
	<u>No. of Pages</u>
Table of Contents	1
List of Drawings	1
Section 01110 Summary of Work	10
Section 01293 Payment Procedures - Testing Laboratory Services	4
Section 01310 Project Management	7
Section 01330 Submittal Procedures	11
Section 01351 Site Specific Health and Safety for Contaminated Sites	8
Section 01357 Hazardous Materials	7
Section 01358 Management of Toxic Waste	3
Section 01410 Regulatory Requirements	3
Section 01450 Quality Control	2
Section 01500 Temporary Facilities	5
Section 01561 Environmental Protection	5
Section 01591 Mobilization and Demobilization	2
Section 01592 Construction Camp	3
Section 01593 Rental Vehicles	2
Section 01610 Basic Product Requirements	2
Section 01720 Preparation - Survey	3
Section 01770 Closeout Procedures	1
Section 01780 Closeout Submittals	5
Section 02072 Geotextiles	4
Section 02073 Geomembranes	11
Section 02090 Hazardous Waste Material	16
Section 02190 Contaminated Soil Remediation	15
Section 02219 Debris Removal	6
Section 02222 Demolition of Structures	20
Section 02300 Granular Materials	7
Section 02315 Grading	19
Section 02510 Instrumentation	9
Section 13281 Asbestos Abatement – Minimum Precautions	12
Section 13282 Asbestos Abatement – Intermediate Precautions	15
Section 13283 Asbestos Abatement – Maximum Precautions	19
Appendix A - Demolition Inventory	
Appendix B - PCB-Amended Painted Material Disposal Requirements	
Appendix C - Demolition and Site Photographs	
Appendix D - Geotechnical Information	

Drawing No.

Title

Siting:

C01	-	Location Plan
C02	-	Overall Site Plan/Project Layout
C03	-	Station Area Site Plan
C04	-	East Station Area Site Plan
C05	-	Former Construction Camp Area Site Plan
C06	-	Non-Hazardous Waste Landfill Section and Detail
C07	-	Non-Hazardous Waste Landfill Key Trench Excavation Plan Grading/Instru.Plan
C08	-	Secure Soil Disposal Facility Section and Detail
C09	-	Contaminated Areas Section and Detail - Sheet 1
C10	-	Contaminated Areas Section and Detail - Sheet 2
C11	-	Contaminated Areas Section and Detail - Sheet 3
C12	-	Miscellaneous Details

Structural:

S01	-	Station Area Demolition Site Plan
S02	-	Warehouse and Quonset Hut Plan, Section and Elevation
S03	-	Module Train Plan and Elevation
S04	-	POL Pump House and Dormitory Plan, Section and Elevations
S05	-	Fuel Tanks Plan and Elevation

1 Description of Work

- .1 This contract covers the site restoration and demolition of facilities at the CAM-F, Sarcpa Lake DEW Line Site, as indicated on the Drawings and Specifications.
- .2 The work comprises the environmental remediation and clean up construction activities at the CAM-F Sarcpa Lake Intermediate DEW Line Site, including, but not limited to:
 - .1 Mobilization and demobilization of all personnel, equipment, support facilities and materials required to complete the work.
 - .2 Construction of new disposal facilities.
 - .3 Excavation and treatment, on-site disposal or containerization of contaminated soils.
 - .4 Demolition of buildings and infrastructure, collection of debris, containerization of hazardous materials and disposal of non-hazardous materials on-site.
 - .5 Excavation and disposal or closure and regrading of existing dumps, buried debris and contaminated soil areas.
 - .6 Potential Extra Work including:
 - a. Support for the Camp Contractor.
 - b. Unknown hazardous materials encountered during demolition.
 - c. Unknown hazardous debris scattered over the site area.
 - d. Free product encountered during contaminated soil excavation.
 - e. Hazardous barrel contents.
 - f. Unknown hazardous waste material encountered during landfill or debris excavation.
- .3 Specific work related to the project that is not included under this contract includes:
 - .1 Specific testing requirements, as specified in Section 01293 – Payment Procedures Testing Laboratory Services will be the responsibility of the Engineer.
 - .2 Testing of hazardous waste materials in accordance with all appropriate regulations for shipment and off-site disposal.
- .4 Work by others includes the provision and operation of a camp to support the clean up construction activities described herein. Within the context of these specifications, the Contractor responsible for the provision and operation of the camp will be referred to as the Camp Contractor.

2

Site Conditions

- .1 The CAM-F site (68° 33' N, 83° 19' W) is located on the Melville Peninsula, approximately 85 km west of Hall Beach, and 100 km south-west of Igloolik in the Territory of Nunavut. The site is landlocked limiting site access to helicopters, small aircraft and a winter CAT train from Hall Beach. CAM-F was constructed in 1957 as an intermediate site for the DEW Line system. It was used for a short period of time until it was abandoned in 1963. It was converted to a scientific research station in 1977 under the Science Institute of the Northwest Territories and Canada, Department of Indian and Northern Affairs and operated seasonally until 1988.
- .2 The CAM-F site consists of two main parts including the station area and former construction camp areas at Sarcpa Lake. Site facilities consist of an airstrip, small module train, warehouse, garage, Quonset, Inuit house, two former landfill areas, and oil and lubricants (POL) storage facilities. The site contains approximately 9,337 barrels, a radar tower that has been knocked down and other site debris. The station is accessed via 3 km by road from the shores of Sarcpa Lake. The beach area at Sarcpa Lake includes a former construction camp. The former camp area consists primarily of scattered barrels and abandoned construction equipment, a small machine shop and generator pad.
- .3 The CAM-F Phase III Environmental Site Assessment and Waste Audit, prepared by Earth Tech (Canada) Inc., dated December 2004 is available for information only under separate cover from the Contract Tender package. Copies of the Phase III Environmental Site Assessment and Waste Audit can be obtained upon request.
- .4 Previous investigation and remediation has been undertaken at the CAM-F site in the 1990's. The results of this work are summarized in the report entitled "Sarcpa lake 1996, PCB Restoration and Engineering Design" prepared by the Analytical Services Unit of Queens University dated March 1997. This report is available under separate cover from the Contract Tender package. Copies of the Sarcpa Lake 1996, PCB Restoration and Engineering Design Report can be obtained upon request
- .5 The CAM-F Geotechnical Report, prepared by EBA Engineering Consultants Ltd., dated November 2004 is available under separate cover from the Contract Tender package. Copies of the Geotechnical Report can be obtained upon request.
 - .1 Geotechnical test pits are referenced on the Drawings. Excerpts from the EBA report, including a summary of potential borrow sources and associated test pit logs are included in the Appendix D.

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- .2 The geotechnical investigations by their nature reports cannot reveal all conditions that exist or can occur on the sites, and the Contractor is assumed to be knowledgeable of the limitations of such testing procedures. Should subsurface conditions be found to vary substantially from the Geotechnical Test Pit logs, changes in the design will be made with the resulting credits or expenditures as directed by the Engineer.
- .6 Geotechnical data is provided for information only and is based on conditions at the time of investigation and at the test hole locations shown and may not be indicative of the entire site or the present conditions.
- .7 The information presented on the Drawings and in the Specifications is based upon site conditions as reported during field investigation programs of August 1996 and August 2004.
- .8 Information obtained from USAF records indicates that the following waste materials may exist at the DEW Line Site:
- | | |
|---------------------------------|----------------------------------|
| - waste oil | - transmission fluid |
| - PCB transformers/capacitors | - 1-1-1-trichloroethane |
| - asbestos | - PBX telephone equipment |
| - sewage | - mercury vapour rectifier tubes |
| - lead-based paints | - paint thinners |
| - radioactive tubes | - batteries |
| - scrap metal | - chlorinated hydrocarbons |
| - radar components | - corrosion inhibitors |
| - fuel drums | - lye |
| - lime | - corrosives |
| - antifreeze | - paper |
| - wood | - plastics |
| - AVGAS (aviation fuel) | - solvent |
| - sulfamic acid | - dynamite |
| - cathode-ray tubes and screens | - RF interference filters |
| - filtron tubes | - generators |
| - oscillators | - scopes |
| - meters | - vehicles |
| - copper wire | - rubber fuel bladders |
- .9 Information regarding the delineation and analytical testing of contaminated soil areas, as indicated on the drawings, has been provided by the Earth Tech Canada Inc.

3 Definitions

- .1 Engineer's Authorized Personnel: Within the context of these Specifications, the term Engineer's Authorized Personnel refers to personnel appointed by the Engineer or authorized on site by the Engineer. Engineer's Authorized Personnel provide recommendations/ technical guidance to the Engineer, as required, for the enforcement of these specifications.
- .2 Contractor: The Engineer will procure a Contactor for the remediation restoration at the CAM-F Sarcpa Lake site.
- .3 Camp Contractor: The Engineer will procure a Camp Contractor who shall supply and operate the camp in support of the environmental restoration at the CAM-F Sarcpa Lake site.
- .4 Contractor's Site Superintendent: The Contractor's resident site representative, who is authorized to make decisions on behalf of the Contractor.

4 Work Schedule

- .1 Provide and maintain work schedule in accordance with instructions of Section 01310 – Project Management and Coordination.
- .2 Keep the Engineer advised of planned work activities in accordance with the instructions of Section 01330 – Submittal Procedures, and at least 24 hours in advance of operations, unless otherwise indicated herein.

5 Measurement for Payment

- .1 Notify Engineer of planned work activities in accordance with requirements of Section 01330 – Submittal Procedures, and at least 48 hours in advance of operations to permit required measurements for payment.
- .2 Unit price items, lump sum pay items and provisional cost recoverable items will be paid under the Basis of Payment Schedule. All other items, whether specifically defined in the specific sections of the Specifications or not, will be paid under Basis of Payment Schedule, Balance of Project Complete.
- .3 Direct costs include all costs directly attributable to a particular pay item including equipment, operators, materials, equipment maintenance and depreciation, etc. All direct costs for unit price items are to be included in the appropriate unit price in Basis of Payment Schedule.

All direct costs for lump sum items are to be included in the appropriate lump sum price in Basis of Payment Schedule.

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- .4 Indirect costs include all costs not directly attributable to the pay items including profit, overhead, administration, etc. All indirect costs associated with pay items in Basis of Payment Schedule, Balance of Project Complete.
- .5 Include costs of any statement of or requirement for work, goods or services required in this section that are not covered by appropriate payment clauses in other sections (including fixed camp costs) in Basis of Payment Schedule - Balance of Project Complete.
- .6 Fixed camp costs shall include:
- .1 Receipt of the construction camp from delivery on the “beach” at Hall Beach., interim storage at Hall Beach, transportation via Cat Train to Sarcpa Lake.
- .2 Provision of support in the form of heavy equipment for the construction and decommissioning of the camp sewage lagoon.
- .3 Demobilization of the construction camp from the site at the completion of the Contract back to Hall Beach. The Camp Contractor takes ownership of the camp and related equipment at Hall Beach.
- .7 Potential Extra Work will be will be negotiated with the Engineer using the labour and equipment rates provided in the Potential Extra Work Schedule. Costs will include: costs for the supply and transport of containers to the site; and equipment and labour costs for potential additional work as outlined as follows:
- .1 Classification of unknown hazardous demolition and site debris for disposal requirements.
- .2 Supply and transport to the site of containers for unknown hazardous waste materials.
- .3 On-site transport of unknown hazardous waste materials following their confirmation as hazardous waste material by the Engineer.
- .4 Containerization of unknown hazardous waste materials.
- .5 Transport of unknown hazardous waste materials to the Temporary Storage Area at CAM-F.
- .6 Transport of unknown hazardous materials to the Temporary Storage Area at Hall Beach during demobilization.
- .8 Except as otherwise indicated herein, work under this Section will not be measured. Include all costs in Basis of Payment Schedule - Balance of Project Complete.

