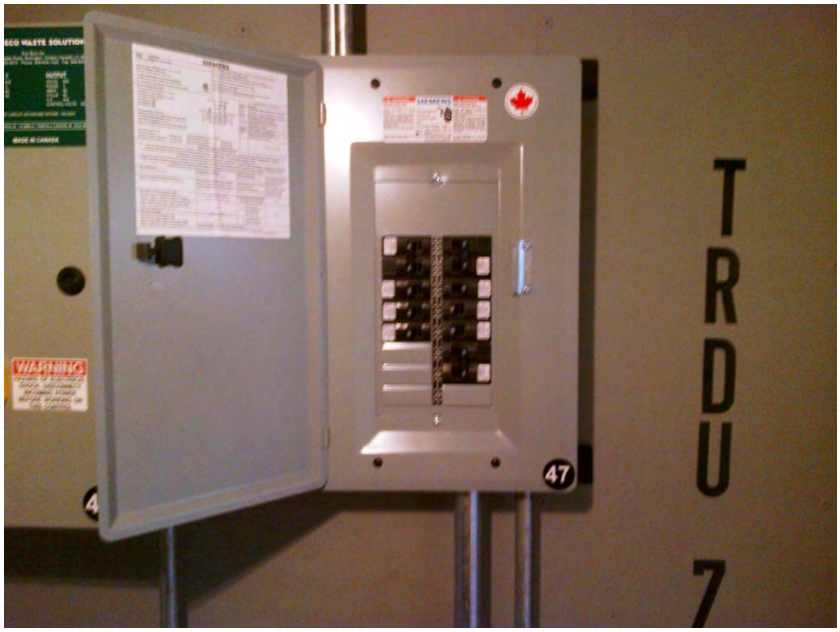
d. When removing the system from its position, be careful not to subject the refractory to mechanical shock, which may result in refractory damage.

3.2.4 Disassembly Instructions

3.2.4.1 EXTERNAL CONNECTIONS

Control Panel Power Off – turn off the power to the Control Panel.

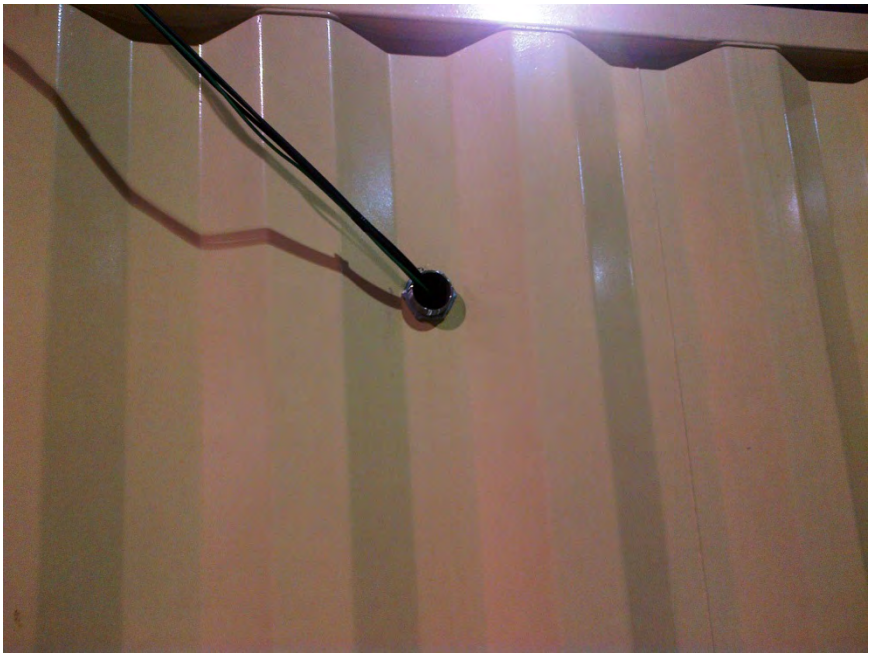
Main Power Disconnect – to be turned OFF before disconnecting any external or internal connections.



Switch off all breakers in the Breaker Panel

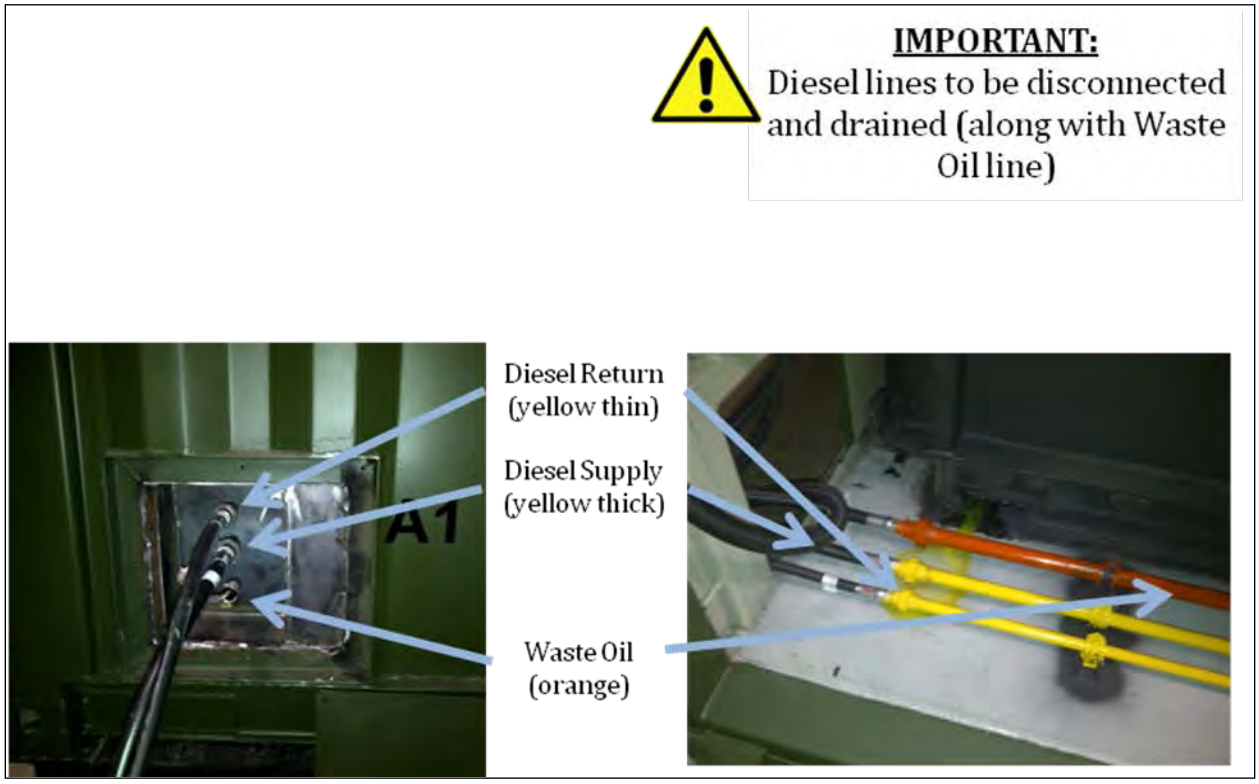
DO NOT DISCONNECT THE ELECTRICAL UNLESS THE BREAKERS ARE IN OFF POSITION

DO NOT DISCONNECT THE MAIN POWER FEED UNLESS THE MAIN SUPPLY FORM THE SITE HAS BEEN INTERRUPTED



2” opening for power supply in container 3

Disconnect the wires to the Main Disconnect and remove the 600v 40Amp 60Hz power through the 2” opening in container 3



Disconnect wires to the tanks level sensors and waste oil tank heater from the junction boxes and remove then through the opening beside the hose adaptors.

3.2.4.2 INTERNAL CONNECTIONS

Junction Boxes in container 1 (primary chamber)

Junction Boxes in container 3 (control container)

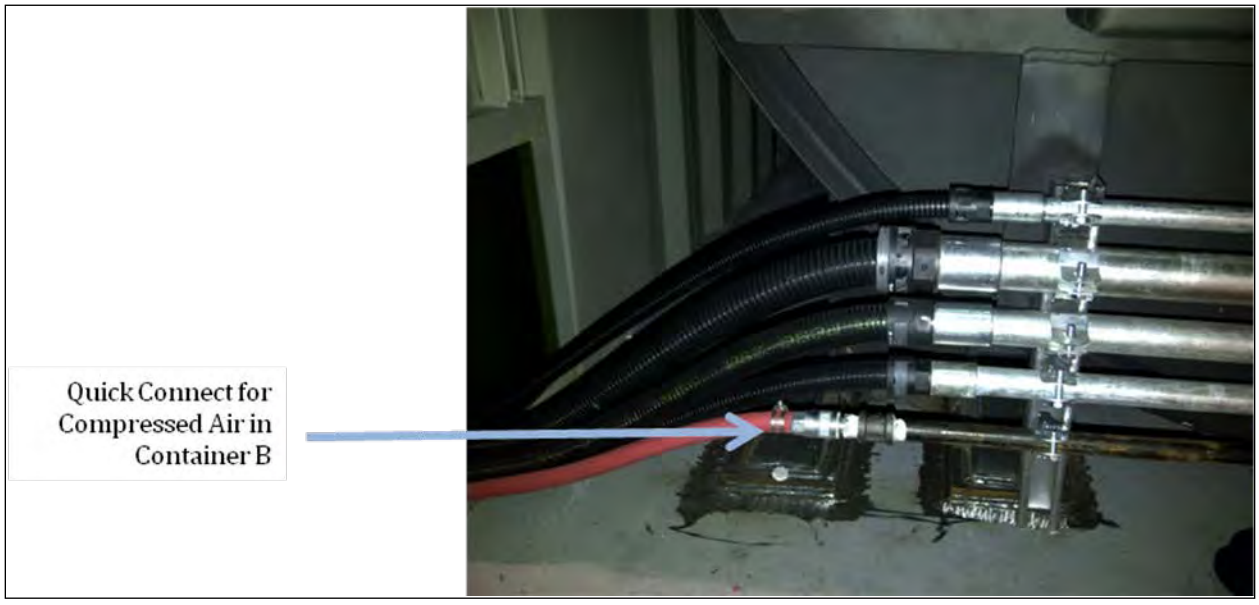
Disconnect the wires from the terminal block inside every junction box in both Container 1 and 3, replace any wire labels and conduit labels missing or damaged

Flexible conduit in Container 2 (secondary chamber)

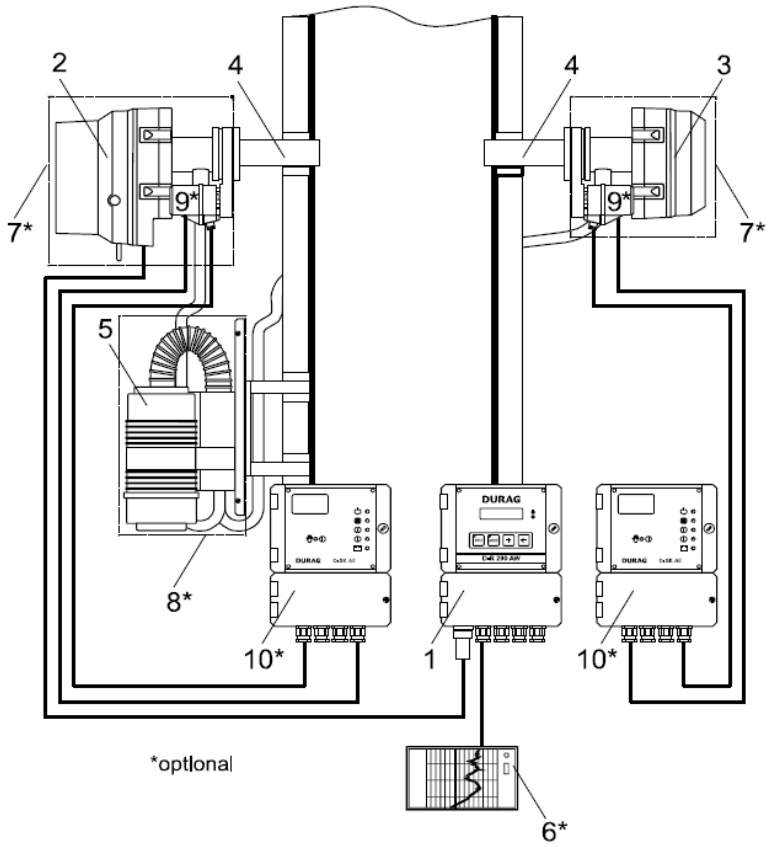
Pull the flexible conduit from container 1 and 3 into container 2 through the openings connecting the containers

Compressed air quick connect for Waste Oil Burner

Disconnect the air hose for the Waste oil Burner from the quick connect fitting



3.2.4.3 REMOVAL OF OPACITY MONITOR



	Standard		* Optional
1	Control unit, D-R 290 AZ (stack display) Or D-R 290 AW (evaluation unit)	6	Customer supplied recorder or data logging system
2	Transceiver, D-R 290 MK	7 & 8	Weather Hood, US built systems use one
3	Reflector, D-R 290 R1 or R2		Large weather hood for blower and optics
4	Mounting flange, D-R 280 E	9	Fail-safe shutters
5	Purge air unit	10	Fail-safe shutter control electronics

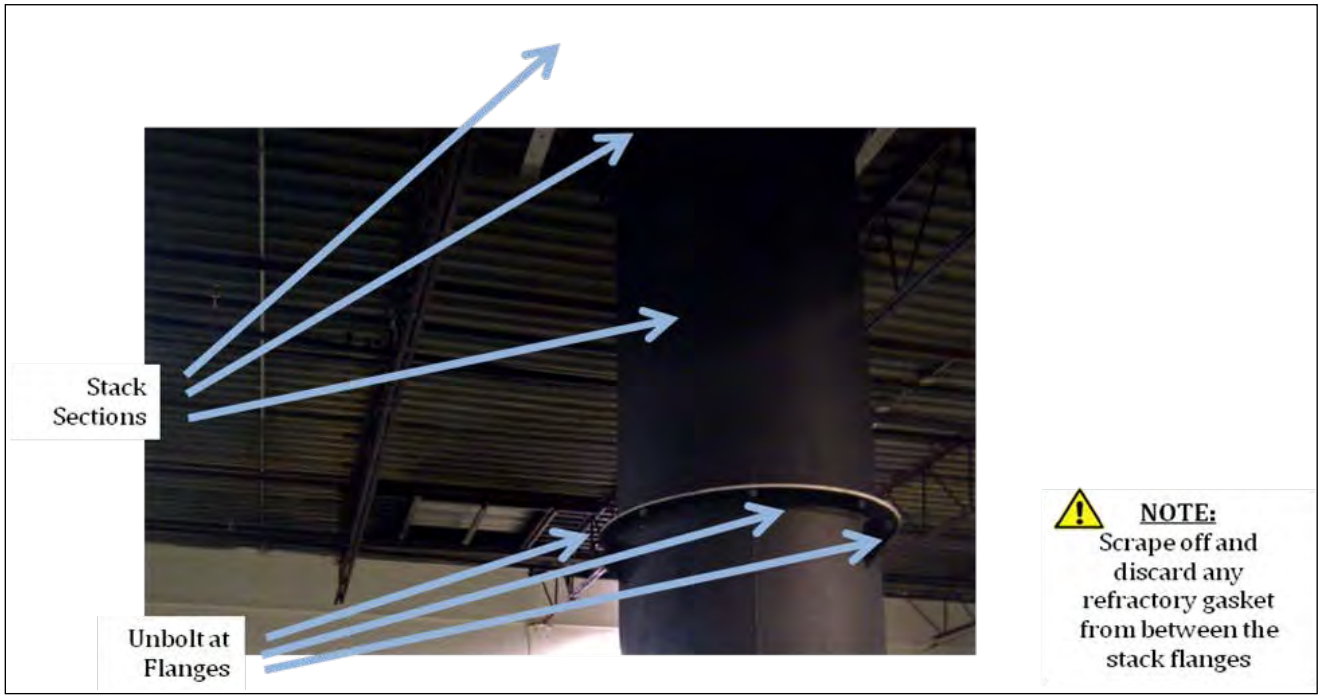
Disconnect power to the Purge Air Unit

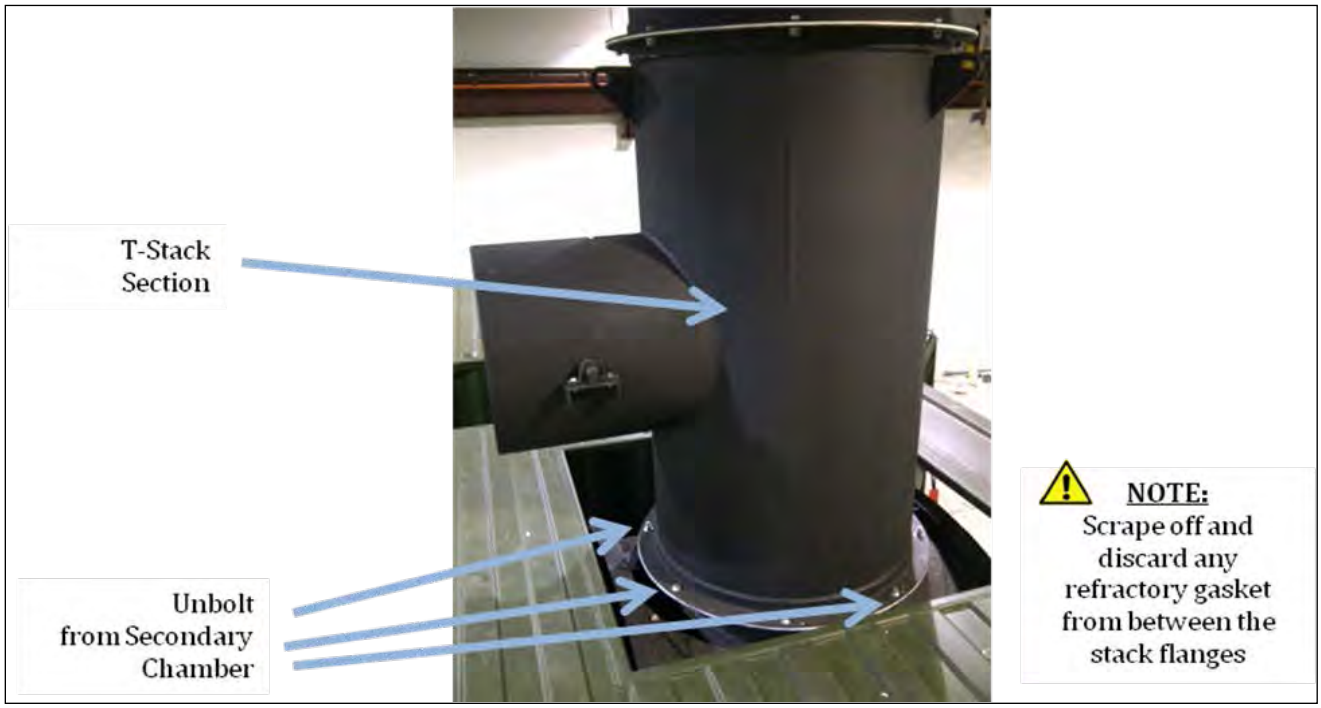
Disconnect the Transceiver to the Control unit

Uninstall the Purge Air Unit in the bracket provided in the T-Stack

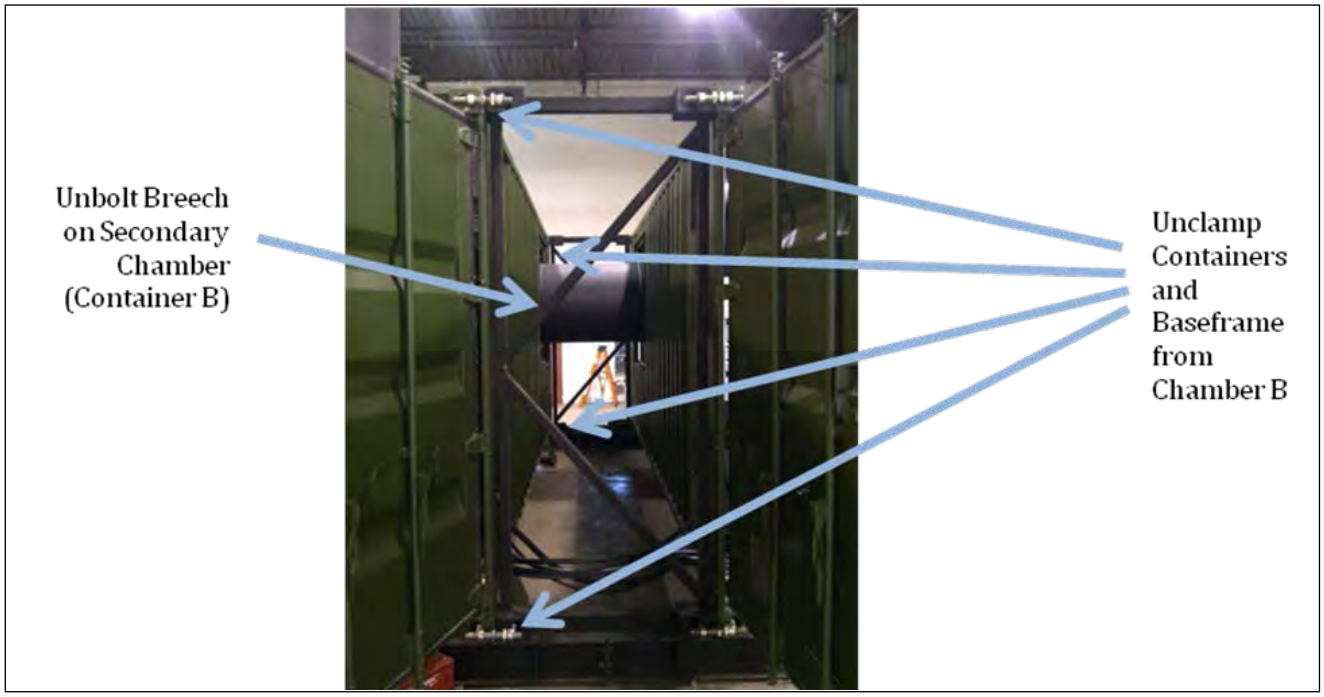
Uninstall the Transceiver and Reflector in the flanges provided in the stack section

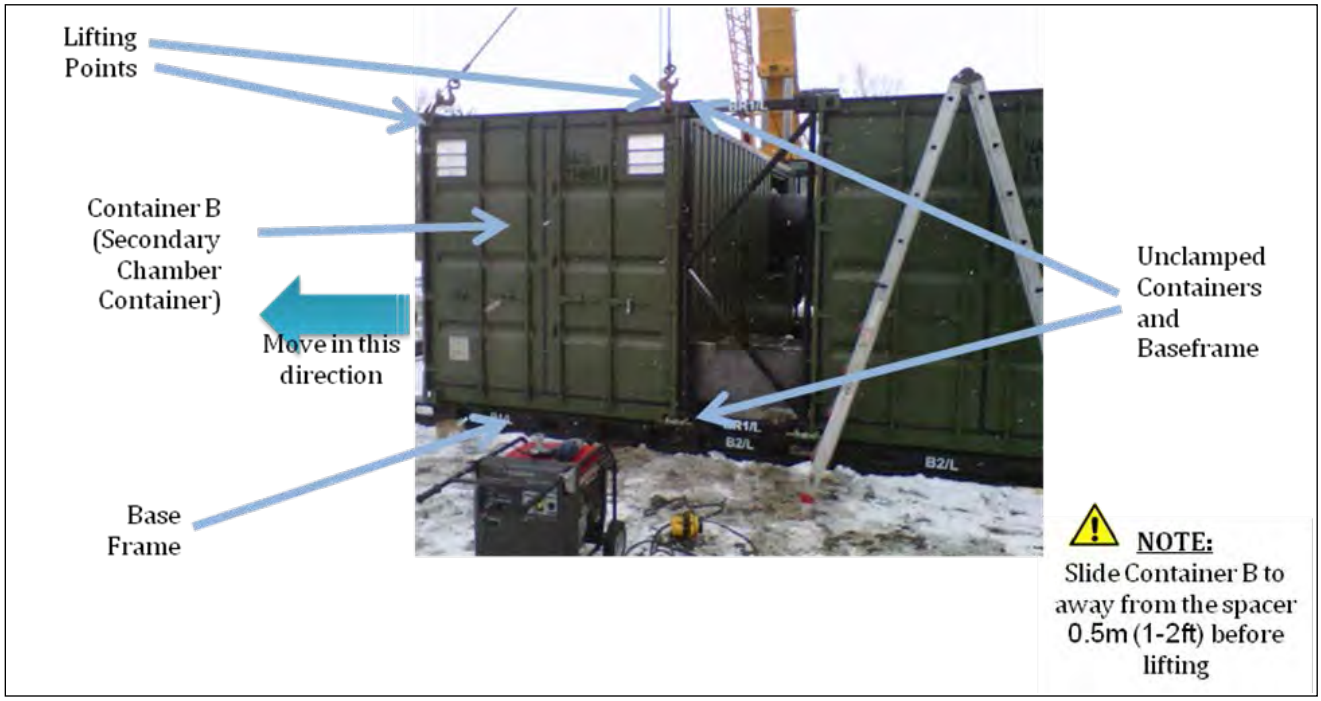
3.2.4.4 REMOVAL OF STACK SECTIONS



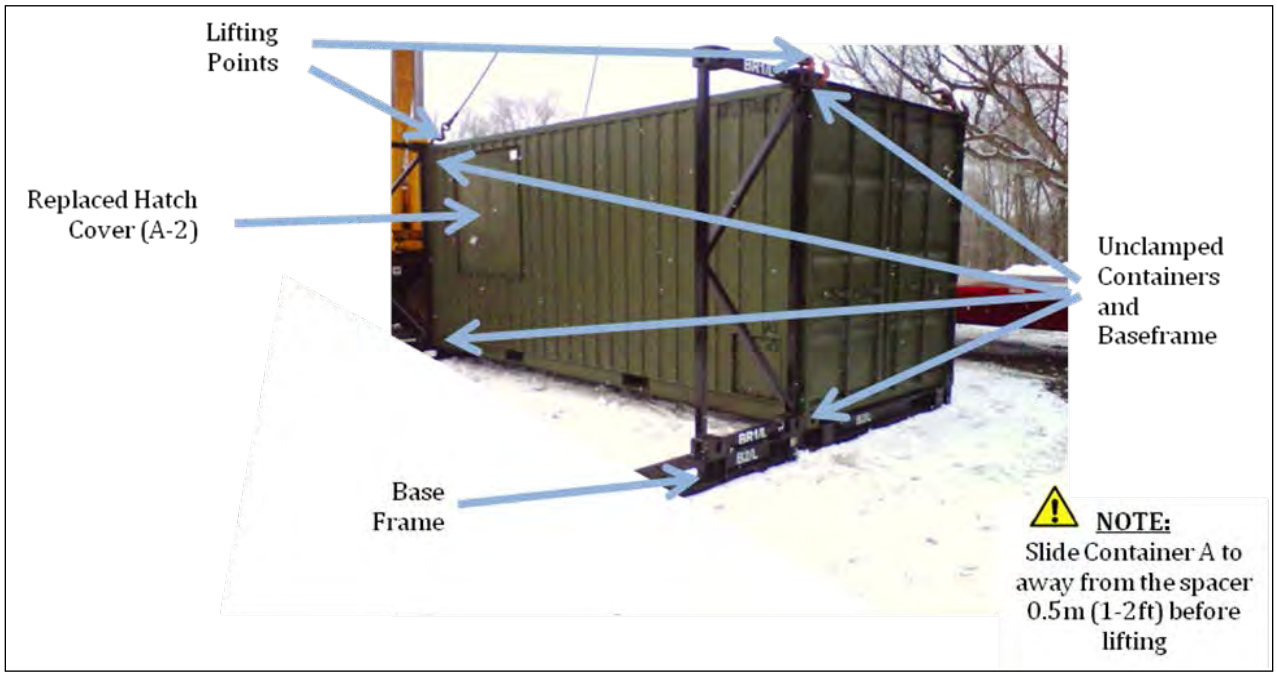


3.2.4.5 DISASSEMBLY AND REMOVAL OF CONTAINERS FROM BASE FRAME STRUCTURE

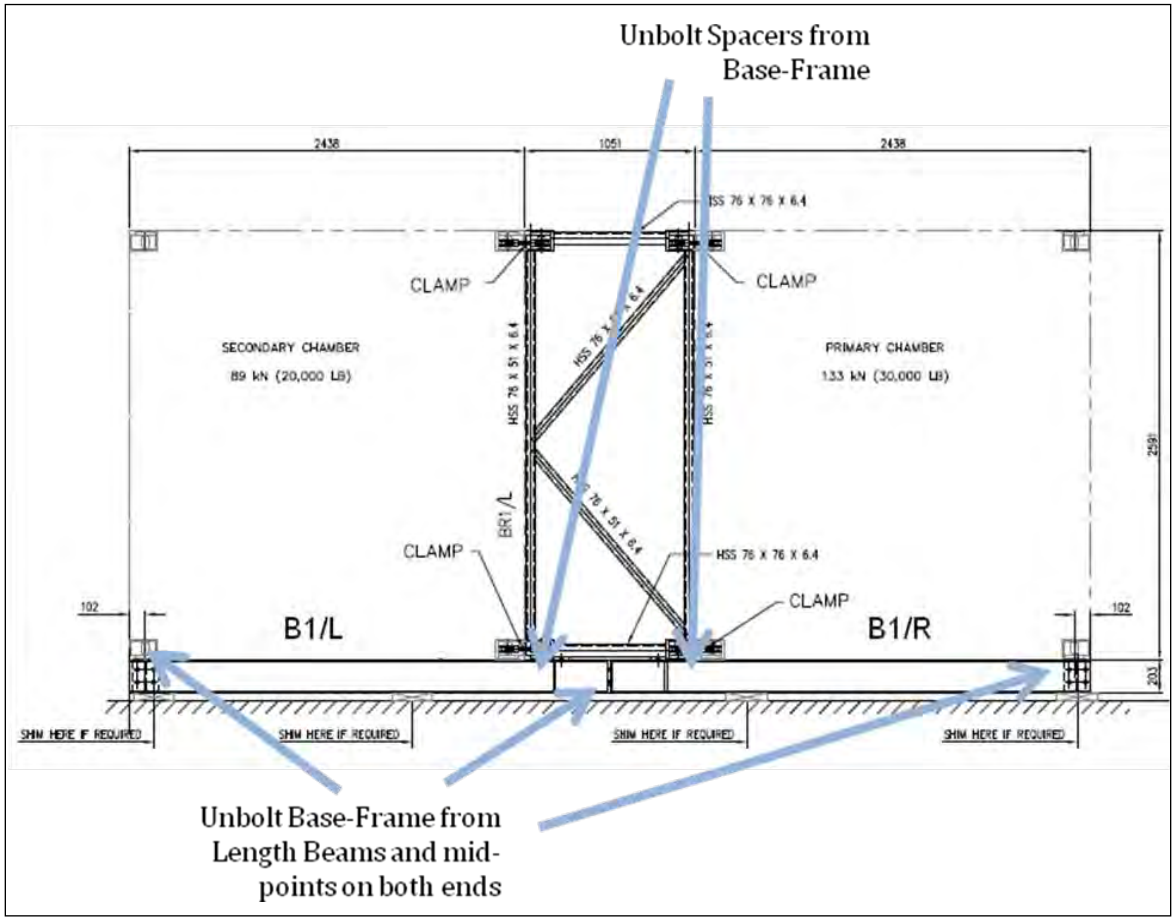

Unbolt Breech on Secondary Chamber (Container B)
Unclamp Containers and Baseframe from Chamber B

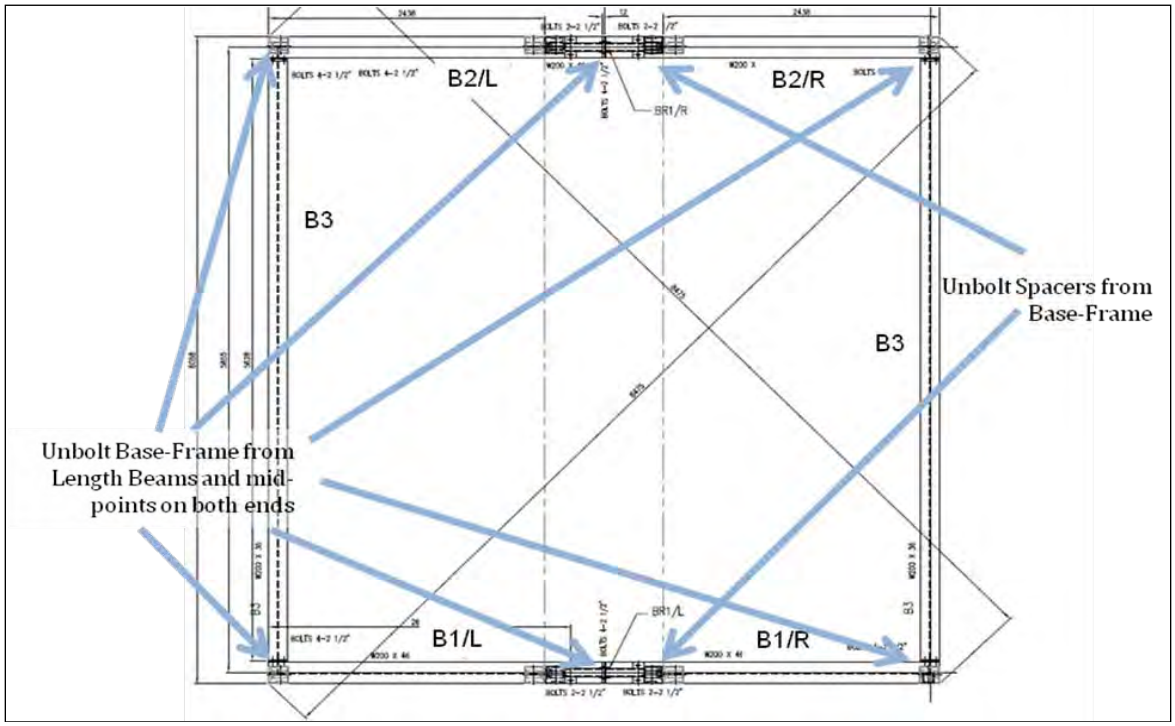

Lifting Points
Container B (Secondary Chamber Container)
Move in this direction
Base Frame
Unclamped Containers and Baseframe
NOTE:
Slide Container B to away from the spacer 0.5m (1-2ft) before lifting


Unbolt Breech on Primary Chamber (sling and brace to support with forklift or bobcat)
Container A
Remove Utility Tunnel
Unclamp Containers and Base-frame from Container A
BR1/L
B2/L


Lifting Points
Replaced Hatch Cover (A-2)
Unclamped Containers and Baseframe
Base Frame
NOTE:
Slide Container A to away from the spacer 0.5m (1-2ft) before lifting

DISASSEMBLY OF BASE FRAME STRUCTURE





Miscellaneous Final Items:

- Replace all remaining hatch covers on Containers A, B and C
- Pack all remaining parts for shipment:
  Nuts, bolts and washers
  Stacks, t-section and breech on marked skids
  I-beams and spacers from the base-frame
  Fuel and Waste Oil tanks

3.2.4.6 PREPARATION FOR STORAGE AND WHILE IN STORAGE

The following items will be required for final packing and storage:

- Lubricant (Lithium Spray Grease)
- Standard Grease (Mobilgrease 28)
- Silicone (MONO Ultra)
- Desiccant (Shipping Container Desiccant)

1. **Primary Chamber Container (1) and Secondary Chamber Container (2):**

General

a. Place desiccant bags under chambers and replace every 6 months

b. Lubricate door frames (hinges and bearings) using standard grease.

c. Place desiccant bags in the Primary and Secondary Chambers and replace every 6 months.

d. Seal all container openings with silicone rubber caulking (Sealastic® or equal - block to discourage pilfering).

Ventilation and Exhaust Fans

e. Coat coupling and all external machined parts with standard grease.

f. Spray light penetrating oil on fan wheel.

g. For long term or outdoor storage, mounted bearings should be re-greased and wrapped with plastic for protection. Rotate the fan wheel by hand at least every two weeks to redistribute grease on internal bearing parts. Each month the bearings should be purged with new grease to remove condensation, since even a filled bearing can accumulate moisture. Use caution when purging, as excessive pressure can damage the seals. Rotate the shaft while slowly adding grease. Place desiccant bag in fan housing and replace every 6 months.

Fan and Pump Motors

h. Spray light penetrating oil on the shafts of the motors.

i. Fill bearing housing with grease containing five percent rust-preventive concentrate.

j. Coat all exposed machined parts with standard grease

k. Do not rotate motors

2. **Controls Container (3)**

Air Compressor

a. Purge compressor cylinders of hydrocarbons.

b. Blank compressor suction and discharge.

c. Fill crankcase, cooling water jacket and valves with oil containing five percent rust-preventive concentrate. Allow space for thermal expansion.

d. Coat all exposed machined parts with standard grease.

e. Top-up oil level in the cooling water jacket.

f. Controls container must be stored in a climate-controlled building during this period to protect the PLC and instrumentation from freezing temperatures or fluctuations in temperature that go below the dew point. No components will require special attention if the container is stored in a building kept above the dew point temperature (e.g. above 15°C at less than 35% relative humidity).

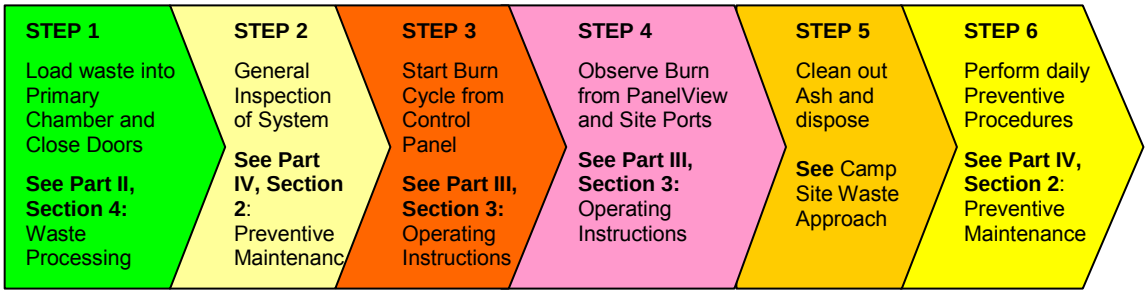
3.2.4.7 PACKING SKIDS AND CRATES IN CONTAINERS

1. Prior to shipment ensure all components are strapped and fastened within the container.

2. If all above items were followed for the preparation and while in storage, the system should be ready for shipment and usage.

3.3 OPERATING INSTRUCTIONS

The operation of the Mobile Waste Incinerator package follows 6 general steps that take place over a 24 hour period.



This section focuses on Steps 3 and 4 and how to start the system and monitor it during operation, however it is assumed that the waste is properly loaded with the weight, density and type stated in Part II Section 4. It is also assumed that the waste is loaded after the ash has been removed from the previous burn cycle and any daily maintenance routines have been completed.

3.3.1 Operator Interface

3.3.1.1 Control Panel Components

Rear View:

1. Main Disconnect Switch
2. Panel View Operator Panel
3. Control Power ON
4. Emergency Stop Button
5. Ethernet Ports

1. Main Disconnect Switch : Controls all power to the system.

2. PanelView Operator Interface ("PanelView"): Displays various screens reflecting system performance.

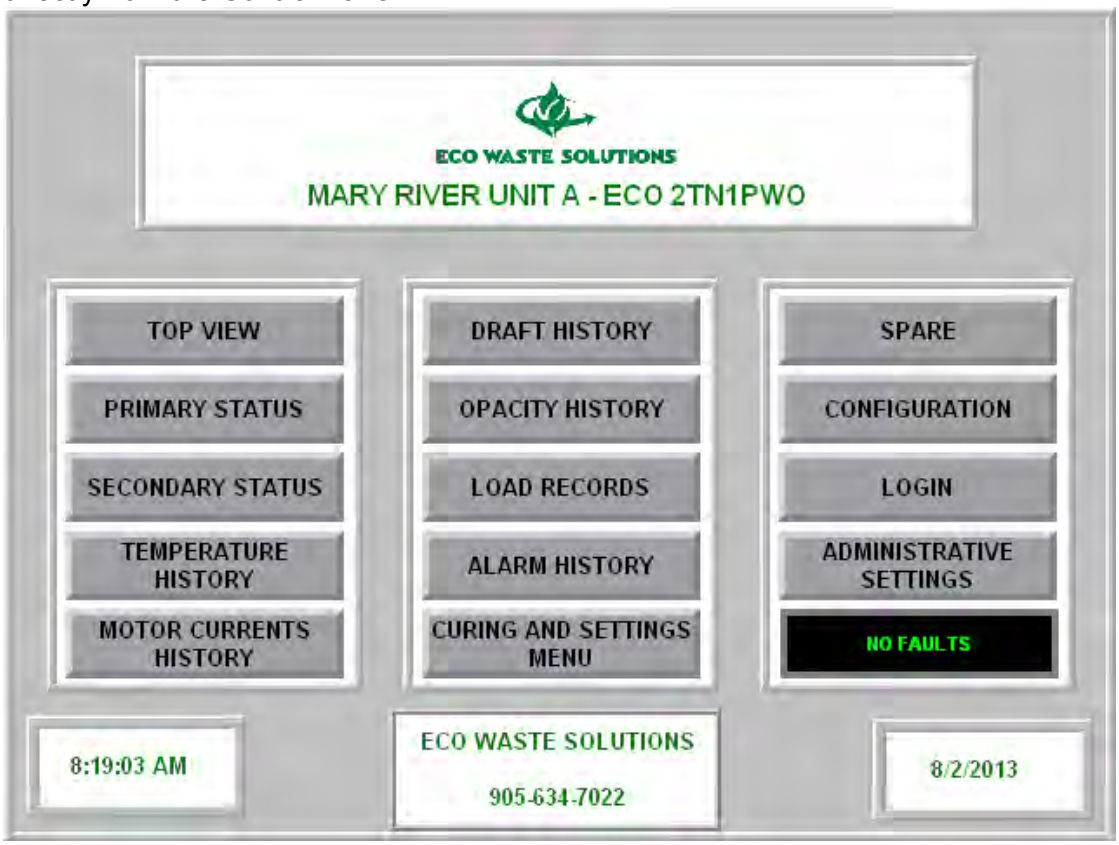
3. Control Power On:
   1 – Green light indicates the control power in the panel is on;
   2 – Pushing this button if the E-stop is out will turn on the control power.

4. Emergency Stop Keylock Button: Stops the current burn cycle in progress and disables the ability to restarting it.

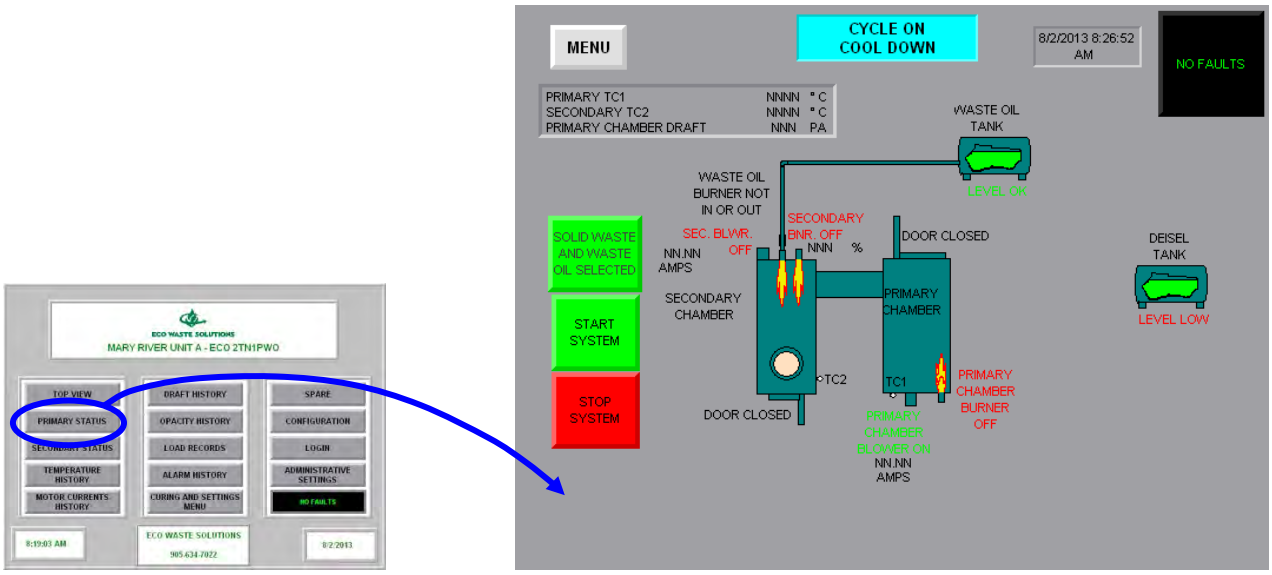
5. USB Flash Drive Port: Port used to insert USB drive to download system historical usage data.

3.3.1.2 Operator Interface

The PanelView Operator Interface controls the operation of the mobile incinerator package directly from the Control Panel.

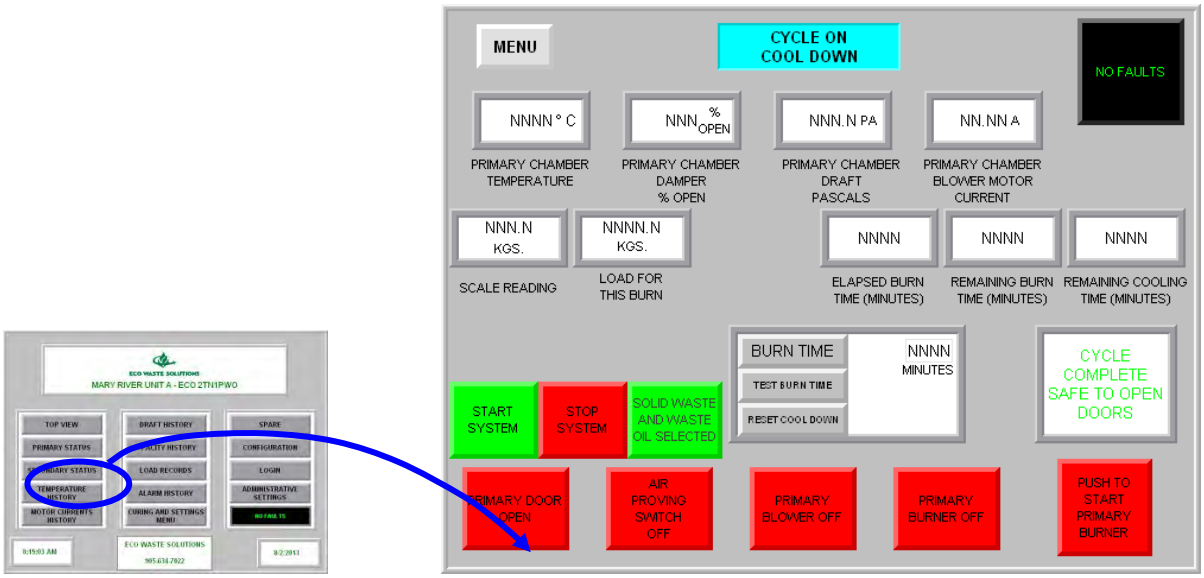


The main screen displays all the available options for viewing the system in operation. The PanelView is a touch-screen and items can be selected by touching them on the screen.



When the **TOP VIEW** button is selected, an overview of the incinerator and related components are displayed. This shows key temperatures, flows, and other indicators of what is happening in the process in a real-time basis.

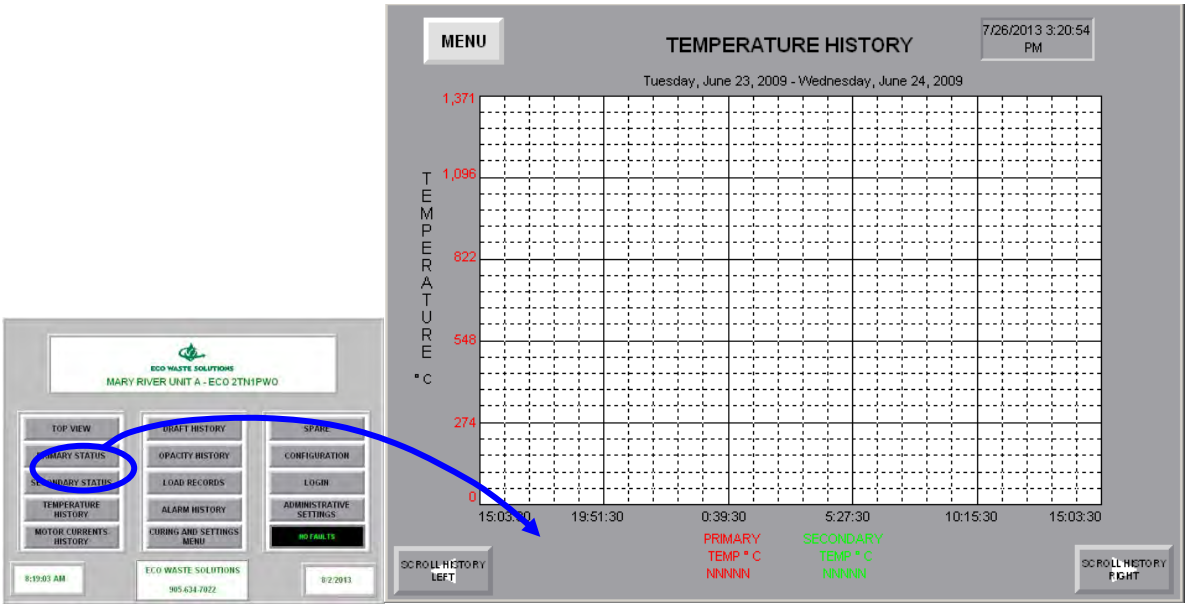
The system will not start if there are alarms or faults present. To clear (acknowledge faults) At any time, touch or press **MENU** to go back to the main screen.



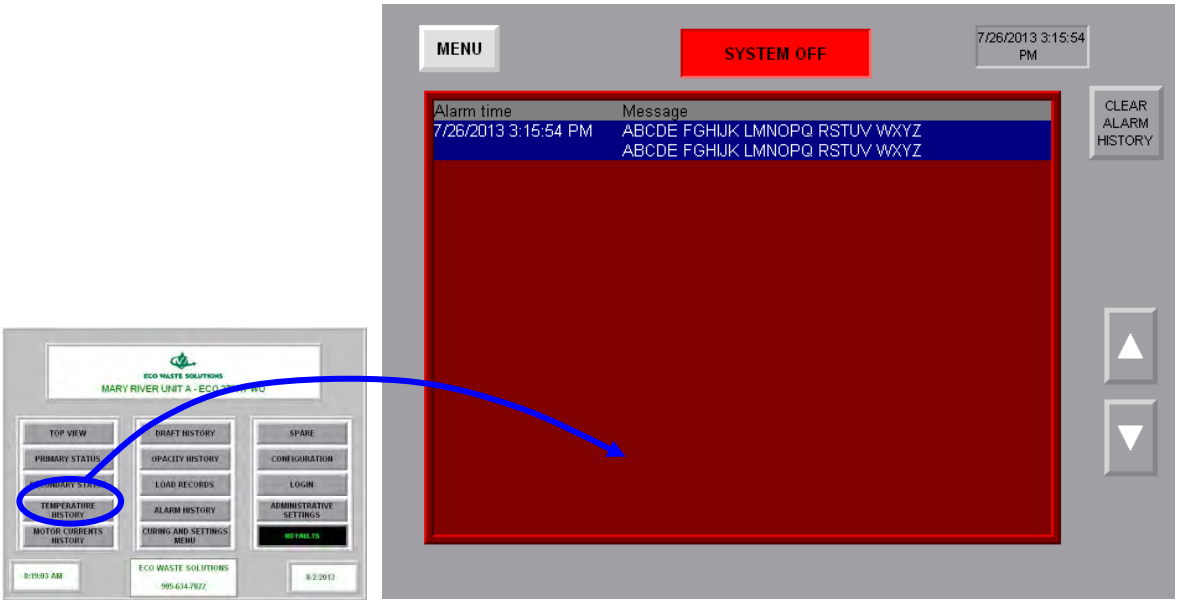
When the PRIMARY or SECONDARY SYSTEM STATUS is selected from the Main Menu a screen (above) will display the status of all the operating parameters of the respective chamber such as the temperatures and the time remaining in the cycle as well as displaying other informational items such as status of the door and blowers, etc.

The operator can change the burn time of the cycle by selecting “BURN TIME” and entering a time (in minutes). The operator may do this over time to either prolong the burn time, or decrease the burn time depending on the waste mix. (E.g. a very wet batch of garbage will take more time than a dryer batch of waste).

At any time, touch or press **MENU** to go back to the main screen.



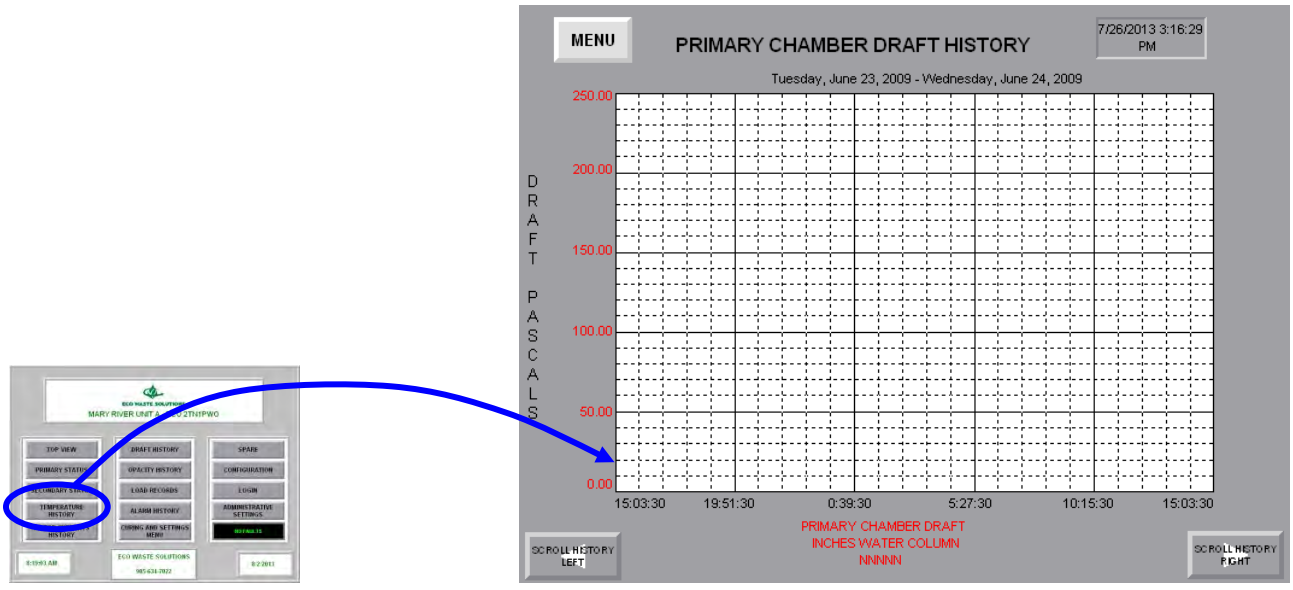
When the **TEMPERATURE HISTORY** is selected the screen will display the temperature history for the last burn showing various temperatures throughout the system. This information is stored for 30 days.



When **ALARM HISTORY** is selected the screen displays the last 25 faults with the date & time of occurrence. The operator can press the CLEAR ALARM HISTORY to clear all of the faults. The operator can also clear individual alarms by selecting them on-screen and pressing the ACKNOWLEDGE button.

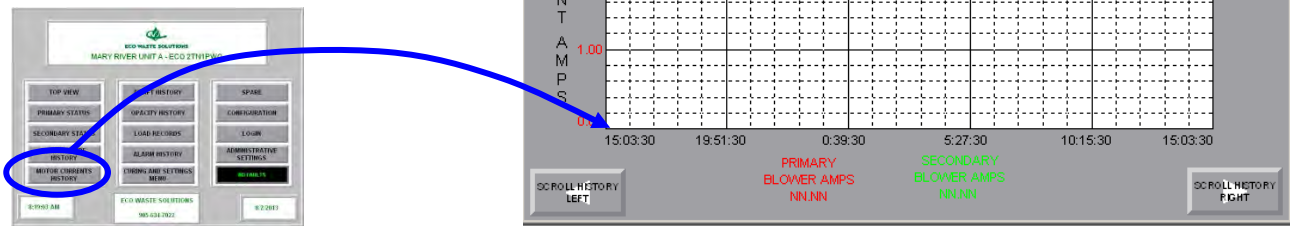
The operator can select **ALARM COUNT**, and view the specific number of alarm faults.

At any time, touch or press **MENU** to go back to the main screen.



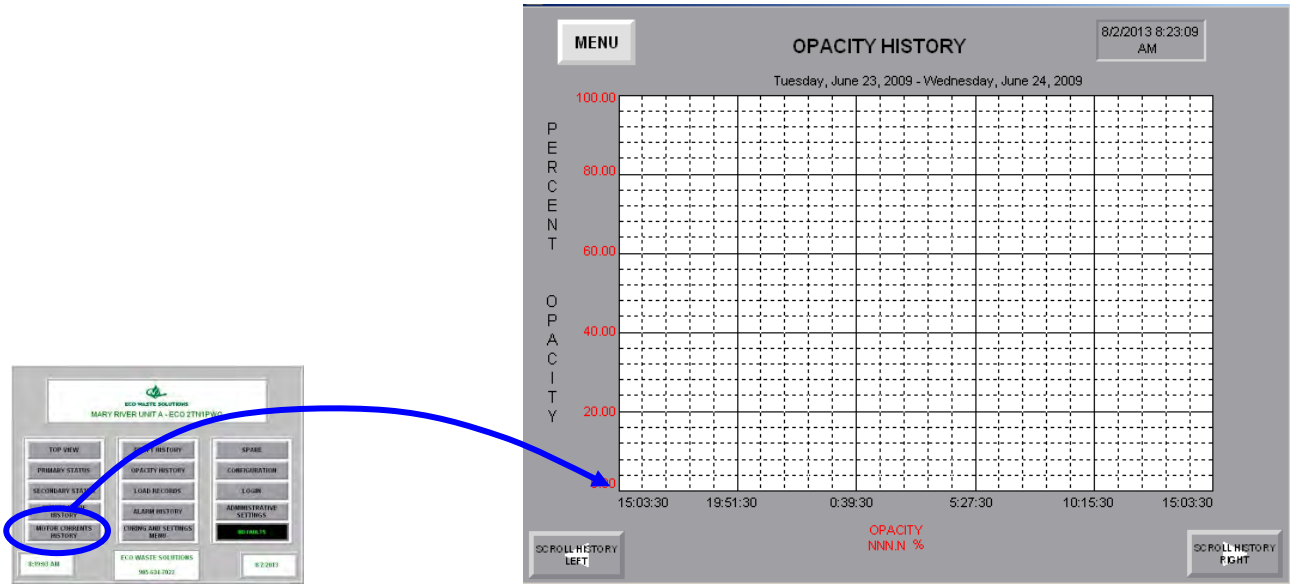
When the **DRAFT HISTORY** is selected the screen will display the draft history for the last burn showing data throughout the system. This information is stored for 30 days.

At any time, touch or press **MENU** to go back to the main screen.



When the **MOTOR CURRENT HISTORY** is selected the screen will display the motor current history for the last burn showing data throughout the system. This information is stored for 30 days.

At any time, touch or press **MENU** to go back to the main screen.



When the **OPACITY HISTORY** is selected the screen will display the opacity current history for the last burn showing data throughout the system. This information is stored for 30 days.

At any time, touch or press **MENU** to go back to the main screen.

3.3.1.3 Starting the Cycle

To start the burn cycle, ensure that the waste is loaded into the system according to the waste mix described in Part II Section 4 and not blocking the burner cone or area where the flame will be directed into the Primary Chamber. Make sure the door is clamped in all places on the Primary Chamber.

At the control panel, on the Panel View press the “Start System” button and the system will initiate the Purge Cycle, followed by the Burn Cycle and then ending with the Cool Down Cycle.

3.3.1.4 Purge Cycle

This is the first step in the burn cycle and is in place for safety reasons. The purge exhausts potentially explosive gases that could be remaining in the system and burners. The primary and secondary blowers will run to purge both chambers. The primary and secondary blower indicators on the Top View screen on the Operator Interface will say “Primary Chamber Blower On” and “Secondary Blower On”

3.3.1.5 Burn Cycle

When the purge is finished the Secondary Burner will come on and for safety reasons will perform a purge and then ignite. Once the Secondary Chamber temperature reaches 1000°C the Primary burner will purge and then ignite. The burn cycle time will start when the Primary Chamber temperature reaches 427°C

The Secondary Burner will modulate to maintain Secondary temperature. If the Secondary Chamber starts getting too hot the Secondary damper opens and the blower will increase in speed to assist with cooling. When the secondary chamber cools down the damper will start to close again.