6 Contractor's Use of Site

- .1 Contractor has use of the CAM-F site with the following restrictions:
 - .1 Do not unreasonably encumber sites with materials or equipment.
 - .2 Move stored products or equipment which interferes with operations of Engineer.
 - .3 Use of site shall comply with the environmental protection requirements of Section 01561 - Environmental Protection.
- .2 Maintain all access roads used by the Contractor during Restoration/construction activities.

7 Permits

- .1 The Engineer has applied for a Land Use Permit, Water Use License and a Quarrying Permit. All restrictions and requirements of these apply to the Contractor.
- .2 Register, obtain and pay for all required licenses and permits for individual tradesmen employed for work as referenced in the various Sections of the Contract Specifications.
- .3 Pay all costs associated with complying with the requirements for the permits and licenses noted in the above Clauses.
- .4 The Engineer with register the Temporary PCB Material Storage Area with the National Registry of PCB Storage Facilities. Provide to the Engineer all requested information including the contents, location and access of the Temporary PCB Storage Area.

8 Site Supervision

- .1 Designate a competent and qualified Site Superintendent to be on site at all times during construction, to have full authority to make decisions for the Contractor, to be knowledgeable of the requirements of the contract, and to act upon Engineer's instructions.

9 Community Relations

- .1 Prior to the commencement of work and at the beginning and end of each construction season, arrange meetings with the Engineer, local leaders, officials, authorities, and public in Hall Beach and Igoolik. Be prepared to discuss local hiring practices and any other items of operations which may impact upon the local communities.

- .2 Provide and pay for the following associated with these meetings:
 - .1 Simultaneous translation services for these meetings.
 - .2 Meeting facility rental (including beverages, coffee, tea, etc.).
 - .3 Return air and ground transportation for Engineer's personnel from CAM-F to Hall Beach and Igloolik and back to CAM-F with an overnight stay based on an aircraft with a capacity of 9 seats with 3 dedicated to the Engineer. A maximum of three representatives from the Engineer will attend these meetings.
- .3 Costs for the items identified in Clauses 9.2.1 and 9.2.2 above will be measured for payment by the number of meetings held and will be paid under Item 01110-1 in the Basis of Payment Schedule.
- .4 Costs for the items identified in Clause 9.2.3 above will be measured for payment by the number of return-trips, and will be paid under Item 01110-2 in the Basis of Payment Schedule.

10 Additional Drawings

- .1 Engineer may furnish additional drawings to assist proper execution of work. These drawings will be issued for clarification only. Such drawings shall have the same meaning and intent as if they were included with plans referred to in Contract documents.

11 Worker Orientation Seminar

- .1 Develop, prior to the start of work, course material for a Worker Orientation Seminar. The outline of this seminar is to be approved by the Engineer and is intended to describe the Restoration activities at the site, and provide instruction in the applicable health, safety, and environmental policies and regulations as related to the site work activities. Course material is to be prepared and presented in the English language and the local Inuit dialect.
- .2 Submit five copies of the Worker Orientation Seminar course material to the Engineer for review at least thirty days prior to mobilizing to the site. Include information describing the facility to be used for conducting the seminars.
- .3 The Orientation Course is to address, but is not necessarily limited to, the following topics:
 - .1 Project Communication:
 - .1 Roles of Engineer and Engineer's authorized representatives.
 - .2 Lines of project communication.

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- .2 Site Restoration Activities (Scope of Work)
 - .1 Demolition and disposal or containerization of demolition waste materials, including PCB Amended Painted Materials.
 - .2 Excavation and disposal/containerisation of contaminated soils.
 - .3 Landfill waste excavation.
 - .4 Asbestos abatement.
 - .5 Collection and disposal of site debris.
 - .6 Collection, containerization, and transportation of hazardous waste material.
 - .7 Construction of landfills.
 - .8 Regrading of landfills.
 - .9 Site grading.
 - .3 Regional Overview of the Sarcpa Lake Area
 - .1 Land use of area (hunting, fishing activities, etc.).
 - .2 Location of site relative to communities.
 - .3 Heritage resources.
 - .4 Climate.
 - .5 Geology and hydrology.
 - .6 Flora and fauna.
 - .4 Project Organization/Schedule/Administration
 - .1 Personnel policies.
 - .2 Supervisory reporting relationships.
 - .3 Communication.
 - .4 Payroll and banking procedures.
 - .5 Work schedules and hours.
 - .6 Camp rules.
 - .5 Environmental Issues and Protection Procedures
 - .1 Climate.
 - .2 Land use.
 - .3 Water resources/fisheries.
 - .4 Terrestrial resources.
 - .5 Heritage resources.
 - .6 Spill contingency plans/procedures.
 - .7 Training activities
 - .6 Site Specific Health and Safety
 - .1 Teamwork.
 - .2 Work attitudes/productivity.
 - .3 Anti-Harassment Policy.
 - .4 First aid procedures.
 - .5 Protective equipment and clothing.
 - .6 Safe operation of equipment and tools.
 - .7 WHMIS requirements.
 - .8 Wildlife Awareness Training
 - .9 Shared use of roads.

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- .7 Work Specific Task Requirements
 - .1 Asbestos abatement.
 - .2 Contaminated soil Restoration.
 - .3 Demolition and material disposal.
 - .4 Transportation of Dangerous Goods (TDG).
 - .5 Permafrost protection.
 - .6 Environmental mitigation procedures.
 - .7 Emergency spill response training.
 - .8 Barrel collection and disposal/containerization.
 - .4 Prior to the start of work and at the start of each construction season, conduct Worker Orientation Seminars for all supervisors, foremen, the Contractor's general workforce, the Engineer, and the Engineer's authorized personnel based on the course material approved by the Engineer.
 - .5 Provide a training seminar of approximately eight hours in length for supervisors, foremen, the Engineer, and the Engineer's on-site support staff. Provide a training seminar of approximately four hours in length for the Contractor's general workforce. Each person on site is to attend one of the seminars. Require each attendee to sign a record of attendance upon completion of the seminar. Retain, for the Engineer's review at any time, this record of attendance.
 - .6 All costs for the preparation of the Worker Orientation Seminar Material and for conducting the seminars, including the preparation of meeting room facilities as required, are to be included in the lump sum price for Worker Orientation Seminar, Item 01110-3, as indicated in Basis of Payment Schedule.
 - .7 The lump sum payment for the Worker Orientation Seminar will be made in two progress instalments as follows:
 - .1 Sixty percent of the lump sum price for the Worker Orientation Seminar will be paid upon completion by the Contractor and review by the Engineer of the Worker Orientation Seminar course material, and upon conducting the seminar prior to the start of work.
 - .2 Forty percent of the lump sum price for the Worker Orientation Seminar will be paid upon demonstration by the Contractor to the Engineer that all of the Contractor's workforce have attended the seminar at the start of each subsequent construction season.

12

Equipment Down Time

- .1 All costs for equipment down time, including financing, leasing, rental or other costs, secure storage, maintenance and winterization of the equipment while it is in transit on the sealift or in storage at Hall Beach or Sarcpa Lake, are to be

included in the lump sum price for Equipment Down Time, Item 01110-4, as indicated in Basis of Payment Schedule. The lump sum price for Equipment Down Time is not to include any costs related to the CAT-Train or equipment usage during the summer construction season.

13

Examination of Site

- .1 Prior to mobilization, check field conditions to obtain actual dimensions required to ensure correct execution of the Work, and notify the Engineer in writing, of all matters which could prejudice proper execution of the work. Provide a minimum of 40 hours notice to the Engineer prior to examining the site.
- .2 Commencement of mobilization shall constitute acceptance of existing conditions, and verification of dimensions.

1 General

- .1 Particular requirements for inspection and testing to be carried out by a testing laboratory designated by the Engineer are specified under various sections.
- .2 Provide and pay for all transportation of all Contractors' samples to an accredited laboratory and testing required to meet requirements of this contract.

2 Appointment and Payment

- .1 The Engineer will appoint and pay for services of a testing laboratory required for the following:

Engineer's Testing Requirements

- .1 Confirmatory testing as described in Clause 4 of this Section.
 - .2 Confirmatory testing following removal of PCB contaminated concrete (>50 mg/kg).
 - .3 Testing for the classification of hazardous contaminated soil for licensed disposal facility acceptance requirements.
 - .4 Testing associated with the characterization of barrel contents for the purpose of determining incineration requirements.
 - .5 Leachate extraction testing of the solid residual material resulting from the incineration of barrel contents, as required.
 - .6 Testing of solvent rinsate used during the cleaning of barrels.
 - .7 Testing associated with the identification and characterization of soil and waste materials excavated from landfills.
 - .8 Testing associated with the identification and characterization of hazardous waste materials.
 - .9 Testing of hydrocarbon contaminated soil during and following treatment.
 - .10 Testing of granular materials including compaction testing.
 - .11 Testing required for quality assurance.
 - .12 Testing of sewage effluent as indicated in Section 01561 or as directed by the Engineer.
- .2 Appoint and pay for testing services for quality control of Contractor's own work including the following:

Contractor's Testing Requirements

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

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- .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing of water resulting from the cleaning of fuel tanks, sewage lines, pipelines and equipment decontamination operations.
 - .4 Testing to determine the disposal requirements of oil-absorbent material used as a filter for liquid wastes resulting from equipment decontamination, fuel tank/pipeline cleaning and barrel processing operations.
 - .5 Testing of water resulting from all dewatering operations.
 - .6 Testing of contact water associated with the development and operation of the Landfarm for the treatment of hydrocarbon contaminated soil.
 - .7 Testing associated with the packaging and including future transport of hazardous waste material to be removed from the site.
 - .8 Air monitoring during demolition and asbestos removal operations.
 - .9 Testing of explosive vapour concentrations associated with degassing of tanks.
 - .10 Tests specified to be carried out by Contractor under the supervision of Engineer.
 - .11 All tests required by the Contractor to ensure conformance and quality control of the Contractor's work.
 - .12 Inspection and testing required by the conditions of permits issued for the work.
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- .3 Where tests or inspections by the designated testing laboratory reveal work not in accordance with contract requirements, pay costs for additional tests or inspections as Engineer may require to verify acceptability of corrected work.
 - .4 The analytical testing laboratory appointed by the Contractor to carry out off-site tests, shall be approved by the Engineer and certified by the Canadian Association for Environmental Analytical Laboratories (CAEAL) for the specific tests required and in advance of analytical testing. Submit copies of the laboratory's CAEAL certification to the Engineer upon request.

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Contractor's Responsibilities

- .1 Furnish labour and facilities to:
 - .1 Provide access to work to be inspected and tested.
 - .2 Facilitate inspections and tests.
 - .3 Make good work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment.
- .2 Notify Engineer a minimum of 72 hours in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Engineer.

4 Confirmatory Testing

- .1 Confirmatory testing will be carried out on contaminated soil areas by the Engineer's testing laboratory as follows:
 - .1 The actual location, frequency and method of testing will be determined by the Engineer.
 - .2 Soil sampling will be carried out within the perimeter of each contaminated soil excavation and at depth within the completed excavation area, immediately upon completion of excavation.
- .2 If required, classification testing will be carried out at Waste Material Processing Areas to classify and delineate contaminated soil and other materials.
- .3 Confirmatory testing will be carried out by the Engineer's authorized personnel if removal of PCB (CEPA) contaminated concrete is required.
- .4 It is anticipated that test results will be available within approximately seven calendar days from the date that samples are transported from the site for laboratory analysis. This is based on a maximum of 30 analyses per day. The samples will be transported via the air transport service provided by the Contractor to Iqaluit. From Iqaluit, the samples will be transported by commercial air service to the Engineer's testing laboratory. Transfer samples to commercial air cargo for the next available flight south (maximum 24 hours from site departure).
- .5 Be responsible for all costs associated with the packaging, handling, and transport of the Engineer's samples to Iqaluit. It is critically important that the Contractor ensures that the samples are expeditiously delivered from the site and transferred to commercial air service.

5 Measurement for Payment

- .1 The costs associated with the packaging, handling and off-site transport of Engineer's samples to Iqaluit are to be based on a minimum quantity of 200 samples. Include all costs for the Packaging, Handling and Transport of the Engineer's Samples to Iqaluit in Item 01293-1, Lump Sum price for Packaging, Handling and Transport of the Engineer's Samples to Iqaluit (based on a minimum of 200 samples) in the Basis of Payment Schedule.

- .2 All costs relative to the Contractor's Testing Requirements, include sampling packaging, handling, off-site transport and testing of the Contractor's samples at an accredited laboratory of choice are to be included in Lump Sum Item 01293-2, Contractor's Testing Requirements including Sampling, Transportation and Analysis at an Accredited Laboratory of choice.

1 Project Control

- .1 Implement and operate throughout the Contract period until the completion of all work, a project control system which includes the following features:

2 Project Meetings

- .1 Engineer will schedule and administer project meetings throughout progress of Work with Engineer and representatives of other agencies.
- .2 Engineer will prepare agenda for meetings.
- .3 Engineer will record minutes including significant proceedings and decisions. Identify action by parties.
- .4 Engineer will reproduce and distribute copies of minutes within after each meeting to meeting participants, affected parties not in attendance and Engineer.

3 Construction Organization and Start-up

- .1 Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Engineer, DIAND, authorities having jurisdiction (i.e. Land Use Inspectors and Water License Inspectors, etc.), Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 7 days before meeting. Meeting location to be confirmed.
- .4 Engineer will chair the meeting. Agenda to include following:
 - .1 Appointment of official representative of participants in Work.
 - .2 Schedule of Work, progress scheduling as per Clause 6 of this section.
 - .3 Requirements for temporary facilities as per Section 01500.
 - .4 Requirements for special procedures for contaminated sites as per Section 01350.
 - .5 Requirements for health and safety for contaminated sites as per Section 01351
 - .6 Requirements for waste management and disposal.
 - .7 Requirements for hazardous materials as per Section 01357.
 - .8 Requirement for management of hazardous waste as per Section 01358.
 - .9 Construction Camp operations as per Section 01592.
 - .10 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime and administrative requirements.

- .11 Take-over procedures, acceptance and warranties as per Section 01770.
 - .12 Monthly progress claims, administrative procedures and holdbacks.
 - .13 Insurances and transcripts.
 - .14 Site security.
 - .15 Site Specific Health and Safety Plan.
 - .16 Spill Contingency Plan, Fire Safety Program and Emergency Response Plan as per Section 01357.
- .5 Comply with instructions of Engineer for use of temporary utilities and construction facilities.
- .6 Comply with Engineer's allocation of mobilization areas of site.
- .7 During construction, coordinate use of site and facilities through Engineer's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

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Site Meetings

- .1 Site meetings are to be scheduled every two weeks and attended by the Contractor, Engineer, major sub-contractors and superintendents. Minutes are to be kept and distributed to attendees. Agenda as follows:
- .1 Field observations, problems, conflicts.
 - .2 Schedules and action contractor plans to take to get back on schedule, if required.
 - .3 Health, safety and security issues.
 - .4 Results of tests, if any.
 - .5 Work plan for the period.
 - .6 Any correspondence or visits from Land Use or Water License inspectors and Authorities Having Jurisdiction.
 - .7 Contractor to submit required monthly reports.
- .2 Between site meetings, progress meetings are to be held weekly between the Contractor and Engineer. Inspect all aspects of on-going work together prior to meeting. Engineer will record any significant items as follows:
- .1 Field observations, problems, conflicts.
 - .2 General review of work progress vs. schedules.
 - .3 Health and Safety issues.
 - .4 Site camp requirements.
 - .5 Requirements for surveying and testing for the following week.
 - .6 Any correspondence from authorities having jurisdiction, or expected visits.
 - .7 Contractor to submit required weekly reports.

- .3 Prior to start of any meeting, Contractor and Engineer shall inspect all work that has been completed and is currently underway.
- .4 Submit a weekly progress report describing major areas of work:
 - .1 Provide an assessment of adherence to schedules and remedial action proposed.

5 On-Site Documents

- .1 Maintain at job site, one copy each of the following:
 - .1 Contract Drawings
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change orders.
 - .5 Other modifications to Contract.
 - .6 Copy of approved Work schedule.
 - .7 Copies of any test results.
 - .8 Labour conditions and wage schedules.
 - .9 Site Specific Health and Safety Plan
 - .10 Contractor's Company Safety Manual
 - .11 Spill Contingency Plan.
 - .12 Copies of manifests and bills of lading.
 - .13 Land Use Permit, Water License and Quarry Permit.
 - .14 Labour & Material Bonds.
 - .15 All applicable Municipal and Territorial permits.
 - .16 Material and Safety Data Sheets.
 - .17 Demolition Audit.
 - .18 Fire Safety Plan
 - .19 Emergency Response Plan
 - .20 Hazardous material audit
 - .21 Waste disposal work plan
 - .22 Excavation work plan.
 - .23 First Aid Credentials at Site Medic.
 - .24 Up-to-date Record Drawings.
 - .25 Standards listed in specific sections of the specification including NIOSH, OSHA, WHMIS, TDGA, etc.

6 Schedules

- .1 Submit preliminary construction progress schedule in accordance with Section 01330 to Engineer, coordinated with Engineer's project schedule.
- .2 After review, revise and resubmit schedule to comply with revised project schedule.

- .3 During progress of Work revise and resubmit as directed by Engineer.

7 Submittals

- .1 Submit requests for payment for review, and for transmittal to Engineer.
- .2 Submit requests for interpretation of Contract Documents, and obtain instructions through Engineer.
- .3 Process substitutions through Engineer.
- .4 Process change orders through Engineer.
- .5 Deliver closeout submittals for review and preliminary inspections, for transmittal to Engineer.
- .6 Submit to Engineer, 3 copies of the Spill Contingency Plan, Emergency Response Plan, and Fire Safety Plan seven (7) days prior to mobilization.
- .7 Submit to Engineer, 3 copies of the Demolition Plan, Excavation Work Plan, Hazardous Material audit, and Waste Disposal Work Plan seven (7) days prior to mobilization, or as directed by the Engineer after mobilization to the site.
- .8 Make submittals to Engineer for review. Include submittals as noted in table 01330-1 in Section 01330.

8 Closeout Procedures

- .1 Notify Engineer when Work is considered ready for substantial performance.
- .2 Accompany Engineer on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Engineer's instructions for correction of items of Work listed in executed Interim Certificate of Completion.
- .4 Notify Engineer of instructions for completion of items of Work determined in Engineer's final inspection.

9 Cost and Quantity Control

- .1 Provide cash flow reporting and projections based on the outline of the CWBS upon Engineer's request.

.2 Documents Required:

- .1 Maintain at job site, one copy of items listed in Clause 5.1 of this section.

.3 Equipment and Material Control:

- .1 Record data on status of construction material and equipment and report upon Engineer's request.

.4 Manpower:

- .1 Record and report manpower listing for each company employed under this Contract, including subcontractors, detailing man-hours during the current month and cumulative total to date and report upon Engineer's request.
- .2 Provide statistical reporting.
- .3 Provide statistics related to lost time accidents upon Engineer's request.

10 Project Milestones

.1 Incorporate the following project milestones into the Site Restoration Schedule:

- .1 Installation and survey of temporary survey control at designated work areas: July 15, 2006 or prior to commencement of work in an area, whichever comes first.
- .2 Installation of all groundwater monitoring wells: by September 15, 2006.
- .3 Final Completion of all works: November 30, 2007.

.2 Schedule work to minimize impacts on the nesting and breeding activities of birds observed near the DEW Line site.

11 Restoration Stage Network Planning

- .1 Prior to award of Contract and within 48 hours of notice, the Contractor may be required to submit information in support of the Contractor's tender including Contractor qualifications.
- .2 Within 10 working days from Contract award date, meet with Engineer via teleconference call to Edmonton and Iqaluit to confirm scope of project and to outline intended Restoration approach and project control methods. Engineer will review content, format, schedule, and medium for project control data submittals. Pay for long distance charges for this teleconference call.
- .3 For the duration of the project, provide specified data and reports to the Engineer.

12 Updating, Monitoring and Reporting Progress

- .1 Arrange participation on site and off site of Subcontractors, Suppliers, and other Contractors performing work for Engineer, Government authorities and third parties, as and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Requirements are as follows:
 - .1 Meetings are to be held on site once every month during the construction season.
 - .2 Preconstruction Meetings will be held in Hall Beach prior to the commencement of mobilization in 2005.
 - .3 The Preconstruction Meeting will also include a visit to the CAM-F site by all meeting participants and a Wildlife Monitor. The maximum time to be spent on the ground at the CAM-F site during this visit will be 6 hours. Provide and pay for ground and air transportation for all meeting participants between Hall Beach/Igloolik and the CAM-F site, and the Wildlife Monitor for this site visit.
 - .4 Preconstruction Meetings will be held at Hall Beach prior to the commencement of each construction season.
 - .5 Submit Updated Site Restoration Schedules to the Engineer and distribute to all subcontractors at least once every month during the construction season.
- .2 Inspect whole of work with Engineer at least once per month to establish progress on each current activity shown on the applicable Site Restoration Schedule.
- .3 Meet with the Engineer and Engineer's support personnel at least once per week during the construction season to review work progress, upcoming scheduled activities, and other project issues.
- .4 Provide written explanations on activities which are overrunning estimated time. If any such activities are on the critical path, indicate what corrective action will be taken to bring them back on schedule.
- .5 If the Contractor considers it necessary or advantageous to change sequencing of activities shown on reviewed schedules, submit proposed revisions to the Engineer for consideration. No change shall be made in order of work activities until the Engineer's comments on the review of the revised schedule have been received.