When the waste in the Primary chamber starts to burn hot enough, the primary burner turns off (815^{o}C) and stays off. When the waste can no longer sustain the temperature in the Primary chamber, the primary burner will come back on (760^{o}C). This will continue until the remaining burn time reaches zero.

When the burn time reaches zero, the system will enter the cool down cycle. The Primary chamber and Secondary chamber burners turn off; the secondary chamber blower turns off and the primary blower starts and runs until the cool down cycle is complete. The cool down cycle is complete after the cool down timer has timed out.

3.3.1.6 Using Historical Charts

a. Go to the Main Screen of the control panel operator interface.
b. Select the historical chart you want to view (e.g. Temperature, Draft, etc).
c. Once the desired chart appears the “buttons” on the bottom left and right of the screen can be used to scroll through to previous days’ information by selecting them and holding down.
d. Once the desired date is selected the graph will be on the screen indicating the time and specific data trends (e.g. Temperature, Draft, etc) of the burn.

3.3.2 Procedure before Start Up

The operating instructions are to occur once the assembly of the system is completed and inspected. Before you continue with the operating instructions ensure that the following items are completed:

a. All physical components attached and bolted
b. All internal electrical connections are completed
c. All internal fuel and air connections are completed
d. All external fuel lines have been connected (tanks to container)

NOTA
Before connecting the external electrical connection, ensure that all internal electrical connections have been made

Once all the above activities and the assembly instructions have been completed, follow the procedure outlined below:

3.3.2.1 Located in the control room of the Controls Container turn on the power on the Main Disconnect

a. If red light is illuminated, change the phase on customer-supplied power. DO NOT TRY CHANGING THE PHASE ON EWS SUPPLY.

b. If green light is illuminated, power supply and phasing are confirmed and start-up procedures can be continued

3.3.2.2 Turn lights on, located in the auxiliary power breaker panel

3.3.2.3 Turn exhaust fan on, located at the auxiliary power breaker panel

a. If outside ambient temperature < 5˚C: Turn heater on from the auxiliary power breaker panel because the temperature in Controls side of container must be > 5˚C

3.3.2.4 Turn on remaining breaker in auxiliary panel

3.3.2.5 Once the Human Machine Interface (HMI) (Panel View) is running and power sequence is correct push the “Control Power On” button.

3.3.2.6 Ensure there is power supply to all containers by selecting the Top View from Panel view and check:
a. All temperature readings (if 1371˚C is displayed the thermocouple is not connected or is faulty.)

b. That the Primary and Secondary Chamber door position on screen is the same as on the system, if shown incorrectly check limit switch

3.3.2.7 Fill fuel tank and the Waste Oil Tank if the planned burn is with waste oil

NOTA ONLY DIESEL FUEL CAN BE STORED IN THE DIESEL FUEL TANK

Before filling the tank ensure:

a. The storage tank is in good condition, e.g. tank shall not exhibit severe rusting, apparent structural defects or deterioration.

b. No leaking visible. If leaking is detected perform the following clean-up steps:
   i. Stop the release
   ii. Contain the released fuel
   iii. Clean up and properly manage the released fuel as per best environmental standards
   iv. Repair or replace the leaking tank prior to returning it to service.

c. Inspect the bottom of tank for sludge formation. Perform the following steps.
   i. Remove fuel tank access cover.
   ii. Do a visual inspection of the inside of the tank, clean if necessary. A drain valve is located at the bottom of the tank to assist with cleanout. Ensure the drain valve is in place before filling.
   iii. Ensure valve is closed
   iv. Fill the tank through the access.

NOTA

Load the oldest liquid inventory first. Long term storage may result in the formation of sludge or the growth of soluble and insoluble bacteria that can clog the downstream filters.

When the tank is full, do a “walk around” of the tank and inspect tank for leaks and structural defects.

3.3.2.8 Ensure all ball valves are in the open position.

3.3.2.9 Physically prime the Primary Burner located in the Primary Chamber container

a. Using scaffolding, a scissor-lift, or another safe method of elevation, prime the fuel line by inserting a funnel into the opening where the line meets the connector to the tank. Fill using a 20 L diesel fuel container until the line is devoid of air, taking care to avoid spillage.

b. **Before starting the burner, make sure that the tank return line is not clogged.**

c. The pump leaves the factory with the by-pass closed.

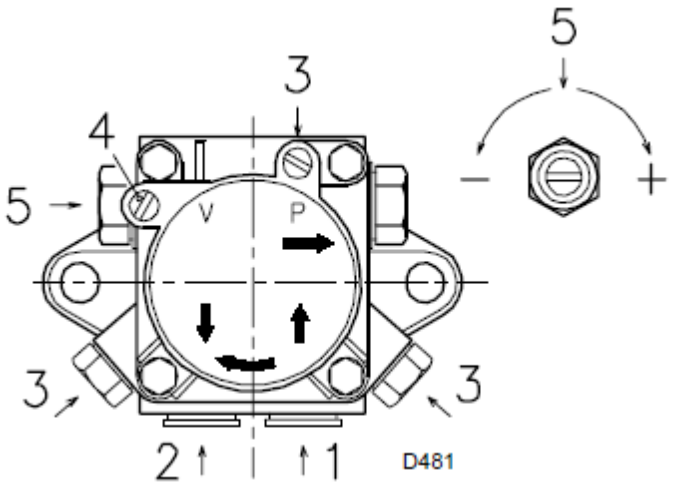


Figure A

d. In order for self-priming to take place, one of the screws (#3) must be loosened in order to bleed off the air contained in the suction line; see Figure A (above) of the pump. Start with switch #1 see Figure B (below) in the "ON" position. The pump must rotate in the direction of the arrow marked on the cover.

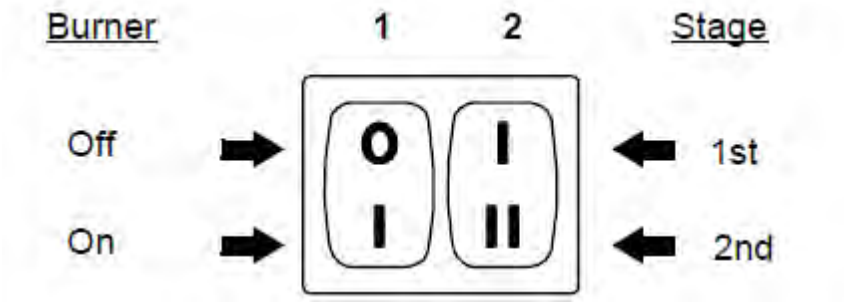


Figure B

e. The pump can be considered to be primed when the light oil starts coming out of the screw #3 see Figure A (above). Stop the burner: switch #1 see Figure B (above) set to "OFF" and tighten the screw #3 see Figure A (above). The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner (by pressing the reset button, red illuminated button on the control box), and then repeat the starting operation as often as required. And so on.

f. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

g. Do not let extraneous light hit the photocell or the burner will lock out; the burner should lock out anyway about 10 seconds after it starts.

h. **NOTA The pump is full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise, the pump will seize.**

i. Whenever the length of the suction piping exceeds 20-30 meters, the supply line must be filled using a separate pump

3.3.2.10 Physically prime the Secondary Burner located in the Secondary Chamber container

a. Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause the sealing organ located on the pump shaft to break.

b. In order for self-priming to take place, screw #3 see Figure C (below) of the pump must be loosened in order to bleed off the air contained in the suction line.

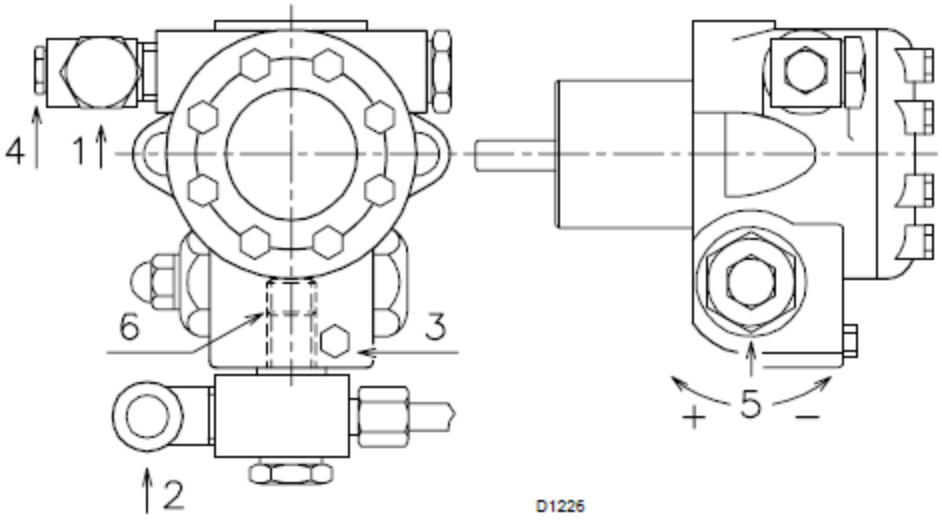


Figure C

c. Start the burner by closing the control devices with switch #1 in Figure D (below) in the "MAN" position. As soon as the burner starts, check the direction of rotation of the fan blade, by looking through the flame inspection window.

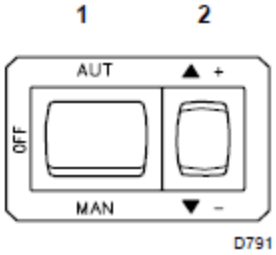


Figure D

d. The pump can be considered primed when the light oil starts coming out of screw #3 in Figure C (above). Stop the burner: switch #1 in Figure D (above) set to "OFF" and tighten screw #3 in Figure C (above). The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, as often as required. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

e. **NOTA The pump is already full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise, the pump will seize**.

Whenever the length of the suction piping exceeds 20-30 meters, the supply line must be filled using a separate pump.

3.3.3 First Time Use (WILL ONLY BE PERFORMED ON SYSTEM ONCE)

NOTA:
This is to be performed the first time the system is ever used; it will only be required to be done once.

3.3.3.1 From Panel View Main Screen select Curing.

3.3.3.2 From the Curing menu select Curing Status push the following buttons to set up the curing for Primary and Secondary Chamber “Push to enable Primary Curing” and push “Push to enable Secondary Curing”

3.3.3.3 From Panel View press Start Cure

3.3.3.4 The system will start the curing process which takes 24 – 30 hours

3.3.3.5 If the curing cycle is interrupted reset the curing cycle from the Curing Status screen

3.3.3.6 The cycle will restart from where it got interrupted.

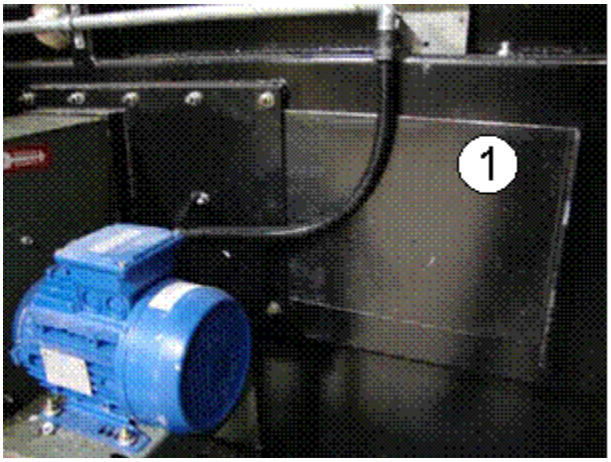
3.3.4 Standard Operating Procedures

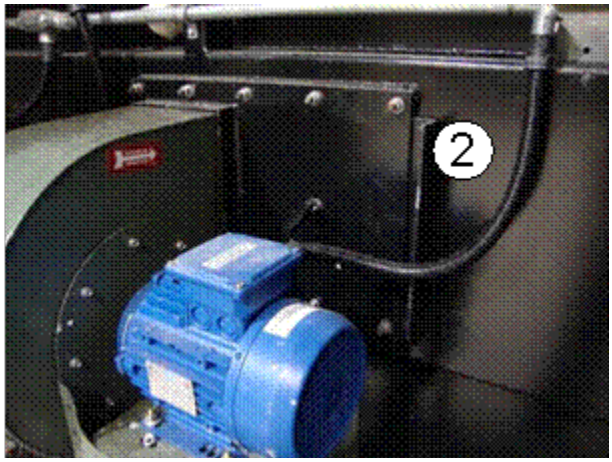
The following section details the procedures for the operation of the incinerator.

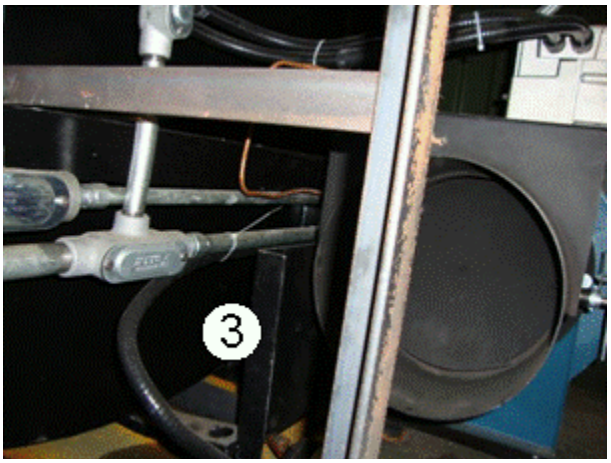
3.3.4.1 System Start up (solid waste only)

a. Drain the air compressor before starting system

b. Ensure that manual slide gates for each blower are in the open position for free airflow into the Primary and Secondary Chambers.



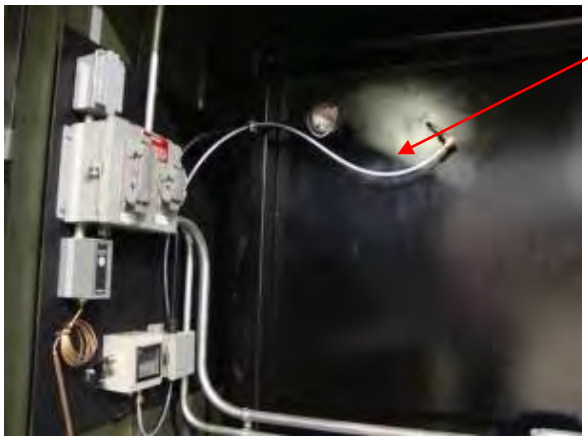




1. Primary Chamber blower Manual Slide Gate Open Position
2. Primary Chamber blower Manual Slide Gate Closed Position
3. Secondary Chamber blower Manual Slide Gate Open

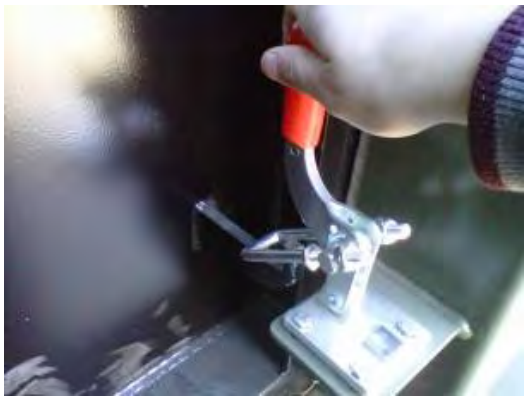
c. Visually inspect the burner hoses to ensure that there are no fuel leaks. Check to see if lines are brittle or cracked, check for any oil spills near the burner, which would indicate a leak.

d. Ensure the draft gauge hose connection is tight and sealed. This is a copper tubing located in the back upper corner of the Primary Chamber.



Draft Gauge Hose connection

e. Unlatch all four clamps on the Primary Chamber door, open and secure in the open position



f. Ensure that the Primary Chamber has been cleaned out, and the Chamber floor is cool (less than 40°C).

NOTA

If the floor is hotter than this temperature the waste may spontaneously catch on fire during loading.

g. Weigh the waste on scale and begin loading the Primary Chamber from the front (or hand bomb as required).

NOTA

In the event that some waste is loaded by hand do not deliberately throw the waste towards the sides of the Primary Chamber. Doing so will damage the ceramic blanket refractory.

NOTA

When loading the waste loading avoid contact with refractory (wall modules, door jams, sills, lintel, etc)

NOTA

Load only the waste stream that the unit has been rated for see Facility Manual Part II Section 4 Waste Processing Capabilities.

NOTA

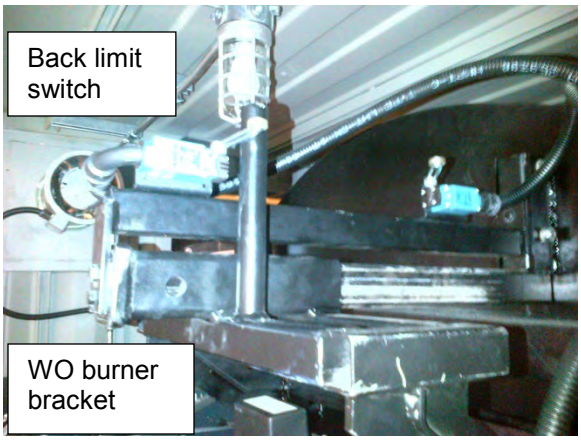
Do not load the Primary Chamber above its rated capacity by weight

NOTA

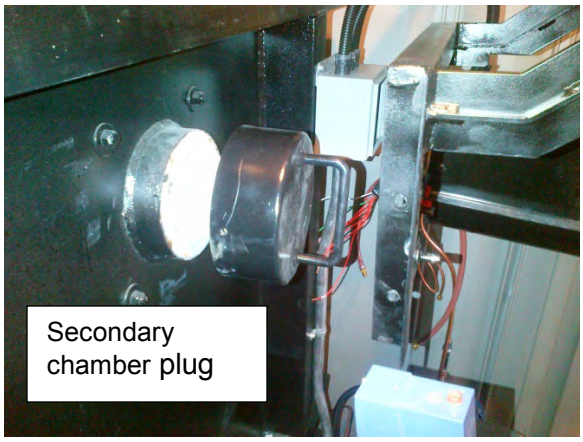
Do not load the Primary Chamber such that the breech section is blocked in any way

h. Close the Primary Chamber access door by clamping each latch until it is tight

i. Ensure that the waste oil burner is all the way out (limit switch in the back of the bracket activated), insert the waste oil plug in place and insert the locking pin to avoid burner from swinging



Waste oil all the way out limit switch made



Secondary chamber plug being installed

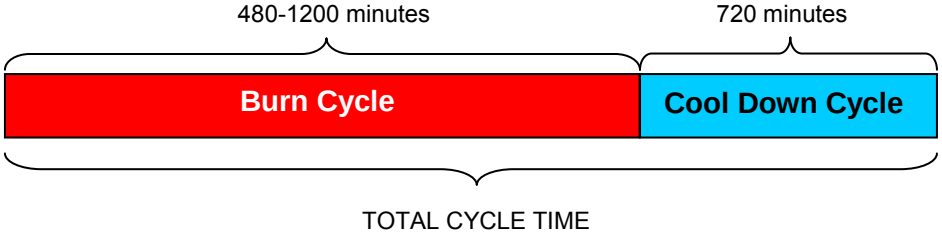
Waste oil burner secured with pin

j. Proceed to the Control Panel on the HMI Panel View, from the Top View menu choose solid waste only.

k. The burn time will be set to the previous burn, if you wish to change the set time, proceed to the Primary Status screen and click on the BURN TIME button. The minimum number of minutes you can enter is 480 (8 hours). When you have finished, the time will be displayed in minutes beside the BURN TIME button

NOTA

The burn time value (in minutes) determines the length of the burn cycle before cool down cycle starts.



Main Control Panel

l. On the Main Control Panel press “Start” on HMI (Panel View). The following steps will automatically take place, controlled by the Control Panel:

i. The Primary Blower and Secondary Blower will purge the system for 2 minutes
ii. The Secondary Burner will purge for safety, and upon completion will ignite
iii. Once the Secondary Chamber temperature reaches 1000°C, the Primary Burner will purge for safety and upon completion with ignite
iv. The Burn time will start counting down when the temperature in the Primary Chamber reaches 427°C

NOTA

The Control System will maintain proper operating conditions and will provide continuous monitoring capability

v. After the burn cycle is completed, the system will automatically enter the Cool Down cycle and the following will be shown on the system status:
- Primary Chamber & Secondary Chamber burners OFF
- Secondary Chamber Blower OFF
- Primary Modutrol 100% open
- Primary Blower ON

vi. Once fully cooled and the temperature is below 90°C, proceed to the Primary Chamber Clean Out procedures

NOTA

System drains and exhausts should discharge at atmospheric pressure. In order to prevent inaccurate readings or instrument damage, do not allow the discharge side to back up or freeze.

3.3.4.2 Clean Out

Operators responsible for loading and cleaning out incinerators shall wear appropriate protective equipment, including dust masks, heavy gloves and safety shoes with puncture-proof toes and soles to avoid injury. Although the ash from the system is considered sterile and will not contain microorganisms, it may contain a quantity of sharp objects, such as broken glass and other sharps which may not be fully destroyed in the burning process, and may thus still pose a hazard to persons who clean out the ash and residues. Also removing the ash does create dust particles in the air. Dust shall not be inhaled. The operator shall wear dust protection safety gear.

When the internal temperature of the Primary Chamber has cooled to less than 90°C, lock out the power to the system on the Main Control Panel by moving the main disconnect to the “OFF” position.

a. Unlock all door latches on the access door to the Primary Chamber

b. While standing in front of the Primary Chamber door, slowly open the door to its fully open position. Secure Primary Door in the open position.

c. Inspect the interior for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure

d. Check the air inlet holes and remove any obstructions if necessary.

e. Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb

f. Close the Primary Chamber access door by clamping each latch until it is tight

g. Clean the inspection view port (glass) with a mild soap and water. To clean the view port, unscrew it by hand and re-tighten by hand.

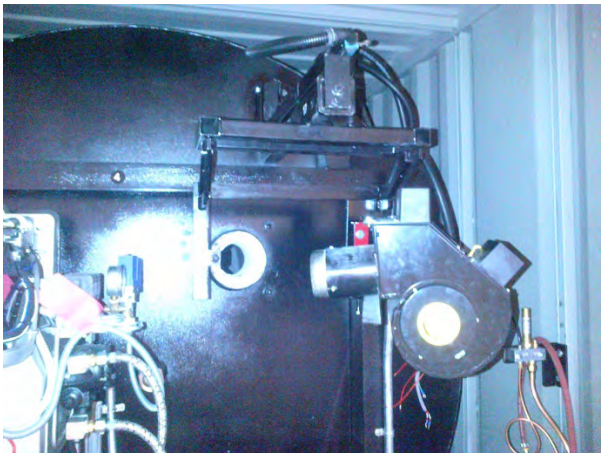
3.3.4.3 Burning Waste Oil

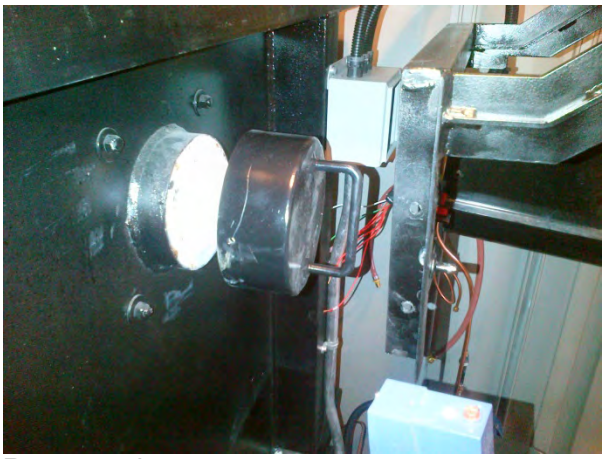
Do not use this incinerator to burn waste oil only. Always burn a complete load of solid waste when burning waste oil

a. Follow all the procedures to load the primary chamber as per procedure 3.3.4.1 above.

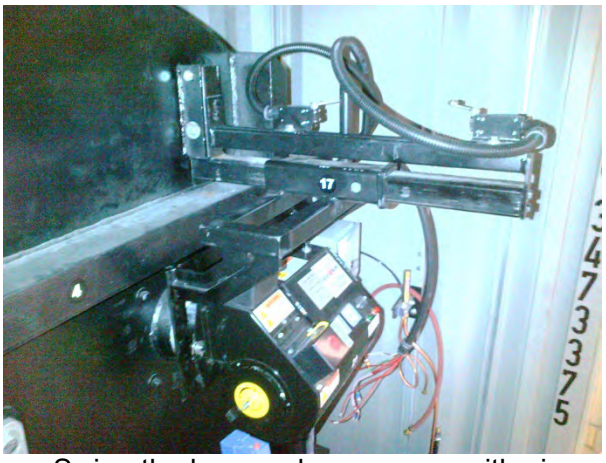
b. Ensure that the secondary chamber plug is removed, the burner cannot swing open by locking the pin and the waste oil burner is all the way in (limit switch in the front of the bracket activated).

With the burner all the way out remove pin


Swing the burner open



Remove plug



Swing the burner close, secure with pin and push all the way in until front limit switch is made

c. Proceed to the Control Panel on the HMI Panel View, from the Top View menu choose Solid Waste and Waste Oil.

3.3.5 Start up

3.3.5.1 After Shut Down (Emergency)

a. Once the power is restored main disconnect back on

b. The Operator Interface and PLC will begin a boot up procedure

c. Wait until the HMI on the control panel has booted up before turning the control power to the panel back on by pressing the Control Power ON button

d. When the power is restored to the Main Control Panel, the button should illuminate.

e. If the system was interrupted during a burn cycle, restart the system by pressing “Start” on HMI. If the system was interrupted during cool down, it will resume the cycle where it left off.

3.3.5.2 After Power Failure

a. On the main menu of the Panel View (HMI), press the Configuration Key and the application will now shut down. (This will take 1-2 minutes).

b. There will be a GREY screen with a number of Touch Buttons.

c. Press the “RUN (F1)” button on this screen.

d. The application will now restart. (This will take approximately 1-2 minutes)

e. When it is up and running, the system is now ready for operation

NOTA

In the event of a power shut down to the system, the control panel must be re-started from the HMI Panel View:

3.3.6 Dealing with Warnings and Faults

3.3.6.1 Troubleshooting

The burn cycle will not start if one of the following conditions exists

a. The Systems is in the “cool down” part of the cycle. Wait until the “cool down” cycle is complete.

b. There is a fault in the system as indicated on the Panel View.

c. Loss of Power due to any one or more of the following:

i. The main disconnect (see image) is off or there is no electrical power. Turn on the disconnect switch or check why there is no power.

ii. An open breaker. Check the breakers and replace any that are defective.

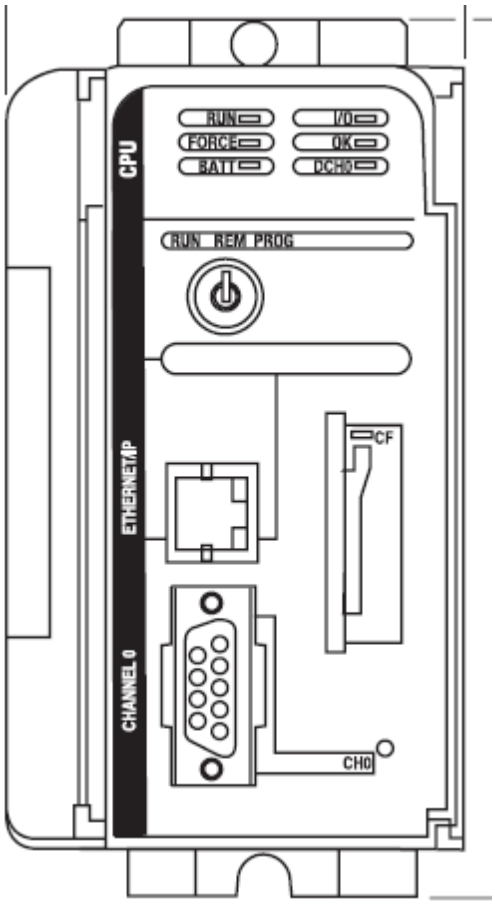
iii. The emergency stop is pushed in. Twist the emergency stop button to unlock, and then push the control power on button. The control power button should now be illuminated.

d. If on the “Top View” screen on the HMI the primary door is not closed, the door has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

e. If on the “Top View” screen on the HMI the secondary door is not closed, the door has not been shut properly. Adjust the limit switch lever arm, if necessary. Check the limit switch and that the wiring is in working order.

f. If fuel tank is low, system will not start. Tank on the HMI will be red, indicating the level is low and needs to be filled.

g. PLC Processor Problem



i. Check the run light on the PLC processor. If the run light is on, the PLC is ready.

ii. “OK light” is green = Controller is OK

iii. “OK light” is Red Flashing = this is a recoverable fault, check the PLC processor. This fault is very unlikely to occur.

iv. OK light is Red = this is a non-recoverable controller fault. Cycle Power. The OK LED should change to flashing red. If LED remains solid red, repl*ace the PLC. This fault is very unlikely to occur.*

v. *"Default Channel Zero (DCH0) light" is green = this indicates the PLC processor has lost the* program. The PLC is equipped with a flash card that will automatically load the program back onto the PLC

3.3.6.2 Possible Problems/Causes/Solutions

Problem	Causes	Solutions
Blower Fails to start	Breaker tripped	Turn power off at Main Disconnect Open Panel and check which breaker has tripped, turn back on
	Motor starters or contactor coil is burnt out	Locate contactor for blower and visually observe if the contactor is pulled in. Use a multi meter to check for voltage across the coil If there is voltage across the coil and the contactor is not pulled in, replace the contactor. *See Part IV Section 4 CMI 4.4.4/01-001G*
Secondary Burner won't ignite	Bad Electrodes	*Refer to Part IV Section 2 Preventive Maintenance Instructions (PMI) 01/02-002.D.01*
	Low Oil Pressure	Adjust pressure setting on burner pump by turning the screw located at the bottom of the pump. Turn clockwise to increase pressure and counter clockwise to decrease pressure.
	Fuel Line Leak	Visually inspect the lines for the leak Tighten any fittings that are near the leak
	Door Switch not making contact	Make sure main door is closed and latched shut Make sure limit switch is hitting striker plate.
	Bad Thermocouple	Replace thermocouple see Section IV Part 4 CMI 4.4.1/05-002A
Primary Burner won't ignite	Bad Electrode	*Refer to Part IV Section 2 PMI 01/02-002.D.01*
	Low Oil Pressure	Adjust pressure setting on burner pump by turning the screw located at the bottom of the pump. Turn clockwise to increase pressure and counter clockwise to decrease pressure.
	Fuel Line Leak	Visually inspect the lines for the leak Tighten any fittings that are near the leak
	Door Switch not making contact or broken	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.

Problem	Causes	Solutions
	Secondary temperature not at 1000°C	Wait until Secondary temperature is at 1000°C and try again
	Burner main switch is turned off	Turn switch on
	Burner alarm has been tripped	Acknowledge burn alarm and then hit the reset button on control panel
Persistent Black Smoke	Insufficient air supply to Secondary Chamber to completely consume emissions	Check to ensure combustion air blower/damper assembly is operating properly.
	Secondary Chamber is not hot enough.	Check that the Secondary temperature is operating at required temperature set point.
	Overloading or loading highly volatile material	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Burner failure	Check burner operation – if no flame or a poor flame is visible through the flame view port adjust air/fuel ratio
	Operation at too high a Primary Chamber temperature	Check/decrease primary chamber combustion air
Smoke coming out of Primary	Too much air	Check dampers on primary blower
	Too much volatile material loaded	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Primary Chamber temperature too high	Waste loaded may not be a good mix of heat value
Too much fuel usage	Too much secondary combustion air	Check/reduce secondary combustion air
	Too much air infiltration	Reduce air flow by adjusting the damper
	Fuel leakage	Check fuel trains and burners for fuel leakage
	Wet waste	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time
	Excessive draft	Check/reduce draft – check door seals and other seals for leakage adjust damper
	Burner setting too high	Check air/fuel mix
Waste Oil Burner		
Pump fails to start	Breaker tripped	Switch Breaker into off position and then switch to on position again. If breaker continues to trip, check for short in the system.
	Motor Starter	Check motor starter
	Overload	Reset overload

Problem	Causes	Solutions
Waste Oil Nozzle not turning on	A ball valve is closed	Ensure all ball valves are open.
	Solenoid Valve has failed	Diagnose if valve has failed. Replace if necessary See Part IV Section 4 CMI 4.4.5/02-003B (page 451)
	Fuel Leak	Check all pipes and hoses
	Secondary Chamber not at temperature	Wait until Secondary Chamber reaches 982°C.
System will not start when Solid is selected	Waste Oil burner is inserted into the back of the Secondary Chamber	Remove Waste Oil burner assembly from the Secondary Chamber.

3.3.6.3 In Case of Alarm

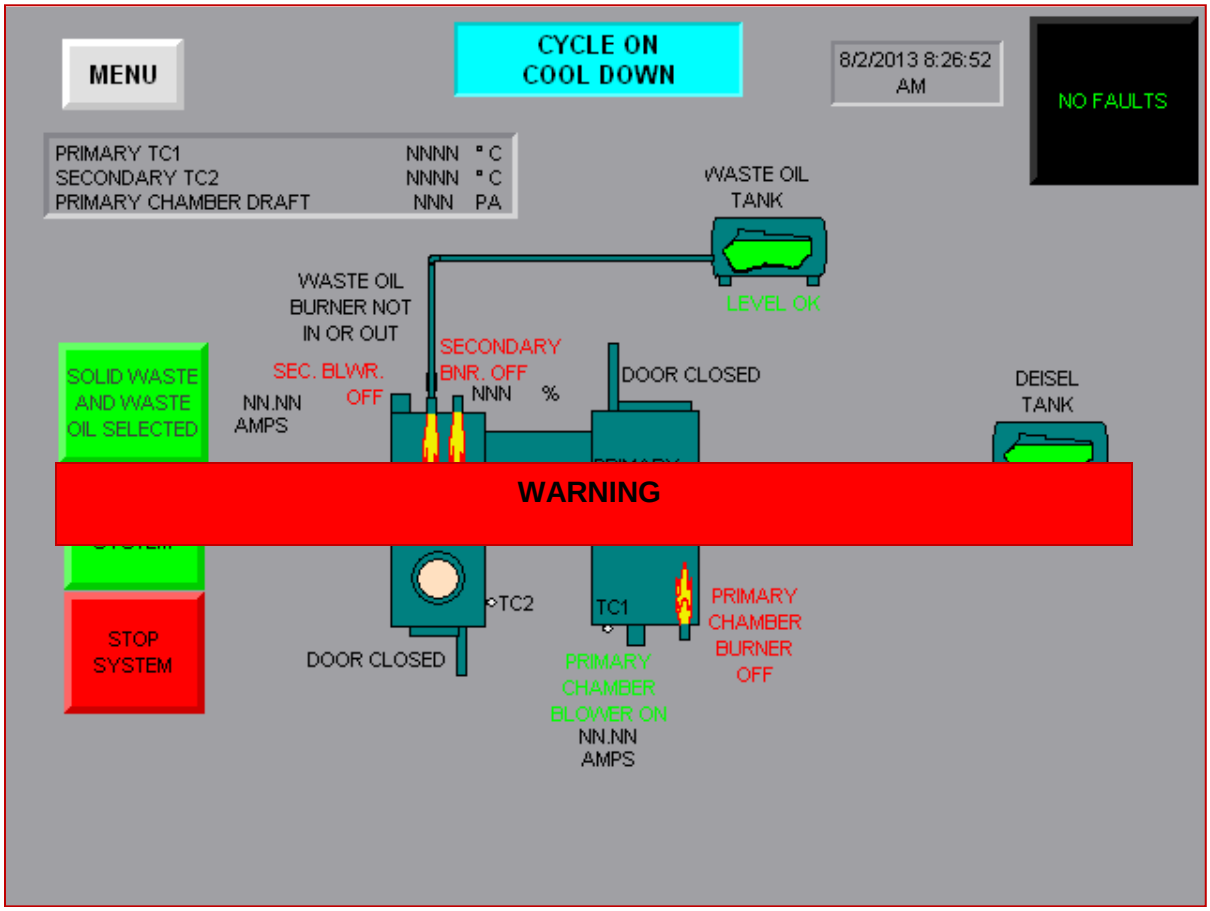
IF BURN IS IN PROGRESS DO NOT HIT EMERGENCY STOP BUTTON ON MAIN CONTROL PANEL.

a. Go to the manual slide gates on the Primary Chamber, located just after the blower, and close them all the way. This will help to put the fire in the chamber out.

b. Check alarms to see what the problem is.

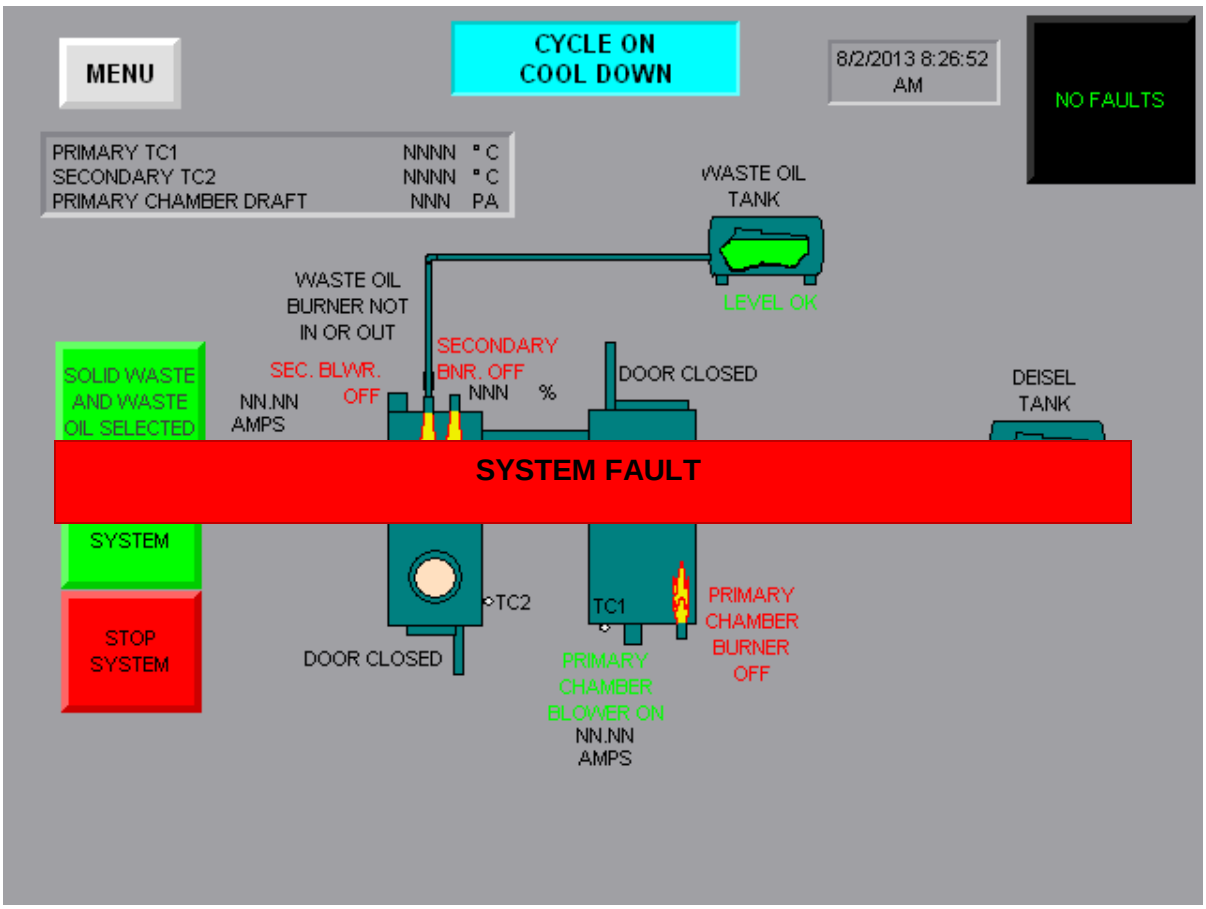
c. Do not open the doors of the Primary Chamber unless the temperature inside the chamber is below 90°C

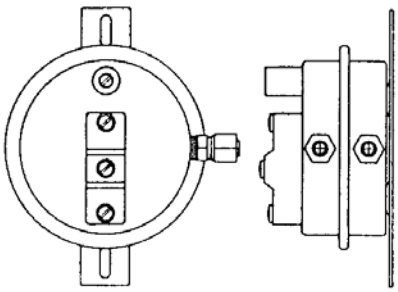
3.3.6.4 System Warnings

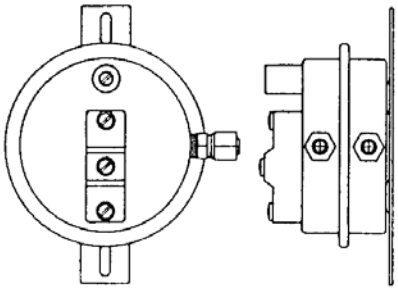


Warnings indicate that a non critical value or device has malfunctioned and requires an operator to review what may be causing this to occur. If not resolved some of the warnings may become a fault.

3.3.6.5 System Faults



ALARM	SOLUTION
The Primary Chamber thermocouple has faulted	Refer to *Part IV Section 2 PMI 05-002.W.01*
The Secondary Chamber thermocouple has faulted	Refer to *Part IV Section 2 PMI 05-002.W.01*
The primary burner is faulted	The primary burner has failed to light when it received a signal telling it to start. To reset the burner, press the reset button located on the Burner and look into sight glass for ignition:
	Check that the pressure is 1378 kPa
	If a spark is present and burner won't ignite: • Check fuel lines for leaks • Check that fuel pump is not clogged
	If no spark is present: • Clean electrodes
The secondary burner is faulted	The secondary burner has failed to light when it received a signal telling it to start. To reset the burner, press the reset button located on the Burner and look into sight glass for ignition:
	If a spark is present and burner wont ignite: • Check fuel lines for leaks • Check that fuel pump is not clogged
	If no spark is present: • Clean electrodes
The system has shut down due to primary blower low air flow.	Visually examine the primary blower for any obstructions that may be causing low air flow
	Check slide gate located between Primary chamber and blower, ensure it is open.
	Check damper assembly, ensuring modutrol crank arm is still connected and that butterfly damper is open, allowing air flow.
	Air proving switch may be defective. See *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
	There are two ports on the air proving switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked
	If no air restriction is observed (i.e. blockage in the tube) change the air proving switch see *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
The primary blower motor breaker is tripped or open.	Turn power off on Control panel by turning the Main Disconnect to the off position CB1

ALARM	SOLUTION
	Open the main control panel and switch break switch to off and then to the on position “CB9”
The system has shut down due to secondary blower low air flow.	Visually examine the primary blower for any obstructions that may be causing low air flow
	Check slide gate located between Secondary chamber and blower, ensure it is open.
	Check damper assembly, ensuring modutrol crank arm is still connected *(if not see Part IV Section 2 PMI 01/02-001.W.01 Damper Crank Arm)* and that butterfly damper is open, allowing air flow.
	Air proving switch may be defective. See *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
	There are two ports on the air proving switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked
	If no air restriction is observed (i.e. blockage in the tube) change the air proving switch see *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
The Secondary blower motor breaker is tripped or open.	Turn power off on Control panel by turning the Main Disconnect to the off position
	Open the main control panel and switch the breaker to off and then to the on position “CB10”
The Secondary blower variable frequency drive is faulted.	Push fault reset button on the Panel view
	If fault persist check the error code on the variable frequency drive and check OEM manual for troubleshooting alarm.
The burner fuel level is low.	Add fuel to the fuel tank and the alarm should reset itself
	If alarm persist replace the low level switch *as per* See *Part IV Section* 4 CMI 4.4.3/01-002G & 02-002G
Selected Solid & Waste Oil The waste oil burner is not in.	Check to see if the waste oil burner is pushed all the way into the Secondary Chamber. • Push waste oil burner all the way in, ensuring it makes contact with the limit switch • If the waste oil burner is all the way in and making contact with the limit switch, replace the limit switch. See Part IV Section 4 CMI 4.4.1/05-005A (page 436)

ALARM	SOLUTION
Solid Waste Only Selected The waste oil burner is not out.	Check to see if the waste oil burner is pulled all the way out of the Secondary Chamber • Pull waste oil burner all the way out, ensuring it makes contact with the limit switch • If the waste oil burner is all the way out and making contact with the limit switch, replace the limit switch. See Part IV Section 4 CMI 4.4.1/05-005A (page 436)
The waste oil burner is faulted.	The waste oil tank is empty, fill tank
	Check that the instrument air is going to the burner check the air pressure gauge on the burner and adjust regulator if necessary.
	Check that the fuel pump is in working condition
	Check that the waste oil breaker is not tripped “CB15”

4.0 MAINTENANCE INSTRUCTIONS

4.1 SUMMARY OF PREVENTIVE MAINTENANCE INSTRUCTIONS

IF APPLICABLE: The air compressor pump is shipped with break-in oil which should be changed after the first 8 hours of operation.

4.1.1 Daily Maintenance

Freq.	Routine	Component	Description
Daily	Inspection & Cleaning	Burners	Clean electrodes & HT Leads.
Daily	Inspection & Cleaning	Burners	Inspect fuel lines for leaks.
Daily	Inspection & Cleaning	Burners	Inspect nozzles in burners.
Daily	Inspection & Cleaning	Refractory	Check inside the Chambers for shrinkage or any exposed metal.

4.1.2 Weekly Maintenance

Routine	Component	Description
Inspection & Cleaning	Air compressor	Check oil level
Inspection & Cleaning	Air compressor	Check air filter
Inspection & Cleaning	Air compressor	Pull ring on safety valve and allow the ring to snap back to normal position (Check for free operation of the safety valve)
Inspection & Cleaning	Blowers and Assembly	Modutrol crank arm connected to damper.
Inspection & Cleaning	Blowers and Assembly	Slide gates are open.
Inspection & Cleaning	Burners	Clean photocell / UV Detector
Inspection & Cleaning	Burners	Clean the glass on the flame inspection window.
Inspection & Cleaning	Burners	Check diffuser disc.
Inspection & Cleaning	Waste Oil Burner Filter	Clean the canister filter
Inspection & Cleaning	Thermocouples	Remove and clean thermocouples as necessary – inspect for damage. Replace if necessary.

4.1.3 Monthly Maintenance

Routine	Component	Description
Inspection & Cleaning	Air compressor	Check all fasteners for proper tightness.
Inspection & Cleaning	Blowers and Assembly	Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures
Inspection & Cleaning	Burners	Check flexible hoses to make sure that they are still in good condition.
Inspection & Cleaning	Burners	Pump delivery pressure must be stable. If the pressure is found to be unstable or if the pump runs noisily see manual for details.
Inspection & Cleaning	Burners	Check that no dust has accumulated inside the fan or on its blades.
Inspection & Cleaning	Burners	Check that all parts of the combustion head are in good condition, positioned correctly, free of all impurities, and that no deformation has been caused by operation at high temperatures.
Inspection & Cleaning	Refractory	Check the refractory in the Secondary Chamber for shrinkage, anything greater then 1.2cm should be patched (i.e. gaps between modules exposing metal surface)
Inspection & Cleaning	Waste Oil	Visually check all electrical components
Inspection & Cleaning	Waste Oil	Remove heater element from casing and inspect for build-up. Clean any deposits. When reinstalling the heater element always ensure the bundle will be restarted immersed. NEVER use the inline oil heater dry

4.1.4 Quarterly Maintenance

Routine	Component	Description
Lubrication Service	Air compressor	Change the oil
Inspection & Cleaning	Blowers and Assembly	Lubricate all bearings – lubrication intervals depend on operating speed (RPM). Clean cooling fan on motors.
Inspection & Cleaning	Blowers and Assembly	Check the V-belt drive (Secondary Blower) for proper alignment and tension (see manual). If belts are worn, replace them as a set, matched within manufacturer's tolerances.
Inspection & Cleaning	Burners	Check all components for heat damage.
Inspection & Cleaning	Refractory	Inspect door gasket for damage or heat damage. Replace segments, if necessary. Doors must close tightly and securely.
Inspection & Cleaning	Refractory	Check all refractory for damage. Patch or replace as needed. Patch if modules show a little gap and replace modules if the modules have shrunk excessively (greater than 1")
Inspection & Cleaning	Paint	Maintain paint exterior to protect metal from heat damage

4.1.5 Yearly Maintenance

Routine	Component	Description
Detailed Maintenance	Refractory	Replace door gasket
Inspection & Cleaning	Electrical	Check the limit switch

4.1.6 Level 2 and Level 3 Maintenance

Please refer to the OEM Manual for additional information regarding maintenance instructions for Level 2 and Level 3.

Periodicity	Level of Repair	Routine	Component	Description
24 Monthly	3	Detailed Maintenance	Refractory	Replace the door sills on Primary Chamber
24 Monthly	3	Detailed Maintenance	Refractory	Replace the door sills on Secondary Chamber
60 monthly	3	Detailed Maintenance	Refractory	Relining of Secondary Chamber.
60 monthly	3	Detailed Maintenance	Refractory	First stack section to be relined.
60 monthly	3	Detailed Maintenance	Fuel Tanks	Inspect Fuel tanks

4.2 PREVENTIVE MAINTENANCE INSTRUCTIONS

The following preventive maintenance instructions (PMI) are to be read in conjunction with the IPDs found in Section 4.3.

4.2.1 Instruction Classification

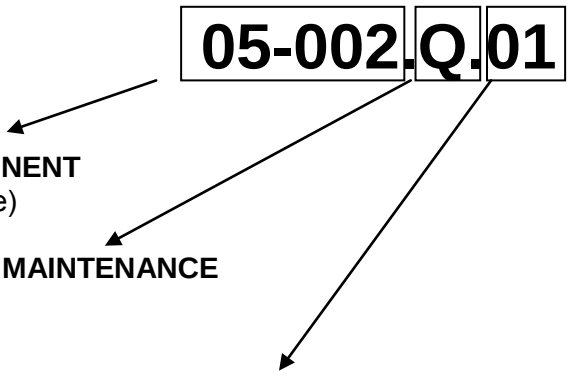
Each component is associated with an identification number, see table below:

System Component	Identification number
Primary Blower	01-001
Secondary Blower	02-001
Primary Burner	01-002
Secondary Burner	02-002
Air Compressor	03-001
Waste Oil Burner	02-003
Main Control Panel	03-010
Refractory	05-001
Thermocouple	05-002
Paint	05-003
Electrical	05-004
Limit Switch	05-005

To differentiate if the instruction is weekly, monthly, quarterly or yearly, the above identification number will be followed by a letter:

Daily:	D
Weekly:	W
Monthly:	M
Quarterly:	Q
Yearly:	Y

For example**,**



SYSTEM COMPONENT
(eg. Thermocouple)

FREQUENCY OF MAINTENANCE
(eg. Quraterly)

MAINTENANCE INSTRUCTION NUMBER
(eg. Maintenance Routine #1)

4.2.2 Zero Mechanical State & Lock Out Instructions

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the EWS model Incinerator. The preventive maintenance instructions are outlined in this section of the Facility Manual.

NOTA
The warranty will become void if proper maintenance is not performed as instructed.

4.2.2.1 Safety

During maintenance of the EWS mobile incinerator, it is very important to be aware of special hazards. Two safety programs are described in the following sections:

1. Zero Mechanical State
2. Power Lock Out Instructions

Failure to comply with these instructions during maintenance could result in injury or death. The responsibility for implementation of a comprehensive safety program rests with the operating staff and supervision. The safety instructions in this Facility Manual should be considered only as a starting point for the safety program at site.

ACCIDENTS CAN BE PREVENTED
A CAREFUL WORKER IS THE BEST SAFETY DEVICE

4.2.2.2 Zero Mechanical State

Zero Mechanical State (ZMS) exists when the possibility of an unexpected mechanical movement has been eliminated. During maintenance, it is mandatory to totally deactivate the incinerator so that there is no possibility of an unexpected machine movement. Power lock-out, described in the next section, is commonly used for this purpose. Most machines are powered by electrical, hydraulic or pneumatic drives. Energy may be stored in a shutdown machine in various ways: Air pressure in a cylinder, hydraulic fluid stored in pressurized hoses, or machine members whose weight can generate fluid pressure. Therefore, just cutting off the electrical power may not be enough to neutralize all power sources. Certain maintenance instructions at site should require ZMS condition as a matter of course.

4.2.2.3 Zero Mechanical State (ZMS) Checklist

1. Every electrical power source to the incinerator must be cut off and locked out (to prevent others who may not be aware of maintenance work from turning the power back on inadvertently).
2. Ensure that the mechanical potential energy of the incinerator is at its lowest practical value so that opening of pipe, tubing, hose or actuation of any valve will not produce an unexpected movement that could cause injury.

3. Check that there is no pressurized fluid (air, oil, gas or other) trapped in the incinerator lines, cylinders or other components. This will ensure that there will be no incinerator motion when a valve is actuated.

4. Secure loose or freely moving parts so that there is no possibility of accidental movement.

4.2.2.4 Power Lock Out Instructions

Unexpected operation of electrical equipment started by automatic or manual remote control may cause injuries to persons who happen to be nearby. For this reason, when repair work is to be done on motors or other electrical equipment the circuit should be opened at the switch box and the switch pad locked in the OFF position. Tag the switch with a lock out tag indicating who must be contacted before the power is turned back on again.

BECAUSE OF THE SEVERE CONSEQUENCES, INCLUDING DEATH, OF NOT PROPERLY LOCKING OUT ELECTRICITY SUPPLIES DURING MAINTENANCE, THE SUPERVISOR SHOULD ENSURE THAT THERE IS ONLY 1 KEY FOR THE LOCK USED TO LOCK OUT THE POWER SUPPLY.

For identification, locks may be color coded to indicate different crews or shifts.

The Supervisor should maintain the master key and list of key numbers, and should keep an extra key to each lock for his department. The master key should not be loaned out under any circumstances.

No matter what method is used to lock out power, strict discipline and constant supervision should be employed during any equipment maintenance work.

4.2.2.5 Power Lock Out Checklist

1. Alert the operator of the equipment.

2. Before starting the work on an engine, motor, line shaft or other power transmission equipment or power-driven machine, make sure it cannot be set in motion without your knowledge.

3. Place your own padlock on the control switch, lever, or valve, even if someone has locked the control panel before you. You will not be protected unless you put your own padlock on it. (Another maintenance person could remove their lock and then someone else could start the equipment if they were not aware of maintenance work being done.)

When you are finished working, remove your own padlock. Never permit someone else to remove it for you. Be sure you are not exposing someone else to danger by removing your padlock.

4.2.3 Daily Instructions

Primary & Secondary Chamber Burners: (01-002.D & 02-002.D)

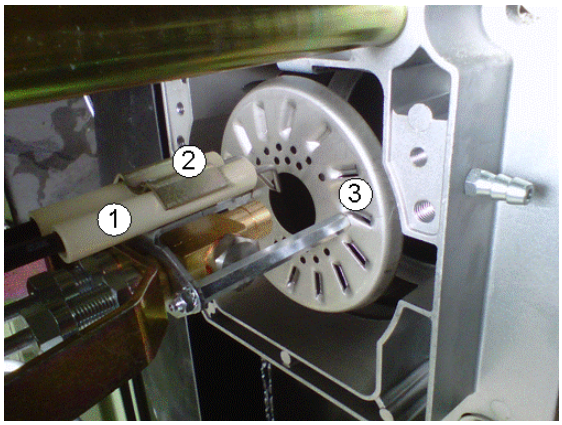
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

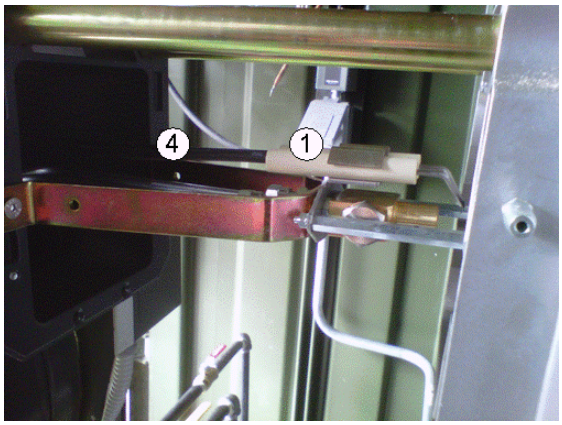
Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01/02-002.D.01: INSPECTING AND CLEANING ELECTRODES AND HT LEADS

1. Remove the cover from the Burners as described in 01-002.W.01 and 02-002.W.01.
2. Inspect the electrodes for any soot build-up.



1. Electrode
2. U-bolt
3. Diffuser Disc

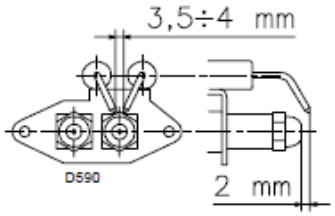


4. HT Leads

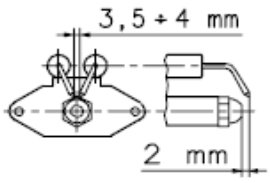
3. Clean/wipe down the ignition electrode with a cloth should there be a build-up of soot.

NOTA Do not use sand paper as this will increase the deposit of future soot.

4. If electrodes are damaged remove the screws and u-bolt (see above photo) and install new electrodes. When reinstalling the electrodes make sure that they are positioned as shown below.
5.



Primary Burner



Secondary Burner

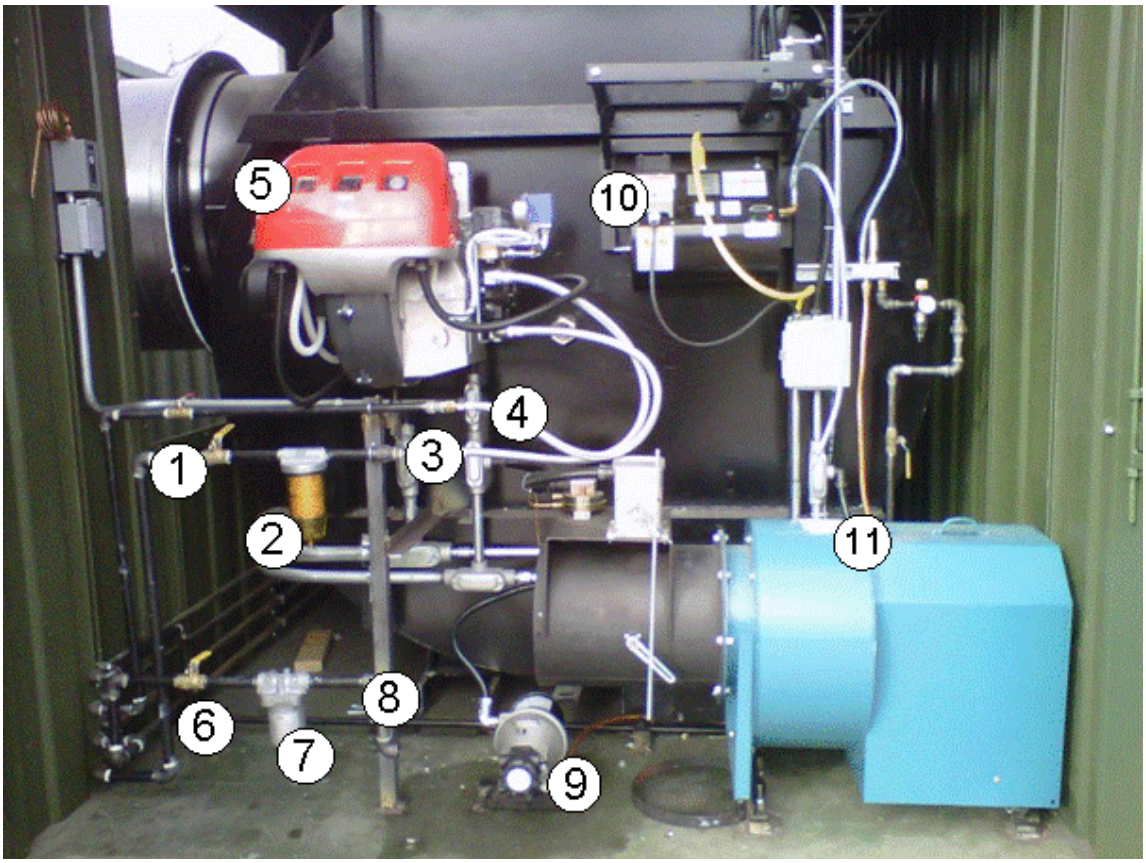
Check the High Temperature (HT) Leads for any heat damage. If HT Leads are severely damaged (i.e., you can see the wire beneath the sheathing) then replace. (See *Part IV Section 4 CMI 4.4.3/01-002A & 4.4.3/02-002A)*

INSTRUCTION 01/02-002.D.02: INSPECTING THE FUEL LINES

1. Visually inspect all fuel lines to the Primary and Secondary Burner as well as to the Waste Oil burner for any leaks.

2. The Primary and Secondary Burner have two oil lines, one feed and one return. The Waste Oil Burner only has one feed line.