13 Measurement for Payment

- .1 The provision of return air transportation from Iqaluit to CAM-F for the Engineer's personnel during the Preconstruction Session will be reimbursed to the Contractor based on Provisional Cost Sum Item 01592-1, as described in Section 01592 – Construction Camp.
- .2 The provision of return air transportation from Iqaluit to CAM-F of Engineer's personnel for the monthly project management meetings will be reimbursed to the Contractor based on Provisional Cost Sum Item 01592-1, as described in Section 01592 – Construction Camp.
- .3 Except as indicated in Clauses 13.1 and 13.2 above, work under this section will not be measured. Include all costs in Balance of Project Complete in the Basis of Payment Schedule. Indicate cost of the work of this section as a separate line item in the Cost Breakdown specified in Section 01110 Summary of Work.
- .4 The provision and transport of wildlife monitors, as required for the site visit during the Preconstruction Meeting, shall be considered incidental to the work and will not be measured separately.
- .5 All indirect costs associated with the work described above including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in Balance of Project Complete in the Basis of Payment Schedule.
- .6 At the beginning of each construction season, the aircraft type, cost of air transportation and schedule will be negotiated between the Engineer and Contractor.

1 General

- .1 This section specifies general requirements and procedures for Contractor's submissions of shop drawings, product data, photographs, samples and mock-ups to the Engineer for review. Additional specific requirements for submissions are specified in individual sections of Division 2.
- .2 Submit to Engineer, for review, shop drawings, product data and samples specified.
- .3 Do not proceed with work until relevant submissions are reviewed by Engineer.
- .4 Present shop drawings, product data, and samples in SI Metric units. Where items or information are not produced in SI Metric units, converted values are acceptable.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submissions.
- .6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents and stating the reasons for deviations.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer's review of submission, unless Engineer gives written acceptance of specific deviations.
- .8 Make any changes in submissions which Engineer may require consistent with Contract Documents and resubmit as directed by Engineer.
- .9 Notify Engineer, in writing, when resubmitting, of any revisions other than those requested by Engineer.

2 Administrative

- .1 Submit to Engineer submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review by Engineer is complete including review by authority having jurisdiction.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.

- .5 Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.
- .10 Keep one reviewed copy of each submission on site.

3 Shop Drawings and Product Data

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow 7 days for Engineer's review of each submission.
- .4 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .5 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of any revisions other than those requested.

- .6 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
- .8 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .9 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Performance characteristics.
 - .5 Standards.
- .10 After Engineer's review, distribute copies.
- .11 Submit 3 prints and an electronic copy of shop drawings for each requirement requested in specification Sections and as Engineer may reasonably request.
- .12 Submit 3 prints and an electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Delete information not applicable to project.
- .14 Supplement standard information to provide details applicable to project.

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- .15 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, 2 copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
 - .16 The review of shop drawings by Engineer is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Engineer approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

4 Submission Requirements

- .1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Verify:
 - .1 Field measurements;
 - .2 Field construction criteria;
 - .3 Catalogue numbers and similar data.
- .3 Allow 14 calendar days for Engineer's review of each submission.
- .4 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name, address, and telephone and fax number.
 - .4 Specification Section number.
 - .5 Identification and quantity of each shop drawing, product data and sample.
 - .6 Other pertinent data.
- .5 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.

- .2 Supplier.
- .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Identification of product or material.
- .6 Performance characteristics.
- .7 Applicable standards.
- .8 Specification Section numbers.
- .9 Relationship to adjacent work.
- .6 After Engineer's review, distribute copies.
- .7 A listing of the documents and information to be submitted by the Contractor is presented in Table 01330-1 at the end of this Section.
- .8 Submit all information and documents by the dates indicated, unless otherwise directed by the Engineer.

5 Samples

- .1 Submit samples of materials, equipment, quality, finishes, workmanship in sizes and quantity specified in individual sections of the Specifications.
- .2 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

6 Engineer's Review of Submissions

- .1 Engineer will review shop drawings, product data and sample submissions.
- .2 Upon completion of review, Engineer will provide a written response to the Contractor indicating the shop drawings, product submissions and samples to be "acceptable", "unacceptable with conditions", or "not acceptable".
- .3 Correct and resubmit marked up reviewed drawings, and distribute reviewed drawings as required.

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- .4 Document changes made to the work during the installation and completion of the works by submitting to the Engineer a revised final submission of applicable drawings or five copies of product data. Provide revised submittals within two months of Completion of Works and noted "Revised As-Built".

7 Measurement for Payment

- .1 Work identified in Clauses 1 to 6 will not be measured. Include all costs in Balance of Project Complete. Indicate the cost of this work as a separate line item in the cost breakdown specified in Section 01110 – Summary of Work.

8 Progress Photographs

- .1 Sizes: 100 x 125 mm.
- .2 Finish: Matt or glossy.
- .3 Paper: Standard commercial colour development and printing.
- .4 Container: Acetate 3-compartment jacket; jacket to be three hole punched, ready for insertion into three-ring binder. Binder(s) to be vinyl, hard-covered, 3 inch D ring, sized for 215 x 280 mm paper, with spine pocket.
- .5 Identification: typewritten name and number of project to be provided on each acetate sheet on cover and spine of binder. Each photo to be numbered sequentially, with number label positioned as not to interfere with the view of the main activity or feature presented in the photograph. Provide a description of each photograph in a photographic log format. Photographic log to be included in binder. Description to include:
- .1 Photo number
- .2 Name and description of feature
- .3 View direction
- .4 Date of exposure.
- .6 Frequency: Submit progress photos, monthly with progress statement or as directed by Engineer.
- .7 Quantity: provide sufficient number of photographs to adequately describe the work activities carried out during the reporting period. A minimum of two photographs taken from two view points shall be provided for each restoration/construction operation.
- .8 Number of sets of prints required: one set in a binder as noted above.

9 Final Photographs

- .1 Sizes: 100 x 125 mm.
- .2 Finish: Matt or glossy.
- .3 Paper: Standard commercial colour development and printing.
- .4 Container: acetate 3-compartment jacket; jacket to be three-hole punched and assembled in a three-ring binder. Binder(s) to be vinyl, hard-covered, 3 inch D ring, sized for 215 x 280 mm paper, with spine pocket.
- .5 Identification: typewritten name and number of project to be indicated on cover and spine of binder. Each photo to be numbered sequentially, with number label positioned so as not to interfere with the view of the main activity or feature presented in the photograph. Provide a description of each photograph in a photographic log format. Photographic log to be included in binder. Description to include:
 - .1 Photo number
 - .2 Name and description of feature
 - .3 View direction
 - .4 Date of exposure.
- .6 Quantity: Provide sufficient number of photographs to adequately describe the work activities carried out during the reporting period. A minimum of two photographs taken from two viewpoints shall be provided for each clean up/construction activity.
- .7 Number of sets of prints required: 2 sets in 2 separate binders.
- .8 Submit final photographs prior to final progress payment request.

10 Progress Photographs and Final Photographs - Digital (Alternative)

- .1 Digital photographs may be substituted as an alternative to Clauses 9 and 10 of this section.
- .2 Digital photographs to have a minimum of 2,048 x 1,536 pixel (3.2 Megapixel) resolution.
- .3 Progress and Final Photographs to be submitted on a compact disc (CD). Provide one (1) copy of the Progress Photographs, and two (2) copies of the Final Photographs.

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- .4 Printed (colour) copies of digital photographs to be provided for Final Photographs only:
- .1 Size: 100 mm x 125 mm.
 - .2 Two digital photographs per 215 x 280 mm page.
 - .3 Pages to be white, of photographic quality paper and to be three-hole punched, ready for insertion into a three-ring binder. Binder(s) to be vinyl, hard-covered, 3 inch D ring, sized for 215 x 280 mm paper, with spine pocket.
- .5 Identification: Typewritten or generated by computer, the name and number of the project on cover and spine of binder and CD case. Each photograph to be labelled with the digital photo file name positioned so as to not interfere with the view of the main activity or feature presented on the photograph. Also provide a description of each photograph in photographic log format. Photographic log to be included with each computer disk, CD, and binder. Description to include:
- .1 Digital photograph file name
 - .2 Name and description of feature
 - .3 View direction
 - .4 Date of exposure.
- .6 Quantity: Provide sufficient number of photographs to adequately describe the work activities carried out during the reporting period. A minimum of two photographs taken from two viewpoints shall be provided for each clean up/construction activity. Viewpoint locations for final digital photographs to be determined by Engineer.
- .7 Submit progress photographs monthly with progress statement or as directed by the Engineer.
- .8 Provide two sets in two binders of final digital photographs.
- .9 Submit final photographs prior to final progress payment request.

11 Negatives

- .1 Submit negatives of all colour prints.
- .2 Insert negatives in envelopes and identify with name and number of project.
- .3 Include negatives with corresponding submissions of progress photographs and final photographs.

12 Digital Files (Alternative)

- .1 Digital files may be submitted as an alternative to negatives referenced in Clauses 11.1 to 11.3 above.
- .2 Digital files shall be in Joint Photographic Experts Group (.jpg) format.
- .3 Cross reference digital file names to photographic logs.

13 Measurement for Payment

- .1 All direct costs for project photographs, including descriptions, binding copies and negatives, are to be included in the lump sum price for Project Photographs, Item 01330-1 in the Basis of Payment Schedule.
- .2 All indirect costs associated with the work described above, including supervision, overhead, profit, etc., shall be included in Basis of Payment Schedule, Balance of Project Complete.