3. If any leaks are observed tighten or replace the fitting where the leak is occurring



1. Fuel In Ball Valve
2. Fuel Filter
3. Fuel Line In
4. Fuel Line Out
5. Secondary Burner
6. Waste Oil Ball valve
7. Waste Oil Filter
8. Waste Oil Line In
9. Waste Oil J-pump
10. Waste Oil Burner
11. Secondary Blower

INSTRUCTION 01/02-002.D.03: INSPECT AND CLEAN BURNER NOZZLES

Primary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the centre retaining bolt.
3. Slide burner out.
4. Check nozzle. If there is carbon, remove the nozzle and clean.
5. Reinstall or replace if necessary

Secondary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the 4 retaining bolts on either side of the burner.
3. Slide burner out.
4. Check nozzle. If there is carbon, remove the nozzle and clean.
5. Reinstall or replace if necessary

Refractory: (05-001.D)

When working with the refractory make sure you use the proper tools; wear goggles, approved dust mask and gloves

INSTRUCTION 05-001.D.01: INSPECTING THE REFRACTORY

Ensure power is locked out.

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

1. Open Primary Chamber door by unlatching all four clamps.

2. Tie-off door to open position to ensure that it will not close unintentionally.

3. Enter Primary Chamber and check the refractory for shrinkage, any gap between the modules greater than 2.5 cm should be patched with the blanket refractory

4. Check for any exposed metal between the modules, if metal is exposed make sure to patch area with blanket material or new module (*Part IV Section 4 CMI 4.4.2/05-001A & 4.4.2/05-001B)*

4.2.4 Weekly Instructions

Primary & Secondary Chamber Blowers: (01-001.W & 02-001.W)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked.

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

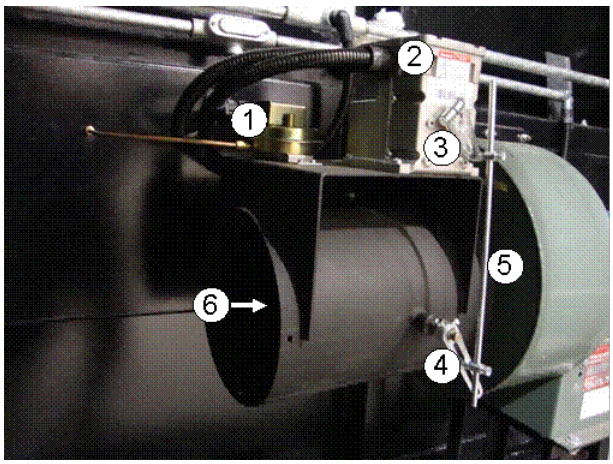
A fan can windmill despite removal of all electrical power therefore, take extra care when working with fans in the system.

The rotating assembly should be blocked securely before attempting maintenance of any kind.

INSTRUCTION 01/02-001.W.01: DAMPER CRANK ARM

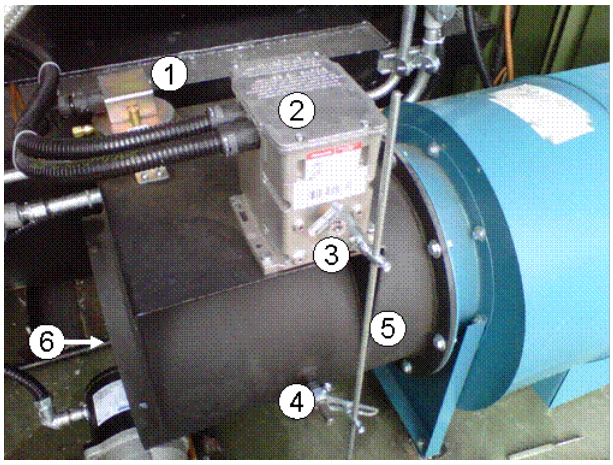
Check to see that the damper crank arm is connected to the damper and the rod.

Ensure mechanical linkage on damper is tight, if loose tighten with wrench.



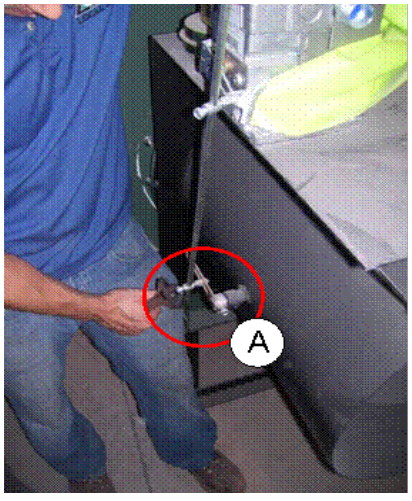
PRIMARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



SECONDARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



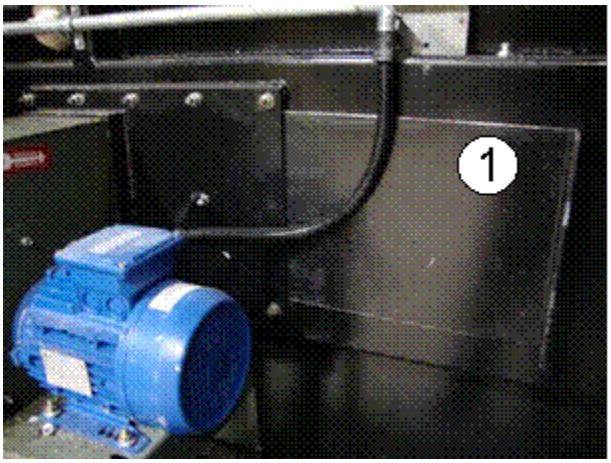
A. Damper Crank arm and connection to Damper and Rod

INSTRUCTION 01/02-001.W.02: SLIDE GATES

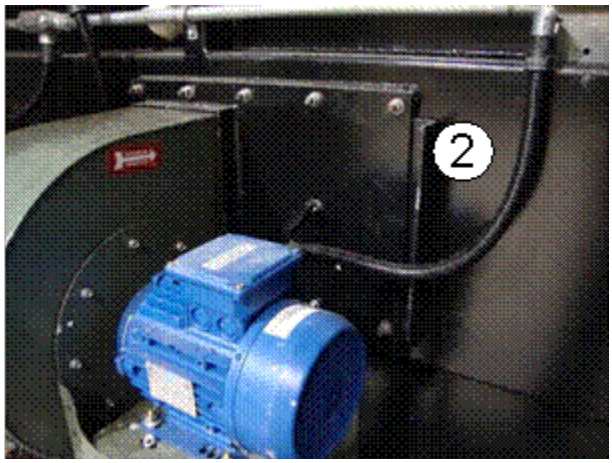
Check to see if slide gates move freely.

1. Move slide gate in and out to ensure free movement. If sticking, use lubricant to loosen. Lubricant should be rated for a high temperature (>150°F) application.

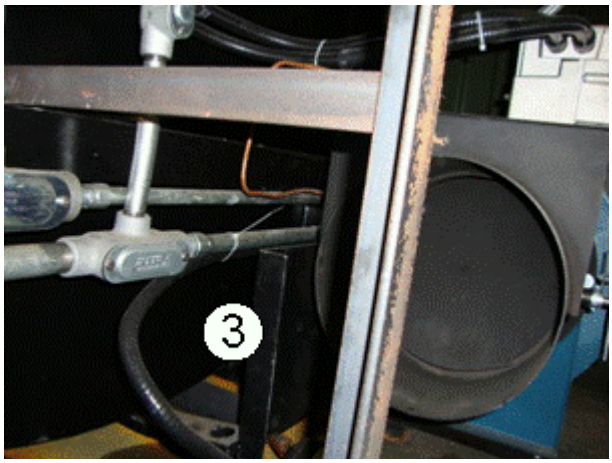
2. Gates must be opened to allow under fire air to enter the chamber. They should only be closed to reduce air in abnormal operating conditions.



1. Primary Chamber Slide Gate Open



2. Primary Chamber Slide Gate Closed



3. Secondary Chamber Slide gate Open

Primary & Secondary Chamber Burners: (01-002.W & 02-002.W)

 **Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01/02-002.W.01: REMOVAL OF BURNER COVERS

Switch off the electrical power. Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.* Cover must be removed to perform maintenance on burners.

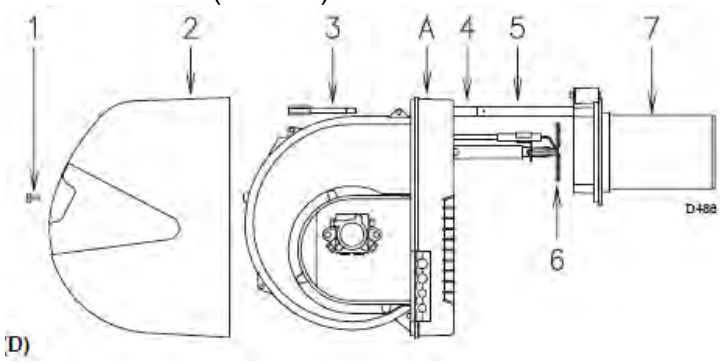
To remove the cover and to pull out the Primary or Secondary Burner, follow instructions below:

1. Loosen screw (Item #1, in the following diagrams) and withdraw the cover (Item #2, in the following diagrams)

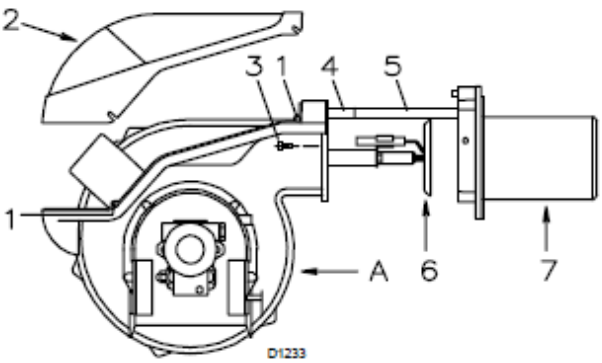
2. Primary Burner has one screw to remove the cover. The Secondary Burner has four screws to remove the cover.

3. Remove bolt (Item #3) for the Primary Burner, or screws (Item #3) for the Secondary Burner.

4. Pull (Part A) backwards keeping it slightly raised to avoid damaging the diffuser disk (Item #6).



Primary Burner has 1 screw



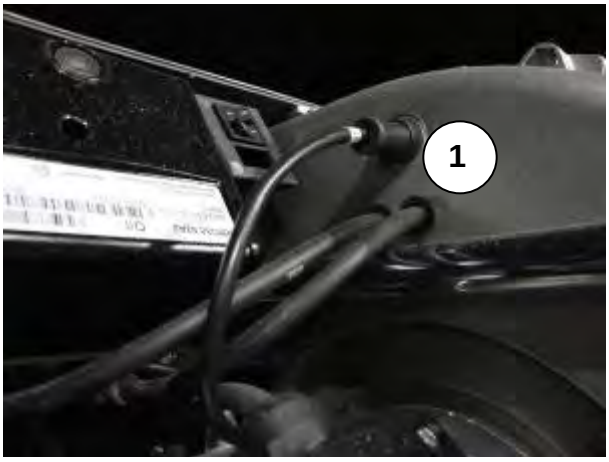
Secondary Burner has 4 screws (2 on each side)

Primary

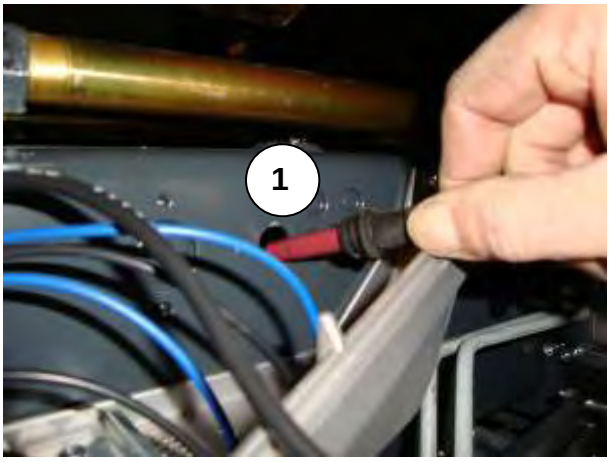
Secondary

INSTRUCTION 01/02-002.W.02: CLEANING THE PHOTO CELL AND U.V. DETECTOR

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.
2. Clean Photo Electric (P.E) cell with a wet cloth
3. P.E. cell (Item #1 on the Primary Burner photo) (Item #1 on the Secondary Burner photo) can be removed by pulling it outward forcefully. Ensure you take note of the position of the eye while removing, this will help when reinstalling.
4. Once cleaned insert P.E. cell back into position ensuring the eye is not facing directly into the chamber (where the flame will be) but on the same angle as before it was removed.
5. Reinstall burner cover.



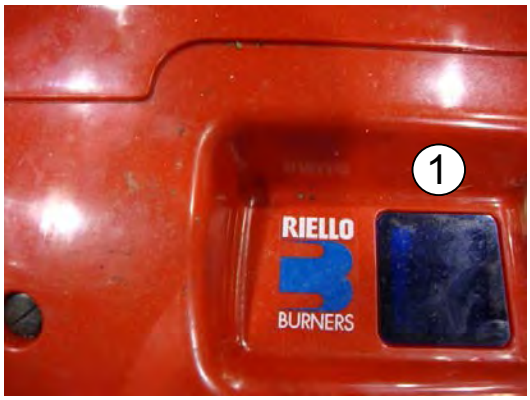
Primary Burner PE Cell

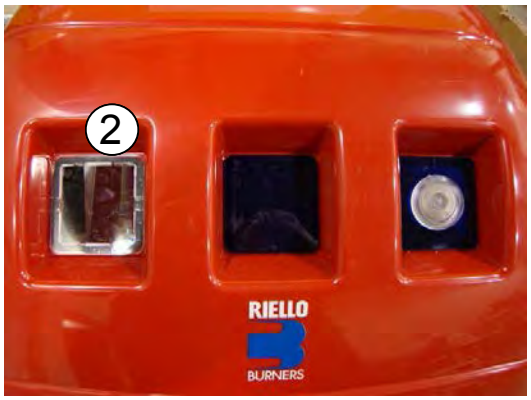


Secondary Burner

INSTRUCTION 01/02-002.W.03: CLEANING THE INSPECTION WINDOWS

Clean the inspection windows with a wet cloth.

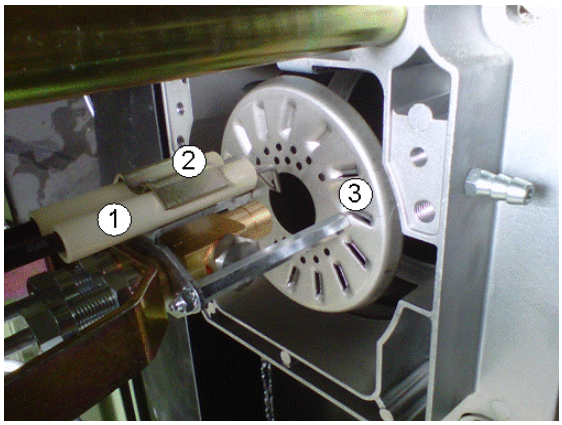




1. Primary Burner Inspection Window
2. Secondary Burner Inspection Window

INSTRUCTION 01/02-002.W.04: INSPECTING THE DIFFUSER DISC ASSEMBLY

1. Remove the cover from the Burners as described in 01/02-002.W.01.
2. Check the diffuser disc assembly and the diffuser disc for any heat damage
3. If any heat damage, deformation or excess rust is noted, replace. (*Part IV Section 4 CMI 4.4.3/01-002B)*



1. Electrode
2. U-bolt
3. Diffuser Disc

Air Compressor: (03-001.W)

INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application.

HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing.

MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing.

HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing. Do not touch hot compressor or tubing.

HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct the air stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.

RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.

Before maintenance is performed on electrical or rotating equipment make sure that the appropriate electrical disconnects are locked out/tagged out. Before removing the vessel access ports make sure that the equipment is off and cool.

NOTA
Too much or too little oil will harm the compressor.

INSTRUCTION 03-001.W.02: INSPECTING AIR FILTERS IN AIR COMPRESSOR

1. Remove both filter covers
2. Gently grab filter element and remove.
3. Visually inspect filter for damage or dirt.
4. If damaged, replace the filter. If dirty, blow out the filter with compressed air.
5. Reinstall the filters and their covers

INSTRUCTION 03-001.W.03: CLEANING AIR COMPRESSOR & CHECKING SAFETY VALVE

Cleaning

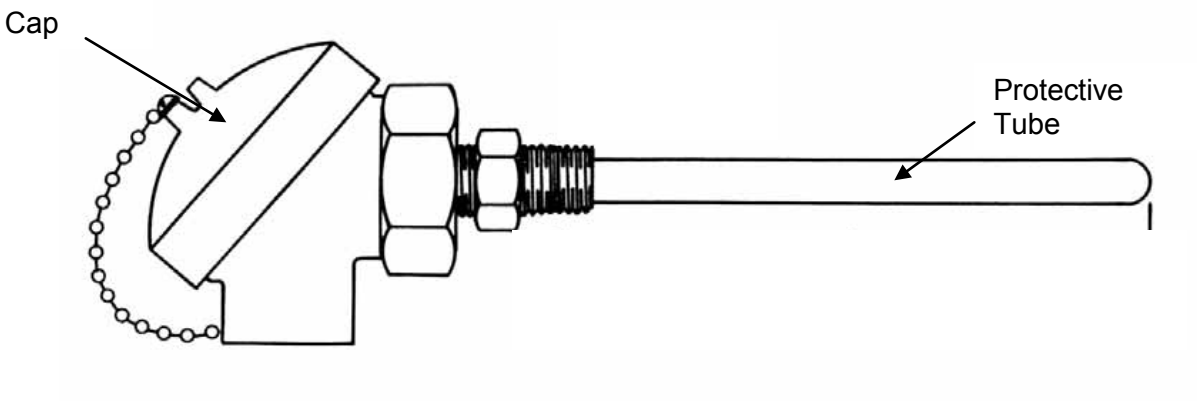
A dirty compressor will cause abnormally high temperature and result in oil carbonization on valve components. Clean all external parts of the compressor with compressed air. Concentrate the cleaning on the external fins where dirt can accumulate as cooling air is forced across them.

Check Safety Valve

1. Check the safety valve manually by pulling ring or lever to make sure that it moves freely and is not siezed.
2. Allow the ring to snap back to normal position.

Thermocouple: (05-002.W)

When working with electrical components, ensure lock out instructions are being followed.

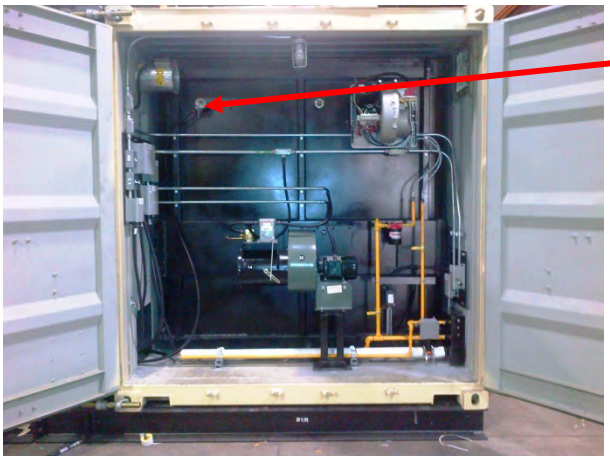


Thermocouple Assembly

Thermocouple Element

INSTRUCTION 05-002.W.01: INSPECT THERMOCOUPLE FOR DAMAGE

Turn main power to the system off - Remove thermocouple and visually inspect for damage. If damaged, see *Part IV Section 4 CMI 4.4.1/05-002A*



1. Primary Thermocouple (TC1)

2. Secondary Thermocouple (TC2) on Secondary Chamber Container

4.2.5 Monthly Instructions

Primary & Secondary Chamber Blowers: (01-001.M & 02-001.M)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.M.01: CHECK FAN WHEEL

1. Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures, if left in operation.
2. The wheel can be accessed one of two ways.
   a. Remove the blower assembly from the unit and look down the outlet of the blower.
   b. Remove the damper assembly from the inlet of the blower and inspect by looking through the inlet of the blower.
3. Check also for the build-up of material which can cause unbalance resulting in vibration, bearing wear and serious safety hazards.
4. Clean the wheel as required.
5. If replacement is necessary follow these steps:

   a. Remove damper assembly from the unit

   b. Remove the blower assembly

   c. Remove the blower housing around the wheel

   d. Loosen all set screws that are located on the wheel.

   e. A puller may be required if the wheel hasn't been removed for some time.

   f. Ensure the shaft "key" is installed on the shaft before installing the new wheel.

   g. When installing a new wheel, the wheel should be positioned in the housing with the correct spacing between the edge of the inlet cone and the wheel. The wheel to cone clearance on the Primary Blower is 0.3175 cm.

   h. Ensure that the wheel is installed securely before reassembling the blower assembly.

   i. Install the blower assembly

   j. Install the damper assembly

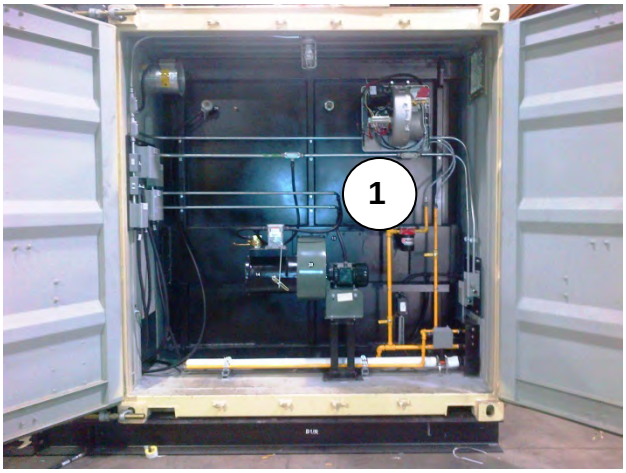
Primary & Secondary Chamber Burners: (01-002.M & 02-002.M)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

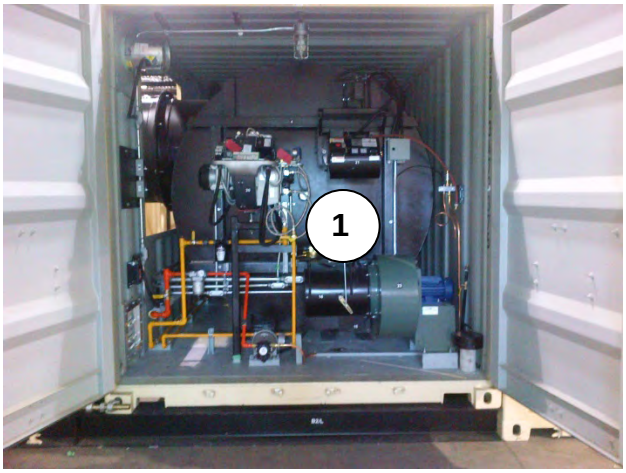
INSTRUCTION 01/02-002.M.01: CHECK FLEXIBLE OIL LINE

1. Check flexible oil lines to make sure that they are still in good condition. This includes frayed, leaking, or worn swivel joints.

2. If any type of damage is observed replace the flexible oil lines see *Part IV Section 4 CMI 4.4.3/01-002F & 4.4.3/02-0002F*



Primary Chamber Burner Flexible lines (1 Above)



Secondary Chamber Burner Flexible Lines (1 Above)

INSTRUCTION 01/02-002.M.02: INSPECT BURNER PUMP DELIVERY PRESSURE

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.

2. The pump delivery pressure must be between 180-210 psi, and can be viewed on the gauge shown below.

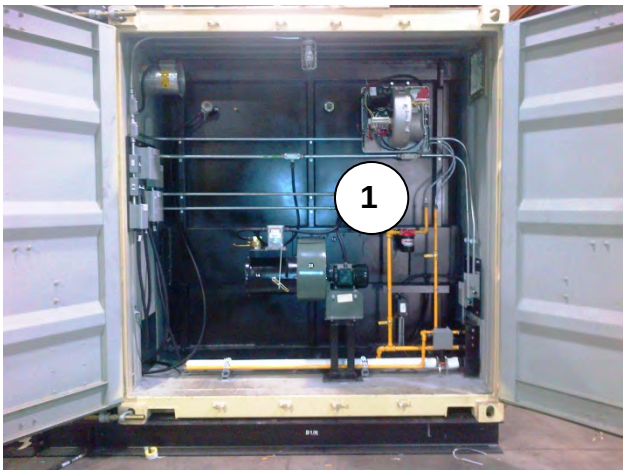
3. If the pressure is found to be unstable or if the pump is running noisily try the following:

a. Detach the flexible hose from the line filter (Shown below as #1).

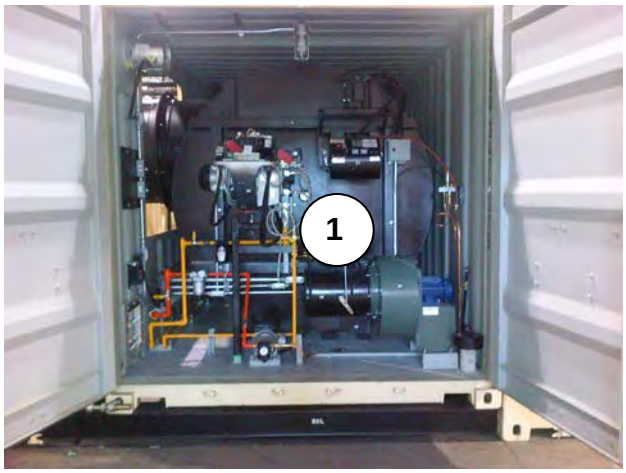
b. At the tank pour fuel into the supply line.

c. If there is fuel coming in through the filter it means the filter is not clogged. If no fuel is coming through the filter remove and replace.

d.



Primary Chamber Burner Flexible lines



Secondary Chamber Burner Flexible Lines

4. If the pump is found to be responsible:
   a. Loosen the bleed screw.
   b. Turn on the burner
   c. Once all the air has been bled out. Close the bleed screw.

   If the pump is still not working after these steps replace the pump: see *Part IV Section 4 CMI 4.4.7/01-002I or 4.4.7/02-002I.*

5. If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping from a loose fitting or damaged line.

INSTRUCTION 01/02-002.M.03: CLEAN BURNERS OF DUST

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.

2. Check that no dust has accumulated inside the burner fan or on fan blades.

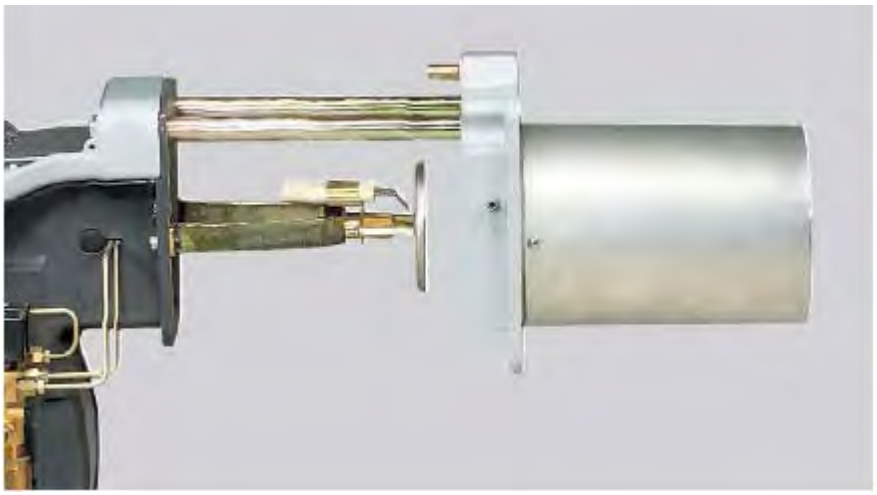
3. If any dust is visible take a clean soft cloth to the fan or the blades and wipe clean.

INSTRUCTION 01/02-002.M.04: CHECK BURNER COMBUSTION HEAD

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.

2. Check that all parts of the combustion head are in good condition, free of all impurities, and that no deformation has been caused by operation at high temperatures.

(Below is an example of burner in good condition)



If damage is found, please refer to *Part IV Section 4 CMI 4.4.3/01-002D* & *4.4.3/02-002D*

Refractory: (05-001.M)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 05-001.M.01: INSPECT REFRACTORY

1. Ensure power is locked out.
2. Open Secondary Chamber door.
3. Fasten door open, ensuring it will not close by its own weight.
4. Enter Secondary Chamber and check the refractory for shrinkage, any gaps between the modules greater than 2.5 cm should be patched.
5. Fix gaps with supplied blanket by stuffing material into opening. (See *Part IV Section 4 CMI 4.4.2/05-001A)*
6. Check for any exposed metal, if metal is exposed make sure to patch area with blanket material or new module. (See *Part IV Section 4 CMI 4.4.2/05-001A* & *4.4.2/05-001B)*
7. Pay special attention to areas where the junction boxes are located, as any excessive heat may melt the wires within the box.

Some cracking is normal, however if pieces are missing or have fallen out, (See *Part IV Section 4 CMI 4.4.2/05-001E)*

Air Compressor: (03-001.M)

INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application unless treated in accordance with all applicable codes and regulations.

HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing. Compressor must be connected to properly grounded circuit. Do not operate compressor in wet conditions. Store indoors.

MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing. Lockout/Tagout machine.

HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing.

HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct air-stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.

RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.

INSTRUCTION 03-001.M.01: CHECK FASTENERS FOR TIGHTNESS

1. Check all fasteners for tightness (tighten as required).

2. Check the safety valve manually, by pulling ring or lever, to make sure that it is not stuck. Allow the ring to snap back to normal position

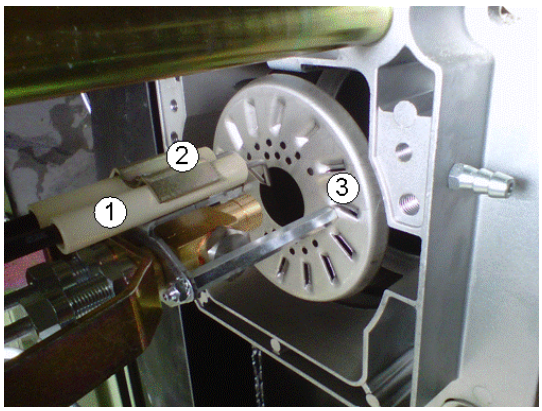
Quarterly Instructions

Primary & Secondary Chamber Burners: (01-002.Q & 02-002.Q)

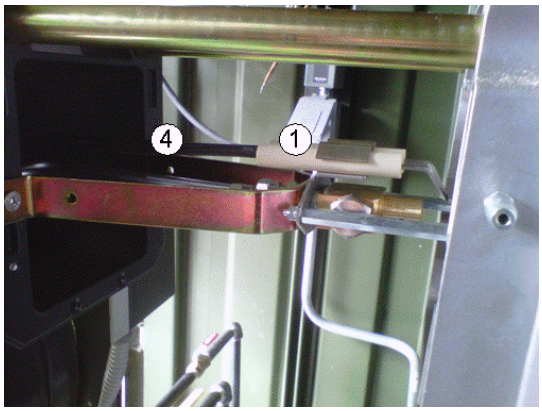
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

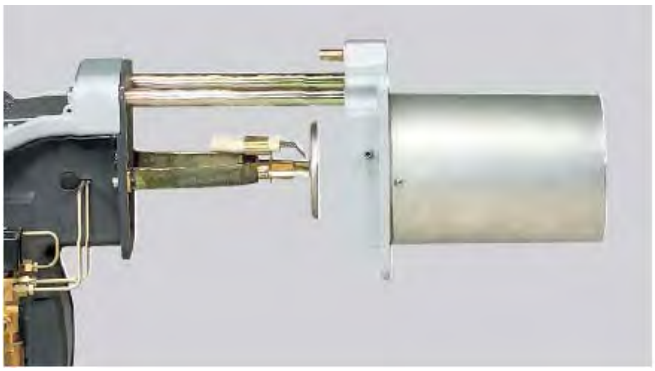
INSTRUCTION 01/02-002.Q.01: INSPECT COMPONENTS FOR HEAT DAMAGE

1. Check all components for heat damage.
2. Look for excessive rust, deformation of all the parts including but not limited to the end cone and the diffuser disc.
3. Check to see that the High Temperature Leads (HT leads) are still intact and have not melted from any excessive heat coming back into the burner. If they are damaged replace with new HT Lead.
    a. The HT leads are attached to the control box and the electrode via a squeeze fitting. Remove the leads from the electrode and control box by simply pulling them out.



1. Electrode
2. U-Bolt
3. Diffuser Disc
4. HT Leads





End cone

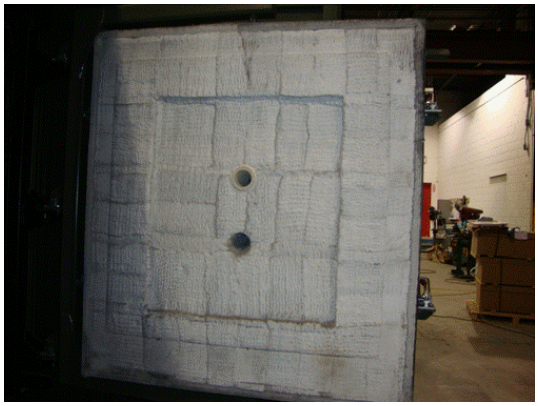
Refractory: (05-001.Q)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

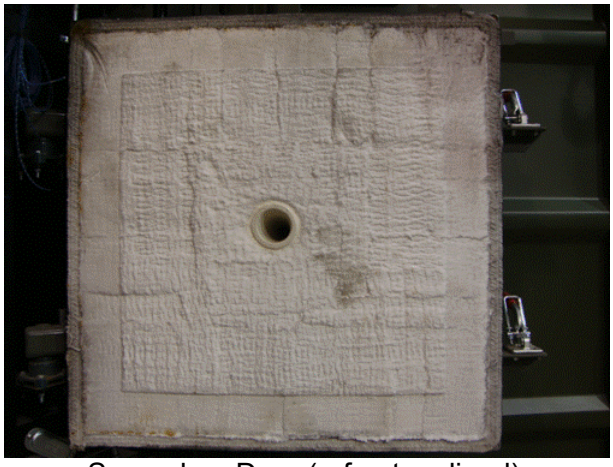
INSTRUCTION 05-001.Q.01: INSPECT DOOR GASKETS

1. Open Primary and Secondary Chamber doors.
2. Fasten doors open, ensuring the door will not close on its own.
3. Inspect door gasket for damage.
4. Replace any damaged segments of door gasket if necessary. Cut out the damaged section and replace with new door gasket. See *Part IV Section 4 CMI 4.4.2/05-001C*.
5. Doors must close tightly and securely, ensuring a good seal.



Primary Door (refractory lined)

1. Primary Door Gasket



Secondary Door (refractory lined)

1. Secondary Door Gasket

INSTRUCTION 05-001.Q.02: INSPECT REFRACTORY FOR SHRINKAGE

1. Ensure power is locked out.
2. Open Primary and Secondary Chamber doors.
3. Fasten doors open, ensuring they will not close on their own.
4. Enter Primary and Secondary Chamber and check the refractory for shrinkage, anything greater than 2.54 cm should be patched.
5. Check to make sure the anchoring of the modules is still strong and intact, if any modules seem loose replace complete module with new module.

A. REMOVAL: Remove existing Module (physically pull away existing refractory from underlying Module Anchor).

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell).

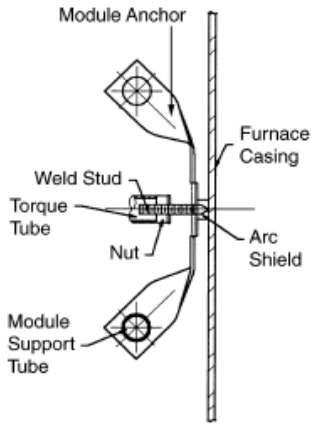


Figure 1: Side view of the Weld Loc Module

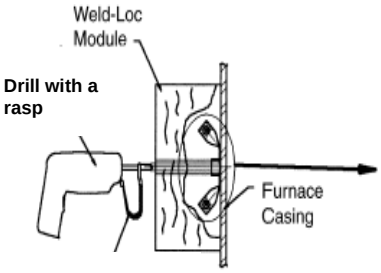


Figure 2: Stud Gun with rasp and Torque Tube.

A. INSTALLATION: Once the new module is in place take the stud gun with rasp to the Torque Tube and drill into place.

B. Once it has tightened the Torque Tube should come off with the drill.

Air Compressor (03-001.Q)

 **INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application unless treated in accordance with all applicable codes and regulations.**

 **HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing. Lockout/Tagout machine. Compressor must be connected to properly grounded circuit.**

 **MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing. Lockout/Tagout machine.**

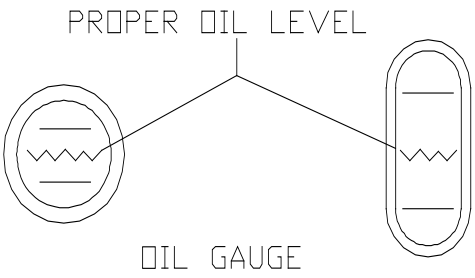
 **HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing. Do not Touch hot compressor or tubing.**

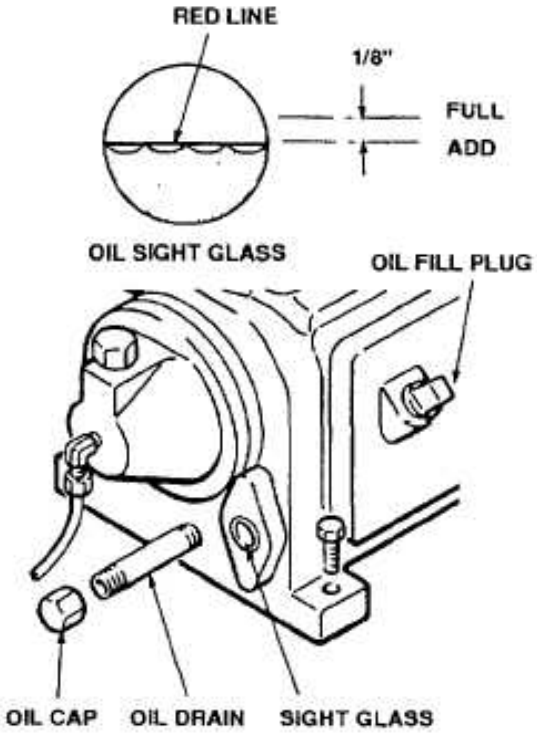
 **HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct air-stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.**

 **RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.**

INSTRUCTION 03-001.Q.01: CHANGE THE OIL

1. Change the oil





2. Remove the oil cap (above) to drain the oil.
3. Replace oil cap.
4. Refill the oil reservoir, using compressor oil, to the fill line as illustrated above.
5. Maintain oil level mid-way between the upper and lower lines of the crankcase sight gauge. See illustration above.

Paint: (05-003.Q)

Ensure proper ventilation and proper equipment is being used when using any paint product.

INSTRUCTION 05-003.Q.01: INSPECT AND MAINTAIN EXTERIOR PAINT

1. Maintain paint exterior to protect metal from heat and corrosion damage. This includes all components in the system including containers and incinerator components.

2. If discoloration is noted and painting needs to be performed, on areas where paint will be applied, you must do a light sanding before application.

3. Follow paint manufacturer's application instructions which will include surface preparation, priming and painting.

4. If components within the container need to be painted, for example the Primary Chamber or the Secondary Chamber, proceed as above. Use a type of paint that meets the following specifications:

Paint Specifications:

Incinerator Paint: This is the paint coated directly on the incinerator shell. This includes the following components:

1. Primary Chamber
2. Secondary Chamber
3. Breech Section
4. Hot Stack Section (Black)

Finish needs to be able to withstand temperatures in the 650-750°F (340-400°C) range.

Container Paint: Paint to conform to Customer outlined specifications.

Parts: There are no paint specifications for each individual component. This is left up to the discretion of the customer.

4.2.6 Yearly Instructions

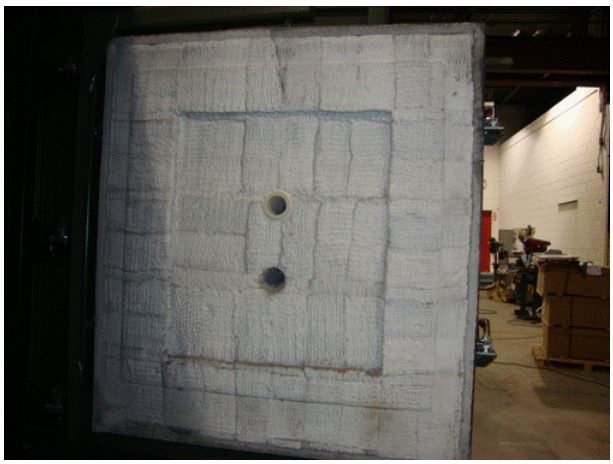
Refractory: (05-001.Y)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

INSTRUCTION 05-001.Y.01:
CHECK DOOR GASKET ALONG PRIMARY & SECONDARY CHAMBER DOORS

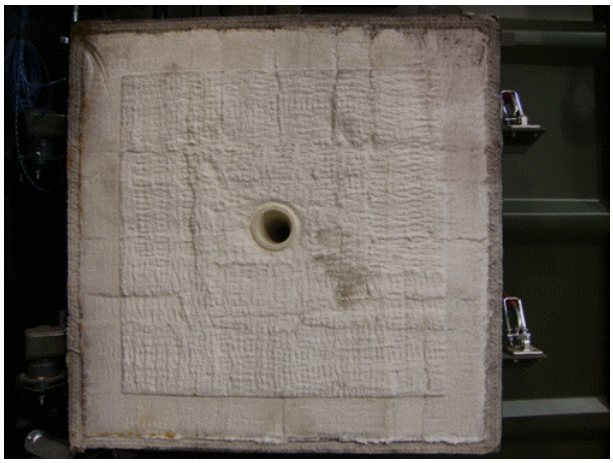
1. If required replace the door gasket. The gasket can last over 2 years but will depend on the careful use by the operator when loading and unloading.

2. Remove the damaged section of door gasket from door and reinstall new gasket



Primary Door (refractory lined)

Primary Door Gasket



Secondary Door (refractory lined)

Secondary Door Gasket

Electrical: (05-004.Y)

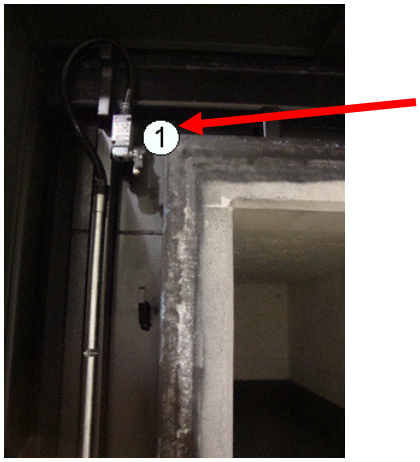
When working with electrical components ensure lock out instructions are being followed

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

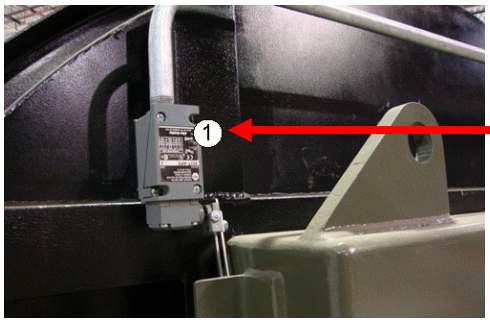
INSTRUCTION 05-004.Y.01: CHECK LIMIT SWITCHES

NOTA System must not be running or in cool down to perform this inspection.

1. Open Primary and Secondary Chamber doors and check top view screen on the HMI Panel view to ensure that it indicates door is open.
2. Close Primary and Secondary Chamber doors and check top view screen on the HMI Panel View to ensure that it indicates door is closed.
3. All limit switches located on the unit are checked this way.
4. Replace limit switches if necessary.



Primary Chamber Limit Switch



Secondary Chamber Limit Switch

5. See *Part IV Section 4 CMI 4.4.1/05-005A*.
6. Check all other limit switches in the system.

4.3 CORRECTIVE MAINTENANCE INSTRUCTIONS (CMI)

The following instructions relate to the replacement or correction (fixing) of components of the EWS Mobile Incinerator Package.

These Corrective Instructions are grouped in this section by the following:

4.4.1 General Corrective Maintenance Instructions
4.4.2 Refractory Corrective Maintenance Instructions
4.4.3 Primary & Secondary Burner Corrective Maintenance Instructions
4.4.4 Primary & Secondary Blower Corrective Maintenance Instructions
4.4.5 Main Control Panel Corrective Maintenance Instructions

As per the *Preventive Maintenance Instructions Section 4.2* of this *Manual*, the following table is utilized to identify the components of the system that require corrective maintenance.

System Component		**Identification number**	
Primary Burner		**01-002**	
	Replacing Fuel Filter		4.4.1/01-002A
Secondary Burner		**02-002**	
	Replacing Fuel Filter		4.4.1/02-002A
Thermocouple		**05-002**	
	Replacing Thermocouple		4.4.1/05-002A
Limit Switch		**05-005**	
	Limit Switch Replacement		4.4.1/05-005A
Container Door Gasket		**05-006**	
	Replacement of Container Door Gasket		4.4.1/05-006A
Refractory		**05-001**	
	Wall Refractory: Gaps between the Modules		4.4.2/05-001A
	Wall Refractory: Replacement of the Modules		4.4.2/05-001B
	Door Gasket		4.4.2/05-001C
	Castable Refractory		4.4.2/05-001D
	Temporary Repair of Castable		4.4.2/05-001E
Primary Burner		**01-002**	
	HT Lead & Electrode Replacement		4.4.3/01-002A
	Diffuser Disc Replacement		4.4.3/01-002B
	Nozzle Replacement		4.4.3/01-002C
	End Cone Replacement		4.4.3/01-002D
	Nozzle Assembly Repair or Replacement		4.4.3/01-002E
	Burner Flexible Oil Line Replacement		4.4.3/01-002F
	Low Level Switch Replacement		4.4.3/01-002G
	Inspection Window Replacement		4.4.3/01-002H
	Fuel Pump Replacement		4.4.3/01-002I
	Control Box Replacement		4.4.3/01-002J
	Oil Tube Replacement		4.4.3/01-002K
	Burner PE Cell & UV Detector Replacement		4.4.3/01-002L
	Burner Fan Motor Replacement		4.4.3/01-002M
Secondary Burner		**02-002**	
	HT Lead & Electrode Replacement		4.4.3/02-002A

	Diffuser Disc Replacement		4.4.3/02-002B
	Nozzle Replacement		4.4.3/02-002C
	End Cone Replacement		4.4.3/02-002D
	Nozzle Assembly Repair or Replacement		4.4.3/02-002E
	Burner Flexible Oil Line Replacement		4.4.3/02-002F
	Low Level Switch Replacement		4.4.3/02-002G
	Inspection Window Replacement		4.4.3/02-002H
	Fuel Pump Replacement		4.4.3/02-002I
	Control Box Replacement		4.4.3/02-002J
	Oil Tube Replacement		4.4.3/02-002K
	Burner PE Cell & UV Detector Replacement		4.4.3/02-002L
	Burner Fan Motor Replacement		4.4.3/02-002M
Primary Blower		**01-001**	
	Air Proving Switch Replacement		4.4.4/01-001A
	Damper Calibration		4.4.4/01-001B
	Modutrol Resistor Replacement		4.4.4/01-001C
	Damper Crank Arm Replacement		4.4.4/01-001D
	Motor Replacement		4.4.4/01-001E
	Modutrol Motor & Transformer Replacement		4.4.4/01-001F
	Replace the Blower Contactor		4.4.4/01-001G
Secondary Blower		**02-001**	
	Air Proving Switch Replacement		4.4.4/02-001A
	Damper Calibration		4.4.4/02-001B
	Modutrol Resistor Replacement		4.4.4/02-001C
	Damper Crank Arm Replacement		4.4.4/02-001D
	Motor Replacement		4.4.4/02-001E
	Modutrol Motor & Transformer Replacement		4.4.4/01-001F
	Replace the Blower Contactor		4.4.4/01-001G
Main Control Panel		**03-010**	
	Main Control Panel		4.4.6/03-010A
	Reboot PLC		4.4.6/03-010B
	PLC Parts Replacement		4.4.6/03-010C

4.3.1 General Corrective Maintenance Instructions

LIMIT SWITCH REPLACEMENT (4.4.1/05-005A)

1. Loosen the 2 screws holding the limit switch in place.
2. Remove limit switch, replace with a new one.
3. Take arm off of old body and mount to new.
4. Tighten the 2 screws holding the limit switch body.

REPLACING THERMOCOUPLE (4.4.1/05-002A)

The thermocouple will require routine replacement. The environment inside the incinerator will erode the protection tube to the point of failure. If the element is exposed to this environment it will be destroyed and will need to be replaced.

1. Unscrew thermocouple lid and remove wires.
2. Remove protection tube. To aid with this a vise and a pipe wrench will be needed.
3. Remove element and replace with new element and protection tube

4. Reinstall on incinerator.

5. After installation turn power back on. Observe the temperature reading of the thermocouple you were just working on. If the wires were installed incorrectly the temperature will read the opposite temperature. (I.e. 20°C would read as -20°C). If this is the case open the thermocouple housing and switch the wires.

REPLACING FUEL FILTER (4.4.1/01-002A AND 02-002A)

The fuel filter will require routine replacement to ensure clean fuel delivery to the Primary and Secondary Chamber burners.

1. Close the Ball Valve on the supply line.

2. Unscrew the used Red filter. Use a bucket to catch the surplus fuel when you unscrew the filter.

3. Before installing the filter lubricate the seal on the new filter.

4. Install the new filter, and open the supply line ball valve.

4.3.2 Refractory Corrective Maintenance Instructions

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

WALL REFRACTORY: GAPS BETWEEN THE MODULES (4.4.2/05-001A)

The ceramic block refractory will shrink over time exposing the exterior metal shell. These gaps need to be filled in with ceramic refractory blanket.

1. Identify gaps in the chamber that are larger than 1” in width between the modules or if you can see exterior shell.

2. With a Utility knife cut a length of ceramic blanket that will fit in the gap between the modules.

3. Stuff the blanket into the space with a straight edge or ruler.

WALL REFRACTORY: REPLACEMENT OF MODULES (4.4.2/05-001B)

Excessive damage to a section of refractory may necessitate the replacement of modules in the incinerator. Such damage is largely due to mechanical wear. The following diagram walks through the removal and installation of new modules.

A. REMOVAL: Remove existing Module (physically pull away existing refractory from underlying Module Anchor)

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell)

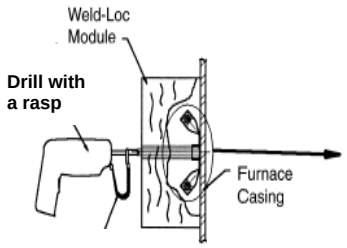


Figure 2: Stud Gun with rasp and Torque Tube (part of module assembly).

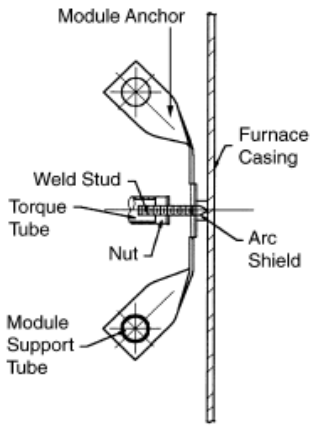


Figure 1: Side view of the Weld Loc Module

C. INSTALLATION: Once the new module is in place take the stud gun (PN: Eco-Stud; EIN: 11-E-S-01-04-016-016) with rasp to the Torque Tube and drill into place.

D. Once it has tightened the Torque Tube should come off with the drill.

DOOR GASKET REFRACTORY (4.4.2/05-001C)

The door gasket will degrade over time and will need to be replaced over time. The bottom of the door will see more degradation due to the waste burning in that vicinity.

1. Identify the damaged section of gasket that will need to be removed
2. With a utility knife cut out the section that needs to be replaced.
3. A new piece of gasket will need to be cut the same length as the removed piece.
4. With contact cement coat the gasket on one side and the door section and install.

CASTABLE REFRACTORY (4.4.2/05-001D)

Operators will notice that the castable refractory will show signs of minor cracking. The minor cracking is normal. Large sections of castable should not separate from the rest of the monolithic cast. Such occurrences are largely due to a sudden impact from machinery or

dropping of the units themselves. Mortar is supplied to help with a temporary repair while a permanent repair is resolved. Such permanent repairs are a third level repair and have to be considered on a case by case basis.

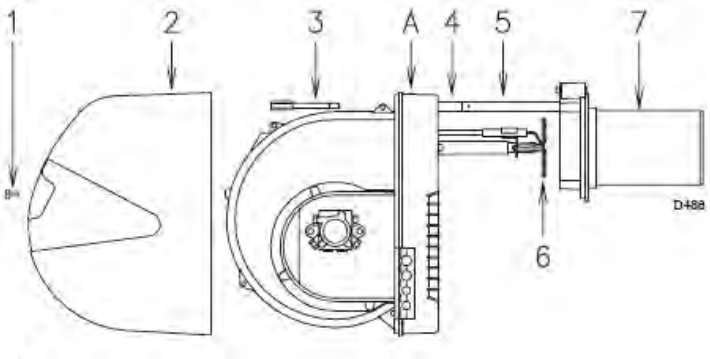
TEMPORARY REPAIR OF CASTABLE (4.4.2/05-001E)

1. Find the pieces of castable refractory that have separated.
2. Clean both the pieces of refractory and the area where the separation occurred.
3. Spread an even amount of high temperature mortar on the pieces and the area of separation.
4. Put the pieces back where they originated and support as necessary for a minimum of an hour while the mortar cures.

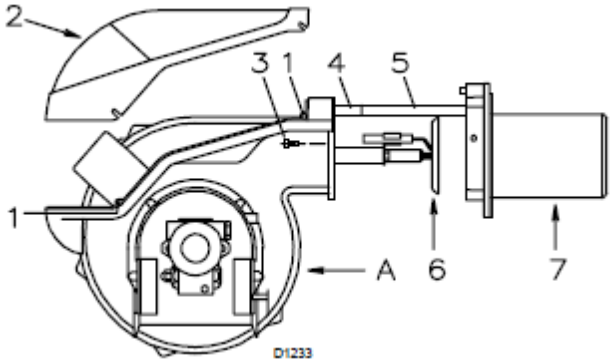
4.3.3 Burner Corrective Maintenance Instructions

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

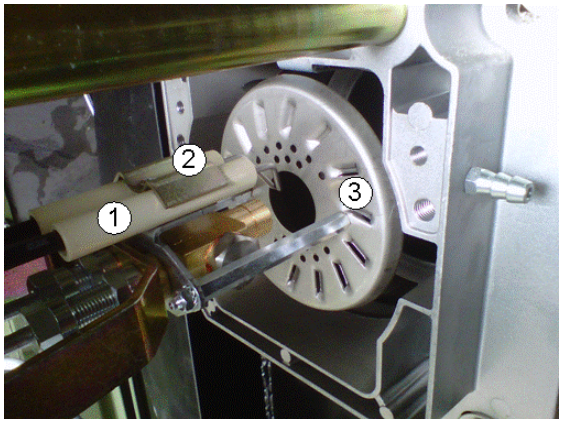
The Burners are pieces of equipment that will require routine corrective and preventive maintenance. Parts within this assembly will need to be repaired or replaced. The most common parts to be repaired or replaced are located at the front end of the burner where the parts are exposed to high temperatures.



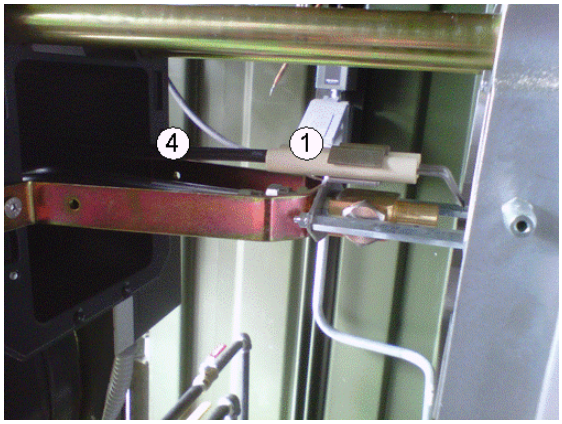
Front End Primary Burner



Front End Secondary Burner



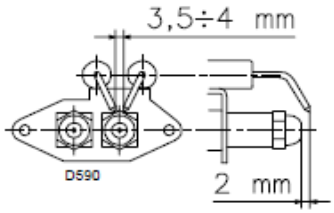
1. Electrode
2. U-bolt
3. Diffuser Disc



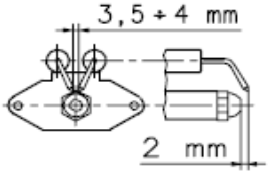
4. HT Leads

HT LEAD & ELECTRODE REPLACEMENT (4.4.3/01-002A & 02-002A)

1. In order to change out the HT leads or Electrode the U-Bolt will have to be removed
2. Remove the electrode by pulling the lead out of the white ceramic tube, replace and re-install.
3. To change the Leads the wire will need to be removed from the burner.
4. Pull the wire out of the burner housing through the rubber grommet.
5. The other end is connected to the back of the control box. Pull the wire straight out and the spring fitting will disengage.
6. Replace the lead with a new one reversing the above directions.
7. When reinstalling the electrodes make sure that they are positioned as shown below:



Primary Burner



Secondary Burner

DIFFUSER DISC REPLACEMENT (4.4.3/01-002B & 02-002B)

1. Locate the diffuser disc in the above pictures.
2. The disc assembly is secured to the nozzle housing by 2 hex nuts.
3. Remove these nuts and remove the assembly from the burner.
4. The disc is attached to the assembly with 2 screws.
5. Remove the screws and replace the disc.
    - Primary Chamber Burner diffuser disc
    - Secondary Chamber Burner diffuser disc
6. Reassemble.

NOZZLE REPLACEMENT (4.4.3/01-002C & 02-002C)

1. Locate the nozzle at the very front end of the burner just behind the diffuser disc.

2. Remove the nozzle with a wrench.

3. Install the new nozzle.
    - Primary Chamber Burner nozzle
    - Secondary Chamber Burner nozzle

END CONE REPLACEMENT (4.4.3/01-002D & 02-002D)

The End Cone is marked Item #7 in the first diagram of Section 4.4.3. The end cone will need replacement when the flame becomes unstable from too much heat damage.

1. Loosen and remove the 4 hex bolts that hold the burner on the flange.

2. Remove the burner completely from the incinerator. This will require more than one operator because the burner is heavy.

3. There are two screws that hold the End Cone on. Remove and save the screws for the new End Cone.

4. Install the new End Cone with the old screws.
    - Primary Chamber burner end cone
    - Secondary Chamber burner end cone

5. Reinstall the burner.

NOZZLE ASSEMBLY REPAIR OR REPLACEMENT (4.4.3/01-002E & 02-002E)

The nozzle assembly is subjected to high heat cycling. The heat cycling will eventually cause the seals and assembly to leak. The assembly will have to be replaced when this occurs. First identify the location of the nozzle assembly.

- Primary Chamber Burner nozzle assembly:
- Secondary Chamber Burner nozzle assembly:

The parts (seals, nozzle assembly) needed for these replacements are all included under one part number.

- Primary Chamber Burner nozzle assembly:
- Secondary Chamber Burner nozzle assembly:

Remove all connections to the nozzle assembly and replace with the above parts.

BURNER FLEXIBLE OIL LINE REPLACEMENT (4.4.3/01-002F & 02-002F)

1. Turn the inline ball valve to the closed position to isolate the fuel supply from the burner. This valve is located down line from the burner.

2. Remove flexible lines.

3. Replace with new lines.

    - Primary Chamber Burner flexible oil line:
    - Secondary Chamber Burner flexible oil line

4. Open ball valve.

Primary Chamber Burner Flexible lines
(1 Above)

Secondary Chamber Burner Flexible Lines
(1 Above)

LEVEL SWITCH REPLACEMENT (4.4.3/01-002G & 02-002G)

The level switch is located in the Diesel Tank.

NOTA

Tanks do not have to be emptied to replace.

1. Unplug the level switch from tank.

2. Disconnect the cord and remove the level switch.

3. Replace level switch and reconnect the cord.

4. Plug in the level switch to tank.

INSPECTION WINDOW REPLACEMENT (4.4.3/01-002H & 02-002H)

The inspection window can be identified as Item # 7 on IPD-I03 for the Primary Burner and Item # 32 on IPD-I04 for the Secondary Burner. To replace the window simply remove the old inspection window and replace with a new one:

- Primary Burner inspection window
- Secondary Burner inspection window

FUEL PUMP REPLACEMENT (4.4.3/01-002I & 02-002I)

Identify the pump on the burner you wish to replace the pump on:

- Primary Burner:
- Secondary Burner :

Remove all fuel connections to the pump with the appropriate wrench. Unbolt the pump from the main body of the burner and pull the pump away from the burner to remove.

Reinstall the new pump, and reattach all fuel connections.

- Primary Burner:
- Secondary Burner :

CONTROL BOX REPLACEMENT (4.4.3/01-002J & 02-002J)

Identify the control box on the burner you wish to replace the control box on:

- Primary Burner:
- Secondary Burner :

Ensure the power is off, unscrew the old control box, and install the new one.

- Primary Burner:
- Secondary Burner :

OIL TUBE REPLACEMENT (4.4.3/01-002K & 02-002K)

Oil tubes leak due to heat cycling which causes the fittings to fail or a loose fitting.

1. Identify the oil tubes on the Primary Burner and Secondary burner

2. First try tightening the fittings to see if the leak stops. If the leak does not stop:

3. Remove the old oil tubes with a wrench and install the new ones:

    - Primary Burner Tubes:
    - Secondary Burner Tubes

BURNER PE CELL & UV DETECTOR REPLACEMENT (4.4.3/01-002L & 02-002L)

Primary Burner: If the PE cell has been damaged, then it will need to be replaced. The PE cell while removed needs to be unplugged from the control box. This is accomplished by pulling the connection towards you. With the new PE cell install the control box end first by pushing the connection hard. Reinstall the PE cell in the burner.

Secondary Burner: If the UV Detector has been damaged, then it will need to be replaced. The UV Detector while removed needs to be unplugged from the control box. This is accomplished by pulling the connection towards you. With the new UV Detector install the control box end first by pushing the connection hard. Reinstall the UV Detector in the burner.

BURNER FAN MOTOR REPLACEMET (4.4.3/01-002M & 02-002M)

Identify the malfunctioning motor in the affected burner:

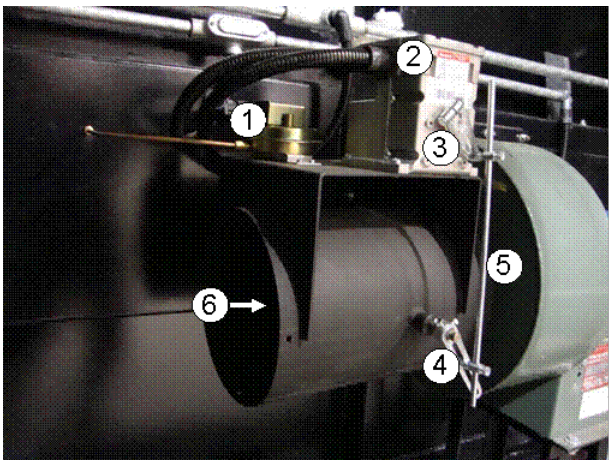
- Primary Burner –
- Secondary Burner -

Unbolt and remove the malfunctioning motor from the housing the burner. Disconnect all electrical connections. Reinstall the new motor exactly how the old motor was installed.

4.3.4 Primary & Secondary Blower Corrective Maintenance Instructions

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

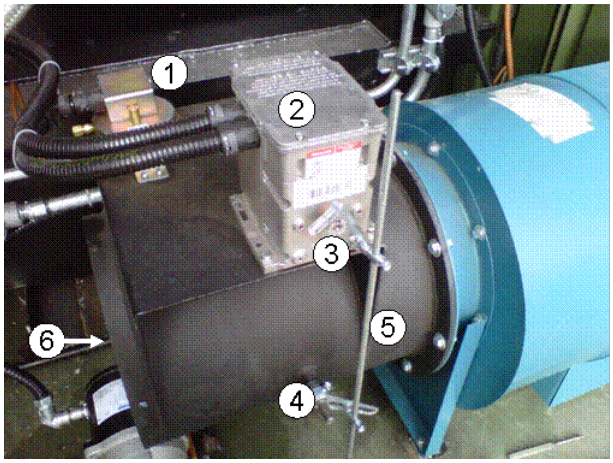
Primary Blower Assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



Primary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

Secondary Blower Assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



Secondary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

AIR PROVING SWITCH REPLACEMENT (4.4.4/01-001A & 02-001A)

1. Ensure all power is locked out.
2. Remove wiring from switch.
3. Remove tubing from switch.
4. Unscrew screws at the two locations and remove switch.
5. Reinstall new switch complete with tubing and wiring and then retighten.
6. Turn power back on.

DAMPER CALIBRATION (4.4.4/01-001B & 02-001B)

Sometimes the damper linkage will slip when the connections become loose (Items 3,4,5 in the Secondary Blower photo) In order to ensure that the linkage is correctly calibrated the operator will need to look at the display screen on the control panel while the unit is in operation

1. Read the %Open value on the control panel operator interface (PanelView) for the Primary Blower.
2. During operation the damper is factory preset to be 0% open, or fully closed.
3. Look inside the damper (Item 6) and ensure that the linkage is completely closed.
4. If it is then this maintenance is complete.
5. Should the damper be open even a small percentage the linkages are to be loosened and the damper adjusted to be completely closed, and then retighten.

MODUTROL RESISTOR REPLACEMENT (4.4.4/01-001C & 02-001C)

The Modutrol resistors are located inside the top lid of the Modutrol motor. Remove the lid to the Modutrol motor by unscrewing the top four (4) screws. The connection between the control panel and the Modutrol is made with a small white connector with 3 terminals. Jumpered between these terminals is the resistors.

Remove and replace the resistors one at a time to ensure the correct resistors are replaced. You identify the correct resistor by examining the color band on the center node of the resistor. Replace like resistors.

DAMPER CRANK ARM REPLACEMENT (4.4.4/01-001D & 02-001D)

The crank arm will only need to be replaced if the arm is damaged due to misuse. Identify the damper crank arm (Item #4 in the picture on the previous page).

Identify the location of the linkage on the rod and the damper arm with a marker, so the new crank arm will be in the same spot when reinstalled. Remove the connections to the crank arm and replace with the new one and ensure it is in the same spot as the old one.

MOTOR REPLACEMENT (4.4.4/01-001E & 02-001E)

Replacing the motor requires a second level maintenance. This information can be found in the OEM manual New York Blower, Installation, Maintenance and Operating, IM-160 Junior Fans.

MODUTROL MOTOR & TRANSFORMER REPLACEMENT (4.4.4/01-001F & 02-001F)

To replace a Modutrol motor requires all power to be off to the system as you will need to expose electrical connections. Firstly get the new motor and orientate the motor in the same direction as the old motor. Identify where the conduit is connected on the old motor and punch the connector holes for the new motor.

Removal

1. Remove and electrical terminations and remove the transformer.
2. Install the transformer in the new Modutrol motor.
3. Remove all conduit connections on the motor.
4. Remove the damper arm and linkage from the motor.
5. Unbolt the motor from the damper, and ensure all nuts and bolts are kept for the new motor install

Install

1. Bolt the new motor in the same orientation as the old motor.
2. Install the damper arm and linkage to the motor
3. Install all conduit connections

Terminate all electrical connections the same as the old motor.

REPLACE THE BLOWER CONTACTOR 4.4.4/01-001G

1. Turn off Main Disconnect.
2. Open Panel.
3. Remove the wires from blower contactor.
4. Pull the retaining clip up.
5. Tilt contactor forward and remove.
6. To reinstall tilt new contactor until it clicks back in.
7. Pull the retaining clip back down to lock.
8. Reinstall wires to contactor.
9. Close panel.
10. Turn power back on.

4.3.5 Main Control Panel Corrective Maintenance Instructions

MAIN CONTROL PANEL (4.4.6/03-010A)

All control panel diagnostics are to be completed by certified or trained technicians. Electrical drawings / diagrams are provided to aid electricians with any diagnostics. For reference the parts diagrams for the main control panels are drawings

REBOOT PLC (4.4.6/03-010B)

Turn Main Disconnect to the off position on the front of the Control Panel. Turn the main disconnect back on.

PLC PARTS REPLACEMENT (4.4.6/03-010C)

For detailed repair procedures, refer to the OEM Manual, Part IV Control Panel, PLC.

Read all warnings for procedures in each OEM Manual as they contain critical safety information. Disconnect the power from each component before starting each corrective maintenance procedure.

Component	Procedure	OEM Manual	Page No.
Panelview 1000-Series	Replacing the Battery	Panelview (2711P-T10C4A8)	130
Panelview 1000-Series	Replacing the Backlight	Panelview (2711P-T10C4A8)	126

Panelview 1000-Series	Load and SD card	Panelview (2711P-T10C4A8)	135
Panelview 1000-Series	Removing the Product ID Label	Panelview (2711P-T10C4A8)	134
Panelview 1000-Series	Replacing the Bezel	Panelview (2711P-T10C4A8)	124
Panelview 1000-Series	Cleaning the Display Window	Panelview (2711P-T10C4A8)	136
16 Point Relay Output Module	Replacing a Single Module	I/O Modules Compact 16-PointRelay Output Module (1756-OA16)	156
8 Channel Analog Output Module	Replacing a Single Module	Analog I/O modules Compact 1756-OF4 Analog Output Module	187
8 Channel Analog Input Card	Replacing a Single Module	Analog I/O Modules Compact 1756-IF8 Input Card	187
6 Channel Thermocouple Input Module	Replacing a Single Module	Analog I/O Compact 1756-IT6I Thermocouple Input Module	187

4.3.6 Additional Maintenance Instructions

For more detailed and additional maintenance instructions please refer to the OEM manuals for the Incinerator components.

Baffinland Iron Mines Corporation

Incinerator Operation Procedure

BAF-PH1-320-PRO-0002

Rev 0

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1 PURPOSE AND SCOPE

Baffinland Iron Mines Corporation is committed to taking the necessary steps to ensure that the collection, handling, storage, transportation and disposal of wastes generated during the construction, operation and closure of the Mary River Project is conducted in a safe, efficient and environmentally compliant manner.

The purpose of this procedure is to provide a set of operational requirements for the safe incineration of waste in an environmentally-acceptable manner at the Mary River Project. The incineration of waste is one of a number of elements of the Mary River Project source segregation and waste management program.

2 REQUIREMENTS

2.1 HAZARDS AND ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT (PPE)

2.1.1 HAZARDS

There are numerous specific hazards associated with the management of the incinerator. They include:

- Explosive Gases (aerosol cans/ batteries)
- High temperature
- Sharp objects (i.e. barrel lids, broken glass)
- Flying dust and small particles
- Potential fuel spills
- Encounter with wildlife (wildlife attractants)
- Electricity

2.1.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Wear Standard P.P.E. - Safety glasses, hard hat with reflective tape, safety boots, reflective vest, clothing in good condition, gloves or mitts in good condition and hearing protection if required
- Full face dust mask (such as Advantage 3000 Respirator)

2.1.3 SAFETY AND ENVIRONMENTAL EQUIPMENT

- 20lb Fire Extinguisher
- Sea cans for storage of wastes to be burnt
- Overpack drums for storage of ash
- Spill kits
- Radio Communication

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2.2 Training and/ or Qualifications

Any persons who may be operating the incinerators at a Baffinland work site shall complete formal, documented training in its proper use.

2.3 General Safety Instructions

- Keep the electrical panel doors closed at all times except when performing electrical maintenance or troubleshooting.
- Allow only qualified operators to perform maintenance and troubleshooting on the machine.
- Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.
- Do not bypass or tie down any of the door safety limit switches.
- Do not open any of the doors while the Primary or Secondary Chambers are above 200°F (93 °C).
- Do not enter the Primary Chamber unless the Emergency Stop Button is pushed.
- When opening or closing the Primary Chamber door keep clear of the door and ensure that the path for the door is clear.
- Secure the Primary Chamber door when it is open so it cannot move accidentally.
- Immediately correct any fuel leaks.
- Do not fill the Primary Chamber above the breech opening. Overfilling can result in poor burning and damage to the Incinerator.
- Be aware of component-specific safety hazards listed within each section of this manual.

3 DEFINITIONS

Refractory: Insulating ceramic liner inside the primary and secondary chambers that is able to withstand high temperatures without fusion or decomposition.

Purge Cycle: First step of the burn cycle which exhausts potentially explosive gases that could be remaining in the system and burners. The primary and secondary blowers will run to purge both chambers. The primary and secondary blower indicators on the Top View screen on the Operator Interface will say “Primary Chamber Blower On” and “Secondary Blower On”.

MSC: Mine Site Complex

PSC: Port Site Complex

4 RESPONSIBILITIES

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The following roles have specific accountabilities that must be met to ensure the Mine Site Complex (MSC) and Port Site Complex (PSC) incinerators are operated in compliance with this procedure and its permit. The following roles and responsibilities shall be followed to safely and successfully operate the incinerator.

Site Services Superintendents/Supervisors are responsible for ensuring that all personnel are fully trained and competent to meet the expectations of this policy.

4.1 MSC/PSC Site Services Supervisor

The Site Services Supervisor is responsible for supervising the operation of the incinerator in accordance with this procedure. Specifically, the Site Services Supervisor shall:

- Supervise the incinerator operator in the safe execution of this procedure.
- Implementing this procedure and ensuring that Incinerator Operators are qualified and knowledgeable in the operation of the Incinerator.
- Providing Personal Protective Equipment required for the safe operation of the incinerator and the protection of workers.

4.2 Incinerator Operator

The Incinerator operator, under the general supervision of the Site Services Supervisor, is responsible for executing the following tasks at the incinerator:

- Understanding and following this Procedure, including:
    - Ensuring that no inappropriate materials are processed and that each batch contains an average mix of waste that resembles the design waste characteristics (particularly volume/weight per batch, average density, and overall heat value).
    - Understanding the commitments made by Baffinland Iron Mines to regulatory bodies, with regards to emission targets, monitoring and recording requirements.
    - Ensuring the burn cycle is long enough to allow for thorough burn-out and the generation of high-quality ash residual that is safe for disposal.
    - Minimize particulate matter (dust) emissions during ash removal and handling.
- Wearing the proper P.P.E. when operating the incinerator.

4.3 Environment Department

The Environment Department is responsible for executing the following tasks:

- Overseeing Incinerator Operations to ensure that practices are in compliance with the guidelines as set out in Baffinland's Waste Management Plan.
- Collect monthly incinerator data from the PLC.

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5 PROTOCOL

5.1 WASTE LOAD DESIGN

The types of waste that can be processed in the incinerator are described in table 1. Waste materials not suitable for processing are described in table 2. When preparing a waste load, the operator shall follow these requirements:

- System capacity is 2,000 kg/day.
- Table 1 describes a typical one metric ton load. Respect proportions as much as possible.
- Prepare the load in layers: Start with cardboard or wood at the bottom, then kitchen waste, then more cardboard, etc.
- Waste shall be loose, as received and not compacted prior to loading.
- When receiving large volume of PET bottles (clear plastic), some compaction is recommended.
- The system shall not be overloaded with plastics or wood, or any other high heat value materials.
- Materials containing large air spaces (empty plastic bottles, cardboard boxes) shall be flattened before loading.
- When processing batches of very wet materials (more than 60% food waste), the burn cycle time should be increased to accommodate the additional time required to dry the waste before it can combust.
- Do not load the system with more than 25% by volume of extremely wet materials such as wet garbage.
- Unauthorized waste materials shall never be processed in the system

Table 1. Waste Materials suitable for incineration

Waste Type	Description	Origin	Proportion
Food Waste	Food, food packaging and containers, plastic and paper waste from food preparation	Kitchen and dining areas, office areas	55% or 550 kg/ton load
Domestic waste	General refuse such as paper, plastics, cans, bottles, cardboard, newsprint	Dormitory areas, recreation facilities, office areas, warehouse, plant and production facilities	30% or 300 kg/ton load
Packaging	Cardboard boxes, paper, plastic	Inbound supplies to all work	10% or 100 kg/ton load

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	containers, plastic film, Styrofoam, poly-weave bags	areas	
Wood waste	Skids, pallets crates	Construction activity, inbound supplies	
Absorbents	Rags, wipes, spill cleanup materials	From all work areas	5% or 50 kg/load
Filters – Air and Fluid	Filters coated with fine particles and trapped solids, saturated with water or fluids (glycol, lube, oils, fuel)	From water treatment facility, or generated at point of maintenance of vehicles, machinery and equipment	
Biomedical waste	Bandages, dressings, gloves, swabs, syringes, sharps	Medical clinic	

Table 2. Unacceptable Waste Materials

Solid Waste	Examples
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils
Radioactive Materials	Smoke detectors, laboratory wastes
Potentially Explosive Materials	Pressurized vessels including, but not limited to propane tanks, aerosol cans (deodorant, shaving, cleaning, etc) and the like. Actual explosives.
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels, batteries
Solvents	Solvents such as acetone, xylene, methanol

5.2 Operating Instructions

The operation of the incinerator package follows 4 general steps that take place over a 24 hour period:

5.2.1 General Inspection of the System

- Ensure that manual slide gates for each blower are in the open position for free airflow into the Primary and Secondary Chambers
- Ensure the Primary Chamber has been cleaned out, and the chamber floor is cool (less than 40 ^{o}C). If the floor is hotter than this temperature the waste may spontaneously catch on fire during loading
- Ensure that the fuel tank is full (valves, levels)
- Perform a visual inspection of the primary and secondary chambers
- If the reset light is illuminated on the primary or secondary burners, call the Maintenance department

5.2.2 Load Waste into Primary Chamber and Close Doors

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- When loading the waste, avoid contact with refractory (wall modules, door jams, sills, lintel, etc.). Doing so will damage the ceramic blanket refractory
- Ensure that the waste is loaded according to the Waste Load Design
- Ensure that the waste is not blocking the burner cone and the breach between primary and secondary burners.
- Close the door

5.2.3 Start Burn Cycle from Control Panel

- Ensure that there are no faults on the panel.
- Ensure the burn time is adequate. The burn time for a one ton load respecting table 1 proportions should be of 720 minutes.
- Ensure that "Solid Waste Only" is selected on the top view.
- At the control panel, on the Panel View press the "Start System" button. The system will initiate the Purge Cycle, followed by the Burn Cycle and then ending with the Cool down Cycle.
    - Observe Systems Purge.
    - Observe Start 120 sec.
    - Observe Burners Purging.
    - Observe Primary blower + burner + secondary blower will shutdown
    - Observe Firing of Secondary Burner
    - Observe secondary chamber reach 1015 ^{o}C (within approximately one hour)
    - Observe primary burner starts + secondary blower
- Periodically check unit

5.2.4 Clean out ash and Dispose

- Once fully cooled and the temperature is below 90 ^{o}C, proceed to the Primary Chamber Clean Out procedure.
- Unlock all door latches on the access door to the Primary Chamber.
- While standing in front of the Primary Chamber door, slowly open the door to its fully open position. Secure Primary Door in the open position.
- Proceed around to the back and open up secondary chamber doors. This will help the cool down process by air flow.
- Inspect the interior for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure.
- Inspect colour of the ash:
    - If whitish-grey, burn cycle was complete.
    - If ash appears wet and dark, it should be reintroduced in the waste load of the following burn cycle.
- Remove ash and dispose in Overpack drum labelled MS-ASH-# or MP-ASH-# (MSC and MPC, respectively).

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- Collect 1 liter of ash from Overpack with metal sampler jar and put in 20 L pail.
- Once the drum is full, switch to a new drum & pail and notify Environment Department.
- The Environment Dept. will take a sample of the 20L pail for analysis, and the pail can then be reused for the next drum.
- Fill out incineration ash log.
- Check the air inlet holes and remove any obstructions if necessary.
- Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb
- Close the Primary Chamber access door by clamping each latch until it is tight
- Clean the inspection view port (glass) with a mild soap and water. To clean the view port, unscrew it by hand and re-tighten by hand.

5.3 Daily Preventive Maintenance

- Allow only qualified operators to perform maintenance and troubleshooting on the machine as per Eco Waste Solutions Incinerator Equipment Manual.

6 REFERENCES AND RECORDS

Nunavut Mine Health and Safety Act and Regulations

Canadian Standards Association

Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction, Operation and Closure, dated April 19, 2013

Nunavut Water Board Type A Water Licence No: 2AM-MRY1325

Commercial Lease No.: Q13C301

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Appendix D -
Mary River Project Landfill Operating Manual

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1. PURPOSE AND SCOPE

The purpose of this procedure is to ensure that non-hazardous solid wastes are disposed of in compliance with the Mary River Project landfill permits, and in an efficient, safe and environmentally sound manner.

This procedure applies to the handling, storage and disposal of all non-hazardous solid industrial waste at the Mary River Project Landfill at the Mine Site and Steensby Port.

This procedure does not apply to hazardous and liquid industrial wastes, hauled sewage or domestic waste.

This manual has been designed to be used both as a field reference document and as a training manual for classroom and self-instruction purposes. Every employee with accountabilities and responsibilities as required by this procedure is expected to be familiar with its use and location at each site. The manual has been divided into two sections: the General Overview; and Standard Operating Procedures. The General Overview contains basic knowledge regarding personnel responsibilities, safety practices, and the overall operations of the landfill. Part B focuses on Landfill Work Instructions and has been formatted to provide supervisors and their employees with a user-friendly method for training and implementation.

2. DEFINITIONS

Waste Management System

A waste management system includes all facilities equipment and operations for the collection, handling, transportation, storage, processing and disposal of waste.

Landfill Site

Controlled site where no hazardous wastes are accepted and only specific wastes as outlined in the Mary River Project Landfills approval permit are allowed. At landfill sites, the waste is regularly compacted and covered.

Mary River Project Landfills

For the purpose of this document, the Mary River Project Landfill and the Mary River Project Non-Hazardous Solid Waste Landfill are one and the same and refer to the landfill at Steensby Port or the Landfill at the Mine Site.

Non-Hazardous Solid Waste

Non-Hazardous Solid Industrial Waste means a solid waste that is not a liquid and is not hazardous and includes and includes:

a) General Waste (cardboard, treated wood, plastics, etc.)
b) Scrap tires
c) Bulky waste such as heavy equipment, trucks, snowmobiles & appliances. These items will be drained of all fluids (oil, fuel, hydraulic fuel; ozone depleting substances must be removed by a licensed technician prior to disposal).
d) Concrete
e) Glass (industrial)
f) Non-toxic incinerator ash
g) Non-Hazardous Solid Spill Clean-up Material
h) Scrap Steel (Non-recyclable)
i) Pallets (Non-recyclable)

A detailed description of these products is contained in the Appendix A

Hazardous Waste

Material that, given its quantity, concentration and composition or its corrosive, inflammable, reactive, toxic, infectious or radioactive characteristics, presents a real or potential danger to human health, safety and public well-being or poses a danger to the environment if it is not stored, treated, transported, eliminated, used or otherwise managed. Includes all material regulated by the Transportation of Dangerous Goods Regulation and those materials requiring a Material Safety Data Sheet. Examples include paint, solvents, propane tanks, waste oil, batteries, electronic equipment, and fuel drums (205 litter barrels) or other material previously containing fuel or other hydrocarbons are considered hazardous waste. A detailed description of these products is contained in the Appendix A

Recyclable

The ability of a secondary material to be re-used in the manufacture of a new product or to be re-used

Domestic Waste

Domestic waste includes waste such as office paper, lunchroom supplies, washroom supplies, food waste, containers contaminated with food. Domestic waste can be considered all bagged & boxed waste originating from offices, kitchens and camps, generally suitable for disposal in the incinerator. A detailed description of these products in contained in Appendix A

Scrap Steel

Scrap steel includes scrap steel material that contains no other non-steel component.

Liquid Industrial Waste

Liquid industrial waste includes “waste that is both liquid waste and industrial waste”.

Empty Container

A container that has been emptied, to the greatest extent possible, using regular handling procedures, but its content shall not exceed 1% of the container's original capacity or 2 liters, whichever is less. This does not include containers which previously contained:

i. Mercury or other heavy metals
ii. Compressed gas cylinders (TDG Class 2.1-2.4)
iii. Oxidizing substance containers, (TDC Class 5.1)
iv. Poisonous substances containers (TDG Class 6.1)

Part A – Mary River Project Landfills General Overview

I. Responsibilities

Designated Mary River employees & contractors have specific accountabilities that must be met to ensure the Mary River Project Landfills are operated in compliance with this procedure and its permit. The following roles and responsibilities of the various employees who work at the disposal site are described below but are not necessarily inclusive of all duties that may required to safely and successfully operate a non-hazardous solid waste landfill.

1. Site Manager

The Site Manager is accountable for the overall operation of the landfill. Specifically, he/she shall:

a) Organize, oversee and administer the operation of the landfill in accordance with current permits, regulations and all appropriate procedures,
b) Plan and coordinate the most efficient use of landfill areas to conserve landfill space,
c) Help develop, implement and enforce landfill specific safety regulations
d) Meet routinely with the Site Services Supervisors to maintain proper control of the site and to determine what, if any, problems exist or may be anticipated. Consider the following:
    i. Operational issues,
    ii. Regulatory Requirements,
    iii. Equipment issues,
    iv. Special operating instructions; e.g., inclement weather, special waste, emergencies.
    v. Schedule routine work as required, e.g., drainage channel cleaning, landfill surface repairs and litter control, etc,
    vi. Ensure that the need for any special operating conditions have been planned for in advance; e.g., identification of features with steaks in advance of winter and the ground freezing,.
    vii. Handle user complaints or problems that the Site Services Supervisor cannot handle,
    viii. Perform all the duties of the Site Services Supervisor in his absence.

2. Site Services Supervisor

The Site Services Supervisor, under the general supervision of the Site Manager, is responsible for supervising refuse disposal and associated activities at the landfill in accordance with this procedure. Specifically, the Site Services Supervisor shall:

a) Regularly brief the Site Manager on the status of routine operations and any special problems,
b) Implement and enforce the landfill safety regulations and operating procedures
c) Install grade control stakes for landfill operators
d) Check grades and contours to ensure that refuse placement and compaction conforms to engineered specifications and designs,
e) Maintain thorough, accurate and detailed records of landfill operations, and other related matters,
f) Ensure through regular inspection that specified fill cover, spill response equipment etc. is present at the landfill,
g) Respond to incidents, complaints and inquiries promptly to ensure the landfill is operated in compliance with this procedure,
h) Inspect waste and direct site users to proper disposal areas according to waste type,
i) Conduct monthly inspection of berm & cover material for cracks & settlement.
j) Set up and monitor traffic patterns to allow maximum traffic flow and safe working conditions.
k) Instruct all contracted crews on critical landfill procedures and areas of concern and monitor progress, keeping records daily & bi- weekly as required this procedure,
l) Perform all the duties of the Landfill Operator/Labourer in his absence.
m) Perform other duties that may be required as determined by the Site Manager

3. Mary River Project Landfill Operator/Labourer

The Landfill Operator/Labours, under the general supervision of Site Services Supervisor, is responsible for executing the following tasks at the landfill. Specifically the Operator/Labourer shall:

a) Work in conjunction with the Site Services Supervisor in executing general landfill operations
b) Perform daily pre-use equipment checks on landfill mobile equipment ,
c) Maintain a level landfill base at the working face dumping area,
d) Cut, maintain and finish grades as indicated on grade stakes or as directed by the Site Services Supervisor,
e) Construct landfill cells according to this procedure,
f) Spread and compact refuse according to this procedure,
g) Cover refuse efficiently according to this procedure, have area covered walked in tight and surface smooth using no more fill than necessary. Leave surface area smooth with no refuse exposed,
h) Inspect waste and direct site users to proper disposal areas according to waste type,

i) Assist in site maintenance work as required; e.g. grade roads, drive water trucks, resurface roads, construct refuse lifts, and other duties as assigned,

j) Ensure the landfill is maintained free of litter, including the relocation of portable litter fences as necessitated by operational requirements and wind conditions,

k) Complete daily report forms as required, know how to respond appropriately to all emergencies utilizing the emergency procedures listed in Section B of this manual,

4. HSE Manager – Landfill Waste Designated Inspector

On occasion when a Mary River Project has a large quantity of waste destined for the landfill, the HSE manager may be provided with specific training to allow he/she to become a designated Mary River Project Landfill waste inspector to facilitate the source segregation, improve the productivity of the project resources and meet the landfill requirement for waste inspection prior to dumping.

Specifically, the HSE Manager - Landfill Waste Designated Inspector shall:

a) Be provided with the necessary training to allow him/her to properly segregate waste by type at the source and pre-inspect waste destined for the landfill

b) Inspect waste and direct site users to proper disposal areas according to waste type,

c) Complete daily report forms as required, know how to respond appropriately to all emergencies utilizing the emergency procedures listed in Section B of this manual,

d) Correct any waste management deficiencies related to the project as identified by landfill staff.

II. Landfill Operations

The Mary River Project non-hazardous solids landfills area permitted area method modified landfill as described in the Guidelines for the Planning, Design and Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories. The landfill has a design life of approximately 20 years and its operation and maintenance is based on the Guidelines to ensure protection of the environment and the health and safety of individuals. The estimated capacity of the current landfill design is 53,000 m^3 of waste and cover material at Mary River and 30,000 m^3 at the Steensby Port. If additional capacity is required in the future, an extension to the current design capacities will be developed. The extension(s) will be submitted for approval as required at the time.

A. Area Method Landfill Waste Cell Construction

Due to the presence of permafrost, the area method will be used to place waste in the landfill. Waste will be deposited on the ground, worked with appropriate heavy equipment, and packed against a constructed berm. Construction of the berm will be advanced with the advancing face of the landfill. The waste cell is the basic building block of the landfill. It is composed of several layers of solid waste compacted on a slope by heavy equipment and enclosed on all sides by soil. The general placement of waste will progress down-slope. Basic instructions for

constructing waste cells with the materials accepted at the Mary River Project Landfills are described below in Figure 1.

1. Control of Working Face

The working face is the portion of the uncompleted cell on which additional waste is spread and compacted. The optimal working face width varies depending on the number of vehicles bringing wastes to the site and the equipment available for spreading and compacting. It should be wide enough to prevent a backlog of trucks and productively work; however, the width should not be so wide as to be impractical to operate or to expose an undue amount of refuse to the wind.

The face width should be reduced by compacting and covering portions of the face as soon as a section of the cell meets the grade design. For control of the waste exposure to wind, the width of the face should not exceed 12m at any time.

2. Equipment Movement

Solid waste should be dumped at the toe of the working face by the collection trucks and pushed up the slope. For safety reasons, keep a minimum of 3m separation between the trucks and the dozer. The unloading area is to be maintained level and clear of waste materials.

3. Spreading Waste on a Slope

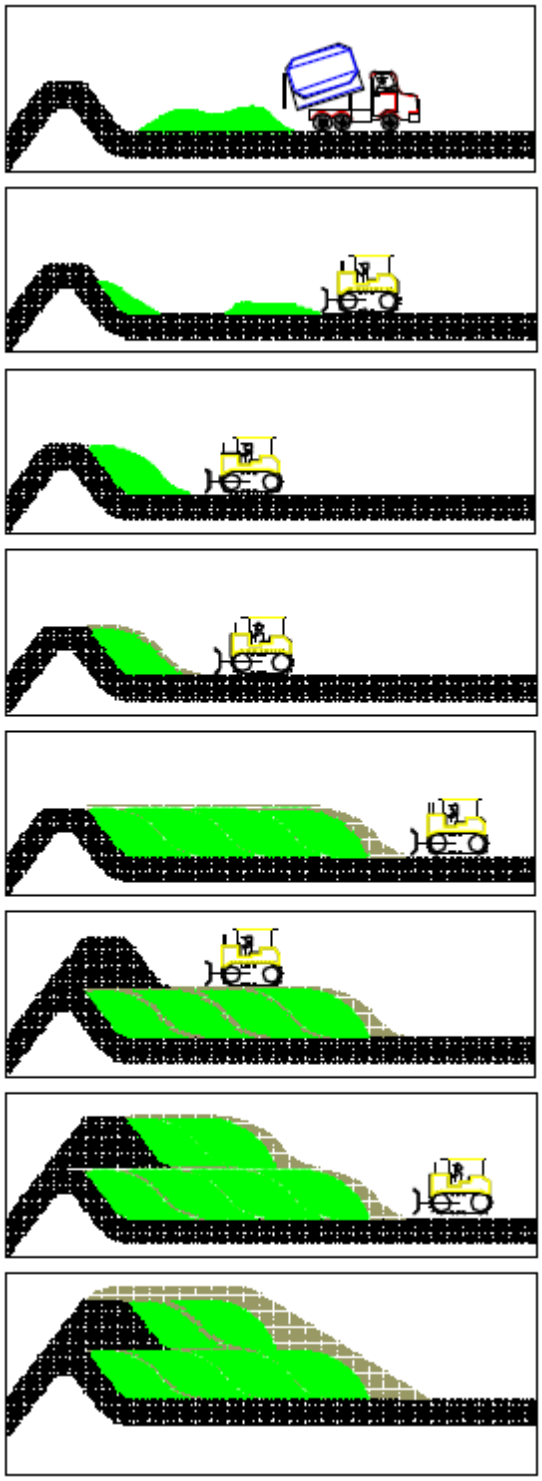
To maximize compaction, and to provide an optimal weight distribution of the dozer, the waste should be spread up a 3:1 slope in 0.3-0.6 meter layers. Fill in any holes that develop in the face with loose waste.

4. Using Grade Stakes

Use grade stakes to aid operators in keeping the slope of the final top fill surface of at a grade of 0.5%, the slope of the cell face 3:1 and the grade of the landfill base to 0.5%. Grade stakes should be set according to instructions given by the Engineering Staff. Stakes should be checked frequently enough to allow operators to make sightings to them as required.

5. Waste Compaction

A high degree of compaction extends the fill life, reduces cover material and long-term land requirements, reduces litter problems, and results in other beneficial effects. Good compaction is achieved by operating the dozer up and down the working face between 3 and 5 times on 0.3-0.6 meter layers of waste until no further compaction occurs. The top deck of the cell must also be compacted by running the landfill compactor dozer across the top, keeping it as level as possible. Compaction of the waste will be undertaken if required, depending on the nature of the waste. This will typically occur once per week or in combination with collection frequency and nature of the waste.



1. Build berm, 2 m high. Dump garbage near the berm. The maximum width of the working exposed face used for dumping should be as small as practical and not exceed 12m

2. Drive over the garbage 3 to 5 times with a dozer. Work the garbage up the berm a little at a time to pack it. Do this daily when material is deposited in the landfill.

3. Alternate between dumping and packing garbage until packed garbage is 2 m high

4. When garbage at the working face is 3 m wide, cover garbage with 0.3m of granular material over the deck of the cell and 0.1m between cells to complete a partial cell. Repeat steps 1 to3 across the width of the landfill until a cell is completed.

5. Repeat steps 1 to 4 until site is full. Then cover all garbage with 0.3 m of granular material. Pack and add more granular material until top is level.

6. Build new 2 m berm on top of cells.

7. Repeat steps 1 to 5.

8. To close out site, put 0.6 m of granular material on cells then pack with bulldozer so that water runs off.

Figure 1. Waste Cell Construction for Mary River Area Method Landfill

6. Cell Completion

Cover soil will be placed over exposed compacted waste cells or portions of waste cells. A minimum of 0.3m of cover shall be placed over the deck and 0.1 meters over the slope of the cell. Use no more fill than necessary. When the cell is completed, no waste should be visible.

B. Cover Soil

1. Excavation

Excavation of soil for cover material shall only be made from designated "borrow" areas. Working cover stockpiles are to be placed within the perimeter of the approved landfill pad where they will be accessible to the working face. However, they are not to be located where they may block truck travel or filling operations.

2. Placement of Final Cell Cover

Use of soil for intermediate and final cover should be placed in the following manner:

a) When using a dozer, push cover soil up the slope and feather it out as evenly as possible. Do not permit the tracks of the equipment to spin as you traverse the compacted slope. This action will tear up the waste and it may be necessary to compact the waste again in order to reapply the cover material.

b) When filling of cell or portion of the cell has reached the final planned grade and width, a final cover of compacted soil should be placed. A minimum of 0.3m of cover shall be placed over the deck and 0.1 meters over the slope of the cell. Use no more fill than necessary.

C. Hard to handle Wastes

Certain wastes acceptable at the Mary River Project Landfills require special handling. The following are basic methods to be used when managing hard-to-handle waste:

1. Bulky Waste

a) Crushable Items – such as furniture and appliances

Such items should be dumped at the toe of the working face if traffic permits. Use the dozer to crush the item on solid ground, and then push it into the toe of the fill. Fill in any holes with regular waste.

b) Demolition Debris

Spread out bulkier pieces of concrete, lumber, and other debris evenly at the toe of the working face. Place regular wastes on top of the demolition wastes.

c) Long Items

Long, awkward items, such as pipe, rolls of paper and plastic should be dumped at the toe of the face, placed parallel to the working face, and covered with regular waste. The dozer should be driven over these items slowly to prevent overturning.

d) Rubber Tires

Place rubber tires at the toe of the fill, spread them out, and cover them with other wastes. Tires are less likely to work their way to the surface if placed at the bottom of the cell. Do not try to compact unreduced rubber tires.

e) Large Metal Wastes

Metal wastes, such as pipes, rolls of cable, and wires should be placed directly at its position of disposal and covered by household or demolition wastes (bridged). This will prevent unnecessary machine damage and shutdown.

2. Low Density Wastes

Waste types such as synthetic fibers, loose plastic film or foam, and rubber and plastic scraps or shavings, require special handling. These materials present problems because they rebound after being run over by the dozer. Spread the lightweight material into 1 to 2 foot deep layers, and then cover it with regular waste, compacting as usual at base of cell. These wastes should be compacted until the operator can no longer detect that the surface of the waste layer is being depressed more than it is rebounding. The weight of the regular waste tends to keep the low-density material down.

3. Powdery Wastes

Wastes such as sawdust and other dusts also require special handling. These wastes are problems because they are stirred up by the equipment and blown by wind. Once in the air, they may be harmful to personnel if they are inhaled or contact the skin. Personnel not working in enclosed cabs should wear protective clothing and respirators if dust becomes airborne. Some powdery wastes may be wetted down with water from a water truck and then covered immediately with soil or regular refuse. This procedure will help reduce blowing and dusting of the powdery waste. If water is not available, cover the powdery wastes with soil or refuse to reduce blowing and dusting of the waste.

D . Maintenance of Completed Areas

1. Inspection of Completed Areas

A bi-weekly inspection of the berm walls and completed cell will be completed each month for signs of cracks and depressions due to settlement. Cracks and settlement will be filled and compacted back to the original grade

2. Groundwater Protection System

Due to the permafrost in the area, no groundwater protection system has been included.

3. Landfill Gas Assessment

Landfill gas is not expected as the deposited waste will be non-hazardous, non-organic and inert. Also, all chemicals will be diverted for proper hazardous waste disposal. Therefore a landfill gas collection system will not be installed in the landfill site.

4. Leachate Characteristics

Leachate is not expected as the waste to be deposited in the landfill will be relatively dry, inert and non-hazardous. Therefore no leachate collection system has been included in the design. In addition, a perimeter berm will be constructed surrounding the landfill site. This will redirect surface runoff originating upstream of the landfill site, thereby minimizing the amount of water which might infiltrate the deposited waste.

E. Traffic Control and Unloading of Waste

1. Proper Spotting and Traffic Control

a) Traffic Flow

Traffic should be kept moving at a safe steady rate to avoid backlogs and congestion working face. Drivers are to back to the toe of the slope before he/she starts to dump. The driver is to pull straight away slowly from the slope while s/he is dumping.

b) Aids to Traffic Control

Directional signs, pylons and barricades are to be provided to help control traffic and direct customers to unload the waste at the base of the cell and have them drive their vehicle straight out when unloading is complete. Ensure proper signage and barricades are in the required locations at the beginning of each day. Relocate signs and barricades as required at the end of each day so that they will be in place and ready for the next day's operation.

c) Separation of Vehicles

Due to the risk of dump trucks and trailers overturning, only one vehicle is to be unloaded at the face at a time, this includes vehicles being unloaded by hand.

d) Logging of Unloaded Wastes

A waste unloading logging station will be located in proximity of the working face. The operator of every vehicle that unloads any quantity of waste is required to log the specifics of the load – Date, time, waste type, vehicle type, approximate quantity, etc....

e) Load-on-Fire Procedures

Loads-on-fire are wastes that are either on fire or that are smouldering or smoking within a vehicle or when deposited at working face. All site personnel should be familiar with procedures for handling such loads. Refer to the Emergency Work Instruction in Section B of this manual for proper response procedures.

f) Prevention of Scavenging

Scavenging by employees, visitors and local people travelling through is not permitted. Scavenging in a waste pile is a safety hazard with a high risk of injury and is strictly prohibited

g) Site User Rules

Landfill staff should know all site user rules and watch for violations. User rules (Appendix C) and wastes acceptable for disposal in the landfill (Appendix A) are to be posted at the entrance to the landfill and at the working face. All violation of land fill user rules shall be recorded in the daily log by landfill staff and reported to the Site Manager.

h) Emergency Procedures

Site personnel shall be familiar with proper fire and accident procedures and are expected to know their role in all possible emergency situations. See the Emergency Work Instructions in Section B of this manual.

F. Landfill On-Site Roadways

1. Road Construction

On-site access roads for use as a thoroughfare for transporting waste to the working face shall only be constructed under the approval of the Camp Manager and according to engineered design specifications. Landfill maintenance access roads are only to be constructed under the approval of the Site Manager.

2. Road Maintenance

a) Maintenance of Gravel Roadways

Roadways that are made in native or filled soil and are heavily travelled required maintenance. These roads should be graded and re-compacted as required to re-establish proper road grades.

b) Filling of Areas Where Settlement Occurs

When all-weather roads are constructed on the tundra, settlement of the filled area may cause cracks to appear in a road or cause the slope of a road to change. Cracks should be filled with material that is compatible with the roadbed. For an area of a sloped road, where the slope has changed drastically, it should be built-up with material compatible with the roadway until the desired elevation is achieved.

c) Maintenance of Drainage Culverts

All drainage culverts should be kept free of obstructions and debris. All drainage crossings should be identified with staking prior to winter such that they can be found and opened in advance of freshet. Prior to the onset of freshet, all drainage culverts shall be opened and ready to accept water flow.

G. Inclement Weather

1. Preparation for Weather Conditions Affecting Landfill Operation

Wind, white out conditions caused by blowing storms in winter and spring freshet may have an impact on landfill operations. The following precautions shall be followed:

a) Wind

In preparation for wind storms, the working face shall be compacted and covered as practical to reduce width of the exposed face. Litter fences should be installed prior to windy weather and relocated as required.

b) White Out Conditions Caused by Winter Storms

Under severe white out condition caused by some winter storms, the Site Manager may declare the landfill temporarily closed if conditions at the landfill cannot be made safe to operate.

c) Freshet

Prior to the spring melt of freshet the site services supervisor will take the following precautions to minimize the impact of the water flow from freshet:

i. Ensure all culverts are cleared prior to freshet
ii. Remove all excess snow from the landfill pad and completed cell slope to minimize water accumulation on the pad.
iii. Install silt fencing or other control devices if required on drainage that contain silt as a result of landfill erosion

H. Surface Water Flow and Quality

Flowing surface water will be prevented from entering the landfill site by the construction of a berm along the upper end of the site (i.e. the berm constructed above for waste placement) and berms along the sides of the site. The landfill site area will be graded 0.5% to promote drainage away from the landfill and to prevent pooling of water within the landfill or against the berms.

Appropriate erosion and sediment control measures will be implemented as required through the use of silt fences, etc. Temporary sediment control measures will be used during all construction activities at the site.

I. Inspections and Reporting

a) Reporting

The *landfill daily unloading volume & operations log (see Appendix C)* is completed daily and logs waste volumes, compaction and cover application.

b) Routine Inspections

Records of all site operations, including inspections, maintenance, and monitoring will be recorded on designated forms and kept together in the Baffinland office (or

other on-site facility used for such purposes). This will be performed and maintained by the landfill Operator.

Routine visual inspections will be completed every two weeks on the *Mary River Project Landfills bi-weekly Inspection form* (See form attached below) by the Site Services Supervisor or designate for various components of the landfill, including:

- General site area
- Landfill berm and cover survey
- Litter control
- Storm water runoff control
- Vector attractants
- Wildlife observations
- Wildlife signs.

III. Landfill Safety Practices

A. General Safety Practices

1. Know Procedures

   All employees at the landfill are responsible for knowing the proper procedures for reporting accidents, injuries, and fires. Employees must know the procedure to be followed for each type of emergency and be aware of their particular role. Work Instructions for various situations are documented in the Work Instructions section of Part B of this manual.

2. Signage for Traffic Control and Direction

   Road boundaries and speed limits on each road shall be clearly posted.

3. Site User Rules

   Site user rules are available at the entrance to the landfill and at the working face. Employees are to watch for violations of site user rules and indicate those rules to violators, stressing that the rules are imposed to ensure the safety of people & equipment. Site User Rules are attached in Appendix C.

4. Level Dumping Area

   For safe operations, the dumping area shall be kept as flat as possible at all times and kept clear of debris.

B. Safety Precautions for Equipment Operators

1. Heavy Equipment Operation

   All mobile equipment in use at the landfill is to be operated in accordance with general Baffinland procedures associated with light truck and heavy equipment.

2. Keep Debris from Cab

   Keep operator's compartment, stepping points, and hand holds free from oil, grease, mud, loose objects, and trash.

3. Look in All Directions before Moving

   The landfill is a high traffic area - Protect personnel and other equipment in the area by looking to the front, rear, and sides before moving equipment. If the operator is unsure of surrounding conditions, he/she shall dismount and inspect the area.

4. Safety Devices

   Proper safety devices, such as safety belts and roll over protection systems, must be installed on all equipment and maintained or replaced to original equipment manufacturer specifications.

5. Carry Blades Low

   Equipment attachments such as loader buckets and tractor blades should be set low to improve visibility and enhance breaking capability. Otherwise, collisions may occur, the vehicle may go over an embankment, or it may roll over.

6. Check Blind Areas

   Never push waste until you are sure that no person or equipment is in the blind area ahead of the refuse. If the operator is not sure of surrounding conditions, he/she shall dismount the equipment and personally inspect the area.

7. Maintain Adequate Clearance

   When pushing waste, maintain adequate clearance from ground personnel, patrons and other vehicles or obstructions to ensure that objects will not strike other equipment or persons. As a rule of thumb use 5 meters as a minimum safe distance to keep away from all people, vehicles, and equipment.

8. Constantly Check Work Area

   The operator must constantly check the work area for the location of other persons or equipment. Be especially cautious when several private vehicles are in the area. Remember that many site users are not familiar with the dangers of heavy equipment.

9. Operate Up and Down Slope

   Operate up and down slopes. Avoid side hill travel whenever possible to reduce the chance of rolling over.

10. Avoid Excessive Speed

    Operating conditions generally determine the speed of heavy equipment. Under no circumstances should heavy equipment be driven at excessive speeds or operated recklessly. Heavy equipment is difficult to control at high speeds and must only be operated at a speed that is safe for existing conditions.

11. Move Cautiously Over Bulky Objects

    When compacting or traversing bulky items, such as vehicles and utility poles, the operator must proceed with extreme caution to avoid tipping or sudden lurching movements.

12. No Scavenging

    Scavenging will not be permitted. Scavengers are subject to a number of potential injuries and possible death.

C. Personal Protection Equipment

Landfill staff is required to wear the standard Mary River Project personal protective equipment, including:

a) Hard hats,
b) Eye protection,
c) Work boots,
d) Work gloves,
e) Reflective vest

D. Emergency Contact Information

All emergencies shall be reported to the site services supervisor and Site Manager immediately.

Appendix A

Classification of Refuse

1. Acceptable Wastes

Non-Hazardous Solid Waste means a solid waste that is not a liquid and is not hazardous The following wastes are examples of Non-hazardous solid wastes acceptable for disposal at the Mary River Project Landfills:

a) Wood products (Clean untreated wood should be diverted to the Burn Area)
b) Plastics
c) Cardboard
d) Scrap Tires
e) Bulky waste such as heavy equipment, trucks, snowmobiles & appliances. These items will be drained of all fluids (oil, fuel, hydraulic fuel; ozone depleting substances must be removed by a licensed technician prior to disposal).
f) Concrete
g) Glass
h) Metal
i) non-toxic incinerator ash
j) Non-Hazardous Solid Spill Clean-up Material
k) Empty Container (as defined in this procedure)

2. Inert Wastes & Recyclable material

The following are examples of inert wastes that the Mary River Project Landfills will accept for disposal. However, these types of materials can generally be recycled and/or reused and it is better to divert this waste stream for reuse when applicable:

a) Clean fill dirt
b) Rock
c) Steel (suitable for reuse)
d) Pallets (suitable for reuse)

3. Hazardous Material / Unacceptable Wastes

There are six general types of materials that are unacceptable for disposal at the Mary River Project Landfills. They are:

a) Chemicals
b) Liquid Wastes including sewage
c) Radio-nuclides (Radioactive waste)
d) Batteries
e) Infections or medical waste
f) Electronic waste – TVs, computer CRTs (screens) and computer hard drives

In addition, Hazardous Wastes, including household hazardous wastes, are NOT accepted at the Mary River Project Landfills. The following list of waste, though not all inclusive, is considered hazardous:

a) All material regulated by the Transportation of Dangerous Goods Act,
b) All material requiring a Material Safety Data Sheet,
c) Paint,
d) Chemicals,
e) Solvents,
f) Propane tanks,
g) All pressurized gas cylinders,
h) Fuel drums (205 liter barrels) or other material/container previously containing fuel or other hydrocarbons,
i) Acids,
j) Waste oil,
k) Cleaning solvents,
l) Gasoline, diesel, Jet A and other Petroleum products,
m) Insecticides,
n) Lube Oil,
o) All heavy metals such as Beryllium, Cadmium, Mercury, etc.

Appendix B

Potential Pollutant Source and Best Management Practices Summary Table

Area	Activity	Pollutant Source	Pollutant	Best Management Practices
Landfill	General landfill operations	Soil Erosion	Sediment	- Maintain design slopes - Repair all berm & cover areas experiencing settling or erosion - No cuts permitted in to the tundra during landfill civil construction or operation - Silt fences installed at any drainage experiencing sediment from soil erosion
Landfill	Fuelling of heavy equipment	Diesel fuel	Diesel fuel	- Fuelling is completed in accordance with Baffinland fuelling procedure. - Personnel are trained on the procedure for fuelling
Landfill	Unloading waste at landfill	Improper segregation or direction of non-permitted wasted	Hazardous waste or non-permitted waste	- Baffinland Waste management system includes waste type source segregation - Landfill operations procedure contains requirement for waste inspection prior to unloading.
Landfill	Unloading waste at landfill	Hazardous material spill	Hazardous waste	- Baffinland Spill Response Plan in place to respond to spills
Landfill & surrounding area	General landfill operations	Landfill working face	Litter	Landfill operations manual contain best management practices including: - Minimizing active working face - Compaction & cover plan - Use of litter fences

Appendix C
Bi- Weekly Inspection Log Table

Mary River Landfill Bi-Weekly Inspection

Date: **Inspector:** **Role:**

Time:

Inspection	Y N N/A	Comments
General Site		
Access Roads in good condition?	Y N N/A	
Unloading area at working face is level?	Y N N/A	
User rules & classification of waste signs in good condition?	Y N N/A	
Is the tundra around the outside perimeter of the landfill berm stable?	Y N N/A	
Landfill Berm & Cover Survey		
Visible signs of settlement (low spots or poolling water)?	Y N N/A	
Visible cracks?	Y N N/A	
Visible signs of erosion from wind or runoff?	Y N N/A	
Does the most recent cell cover have 0.1 m on the face & 0.3 m on the deck	Y N N/A	
Cover material is stockpiled?	Y N N/A	
Litter Control		
Working face length is as small as practical & <12m?	Y N N/A	
Perimeter litter fences established	Y N N/A	
Working face litter fence established (at end of day operation)?	Y N N/A	
Are the litter fences capturing the litter?	Y N N/A	
Has the site been cleaned of litter in the last two weeks?	Y N N/A	
Storm water Runoff Control		
Is general water drainage working?	Y N N/A	
Are Culverts draining?	Y N N/A	
Are water flows silt free?	Y N N/A	

Inspection Description

Circle Y or N as appropriate, or N/A for any questions that are not applicable.

A “yes” answer generally denotes compliance with that requirement.

A "No" or "N/A" should be explained further in the comments

Survey of Vector Attractants at the Working Face

Attractants	Attractant Levels (cirlce one)				
Food	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Food Packaging	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Oil products containers	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Oil contaminated waste	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Aerosol cans	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Batteries	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Other _____	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Other	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces

Wildlife Observations

Species	#	Comments

Wildlife Signs (tracks, scats, borrow holes or chews)

Species	Type of sign	#	Comments

Additional Comments: _____

Daily Unloading Log Table

Baffinland Iron Mines Corporation

Baffinland Iron Mines Corporation

/ River Non-Hazardous Solid Waste Landfill Daily Unloading & Operations Log

Working Face - Status at End of Day
WF – Working Face, CW – Compacted Waste, C - Cover
Admin Use Only

Day of the Week: _____ **Date:** _____

			Volume Estimate								
			Vehicle					Other			
Time	**Source Location of Waste**	**General Description of Waste**	**Light Truck**	**Kenworth**	**Kenworth +Pup**	**%Full**	**Volume**	**Other Vehicle**	**Volume Estimate (m3/Cubes)**	**Driver's Name**	**Waste Unloading Approver's Name**
9:40 AM	Mary River Laydown Area	Scrap Wood			√	80%				John Smith	Site Services Supervisor
					Daily Totals:						

General Description Of Waste: Wood, Plastics, Cardboard, Scrap Tires, Bulky waste such as heavy equipment, trucks, snowmobiles & appliances, Concrete, Glass, Metal, non-toxic incinerator ash, Non-Hazardous Solid Spill Clean-up Material

Daily Grand Total:

Appendix D

Mary River Non-Hazardous Solid Waste Landfill

User Rules

1. All waste is to be inspected prior to dumping – Contact the Site Services Supervisor prior to delivery

2. No liquid or hazardous waste is accepted at this landfill

3. Vehicles shall follow posted speed limits and directions to unloading area - Unloading in other areas is strictly prohibited

4. Dump waste immediately behind the vehicle as close to the toe of the working face as possible

5. No Unloading by Rapid Acceleration or Deceleration

6. Each vehicle operator is to complete the unloading log for each load

7. No Scavenging is permitted

8. No open fires or the burning of waste is allowed on the site

9. All spills are to be stopped if safe to do so, and immediately reported to the Site Services Supervisor.

10. PPE required to be worn at landfill area

11. In case of Emergency – Immediately contact the Site Services Supervisor or Site Manager

Part B – Mary River Project Landfills Work Instructions

Part B focuses on work instructions and has been formatted to provide supervisors and their employees with a user-friendly method for access, training, and implementation of these procedures

Specific work instructions concerning landfill operations and emergencies and have been documented in order to establish standard policies and practices for the Operations staff. These topics will be reviewed periodically in routine safety meetings, which will allow operators to keep up-to-date on any changes in standard operations. Site services personnel are expected to be familiar and comply with the work instructions relating to their areas of responsibility.

Work Instructions

General Site Maintenance
Work Instructions

Landfills require general maintenance throughout the year in order to keep them orderly and clean. Much of this maintenance is in anticipation of permit requirements and seasonal weather changes

Guidelines:

1. Access roads on the site are to be maintained and graded to eliminate ruts and repaired to eliminate cracks and settling.

2. Maintain drainage, keep road culverts and landfill drainage free of debris.

3. Define critical landfill perimeter and spot locations with stakes and signs prior to winter to facilitate identification

Off-Road Vehicular Traffic
Work Instructions

"Off-Road" refers to any vehicle traveling off of any defined roadway or access-way or landfill pad, regardless of the road surface. Permitted roads are identified on the attached landfill plan and include the gravel access road and the landfill berm perimeter road.

- All off-road vehicular traffic is strictly prohibited without clearance from Mine Manager
- Prior approval is required for any vehicles engaging in off-road activities while on site
- New road construction is not permitted without approval from the Mary River Project Operations Manager

Benefit of Compliance to Instruction:

- Avoid disturbances and impacts to sensitive tundra

Dust Control
Work Instructions

1. Place dusty loads at the toe of the face of the trash and bridge over as quickly as possible.

Benefit of Compliance to Instruction:

- Creates a cleaner, safer work environment
- Ensures compliance with permit requirements and reduces the impact on the natural environment

Landfill Equipment Fluid Releases
Work Instructions

1. Complete a visual “walk around” inspection of all landfill motive equipment prior to starting. Inspect for damaged hoses and for puddles or stains from leaking fluids under your machine. If fluid leaks are evident, do not start equipment. Notify your Supervisor and the mechanic.

2. Periodically scan the equipment management system on the dashboard of the machine for flashing lights and warning horns that may indicate a system failure. Move to a safe area, stop and inspect the machine systems for leaks and malfunctions as necessary.

3. Routinely glance through the windows at the machine components that are susceptible to damage, for example, lift cylinders, hydraulic hoses, grease and oil seals. Listen as you operate your machine for unusual noises that may be an indication of a mechanical failure. If so, move to a safe area, stop the machine and notify your Supervisor and the mechanic.

4. As you make a “pass” in a forward direction and prepare to change direction, look over your shoulder and inspect the ground for streaks of oil or anti freeze. If leaks are observed, move machine to a safe area, shut machine down, contain spill using a bucket or pan and notify supervisor and mechanic.

5. All discharges of fluids from heavy equipment in the landfill are to be treated as a spill. All spills are to be addressed as per the Spill Response Plan. Key points are:
   - If safe to do so, stop the source of the spill.
   - Immediately report the spill to your supervisor.
   - For large spills initiate the Spill Response Plan.
   - Initiate cleanup of the spilt material using the emergency spill kits
   - Document the spill by the end of shift with a Spill Report Form – these are available from the Operations Department or your supervisor, provide spill report to Environment Department within 12 hrs.

Benefit of Compliance to Instruction:

• Regulatory Compliance

• Operator safety

• Environmental protection

Litter Control
Work Instructions

The control of litter is an essential part of our permit conditions and readily evident to all who drive by or onto the landfill. In an effort to maintain compliance with our permit and reduce the amount of time and effort required for this task the following procedures are to be followed:

Prevention of Litter at Working Face:

1. Minimize the length of the working face to reduce the size of the face exposed to wind. The maximum length of the exposed cell face shall not exceed 12 meters at any time.

2. Keep waste well confined at the working face to reduce the amount of waste susceptible to wind.

3. Deposit waste at the toe of the fill slope face and spread it upward.

4. Cover the compacted waste as soon as possible to minimize blowing litter

Control with Litter Fences

1. Position fences near the working face as wind and fill operations change.

2. Move or lengthen semi-permanent litter fences that are strung around the area to conform to filling operations and prevent migration of litter off the site.

Litter Pickup

1. Litter crews are to pick any litter off the fences to prevent the fence from being clogged and subject to overturning by the wind.

2. Promptly pick up any litter not trapped by the fences to prevent off-site migration.

Litter in Heavy Wind Conditions

1. Install litter fences prior to windy weather and relocate as required.

2. If lightweight material cannot be contained within the site, place intermediate cover over the material to prevent it from blowing.

Benefit of Compliance to Instruction:

- Compliance with operating permit
- Reduction in amount of litter migrating out of waste cell
- Minimize impact to native habitat
- Reduce the rework for picking up litter

Vector Control
Work Instructions

Vectors (any animals that carry diseases) are generally not present at a properly operated and maintained non-hazardous solid waste landfill (No domestic waste). The provisions of source segregation and waste inspection at the landfill prior unloading waste will safeguard against vector problems. Well-compacted wastes and cover material effectively prevent vectors from emerging or burrowing into waste materials. The following are basic guidelines to ensure proper vector control on site:

1. All waste is to be inspected at the landfill prior to unloading to confirm no domestic or food waste is present.
2. Maintain a narrow working face and cover all un-worked areas to minimize animal foraging at the site.
3. Cover waste on all unused slopes.
4. Ensure good compaction of the cover material to discourage animals from burrowing through it.
5. Keep equipment, storage and leisure areas free of debris and food waste to prevent vectors from establishing residence in or near areas where employees, support personnel work.

Benefit of Compliance to Instruction:

- Protects the health and safety of employees
- Eliminates potential exposure pathways to employees
- Reduces risk of contact with vectors and scavengers
- Maintains compliance with operating permit

Building and Equipment Fires
Work Instructions

Fire

1. Attempt to extinguish a small, controlled fire with equipment on site *WITHOUT* endangering yourself or other personnel. When in doubt, evacuate area and notify your supervisor & security immediately, providing all the required information (Your name, fire location, type, size etc…).

2. Keep all unauthorized people away from the area on fire.

3. Report the details of the fire in the *Special Occurrence Log* and, if applicable, complete an investigation report form (see your supervisor for these materials).

Benefit of Compliance to Instruction:

- Safety of all employee's is protected

Fire in Load
Work Instructions

Fire in Load refers to a vehicle load of wastes that are either on fire and/or smoldering or smoking prior to discharge to the landfill. All site personnel are expected to be familiar with the following procedures for handing such loads:

1. Direct the driver to dump the material in a clear area that is away from the fill face and clear of any vegetation and/or debris.

2. Notify your immediate Supervisor or the Site Manager of the fire.

3. Spread out the load and extinguish the fire with water or soil

4. Once fire is determined to be completely out, allow the material to remain in the cleared area for the remainder of the working day.

5. If no fire is detected at the end of the working day, place the load into the fill.

6. If fire is discovered after the load has been dumped at the working face, the equipment operator will push the material away from the face (if it is safe to do so) to a cleared area where it can be covered with soil or extinguished with water.