TABLE 01330-1 CAM-F: Sarcpa Lake: DEW Line Site Restoration CONTRACTOR SUBMITTAL SCHEDULE			
Specification		Description	Date
Section	Clause		
01110	11.2	Worker Orientation Course Seminar Info. (5 copies)	30 days prior to mobilization
01110	11.5	Record of Attendance to Training Centre	Upon Engineer's request
01293	2.4	CAEAL Laboratory Certification	Upon Engineer's request
01310	4.4	Weekly Progress Reports	Weekly
01310	6.1	Project Schedule	Thirty (30) days prior to mobilization.
01310	7.1	Request for Contract Progress Payments	Monthly
01310	7.6	Spill Contingency Plan, Emergency Response Plan, and Fire Safety Plan	Upon Engineer's request
01310	7.7	Demolition Plan, Excavation Work Plan, Hazardous Material audit, and Waste Disposal Work Plan	Seven (7) days prior to mobilization
01310	9.1	Cash flow projections	Upon Engineer's request
01310	9.3	Material and Equipment List	Upon Engineer's request
01310	8.4	Manpower reports	Upon Engineer's request
01330	1.2, 2.1	Document Submittals	Monthly with progress statement
01330	8.6	Progress Photographs	Monthly with progress statement
01330	9.8	Final Photographs	Prior to final progress payment request
01351	1.5	Safety Meeting Minutes	Weekly
01351	2.1	Site Specific Health and Safety Plan	Prior to mobilization
01351	2.2	Proof of PPE certification	Prior to start of each construction season
01351	2.3	Contingency and Emergency Response Plan	Prior to start of each construction season
01351	5.1	Report accidents	verbal report immediately followed by written report in 24 hours
01351	8.2	Details of Fire Safety Program	Prior to start of construction
01500	3.3	Location of services and equipment	Prior to each construction season
01500	12.3	Documentation Certifying Calibration of Survey Equipment	Prior to each construction season
01561	4.2	Copies of Environmental Agency Submittals/Approvals	As required
01561	7.1	Erosion, Sediment and Drainage Control Plan	Prior to commencement of work
01610	1.2	Material and Equipment List	Within 7 days of Engineer's written request
01720	7.1, 7.2, 7.3	Survey Information	Once per month or more often Upon Engineer's request
01780	8	Survey Information	At project completion/prior to final inspect.
01780	7.1	Manufacturers' Data Books	Within 120 days of project completion
01780	3.1, 6.5, 8.2	Records and Survey Information	As required

Submittal
Procedures

Specification		Description	Date
Section	Clause		
02072	1.3.1	Manufacturer's Certification - Geotextiles	Prior to shipment of material to the site
02073	1.4.2	Manufacturer's Certification - Geomembranes	Prior to shipment of material to the site
02190	2.1.1.2	Approval for Hazardous Contaminated Soil Containers	Prior to commencement of work
02190	3.2.7	List of Numbered Hazardous Contaminated Soil Containers	Prior to project completion
02222	1.7.1	Drawings, Diagrams, Details of Disassembly Work	Prior to demolition work (as required)
02222	2.1.1	Details of Hazardous Waste Containers	Prior to commencement of work
02222	2.1.5.5	Details of Barge Containers	Prior to commencement of work
02222	3.6	Inventory of Location and Contents in Containers	Upon completion of demolition work
02222	3.6	Photographic Record of Completed Containers prior to Closing	Upon completion of demolition work
02222	3.7.9	Results of VOC (LEL) Testing of Tanks	Upon Engineer's request
02222	3.8.1	Reuse and Recycling Proposal	Prior to demolition work (as required)
02510	2.5.7.1	Thermister Calibration Data	Prior to shipment of material to the site
02510	2.7.6	O & M Manuals for Data Loggers	Immediately following data logger installation
13281, 13282, 13283	1.9.1	Minutes of Contractor's Mtg with the Gov.of Nunavut re: Asbestos Plan	After meeting (if necessary)
13281, 13282, 13283	1.9.3	Notifications to Regulatory Authorities of Asbestos Schedule	Prior to commencement of asbestos work
13281, 13282, 13283	1.10.2.2	Written Approval of Asbestos Abatement Plan	Prior to commencement of asbestos work
13281, 13282, 13283	3.0.1/3.3.7	Asbestos Removal Inventory	Upon completion of demolition work
13283	1.4.1	Asbestos Abatement Plan	Prior to commencement of asbestos work
13283	3.2.3.1	General Plan for Decontamination Facilities	Prior to Acquisition and Installation of the Facilities

1 General

- .1 Maintain and complete all health and safety, fire safety, and environmental compliance activities in accordance with applicable sections and Authorities having Jurisdiction.
- .2 Schedule a compliance meeting on an as required basis, or as determined by Engineer.
- .3 Purpose: to review reporting and inspection requirements to meet the intent of the Nunavut Safety Act, the Water License, the Land Use Permit, regulatory, and other requirements as may be required.
- .4 Location: Compliance meetings shall be held at the Work site.
- .5 Minutes: Engineer will record minutes, chair the meeting and distribute minutes to parties of record prior to the next scheduled meeting.
- .6 Attendees:
 - .1 Contractor: Manager and / or Supervisor(s), representatives of major Subcontractors, and others as necessary.
 - .2 Engineer, and representatives of Independent Inspection Agencies.
 - .3 DIAND representative(s).
- .7 Agenda:
 - .1 Review and approval of minutes of previous meeting.
 - .2 Review of items of significance that could affect Work.
 - .3 Inspect the site on a monthly basis, or more or less often, as determined by the Engineer or as dictated by the Authorities Having Jurisdiction.
 - .4 Identify and record field observations, problems, and conflicts that must be noted in reports required by the Authorities having Jurisdiction.
 - .5 Identify corrective measures and procedures to regain approval from Authorities Having Jurisdiction.
 - .6 Identification of requirements for maintenance of quality standards needed for compliance with applicable Codes and Legislation.
 - .7 Review site safety and security issues.
 - .8 Environmental and regulatory compliance.
 - .9 Other topics for discussion as appropriate to current status of the Work.

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Submittals

- .1 Submit Site Specific Health and Safety Plan at least 7 days before mobilization. Engineer will have the Contractor's Site Specific Safety Plan reviewed, to ensure that all the elements required by the Nunavut Safety Act, OSHA Regulations, other Authorities Having Jurisdiction, and Contract Specifications have been addressed. Any items, which are identified as missing, shall be added and the plan revised, so as to incorporate the additional items. The revised safety plan, where required, shall be resubmitted to the Engineer within fourteen (14) days after the first review.
- .2 No later than 14 days after work at site commences, and prior to the first Compliance Meeting submit proof of Personal Protection Equipment fit testing (e.g. Respirator fit testing) for site personnel; update submission when new personnel are added to the Work.
- .3 Submit prior to Start-Up Meeting, on-site Contingency and Emergency Response Plan addressing standard operating procedures to be implemented during emergency situations.
 - .1 Safety plans including procedures to meet Safety Requirements below,
 - .2 The Engineer will have the Contractor's Site Specific Safety Plan (SSSP) reviewed by Authorities Having Jurisdiction and may request modifications or additions as necessary for the work.
 - .3 Contractor's Site Specific Health and Safety Plan shall be kept on site, made available to site personnel and updated after each Safety Meeting. Co-ordinate with the Crown's Environmental Health and Safety Policy requirements.
- .4 Conduct and submit to the Engineer, a site assessment of deficiencies in health, safety, medical/first aid supplies. Submit to Engineer a schedule for upgrading deficiencies to meet requirements of Authorities having jurisdiction.

3

Construction Safety Measures

- .1 Observe and enforce construction safety measures required by the latest revisions of: Canada Labour Code, National Building Code of Canada, National Fire Code of Canada, Workers' Compensation Board, the applicable Occupational Health and Safety Regulations, and Territorial and local statutes and authorities.
- .2 In the event of discrepancies between any requirements of the above listed authorities, the more stringent requirements shall govern.

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- .3 Maintain at the site, five safety hats with liners, and five safety hi-visibility vests for use by the Engineer and visitors.
 - .4 Comply with all applicable health and safety policies and procedures of the Engineer.
 - .5 The Engineer or his representative has the authority to stop work on the contract if, in his/her opinion, the work is being performed in an unsafe manner as required by the applicable safety legislation.
 - .6 Prepare and coordinate a Contingency and Emergency Response Plan with contributions from appropriate authorities including Government of Nunavut Safety Act, Hospitals, RCMP, Ministry of Transportation, and Ministry of Health. Plan will identify off site Emergency Response Coordinator through whom all information and coordination will flow in the event of an incident.
 - .7 Verify that emergency procedures including appropriate First aid facilities and First Aid personnel are in place at the Work Site. First aid facilities and First Aid personnel must be in compliance with the Nunavut Safety Act.
 - .8 Develop, as part of Site Specific Safety Plan, a written Contaminated Site Working and Decontamination procedures. Working procedures to outline personal protective equipment (PPE) requirements for various parts of site and for different operations.

4

Medical

- .1 Provide and maintain first aid and medical care and facilities for all workers as required by the Statutes of the Nunavut Safety Act.
- .2 Maintain first aid supplies and sick quarters separately from general living quarters when camp population normally ranges between 26 and 50 occupants.
- .3 Provide the appropriate Nunavut first aid kit, based on the number of workers, in accordance with the Nunavut Safety Act.
- .4 Establish an emergency response plan acceptable to the Engineer, for the removal of any injured person to medical facilities or a doctor's care in accordance with applicable legislative and regulatory requirements.
- .5 Provide proof of First Aid credentials to the Engineer prior to the start of each construction season. Provide the appropriate number of first aid attendants on site in accordance with the Nunavut Safety Act (minimum of one).

5 Accidents and Accident Reports

- .1 Immediately report, verbally, followed by a written report within 24 hours, to the Engineer, all accidents of any sort arising out of or in connection with the performance of the work, giving full details and statements of witnesses. If death or serious injuries or damages are caused, report the accident promptly to the Engineer by telephone or facsimile in addition to any report required under federal and territorial laws and regulations.
- .2 If a claim is made by anyone against the Contractor or the subcontractor on account of any accident, promptly report the facts in writing to the Engineer, giving full details of the claim.

6 Security

- .1 Abide by the Camp Rules provided by the Camp Contractor.
- .2 Limit site access only to persons employed on the project. Unauthorized persons will be permitted on site only with the approval of the Engineer.

7 Wildlife Monitors

- .1 Provide for the duration of the construction seasons, full-time wildlife monitors acceptable to the Engineer. Provide sufficient number of wildlife monitors with firearms and ammunition to protect the safety of all workers in all areas, including the Engineer and Engineer's support staff during site operations.
- .2 Assign a wildlife monitor to accompany the Engineer and Engineer's support staff during all inspections and soil/material sampling activities that take place away from the construction camp area.
- .3 Assume full responsibility for reporting incidents associated with wildlife encounters.
- .4 Supply one ATV per wildlife monitor to facilitate his duties. Ensure wildlife monitors are fully trained in the safe use of the ATV equipment.
- .5 Provide the wildlife monitors with mobile communication radios with charging units for on-site communication between the wildlife monitors, Contractor base radio, and Engineer and Engineer's Authorized Personnel. If radios do not provide sufficient range for continuous communication, provide satellite phones.

8 General

- .1 Provide all fire prevention, fire protection and fire fighting services at the project site.
- .2 Implement a fire safety program that includes fire prevention, fire protection and fire fighting requirements. Submit details of the fire safety program in writing to the Engineer for review prior to start of construction. Such review does not relieve the Contractor from any obligations or responsibilities required by the Contract.
- .3 Ensure that any subcontractors and other contractor personnel on-site are briefed on fire safety requirements and are familiar with the fire prevention, fire protection and fire fighting program.
- .4 The fire safety program shall meet or exceed the most recent editions of the following codes and standards:
 - .1 Nunavut Safety Act.
 - .2 National Fire Code of Canada.
 - .3 Canada Labour Code.
- .5 Personnel designated for fire fighting services must be provided with training for any special hazards that may be present. These personnel must also be provided with protective equipment as required by the Canada Labour Code.

9 Reporting Fires

- .1 A person discovering a fire and all fire related incidents shall report immediately, by fastest available means, to Engineer and site superintendent.
- .2 A person discovering a fire shall, if possible, remain in the vicinity to direct fire fighting personnel.

10 Fire Extinguishers

- .1 Provide and maintain fire extinguishers in sufficient quantity to protect, in an emergency, the work in progress and the physical plant on site.

11 Smoking Precautions

- .1 Do not permit smoking in hazardous areas. Exercise care in the use of smoking materials in non-restricted areas.
- .2 Provide and place signs prohibiting smoking in areas where smoking is not permitted.