Benefit of Compliance to Instruction:

- Health & safety of employees is protected
- Reduce the risk of a landfill fire

Hazardous Materials Spill Response and Reporting Work Instructions

The responsibility for implementing this procedure begins with the person(s) responsible for the chemical spill (spill) or the first person(s) to discover the spill. They will be responsible for reporting the spill and completing cleanup actions (small spills) or requesting assistance for large spills.

Spill Reporting:

1. Report all spills of hazardous materials to your supervisor and the camp manager as soon as possible, regardless of the quantity of spilled material.

2. Be sure to provide the following information:

    • Type of spilled material
    • Quantity of spilled material
    • Location where spill occurred
    • Time and date the spill occurred
    • Description of the actions taken to contain and clean up the spilled material

3. The Site Services Supervisor will record the above information in the Log of Special Occurrences.

Spill Response:

All spills are to be addressed as per the Spill Response Plan. Key points are:

- If safe to do so, stop the source of the spill. Employees may attempt to contain the spill, provided their personal safety or the safety of others is not jeopardized by their actions
- Immediately report the spill to your supervisor.
- For large spills initiate the Spill Response Plan.
- Initiate cleanup of the spilt material using the emergency spill kits
- Document the spill by the end of shift with a Spill Report Form – these are available from the Operations Department or your supervisor, provide spill report to Environment Department within 12 hrs.

Benefit of Compliance to Instruction:

- Employees are trained to safely respond to spills, minimizing the potential impact to personnel or the environment
- Spills documented in accordance with regulatory requirements
- Regulatory Agency notified in a timely manner

Subsurface Landfill Fires
Work Instructions

Warning signs may include:

- Smoke and/or heat waves emanating from cracks and/or fissures;
- Localized settlement (sinkholes up to several meters in diameter);
- The odor of burning plastic/refuse may be present

BEWARE!

*The surrounding area may not be stable. The rapid decomposition of refuse by burning may have created large voids underground.
*Fumes may be toxic!

Safety Procedures

1. If an area is suspected of having an underground fire, block further access to the area and keep people away. Make sure anyone near the suspected fire is notified and/or vacated as may be necessary. If flames are present above ground, immediately notify the site services supervisor and camp manager through radio dispatch. (Note: Pumping water into the ground may not stop the smoldering and will not prevent future fires. Smothering with dirt is the preferred option).

2. Try to stay upwind of any smoke and not breathe fumes, if any.

3. Secure the site with cones, barricades, survey ribbon, etc. If voids are suspected the ground may be unstable – Do not walk or use heavy equipment on the waste pile.

4. The site services supervisor, camp manager and other staff will evaluate the conditions and develop a plan to safely deal with the fire (almost always smothering with dirt).

5. Notify the Baffinland environment department to evaluate the incident and confirm the repair plan is in compliance with permits

6. Once the fire is extinguished and the situation secured, look for other cracks and/or depressions in the area and schedule their repair. (They could be the source of air that allowed the fire to start originally).

7. Complete repairs to the landfill structure. Note completion of work in site log along with fire location for future reference.

Benefit of Compliance to Procedure:

- Employee's safety protected
- Environment is protected

Appendix E -
Landfarm Operation Information

The information contained herein is proprietary to Baffinland Iron Mines Corporation and is used solely for the purpose for which it is supplied.
It shall not be disclosed in whole or in part, to any other party, without the express permission in writing by Baffinland Iron Mines Corporation.

Note: This is an UNCONTROLLED COPY. All staff members are responsible to ensure the latest revision is used.

TETRA TECH EBA

March 20, 2014

ISSUED FOR REVIEW
FILE: E14103075-01

Baffinland Iron Mines Inc.
120 Adelaide Street West, Suite 1016
Toronto, ON M5H 1T1

Attention: Jim Millard
Environmental Manager

Subject: Design Brief for Milne Inlet Landfarm and Contaminated Snow Containment Facility
Milne Inlet, NU

This 'Issued for Review' document is provided solely for the purpose of client review and presents our interim findings and recommendations to date. Our usable findings and recommendations are provided only through an 'Issued for Use' document, which will be issued subsequent to this review. Final design should not be undertaken based on the interim recommendations made herein. Once our report is issued for use, the 'Issued for Review' document should be either returned to Tetra Tech EBA or destroyed.

1.0 INTRODUCTION

1.1 General

Tetra Tech EBA Inc. (Tetra Tech EBA) was retained by Baffinland Iron Mines Corp. (Baffinland) to update the Milne Inlet landfarm design previously completed for the Mary River Project. The update was requested by Baffinland to accommodate increased contaminated soil volumes and provide a secondary containment cell for hydrocarbon contaminated snow.

This document provides a summary of the updated design. Construction drawings and specifications for the updated landfarm and contaminated snow containment facility have been prepared and are attached. In the case of discrepancies, the construction drawings and specifications supersede the design brief.

1.2 Project Details

Tetra Tech EBA completed a design for the landfarm in 2012 (Tetra Tech EBA, 2012). The landfarm facility was sized to accommodate staged remediation of an estimated 1,700 m^3 of contaminated soil from a bladder fuel farm. Subsequent contaminated soil excavation generated approximately 9,000 m^3 of contaminated soil.

To accommodate this increased contaminated soil volume, Baffinland requested that the landfarm footprint be approximately doubled in size. Successive treatments will still be required to remediate the contaminated soil volume; however, increasing the landfarm footprint beyond what is shown on the drawings is not possible due to space constraints at the site, and the increased material volumes required to construct an even larger facility.

In addition to increasing the landfarm footprint, Baffinland requested that a second containment cell be constructed adjacent to the landfarm to contain hydrocarbon contaminated snow. A minimum containment volume of 1,000 m^3 was requested.

Tetra Tech EBA Inc.
14940 - 123 Avenue
Edmonton, AB T5V 1B4 CANADA
Tel 780.451.2121 Fax 780.454.5688

2.0 DESIGN SUMMARY

The landfarm and contaminated snow containment facility (facility) location and general site layout is shown on Drawing C01. Design details for the facility are provided on Drawings C02 and C03, and in the construction specifications.

The facility consists of two geomembrane lined containment cells. The larger west cell will be used as a landfarm for the biotreatment of contaminated soil from the bulk fuel storage facility. The smaller east cell will be used for the containment of hydrocarbon contaminated snow collected during winter operations.

2.1 Landfarm Area

The landfarm cell is an irregularly shaped, lined containment area, measuring approximately 136 m x 63 m with a floor area of 7,620 m^2 (excluding sump). The landfarm is bounded on its south side by water features (channel and pond), and on its north side steep, unstable slopes. The landfarm was sized to maximize the footprint while not encroaching on either of these features.

The cross section design is consistent with Tetra Tech EBA (2012) and consists of a granular containment area utilizing fill materials available on site. The cell is lined with a HDPE geomembrane liner, protected with a top and bottom nonwoven geotextile, and keyed into the perimeter berms. The liner system will be covered with 0.3 m aggregate fill to protect the liner. Liner system and cross section details are provided on Drawing C03.

The landfarm has been designed to contain seasonal water accumulation due to snow melt and precipitation events. The total capacity in the landfarm, assuming a 0.3 m freeboard, is 3,383 m^3. The expected seasonal inputs are summarized in Table 1.

Table 1 – Estimated Seasonal Water Accumulation

Average Snow Accumulation on Base, SWE (m^3)	Snow Drift Accumulation, SWE (m^3)	Extreme Seasonal Precipitation (m^3)	Total Annual Accumulation (m^3)
956	370	2,000	3,307

The average base snow accumulation was calculated using a snow water equivalent of 105 mm applied over the landfarm area, as documented in Tetra Tech EBA (2012). The snow drift volume was based on snow accumulation at a 6:1 slope around the perimeter berms with a density of 325 kg/m^3. The extreme precipitation volume was evaluated by a frequency analysis of recorded summer rainfall events at Igloolik and Pond Inlet. This provided an annual 1:100 year precipitation value of 260 mm.

The total annual accumulation of 3,307 m^3 represents the average snowfall accumulation combined with a 1:100 year annual seasonal rainfall. This volume is considered to be a conservative estimate of the annual precipitation in the landfarm as it represents an extreme annual summer volume and does consider evaporation (estimated at 190 mm per year), and any water treatment and extraction completed by Baffinland.

The landfarm design includes a small sump in the southwest corner of the landfarm to accommodate small seasonal rainfall events. The capacity of the sump area is of 325 m^2.

2.2 Contaminated Snow Containment Facility

The contaminated snow containment facility is located east of the landfarm and shares a common berm with the landfarm. The cross section design is consistent with the landfarm design, with the exception that the cover thickness over the liner system has been increased to 0.6 m. For the landfarm, placement of contaminated soil contributes to the overall cover thickness over the liner system. In the contaminated snow containment facility no contaminated soil was placed so the cover thickness was increased to compensate. Along the crest of the berm, the thickness of the cover over the key trench is only 0.3 m.

The contaminated snow containment facility is a rectangular, lined containment area, measuring approximately 47 m x 43 m. The facility is graded to the south side of cell, to a point, 12 m east of the southwest corner. This will permit the facility to be accessed from either the southwest or southeast corners. The contaminated snow containment facility is shown on Drawing C02.

The contaminated snow containment facility has a containment volume of 929 m^3, with 0.3 m of freeboard. The water capacity at the liner crest is 1,428 m^3. The containment volume was developed in dialogue with Baffinland based on estimated contaminated snow volumes.

2.3 Access Road

The landfarm and contaminated snow containment facility will be accessed from the road located southwest of the facility. A detailed access road design has not been completed as part of this design; however, two possible access configurations are shown on Drawing C01. These configurations can be adjusted based on Baffinland's specific requirements and actual site conditions.

All access roads will be required to cross the small watercourse on the south side of the facility.

3.0 CONSTRUCTION MATERIALS

3.1 Pad and Berm Materials

The pad and berms of both the landfarm and the contaminated snow containment area will be constructed with Type 2 material, while Type 5 material is used adjacent to the liner. Specified particle size distributions for each material are included in construction specifications.

3.2 Geomembrane Liner System

Both the landfarm and contaminated snow containment areas will be lined with an HDPE liner system. The liner system comprises a 60 mil HDPE geomembrane sandwiched between layers of 12-oz non-woven geotextile. The properties and characteristics of the geomembrane are outlined in the construction specifications.

The liner system bedding consists of a 150 mm layer of Type 5 granular fill. The liner system cover in the landfarm area consists of 300 mm of Type 5 granular fill, the contaminated snow containment area cover is 600 mm of the Type 5 granular fill, as discussed above. Soil from the bladder farm that has contaminants below the Government of Nunavut PHC industrial guidelines can be used for Type 5 granular fill on top of the geomembrane liners.

3.3 Quantities

Material quantities for the landfarm and contaminated snow containment facility are summarized in Table 2. The Type 2 and Type 5 quantities represent in place volumes and do not include any allowances for overbreak, wastage, or overbuild.

Table 2 – Estimate Material Quantities

Area	Type 2 Granular Fill (m^3)	Type 5 Granular Fill (m^3)	Geotextile (m^2)*	60 mil HDPE Geomembrane (m^2)*
Landfarm	14,953	4,099	22,733	11,367
Contaminated Snow Containment Facility	2,306	1,745	5,352	2,716
Total	**17,259**	**5,844**	**28,085**	**14,083**

* Geotextile and geomembrane quantities provide a 15 percent allowance for overlap and waste

4.0 CONSTRUCTION CONSIDERATIONS

The following sections provide construction considerations and recommendations for construction of the landfarm and contaminated snow containment facility. Additional construction requirements are available in the construction specifications.

4.1 Foundation Preparation

The landfarm and contaminated snow containment facility will be constructed over the existing ground surface. Any ground disturbance should be minimized. Large boulders which may protrude into the liner system should be removed; however, no excavation of the foundation soils should occur.

Construction over undisturbed natural ground may create a thermal barrier, causing the permafrost table to aggrade upwards towards the base of the fill. Although construction of the landfarm overtop the ice-rich areas is not expected to cause significant permafrost degradation, the naturally-occurring patterns in the ground may eventually translate to the top and side surfaces of the berms, which may require periodic maintenance.

4.2 Material Placement

4.2.1 Granular Materials

All granular materials should be placed in lifts not exceeding 300 mm in thickness and compacted as specified in the construction specifications. Moisture conditioning may be required to achieve the compaction requirements.

4.2.2 Geomembrane Liner

The installation of the non-woven geotextile and geomembrane will commence after the 300 mm layer of Type 5 material has been placed and compacted. The bedding material must be made smooth and must be placed in a manner that will prevent damage to the liner.

The edges of the liners will be terminated in key trenches around the perimeter of the containment areas. Bedding cover material should be placed on the edges of the liner to secure the liner in place within the key trench. Low ground pressure equipment should push cover material ahead of itself, and never travel directly on the geomembrane.

4.3 Quality Assurance / Control

The construction quality assurance program must be structured to ensure that construction sensitive features of the design are achieved. The elements of the program will include:

- Careful surveying to establish material quantities and allow preparation of as-built construction drawings;
- Specific engineering approvals at critical times such as foundation preparation, and key trench excavation and cleaning;
- Monitoring field and laboratory testing of fill materials;
- Specific approval of construction procedures for moisture condition and placement of embankment materials, and liner installation;
- Observation and approval of contractor's proposed material placement sequences and preparation of each surface prior to the placement of the next lift; and
- Defined procedures for reporting with identified responsibilities for decision making during construction.

Specific testing requirements and frequencies for granular fill and liner installation are outlined in the construction specifications.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Baffinland Iron Mines Corporation and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Baffinland Iron Mines Corporation, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are attached to this memo.

6.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.

Prepared by:
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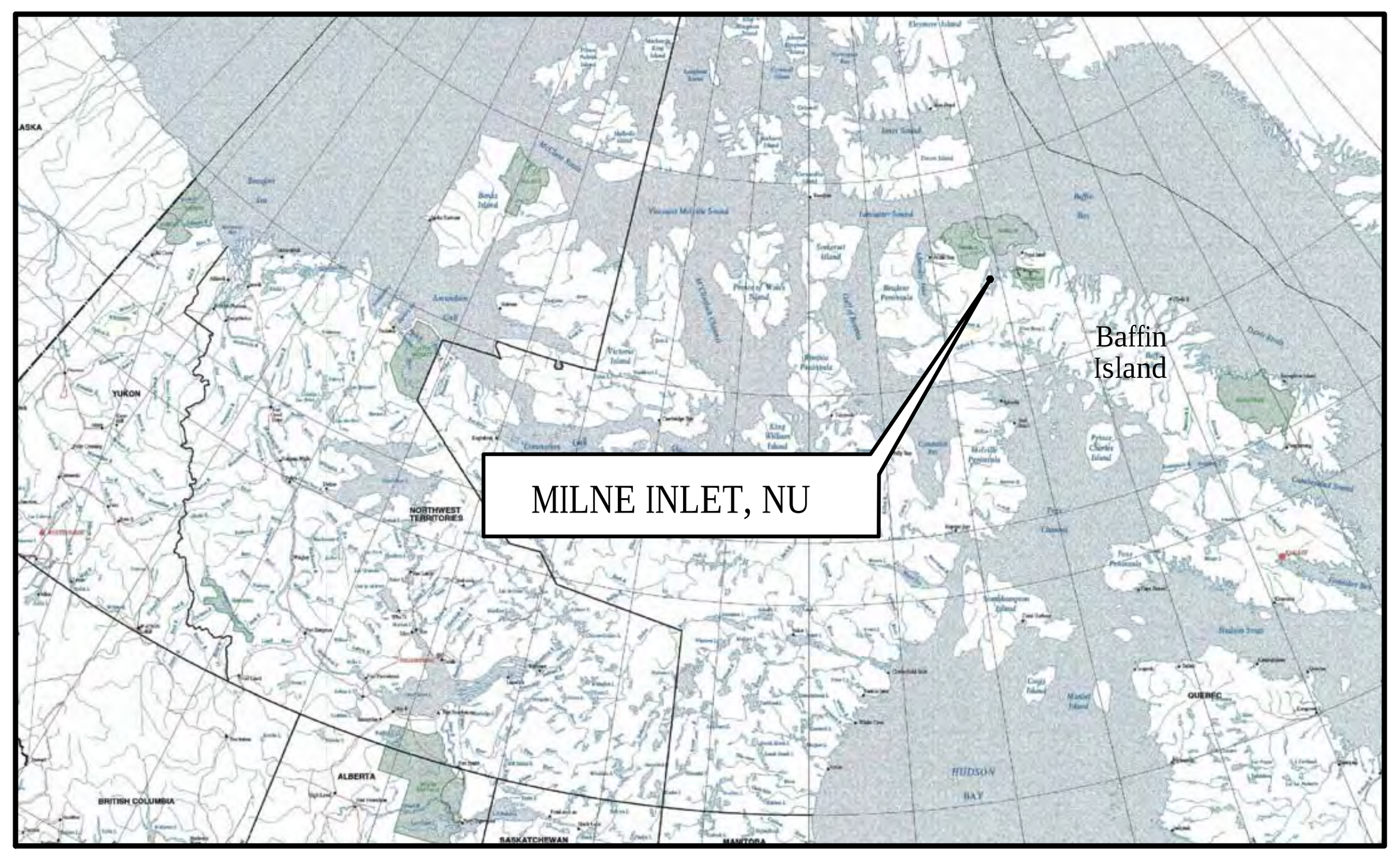
/tm

FIGURES

DRAWING INDEX

GENERAL ARRANGEMENTS

DRWG #	TITLE
C101	(GENERAL SITE) SITE LOCATION AND IDENTIFICATION OF MAJOR FEATURES
C102	PLAN AND LAYOUT
C103	CROSS-SECTIONS AND DETAILS

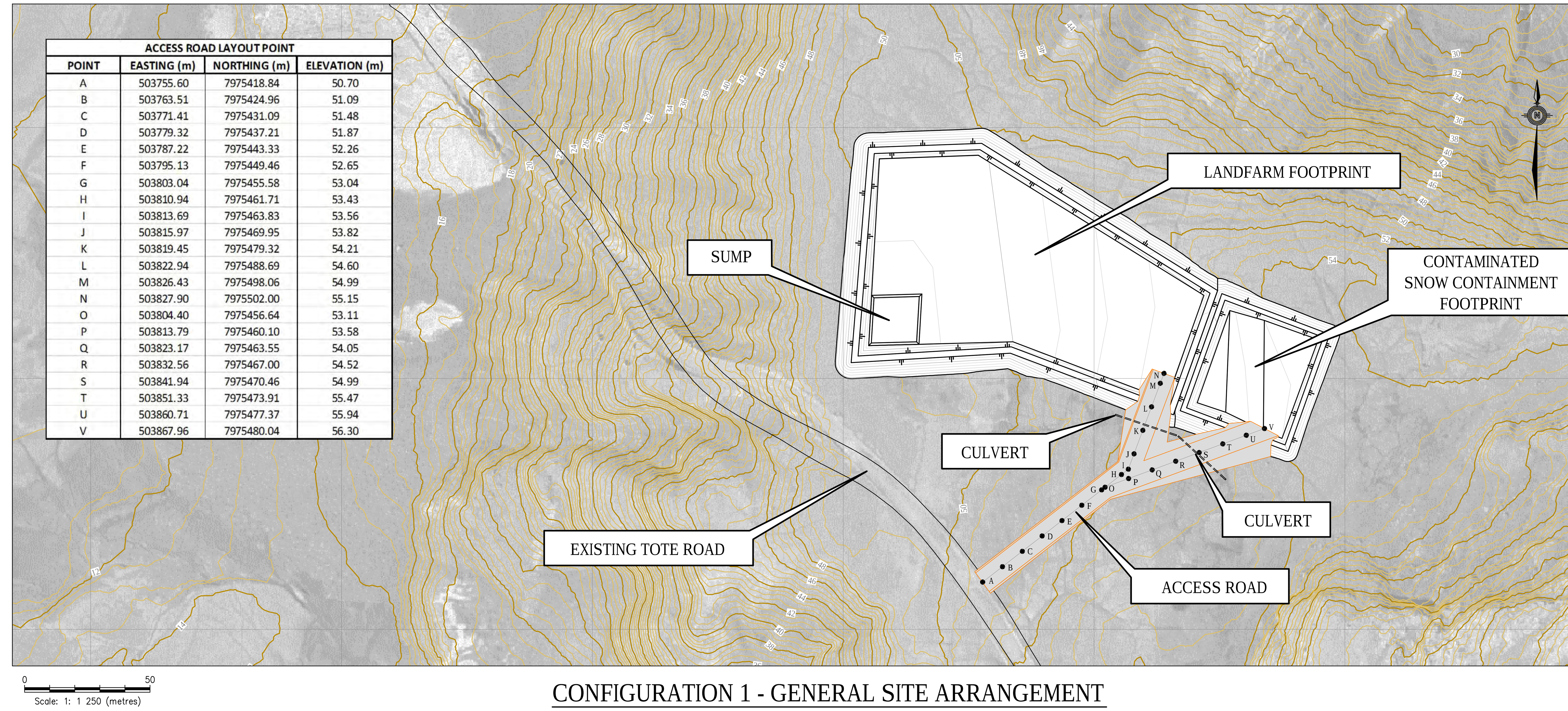


KEY MAP

SCALE: NTS

GENERAL LOCATION MAP

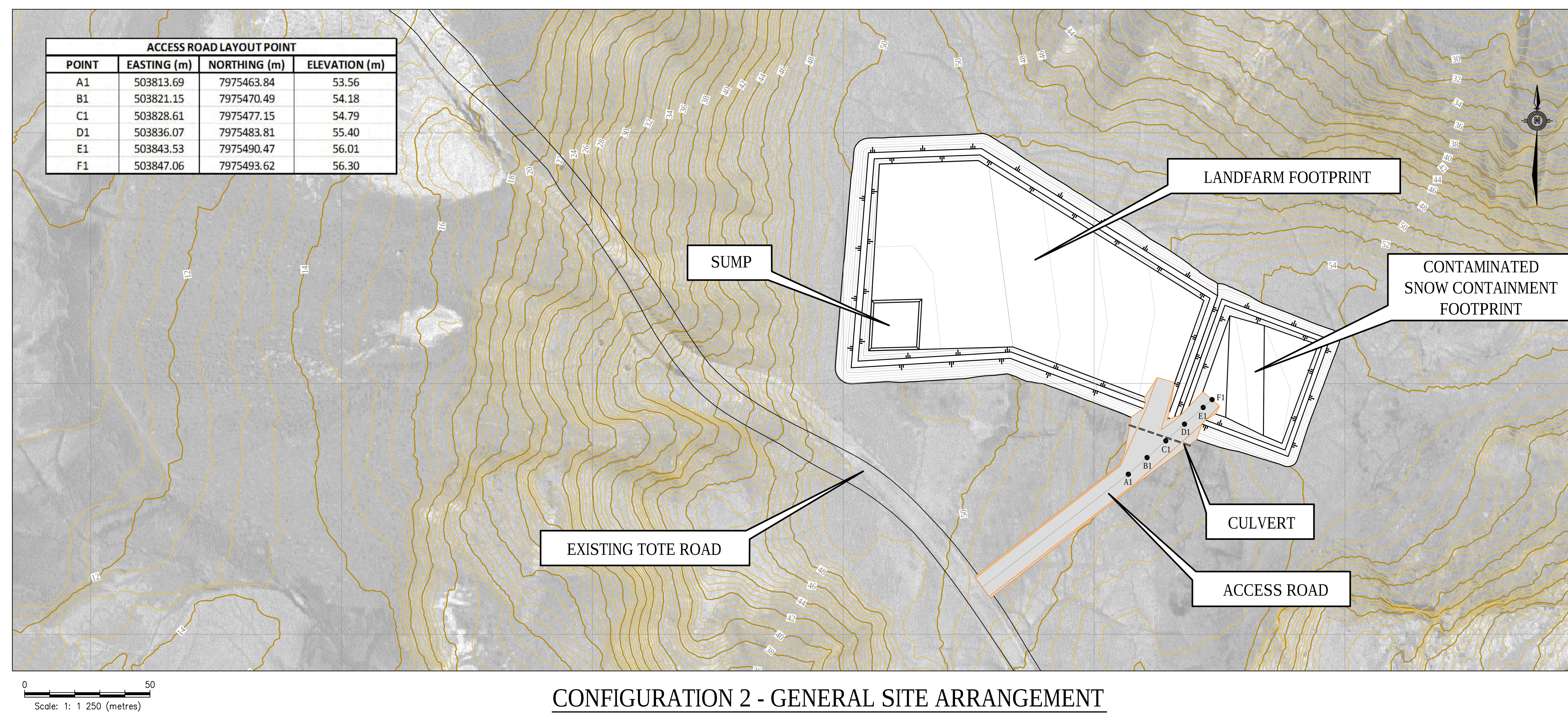
SCALE: NTS



ACCESS ROAD LAYOUT POINT			
POINT	EASTING (m)	NORTHING (m)	ELEVATION (m)
A	503755.60	7975418.84	50.70
B	503763.51	7975424.96	51.09
C	503771.41	7975431.09	51.48
D	503779.32	7975437.21	51.87
E	503787.22	7975443.33	52.26
F	503795.13	7975449.46	52.65
G	503803.04	7975455.58	53.04
H	503810.94	7975461.71	53.43
I	503813.69	7975463.83	53.56
J	503815.97	7975469.95	53.82
K	503819.45	7975479.32	54.21
L	503822.94	7975488.69	54.60
M	503826.43	7975498.06	54.99
N	503827.90	7975502.00	55.15
O	503804.40	7975456.64	53.11
P	503813.79	7975460.10	53.58
Q	503823.17	7975463.55	54.05
R	503832.56	7975467.00	54.52
S	503841.94	7975470.46	54.99
T	503851.33	7975473.91	55.47
U	503860.71	7975477.37	55.94
V	503867.96	7975480.04	56.30

CONFIGURATION 1 - GENERAL SITE ARRANGEMENT

SCALE: 1: 1,250



ACCESS ROAD LAYOUT POINT			
POINT	EASTING (m)	NORTHING (m)	ELEVATION (m)
A1	503813.69	7975463.84	53.56
B1	503821.15	7975470.49	54.18
C1	503828.61	7975477.15	54.79
D1	503836.07	7975483.81	55.40
E1	503843.53	7975490.47	56.01
F1	503847.06	7975493.62	56.30

CONFIGURATION 2 - GENERAL SITE ARRANGEMENT

SCALE: 1: 1,250

NOTE:

ELEVATIONS FOR ACCESS ROAD ARE ESTIMATED BASED ON LIDAR ELEVATIONS.
THE ACCESS ROAD WAS NOT DESIGNED.

REVISIONS

NUM	DATE	DWN	CKD	APR	DESCRIPTION

DRAWING STATUS

NUM	DATE		DESCRIPTION
B	Mar. 20/2014	GDK	ISSUED FOR REVIEW
A	Mar. 18/2014	GDK	ISSUED FOR REVIEW

PERMIT

PROFESSIONAL SEAL

CLIENT

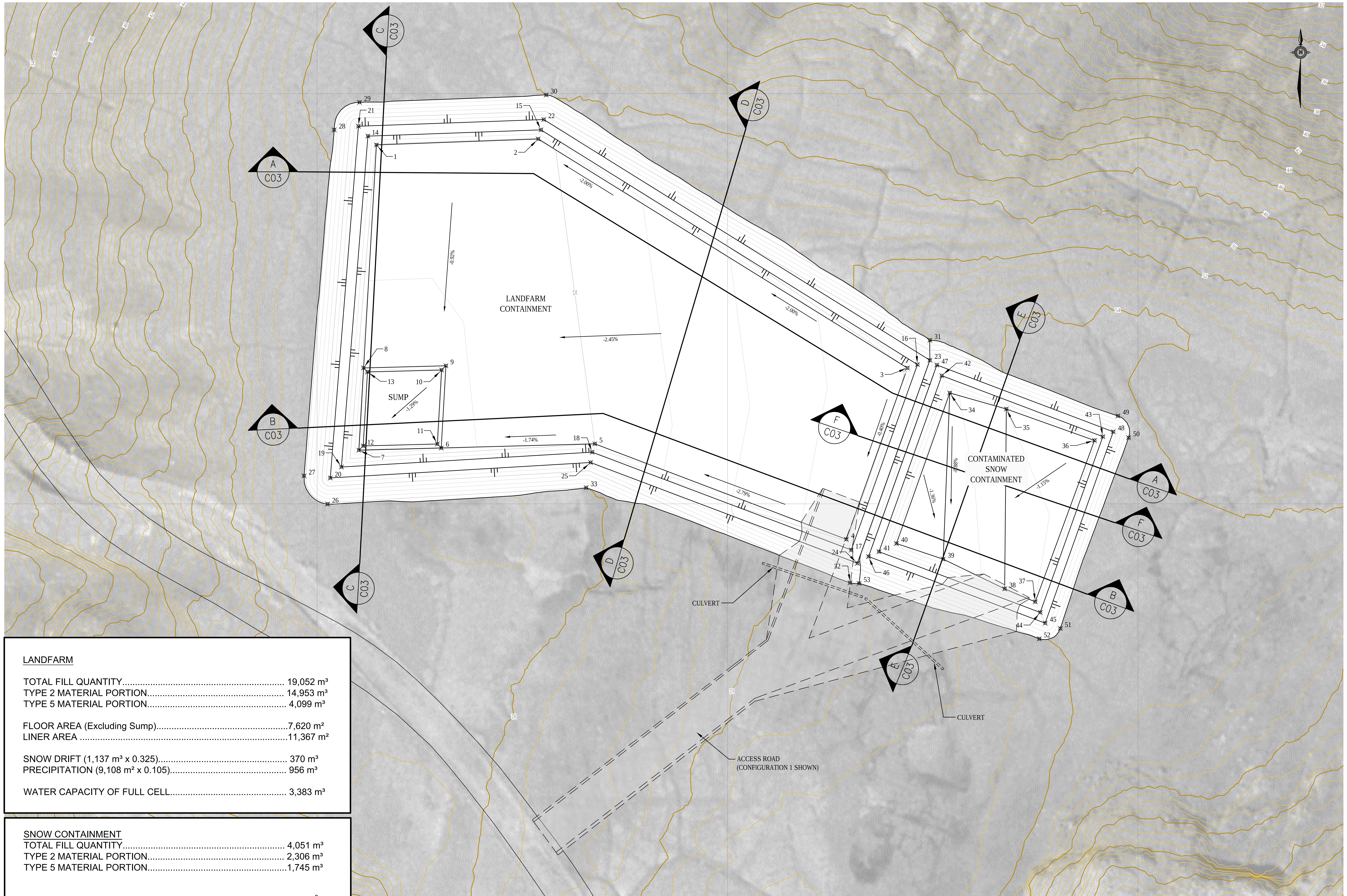
Baffinland Iron Mines Corporation

TETRA TECH EBA

MILINE INLET LANDFARM DESIGN
MILINE INLET, NU

SITE LOCATION AND IDENTIFICATION OF MAJOR FEATURES

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
E14103075-01	EDM	DRG	EG	0	C01
DATE:	SHEET No.	DWN	APP	STATUS	
March 20, 2014	1 of 3	DRG/DBD	GDK	B	



LANDFARM

TOTAL FILL QUANTITY.. 19,052 m³
TYPE 2 MATERIAL PORTION.. 14,953 m³
TYPE 5 MATERIAL PORTION.. 4,099 m³

FLOOR AREA (Excluding Sump)...7,620 m²
LINER AREA ....11,367 m²

SNOW DRIFT (1,137 m³ x 0.325).. 370 m³
PRECIPITATION (9,108 m² x 0.105)... 956 m³

WATER CAPACITY OF FULL CELL... 3,383 m³

SNOW CONTAINMENT

TOTAL FILL QUANTITY.. 4,051 m³
TYPE 2 MATERIAL PORTION.. 2,306 m³
TYPE 5 MATERIAL PORTION..1,745 m³

CONTAINMENT VOLUME (0.3m FREEBOARD)..........................929 m³

LINER AREA ....2,716 m²

LANDFARM LAYOUT POINTS

POINT #	NORTHING	EASTING	ELEVATION
1	7975587.511	503714.454	51.900
2	7975588.943	503753.860	51.900
3	7975533.109	503843.833	54.017
4	7975491.339	503828.939	53.826
5	7975514.617	503767.660	52.000
6	7975513.616	503730.232	51.349
7	7975513.079	503710.168	51.000
8	7975533.117	503711.322	51.242
9	7975533.654	503731.386	51.405
10	7975532.625	503730.325	50.905
11	7975514.591	503729.286	50.849
12	7975514.108	503711.228	50.500
13	7975532.142	503712.267	50.742
14	7975589.637	503712.373	53.001
15	7975591.169	503754.535	53.001
16	7975533.954	503846.258	55.035
17	7975488.747	503830.139	54.850
18	7975512.598	503767.006	53.001
19	7975508.964	503705.924	53.001
20	7975506.298	503703.203	53.001
21	7975592.054	503710.058	53.001
22	7975593.695	503755.209	53.001
23	7975535.010	503849.289	55.035
24	7975485.508	503831.638	54.850
25	7975510.071	503766.622	53.001
26	7975499.931	503702.536	49.800
27	7975506.808	503696.821	49.800
28	7975591.157	503704.166	50.100
29	7975597.870	503710.330	50.100
30	7975599.676	503755.799	49.996
31	7975539.868	503849.301	52.924
32	7975480.761	503829.844	52.313
33	7975503.940	503765.540	49.973

SNOW CONTAINMENT LAYOUT POINTS

POINT #	NORTHING	EASTING	ELEVATION
34	7975527.021	503854.129	54.400
35	7975523.112	503867.909	55.000
36	7975515.446	503889.390	55.200
37	7975476.097	503874.955	55.000
38	7975479.275	503867.509	54.800
39	7975486.515	503852.529	54.000
40	7975490.322	503841.148	54.200
41	7975488.331	503836.891	55.858
42	7975531.243	503852.192	56.034
43	7975516.390	503891.423	56.000
44	7975473.512	503876.182	56.000
45	7975470.921	503877.383	56.000
46	7975487.153	503834.348	55.858
47	7975533.835	503850.993	56.034
48	7975517.567	503893.964	56.000
49	7975521.416	503895.096	54.000
50	7975516.128	503897.698	54.000
51	7975469.610	503881.071	54.043
52	7975467.106	503875.944	53.961
53	7975480.601	503832.038	52.386

NOTE:

WATER CAPACITY OF THE LANDFARM AND CONTAINMENT AREA ASSUMES 0.3 m FREEBOARD

0 — 25
Scale: 1: 500 (metres)

REVISIONS

NUM	DATE	DWN	CKD	APR	DESCRIPTION

DRAWING STATUS

NUM	DATE	APR	DESCRIPTION
B	Mar. 20/2014	GDK	ISSUED FOR REVIEW
A	Mar. 18/2014	GDK	ISSUED FOR REVIEW

PERMIT

PROFESSIONAL SEAL

CLIENT

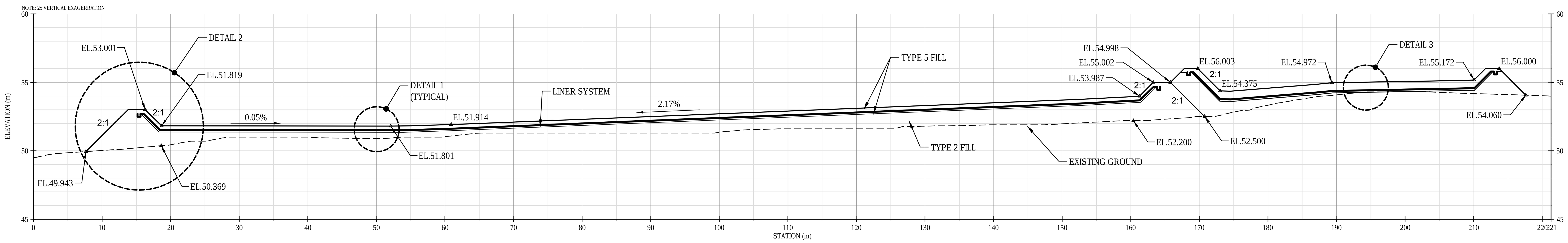
Baffinland Iron Mines Corporation

TETRA TECH EBA

MILNE INLET LANDFARM DESIGN
MILNE INLET, NU

PLAN AND LAYOUT

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
E14103075-01	EDM	DRG	EG	0	C02
DATE:	SHEET No.	DWN	APP	STATUS	
March 20, 2014	2 of 3	DRG/DBD	GDK	B	



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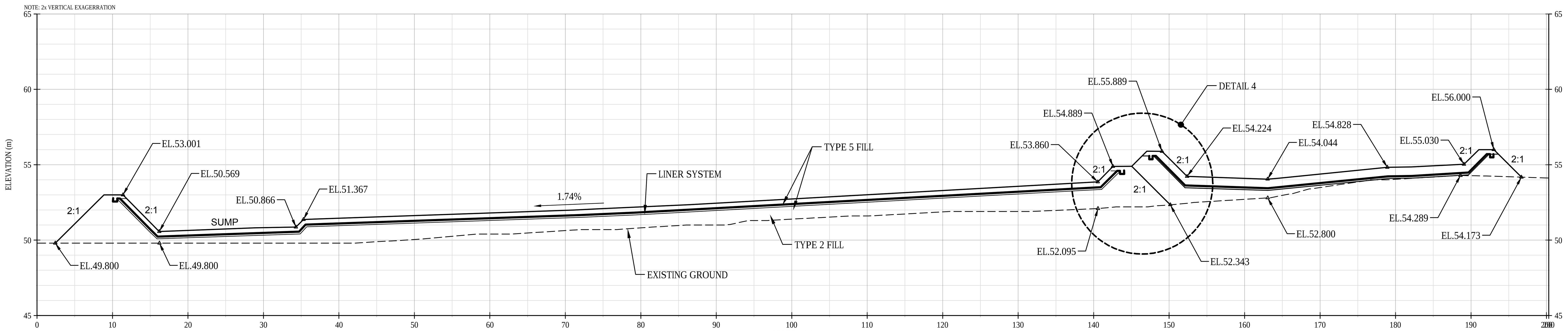

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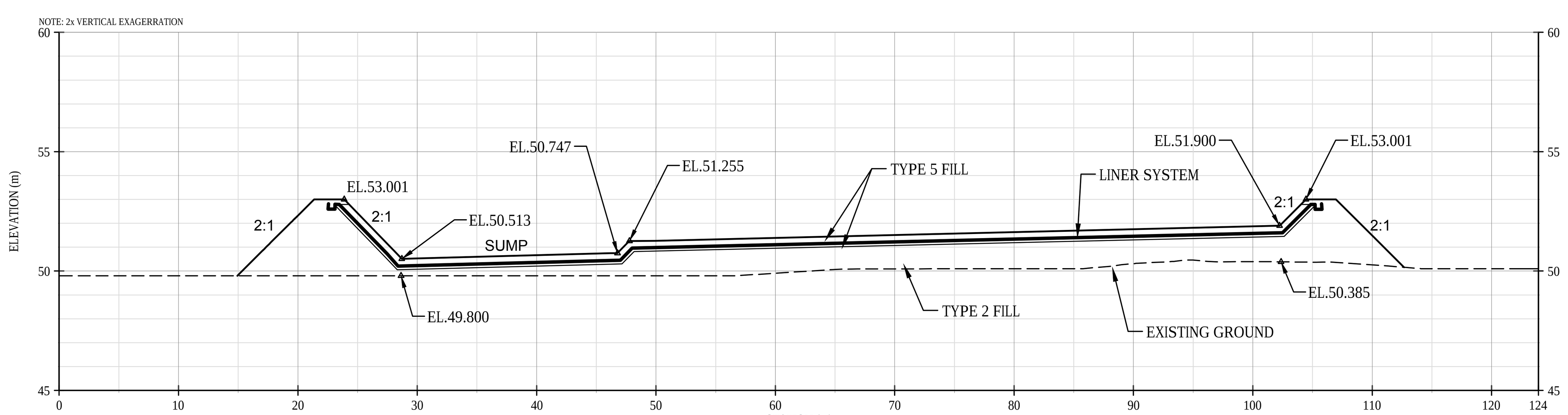

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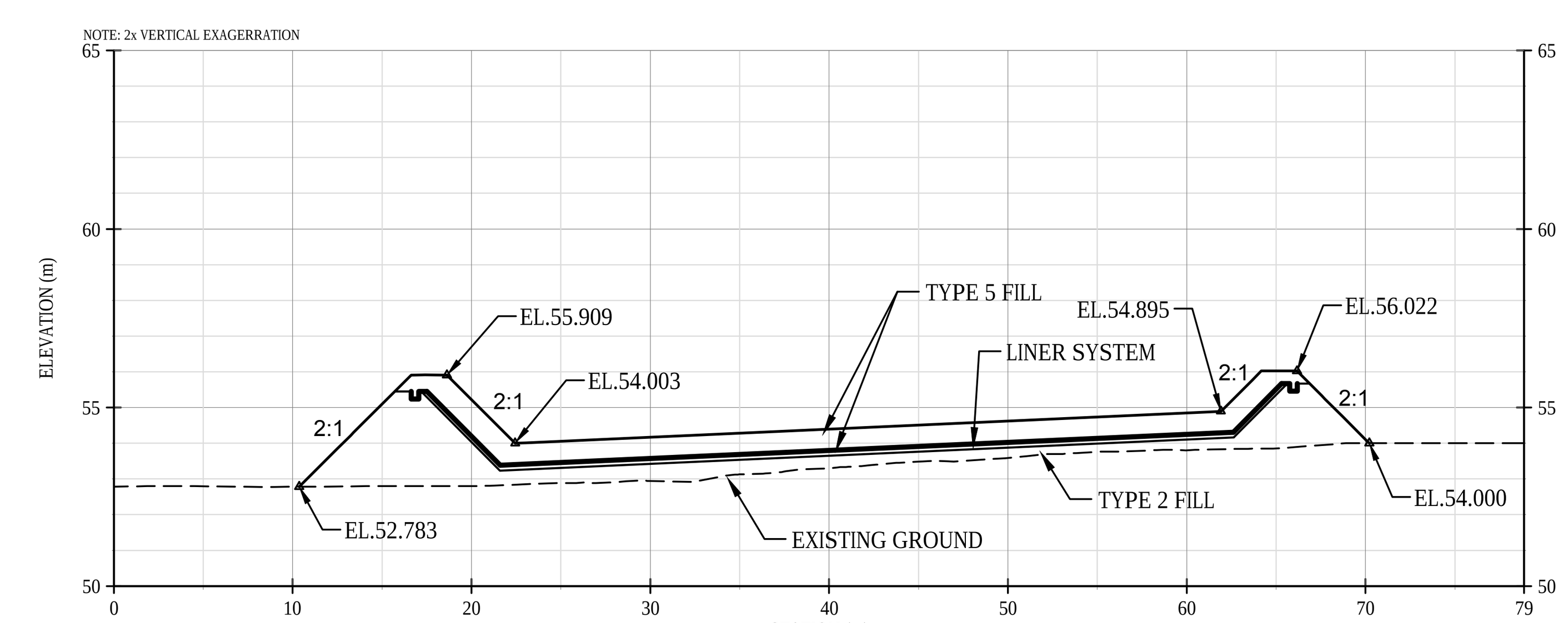

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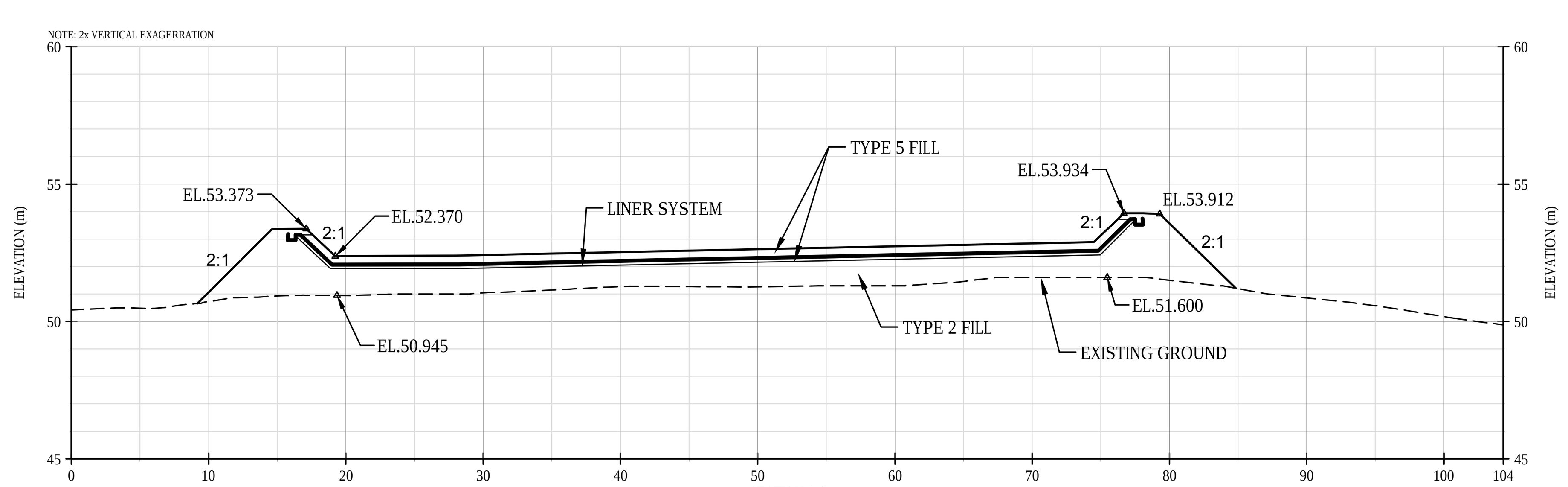

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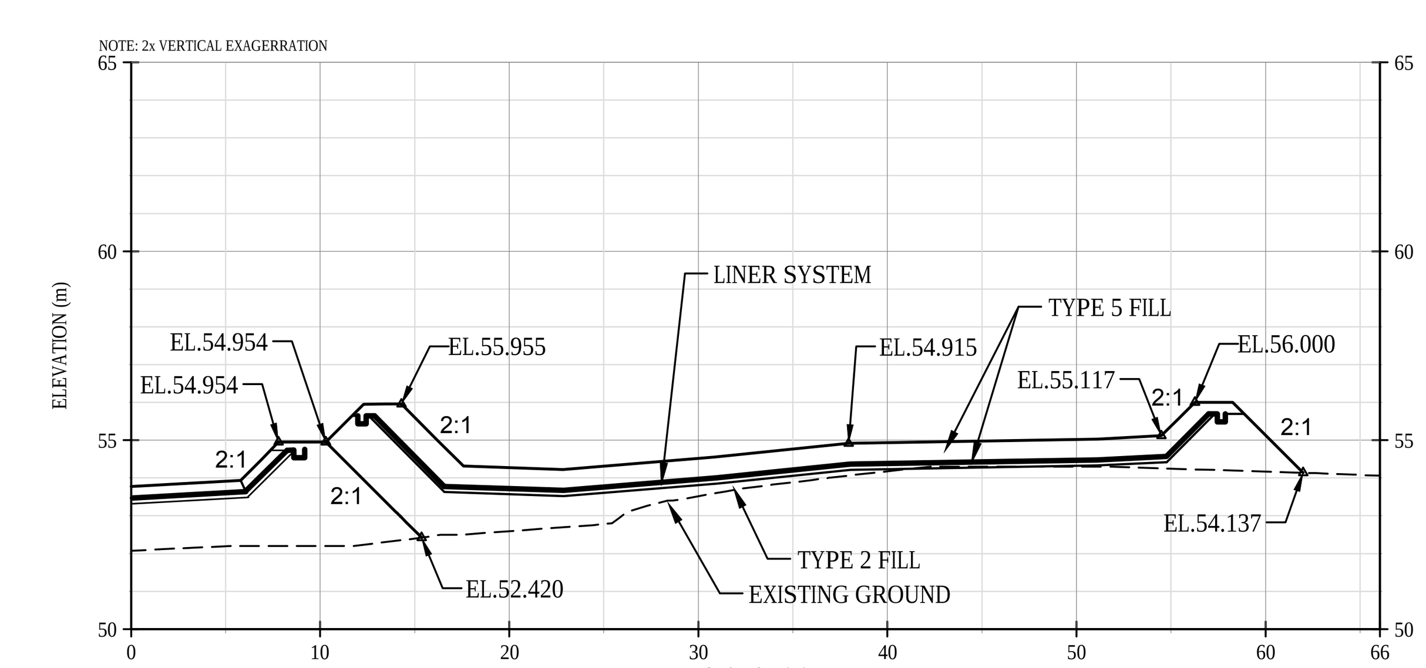

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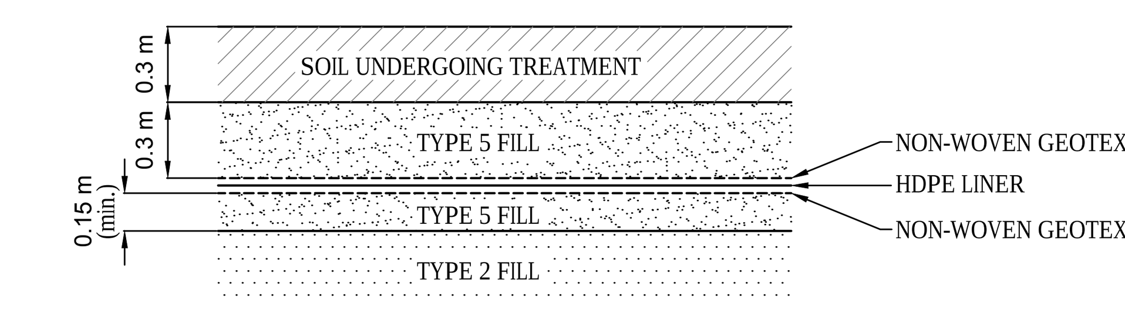
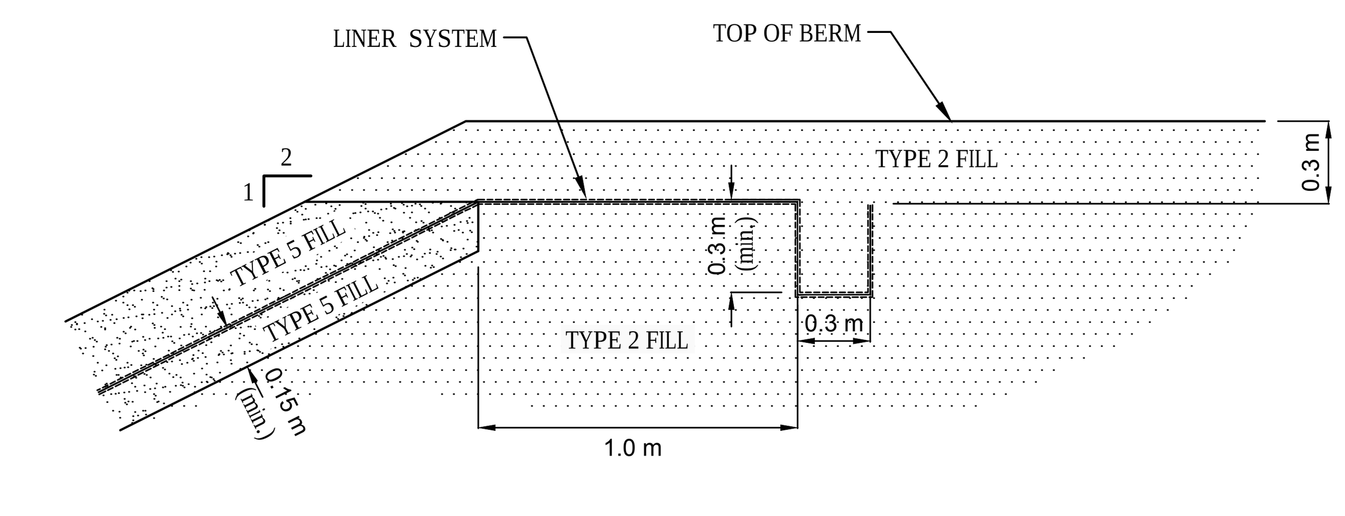
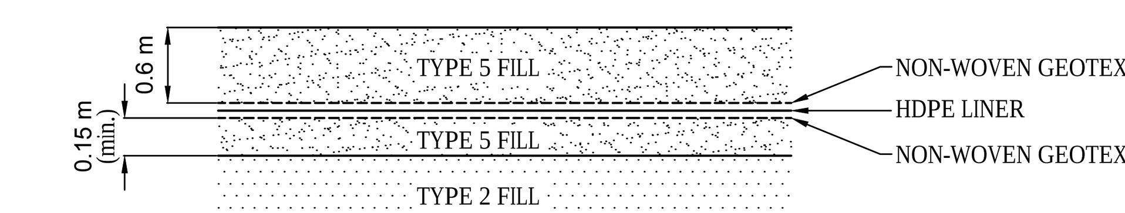


DETAIL - LINER SYSTEM (1 / C03) N.T.S.



DETAIL - LINER ANCHORING (2 / C03) N.T.S.



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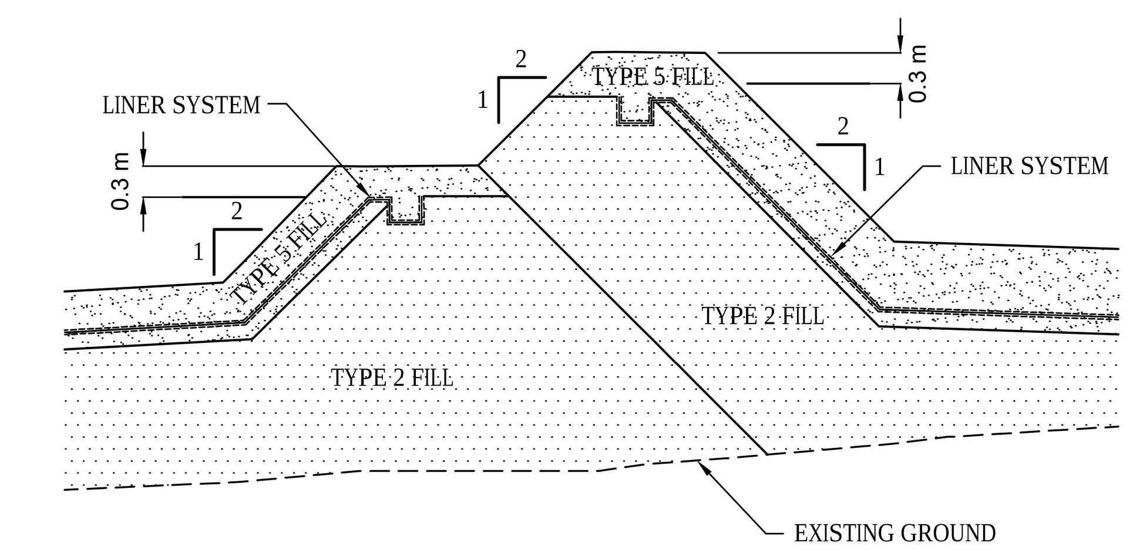

DETAIL - LINER ANCHORING (4 / C03) N.T.S.

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES.
2. COVER OVER LINER ALONG CREST OF SNOW CONTAINMENT FACILITY BERM IS 0.3 m

0 — 20
Scale: 1: 400 (metres)

REVISIONS

NUM	DATE	DWN	CKD	APR	DESCRIPTION

DRAWING STATUS

NUM	DATE	APR	DESCRIPTION
B	Mar. 20/2014	GDK	ISSUED FOR REVIEW
A	Mar. 18/2014	GDK	ISSUED FOR REVIEW

PERMIT

PROFESSIONAL SEAL

CLIENT

Baffinland Iron Mines Corporation

TETRA TECH EBA

MILNE INLET LANDFARM DESIGN
MILNE INLET, NU

SECTIONS

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
E14103075-01	EDM	DRG	EG	0	C03
DATE: March 20, 2014	SHEET No. 3 of 3	DWN DRG/DBD	APP GDK	STATUS A	

APPENDIX A

TETRA TECH EBA'S SERVICES AGREEMENT AND GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of Tetra Tech EBA’s Client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Tetra Tech EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, Tetra Tech EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. Tetra Tech EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. Tetra Tech EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

Tetra Tech EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B
SPECIFICATIONS

TETRA TECH EBA

CONSTRUCTION SPECIFICATIONS FOR THE MILNE INLET LANDFARM AND CONTAMINATED SNOW CONTAINMENT FACILITY

PRESENTED TO

Baffinland Iron Mines Corporation

MARCH 2014
ISSUED FOR REVIEW
FILE: E14103075-01

This "Issued for Review" report is provided solely for the purpose of client review and presents our findings and recommendations to date. Our findings and recommendations are provided only through an "Issued for Use" report, which will be issued subsequent to this review. You should not rely on the interim recommendations made herein. Once our report is issued for use, the "Issued for Review" document should be either returned to Tetra Tech EBA or destroyed.

Tetra Tech EBA Inc.
14940 - 123 Avenue
Edmonton, AB T5V 1B4 CANADA
Tel 780.451.2121 Fax 780.454.5688

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TABLE OF CONTENTS

CONFIDENTIALITY STATEMENT

This document contains confidential commercial and technical information and must not be released in whole, or in part, to any third party without the express written consent of Tetra Tech EBA Inc.

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Baffinland Iron Mines Corporation and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Baffinland Iron Mines Corporation, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are provided in Appendix A of this report.

SECTION 1001: EARTHWORKS

1.0 GENERAL

1.1 References

Where material properties are specified, the following standards are applicable:

Materials International

.1 ASTM D698 [07e1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft) (600kN m/m^3).

.2 ASTM D422 Test Method for Particle-Size Analysis of Soils.

.3 ASTM D1140 Test Method for Amount of Material in Soils Finer than the No. 200 (75 µm) Sieve.

.4 ASTM C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM D2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.

.6 ASTM D1556 Test Method for Density of Soil in Place by the Sand-Cone Method.

.7 ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (shallow depths).

Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.2 Scope

.1 This Specification defines the requirements for furnishing of all labour, equipment, and materials for earthworks required for site preparation as indicated on the Drawings and as specified herein for Baffinland Iron Mines Milne Inlet Landfarm, in Nunavut, Canada.

.2 All work shall conform to the lines, grades, and cross sections indicated on the Drawings. Included is all site preparation, excavation, processing as necessary, stockpiling, loading, hauling, placing, compacting, and finishing of all material classified as acceptable for fill material. Excavation and processing of this material shall include sorting or screening that may be necessary to produce the required gradations.

1.3 Protection of Existing Utilities

.1 If relevant, location, isolation, and/or relocation of buried utilities shall be completed before any excavation commences.

1.4 Drawing Discrepancies

.1 Any discrepancies found on the drawings shall be brought to the immediate attention of the Owner's Representative.

.2 No deviations shall be permitted from the design drawings without written approval from the Owner's Representative.

.3 Contractor shall immediately submit in writing to the Owner's Representative any conflicts discovered within this Specification or between this Specification, the purchase order, the accompanying data sheets and drawings, and any other supplemental information or Specifications. The Owner's Representative will then make a ruling and clarify the matter in writing.

1.5 Product Delivery and Storage

.1 Store separate from other materials, stockpile, and protect all materials from contamination prior to their use.

.2 Deliver, stockpile, and handle materials using proper equipment. Reject and remove from site all materials contaminated with foreign matter, or in any way damaged or defective.

.3 Should any materials become segregated, remix the material to provide uniform gradation. Alternatively, remove and replace the segregated material.

1.6 Material Sources

.1 Use material sources and borrow pits shown on the Drawings or alternate borrow pits as designated by the Owner's Representative. Contractor shall use these sources, subject to the conditions of the Owner's quarry permits. Maintain haul and access roads to provide safe passage and control for traffic at all times.

.2 Before development of borrow pits, excavate test pits as and where necessary to assess the quality composition and extent of the deposits as directed by the Owner's Representative.

.3 The Contractor shall refer to the Borrow Site Reclamation Overview Milne Inlet Access Road, Mary River Project, Baffin Island, NU, file E14101074 (EBA 2009) for site-specific guidelines related to borrow pit development and reclamation.

.4 Leave unsuitable material in the borrow pit unless its removal is required for continued operation of the pit. Dispose of such material to areas designated by the Owner's Representative

1.7 Survey Control

.1 The Contractor shall furnish all stakes, markers, tools, and equipment required to lay out the work, and to lay out the work from the benchmarks. Markers that are lost or disturbed by the Contractor's operations shall be replaced at their expense.

1.8 Drainage

.1 Excavation, fill, and backfill work areas shall be continually and effectively drained. Water shall not be permitted to accumulate in excavations or foundation areas for compacted fill. The Contractor shall provide pumping equipment to divert water flows away from work areas. The proposed point of discharge shall be approved by the Owner. The Contractor must also ensure that sediments contained in diverted water will not enter a natural watercourse.

.2 Backfill may not commence until all water has been drained or otherwise removed from the excavation, and the Owner's Representative approves the commencement of backfilling operations.

1.9 Inspection and Testing

.1 The Owner's Representative will witness excavation and backfilling operations, take samples, and perform nuclear densometer testing to ensure compliance with contract and specification requirements.

1.10 Environmental Protection Plan

.1 The Contractor is to comply with all requirements of Baffinland's Environmental Protection Plan (2007 to 2009) or most recent version.

2.0 PRODUCTS

2.1 General

.1 All backfill shall be free from clay lumps, organic matter, frozen material, refuse, or other deleterious material.

.2 Gradations shall be within the limits specified when materials are tested to ASTM C136 and ASTM C117. Sieve sizes shall conform to CAN/CGSB-8.1-88.

2.2 Materials

.1 Representative bulk samples of any materials proposed shall be submitted to the Owner's Representative for particle size analysis, laboratory compaction testing, and evaluation prior to a final decision on the use of such materials.

.2 Rock Rip-rap: Hand-laid rock rip-rap material shall consist of sound, durable stones having at least a minimum dimension of 200 mm.

.3 Type 2 and Type 5 granular fill properties for the following requirements:

.a Crushed, pit run, or screened stone, gravel or sand.

.b Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1, CAN/CGSB-8.2.

.c Oversize rocks in the pit run material shall be removed from the Work.

.d Table:

Table 1001-1: Aggregate Particle Size Distribution Limits

ASTM Sieve Size (mm)	Type 2 Aggregate (Berms, Pad)	Type 5 Aggregate (Embedment of Geomembranes)
100	100	
50	60 -100	
25	40 – 100	100
12.5		75 – 100
4.75	20 – 70	50 – 100
2.0	10 – 60	30 - 100
0.63		10 – 95
0.075	0 -5	0 - 5

3.0 EXECUTION

3.1 General

.1 Construction shall be performed in accordance with the best industry practices and with equipment best adapted to the work being performed. Material shall be placed so that each zone is homogenous, free of stratifications, ice chunks, lenses, pockets, ruts, and layers of material of different texture, and grading not conforming to the requirements specified herein.

.2 No fill material shall be placed on any part of the foundation until it has been prepared as specified herein and approved by the Owner's Representative. Placement of material shall conform to the lines, grades, and elevations shown on the Construction Drawings or as specified herein and shall be performed in such a manner as to avoid mixing of materials in adjacent zones.

.3 Fill placement shall not proceed when the work cannot be performed in accordance with the requirements of the Specifications. Any part of the Project, which has been damaged by the action of rain and snow, or any other cause, shall be removed and replaced with material conforming to the requirements specified herein before succeeding layers are placed.

.4 Stockpiling, loading, transporting, dumping, and spreading of all materials must be carried out in such a manner to avoid segregation or any other condition that does not meet the requirements stated herein. Segregated materials shall be removed and replaced with the materials meeting the requirements stated herein and receiving the Owner's Representative's approval.

.5 The Contractor shall remove all snow, debris, vegetation, or any other material not conforming to the requirements stated herein prior to placing fill. The Contractor shall dispose of these materials in an area approved by the Owner.

.6 The Owner's Representative may, at their discretion, adjust the berm top width to account for site specific foundation conditions and construction equipment. The minimum top of berm width shall be 2.5 m.

3.2 Preparation

3.2.1 Protection of Permafrost

.1 In permafrost areas, permafrost degradation by excavating trenches or ditches may be initiated if adequate thermal and erosion protection is not present.

.2 Ice-rich permafrost has been identified in the area of the landfarm, and surface disturbance of these areas should be avoided or minimized.

.3 Avoid open excavations and areas of standing water near the project footprint. Promptly remove melt water accumulations in excavations.

.4 Access road is to be constructed on original ground to protect the permafrost.

3.2.2 Temporary Erosion and Sedimentation Control

.1 Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during construction works.

3.2.3 Landfarm Footprint Preparation

.1 Remove open graded boulders and deleterious materials from the landfarm footprint area.

.2 Excavate to lines, grades, elevations, and dimensions as indicated on the Drawings.

.3 Landfarm footprint must be approved by the Owner's Representative before fill is placed.

3.2.4 Fill Placement and Compaction

.1 Use types of fill as indicated on the Drawings. Compaction densities are percentages of maximum densities obtained from ASTM D698.

.a Place Type 2 fill in lifts not exceeding 300 mm thickness using techniques to avoid segregation.

.b Compact Type 2 fill to 95 % of corrected maximum dry density.

.c Beneath the liner system, place 150 mm lift of Type 5 material and roll smooth. Angular particles larger than 75 mm must be removed. Only clean materials originating from designated borrow pits may be used beneath the liner.

3.2.5 Protective Layer over HDPE Geomembrane

.1 Place Type 5 materials over the HDPE geomembrane liner in a minimum lift thickness in accordance with the manufacturer's recommendations, depending on the type of equipment used to place the fill.

.2 Prevent damage to the liner during granular fill placement using the following guidelines:

Table 1001-2: Fill Placement Guidelines

Backfill Thickness Over Liner	Allowable Ground Pressure
No backfill	Foot traffic or ATV only
150 mm or less	Hand placement
200 mm to 300 mm	28.7 kPa to 29.0 kPa (D3-D4 CAT Track Loaders B Low Ground Pressure)
300 mm to 600 mm	29.0 kPa to 59.9 kPa (D4 to D6 Style CAT or Equivalent)
600 mm to 900 mm	72.8 kPa to 109 kPa (D7 to D9 CAT or Equivalent)

.3 Type 5 soils originating from the protective layer of the Milne Inlet bulk fuel storage facility (bladderfarm) may be recycled within the contained area at the landfarm provided that the soils meet the particle size gradation requirements and also meet the Government of Nunavut Environmental Guideline for Contaminated Site Remediation (2009), for coarse-grained soils and industrial land use.

.4 If soils from the Milne Inlet bulk fuel facility are to be recycled in the landfarm protective layer, refer to the Summary Report on Assessment of Hydrocarbon-impacted Soils within the Bulk Fuel Storage Facility at Milne Inlet, NU, Tetra Tech EBA letter-report dated November 2, 2011 (draft) for a plan view and delineation of sandy soils within the fuel storage facility petroleum hydrocarbon soil results suitable for recycling at the time of soil sampling (September 2011).

.5 If used in the landfarm protective layer, soils originating from the Milne Inlet bulk fuel facility must be tested for benzene, toluene, ethylbenzene, and xylenes (BTEX), CCME hydrocarbon fractions F1-F4, and lead at a minimum frequency of one (1) set of samples per stockpile or per 200 m^3 of soil.

3.2.6 Quality Assurance

.1 General

.a This section describes the required quality assurance testing that shall be carried out for fill materials.

.b The testing will be carried out by the Owner's Representative or an independent testing firm engaged by the Owner.

.2 Testing Requirements

.a Samples of Type 2 and Type 5 material shall be tested as follows to verify that they meet the specified requirements. Additional testing shall be carried out as requested by the Owner's Representative.

.b Table:

Table 1001-3: Testing Requirements

Test	ASTM Standard	Minimum Test Frequency of Placed Material
Moisture-density Relationship	D698	One per 50 m^3
In-Situ Density	D5195	One per 300 m^3
Grain Size Distribution	D422	One per 500 m^3

END OF SECTION

SECTION 1002: HDPE GEOMEMBRANE

1.0 GENERAL

1.1 Summary

.1 This specification includes furnishing and installing HDPE geomembranes with a formulated sheet density of 0.940 g/cc or greater associated with HDPE geomembranes.

1.2 References

Where material properties are specified, the following standards are applicable:

.1 American Society for Testing and Materials (ASTM):

.a D 413, Standard Test Methods for Rubber Property—Adhesion to Flexible Substrate

.b D 638, Standard Test Method for Tensile Properties of Plastics.

.c D 751, Standard Test Methods for Coated Fabrics.

.d D 792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

.e D 1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

.f D 1204, Standard Test Method for Linear Dimensional Changes of Non Rigid Thermoplastic Sheeting or Film at Elevated Temperature.

.g D 1238, Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

.h D 1505, Standard Test Method for Density of Plastics by Density-Gradient Technique.

.i D 1603, Standard Test Method for Carbon Black in Olefin Plastics.

.j D 3895, Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis.

.k D 4218, Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.

.l D 4437, Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.

.m D 4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

.n D 5199, Standard Test Method for Measuring Nominal Thickness of Smooth Geomembranes.

.o D 5397, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefins using Notched Constant Tensile Load Test.

.p D 5596, Standard Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds.

.q D 5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.

.r D 5820, Test Method for Air Testing.

.s D 5994, Standard Test Method for Measuring Nominal Thickness of Textured Geomembranes.

.t D 6365, Standard Practice for the Non-destructive Testing of Geomembrane Seams using The Spark Test.

.u D 6392 Determining the Integrity of Non-reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.

.v D 5820-95, Pressurized Air Channel Test for Dual Seamed Geomembranes.

.2 Geosynthetic Research Institute (GRI)

.a GRI GM 9, Cold Weather Seaming of Geomembranes

.b GRI GM 10, The Stress Crack Resistance of HDPE Geomembrane Sheet

.c GRI GM 12, Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gage

.d GRI GM 13, Test Properties, Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

.e GRI GM 14, Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes

.f GRI GM 19, Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

1.3 Submittals

.1 Submit the following to the Engineer or Owner for review and approval, within a reasonable time so as to expedite shipment or installation of the Geomembrane:

.a Documentation of manufacturer's qualifications as specified in subsection 1.4 of this Section.

.b Manufacturer's Quality Control program manual or descriptive documentation.

.c A material properties sheet, including at a minimum all properties specified in GRI GM 13, including test methods used.

.d Sample of the material.

.e Documentation of Installer's qualifications, as specified below and in Subsection 1.4 of this Section:

i. Submit a list of at least ten completed facilities. For each installation, provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility; type and thickness of geomembrane and; surface area of the installed geomembrane.

ii. Submit resumes or qualifications of the Installation Supervisor, Master Seamer and Technicians to be assigned to this project.

iii. Submit written Welding Procedures for each type of weld to be used, describing the following minimum parameters. The Welding Procedure shall incorporate:

- Joint geometry.
- Specific base resins or range of resin properties for sheet and filler material to which the procedure applies (identify by manufacturer and resin name).
- Limitations with respect to positions or locations, such as slopes, vertical, overhead, etc.
- Type and extent of surface preparation required.
- Temperature settings for equipment, including descriptions for method and frequency of monitoring.

- Ambient conditions at which the procedure is applicable. Indicate method of measurement for each parameter.

.f Submit all information pertaining to the type of welding equipment to be used and provide the Owner with the opportunity to inspect a log record of maintenance and overhaul history of the seaming equipment and accessories (generator, power cords, volt meter, etc.).

.g Quality Control Program.

.2 Example Material Warranty and Liner Installation Warranty

.3 Shop Drawings

.a Submit copies of shop drawings for Engineer's approval within a reasonable time so as not to delay the start of geomembrane installation. Shop drawings shall show the proposed panel layout identifying seams and details. Seams should generally follow the direction of the slope. Butt seams or roll-end seams should not occur on a slope unless approved by the Owner or Engineer. Butt seams on a slope, if allowed, should be staggered.

.b Placement of geomembrane should not be allowed to proceed until Owner's Representative has received and approved the shop drawings.

.4 Additional Submittals (In-Progress and at Completion)

.a Manufacturer's warranty

.b Geomembrane installation warranty

.c Low-temperature seaming procedures

.d Field seam non-destructive test results

.e Field seam destructive test results

.f Daily field installation reports

.g Installation record drawing

1.4 Quality Control

.1 Manufacturer's Qualifications:

.a The manufacturer of geomembrane of the type specified or similar product shall have at least five years of experience in the manufacture of such geomembrane.

.b In addition, the geomembrane manufacturer shall have manufactured at least 1,000,000 m^2 (10,000,000 ft^2) of the specified type of geomembrane or similar product during the last five years.

.2 Installer's Qualifications

.a The Geomembrane Installer shall be the Manufacturer, approved Manufacturer's Installer or a contractor approved by the Owner's Representative to install the geomembrane.

.b The Geomembrane Installer shall have at least three years of experience in the installation of the specified geomembrane or similar. The Geomembrane Installer shall have installed at least 10 projects involving a total of 500,000 m^2 of the specified type of geomembrane or similar during the last three years.

.c Installation shall be performed under the direction of a field Installation Supervisor who shall be responsible throughout the geomembrane installation, for geomembrane panel layout, seaming, patching, testing, repairs, and all other activities of the Geomembrane Installer. The Field Installation Supervisor shall have installed or supervised the installation and seaming of a minimum

of 10 projects involving a total of 500,000 m^2 of geomembrane of the type specified or similar product.

.d Seaming shall be performed under the direction of a Master Seamer (who may also be the Field Installation Supervisor or Crew Foreman) who has seamed a minimum of 300,000 m^2 of geomembrane of the type specified or similar product, using the same type of seaming apparatus to be used in the current project. The Field Installation Supervisor and/or Master Seamer shall be present whenever seaming is performed.

.e All seaming, patching, other welding operations, and testing shall be performed by qualified technicians employed by the Geomembrane Installer.

1.5 Transport, Storage, and Handling

.1 General

.a Ensure that the geomembrane is not folded at any time during the manufacture, fabrication, shipping, or installation processes.

.2 Identification

.a Each roll of geomembrane delivered to the site shall be labelled by the manufacturer. The label shall be firmly affixed and shall clearly state the manufacturer's name, product identification, material thickness, roll number, roll dimensions, and roll weight.

.b If the manufactured rolls are assembled into panels prior to shipping, the label shall also include the panel number and the roll numbers which comprise the manufactured panel.

.3 Transportation

.a Place a sacrificial strip of membrane between the geomembrane and each strap.

.b Cut off the free ends of metal strapping prior to shipping.

.c Install protective caps to cover and protect the edge of the geomembrane during transportation.

.4 Site Handling and Storage

.a Store rolls on a sacrificial sheet at site. Continuously and uniformly support rolls on a smooth, level prepared surface.

.b Geomembrane shall be protected from mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions.

.c Rolls shall be stored away from high traffic areas.

.d Any damage to the material resulting from manufacturing, shipping, or handling shall be identified to the Owner or the Owner's Representative.

1.6 Project Conditions

.1 Geomembrane should not be installed in the presence of standing water, while precipitation is occurring, during excessive winds, or when material temperatures are outside the limits specified in Part 3.

1.7 Material Warranty

.2 Material warranty shall be five years or as otherwise agreed by the Manufacturer and the Owner.

1.8 Geomembrane Installation Warranty

.1 The Geomembrane Installer shall guarantee the geomembrane installation against defects in the installation and workmanship for two years commencing with the date of final acceptance.

2.0 PRODUCTS

2.1 Source Quality Control

.1 Manufacturing Quality Control

.a The test methods and frequencies used by the manufacturer for quality control/quality assurance of the above geomembrane prior to delivery shall be in accordance with GRI GM 13 for HDPE geomembrane or modified as required for project specific conditions.

.b The manufacturer's geomembrane quality control certifications, including results of quality control testing of the products, must be supplied to the Owner's Representative to verify that the materials supplied for the project are in compliance with all product and or project specifications in this Section. The certification shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers and corresponding shipping information.

.c The Manufacturer will provide Certification that the geomembrane and welding rod supplied for the project are made from the same material type and are compatible.

.2 Geomembrane

.a The geomembrane shall consist of new, first quality products designed and manufactured specifically for the purpose of this work which shall have been satisfactorily demonstrated by prior testing to be suitable and durable for such purposes.

.b The geomembrane rolls shall be seamless, high density polyethylene (HDPE - Formulated Sheet Density ≥ 0.94g/cc) containing no plasticizers, fillers, or extenders and shall be free of holes, blisters or contaminants, and leak free verified by 100% in line spark or equivalent testing.

.c The geomembrane shall be supplied as a continuous sheet with no factory seams in rolls.

.d The geomembrane will meet the property requirements as shown in Table 4 (GRI GM 13) below:

Table 1002-4: Geomembrane Properties

Properties	ASTM Test Method	Test Value 1.5 mm	Testing Frequency
Thickness (min ave.) – lowest individual of 10 values	D5199	Nom -10%	Per roll
Density (min)	D1505/ D792	0.940 g/cc	90,000 kg
Tensile Properties [1] (min. ave.) – Yield strength – Break strength – Yield elongation – Break elongation	D6693 Type IV	 22 kN/m 40 kN/m 12 % 700%	9,000 kg
Tear Resistance (min. ave.)	D1004	187 N	20,000 kg
Puncture Resistance (min. ave.)	D4833	480 N	20,000 kg
Stress Crack Resistance [2]	D5397 (App.)	300 hr	Per GRI-GM10
Carbon Black Content (range)	D4218[3]	2.0 – 3.0%	9,000 kg
Carbon Black Dispersion	D5596	Note[4]	20,000 kg
Oxidative Induction Time (OIT) (min. ave.)[5] a) Standard OIT - or - b) High Pressure OIT	 D3895 D5885	 100 min. 400 min.	90,000 kg
Oven Aging at 85°C[5,6] a) Standard OIT (min. ave.) - % retained after 90 days - or - b) High Pressure OIT (min. ave.) - % retained after 90 days	D5721 D3895 D5885	 55% 80%	Per each formulation
UV Resistance[7] a) Standard OIT (min. ave.) - or - b) High Pressure OIT (min. ave.) - % retained after 1,600 hrs[9]	GM11 D3895 D5885	 N.R.[8] 50%	Per each formulation

[1] Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gage length of 33 mm. Break elongation is calculated using a gage length of 50 mm.
[2] The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
[3] Other methods such as D1603 (tube furnace) or D6370 (TGA) are acceptable if an appropriate correlation to D4218 (muffle furnace) can be established.
[4] Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2 and 1 in Category 3.
[5] The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
[6] It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
[7] The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60 °C.
[8] Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
[9] UV resistance is based on percent retained value regardless of the original HP-OIT value.

Table 1002-5: Geomembrane Seam Properties

Geomembrane Nominal Thickness	1.5 mm
Hot Wedge Seams[1]	
– Shear strength [2], N/25 mm	525
– Shear elongation at break[3]	50
– Peel strength[2], N/25 mm	340
– Peel separation, %	25

[1] Also for hot air and ultrasonic seaming methods.
[2] Value listed for shear and peel strength are for 4 out of 5 test specimens; the 5th specimen can be low as 80% of the listed values.
[3] Elongation measurements should be omitted for field testing.

.e The geomembrane seams shall meet the property requirements as shown in Table 1 of GRI GM 19 and reproduced below:

Table 1002-6: Geotextile Properties

Property [1]	ASTM Test Method	Unit	MARV (12 oz)
Weight (typical)	D5261	oz/yd^2 (g/m^2)	12.0 (407)
Grab Tensile	D4632	lbs (kN)	300 (1.33)
Grab Elongation	D4632	%	50
Trapezoid Tear Strength	D4533	lbs (kN)	115 (0.511)
Puncture Resistance	D6241	lbs (kN)	790 (3.51)
U.V. Resistance[2]	D4355	%/hrs	70/500

[1] All values are Minimum Average Roll Value except UV resistance which is minimum value.
[2] Evaluation to be on a 2.0-inch strip tensile specimen after 500 hours of exposure.

3.0 EXECUTION

3.1 Subgrade Preparation

.1 The subgrade shall be prepared in accordance with the project specifications. The geomembrane subgrade shall be uniform and free of sharp or angular objects that may damage the geomembrane prior to installation of the geomembrane.

.2 The Geomembrane Installer and Owner's Representative shall inspect the surface to be covered with the geomembrane on each day's operations prior to placement of geomembrane to verify suitability.

.3 The Geomembrane Installer and Owner's Representative shall provide daily written acceptance for the surface to be covered by the geomembrane in that day's operations. The surface shall be maintained in a manner to ensure subgrade suitability.

.4 All subgrade damaged by construction equipment and deemed unsuitable for geomembrane deployment shall be repaired prior to placement of the geomembrane. All repairs shall be approved by the Owner's Representative and the Geomembrane Installer.

3.2 Geomembrane Placement

.1 No geomembrane shall be deployed until the applicable certifications and quality control certificates listed in Part 1 of this Section are submitted to and approved by the Owner's Representative within the

timeframe specified in the Contract Documents. If the material does not meet project specifications it shall be removed from the work area.

.2 The geomembrane shall be installed to the limits shown on the project Drawings and essentially as shown on approved panel layout drawings.

.3 No geomembrane material shall be unrolled and deployed if the material temperatures are lower than 0 degrees C unless otherwise approved by the Owner's Representative in writing. The specified minimum temperature for material deployment may be adjusted by the Owner's Representative. Temperature limitations should be defined in the preconstruction meeting. Typically, only the quantity of geomembrane that will be anchored and seamed together in one day should be deployed.

.4 No vehicular traffic shall travel on the geomembrane other than an approved low ground pressure vehicle or equivalent.

.5 Sand bags or equivalent ballast shall be used as necessary to temporarily hold the geomembrane material in position under the foreseeable and reasonably-expected wind conditions. Sand bag material shall be sufficiently close-knit to prevent soil fines from working through the bags and discharging on the geomembrane.

.6 Geomembrane placement shall not be done if moisture prevents proper subgrade preparation, panel placement, or panel seaming. Moisture limitations should be defined in the preconstruction meeting.

.7 Damaged panels or portions of the damaged panels which have been rejected shall be marked and their removal from the work area recorded.

.8 The geomembrane shall not be allowed to "bridge over" voids or low areas in the subgrade. The geomembrane shall rest in intimate contact with the subgrade.

.9 Wrinkles caused by panel placement or thermal expansion should be minimized.

.10 Build in adequate slackness to allow for thermal contraction without significant applied stress at temperatures between ambient temperature at installation and -50 degrees C.

.11 Considerations on Site Geometry: In general, seams shall be oriented parallel to the line of the maximum slope. In corners and odd shaped geometric locations, the total length of field seams shall be minimized. Seams shall not be located at low points in the subgrade unless geometry requires seaming at such locations and if approved by the Owner's Representative. Welds on slopes must be constructed with the upper panel overtop of the lower panel.

.12 Overlapping: The panels shall be overlapped prior to seaming to whatever extent is necessary to affect a good weld and allow for proper testing. In no case shall this overlap be less than 75 mm.

3.3 Equipment

.1 The Geomembrane Installer shall maintain at least one spare operable seaming unit on site at all times.

3.4 Seaming Procedures

.1 The welding technique shall produce a joined interface of uniform properties across the full width of the weld.

.2 Welding may only be performed within the "window" of parameters supplied by the Contractor in the written Welding Procedures.

.3 Portable structures may be used to facilitate attainment of these parameters in the area to be seamed, but must be approved by the Owner's representative.

.4 Welding shall not proceed when the prepared surfaces cannot be maintained free of moisture.

.5 All surfaces to be joined shall be cleaned free of grease, oils, dirt, and foreign material.

.6 Prepared surfaces shall not remain exposed for more than 30 minutes before welding.

.7 Cold weather installations should follow guidelines as outlined in GRI GM9.

.8 No geomembrane material shall be seamed when liner temperatures are less than 0 degrees C unless the following conditions are complied with:

.a Seaming of the geomembrane at material temperatures below 0 degrees C (measured 150 mm above the geomembrane surface) is allowed if the Geomembrane Installer can demonstrate to the Owner's Representative, using pre-qualification test seams, that field seams comply with the project specifications, the safety of the crew is ensured, and geomembrane material can be fabricated (i.e. pipeboots, penetrations, repairs. etc.) at sub-freezing temperatures.

.b The Geomembrane Installer shall submit to the Owner's Representative for approval, detailed procedures for seaming at low temperatures, possibly including the following:

i. Preheating of the geomembrane

ii. The provision of a tent or other device if necessary to prevent heat losses during seaming and rapid heat losses subsequent to seaming.

iii. Number of test welds to determine appropriate seaming parameters

.9 No geomembrane material shall be seamed when the sheet temperature is above 75 degrees C as measured by an infrared thermometer or surface thermocouple unless otherwise approved by the Owner's Representative. This approval will be based on recommendations by the manufacturer and on a field demonstration by the Geomembrane Installer using prequalification test seams to demonstrate that seams comply with the specification.

.10 Seaming shall primarily be performed using automatic fusion welding equipment and techniques. Extrusion welding shall be used where fusion welding is not possible such as at pipe penetrations, patches, repairs, and short (less than a roll width) runs of seams.

.11 Fishmouths or excessive wrinkles at the seam overlaps shall be minimized and when necessary cut along the ridge of the wrinkles back into the panel so as to effect a flat overlap. The cut shall be terminated with a keyhole cut (nominal 10 mm diameter hole) so as to minimize crack/tear propagation. The overlay shall subsequently be seamed. The key hole cut shall be patched with an oval or round patch of the same base geomembrane material extending a minimum of 150 mm beyond the cut in all directions.

3.5 Field Quality Control

The Owner's Representative shall be notified prior to all pre-qualification and production welding and testing, or as agreed upon in the preconstruction meeting.

.1 Prequalification Test Seams

.a Test seams shall be prepared and tested by the Geomembrane Installer to verify that seaming parameters (speed, temperature, and pressure of welding equipment) are adequate.

.b Test seams shall be made by each welding technician and tested in accordance with ASTM D 4437 at the beginning of each seaming period. Test seaming shall be performed under the same conditions and with the same equipment and operator combination as production seaming. The test seam shall be approximately 3.3 m long for fusion welding and 1 m long for extrusion welding with the seam centered lengthwise. At a minimum, test seams should be made by each technician one time every four to six hours; additional tests may be required with changes in environmental conditions.

.c Two 25 mm wide specimens shall be die-cut by the Geomembrane Installer from each end of the test seam. These specimens shall be tested by the Geomembrane Installer using a field tensiometer testing both tracks for peel strength and also for shear strength. Each specimen should fail in the parent material and not in the weld, “Film Tear Bond"(F.T.D. failure). Seam separation equal to or greater than 25% of the track width shall be considered a failing test.

.d The minimum acceptable seam strength values to be obtained for all specimens tested are listed in Part 2 of this Section. Four specimens shall pass for the test seam to be a passing seam.

.e If a test seam fails, an additional test seam shall be immediately conducted. If the additional test seam fails, the seaming apparatus shall be rejected and not used for production seaming until the deficiencies are corrected and a successful test seam can be produced.

.f A sample from each test seam shall be labelled. The label shall indicate the date, geomembrane temperature, number of the seaming unit, technician performing the test seam, and pass or fail description. The sample shall then be given to the Owner's Representative for archiving.

.2 Field Seam Non-Destructive Testing

.a All field seams shall be non-destructively tested by the Geomembrane Installer over the full seam length before the seams are covered. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of tester, and outcome of all non-destructive testing shall be recorded and submitted to the Owner's Representative.

.b Testing should be done as the seaming work progresses, not at the completion of all field seaming, unless agreed to in advance by the Owner's Representative. All defects found during testing shall be numbered and marked immediately after detection. All defects found should be repaired, retested, and remarked to indicate acceptable completion of the repair.

.c Non-destructive testing shall be performed using vacuum box, air pressure, or spark testing equipment.

.d Non-destructive tests shall be performed by experienced technicians familiar with the specified test methods. The Geomembrane Installer shall demonstrate to the Owner's Representative all test methods to verify that the test procedures are valid.

.e Extrusion seams shall be vacuum box tested by the Geomembrane Installer in accordance with ASTM D 4437 and ASTM D 5641 with the following equipment and procedures:

.f The vacuum pump shall be charged and the tank pressure adjusted to approximately 35 kPa.

.g The Geomembrane Installer shall create a leak tight seal between the gasket and geomembrane interface by wetting a strip of geomembrane approximately 0.3 m by 1.2 m (length and width of box) with a soapy solution, placing the box over the wetted area, and then compressing the box against the geomembrane. The Geomembrane Installer shall then close the bleed valve, open the vacuum valve, maintain initial pressure of approximately 35 kPa for approximately 5 seconds. The geomembrane should be continuously examined through the viewing window for the presence of

soap bubbles, indicating a leak. If no bubbles appear after five seconds, the area shall be considered leak free. The box shall be depressurized and moved over the next adjoining area with an appropriate overlap and the process repeated.

.h All areas where soap bubbles appear shall be marked, repaired and then retested.

.i At locations where seams cannot be non-destructively tested alternate non-destructive spark testing or equivalent should be substituted.

.j Equipment for Spark testing shall be comprised of but not limited to: A hand held holiday spark tester and conductive wand that generates a high voltage

.k The testing activities shall be performed by the Geomembrane Installer by placing an electrically conductive tape or wire beneath the seam prior to welding. A trial seam containing a non-welded segment shall be subject to a calibration test to ensure that such a defect (non-welded segment) will be identified under the planned machine settings and procedures. Upon completion of the weld, enable the spark tester and hold approximately 25 mm above the weld moving slowly over the entire length of the weld in accordance with ASTM 6365. If there is no spark the weld is considered to be leak free.

.l A spark indicates a hole in the seam. The faulty area shall be located, repaired and retested by the Geomembrane Installer.

.m Care should be taken if flammable gases are present in the area to be tested.

.n All seams that are vacuum tested shall be marked with the date tested, the name of the technician performing the test and the results of the test.

.o Double Fusion seams with an enclosed channel shall be air pressure tested by the Geomembrane Installer in accordance with ASTM D 5820 and ASTM D 4437 and the following equipment and procedures:

.p Equipment for testing double fusion seams shall be comprised of but not limited to: an air pump equipped with a pressure gauge capable of generating and sustaining a pressure of 210 kPa mounted on a cushion to protect the geomembrane; and a manometer equipped with a sharp hollow needle or other approved pressure feed device.

.q The Testing activities shall be performed by the Geomembrane Installer. Both ends of the seam to be tested shall be sealed and a needle or other approved pressure feed device inserted into the tunnel created by the double wedge fusion weld. The air pump shall be adjusted to a pressure of 210 kPa, and the valve closed. Allow two minutes for the injected air to come to equilibrium in the channel, and sustain pressure for five minutes. If pressure loss does not exceed 28 kPa after this five minute period the seam shall be considered leak tight. Release pressure from the opposite end verifying pressure drop on needle to ensure testing of the entire seam. The needle or other approved pressure feed device shall be removed and the feed hole sealed.

.r If loss of pressure exceeds 28 kPa during the testing period or pressure does not stabilize, the faulty area shall be located, repaired, and retested by the Geomembrane Installer.

.s Results of the pressure testing shall be recorded on the liner at the seam tested and on a pressure testing record.

.3 Destructive Field Seam Testing

.a One destructive test sample per 150 linear m seam length or another predetermined length in accordance with GRI GM 14 shall be taken by the Geomembrane Installer from a location specified by the Owner's Representative. The Geomembrane Installer shall not be informed in advance of the sample location. In order to obtain test results prior to completion of geomembrane installation, samples shall be cut by the Geomembrane Installer as directed by the Owner's Representative as seaming progresses.

.b All field samples shall be marked with their sample number and seam number. The sample number, date, time, location, and seam number shall be recorded. The Geomembrane Installer shall repair all holes in the geomembrane resulting from obtaining the seam samples. All patches shall be vacuum box tested or spark tested. If a patch cannot be permanently installed over the test location on the same day of sample collection, a temporary patch shall be tack welded or hot air welded over the opening until a permanent patch can be affixed.

.c The destructive sample size shall be 300 mm wide by 1 m long with the seam centered lengthwise. The sample shall be cut into three equal sections and distributed as follows: one section given to the Owner's Representative as an archive sample; one section given to the Owner's Representative for laboratory testing as specified in Paragraph 5 below; and one section retained by the Geomembrane Installer for field testing as specified in Paragraph 6 below.

.d For field testing, the Geomembrane Installer shall cut 10 identical 25 mm wide replicate specimens from the sample. The Geomembrane Installer shall test five specimens for seam shear strength and five for peel strength as per ASTM 6392. Peel tests will be performed on both inside and outside weld tracks. To be acceptable, four of five test specimens must pass the stated criteria in Part 2 with less than 25% separation. If four of five specimens pass, the sample qualifies for testing by the testing laboratory if required.

.e If independent seam testing is required by the specifications it shall be conducted in accordance with ASTM 5820 or ASTM D4437 or GRI GM 6.

.f Reports of the results of examinations and testing shall be prepared and submitted to the Owner's Representative.

.g For field seams, if a laboratory test fails, that shall be considered as an indicator of the possible inadequacy of the entire seamed length corresponding to the test sample. Additional destructive test portions shall then be taken by the Geomembrane Installer at locations indicated by the Owner’s Representative; typically 3 m on either side of the failed sample and laboratory seem tests shall be performed. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of non-adequate seams and all seams represented by the destructive test location shall be repaired with a cap-strip extrusion welded to all sides of the capped area. All cap-strip seams shall be non-destructively vacuum box tested until adequacy of the seams is achieved. Cap strip seams exceeding 50 m in length shall be destructively tested.

.4 Destructive test results shall be reported prior to covering of liner or within 48 hours.

.5 Identification of Defects

.a Panels and seams shall be inspected by the Installer and Owner's Representative during and after panel deployment to identify all defects, including holes, blisters, undispersed raw materials, and signs of contamination by foreign matter.

.6 Evaluation of Defects: Each suspect location on the liner (both in geomembrane seam and non-seam areas) shall be non-destructively tested using one of the methods described previously. Each location which fails non-destructive testing shall be marked, numbered, measured and posted on the daily "installation" drawings and subsequently repaired.

.a If a destructive sample fails the field or laboratory test, the Geomembrane Installer shall repair the seam between the two nearest passed locations on both sides of the failed destructive sample location.

.b Defective seams, tears, or holes shall be repaired by reseaming or applying a extrusion welded cap strip.

.c Reseaming may consist of either:

i. Removing the defective weld area and rewelding the parent material using the original welding equipment; or

ii. Reseaming by extrusion welding along the overlap at the outside seam edge left by the fusion welding process.

.d .Blisters, larger holes, and contamination by foreign matter shall be repaired by patches and/or extrusion weld beads as required. Each patch shall extend a minimum of 150 mm beyond all edges of the defects.

.e All repairs shall be measured, located and recorded

.7 Verification of Repairs on Seams: Each repair shall be non-destructively tested using either vacuum box or spark testing methods. Tests which pass the non-destructive test shall be taken as an indication of a successful repair. Failed tests shall be reseamed and retested until a passing test results. The number, date, location, technician, and test outcome of each patch shall be recorded.

.8 Field Installation Reports: At the beginning of each day's work, the Installer shall provide the Owner's Representative with daily reports for all work accomplished on the previous work day. Reports shall include the following:

.a Total amount and location of geomembrane placed;

.b Total length and location of seams completed, name of technicians doing seaming and welding unit numbers;

.c Drawings of the previous day's installed geomembrane showing panel numbers, seam numbers and locations of non-destructive and destructive testing;

.d Results of pre-qualification test seams;

.e Results of non-destructive testing; and

.f Results of vacuum testing of repairs.

.g Hourly temperatures during seaming which includes the actual temperature of the surface of the geomembrane (using a pyrometer) and the ambient air temperature measured approximately 1 m above the geomembrane.

.h The method of removing frost from the area to be seamed (if any is present), as well as drying and cleaning of the surfaces involved, should be described.

.i The condition of the subgrade beneath the area being seamed should be assessed. If a rub sheet is used during the seam process it should be noted.

.j Complete identification of the field seaming system used, including material, methods, preheat, seaming rate, use of tents or enclosures and other details of the procedure should be documented.

.k The type, nature, number, condition, and details of trial seams, as well as the results of such tests, should be detailed.

.l The type, nature, number, and details of destructive samples and disposition of sections of the sample should be described. Proper identification is required to identify results of CQA laboratory testing in the final as-built plans of the project.

.m Any unusual condition with respect to personnel, equipment, sampling, and/or testing that may be attributable to the cold weather should be described and documented.

.9 Additional Documentation

.a A panel is defined as the unit area of a geomembrane which is to be seamed in the field. If the liner is not fabricated into panels prior to delivery, then a panel is considered to be a roll or a portion of a roll of material.

.b Each panel shall be given a Panel Identification Code, consistent with the layout plan. The Panel I.D. Code will be used for all Quality Assurance records.

.c Each Field-seam shall be identified and sequentially numbered on the as-built drawing. Include the date of seaming, identifying number of welding machine, and operator name. Identify on the drawing where the machine or operator was changed.

.d If a fabricated panel is being used, the Contractor shall also indicate the locations of all factory seams on this drawing, and shall differentiate between field seams and factory seams.

3.6 Liner Acceptance

.1 Geomembrane liner will be accepted by the Owner's Representative when:

.a The entire installation is finished or an agreed upon subsection of the installation is finished;

.b All Installer’s QC documentation is completed and submitted to the owner

.c Verification of the adequacy of all field seams and repairs and associated geomembrane testing is complete.

3.7 Anchor Trench

.1 Construct as specified on the project Drawings.

3.8 Disposal of Scrap Materials

.1 On completion of installation, the Geomembrane Installer shall dispose of all trash and scrap material in a location approved by the Owner, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner. No scrap material shall be allowed to remain on the geomembrane surface.

END OF SECTION

SECTION 1003: GEOTEXTILE

1.0 GENERAL

1.1 General

.1 This specification covers nonwoven geotextile test properties for subsequent use as protection (or cushioning) materials. The typical use will be as a protective covering or underlayment of a geomembrane against puncture or tear due to rock, stones, concrete, or other hard surfaces and/or objects.

1.2 References

Where material properties are specified, the following standards are applicable:

American Society for Testing and Materials (ASTM)

.1 ASTM D 4354 Practice for Sampling of Geosynthetics for Testing.

.2 ASTM D 4355 Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).

.3 ASTM D 4533 Test Method for Trapezoidal Tearing Strength of Geotextiles.

.4 ASTM D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles.

.5 ASTM D 4759 Practice for Determining the Specification Conformance of Geosynthetics.

.6 ASTM D 4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

.7 ASTM D 4873 Guide for Identification, Storage and Handling of Geotextiles.

.8 ASTM D 5261 Test Method for Measuring Mass per Unit Area of Geotextiles.

.9 ASTM D 5494 Test Method for the Determination of Pyramid Puncture Resistance of Unprotected and Protected Geomembranes.

.10 ASTM D 6241 Test Method for Static Puncture Strength of Geotextiles and Geotextile Related Product Using a 50-mm Probe.

Geosynthetic Research Institute (GRI)

.1 GRI GT12. Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials.

2.0 PRODUCTS

2.1 Materials

.1 12 oz. needle-punched nonwoven geotextile made of 100% polypropylene staple fibers conforming to the following properties to meet or exceed GRI GT12.

.a Table:

Table 1003-7 Geotextile Properties

PROPERTY (1)	TEST METHOD	UNIT	MARV (12 oz.)
Weight (Typical)	ASTM D5261	oz/yd^2 (g/m^2)	12.0 (407)
Grab Tensile	ASTM D4632	lbs (kN)	300 (1.33)
Grab Elongation	ASTM D4632	%	50
Trapezoid Tear Strength	ASTM D4533	lbs (kN)	115 (0.511)
Puncture Resistance	ASTM D6241	lbs (kN)	790 (3.51)
U.V. Resistance (2)	ASTM D4355	%/hrs	70/500

Notes:
(1) All values are Minimum Average Roll Value except UV resistance which is a minimum value.
(2) Evaluation to be on a 2.0-inch strip tensile specimen after 500 hours of exposure.

3.0 EXECUTION

3.1 General

.1 Deliver, store, and handle geotextile in accordance with ASTM D4873.

.a Delivery: Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight and contaminants. The protective wrapping shall be maintained during periods of shipment and storage. The plastic wrapping shall not be removed until deployment. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Label each roll with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

.b Storage: During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile. To protect geotextile from becoming saturated, either elevate rolls off the ground or place them on a sacrificial sheet of plastic in an area where water will not accumulate.

.c Handling: Handle and unload geotextile rolls with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

.2 Installation

.a Place geotextile directly on top of and below geomembrane as shown on the drawings. The surface must be smooth and free of sharp objects.

.b Where located below a geomembrane, maintain intimate contact between geotextile and soil so that no void spaces occur. Avoid laps and folds in the geotextile.

.c Employ sufficient anchorage to hold the geotextile in place during deployment and backfilling.

.d Do not cover geotextile prior to inspection and approval by the Owner's Representative.

.e Place fill material or geomembrane immediately after inspection is complete.

.f Placement of soil cover soil:

i. Place in a manner that prevents soil from entering the geotextile overlap zone, prevents tensile stress from being mobilized in the geotextile, and prevents wrinkles from folding over onto themselves.

ii. Maximum drop height for fill directly onto geotextile is 1 m.

iii. Minimum lift thickness prior to starting compaction is 300 mm.

.g On side slopes, soil backfill shall be placed from the bottom of the slope upward.

.h Seams and Joints: Seams shall be overlapped, minimum overlap 600 mm.

.i Heat tack or sew seams.

.j Anchor the geotextile at the perimeter of the landfarm as shown on the Drawings.

.3 Protection

.a Do not permit passage of any vehicle directly on the geotextile.

END OF SECTION

SECTION 1004: SURVEYING

1.0 GENERAL

1.1 Qualifications of Surveyor

.1 Qualified experienced Surveyor(s), acceptable to Owner's Representative.

1.2 Survey Reference Points

.1 Locate, confirm, and protect control points prior to starting site work.

.2 Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Owner's Representative.

.4 Report to Owner's Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

2.0 PRODUCTS

2.1 Survey Equipment

.1 RTK GPS receiver and base station with minimum 0.01 m accuracy, tripod, spare battery, battery charger, downloading hardware and software and all associated ancillary items (cables, hardlock, etc.).

.2 Automatic level with tripod.

.3 Single prism with 5 m collapsible range pole.

.4 Triple prism with tripod.

.5 50 m cloth tape (steel reinforced).

.6 5 m collapsible level rod.

.7 Magnetic pin finder (high frequency).

2.2 Survey Markers

.1 Provide all survey markers and other items required to complete work as specified, including, but not limited to:

.a Pointed stakes (minimum 1.2 m in length, 12 mm thick, 38 mm wide)

.b Pointed hubs (minimum 0.5 m in length, 20 mm thick, 38 mm wide)

.c Nails (100 mm long), spikes (250 mm long), pins (1 m long), etc.

.d Fluorescent paint, flagging, etc.

.e Felt markers, chalk, wax pens, etc.

.2 Maintain supply of survey markers for Owner's Representative's use

3.0 EXECUTION

3.1 General

.1 Establish stable temporary survey control points for use in laying out work.

.2 Establish lines and levels, locate, and lay out, by instrumentation.

.3 Prepare a topographic map of work sites prior to construction as directed by Owner's Representative to provide a baseline survey.

.4 Stake location of facilities in the field, and prepare a record drawing showing final location and contours of the facilities.

.5 Maintain surveys for quantity calculations.

3.2 Records

.1 Maintain a complete, accurate log of control and survey work as it progresses.

3.3 Submittals

.1 Submit name of Surveyor(s) to Owner's Representative.

.2 On request of Owner's Representative, submit documentation (e.g. raw survey observations) to verify accuracy of work. Maintain accuracy to 0.01 m vertically and 0.01 m horizontally.

.3 Topographic survey data shall include sufficient points and changes in slope to accurately depict the topography.

.4 Submit survey data backup for quantities of earthworks fill materials.

.5 Submit survey data in the following electronic formats or equivalent:

.a Survey point file (.csv or .xls).

.b AutoCAD File (.dxf or .dwg).

.c Copy of survey field book or field book file (.fbk).

.6 All survey data files must include the following information:

.a Date of survey, descriptive site name, and site location.

.b Survey point information including point number, descriptor, UTM co-ordinates with NAD83 datum, and elevation from sea level.

END OF SECTION

Appendix F -
Waste Sorting Guidelines

The information contained herein is proprietary to Baffinland Iron Mines Corporation and is used solely for the purpose for which it is supplied.
It shall not be disclosed in whole or in part, to any other party, without the express permission in writing by Baffinland Iron Mines Corporation.

Note: This is an UNCONTROLLED COPY. All staff members are responsible to ensure the latest revision is used.

WASTE SORTING GUIDELINES

Why sort waste?

To protect the health and safety of site personnel.
To minimize contamination, wildlife attraction, and other adverse environmental impacts.

Where to sort waste?

Workplaces and the Waste Sorting Areas (and future Waste Management Buildings).

Who should sort waste?

Everyone.
All who manage, handle, store and/or dispose of any of the materials mentioned in these guidelines.

- *All employees and contractors generating waste are responsible for ensuring that it is labeled and sorted correctly.*
- *Employees and contractors are also responsible for contacting BIM Site Services Supervisor on channel 4 when waste containers are full and ready for pick-up.*
- *For unusual or hard to segregate waste types, please contact the Environmental Department.*

INCINERATOR WASTE

Disposal Instructions

Indoors – all waste bins indoors unless marked otherwise.
Outdoors - Small red dumpsters with latched doors on top.

Acceptable Waste

Cardboard
Food Scraps
Oily Rags
Paper
Small Plastics

Note: All clean untreated wood (e.g. lumber, timber, pallets) to be stockpiled and taken to the wood storage area.

LANDFILL WASTE

Disposal Instructions

Outdoors – Large open top red roll-off dumpsters
Access to the Mine Site Non-Hazardous Landfill is for **Authorized Personnel Only**. Landfill operators should refer to the landfill user rules for more information.

Acceptable Waste

Concrete
Empty Clean Containers
Glass
Metal
Bulky Clean Plastics (i.e. packaging, clean liner)
Plywood and other treated wood products

HAZARDOUS WASTE

Waste Type	Disposal Instructions
Absorbent (used)	White Quatrex bag or sealable drum
Aerosol Cans	Labeled bins/buckets indoors; sealable drums outdoors
Antifreeze	Cubes or sealable drums
Batteries (AA, 9V, etc.)	Labeled bins/buckets indoors
Batteries (vehicle)	Black Quatrex bag
Contaminated Soil	White Quatrex bag or sealable drums
Contaminated Water	Sealable drums
Electronic Waste	White Quatrex bag
Fluorescent Bulbs	Labeled bins/buckets indoors
Mixed Contaminated Waste Containers	White Quatrex (antifreeze, grease, oil, polymer, etc.)
Waste Fuel	Sealable drums
Waste Grease	Sealable drums
Waste Oil	Cubes or sealable drums
Waste Oil Filters	Sealable drums

Appendix G -
2014 Work Plan and Updated Site Layout Drawings

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Baffinland

WORK PLAN

2014

31 October 2013

Table of Contents

1. INTRODUCTION

The following document presents the 2014 Work Plan as required under Section 6.1 of the Commercial Lease, No. Q13C301, agreed between Baffinland Iron Mines Corporation and the Qikiqtani Inuit Association. Additionally, this document is a requirement under the Type A Water Licence 2AM-MRY1325 for the purposes of an Annual Security Review for activities undertaken on an annual basis. In the event the Project does not advance, all work items described and constructed as per the 2014 Work Plan will be subject to reclamation, as per relevant regulatory and permit obligations.

Given that the proposed Early Revenue Phase (ERP) is currently under review, this document separates out activities that may occur if the ERP is approved, separate from activities that are planned to proceed as part of the approved Project. In order to align this document with the structure defined within the Commercial Lease, wording in italicized blue throughout this document is used to highlight wording from the Commercial Lease.

2. 2014 WORK PLAN

2.1 2014 SCOPE OF WORK

The Tenant shall provide: *"A description of the Operations and Work that the Tenant expects to perform in the next Year, and an identification of the Lands, within existing or proposed Land Use Areas that are to be specifically identified within the Property, where such Operations and Work shall occur"*

This 2014 Work Plan provides for:

1. The continued development and construction of infrastructure required at Milne Port and the Mine Site for the Mary River Project.
2. For Milne Port, it is expected that sealifts will occur during open water (approximately between July 15th and October 1st 2014). An estimated 7 vessels (dimension of barges approximately 35 m x 140 m) will be necessary to transport the equipment and material required for the execution of the 2014 Work. Material, equipment, fuel and supplies required for construction activities at the Mine Site and the operation of the Mary River facilities will be transported to the Mine Site via the Tote Road year round.
3. Ongoing environmental baseline data collection and geotechnical drilling in order to sustain the development of the Project will continue. These activities will resume at the Milne Port site, along the Tote Road, at the Mine Site, at numerous quarry sites and at other Project development areas.
4. Continual environmental monitoring in accordance with the approved environmental management monitoring and mitigation plans.
5. Continued archaeological surveys at project component areas as required.

There will be continued progressive reclamation of areas of current and past use in association with drilling, bulk sample, and historical exploration programs. In addition, progressive reclamation plans will include:

- Implementation of an action plan, developed and submitted in 2013, to address concerns from stakeholders about long term salt storage;
- Implementation of a program to dispose of existing inventory incinerator bottom ash in the existing Mary River Landfill and the development of a plan to manage and dispose of ash being generated on an ongoing basis;
- Completion of the ongoing decommissioning of the existing bladder farm at Milne Inlet. Work includes the transport of hydrocarbon impacted soils to the planned landfarm facility;
- Commence decommissioning of the existing Mary River bladder farm;
- Continue the development and implementation of a long term multi-year plan to address localized areas of permafrost melting associated with current borrow areas, and taking into consideration the longer term designs for the Tote Road upgrades and new quarry development;
- Demobilization of equipment and supplies not required for near term activities, as well as the current inventory of hazardous waste and other materials by means of sealift from Milne Port;
- Continued development of the Mine Site landfill and deposition of non-hazardous wastes in accordance with the landfill operations and maintenance manual; and,
- Discharge of treated sewage stored in existing PWSPs at the Mary River Camp and Milne Inlet after treatment as required. Two periods of discharge are planned, the first corresponding to freshet (May-June), and the second later in the summer if required.
- Ongoing removal from the site, or safe disposal on-site of infrastructure, equipment and supplies no longer required for ongoing construction and operations. The items are defined by the Mary River Project Interim Abandonment and Reclamation Plan, and include infrastructure and site materials, fuel caches, drums, barrels, buildings and contents, docks, water pumps and lines, material and equipment prior to the expiry of applicable permits. Where required, internal roads will be re-graded to restore natural drainage to reduce erosion.
- Unless otherwise identified within the approved Abandonment and Reclamation Plan under this Licence, where roads are no longer in use, Baffinland will remove culverts and open the natural drainage channel. In carrying out this activity, measures will be implemented to minimize erosion and sedimentation.
- Areas that have been contaminated by hydrocarbons from normal fuel transfer, handling and storage activities will be reclaimed to meet objectives as outlined in the Government of Nunavut's Environmental Guideline for Site Remediation, 2010. The use of reclaimed soils for the purpose of back fill or general site grading may be carried out

only upon consultation and approval by the Government of Nunavut, Department of Environment and an Inspector.

The Work Plan is presented within the context of the applicable regulatory authorizations and schedule. Baffinland holds, or will soon hold, all the permits and authorizations required to carry out the 2014 Work Plan. The main regulatory instruments that allow for the 2014 Work Plan activities include:

- Project Certificate No. 005
  - All works and activities proposed have been screened by the NIRB and have been considered in the Project Certificate issued by the NIRB on December 28, 2012.
- Type A Water Licence (2AM-MRY1325)
  - All works and activities planned for 2014 are within the scope of the licence.
- Type B Water Licence (2BB-MRY1114)
  - The renewed Type B Water Licence (application to be submitted in November 2013) will authorize Baffinland to undertake mineral exploration activities, geotechnical and exploration drilling programs, construction of ice roads, ongoing operation, maintenance and upgrades to existing pioneer camps at Steensby Inlet and Mid Rail, construction of airstrips on lakes for winter months and potential bulk sampling.
- Quarry Permits
  - Schedule 'B' Quarry Concession Agreement under IOL Commercial Lease New Lease, Q13C301.
  - It is anticipated that quarrying of rock and gravel from permitted quarry locations (as shown on Schedule "A1") of the IOL Commercial Lease will continue. In addition, Baffinland will be applying for access and quarry permits to extract rock and gravel material adjacent and near the existing Milne Inlet Tote Road by means of an Amendment to the existing Schedule 'B' to the Lease.
  - New quarries are needed at the following locations:
    1. Q7, Tote Road Station 5+560,
    2. Q11, Tote Road Station 28+400,
    3. P1, Tote Road Station 86+000,
    4. Q19, Tote Road Station 163+500
    5. Deposit No. 1 Quarry 2 (D1Q1), Haul Road Station 6+540
    6. Deposit No. 1 Quarry 1 (D1Q2), Haul Road Station 2+000
- Ongoing operation of existing borrow source areas adjacent to Tote Road at Km 2 (formerly borrow source no. 1), and Km 97 (formerly borrow source no. 3).

- The construction of access roads from the Tote road will be necessary to access quarry locations. Where it is necessary, culvert crossings will be installed along the access roads.
- AANDC Land Use Permit and Quarry Permit to access existing and possibly new borrow and rock quarries adjacent and near the Tote Road (currently covered under the Class A Crown Land Use Permit, N2007F004, and Quarry Permit, 2013QP0086).

Appendix A includes layouts H349000-1000-00-015-0001, H349000-1000-00-015-0002, H349000-1000-00-015-0003 and H349000-1000-00-015-0004.

2.2 INFRASTRUCTURE AND CONSTRUCTION WORKS

The Tenant shall provide: *"A description of the topographical features and any natural or manmade features, structures or works that may be affected by the Tenant's Operations and Work within existing or proposed Land Use Areas that are to be specifically identified within the Property;"*

Construction activities forecast for 2014 under Project Certificate No. 005 include:

Milne Inlet

During the sealift, most of the activities at Milne Port will focus on unloading the barges and positioning received equipment and material in designated laydown areas. In addition, the following construction activities will continue:

- Continue to install Project Wide Communication and IT Infrastructure;
- Construct remaining earth/rock fill for laydown areas, the concrete batch plant pad, and local site roads within the Milne site not completed in 2013;
- Construct rip-rap lined rock fill embankment for Ramp to the Beach;
- Install Emergency Services building;
- Install services maintenance buildings including the Concrete Batch Plant Building, Milne Maintenance Building, Milne Workshop office, Milne Welding Shop and workshop office;
- Install Power and Generation systems;
- Construct and commission one 12 ML diesel fuel Storage Tank and one 750,000 L Jet A fuel Storage Tank;
- Install concrete floor slab on grade at the Sewage Treatment Truck Building, Welding Shop and Maintenance Building;
- Construct Hazardous Waste Containment Area(s) for storage of hazardous wastes;
- Construct the Waste Disposal Land Farm, contaminated snow dump and containment pad;
- Install Servicing Buildings E-Houses;

- Install Power Supply and Distribution for Warehouses;
- Install Electrical Devices for Batch Plant Building.

Tote Road

All equipment, material, fuel, and supplies required for construction and operation activities at Mary River will be transported from Milne Port to the Mine Site via the Tote Road.

The upgrade of the road commenced late in 2013 and is expected to take 8 to 10 months. During 2014 the activities associated with the upgrade to the Tote Road include;

- Improvements;
- Reduce maximum slopes,
- Increase turn radius;
- Increase culvert size where required;
- Modify and/or upgrade water crossings (culverts and bridges), including of removal of sea-can bridges;
- Installation of culverts as required;
- Crush material as required, haul, place and compact new rock fill per design;
- Installation and maintenance of erosion control devices;
- Construct ditches with rip rap as required;
- Commence the development of Quarries Q7, Q11, Q19 and borrow pit P1 to provide access to aggregate for upgrades;
- Drill, blast and excavate as required to reduce steep grades and improve curves where necessary and to improve sight distance and visibility along the road;
- Construct abutment and approach areas at river crossings; and
- Install four single span bridges.

Mine Site

Construction activities at the Mine Site will consist of:

- Construct, install and grade Waste Rock Haul Road, Waste rock pad, drainage ditches and settling pond;
- Construct crusher pad, ore stockpile pad area, drainage ditches and settling pond for mining operations;
- Receive mobile equipment for materials handling, maintenance and site services;
- Install and commission emulsion plant;
- Construct Pit 1 Haul Road ;

- Commence development of the preliminary Deposit One pit benches;
- Installation of a pit office facility at a temporary location and dismantling of same later in the year;
- Install and construct permanent Pit Office Building;
- Set up crushing and screening mobile equipment;
- Install truck weigh facility;
- Erect and install concrete batch plant;
- Upgrade (extend) the Mary River airstrip;
- Install aerodrome office, field electrical center, airfield lighting and visual aids as well as power generation and fuel supply systems;
- Installation and commissioning of Services Buildings including maintenance shop, warehouse, welding shop, workshop and washcar buildings;
- Installation of temporary facilities referred to above until the permanent ones are available for use, dismantle temporary locations when no longer needed;
- Install power generation systems;
- Continued development of the quarry QMR2 at Mine Site and commence development of quarries D1Q1 and D1Q2;
- Transfer fuel from Milne Port tank farm to newly installed fuel tank farm at the Mine Site.

Construction activities associated with the Early Revenue Phase

As stated in correspondence to the NIRB on January 13, 2013, due to various business drivers, Baffinland proposes to make changes to the schedule and some activities in the initial stages of project development associated with the Mary River Project Proposal for which the NIRB issued Project Certificate No. 005 (the 'Project Certificate').

In its request to the NIRB, Baffinland indicated that although the Proponent remains committed in the long-term to developing the Project as authorized in the Project Certificate, in the short term Baffinland proposes to change some development activities and project timelines to accommodate a proposed "Early Revenue Phase" which would include development of a nominal 3.5 million tonnes per annum (Mt/a) road haulage operation from the Mary River mine site to a port facility at Milne Inlet for shipping of iron ore during the open water season. As noted by Baffinland, this development option was presented previously as a project alternative, and was included within the initial technical review of the Draft Environmental Impact Statement for the Mary River Project Proposal.

Baffinland recognizes that this Early Revenue Phase (ERP) will require an amendment to the Project Certificate which in turn requires the submission and review of an Environmental Impact Statement. In accordance to the directives issued by the NIRB, Baffinland completed its Environmental Impact

Statement for the Early Revenue Phase of the Project in June 2013. The proposal is subjected to the NIRB review process which is expected to be completed by the first quarter of 2014.

Once a favourable decision is granted from the Minister of AANDC with respect to the ERP, and subject to obtaining any amendments (if any) which might be necessary to the Water Licence, Baffinland will proceed with the construction of facilities required for the completion of the ERP.

Construction activities for the ERP, which would only commence if and once the addendum to the FEIS is granted, consist of the following activities at Milne Port:

- Construct a causeway and ore dock that will extend into offshore waters. The causeway and ore dock platform with be built up with aggregate and suitable dredged material;
- Dredging, as required, to maintain the required vessel draft depths and for placement of caissons, in the location of the dock. Dredge material to be deposited near shore in an area demarcated for this activity adjacent to the causeway location. If dredge material is not suitable for re-use to build up the causeway, then the dredge material will be deposited near shore in an area demarcated for this activity. As a preventative measure, a silt curtain will be installed around the extent of the dredging activities;
- Construct concrete and steel pile foundations onto the rock filled causeway and ore dock to support the ship loader and related ship loader facilities;
- Install 2 mooring buoys or dolphins;
- Install and commission the ship loader onto the ore dock foundations. This work is expected to continue into 2015;
- Construct and commission ore stockpile pad;
- Install and commission the ore stacker reclaim conveyor system within the ore stockpile pad;
- Construct Stockpile settling ponds.

2.3 INFRASTRUCTURE LAYOUT AT END OF 2014

The Tenant shall provide: *"A detailed description of planned construction and infrastructure changes, additions or removals within the boundaries of the Impact Areas and the Exploration Areas, either permanent or temporary;"*

Site layouts for Milne and Mary River can be found in Appendix B of this document.

2.4 MINING, QUARRYING AND EXPLORATION ACTIVITIES

The Tenant shall provide: *"A description of any and all mining and exploration activities planned for the year, including:*

i. Exploration activity and drilling plan,

During 2014 Baffinland anticipates the approval for a renewal to the Type B Water Licence (2BB-MRY1114). All activities listed under this renewal have been permitted in the past and are common to exploration properties throughout Nunavut.

The scope of the Type B Licence allows for Baffinland to continue/undertake the following activities on its mineral leases in the Qikiqtani Region of Nunavut.

- Mineral exploration drilling;
- Surface mineral exploration activities including mapping, sampling, geophysical surveys, geochemical surveys, mechanical trenching and stripping of surficial overburden;
- Geotechnical drilling programs and surveys at project development areas, as required to support Project design requirements;
- Port site(s), with land based drilling as well as possible barge based and ice based drilling on the sea ice at Milne Port. A platform for the geotechnical and geophysical testing may be barge based or a platform built up on the ice;
- Activities in support of scientific and engineering studies related to the advancement of future expansion of the Mary River Project;
- Ongoing operation, maintenance and upgrades to existing pioneer camps at Steensby Inlet and Mid-Rail location:
  - Steensby Inlet Camp: Latitude 70 ^{o} 17’ 40” Longitude 78 ^{o} 29 15”
  - Mid-Rail Camp: Latitude 70 ^{o} 58’ 20” Longitude 78 ^{o} 22’ 15”
- Potential seasonal occupation of Steensby Inlet and Mid-Rail Camps;
- Potential for establishing future satellite camps to support exploration and drilling activities (amendment of licence would be required) on Baffinland’s mineral claims;
- Future Bulk Sampling Program;
- Fixed wing aircraft and helicopter to support general site activities including environmental monitoring and potentially additional exploration drilling and regional exploration;
- Construction and use of airstrips on lakes for winter months;
- Use of float planes on lakes during the summer months;
- Construction of winter roads, stream/river crossings;
- Sealift operation and establishment and use of laydown areas;
- Progressive reclamation programs associated with exploration program;
- Waste rock disposal areas.

ii. An estimate of the amount and type of ore and waste to be mined in each month,

During 2014 Baffinland anticipates commencing the mining of ore during October 2014. Below is an estimate of the breakdown of ore vs. waste mined by month.