- .3 Signs prohibiting smoking shall be in English and the local dialect and shall have black lettering not less than 50 mm high, with a 12 mm wide stroke on a yellow background. In lieu of lettering, symbols of not less than 150 mm by 150 mm may be used.
- .4 Smoking is prohibited within 7.5 metres of fuel storage and dispensing facilities.
- .5 Provide and place signs indicating that smoking within 7.5 metres of fuel storage and dispensing facilities is not permitted, and that the vehicle ignition must be turned off while the vehicle is being refuelled. Provide at least one weather-resistant sign at each fuel dispensing location. The signs shall have a minimum dimension of 200 mm and letters not less than 25 mm high. In lieu of lettering, signs may have international "No Smoking - Ignition Off" symbols not less than 100 mm in diameter. Install signs in a location visible to all drivers approaching the dispensing location, and at the dispensing unit.

12 Rubbish and Waste Materials

- .1 Rubbish and waste materials are to be kept to a minimum.
- .2 Storage:
 - .1 Extreme care is required where it is necessary to store oily waste in work areas to ensure maximum possible cleanliness and safety.
 - .2 Greasy or oily rags or materials subject to spontaneous combustion shall be disposed of as hazardous material in accordance with Section 02090 - Hazardous Waste Material.

13 Flammable Liquids

- .1 The handling, storage and use of flammable liquids shall be governed by the current National Fire Code of Canada.
- .2 Flammable liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable liquids exceeding 45 litres for work purposes, requires the permission of the permitting authority.
- .3 Transfer of flammable liquids is prohibited within buildings.
- .4 Do not transfer flammable liquids in the vicinity of open flames or any type of heat-producing devices.

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- .5 Do not use flammable liquids having a flash point below 38°C such as naphtha or gasoline as solvents or cleaning agents.
 - .6 Store flammable waste liquids, for disposal, in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum and the Engineer is to be notified when disposal is required.
 - .7 Dispose of all flammable liquids in accordance with all applicable environmental regulations and with the requirements of Section 02090 - Hazardous Waste Material.

14 Hazardous Substances

- .1 If the work entails the use of any toxic or hazardous materials or chemicals, or otherwise creates a hazard to life, safety or health, work shall be in accordance with the National Fire Code of Canada, Occupational Health and Safety Legislation, and WHMIS.
- .2 The Engineer is to be advised, and a "Hot Work" permit issued by the Contractor's designated representative in all cases involving welding, burning or the use of blow torches and salamanders, in buildings or facilities. Special precautions are necessary to safeguard life and property from damage by fire or explosives.
- .3 Wherever work is being carried out in dangerous or hazardous areas involving the use of heat, fire watchers, equipped with sufficient fire extinguishers, shall be provided. The determination of dangerous or hazardous areas along with the level of precaution necessary for Fire Watch shall be at the discretion of the Contractor. Notify the Engineer prior to that determination.
- .4 Provide proper ventilation and eliminate all sources of ignition where flammable liquids, such as lacquers or urethanes are used.
- .5 Do not store flammable substances within 30 m of the Temporary PCB Materials Storage Area.

15 Questions and/or Clarifications

- .1 Direct any questions or clarification on Fire Safety in addition to the above requirements to the Engineer.

16 Measurement for Payment

- .1 Work under this section, except as noted in Clause 16.2, will not be measured separately for payment. Include all costs for the work of this section in the Basis of Payment Schedule - Balance of Project Complete.

- .2 All direct costs for the preparation and completion of the Site Specific Health and Safety Plan, are to be included in the lump sum price for Site Specific Health and Safety Plan, Item 01351-1, as indicated in Basis of Payment Schedule. The lump sum price for the Site Specific Health and Safety Plan will be paid after a satisfactory Site Specific Health and Safety Plan has been submitted to the Engineer.

1 General

1.1 References

- .1 Export and Import of Hazardous Waste Regulations (EIHW Regulations), SOR/92-637.
- .2 National Fire Code of Canada 1995.
- .3 Transportation of Dangerous Goods Act (TDG Act) 1992, (T-19.01).
- .4 Transportation of Dangerous Goods Regulations (TDGR), (SOR/85-77, SOR/85-585, SOR/85-609, SOR/86-526).

1.2 Definitions

- .1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets the hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of federal and provincial laws.

1.3 Submittals

- .1 Submit product data in accordance with Section 01330 - Submittal Procedures.
- .2 Submit to Engineer current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on site.
- .3 Submit hazardous materials management plan to Engineer that identifies all hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

1.4 Storage and Handling

- .1 Coordinate storage of hazardous materials with Engineer and abide by internal requirements for labelling and storage of materials and wastes.
- .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.
- .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use. Store all flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Engineer
- .5 Transfer of flammable and combustible liquids is prohibited within buildings.
- .6 Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.
- .7 Flammable liquids having a flash point below 38°C, such as naphtha or gasoline, will not be used as solvents or cleaning agents.
- .8 Store flammable and combustible waste liquids for disposal in approved containers located in a safe, ventilated area. Keep quantities to a minimum.
- .9 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled.
- .10 Abide by the following storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers which are in good condition.
 - .2 Label containers of hazardous materials and wastes in accordance with WHMIS. All barrels shall be individually identified. Label shall be to industry standards and shall provide all information necessary for health and safety and environmental purposes. Label shall identify DIAND as the permit holder.

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- .3 Store hazardous materials and wastes in containers compatible with that material or waste.
 - .4 Segregate incompatible materials and wastes.
 - .5 Ensure that different hazardous materials or hazardous wastes are not mixed.
 - .6 Store hazardous materials and wastes in a secure storage area with controlled access.
 - .7 Maintain a clear egress from storage area.
 - .8 Store hazardous materials and wastes in a manner and location which will prevent them from spilling into the environment.
 - .9 Have appropriate emergency spill response equipment available near the storage area, including personal protective equipment.
 - .10 Maintain an inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
 - .11 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
 - .12 Report spills or accidents immediately to Engineer Submit a written spill report to Engineer within 24 hours of incident.

1.5

Transportation

- .1 Transport hazardous materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .2 If exporting hazardous waste to another country, ensure compliance with federal Export and Import of Hazardous Waste Regulations.
- .3 If hazardous waste is generated on site:
 - .1 Coordinate transportation and disposal with Engineer
 - .2 Ensure compliance with applicable provincial laws and regulations for generators of hazardous waste.
 - .3 Use only a licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Prior to shipping material, obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.
 - .5 Label container[s] with legible, visible safety marks as prescribed by federal and provincial regulations. All barrels shall be individually identified. Label shall be to industry standards and shall provide all information necessary for health and safety and environmental purposes. Label shall identify DIAND as the permit holder.

- .6 Ensure that only trained personnel handle, offer for transport, or transport dangerous goods.
- .7 Provide a photocopy of all shipping documents and waste manifests to Engineer.
- .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to Engineer.
- .9 Report any discharge, emission, or escape of hazardous materials immediately to Engineer and appropriate provincial authority. Take reasonable measures to control release.

1.6 Spill Contingency Plan

- .1 Prepare a spill contingency plan commensurate with anticipated volumes of fuel that will be stored on site, method of dispensation, and possible maximum volume that could be spilled. Identify response capabilities by detailing response times, and types and volumes of spills to which Contractor can respond. Depending on possible severity of "worst case", include in plan the following:
 - .1 A description of pre-emergency planning.
 - .2 Personnel roles, lines of authority and communication, emergency phone numbers.
 - .3 Emergency alerting and response procedures.
 - .4 Evacuation routes and procedures, safe distances and places of refuge.
- .2 Provide an oil and hazardous material spill contingency plan prior to starting work and conforming to requirements of authorities having jurisdiction.
 - .1 Directions/methods of getting to the nearest medical facility.
 - .2 Emergency decontamination procedures.
 - .3 Emergency Medical treatment and first-aid.
 - .4 Emergency equipment and materials.
 - .5 Emergency protective equipment.
 - .6 Procedures for reporting incidents.
 - .7 Spill response and containment plans for all materials that could potentially be spilled.
- .3 Report spills or accidents immediately to Engineer. Submit a written spill report to Engineer within 24 hours of incident.

2 Products

2.1 Materials

- .1 Only bring on site the quantity of hazardous materials required to perform work.
- .2 Maintain MSDSs in proximity to where the materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

3 Execution

3.1 Disposal

- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Recycle hazardous wastes for which there is an approved, cost effective recycling process available.
- .3 Send hazardous wastes only to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of hazardous materials in waterways or in on-site landfills is prohibited.
- .6 Dispose of hazardous wastes in a timely fashion in accordance with applicable provincial regulations.

4 Potentially Hazardous Materials

- .1 The work of this contract involves the handling of potentially hazardous materials including materials coated with paint containing lead and polychlorinated biphenyls (PCBs).
- .2 PCBs at concentrations in excess of 50 mg/kg are considered to be hazardous substances. Storage and handling of PCBs are regulated under the Canadian Environmental Protection Act, and federal, territorial and provincial Transportation of Dangerous Goods Act. Comply with all applicable regulations.
- .3 The results of field and laboratory analyses carried out at the site indicate that some of the components of facilities to be demolished are coated with PCB-

amended paint. The concentrations of PCBs within the paint of some of the components exceed 50 mg/kg. Comply with the practices described in Section 02222 - Demolition when working with PCB painted or containing materials.

- .4 Fluorescent lamp ballasts are to be handled, and general safety precautions followed, as stated below:
 - .1 Some ballasts in the buildings to be demolished may contain PCB-filled capacitors.
 - .2 Wear gloves while handling ballasts and dispose of gloves with ballasts. Avoid breaking or damaging ballasts cases.
 - .3 Refer to Environment Canada publication, "Identification of Fluorescent Lamp Ballasts Containing PCBs" (ISBN 0-662-19091-2).

5 Unknown Hazardous Waste Material Collection Measurement for Payment

- .1 Costs for the collection and containerization of unknown hazardous waste material will be negotiated with the Engineer under the Potential Extra Work Payment Schedule using the Contractor's Labour and Equipment rates.
- .2 Unknown hazardous waste material is that waste material designated as hazardous in accordance with the definition of hazardous material in Section 02090 - Hazardous Waste Material, and which has not been specifically identified for collection and disposal as part of other work components.
- .3 Unknown Hazardous Waste Material shall include:
 - .1 Unknown hazardous material encountered during demolition operations.
 - .2 Hazardous debris scattered over the site area.
 - .3 Free product encountered during contaminated soil excavation.
 - .4 Hazardous barrel contents.
- .4 Unknown Hazardous Waste Materials shall not include:
 - .1 Materials from facilities to be demolished that are coated with PCB-amended paint where the PCB concentrations, with consideration of the substrate, are in excess of 50 mg/kg.
 - .2 Asbestos containing materials from facilities to be demolished.
 - .3 Sewage and sewage sludge from sewage tanks and sewage lines to be demolished.
 - .4 Fuel and fuel residual product from fuel tanks and pipelines to be demolished.