Table 2-1: Mine Forecast 2014

Month	Ore Mined (wmt)	Waste Mined (wmt)	Total Mined (wmt)
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	0	250,000	250,000
July	0	250,000	250,000
August	0	250,000	250,000
September	0	250,000	250,000
October	252,000	120,000	372,000
November	243,000	125,000	368,000
December	252,000	125,000	377,000
Total	**747,000**	**1,370,000**	**2,117,000**

iii. An estimate of the amount and type of ore to be shipped each month,

At this time, no ore is planned to be shipped in 2014, however should the ERP be approved, Ore will be hauled along the Tote Road and stockpiled at Milne Inlet.

iv. Expected quarterly quantities to be quarried of each Specified Substance including sand, gravel and construction stone, where possible, estimated by individual quarry site or borrow location;"

A summary of the expected quantities of quarried materials extracted during 2014 is provided per quarry below.

Table 2-2: 2014 Quarry and Borrow Pit Quantities

Quarry	Annual Volume (m^3)	Annual Surface Area (m^2)
Q1	690,000	92,000
Q7	75,000	14,600
Q11	175,000	17,500
P1 & other approved borrow sources	275,000	55,000
Q19	175,000	14,600
QMR2	250,000	70,000
D1Q1	275,000	27,500
D1Q2	700,000	22,500

2.5 SOLID WASTE DISPOSAL

The Tenant shall provide: *"Expected annual quantities of Solid Waste to be deposited in approved Waste Storage Areas;"*

The expected annual quantity of solid wastes to be deposited during 2014 can be found in the Waste Management Plan (H349000-1000-07-126-0007) for the Project and are provided in the table below.

Table 2-3: Estimated Domestic Solid Non Hazardous Waste Generation

Waste	Waste Description	Disposal Method	Est. Total Annual Production (tonnes)
2014 Work Plan			
Organic	Kitchens	Incinerator	568
Paper	Packaging/Offices	Incinerator/On-site landfill	168
Plastic	Offices/Camps	Incinerator[2]/On-site landfill	120
Cardboard	Packaging/Camps	Incinerator	128
Cloth	Camps	Incinerator	39
Multi-Material	Packaging/Camps	Incinerator/On-site landfill	28
Metal	Packaging	On-site landfill	17
Glass	Camps	On-site landfill	16
Wood	Packaging	Incinerator	11
Bottom Ash from Camp Incinerators	Historical Inventory of Ash plus on-going generation from new camp incinerators	On-site landfill	170

[1] Composition based in part on 2011 Mary River Waste Audit results (Aug 27 - Aug 29), Assume 50% of waste generated to be domestic.

[2] Poly-chlorinated plastics will be sorted out of waste stream and sent to landfill and will not be incinerated

[3] The disposal of incinerator bottom ash in the landfill will not proceed unless it is tested by an acceptable test procedure. If the composition of the ash makes it unsuitable for disposal at the Landfill facilities, the waste will be directed to an appropriate facility for disposal.

2.6 SPECIFIED SUBSTANCES

The Tenant shall provide: *"Expected uses of Specified Substances pursuant to a Quarry Concession Agreement that is existing or to be entered into by the Parties pursuant to this Lease;"*

Expected specified substances pursuant to the Quarry Concession Agreement can be seen in Table 2-2 of Section 2.4. These quarried materials will be utilized in the construction activities as detailed in Section 2.2.

2.7 WATER USE

The Tenant shall provide: *"Expected uses of water pursuant to a Water Compensation Agreement that is existing or to be entered into by the Parties pursuant to this Lease;"*

The existing Type A Water Licence 2AM-MRY1325 permits the maximum following water use for domestic and industrial purposes during construction phase of the Project.

Table 2-4: Water Use for Domestic and Industrial Purposes during Construction Phase

Site	Source	Volume	Combined Volume
Milne Port (Milne Inlet)	Phillips Creek (Summer)	68.5m³/day	25,000 m³/year
	Km 32 (Winter)		
Mine Site (Mary River)	Camp Lake	657.5 m³/day	240,000 m³/year
Steensby Port (Steensby Inlet)	ST 347 km Lake	345.8 m³/day	155,400 m³/year
	3 km Lake		

Source: Type A Water Licence, 2AM-MRY1325

2.8 MATERIALS SHIPPED OUT

The Tenant shall provide: *"Expected quantities of materials that will be shipped off the Property;"*

Expected quantities of materials planned to be shipped off site in 2014 are detailed in Table 2-5 and Table 2-6. Table 2-5 provides estimated hazardous waste and hazardous material quantities to be shipped off site during 2014 and is based on projections detailed in the Hazardous Material and Waste Management Plan for the Project with an additional allowance for decommissioned bladder farm materials. Table 2-6 details quantities of any additional material planned to be demobilized from site in 2014.

Table 2-5: Hazardous Waste Generation Estimate for 2014

Waste Category	Waste Description	Disposal Method	2014 Est. Generation (kg/person/ day)	Person Days On-Site	Est. Total Annual Production (tonnes)	Est. Total Annual Production (tonnes) with 20% Contingency
Construction Phase [1]						
Batteries	Misc.	Shipped off Site	0.125		14.93	17.92
Hydro Carbon Contaminated Material	Sludge, Absorbents, Oil Filters etc	Incinerated/Shipped off Site	0.288		34.30	41.16
Waste Oil	Maintenance	Incinerated/Shipped off Site	1.732		206.30	247.55
Waste Fuels	Maintenance	Incinerated/Shipped off Site	0.129		15.32	18.38
Waste Grease	Domestic/Maintenance	Incinerated/Shipped off Site	0.046	119082	5.42	6.51
Waste Hazardous Liquids	Other, Paint, Oily Water	Shipped off Site	0.561		66.86	80.23
Waste Aerosol Canisters	Misc.	Shipped off Site	0.004		0.43	0.51
Contaminated Containers/Solids	Various	Shipped off Site	0.447		53.25	63.89
Misc Hazardous Materials	Misc.	Shipped off Site	0.350		41.73	50.08
				TOTAL	**438.53**	**526.24**

NOTES

[1] Assume 450 people on site for 365 days during construction phase to remain conservative

[2] Assume 325 people on site for 365 days during operation phase to remain conservative

[3] Generation rate based on Mary River specific estimate. No contingency included

Table 2-6: Materials to be shipped out in 2014

Description	Equipment Type	Quantity
Winch Truck	Mobile equipment	1
Pick-up F350	Mobile equipment	9
Mechanic Truck F550	Mobile equipment	2
Bus	Mobile equipment	1
Fuel Truck	Mobile equipment	2
Roll-off / Vac Truck	Mobile equipment	2
Crane - 60 ton – with jib	Mobile equipment	1
Packer CS563	Mobile equipment	1
Skid Steer	Mobile equipment	2
Crusher and Screener unit	Crushing & Screening	1
Water Truck	Mobile equipment	1
Loader with bucket	Mobile equipment	5
Dozer D8T	Mobile equipment	2
Dozer D7R	Mobile equipment	1
Grader 16H	Mobile equipment	1
Grader 14H	Mobile equipment	1
Excavator 345C	Mobile equipment	2
Rock Truck 773E	Mobile equipment	2
Shop - Norseman 40'x60'	Structure	4
Compressor 375HD PQ - Trailer Mounted (S/B C250)	Mobile equipment	1
Light Tower 8 KW	Structure	8
Tanker Trailer 50,000L	Mobile equipment	2
Scissor Deck	Mobile equipment	1
Welder mounted on Trailer - Ideal Arc DC600	Mobile equipment	1
Office Trailer	Structure	2
49 Person Accommodation Complex	Structure	1
Sewage Treatment Plant	Structure	1
Duel Burner Incinerator	Structure	1
Sewage Holding Tank	Tank	1
Washroom / Lunchroom (Wheeled) (survival shack)	Shop / maintenance equipment	2
Seacan 20'	Container	36
Generator	Generator	3

2.9 MATERIALS SHIPPED IN

The Tenant shall provide: *"Expected quantities of materials that will be shipped to and stored on the Property;"*

At least two bulk fuel deliveries will occur during the 2014 sealift. At the onset of the shipping season, arctic diesel and Jet A fuel will be delivered to fill the newly constructed tanks at the Milne tank farm.

The anticipated fuel delivery is as follows:

Table 2-7: 2014 Anticipated Fuel Delivery

	Diesel	Jet A	Marine Diesel
Total Bulk Fuel Delivery	50 ML	2 ML	0.2ML

**Source ERP Addendum Key Project Facts Table, Volume One*

The material, equipment, supplies, buildings and machinery that were not received at Milne Inlet during the 2013 sealift will be carried over to the 2014 sealift and includes the following:

Table 2-8: Facilities and Equipment Remaining at Marshalling Yard after 2013 Sealift

Facility	Quantity
Maintenance building (2521-bld-001)	1
Welding shop (2521-bld-002), (4521-bld)	2
Truck washing building (4523-bld-001)	1
Truckweight foldaway (4382-bld-001)	1
Heavy Equipment and Rolling Stock	**Quantity**
Ore haul pup trailer	5
Ore haul lead trailer	6
Dump box for 740 dump truck	1
Cat 740b dump truck	2
Cat 740b rock truck	1
Cat 824h WH dozer	1
Cat 988h loader	1
Cat 345dl excavator	1

An extensive list of all mechanical equipment to be received during the 2014 is presented in the table below:

Table 2-9: Mechanical Equipment to be Received during 2014

Description	Equipment type	Quantity
Magnetic base drill	Shop / maintenance equipment	2
Hydraulic porta power pump	Shop / maintenance equipment	2
Bench grinder	Shop / maintenance equipment	6
Truck mount goodall boost system	Shop / maintenance equipment	2
Goodall boost system	Shop / maintenance equipment	2
A/c recovery recharge unit	Shop / maintenance equipment	2
Battery charger	Shop / maintenance equipment	4
Tube bender	Shop / maintenance equipment	2
Platform scale	Shop / maintenance equipment	2
Milling machine	Shop / maintenance equipment	1
Tire siping machine	Shop / maintenance equipment	1
Track pin press	Shop / maintenance equipment	2
Inching tool	Shop / maintenance equipment	1
Generator	Generator	4
Single pass production drill	Mobile equipment	1
Tote road ore haul truck - tractor	Mobile equipment	16
Tote road ore haul truck - lead trailer	Mobile equipment	10
Tote road ore haul truck - pup trailer	Mobile equipment	10
Mobile equipment lowboy trailer	Mobile equipment	1
Stockpile, front end loader	Mobile equipment	4
Mid size excavator	Mobile equipment	2
Laboratory Equipment	Laboratory equipment	27
Diesel fuel dispensing module arctic diesel pump	Pump	14
Jet-a1 fuel dispensing module fuelling station	Fire services	2
Jet-a1 fuel dispensing module discharge pump	Pump	2
Fuel oil pump	Pump	6
Jet-a1 tank	Tank	2
Maintenance building diesel tank	Tank	1
Warehouse building diesel tank	Tank	1
Truck wash building diesel tank	Tank	1
Arctic diesel tank	Tank	2
Stockpile generator	Generator	5
Shiploader	Shiploader	2
Reclaim conveyor	Conveying	1
Shiploader link conveyor	Conveying	1

Description	Equipment type	Quantity
Discharge chutes & diverters for reclaim conveyor & shiploader	Chute / diverter	11
Sampler bin	Hopper	1
Ore sampler	Sampler	1
Belt scale	Screen	1

To the extent practicable, all materials and supplies required to execute the 2014 Work Plan and the work scheduled for January to June 2014 has been received during the 2013 sealifts. Additional materials and supplies to support operations through the remainder of 2014 and 2015 will arrive including:

- Delivery of ammonium nitrate (AN), 520,000 kg;
- Delivery of pre-packaged explosives 83,000 kg;
- Delivery of maintenance parts;
- Delivery of consumables (lubricants, grease, detergents, boosters, EZ Dets, dry goods, food, household supplies, etc.).

2.10 CLOSURE AND RECLAMATION COSTS

The Tenant shall provide: *"A description of the applicable provisions of the Closure and Reclamation Plan for the upcoming Year, a report of the estimated costs to be incurred to implement the Closure and Reclamation Plans for the Year and the balance of the Term;"*

The provision of additional securities for the 2014 work is allocated as summarised in Table 2-10 below. Further detail can be found in document H349000-1000-07-126-0017.

Table 2-10: Mary River Project Closure and Reclamation Security Summary, 2014

Liability Allocation		Mary River Exploration Project Closure Cost Estimate **(Type B Renewal)**	2014 Work Plan Marginal Closure Estimate – **Approved Activities (Type A)**	2014 Work Plan Marginal Closure Estimate – **ERP Activities (Type A)**	TOTAL 2014 Marginal Closure Estimate for Mary River Project - **(Type A)**
TOTAL		**$1,247,000**	**$3,315,000**	**$279,000**	**$3,594,000**
IOL	Land	$147,000	$3,150,000	$279,000	$3,428,000
	Water	$18,000	$0	$0	$0
	Total IOL	**$165,000**	**$3,150,000**	**$279,000**	**$3,428,000**
Crown	Land	$1,082,000	$166,000	$0	$166,000
	Water	$0	$0	$0	$0
	Total Crown	**$1,082,000**	**$166,000**	**$0**	**$166,000**

2.11 OPTION EXERCISE NOTICES

The Tenant shall provide: *"All Option Exercise Notices;"*

- None contemplated at this time

2.12 LEASE SCHEDULE UPDATES

The Tenant shall provide: *"Updates to items contained in the Schedules of this Lease (if applicable), including without limitation the Closure and Reclamation Plan, the Contingency and Emergency Response Plan, and the Environmental Management and Monitoring Plans;"*

- No changes from those included within the lease document signed September 6, 2013

2.13 LEASE AMMENDMENT PROVISIONS

The Tenant shall provide: *"Requested amendments to the provisions of this Lease (if applicable);"*

- No changes from those included within the lease document signed September 6, 2013

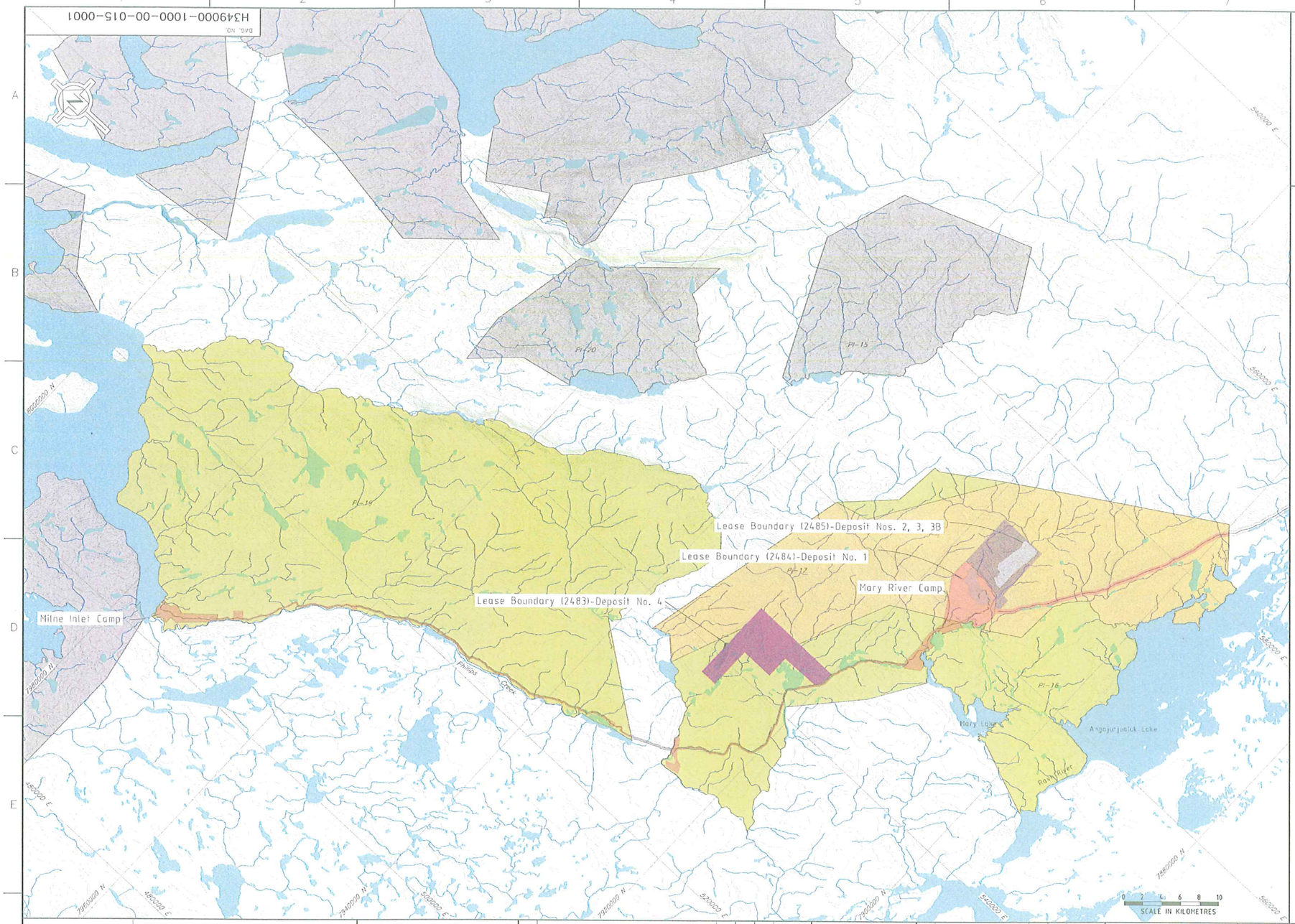
XX:xx
Attachment(s)/Enclosure

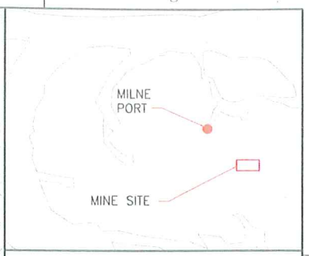
APPENDIX A

Drawings:

- **H349000-1000-00-015-0001;**
- **H349000-1000-00-015-0002;**
- **H349000-1000-00-015-0003; and**
- **H349000-1000-00-015-0004.**

DWG. NO. H349000-1000-00-015-0001





KEYPLAN

LEGEND:

- WATER
- GENERAL INUIT OWNED LAND-SURFACE ONLY EXCLUDING MINERALS
- GENERAL INUIT OWNED LAND-SURFACE AND SUBSURFACE INCLUDING MINERALS
- CROWN LAND
- INUIT OWNED LAND-SURFACE ONLY EXCLUDING MINERALS
- EXISTING TOTE ROAD

DESCRIPTION	AREA (ha)
IMPACT AREA	
MARY RIVER AREA	5184
MILNE AREA	201
TOTE ROAD QUARRIES	413
RAIL	1329
MILNE INLET TOTE ROAD CENTRE LINE PLUS 100m	1555
TOTAL IMPACT AREA	7228
EXPLORATION	
2/3 DEPOSIT	2457
4/5 DEPOSIT	4350
TOTAL EXPLORATION AREA	6807
TOTAL AREA	14035 ha

REGISTERED PROFESSIONAL ENGINEER M.J. BOYKO LICENCE 11015 NT/NU

PERMIT TO PRACTICE HATCH LTD
Signature
Date 17 JULY 13
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

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0	PRODUCTION LEASE		2013-07-15
ISSUE AUTHORIZATION			

HATCH™

DESIGNED BY	DRAWN BY
M. ANDERSON	C. LEISTNER
DATE 2013-05-15	DATE 2013-05-15
CHECKED BY	DISC'P. ENGR.
T. THEAKER	J. LEMAY
DATE 2013-07-15	DATE 2013-07-15
PROJ. DES. COORD.	PROJ. ENGR.
T. THEAKER	J. CLEGG
DATE 2013-07-15	DATE 2013-07-15
PROJ. MGR.	
S. PERRY	
DATE 2013-07-15	

Baffinland

MARY RIVER PROJECT

SCHEDULE A1
THE PROPERTY

SCALE	DWG. NO.	REV.
1:200000 OR AS NOTED	H349000-1000-00-015-0001	0

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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16/07/2013 3:57:41 PM
kru60388

H349000-1000-00-015-0002

MILNE INLET

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E:504250.00

Q1

N:7975575.00
E:502500.000

Q2

EXISTING LAND LEASE BOUNDARY

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E:502750

N:7975175.00
E:504850.00

PHILLIPS CREEK

MILNE INLET TOTE ROAD

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E:502750.00

N:7974750.00
E:503450.00

POTENTIAL DEVELOPMENT AREA

N:7974200.00
E:504550.00

N:7974000.00
E:503450.00

Q7

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E:505725.00

N:7971350.00
E:507100.00

N:7971075.00
E:506575.00

0 120 240 360 480 600
SCALE IN METRES

MILNE PORT

5

MINE SITE

KEYPLAN

LEGEND:

- WATER
- RIVER/STREAM/DRAINAGE
- POTENTIAL DEVELOPMENT AREA
- EXISTING BAFFINLAND'S COMMERCIAL LEASE ON INUIT OWNED LAND
- IMPACT AREA
- ROAD
- TOTE ROAD
- QUARRY SAMPLE LOCATIONS

BRIDGET ERED PROFESSIONAL ENGINEER
M.ANDERSON
LICENSEE
9713
NTNU

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1.5 METRES.
4. AS-CONSTRUCTED INFORMATION PROVIDED BY GENIVAR IN 2008.

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CHECKED BY: T. THOMPSON DATE 2013-07-15	DISCIP. ENGR.: J. LEMAY DATE 2013-07-15
PROJ. DIR. (PORT): T. THOMPSON DATE 2013-07-15	PROJ. ENGR.: M. CLELAND DATE 2013-07-15
PROJ. MGR.: S. PERRY DATE 2013-07-15	

Baffinland

MARY RIVER PROJECT

SCHEDULE A3
MILNE INLET IMPACT AREA

SCALE: AS NOTED OR AS NOTED	DWG. NO. H349000-1000-00-015-0002	REV. 0

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

DWG. NO. H349000-1000-00-015-0003

GENERAL INUIT OWNED LAND-SURFACE AND SUBSURFACE INCLUDING MINERALS

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E: 546625.00

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E: 537500.00

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E: 542050.00

N: 7924675.00
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E: 544475.00

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MILNE PORT

MINE SITE

KEYPLAN

LEGEND:

- WATER
- RIVER/STREAM/DRAINAGE
- POTENTIAL DEVELOPMENT AREA
- EXISTING BAFFINLAND'S COMMERCIAL LEASE ON INUIT OWNED LAND
- IMPACT AREA - BORROW SOURCE
- EXPLORATION AREA - DEPOSIT 4/5
- ROAD
- TOTE ROAD

NOTE:

CONTOURS AND WATER INFORMATION NOT AVAILABLE

0 300 600 900 1200 1500
SCALE IN METRES

REGISTERED PROFESSIONAL ENGINEER
M. J. BURNS
LICENSEE
NUNAVUT

REFERENCE DRAWINGS

DRAWING NO.	DRAWING TITLE

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HATCH LTD.
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Date 17 JULY 13
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PROJ. MGR.: S. PERRY DATE 2013-07-15	

Baffinland

MARY RIVER PROJECT

SCHEDULE A4
DEPOSITS 4/5 EXPLORATION AREA

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ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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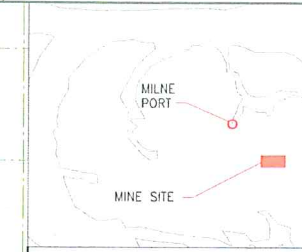

KEYPLAN

LEGEND:

- WATER
- RIVER/STREAM/DRAINAGE
- POTENTIAL DEVELOPMENT AREA
- EXISTING MINING LEASE ON INUIT OWNED LAND
- IMPACT AREA
- EXPLORATION AREA
- ROAD
- TOTE ROAD
- QUARRY SAMPLE LOCATIONS

REGISTERED PROFESSIONAL ENGINEER — M. J. BUYKX — LICENSEE 17/7/13 — NT/NU

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REVISIONS

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0	PRODUCTION LEASE		2013-07-15

ISSUE AUTHORIZATION

HATCH™

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DRAWN BY C. LEISTNER DATE 2013-05-15
CHECKED BY T. THERTELL DATE 2013-07-15
DISCIP. ENGR. J. LEMAY DATE 2013-07-15
PROJ. DES. COORD. T. THERTELL DATE 2013-07-15
PROJ. ENGR. J. CLELAND DATE 2013-07-15
PROJ MGR. S. PERRY DATE 2013-07-15

Baffinland

MARY RIVER PROJECT

SCHEDULE A2
MARY RIVER IMPACT & EXPLORATION AREA

SCALE 1:30000 OR AS NOTED
DWG. NO. H349000-1000-00-015-0004
REV. 0

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

APPENDIX B

Drawings:

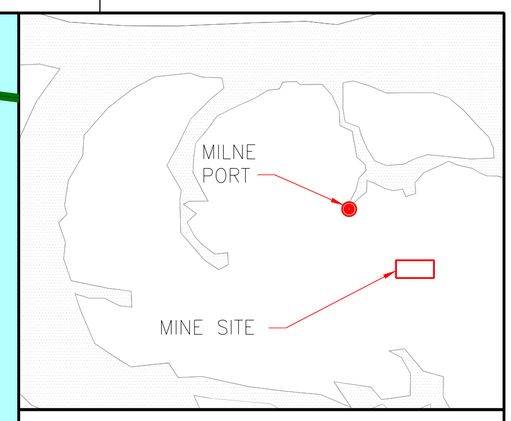
- **Milne Port Site Layout**
- **Mine Site Layout**

Updated

Milne Port and Mine Site Waste Management

Layout Drawings

H349000-2000-00-015-0013



KEYPLAN

HAZARDOUS WASTE BERM

SERVICE AREA
PAD SITE FACILITIES

ACCOMMODATION
COMPLEX

SEWAGE TREATMENT PLANT

INCINERATOR

WASTE MANAGEMENT
FACILITY

HAZARDOUS WASTE BERM

MATRIX CAMP

EXISTING
TRAILER CAMP

MAINTENANCE
SHOP

LAND FARM

CONCRETE BATCH
PLANT, CRUSHER AND
STOCKPILE

PERMITTED OPEN
BURN PIT AREA

APPROXIMATE EXTENT OF
QUARRY Q1 DEVELOPMENT

LEGEND:

- WATER
- PROPOSED QUARRY
- LAYDOWN AREA (CONSTRUCTION PHASE)
- ADVANCED EXPLORATION UNDER EXISTING TYPE 'B' WATER LICENSE
- RIVER/STREAM/DRAINAGE
- PROJECT DEVELOPMENT AREA
- EXISTING BORROW AREA (IOL COMMERCIAL LEASE)
- EXISTING ROCK QUARRY (IOL COMMERCIAL LEASE)
- PRIMARY SOLID WASTE COLLECTION POINT
- PRIMARY WASTE GENERATION AREA
- BAFFINLAND'S COMMERCIAL LEASE ON INUIT OWNED LAND
- ROAD

Baffinland

MARY RIVER PROJECT

MILNE PORT WASTE MANAGEMENT LAYOUT

SCALE	DWG. NO.	REV.
OR AS NOTED	H349000-2000-00-015-0013	A

DWG. NO. H349000-4000-00-015-0013

TOM RIVER

CAMP LAKE

SHEARDOWN NW LAKE

MARY RIVER

CAMP INFRASTRUCTURE

SEWAGE WATER TREATMENT PLANT

SITE SERVICES FACILITIES

QUARRY QMR2

QUARRY D1Q1

QUARRY D1Q2

PIT OFFICE

OPEN PIT DEVELOPMENT

HAZARDOUS WASTE CONTAINMENT BERM

OLD INCINERATOR

TEMPORARY INCINERATOR LOCATION

CONCRETE BATCH PLANT

BULK FUEL STORAGE FACILITY

EXPLORATION CAMP FACILITIES

EXISTING LANDFILL ROAD

EXISTING LANDFILL

FUTURE EMULSION PLANT

0 200 400 600 800 1000
SCALE IN METRES

MILNE PORT

MINE SITE

KEYPLAN

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1.5 METRES.
4. AS-CONSTRUCTED INFORMATION PROVIDED BY GENIVAR IN 2008.

LEGEND:

- WATER
- QUARRY
- LAYDOWN AREA (CONSTRUCTION PHASE)
- EXISTING BORROW AREA (IOL COMMERCIAL LEASE)
- EXISTING ROCK QUARRY (IOL COMMERCIAL LEASE)
- ROAD
- RIVER/STREAM/DRAINAGE
- PROJECT DEVELOPMENT AREA
- BAFFINLAND'S COMMERCIAL LEASE ON INUIT OWNED LAND
- RAW WATER INTAKE PIPELINE
- PRIMARY SOLID WASTE COLLECTION POINT
- PRIMARY WASTE GENERATION AREA

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

MINE SITE
WASTE MANAGEMENT LAYOT

SCALE	DWG. NO.	REV.
1:15000 OR AS NOTED	H349000-4000-00-015-0013	A

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Appendix H -
Table of Concordance

- Concordance Table with Type A Water Licence (2AM-MRY1325) Conditions
- Concordance Table with Nunavut Impact Review Board (NIRB) Project Certificate.

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Table H- 1 shows the Part, number and Condition of the Type A water Licence (Water Licence No: 2AM-MRY1325) and the location within the Waste Management Plan for Construction, Operation and Closure.

TABLE H- 1: CONCORDANCE TABLE WITH TYPE A WATER LICENCE (2AM-MYR1325) CONDITIONS

Part	Number	Condition	Section
D	18	The Licencee shall submit a Construction Monitoring Report to the Board, within ninety (90) days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes. The construction summary report shall be prepared by an Engineer(s) in accordance with Schedule D, Item 1.	Within 90 days the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes
D	20	The Licencee shall prevent any chemicals, fuel or wastes associated with the undertaking from entering any Water body.	Section 4.3.3 Section 4.3.4
F	1	The Board has approved with the issuance of the licence, the Plan entitled "Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction Operation, and Closure", dated April 2013.	N/A
F	4	The Licencee shall provide a revised Waste Management Plan, as required under Part B, Item 15(d), that takes into consideration for this and future revisions under this Licence, the following: a. A Quality Assurance and Quality Control Plan for open burning procedures under this Licence; b. Provide a section and information on the proposed land disposal of dredging waste for the purposes of construction at Milne Port Site and Steensby Port Site, with information on location, amount of materials, method of disposal and any mitigation measures required for the protection of water.	a) Section 9.2 b) Prior to dredging an update of the management plan will be done and provided to the NWB as per the annual reporting requirements
F	6	The Licencee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) meters from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.	Section 4.3.3 Section 4.3.4
F	7	The Licencee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an Incinerator System;	Section 4.2 Section 4.5
F	8	The Licencee shall test the bottom ash generated by all Incinerator Systems, by using the acceptable test procedures for analyzing residuals, prior to being disposed of at any Landfill Facility. If the composition of the ash makes it unsuitable for disposal at the Landfill facilities, the Licencee shall direct the Waste to an appropriate facility for disposal. The records of analysis results and volumes of ash shall be maintained and provided to an Inspector upon request.	Section 4.5.3
F	9	The Licencee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood, to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.	Appendix I

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Part	Number	Condition	Section
F	11	The Licencee shall submit to the Board and the Inspector, thirty (30) days prior to the removal and transfer of waste, a declaration of authorization from any community receiving waste from the project, which clearly states that authorization has been granted for the deposit by the Licencee at the Hamlet's appropriately licenced facilities.	Section 4.3.3 Section 4.3.4
F	12	The Licencee shall provide at least ten (10) days' notice to the Inspector prior to planned Discharges from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project. The notice shall include the estimated volume proposed for Discharge and the location and description of the receiving environment.	Section 4.3.4
F	14	The Licencee shall remove any waste generated from temporary and permanent shelters along the tote road and along the railway corridor for treatment at appropriately licenced Waste Management Facilities.	Section 4.3.3
F	30	The Licencee shall maintain records of all Waste backhauled from the Mary River Project and confirmation of proper disposal through the use of Waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records shall be made available upon request, to an Inspector or the Board.	Section 4.3.3 Section 4.3.4

Table H- 2 shows the number and Condition of the NIRB Project Certificate and the location within the Waste Management Plan for Construction, Operation and Closure.

TABLE H- 2: CONCORDANCE TABLE WITH NIRB PROJECT CERTIFICATE #005

Number	Condition	Section
11	The Proponent shall develop and implement an Incineration Management Plan that takes into consideration the recommendations provided in Environment Canada's Technical Document for Batch Waste Incineration (2010).	Section 4.5 Appendix C
12	Prior to commencing any incineration of on-site Project wastes, the Proponent shall conduct at least one stack test immediately following the commissioning of each temporary and permanent incinerator.	Section 4.5
64	The Proponent shall ensure that its Environment Protection Plan incorporates waste management provisions to prevent carnivores from being attracted to the Project site(s). Consideration must be given to the following measures: a) The Proponent shall ensure that its Environment Protection Plan incorporates waste management provisions to prevent carnivores from being attracted to the Project site(s). Consideration must be given to the following measures: Installation of an incinerator beside the kitchen that will help to keep the food waste management process simple and will minimize the opportunity for human error (i.e. storage of garbage outside, hauling in a truck (odors remain in truck), hauling some distance to a landfill site, incomplete combustion at landfill, fencing of landfill, etc.); and b) Installation of solid carnivore-proof skirting on all kitchen and accommodation buildings (i.e., heavy-duty steel mesh that would drop down from the edge of the buildings/trailers and buried about a half meter into the ground to prevent animals from digging under the skirting).	This Condition has been addressed in the Environmental Protection Plan (BAF-PH1-830-P16-0008)

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Appendix I -
Open Burning of Untreated Wood, Cardboard and Paper Products Procedure (BAF-PH1-300-PRO-0001)

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Baffinland Iron Mines Corporation

Open Burning of Untreated Wood, Cardboard and Paper Products Procedure

BAF-PH1-300-PRO-0001

Rev 0

Prepared By: Michael Anderson
Department: Operations
Title: Vice President - Operations
Date: January 6, 2014
Signature:

Approved By: Erik Madsen
Department: Sustainable Development, Health, Safety & Environment
Title: Vice President – Sustainable Development, Health, Safety & Environment
Date: January 6, 2014
Signature:

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DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
01/06/14	0	MA	EM	Use

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1 PURPOSE AND SCOPE

The purpose of this procedure is to provide a set of operational requirements for the safe controlled burning of untreated clean wood waste and cardboard in an environmentally-acceptable manner at the Mary River Project. The open burning of untreated wood waste is one of a number of elements of the Mary River Project source segregation and waste management program.

2 REQUIREMENTS

2.1 PERMITS/ ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT/ SPECIAL EQUIPMENT

Hazards

There are numerous specific hazards associated with the management of open burning. They include:

- Puncture or slivers from handling broken wood or wood containing nails & screws
- Smoke inhalation from working in the smoke plume of the fire
- Burns from direct contact with the flames or indirect burns from clothing coming in to contact with flame.
- Burns or fire from handling embers (un-combusted wood) in the ash

Personal Protective Equipment Requirements

- Wear Standard P.P.E. - Safety glasses, hard hat with reflective tape, safety boots, reflective vest, clothing in good condition, gloves or mitts in good condition
- Do not wear loose flammable clothing such as an unbuttoned work shirt when working around the burn container

Safety Equipment Requirements

- Skid Steer/Bob Cat will be used to stockpile the clean wood and cardboard in the burn container
- A spade or shovel should be used to turn over & inspect the residual ash.

2.2 TRAINING AND/ OR QUALIFICATION REQUIREMENTS

Any person who may be burning untreated wood at a Baffinland work site shall complete documented training in of this procedure and demonstrate their understanding of the hazards and controls.

3 DEFINITIONS

MSC: Mine Site Complex

PSC: Port Site Complex

SOP: Standard Operating Procedure

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Open Burning: Burning of any material or substance in the ambient air in an open topped burn container.

Permit: A paper or electronic form that documents the approval of open burning at one of the two approved open burn sites. This permit will cover a specified period when open burning would be allowed under the conditions specified in this SOP.

Clean Untreated Wood Waste: Clean untreated wood waste includes wood or timber, not suitable for recycling or reuse that is substantially free of glue, petroleum based materials, other chemicals, or contains other non-wood products

Cardboard, Paper Products and other packaging: Clean paper products and paperboard packing material including boxboard and cardboard, as well as natural fibre textiles (i.e. cotton, wool).

4 RESPONSIBILITES

The following roles have specific accountabilities that must be met to ensure the **Mine Site Complex (MSC)** and **Port Site Complex (PSC)** clean wood waste open burnings are operated in compliance with this procedure and its permit. The following roles and responsibilities shall be followed to safely and successfully operate the open burns. Area Superintendents/Supervisors are responsible for ensuring that all personnel are fully trained and competent to meet the expectations of this procedure.

4.1 MSC/PSC MANAGER OR HIS DESIGNATE

The Site Services Manager or designate is accountable for the overall operation of the open burning. Specifically, he or she shall:

Organize, oversee and administer the operation of the burn in accordance with current permits, regulations and this procedure.
Evaluate the burn permit requirements and monitor and direct the wood and cardboard waste open burn activities

4.2 MSC/PSC SITE SERVICES SUPERVISOR

The Site Services Supervisor, under general supervision of the Site Services Manager or designate, is responsible for supervising the operation of the open burning in accordance with this procedure. Specifically, the Site Services Supervisor shall:

Supervise the Open Burn Operator in the safe execution of this procedure
Inspect the burn container residual ash to ensure it contains no hot embers prior to transport to the landfill

4.3 SITE SERVICES OPERATOR

The Site Services Operator, under the general supervision of the Site Services Supervisor is responsible for executing the following tasks at the burn container. Specifically the Operator shall:

Work in conjunction with the Site Services Supervisor in executing this procedure.
Conduct the burn in compliance with this procedure.

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Know how to respond appropriately to all emergencies described in this procedure.
Complete report forms as required. The approximate quantity and general types of waste (based on visual estimation of volume to nearest cubic meter) will be noted on a form to be filled out daily whenever open burning occurs. The completed forms are to be submitted to the Environment Department on a monthly basis.

4.4 Environmental Manager or Designate

The Environmental Manager or Designate will issue the approval to open burn (Open Burn Permit) for a specified period and will work with Site Services Manager, Supervisors, and Operators to ensure that the open burn activities are comply with applicable environmental permits and in accordance with directives provided by responsible regulators and agencies. Environmental monitors, under the direction of the Environmental Manager or Designate will conduct periodic inspections of the designated open burn areas and operations to ensure compliance with permits and this SOP. If environmental non-compliances are identified, the Open Burn Permit can be revoked and a request for specified corrective actions to be implemented. The quantity and types of waste being open burned are summarized and reported in the Annual NWB and QIA Reports submitted by March 31 of each year.

5 PROTOCOL

5.1 Source Segregation and Waste Management Programs

It is Baffinland's policy to minimize material and packaging purchased and shipped to Mary River to reduce the amount of waste produced at the site, reuse and recycle waste, and maximize diversion from the landfill.

The Mary River source separation program consists of a series of ongoing activities to separate reusable and recyclable waste materials from other wastes at the point of origin. The purpose of the source separation program is to separate the waste into its material categories as well as from other wastes so that wastes that can be reused or recycled, are diverted from the landfill. The execution of the source segregation program at the Mary River Project serves to:

- Ensure hazardous material is segregated, packaged and shipped to licensed facilities in the South
- Promote the diversion of waste away from the non-hazardous solid waste landfill
- Direct domestic kitchen, office and camp waste to incinerators
- Reduce, reuse and recycle wood products to the extent practicable
- Divert non-reusable/non-recyclable clean wood waste and cardboard from the non-hazardous solid waste landfill for open burning

5.2 Clean Wood and Cardboard Open Burning Operations

Open burning shall strictly be operated in an open top sea container. This shall help to prevent waste and ash from blowing around and allow easy removal and disposal of ash.

5.2.1 Open Burning Container Locations and Access Control

There are only two approved open burn locations at the Mary River Project. Both sites are signed and as identified at the following locations:

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- MSC: N 71° 19’ 56.4” W 79° 24’ 33.2”
- PSC: N 71° 52' 30.571" W 80° 53' 27.874"

The burn area will be restricted access. The burn area locations are located a distance greater than 30 metres from any water body and are far enough from camp facilities to prevent impact to personnel from airborne emissions.

5.2.2 Acceptable Clean Wood Waste

Acceptable clean wood waste **permitted** for open burning includes the following products that are not suitable for re-use or recycling:

- Lumber
- Timber
- Pallets
- Paper products & paperboard packaging

Non-clean wood wastes are **not permitted** for open burning. This includes the following wood products:

- Treated or painted wood
- Plywood
- Petroleum-based materials
- Materials contaminated with petroleum or petroleum derivatives
- Petroleum products used as accelerants
- Plastics, electrical wire, Styrofoam or asbestos

5.2.3 Open Burn Permit

Prior to ignition of the wood pile the Open Burn Operator shall ensure that all conditions of this SOP are met that the Burn Permit for the dedicated burn locations is in good standing.

Open burning shall occur only with a permit that is current and in good standing and that covers the period required. In the event of non-compliance of this SOP or in the event of an environmental or safety infraction, the permit may be revoked for a specified period of time until corrective action is implemented to the satisfaction of the Site Services and Environmental Managers. The Open Burn Permit is provided by the Environmental Manager or his designate and will be valid for a set period of time.

5.2.4 Weather Conditions

Mild to moderate winds provide for the best smoke dispersal. Extreme winds create a potential uncontrollable fire condition. Ignition of waste pile is not permitted in winds greater than 20 km/h

The burn shall be temporarily stopped if the burn has the potential to:

- Create a condition in which a fire hazard is created or a condition in which the open burning can cause a fire to spread beyond its initial area
- Cause air pollution that creates a health hazard, a public nuisance or directly impacts wildlife

To ensure a “hot burn” is maintained to create an efficient burn, start the fire during dry conditions (ie. Not during wet, rain conditions).

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5.2.5 Open Burn Supervision

The designated MSC/PSC Manager is responsible for ensuring the conditions as required by this procedure are complied with.

5.2.6 Burning Guidelines

The wood will be kept as dry as possible before burning.
The primary goal in operating the open burn pit is to maintain a "hot burn" to create an efficient burn. To that end, the burning shall be managed as follows:

- The size of the burn pile will be contained within the container using consistent/constant feed rates to avoid over feeding and damping the fire
- A "hot burn" should be maintained to create an efficient burn using consistent/constant feed rates to avoid over-feeding and damping the fire.
- Construct piles loosely, with spaces to allow adequate oxygen to reach the burning material. Create a "heart" of fine, flammable paper or fine wood waste and light it down low on the side the wind is coming from
- Construct piles in a dome or teepee shape that allows heat to build so that flames can be maintained and the wood can be consumed rapidly. Flat, sprawling piles rarely burn well.
- Make sure your pile is clean, the arch enemy of a good burn pile is dirt
- The Open Burn Operator shall stay with the pile to make sure it burns hot and clean.

5.2.7 Ignition

The only authorized methods for igniting the wood waste in the open burning container are:

- Propane burners provide a safe ignition. All propane bottles are to be stored in the vehicle when not immediately being used for ignition and are to be disposed of in an authorized recycling container for pressurized or hazardous material.
- Paper and matches can be used as a safe method of ignition.

No fuel or other petroleum based product or other chemical is permitted as an accelerant

5.2.8 Extinguishing Requirements

Fires will be extinguished under the following conditions:

- When any condition as required by this procedure is not met
- To ensure smouldering of material does not persist upon completion of the open burn.

Appropriate quantities of water or heavy equipment access to fill will be available for extinguishing open burn fires when required.

5.2.9 Disposal of Open Burn Ash

All residual waste and ash will be collected and disposed of in the MSP approved non-hazardous material solid waste landfill or a designated area approved by the Inspector. The following conditions must be met prior loading and transport of the ash to the landfill:

- Upon completion of the open burn and subsequent extinguishing, ash will be allowed to cool for 48 hours.
- The Site personnel shall stir up and inspect the ash to confirm there are no remaining hot embers.

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- Fill shall be mixed with the ash in the burn container to confirm the ash is extinguished and to prevent loss of ash during transport to the landfill.

6 REFERENCES AND RECORDS

Nunavut Mine Health and Safety Act and Regulations

Canadian Standards Association

Nunavut Water Board Type A Water Licence No: 2AM-MRY1325

Commercial Lease No.: Q13C301

Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction, Operation and Closure, dated April 19, 2013

Form for recording approximate volumes and types of wastes to be open burned.

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Appendix J - Steensby and Rail Camps Waste Management – Plans for Future Work

Including:

- H337697-4510-07-002-0001 Steensby Port Site - Mary River Project Block Flow Diagram for Construction Solid Waste
- H337697-7000-07-002-0003 Ravn River Rail Camp - Mary River Project Block Flow Diagram for Construction Solid Waste
- H337697-7000-07-002-2002 Mid Rail Rail Camp - Mary River Project Block Flow Diagram for Construction Solid Waste
- H337697-7000-07-002-0004 North Cockburn Lake Rail Camp - Mary River Project Block Flow Diagram for Construction Solid Waste
- H337697-7000-07-002-0005 South Cockburn Lake Rail Camp - Mary River Project Block Flow Diagram for Construction Solid Waste

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J.1 Purpose

In order to handle, storage, transport and treat/dispose the wastes generated during the construction, operation and closure phase of the Project, several treatment or disposal facilities must be built on-site to ensure that the waste management is being conducted in a safe, efficient and environmental-compliant manner. The infrastructure deemed necessary to manage the wastes appropriately are:

- Two long term waste management facilities at Steensby Port.
- Two long term landfills and land farms at Steensby Port.
- Temporary incinerator and waste storage areas at Steensby Port and Rail Camps for use only during construction.

All Project activities are regulated and will be performed according to the law and regulations applicable to the Project and procedures developed.

The Waste Management Plan (WMP) presented in this document establishes a management strategy for all the wastes generated during the construction, operation, closure and reclamation of the Project.

J.2 Waste Management Methods

Table J- 1, and Table J- 2, presents the expected quantities of waste generated for the construction and operation phases respectively.

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TABLE J- 1: NON-HAZARDOUS SOLID WASTE GENERATION ESTIMATE

Project Phase and Location	Time Period	Total Waste Generated (excluding sludge and ash)[2]	Incineration Waste			Inert Landfill Waste			
			Waste Stream - Suitable for Incineration	Sewage Sludge Cakes [6]	Total Waste Incinerated	Waste Stream - Suitable for Landfill	Inert Wastes[6]	Ash[7][9]	Total
		(tonnes)					(m^3)		
ERP OPERATIONS PHASE (incl. 18 Mt/a Construction Phase w/ Rail Camps) [3] [10]									
Mine Site Camp	Daily (avg)	3.98	1.33	0.26	1.59	2.65	6.63	0.79	7.42
	Annual [7]	1451	484	95.9	580	967	2419	290	2709
Steensby Port Camp	Daily (avg)	1.68	0.56	0.11	0.67	1.12	2.80	0.34	3.14
	Annual [7]	613	204	40.5	245	409	1022	122	1144
Milne Inlet Camp	Daily (avg)	0.34	0.11	0.02	0.13	0.22	0.56	0.07	0.63
	Annual [7]	123	41	8.1	49	82	204	24	229
Rail Camp (Ravn River)[8]	Daily (avg)	2.24	0.75	0.15	0.89	1.49	3.73	0.45	4.18
	Annual [7]	818	273	54.0	327	545	1363	163	1526
Rail Camp (Mid Rail)[8]	Daily (avg)	1.12	0.37	0.07	0.45	0.75	1.87	0.22	2.09
	Annual	409	136	27.0	163	273	681	82	763
Rail Camp (North Cockburn)[9]	Daily (avg)	1.12	0.37	0.07	0.45	0.75	1.87	0.22	2.09
	Annual [7]	409	136	27.0	163	273	681	82	763
Rail Camp (South Cockburn)[9]	Daily (avg)	1.68	0.56	0.11	0.67	1.12	2.80	0.34	3.14
	Annual [7]	613	204	40.5	245	409	1022	122	1144
Construction Annual Total		4435	1478	293	1772	2957	7392	886	8278

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Project Phase and Location	Time Period	Total Waste Generated (excluding sludge and ash)[2]	Incineration Waste			Inert Landfill Waste			
			Waste Stream - Suitable for Incineration	Sewage Sludge Cakes [6]	Total Waste Incinerated	Waste Stream - Suitable for Landfill	Inert Wastes[6]	Ash[7][9]	Total
		(tonnes)					(m^3)		
18 MT/a OPERATION PHASE[4]									
Mine Site Camp	Daily (avg)	3.98	1.99	0.26	2.25	1.99	4.97	1.13	6.10
	Annual	1451	726	95.9	822	726	1814	411	2225
	Total[7] (20 years)	29025	14512	1917.7	16430	14512	36281	8215	44496
Steensby Port Camp	Daily (avg)	1.68	0.84	0.11	0.95	0.84	2.10	0.48	2.58
	Annual	613	307	40.5	347	307	767	174	940
	Total[7] (20 years)	12264	6132	810.3	6942	6132	15330	3471	18801
Milne Inlet Camp	Daily (avg)	0.34	0.17	0.02	0.19	0.17	0.42	0.10	0.52
	Annual	123	61	8.1	69	61	153	35	188
	Total[7] (20 years)	2453	1226	162.1	1388	1226	3066	694	3760
Operation Total		43742	21871	2890	24761	21871	54677	12380	67057

NOTES
(1) Maximum populations were assumed to be carried year round to be conservative
(2) Disposal Rate of 5.6 kg/day - Cold Region Utilities Monograph, 3rd edition, pg 14-16 1996
(3) Assumed 1/3 of waste stream is suitable for incineration, 2/3 suitable for landfill during construction phase due to high amounts of packaging waste during construction
(4) Assume 1/2 of waste stream is suitable for incineration, 1/2 suitable for landfill during operation phase as per Meadowbank Landfill Management Plan, 2008
(5) Estimated sewage sludge production at 0.37 kg/person/day based on Seprotech specification
(6) Estimated waste density was assumed as 0.4 tonnes/m3 for moderately compacted solid waste - AMEC Earth & Environmental. Victor Diamond Mine Project Comprehensive Study. Waste Management Addendum Jan 18 2005
(7) Estimated ash density was assumed as 1.0 tonnes/m3 - AMEC Earth & Environmental. Victor Diamond Mine Project Comprehensive Study. Waste Management Addendum Jan 18 2005
(8) Assume all waste suitable for landfill goes to Mine site
(9) Assume all waste suitable for landfill goes to Steensby Inlet
(9) Assume 90% volume reduction, 200 kg/m3 density for non-compacted waste
(10) Pending Regulatory Approval

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TABLE J- 2: ESTIMATED DOMESTIC SOLID NON HAZARDOUS WASTE BY TYPE

Waste	Waste Source	Est. Total Annual Production (tonnes)
ERP OPERATIONS PHASE (incl. 18 Mt/a Construction Phase w/ Rail Camps)		
Organic	Kitchens	1169
Paper	Packaging/Offices	335
Plastic	Offices/Camps	240
Cardboard	Packaging/Camps	255
Cloth	Camps	78
Multi-Material	Packaging/Camps	55
Metal	Packaging	33
Glass	Camps	31
Wood	Packaging	22
18 MT/a OPERATION PHASE		
Organic	Kitchens	576
Paper	Packaging/Offices	165
Plastic	Offices/Camps	118
Cardboard	Packaging/Camps	126
Cloth	Camps	38
Multi-Material	Packaging/Camps	27
Metal	Packaging	16
Glass	Camps	15
Wood	Packaging	11

NOTES
1. Composition based in part on 2011 Mary River Waste Audit results (Aug 27 - Aug 29), Assume 50% of waste generated to be domestic
2. Poly-chlorinated plastics will be sorted out of waste stream and sent to landfill and will not be incinerated

J.2.1 Permanent Waste Sorting and Processing Facilities

Permanent waste management facilities will be constructed at the Steensby Port. This facility will consist of a heated all season building and adjacent laydown areas that provide the following capabilities, functions and/or facilities:

- A central depot where waste generated across the site will be managed, properly processed, packaged, labelled, inventoried, secured (e.g., on pallets) and stored for sealift or reuse on site.
- The waste management facility has a poured concrete floor with large doors for transferring waste in and out plus an adjacent office for the waste management technician.

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- Waste oil storage tank adjacent to facility with potential waste oil filtering process inside and temporary storage for filtered or unfiltered oil.
    - The filtered waste oil will be used for waste oil burners used to heat select facilities on site which include the waste management facility itself, truck warming shed, etc. Waste oil can also be blended into fuel for certain operations. See Appendix L for examples of 'typical' used oil heaters and boilers.
- Oil filter draining and crushing facility.
- Drum crushing machine.
- Strapping and plastic wrap capabilities.
- Label making capabilities.

As much as possible and practical, the various waste streams will be sorted at the source according to the Mary River Project Waste Sorting Guideline (Appendix F).

All food waste and other animal attractants (greases, glycol based antifreeze) will be stored inside of the facility prior to incineration to avoid the attraction of wildlife.

All wastes generated during construction, operation and closure will be managed in order to prevent any wastes entering any Water body. Thus, area designated as waste disposal will be located at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired.

Prior to a planned discharge from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project, Baffinland will provide at least ten (10) days' notice to the Inspector. The notice will include the estimated volume proposed for Discharge and the location and description of the receiving environment.

Prior the removal and transfer of wastes, Baffinland will provide to Nunavut Water Board (NWB) a Chain of Custody Form for southern destination receiving the wastes; however, wastes will not go to community hamlets.

Baffinland will maintain records of all Waste backhauled from the Mary River Project and confirmation of proper disposal through the use of Waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records will be available upon request, to an Inspector or the Board.

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TABLE J- 3: MARY RIVER PROJECT WASTE MANAGEMENT FACILITY SUMMARY

Location	Facility Type	Components	Function
Steensby Port	Temporary - Waste Management Facility	• Secured area • Secure hazardous waste storage area • Animal proof containers for storage of animal attracting waste.	A secure central depot where waste generated across the site will be managed, properly processed, packaged, labeled, inventoried, secured (e.g., on pallets) and stored for transportation to disposal or treatment locations.
Steensby Port	Landfarm	• Landfarm facility	See Appendix E.
Steensby Port	Landfill	• Licenced Landfill Facility • Access road • Used tire storage area.	Disposal of inert, non-combustible waste and non-hazardous wastes.
Steensby Port	Permanent - Waste Management Facility	• Secured area • Heated building • Incinerator • Secure hazardous waste storage area.	A central depot where hazardous waste and waste suitable for incineration generated across the site will be managed properly processed, packaged, labeled, inventoried, and treated and/or stored for disposal on site or off site as appropriate.
Ravn River Rail Camp	Temporary - Waste Management Facility	• Secured area • Incinerator • secure hazardous waste storage area.	A central depot where hazardous waste and waste suitable for incineration generated across the site will be managed properly processed, packaged, labeled, inventoried, and treated and/or stored for disposal on site or off site as appropriate.
Mid Rail Rail Camp	Temporary - Waste Management Facility	• Secured area • Incinerator • secure hazardous waste storage area.	A central depot where hazardous waste and waste suitable for incineration generated across the site will be managed properly processed, packaged, labeled, inventoried, and treated and/or stored for disposal on site or off site as appropriate.
North Cockburn Lake Rail Camp	Temporary - Waste Management Facility	• Secured area • Incinerator • secure hazardous waste storage area.	A central depot where hazardous waste and waste suitable for incineration generated across the site will be managed properly processed, packaged, labeled, inventoried, and treated and/or stored for disposal on site or off site as appropriate.
South Cockburn Lake Rail Camp	Temporary - Waste Management Facility	• Secured area • Incinerator, • secure hazardous waste storage area.	A central depot where hazardous waste and waste suitable for incineration generated across the site will be managed properly processed, packaged, labeled, inventoried, and treated and/or stored for disposal on site or off site as appropriate.