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- .5 Hazardous Contaminated Soil as defined in Section 02190 – Contaminated Soil.
 - .6 Any hazardous material identified in the Demolition Inventory contained in Appendix A.
- .5 Costs for the collection and containerization (including supply of containers) for the above items shall be included in the demolition costs for the various facility components and the contaminated soil costs for the hazardous contaminated soil.
- .6 Potential Extra Work for Unknown Hazardous Waste Material Collection shall cover costs for:
- .1 Classification of unknown hazardous demolition and site debris for disposal requirements.
 - .2 Supply and transport to the site of containers for unknown hazardous waste materials.
 - .3 On-site transport of unknown hazardous waste materials following their confirmation as hazardous waste material by the Engineer.
 - .4 Containerization of unknown hazardous waste materials.
 - .5 Transport of unknown hazardous waste materials to the Temporary Storage Area at CAM-F.
 - .6 Transport of unknown hazardous waste to the Hall Beach temporary storage area during demobilization.

1 General

1.1 References

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
- .2 National Fire Code of Canada 1995.
- .3 Transportation of Dangerous Goods Act (TDG Act) 1992.
- .4 Transportation of Dangerous Goods Regulations (TDG Regulations),
SOR/85-77, SOR/85-585, SOR/85-609, SOR/86-526.
- .5 Storage of PCB Material Regulations, SOR/92-507.
- .6 PCB Waste Export Regulations, 1996, SOR/97-109.
- .7 Ozone-Depleting Substances Regulations, SOR/95-576.
- .8 Environmental Code of Practice on Halons. July 1996.
- .9 Environmental Code of Practice for Elimination of Fluorocarbon Emissions
from Refrigeration and Air Conditioning Systems. March 1996.

1.2 Definitions

- .1 Toxic: For the purposes of this specification, a substance is considered toxic if
it is listed on the Toxic Substances List found in Schedule 1 of CEPA.
- .2 List of Toxic Substances: found in Schedule 1 of CEPA, lists all substances
that have been assessed as toxic. The federal government can make regulations
with respect to a substance specified on the List of Toxic Substances. Column
II of this List identifies the type of regulation applicable to each substance.
- .3 PCBs: includes any chlorobiphenyls referred to in Column I of item 1 of the
List of Toxic Substances in Schedule I of the Canadian Environmental
Protection Act.

1.3 Submittals

- .1 Product Data
 - .1 Submit photocopy of shipping documents and waste manifest to the
Engineer when shipping toxic wastes off site.

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- .2 Maintain 1 copy of product data in readily accessible file on site.

- .2 Submission Requirements

- .1 Submit product data to Engineer in duplicate in accordance with Section 01330 - Submittal Procedures.
- .2 Sheet size: 21.5 cm x 28 cm.
- .3 Express all weights and volumes in SI Metric units.
- .4 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of attached product data.
 - .5 Other pertinent data.

- 1.4 Storage and Handling

- .1 Store and handle toxic wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .2 Store and handle flammable and combustible wastes in accordance with current National Fire Code of Canada requirements.
- .3 Coordinate storage of toxic wastes with Engineer and abide by internal requirements for labelling and storage of wastes.
- .4 Observe smoking regulations at all times. Smoking is prohibited in any area where toxic wastes are stored, used, or handled.
- .5 Only certified persons who have successfully completed the Environment Canada Environmental Awareness Course for the Environmentally Safe Handling of Refrigerants are permitted to work on refrigeration and air conditioning systems.
- .6 Report spills or accidents involving toxic wastes immediately to Engineer and to appropriate regulatory authorities. Take all reasonable measures to contain the release while ensuring health and safety is protected.
- .7 Transport toxic wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .8 Use only an authorized/licensed carrier to transport toxic waste.
- .9 Coordinate transportation and disposal of toxic wastes with Engineer.

- .10 Notify appropriate regulatory authorities and obtain all required permits and approvals prior to exporting a toxic waste.

1.5 Waste Management and Disposal

- .1 Dispose of toxic wastes generated on site in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Ensure toxic waste is shipped to an authorized/licensed treatment or disposal facility and that all liability insurance requirements are met.

1 References and Codes - General

- .1 Perform Work in accordance with National Building Code of Canada (NBC) including all amendments and other codes of provincial, territorial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.
- .3 Perform work in accordance with the Specifications and meet or exceed all codes, standards and regulations applicable to the Work and issued under the authority of the Government of Canada and the Government of Nunavut. Advise the Engineer of any discrepancies in the codes, standards and regulations applicable to the Work.
- .4 Codes, standards and regulations applicable to the work and which form part of the Contract have been referenced in various Sections of the Contract Specifications.
- .5 In any case of conflict between the requirements specified in the codes, standards or regulations applicable to the work, the most stringent requirement shall apply.
- .6 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding employee training, use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets as required by WHMIS legislation. Submit copies of WHMIS data sheets to Engineer on delivery of materials.

2 References and Codes- Federal:

- .1 Meet or exceed the governing codes, standards and guidelines, and regulations applicable to Work and issued under the authority of the Government of Canada as follows:
 - .1 Canada Labour Code Part 11-Occupational Health and Safety (R.S. 1985, c.L-2).
 - .2 Canada Mining Regulations (C.R.C.C. 1516)
 - .3 Canada Occupational Health and Safety Regulations (SOR/86-304)
 - .4 Canadian Environmental Protection Act, S.C. 1999 (S.C. 1999, c.33) a. SOR/2002-318
 - .5 Controlled Products Regulations (SOR/88-66) a.SOR/2001-254
 - .6 Inter-provincial Movement of Hazardous Waste Regulations (SOR/2002-301)

- .7 National Fire Code of Canada, 1995 a. 2002
- .8 Ozone Depleting Substances Regulations, 1998 (SOR/99-7)
- .9 Transportation of Dangerous Goods Act, 1992 (S.C. 1992, c.34) a.1999, c.31
- .10 Transportation of Dangerous Goods Regulations (SOR/2001-286) a. SOR/2003-400
- .11 Territorial Land Use Regulations (C.R.C., c.1524) a.98-430

3 References and Codes- Northwest Territories

- .1 Meet or exceed the governing codes, standards and guidelines, and regulations applicable to Work and issued under the authority of the Government of the Northwest Territories as follows:
 - .1 Environmental Protection Act (Nunavut) (R.S.N.W.T. 1988, c. E-7) a. 1998, c.21, c.24
 - .2 Fire Prevention Act, R.S.N.W.T. 1988, c.F-6
 - .3 Labour Standards Act (Nunavut) (R.S.N.W.T. 1988, c.L-1) amended S.N.W.T 2003, c.15, in force January 2004
 - .4 Public Health Act, R.S.N.W.T. 1988, c.P-12
 - .5 Spill Contingency Planning and Reporting Regulations R-068-93
 - .6 Transportation of Dangerous Goods Act (1990 S.N.W.T. 1990, c.36)
 - .7 Used Oil and Waste Fuel Management Regulations, November 2003
 - .8 Work Site Hazardous Materials Information System Regulations (R.R.N.W.T 1990, c.S-2)
 - .9 Mine Health & Safety Act (Nunavut) (S.N.W.T. 1994, c.25 in force December 15, 1995, S3-014-95).

4 Standards and Guidelines

- .1 Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products, 1994 CCME
- .2 Guidelines for Canadian Drinking Water Quality, April 2004
- .3 Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments, April 1976
- .4 Guideline for the Management of Waste Batteries, September 1998
- .5 Guideline for the Management of Waste Lead and Lead Paint, April 2004
- .6 Guideline for the Management of Waste Solvents, September 1998
- .7 Guideline for Contaminated Site Remediation, November 2003

- .8 Guideline for Ambient Air Quality, December 2002
- .9 Guideline for Dust Suppression, February 1998
- .10 Guideline for the General Management of Hazardous Waste, February 1998
- .11 Guideline for Ozone Depleting Substances, February 1998

5 Hazardous Material Discovery

- .1 Stop work immediately and notify Engineer upon discovery of following materials during course of work:
 - .1 Designated substances such as PCBs, asbestos, and mercury.
- .2 Work at site will involve contact with:
 - .1 Metal impacted soil
 - .2 PHC (total petroleum hydrocarbons) impacted soils.
 - .3 Hazardous liquids and petroleum based sludges.
 - .4 Demolition debris with lead based paints.
 - .5 Asbestos containing materials

1 Inspection

- .1 Allow Engineer access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Engineer may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Engineer shall pay cost of examination and replacement.

2 Independent Inspection Agencies

- .1 Independent Inspection/Testing Agencies will be engaged by Engineer for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Engineer.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Engineer at no cost to Engineer. Pay costs for retesting and re-inspection.

3 Access to Work

- .1 Allow inspection/testing agencies access to Work.
- .2 Co-operate to provide reasonable facilities for such access.

4 Procedures

- .1 Submit materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.

- .2 Provide labour and facilities to obtain and handle samples and materials on site.
Provide sufficient space to store and cure test samples.

5 Rejected Work

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Engineer as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Engineer it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Engineer may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Engineer.

1 General

- .1 Temporary facilities consist of essential temporary buildings, structures, utilities and services required at the site during Restoration of the site.
- .2 Refer to Section 01592 for Construction Camp requirements. The construction camp will be provided by the Camp Contractor.

2 Scope

- .1 Provide all temporary facilities consisting of the design, supply, construction, maintenance, operation and removal of the facilities and services required to support the Restoration of the site. Provide temporary facilities as specified at the work site, and any other location where temporary facilities are essential to the Work. Temporary facilities shall meet requirements of Land Use Permit issued for the Work, satisfy requirements of Federal, Territorial and local authorities having jurisdiction, and comply with the requirements of Section 01561 - Environmental Protection.
- .2 Design and construct scaffolding in accordance with CSA S269.2-M87. Provide details and procedures for ensuring all scaffolding equipment, materials, and construction practices meet all applicable regulations and site specific requirements.

3 Location of Equipment and Fixtures

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Inform Engineer of impending installation and obtain his approval for actual location if deviation from specified location is contemplated.
- .3 Submit field drawings to indicate relative position of various services and equipment when required by Engineer.

4 Existing Services

- .1 The location of equipment, fixtures, outlets, and utility services specified or indicated on the Drawings is to be considered as approximate.
- .2 Before commencing Work, establish location and extent of services in area of Work, and notify Engineer of findings.
- .3 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.

- .4 Record locations of maintained, joined, re-routed and abandoned service lines indicating horizontal distances and vertical elevations.
- .5 Take necessary precautions and prevent damage to existing services and facilities.
- .6 Repair and replace services or facilities damaged as a result of Contractor's operations at no additional cost to the Engineer.

5 Access and Dust Control

- .1 Provide and maintain adequate access, including snow removal, to all working areas of the site, camp, utilities and offices during all periods of work by Contractor, subcontractors and other contractors performing work for the Engineer.
- .2 If authorized to use existing roads for access to the project site, including granular borrow areas, maintain such roads for the duration of the Contract, and make good damage resulting from Contractor's use of such roads.
- .3 Access includes removal of snow, as may be required, to gain initial access to site and for reopening of camp and project site as required to meet the project schedule.
- .4 Control site restoration operations to eliminate all excessive dust-creating activities, or as directed by the Engineer. This includes maintenance and watering of the haul roads and all other roads required for the operations to carry out the scope of work for this contract. The use of oil for dust control is prohibited. Use only water.