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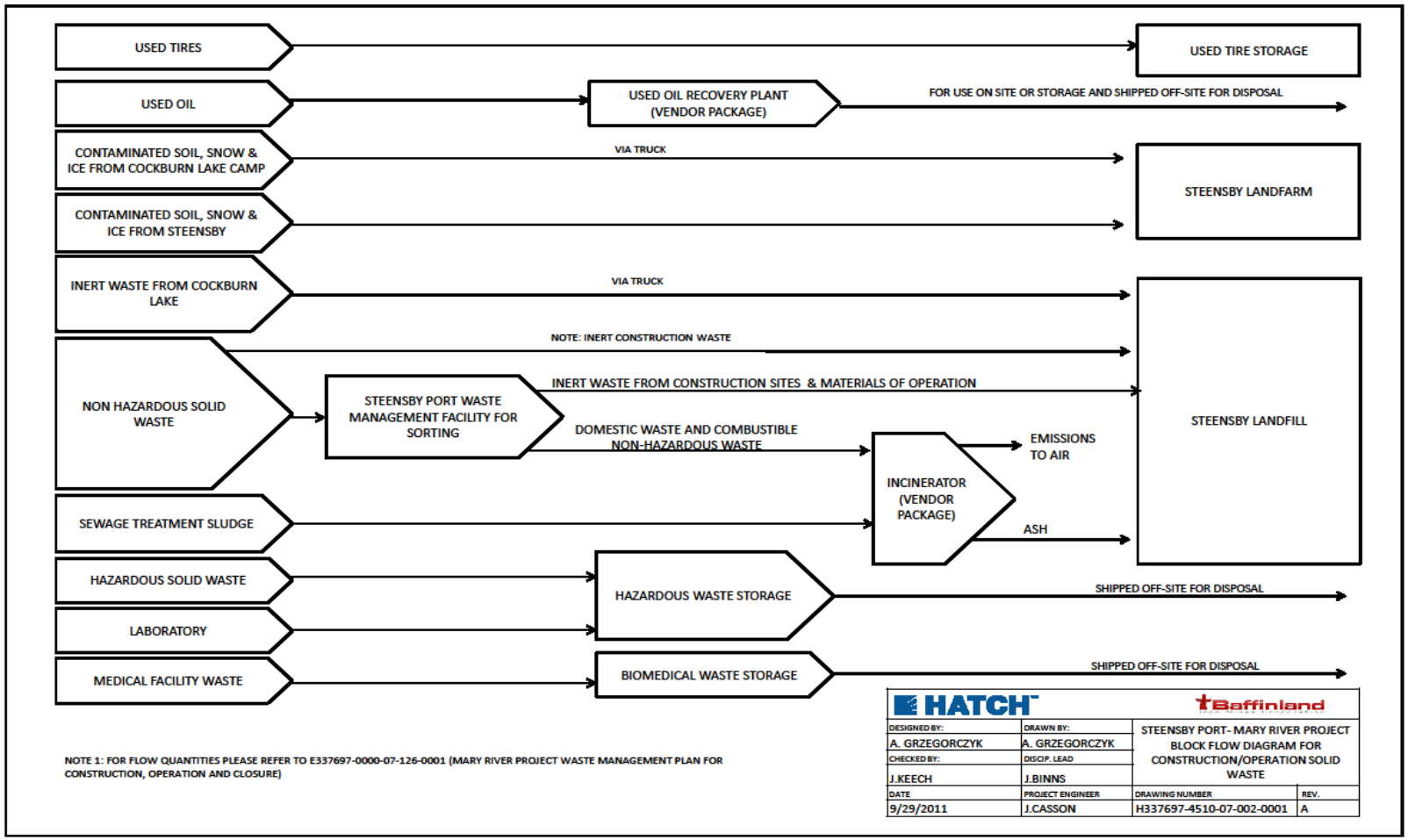
J.3 H337697-4510-07-002-0001: Steensby Port Site – Mary River Project Block Flow Diagram for Construction Solid Waste



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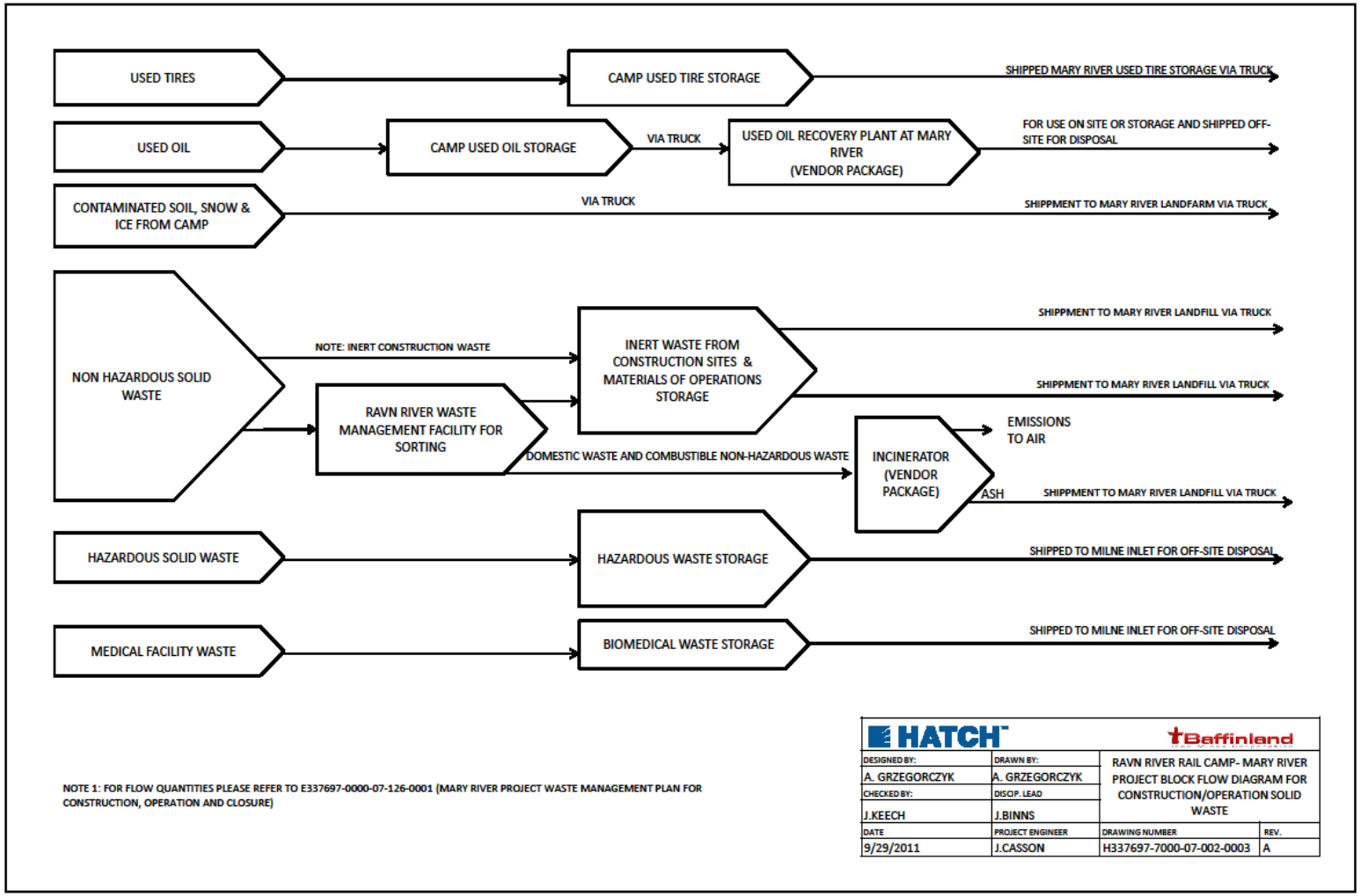
J.4 H337697-7000-07-002-0003: Ravn River Rail Camp – Mary River Project Block Flow Diagram for Construction Solid Waste



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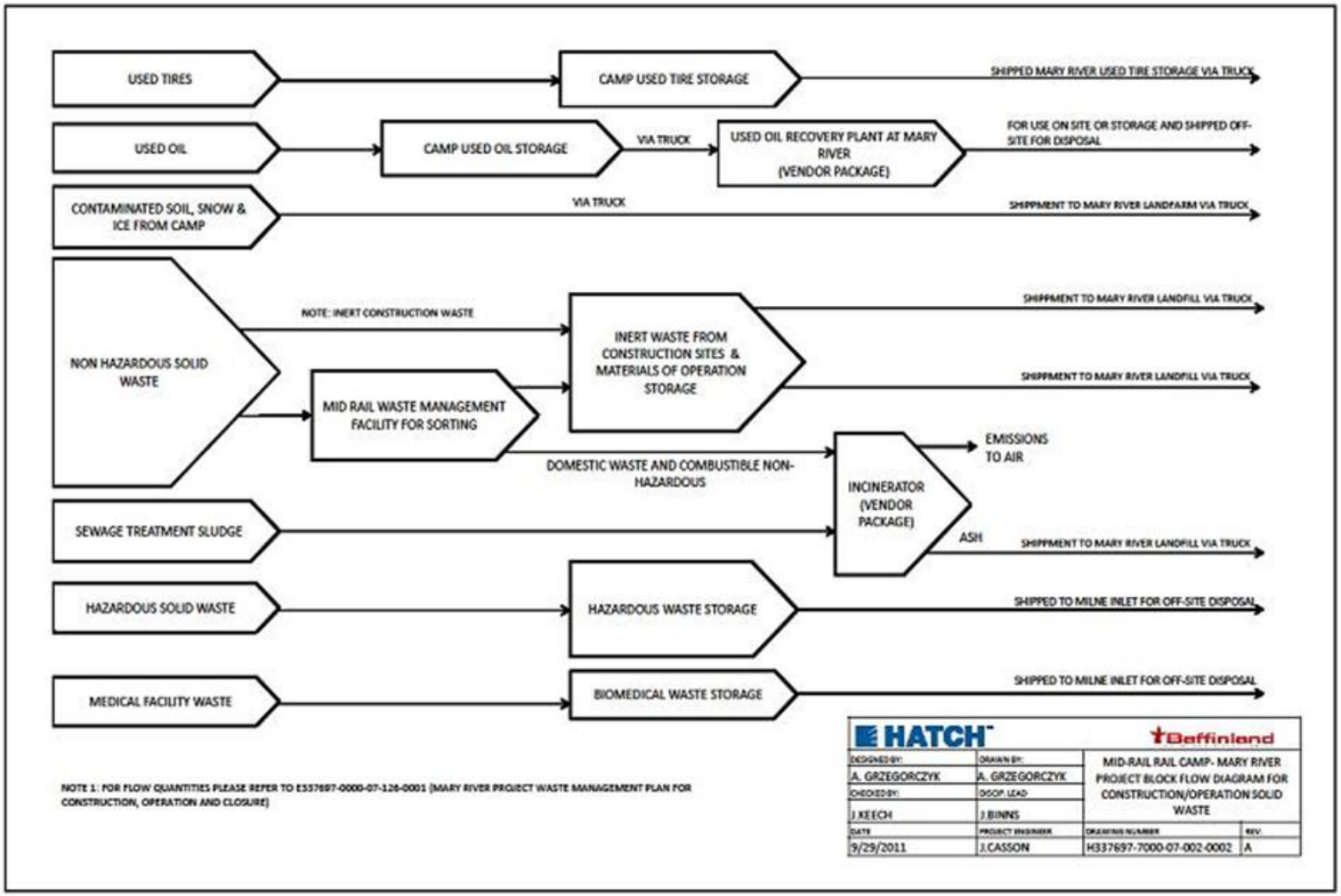
J.5 H337697-7000-07-002-2002: Mid Rail, Rail Camp – Mary River Project Block Flow Diagram for Construction Solid Wastes



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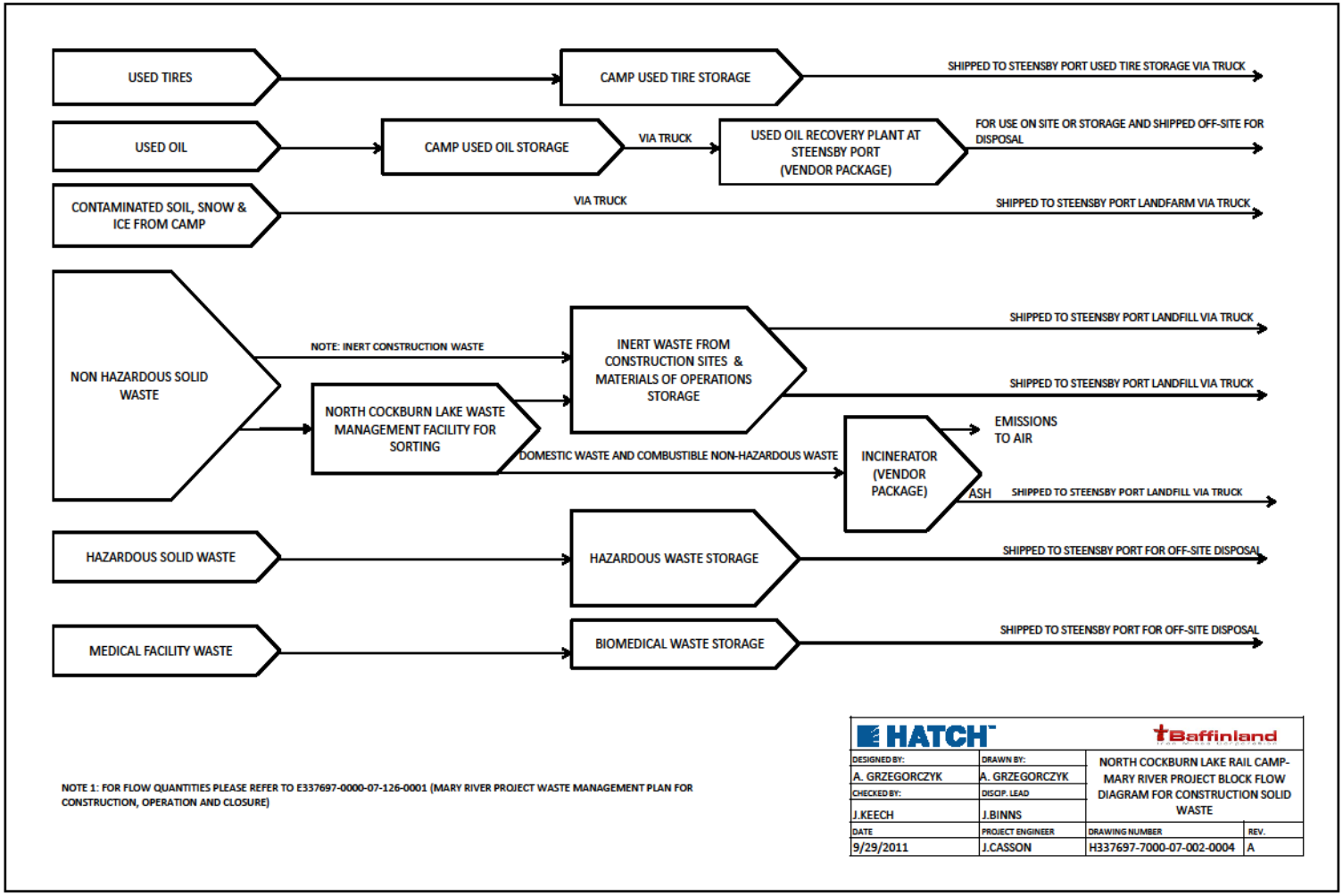
J.6 H337697-7000-07-002-0004: North Cockburn Lake Rail Camp – Mary River Project Block Flow Diagram for Construction Solid Waste



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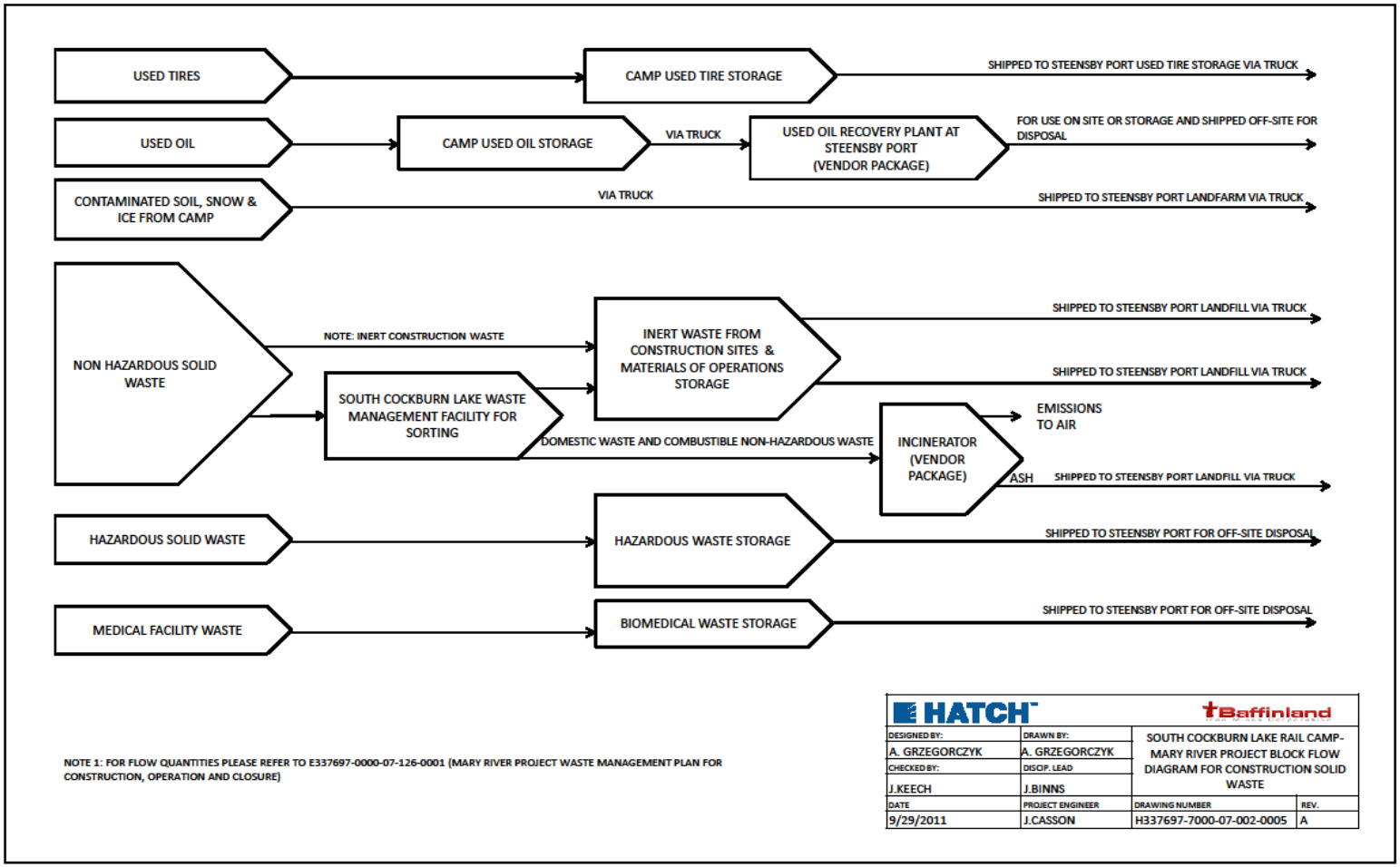
J.7 H337697-7000-07-002-0005: South Cockburn Lake Rail Camp – Mary River Project Block Flow Diagram for Construction Solid Waste



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Appendix K - Locations and Layouts of Waste Management Facilities – Steensby and Rail Camps – Plans for Future Work

- H337697-7000-10-014-1003 Ravn River Rail Camp Construction Works Site Layout
- H337697-7000-10-014-1004 Mid Rail Camp Construction Works Site Layout
- H337697-7000-10-014-1005 South Cockburn Lake Rail Camp Construction Works Site Layout
- H337697-7000-10-014-1006 Steensby Inlet Construction Works Site Layout
- H337697-4660-10-014-0001 Steensby Inlet Landfill and Landfarm Site Layout
- E337697-PM406-50-014-0003 Steensby Inlet Environmental Waste Management Bldg Layout
- H337697-4660-10-042-0001 Steensby Inlet Environmental Waste Management Facility

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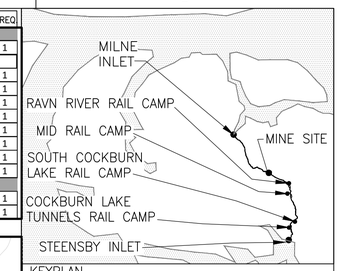
DWG. NO. H337697-7000-10-014-1003

IDENTIFIER #	FACILITY NAME/FUNTION	FACILITY TYPE	SIZE(ftxft)	SIZE(mxm)	#REQ
General Site Services					
BLD-7310-001-RR	Temporary Accommodation Facility - 200 Person Capacity	Pre-Fab / Pre-Eng	-	-	1
BLD-7610-001-RR	Power Generation Facility	Module	-	-	1
BLD-7350-002-RR	Potable Water Treatment Plant	Module	-	-	1
BLD-7130-001-RR	Waste Management Incinerator	Module	20' x 20'	6m x 6m	1
BLD-7710-001-RR	Warehouse / Workshop / Storage - General Complex/Site Services Maintenance and Storage	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7710-001-RR	Warehouse / Workshop / Storage - ERT Facility	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7110-001-RR	Office Complex - ERT Office/Debrief/Command Center	Trailer	60' x 12'	18m x 4m	1
BLD-7320-001-RR	Lunchroom Facility	Trailer	60' x 12'	18m x 4m	1
BLD-7330-001-RR	Wash Car Complex	Trailer	30' x 10'	9m x 3m	1
Fresh Water and Sewage					
BLD-7350-003-RR	Pumphouse	Module	-	-	1
PPL-7350-001-RR	Pipeline - Freshwater Intake to Potable Water Treatment Plant	HDPE Pipe	-	Xm	1



KEYPLAN

593500 E

595000 E

7895500 N

7894000 N

FRESH WATER INTAKE AND PUMP HOUSE N:7895658.80 E:594610.99

FRESHWATER STORAGE TANK AND POTABLE WATER TREATMENT PLANT

CULVERT CROSSING

EXPLOSIVES MAGAZINE

WASTE MANAGEMENT FACILITY

INCINERATOR BUILDING

POWER GENERATOR FACILITY

200 PERSON CONSTRUCTION CAMP

AVAILABLE LAYDOWN AREA APPROX. 56200m²

LUNCHROOM FACILITY

WASH CAR COMPLEX

CAMP ACCESS ROAD

ERT OFFICE/DEBRIEF /COMMAND CENTER

ERT FACILITY

GENERAL COMPLEX/SITE SERVICES MAINTENANCE AND STORAGE

W.L. 164.5 ±
W.L. 177.1 ±
W.L. 148.7 ±
W.L. 146.9 ±
W.L. 146.2 ±
W.L. 149.4 ±
W.L. 148.0 ±
W.L. 144.3 ±
W.L. 138.2 ±
W.L. 135.5 ±
W.L. 139.5 ±
W.L. 133.6 ±
W.L. 139.1 ±
W.L. 139.4 ±
W.L. 133.9 ±
W.L. 134.3 ±
W.L. 134.3 ±
W.L. 132.6 ±

LEGEND:

- WATER
- WETLAND
- CONSTRUCTION WORKS LAYDOWN AREA
- RIVER/STREAM/DRAINAGE
- RAILWAY ALIGNMENT
- FRESHWATER PIPELINE

NOTE(S):

1. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METERS.
3. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 10 METERS.

SCALE 100 50 0 100 200 300 400 500 m

SCALE 1:5,000

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REFERENCE DRAWINGS	

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR ENVIRONMENTAL PERMIT	YH	AS	TH	11/09/30
REVISIONS					

REV.	ISSUE FOR	AUTH. BY	DATE
ISSUE AUTHORIZATION			

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PROJ. DES. COORD. DATE	PROJ. ENGR. DATE
PROJ. MGR. DATE	

MARY RIVER PROJECT

RAVN RIVER RAIL CAMP CONSTRUCTION WORKS SITE LAYOUT

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OR AS NOTED	H337697-7000-10-014-1003	A

Sep 30 , 2011 - 2:03pm Login name: HUA59318
Drawing Name: C:\prj\projectwise\yhuang\dms14683\H337697-7000-10-014-1003.dwg
Layout: RAVN RIVER CAMP

DWG. NO. H337697-7000-10-014-1004

595000 E

596500 E

598000 E

7876500 N

EXPLOSIVES MAGAZINE

ACCESS ROAD

200 PERSON CONSTRUCTION CAMP

ERT FACILITY

ERT OFFICE/DEBRIEF /COMMAND CENTER

WASH CAR COMPLEX

LUNCHROOM FACILITY

GENERAL COMPLEX/SITE SERVICES MAINTENANCE AND STORAGE

POWER GENERATOR FACILITY

INCINERATOR BUILDING

FRESH WATER INTAKE AND PUMP HOUSE
N:7876430.04
E:595602.59

FRESHWATER STORAGE TANK AND POTABLE WATER TREATMENT PLANT

WASTE MANAGEMENT FACILITY

AVAILABLE LAYDOWN AREA
APPROX. 63800m²

CAMP ACCESS ROAD

MILNE INLET

RAVN RIVER RAIL CAMP

MID RAIL CAMP

MINE SITE

SOUTH COCKBURN LAKE RAIL CAMP

COCKBURN LAKE TUNNELS RAIL CAMP

STEENSBY INLET

KEYPLAN

IDENTIFIER #	FACILITY NAME/FUNTION	FACILITY TYPE	SIZE(ftxft)	SIZE(mxm)	#REQ.
General Site Services					
BLD-7310-001-MD	Temporary Accommodation Facility - 200 Person Capacity	Pre-Fab / Pre-Eng	-	-	1
BLD-7610-001-MD	Power Generation Facility	Module	-	-	1
BLD-7350-002-MD	Potable Water Treatment Plant	Module	-	-	1
BLD-7130-001-MD	Waste Management Incinerator	Module	20' x 20'	6m x 6m	1
BLD-7710-001-MD	Warehouse / Workshop / Storage - General Complex/Site Services Maintenance and Storage	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7710-001-MD	Warehouse / Workshop / Storage - ERT Facility	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7110-001-MD	Office Complex - ERT Office/Debrief/Command Center	Trailer	60' x 12'	18m x 4m	1
BLD-7320-001-MD	Lunchroom Facility	Trailer	60' x 12'	18m x 4m	1
BLD-7330-001-MD	Wash Car Complex	Trailer	30' x 10'	9m x 3m	1
Fresh Water and Sewage					
BLD-7350-003-MD	Pumphouse	Module	-	-	1
PPL-7350-001-MD	Pipeline - Freshwater Intake to Potable Water Treatment Plant	HDPE Pipe	-	Xm	1

LEGEND:

- WATER
- WETLAND
- CONSTRUCTION WORKS LAYDOWN AREA
- RIVER/STREAM/DRAINAGE
- RAILWAY ALIGNMENT
- FRESHWATER PIPELINE

NOTE(S):

1. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METERS.
3. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 10 METERS.

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SCALE 1:5,000

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR ENVIRONMENTAL PERMIT	YH	AS	TH	11/09/30

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

HATCH™

DESIGNED BY Y.H. DATE	DRAWN BY Y.H. DATE
CHECKED BY A.S. DATE	DISCIP. ENGR. DATE
PROJ. DES. COORD. DATE	PROJ. ENGR. DATE
PROJ. MGR. DATE	

Baffinland Iron Mines Corporation

MARY RIVER PROJECT

MID RAIL CAMP
CONSTRUCTION WORKS
SITE LAYOUT

SCALE	DWG. NO.	REV.
OR AS NOTED	H337697-7000-10-014-1004	A

Sep 30, 2011 - 2:05pm Login name: HUA59318 Layout: Mid Rail Comp
Drawing Name: C:\pr\projectwise\yhuang\dms14683\H337697-7000-10-014-1004.dwg

DWG. NO. H337697-7000-10-014-1005

FRESH WATER INTAKE AND PUMP HOUSE
N:7820563.84
E:597661.01

FRESHWATER STORAGE TANK AND POTABLE WATER TREATMENT PLANT

500 PERSON CONSTRUCTION CAMP

POWER GENERATOR FACILITY

ERT FACILITY

ERT OFFICE/DEBRIEF /COMMAND CENTER

LUNCHROOM FACILITY

WASH CAR COMPLEX

GENERAL COMPLEX/SITE SERVICES MAINTENANCE AND STORAGE

INCINERATOR BUILDING

CAMP ACCESS ROAD

WASTE MANAGEMENT FACILITY

AVAILABLE LAYDOWN AREA
APPROX. 71500m²

EXPLOSIVES MAGAZINE

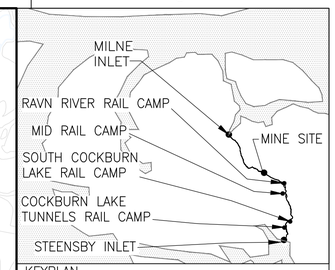
7820000 N

7819000 N

597000

598000

599000



KEYPLAN

LEGEND:

- WATER
- WETLAND
- CONSTRUCTION WORKS LAYDOWN AREA
- RIVER/STREAM/DRAINAGE
- RAILWAY ALIGNMENT
- FRESHWATER PIPELINE

NOTE(S):

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3. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 10 METERS.

IDENTIFIER #	FACILITY NAME/FUNTION	FACILITY TYPE	SIZE(ftxft)	SIZE(mxm)	#REQ.
	General Site Services				
BLD-7310-001-CL	Temporary Accommodation Facility - 500 Person Capacity	Pre-Fab / Pre-Eng	-	-	1
BLD-7610-001-CL	Power Generation Facility	Module	-	-	1
BLD-7350-002-CL	Potable Water Treatment Plant	Module	-	-	1
BLD-7130-001-CL	Waste Management Incinerator	Module	60' x 60'	18m x 18m	1
BLD-7710-001-CL	Warehouse / Workshop / Storage - General Complex/Site Services Maintenance and Storage	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7710-001-CL	Warehouse / Workshop / Storage - ERT Facility	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7110-001-CL	Office Complex - ERT Office/Debrief/Command Center	Trailer	60' x 12'	18m x 4m	1
BLD-7320-001-CL	Lunchroom Facility	Trailer	60' x 12'	18m x 4m	1
BLD-7330-001-CL	Wash Car Complex	Trailer	30' x 10'	9m x 3m	1
	Fresh Water and Sewage				
BLD-7350-003-CL	Pumphouse	Module	-	-	1
PPL-7350-001-CL	Pipeline - Freshwater Intake to Potable Water Treatment Plant	HDPE Pipe	-	Xm	1

SCALE 100 50 0 100 200 300 400 500 m

SCALE 1:5,000

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR ENVIRONMENTAL PERMIT	YH	AS	TH	11/09/30

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

HATCH™

Baffinland Iron Mines Corporation

DESIGNED BY Y.H. DATE	DRAWN BY Y.H. DATE
CHECKED BY A.S. DATE	DISCIP. ENGR. DATE
PROJ. DES. COORD. DATE	PROJ. ENGR. DATE
PROJ. MGR. DATE	

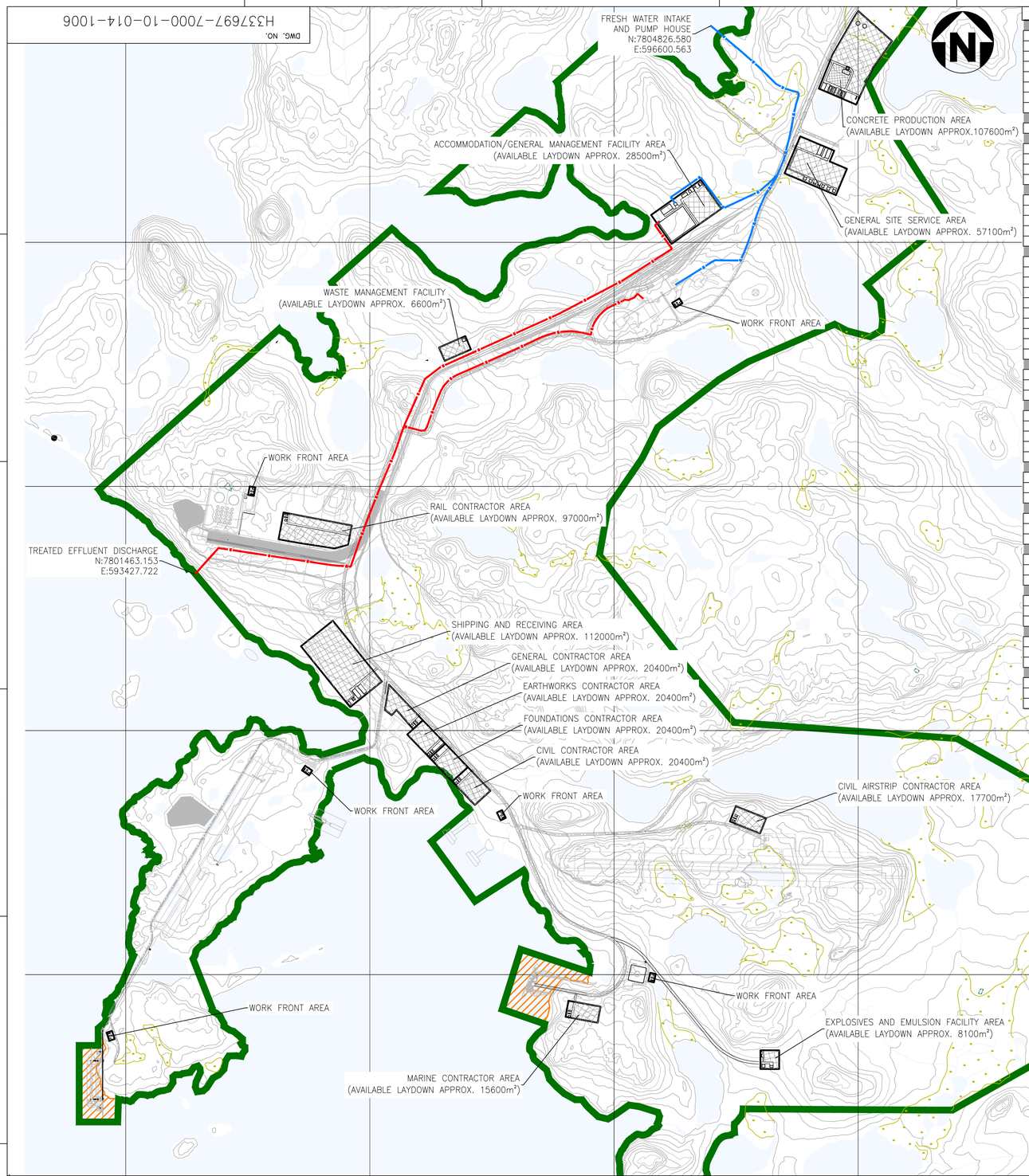
MARY RIVER PROJECT

SOUTH COCKBURN LAKE RAIL CAMP
CONSTRUCTION WORKS
SITE LAYOUT

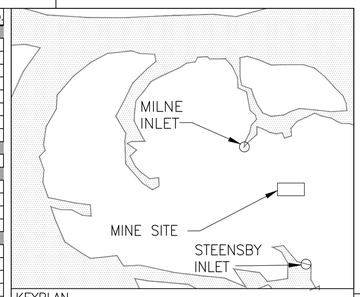
SCALE	DWG. NO.	REV.
AS NOTED	H337697-7000-10-014-1005	A

Sep 30 , 2011 , 2:06pm Login name: HUA59318 Layout: SOUTH COCKBURN LAKE CAMP
Drawing Name: C:\prj\projectwise\yhuang\dms14683\H337697-7000-10-014-1005.dwg

DWG. NO. H337697-7000-10-014-1006



IDENTIFIER #	FACILITY NAME/FUNTION	FACILITY TYPE	SIZE(ftxft)	SIZE(mxm)	#REQ.
Accommodation / General Management Facilities					
BLD-7350-001-SP	Sewage Treatment Plant	Module	-	-	1
BLD-7610-001-SP	Power Generation Facility	Module	-	-	1
BLD-7350-002-SP	Potable Water Treatment Plant	Module	-	-	1
BLD-7110-001-SP	Office Complex - Layout as ten trailers wide	Trailer	60' x 120'	18m x 37m	1
BLD-7330-002-SP	Wash Car Complex - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	1
BLD-7710-001-SP	Warehouse / Workshop / Storage - ERT Facility	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7110-001-SP	Office Complex - ERT Office/Debrief/Command Center	Trailer	60' x 12'	18m x 4m	1
BLD-7440-001-SP	Medical Facility - Layout as four trailers wide	Trailer	60' x 48'	18m x 15m	1
Waste Management Facility					
BLD-7130-001-SP	Waste Management Incinerator	Module	60' x 60'	18m x 18m	1
Explosives and Emulsion Facility					
BLD-7990-001-SP	Explosives Storage - Temporary Emulsion Building	Sea Container	40' x 8'	12m x 2m	8
BLD-7710-001-SP	Warehouse / Workshop / Storage - Explosives Maintenace and Equipment Storage Facility	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7320-001-SP	Lunchroom Facility	Trailer	60' x 12'	18m x 4m	1
BLD-7330-001-SP	Wash Car Complex	Trailer	30' x 10'	9m x 3m	1
Shipping and Receiving Laydown Area					
BLD-7710-002-SP	Warehouse / Workshop / Storage - Construction Warehouse Facility	Pre-Fab / Pre-Eng	200' x 80'	61m x 24m	1
BLD-7710-002-SP	Warehouse / Workshop / Storage - Operations Warehouse Facility	Pre-Fab / Pre-Eng	200' x 80'	61m x 24m	1
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	10
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	1
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	1
General Site Services					
BLD-7710-002-SP	Warehouse / Workshop / Storage - Light and Heavy Vehicle Maintenance Shop	Pre-Fab / Pre-Eng	200' x 80'	61m x 24m	1
BLD-7710-002-SP	Warehouse / Workshop / Storage - Light and Heavy Vehicle Maintenance Shop (Annex)	Pre-Fab / Pre-Eng	200' x 30'	61m x 9m	1
BLD-7710-002-SP	Warehouse / Workshop / Storage - Equipment Assembly and Storage Facility	Pre-Fab / Pre-Eng	200' x 80'	61m x 24m	1
BLD-7710-001-SP	Warehouse / Workshop / Storage - Carpentry & Civil Workshop	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7710-001-SP	Warehouse / Workshop / Storage - Piping & Mechanical Workshop	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7710-001-SP	Warehouse / Workshop / Storage - Structural Steel Fabrication Workshop	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7710-001-SP	Warehouse / Workshop / Storage - Electrical Fabrication Workshop	Pre-Fab / Pre-Eng	60' x 60'	18m x 18m	1
BLD-7110-001-SP	Office Complex - Layout as four trailers wide	Trailer	60' x 48'	18m x 15m	1
BLD-7320-001-SP	Lunchroom Facility - Layout as four trailers wide	Trailer	60' x 48'	18m x 15m	1
BLD-7330-002-SP	Wash Car Complex - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	1
Work Front Area					
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	6
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	6
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	12
Concrete Production					
BLD-7710-004-SP	Shelter - Concrete Batch Plant Facility	Pre-Fab / Pre-Eng	150' x 80'	46m x 24m	1
BLD-7710-005-SP	Shelter - Concrete Aggregate & Cement Stockpiles (layout 2 shelters side by side)	Pre-Fab / Pre-Eng	150' x 72'	46m x 22m	4
BLD-7710-004-SP	Warehouse / Workshop / Storage - Concrete Batch Plant Maintenance and Equipment Storage	Pre-Fab / Pre-Eng	150' x 80'	46m x 24m	1
BLD-7320-001-SP	Lunchroom Facility	Trailer	60' x 12'	18m x 4m	1
BLD-7330-001-SP	Wash Car Complex	Trailer	30' x 10'	9m x 3m	1
General Contractor Laydown Area					
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	1
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	1
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	5
Earthworks Contractor Laydown Area					
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	1
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	1
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	5
Foundations Contractor Laydown Area					
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	1
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	1
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	5
Civil Contractor Laydown Area					
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	2
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	2
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	10
Civil Airstrip Contractor Laydown Area					
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	2
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	2
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	10
Rail Contractor Laydown Area					
BLD-7320-001-SP	Lunchroom Facility - Layout as two trailers wide	Trailer	60' x 24'	18m x 7m	1
BLD-7330-002-SP	Wash Car Complex	Trailer	60' x 12'	18m x 4m	1
BLD-7710-003-SP	Heated Storage	Sea Container	40' x 8'	12m x 2m	5



KEYPLAN

LEGENDS:

- WATER
- WETLAND
- CONSTRUCTION WORKS LAYDOWN AREAS
- FORESHORE AREA
- RIVER/STREAM/DRAINAGE
- POTENTIAL DEVELOPMENT AREA
- FUTURE RAILWAY ALIGNMENT
- ACCESS ROAD
- TREATED EFFLUENT PIPELINE
- FRESHWATER PIPELINE

NOTE(S):

1. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 5 METRES.
4. AS-CONSTRUCTED INFORMATION PROVIDED BY GENIVAR IN 2008.
5. PROPOSED PERMANENT WORKS LAYOUT SHOWN FOR REFERENCE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

SCALE 300 150 0 500 1000 1500 m

SCALE 1:15,000

REFERENCE DRAWINGS	
DRAWING NO.	DRAWING TITLE
H337697-4510-10-014-0001	STEENSBY INLET PROPOSED PERMANENT WORKS SITE LAYOUT

REVISIONS					
NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR ENVIRONMENTAL PERMIT	YH	AS	TH	11/09/30

ISSUE AUTHORIZATION			
REV.	ISSUE FOR	AUTH. BY	DATE

HATCH™

DESIGNED BY Y.H. DATE	DRAWN BY Y.H. DATE
CHECKED BY A.S. DATE	DISCIP. ENGR. DATE
PROJ. DES. COORD. DATE	PROJ. ENGR. DATE
PROJ. MGR. DATE	

Baffinland Iron Mines Corporation

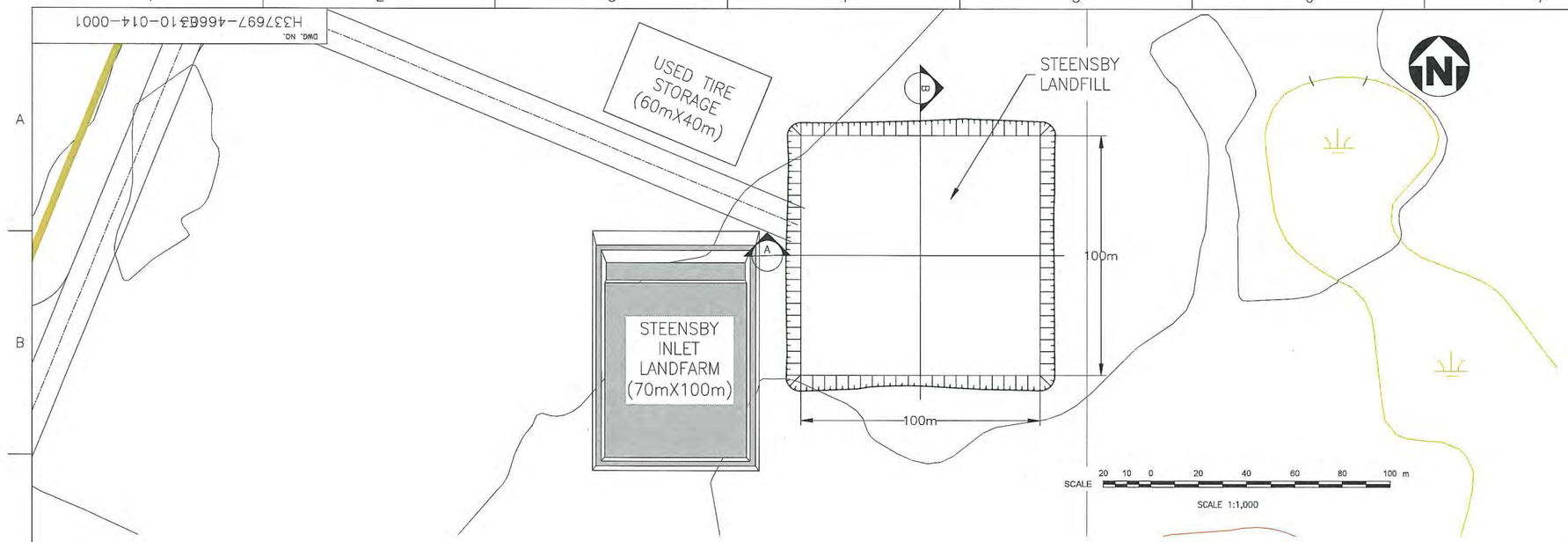
MARY RIVER PROJECT

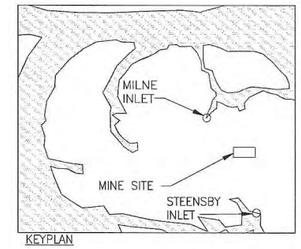
STEENSBY INLET CONSTRUCTION WORKS SITE LAYOUT

SCALE	DWG. NO.	REV.
OR AS NOTED	H337697-7000-10-014-1006	A

Sep 30, 2011 1:51pm Login name: HUA59318 Layout: STEENSBY INLET
Drawing Name: C:\prj\projectwise\yhuang\dms14683\H337697-7000-10-014-1006-STEENSBY.dwg

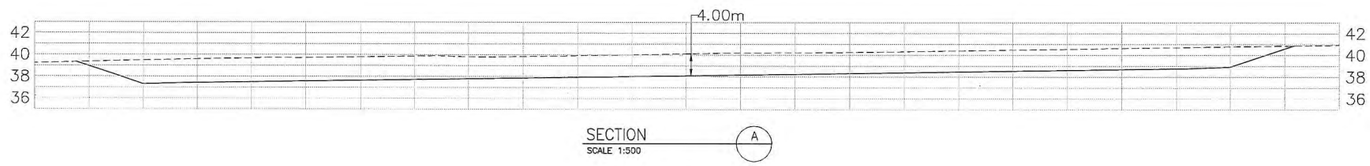
DWG. NO. H337697-4660-10-014-0001



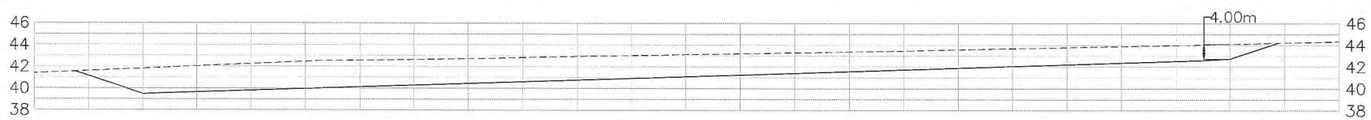


KEYPLAN

WATER
WETLAND
PERMANENT LAYDOWN AREA
RIVER/STREAM/DRAINAGE
PROPOSED RAILWAY ALIGNMENT
ACCESS ROAD



SECTION A
SCALE 1:500



SECTION B
SCALE 1:500

SCALE 5 2.5 0 5 10 15 20 25 m
SCALE 1:250

NOTE(S):

1. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METERS.
3. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 5 METERS AND IS TO GEODETIC DATUM WHERE ELEVATIONS ARE GIVEN.
4. THE SITE LAYOUT IS BASED ON EIS 2010, FIGURE 3-2. 9 AND AMEC'S DRAWINGS:
   A1-159952-8120-121-0201
   A1-159952-8120-121-0203
5. AS-CONSTRUCTED INFORMATION PROVIDED BY GENIVAR, SURVEYED IN SEP. 2008

Sep 22 , 2011 , 5:21pm Login name: tuns1283
Drawing Name: P:\289880 - Mary River\CAD\Civil\Roads\Environmental Dwg\Land Form & Land Fill\H337697-4660-10-014-0001.dwg
Layout: H337697-4510-10-014-0001

DRAWING NO.	DRAWING TITLE
	REFERENCE DRAWINGS

REGISTERED PROFESSIONAL ENGINEER
J.V. CASSON
LICENSEE
Sept 29/11
NT/NU

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR INTERNAL REVIEW				

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
A	ENVIRONMENTAL PERMIT		

ISSUE AUTHORIZATION

HATCH

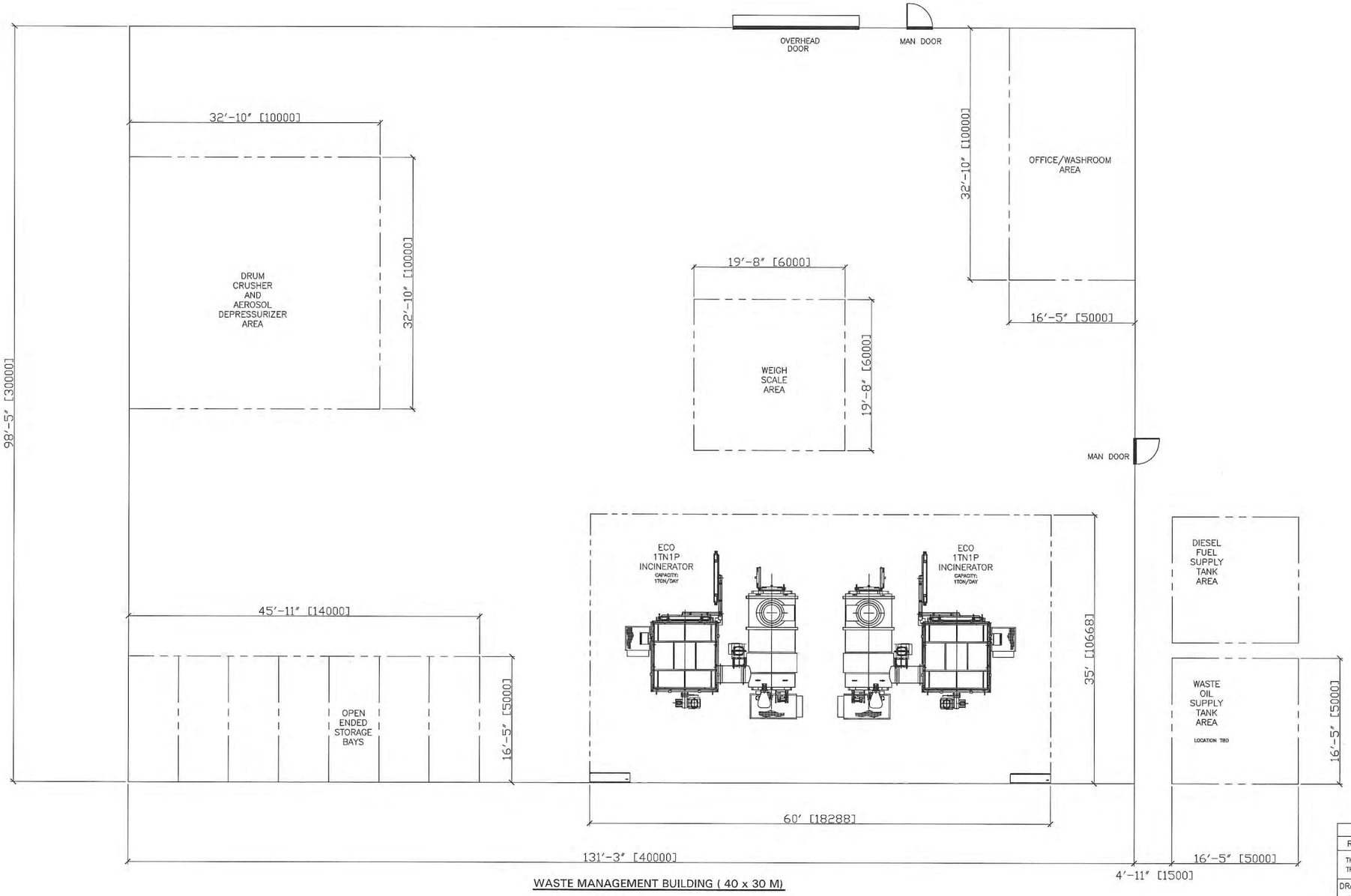
DESIGNED BY J. LIU DATE 2011/08/29	DRAWN BY J. RANGEL DATE 2011/08/29
CHECKED BY J. LIU DATE 2011/08/29	DISCIP. ENGR. T. HO DATE 2011/08/29
PROJ. DES. COORD. D. HINTON DATE 2011/08/29	PROJ. ENGR. J. CASSON DATE 2011/08/29
PROJ. MGR. H. CHARALAMBU DATE 2011/08/29	

Baffinland Iron Mines Corporation

MARY RIVER PROJECT

STEENSBY INLET
LANDFILL AND LANDFARM
SITE LAYOUT

SCALE	DWG. NO.	REV.
OR AS NOTED	H337697-4660-10-014-0001	A



WASTE MANAGEMENT BUILDING (40 x 30 M)

REGISTERED PROFESSIONAL ENGINEER
J.V. CASSON
LICENSEE
N.T./N.U.

E337697-PM406-50-014-0003

REV.	DATE	DESCRIPTION	BY	APPROVED
A	22/09/11	INITIAL RELEASE	JX	

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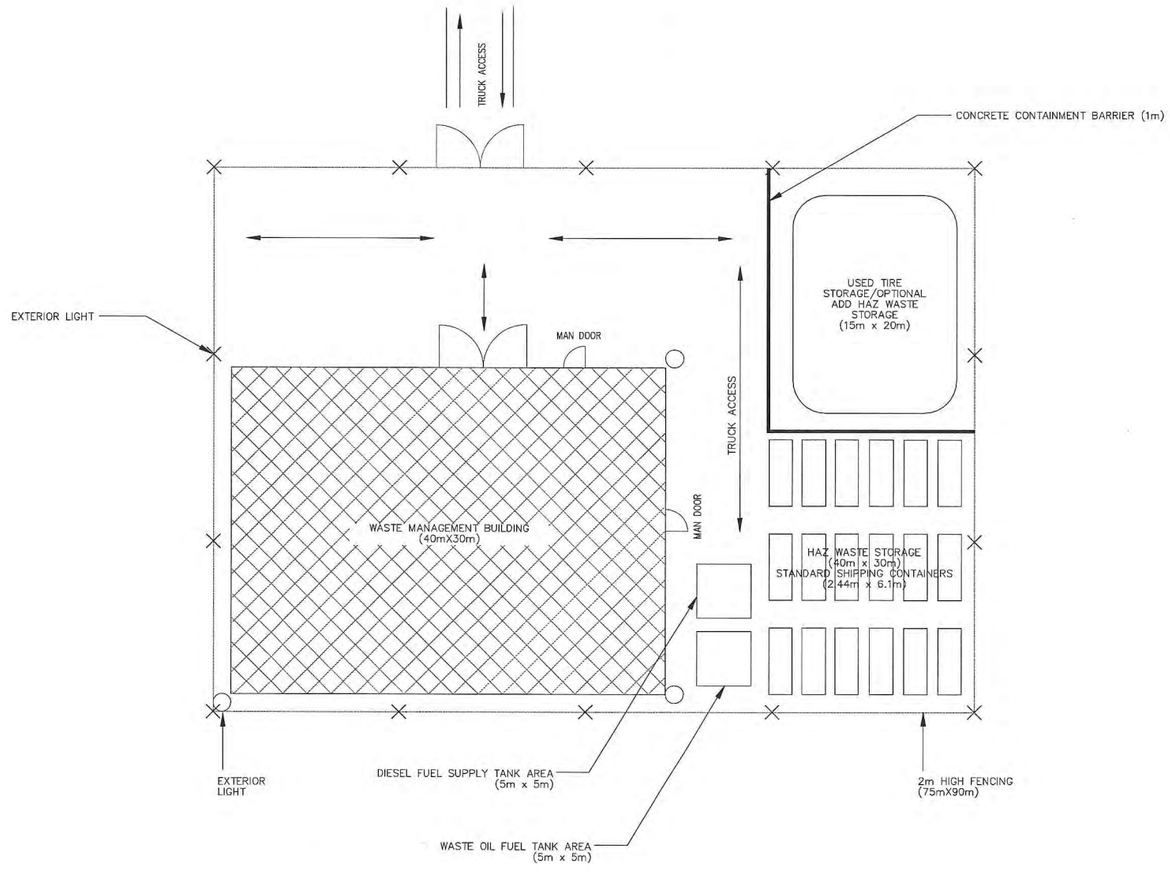
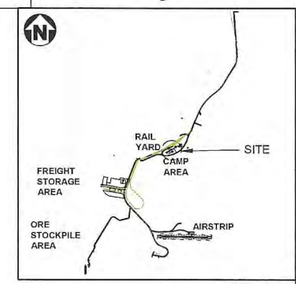
DRAWN: JX	DATE: 21-09-2011
CHECKED: –	DATE: –

ECO WASTE SOLUTIONS
ECO BURN INC.

PROJECT NAME: MARY RIVER PROJECT	CUSTOMER P.O. NO.12292
PROJECT NUMBER: H337697	CUSTOMER EQUIPMENT. # PM406 WASTE INCINERATORS
SCALE: –	TITLE: STEENSBY INLET ENVIRONMENTAL WASTE MANAGEMENT BUILDING LAY OUT
JOB NO. 11-2MS	P.1_OF_1
THIRD ANGLE	DWG. NO. STEENSBY BUILDING LAYOUT
	REV. A

DWG. NO. H337697-4660-10-042-0001





SCALE N.T.S.

KEY PLAN
STEENSBY SITE

LEGENDS

- WATER
- RIVER/STREAM/DRAINAGE
- FENCE

NOTES:

ALL BUILDING AND FACILITIES TO HAVE INTERIOR AND EXTERIOR LIGHTING.

SCALE 5 2.5 0 5 10 15 20 25 m

SCALE 1:250

REGISTERED PROFESSIONAL ENGINEER
JW. CASSON
LICENSEE
NT/NU

REV.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	ISSUED FOR INTERNAL REVIEW				

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
A	ENVIRONMENTAL PERMIT		

ISSUE AUTHORIZATION

REFERENCE DRAWINGS

DRAWING NO.	DRAWING TITLE

HATCH

DESIGNED BY / DATE	DRAWN BY D.F. / DATE
CHECKED BY R.L. / DATE	DISCIP. ENGR. / DATE
PROJ. DES. COORD. / DATE	PROJ. ENGR. / DATE
PROJ. MGR. / DATE	

Baffinland Iron Mines Corporation

MARY RIVER PROJECT

STEENSBY INLET
ENVIRONMENTAL
WASTE MANAGEMENT FACILITIES

SCALE	DWG. NO.	REV.
OR AS NOTED	H337697-4660-10-042-0001	A

Sep 23, 2011 - 2:55pm Login name: tus1283 Layout: Layout1
Drawing Name: P:\289980 - Mary River\CAD\Civil\Roads\Environmental Dwg\Waste Management Facilities\H337697-4660-10-042-0001.dwg

Appendix L -
Examples of 'Typical' Used Oil Heaters and Boilers

The information contained herein is proprietary to Baffinland Iron Mines Corporation and is used solely for the purpose for which it is supplied.
It shall not be disclosed in whole or in part, to any other party, without the express permission in writing by Baffinland Iron Mines Corporation.

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CLEAN BURN
ENERGY SYSTEMS
The World Leader In Used-Oil Heating Systems™

Versatile Hot Water Technology

Used-Oil Coil Tube Boilers

Models CB-200-CTB, CB-350-CTB and CB-500-CTB

Clean Burn offers the industry's only coil tube boilers engineered from the ground up to burn used oils. They efficiently recycle used oils as a free fuel source to generate hot water, and are remarkably versatile for a wide range of applications, such as car wash facilities, baseboard heating, space heating, in-floor heating and ice melt applications.

Only Clean Burn offers three sizes of used-oil coil tube boilers, each UL listed for use in central heating systems. These can be used in combination to create a boiler system perfectly sized for any facility.

As the industry gold standard for robust construction, reliability and long service life, Clean Burn provides a greater return on investment than any other equipment of its kind. And Clean Burn distributors provide unrivaled service and support.

Model CB-500-CTB


Model CB-350-CTB


Model CB-200-CTB

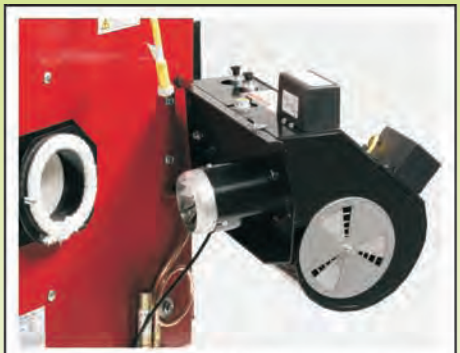
Clean Burn is a strong advocate of environmental protection and energy conservation. Our multi-oil heating systems, storage tanks and recycling centers eliminate extra handling and transportation of used oils and, consequently, help avoid the possibility of used oils entering our water supplies.

ENERGY STAR

The first choice for reliability, economy and return on investment

Easier maintenance

With Clean Burn Coil Tube Boilers, you spend 30 minutes cleaning every 750-1000 hours of operation. With competitive units, you spend 2 hours cleaning every 400 hours of operation.



Patented burner technology

The Clean Burn burner swings out for easy cleaning, maintenance and service. An exclusive heater block, atomizer and combustion mechanism make Clean Burn unmatched for reliability, performance and long service life.

Wired, plumbed for installation

Clean Burn Coil Tube Boilers arrive with wiring and plumbing in place, helping make installation much faster and easier. They meet all national fire and safety codes.

The world's most reliable, most technically advanced used-oil boilers, only from Clean Burn.

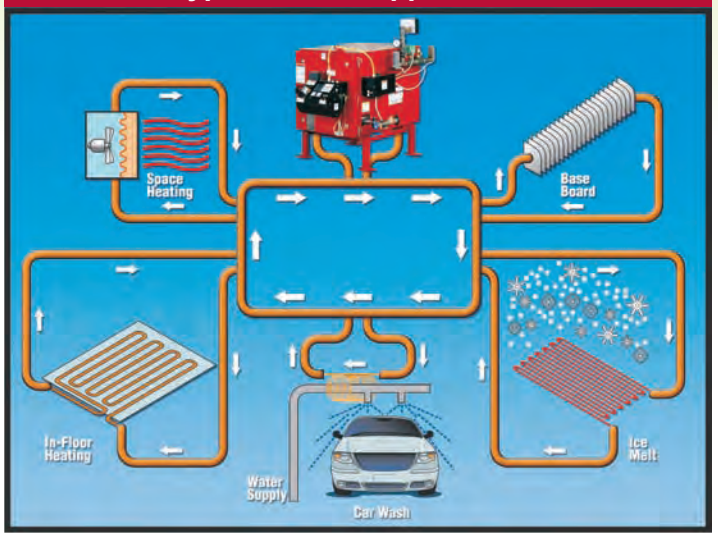
Multiple Clean Burn Boilers can be used to create larger systems.

Clean Burn Coil Tube Boilers are uniquely designed for installation flexibility. Each is engineered for use as a single boiler unit, or as part of a series of boilers working as a larger system.

- Three-pass heat exchanger captures more heat for greater efficiency
- Low-mass water design provides quick start-up and reduces stack heat loss
- Patented burner engineered exclusively for used-oil combustion
- System is pre-plumbed, pre-wired, ready for installation
- Narrow cabinet designs provide installation flexibility

UL listed, ASME tested and approved.

Typical Boiler Applications



Clean Burn used-oil boiler systems are so versatile that they are used for a wide range of applications, from heating water in a car wash to in-floor heating systems and more.

MODEL	CB-200-CTB	CB-350-CTB	CB-500-CTB
BTU/hour input:	200,000 / 58.6 kW	350,000 / 102 kW	500,000 / 146.5 kW
BTU/hour output:	148,500 / 43.5 kW	260,000 /76.2 kW	372,000 /109.0 kW
Fuels: Used oils Fuel oils	Crankcase, ATF and hydraulic #2, #4, #5	Crankcase, ATF and hydraulic #2, #4, #5	Crankcase, ATF and hydraulic #2, #4, #5
Heating surface	39 sq. ft. / 3.6 sqM	68 sq. ft. / 6.3 sqM	97 sq. ft. / 9.0 sqM
Boiler water volume	5 gal. / 19 L	12 gal. / 45.4 L	20.6 gal. / 78 L
Design water flow per coil	15 gpm / 57 lpm	25 gpm / 95 lpm	37 gpm / 140 lpm
Cabinet dimensions	39.5" L x 29" W x 29" H 1003 mm x 737 mm x 737 mm	56" L x 34.25" W x 34.5" H 1422 mm x 870 mm x 876 mm	66.5" L x 39.75" W x 41.75" H 1689 mm x 1009 mm x 1060 mm
Overall dimensions (with burner/breach/plumbing)	57.5" L x 33.25" W x 37" H 1460 mm x 844 mm x 939 mm	74" L x 39.25" W x 41" H 1880 mm x 997 mm x 1041 mm	85.25" L x 43.5" W x 47.85" H 2165 mm x 1105 mm x 1215 mm
Approximate weight	677 lbs. / 304.7 kg	1240 lbs. / 562.4 kg	1600 lbs. / 725.7 kg
Electrical requirements	115 VAC 60 Hz single phase*	115 VAC 60 Hz single phase*	115 VAC 60 Hz single phase*
Maximum oil consumption	1.4 GPH / 5.3 lph	2.5 GPH / 9.5 lph	3.57 GPH / 13.5 lph
Stack size	8" / 203 mm	8" / 203 mm	10" / 254 mm
Air compressor req's	2.0 CFM @ 25 PSI 3.4 m^3/h @ 1.7 bar	2.5 CFM @ 25 PSI 4.25 m^3/h @ 1.7 bar	2.5 CFM @ 25 PSI 4.25 m^3/h @ 1.7 bar
Recommended clean-out	750 hours	1000 hours	1000 hours

*230V / 50 Hz units also available

CLEAN BURN

The #1 Waste Oil Furnace In Customer Satisfaction™

1835 Freedom Road
Lancaster, PA USA 17601
1-800-331-0183 Fax: 717-656-0952
www.CleanBurn.com

All Clean Burn products are backed by unmatched professional factory installation and service