6 Light and Power Supply

- .1 Provide, operate, and maintain an electrical power supply system, in accordance with governing regulations, to service the Contractor's site power requirements.
- .2 Install temporary facilities as necessary for power distribution, such as power cable and pole lines, subject to Engineer's approval.
- .3 Provide lighting and power at site for use during work by Contractor, subcontractors, and Engineer's support personnel.

7 Heating and Ventilation

- .1 Provide heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of work.
 - .2 Protect work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.

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- .4 Provide ambient temperatures and humidity levels for storage and installation of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
 - .2 Provide ventilation for temporary facilities as follows:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during work.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful elements.
 - .3 Maintain strict supervision of operation of heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.

8 Drainage

- .1 Refer to Section 01561 - Environmental Protection and to specific sections in Division 2 of these Specifications for site drainage and pumping requirements.

9 Signs and Notices

- .1 Safety and Instruction Signs and Notices:
 - .1 Signs and notices for safety and instruction shall be in English, and the local dialect. Graphic symbols shall conform to CAN3-Z321-77, or latest edition thereof.
- .2 Maintenance and Disposal of Site Signs:
 - .1 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project, or earlier if directed by Engineer.

10 Scaffolding

- .1 Construct and maintain scaffolding in a rigid, secure and safe manner.
- .2 Erect scaffolding independent of walls. Remove promptly when no longer required.
- .3 Conform to safety requirements of Section 01351 Site Specific Health and Safety for Contaminated Sites.

11 Removal or Shut-Down of Facilities

- .1 Schedule and obtain approval from the Engineer to remove temporary facilities from site.
- .2 When project is closed down at end of construction season, keep facilities operational until close down is approved by Engineer. Ensure adequate protection of facilities over shut down period and re-open as the work schedule requires.

12 Survey Equipment

- .1 Maintain at site, for duration of the construction period, a complete set of survey equipment for occasional use by the Engineer. Shared use of the Contractor's survey equipment is acceptable.
- .2 Equipment shall include:
 - .1 Surveying Total Station with data recording capability, 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 metre collapsible range pole.
 - .4 Triple prism with tripod.
 - .5 50 metre cloth tape (steel reinforced)
 - .6 5 metre collapsible level rod.
 - .7 Magnetic pin finder (high frequency).
- .3 Calibrate all equipment prior to each construction season. Submit to the Engineer documentation certifying the calibration of the equipment.
- .4 The survey equipment shall remain the property of the Contractor.

13 Digital Camera

- .1 Maintain at site, for the duration of the construction period, a digital camera for occasional use by the Engineer. Shared use of the Contractor's digital camera is acceptable.
- .2 Equipment shall include:
 - .1 Digital camera with a minimum 2,048 x 1,536 pixel resolution, a 3X optical zoom lens capability, flash capability, spare batteries and battery charger, and data card memory ability and spare 128 MB data card.
 - .2 All necessary computer software and hardware, including a CD burner, for the downloading of information to a computer and storage of information.
- .3 This camera remains the property of the Contractor at the conclusion of the work.

14 Measurement for Payment

- .1 Work under this section will not be measured except as indicated below. Include all costs for Items 1 to 13 in Basis of Payment Schedule - Balance of Project Complete. Indicate the cost of this work as a separate line item in the cost breakdown specified in Section 01110 Summary of Work.

1 Relics and Antiquities

- .1 Relics and antiquities and items of historical or scientific interest such as cairns, tent rings, commemorative plaques, inscribed tablets, and similar objects found on-site or in buildings to be demolished shall remain the property of the appropriate jurisdictional authority.
- .2 Prior to commencing work at the site, review the following with the Engineer:
 - .1 The extent of the archaeological sensitive areas.
 - .2 The methods to be used by the Contractor to mark and protect the areas from construction/restoration activities.
- .3 Give immediate notice to Engineer if evidence of archaeological finds are encountered during construction/restoration activities, and await the Engineer's written instructions before proceeding with work in this area.
- .4 Protect archaeological finds and similar objects found during course of work.

2 Site Maintenance

- .1 Keep the site free from the accumulation of waste materials and debris as specified in this section.
- .2 Upon completion of the work, clean away and dispose of all surplus material, supplies, rubbish and temporary works leaving the site neat and tidy to the requirements of the Engineer and the Land Use Permit.

3 References

- .1 Comply with all applicable environmental laws, regulations and requirements of Federal, Territorial, and other regional authorities, and acquire and comply with such permits, approvals and authorizations as may be required.
- .2 Ensure that all applicable legislation, regulations and guidelines are followed in carrying out the work. The following lists some of the key regulatory references:
 - .1 The Canadian Environmental Protection Act (CEPA).
 - .2 The Transportation of Dangerous Goods Act and Regulations.
 - .3 The Fisheries Act.
 - .4 The Arctic Waters Pollution Prevention Act and Regulations.
 - .5 The Migratory Birds Convention Act.
 - .6 The Canada Wildlife Act.
 - .7 The Canada Shipping Act.
 - .8 The Navigable Waters Protection Act.

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- .9 The Territorial Lands Act.
 - .10 The Territorial Land Use Regulations.
 - .11 The Territorial Quarrying Regulations.
 - .12 The Nunavut Waters Act and Regulations.
 - .13 Canada Labour Act and Regulations.
 - .14 Atomic Energy Control Act and Regulations.
 - .15 Explosives Act and Regulations.
 - .16 National Fire Code.
 - .17 The Explosives Use Act and Regulations (Nunavut).
 - .18 The Nunavut Wildlife Act.
 - .19 The Environmental Protection Act (Nunavut).
 - .20 Guidelines for the Management of Waste Antifreeze (NWT).
 - .21 Guidelines for the Management of Waste Asbestos (NWT).
 - .22 Guidelines for the Management of Waste Batteries (NWT).
 - .23 Guidelines for the Management of Waste Solvents (NWT).
 - .24 Guidelines for the Management of Waste Paint (NWT).
 - .25 Guidelines for the Management of Hazardous Wastes in the NWT.
 - .26 The Spill Contingency Planning and Reporting Regulations (Nunavut).
 - .27 The Northwest Territories Archaeological Sites Regulations (The NWT Act).
 - .28 The Fire Prevention Act (Nunavut).
 - .29 Safety Act: Occupational Health Regulations (Nunavut).
 - .30 Guidelines for Removal of Materials Containing Friable Asbestos.
 - .31 Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments.
 - .32 National Guidelines for the Landfilling of Hazardous Waste.
 - .33 Guidelines for Preparation of Hazardous Material Spill Contingency Plans.
 - .34 Code of Good Practice on Dump Closing or Conversion to Sanitary Landfills at Federal Establishments.
 - .35 Code of Practice for Used Oil Management in Canada.
 - .36 Canadian Environmental Quality Criteria for Contaminated Sites - Canadian Council of Ministers of the Environment.
 - .37 Guidelines for Municipal Type Wastewater Discharges (NWT).
 - .38 Guidelines for Discharge of Treated Municipal Wastewater (NWT).
 - .39 Canada Labour Act and Regulations.
 - .40 Canadian Drinking Water Guidelines.
 - .41 Public Health Act (Nunavut) - General Sanitation Regulations and Camp Sanitation Regulations.
 - .42 Guidelines for Contingency Planning (NWT)
- .3 Comply with any operational and reporting requirements outlined in the Nunavut Final Agreement.

4 Submittals

- .1 Submit all required Contractor submittals to satisfy environmental requirements directly to the responsible agency.
- .2 Submit one complete copy of all submittals and agency approvals to the Engineer.

5 Wastewater Discharge Criteria

- .1 Wash water, meltwater collection, rinse water resulting from the cleaning of fuel tanks and pipelines, water from dewatering contaminated soil areas, and/or any other liquid effluent stream shall be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters, and shall conform to the following guidelines:

<u>Parameter</u>	<u>Maximum Allowable Concentration</u>
pH	6 to 9
Oil and Grease	5 mg/L and none visible
Arsenic (total)	100 µg/L
Benzene	370 µg/L
Cadmium (dissolved)	10 µg/L
Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Copper (dissolved)	200 µg/L
Ethylbenzene	90 µg/L
Lead (dissolved)	50 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
PCB: discharge to barren area	50 µg/L
PCB: discharge to vegetated area	5 µg/L
Phenols	20 µg/L
Toluene	2 µg/L
Zinc (total)	1,000 µg/L

- .2 Dispose of any liquid effluent not conforming to these guidelines as hazardous material in accordance with Section 02090 - Hazardous Waste Material.

6 Sewage Disposal Requirements

- .1 Comply with the requirements of the Land Use Permit, the Water License and the Public Health Act (Nunavut).

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- .2 Provide construction equipment and personnel to construct the sewerage lagoon in keeping with drawings provided by the Engineer. Locate the temporary lagoon area:
 - .1 A minimum of 100 m from the construction camp, Engineer's Office, and/or other temporary facilities.
 - .2 A minimum of 100 m from drainage paths.
 - .3 A minimum of 450 metres from water bodies supporting aquatic life.
 - .4 Downwind of the construction camp based on the prevailing wind direction.
 - .3 At the completion of construction, backfill the temporary lagoon to provide a minimum of 300 mm granular fill over settled solids.

7

Erosion, Sediment and Drainage Control Plan

- .1 Submit an Erosion, Sediment and Drainage Control Plan to the Engineer for review and approval prior to commencing excavation work in beach and other fisheries sensitive areas and specifically address the protection of bodies of water adjacent to the excavation and the following:
 - .1 Details of grading work to prevent surface drainage into or out of excavation areas.
 - .2 Details of erosion control works and materials to be used, including the deployment of silt fencing and containment booms during construction and excavation activities.
 - .3 Work schedule including the sequence and duration of all related work activities.
 - .4 The treatment of site runoff to prevent siltation of watercourses.
 - .5 Dewatering procedures for excavated materials including silt removal procedures prior to discharge.
 - .6 Stabilizing procedures during excavation.
 - .7 Maintenance of filters and sedimentation traps.

8

Environmental Protection Supplies

- .1 Comply with federal and territorial fisheries and environmental protection legislation, including preventing the loss or destruction of fish habitat, and minimizing the impact of sedimentation, siltation or otherwise causing a degradation in water quality.
- .2 Provide a minimum of 60 m of polypropylene silt fence (typical height of 0.9 m) and the necessary stakes for installation. This shall be used as necessary to prevent sediment transport into water bodies. Product acceptance will be based on compliance with the following minimum/maximum average values.

- | | | |
|----|---|---------|
| .1 | Minimum Grab Tensile Strength (ASTM D4632): | 520 N. |
| .2 | Maximum Elongation (ASTM D4632): | 15 %. |
| .3 | Minimum Puncture Strength (ASTM D4833): | 250 N. |
| .4 | Maximum Apparent Opening Size (ASTM D4751) | 500 µm. |

- .3 Provide a minimum of 100 lineal metres of 200 mm diameter hydrophobic, sorbent booms. This shall be used as necessary to prevent the migration of hydrocarbons.
- .4 Supply, transport, install and maintain erosion, sediment and drainage controls necessary to complete the work in accordance with the approved Erosion, Sediment and Drainage Control Plan.
- .5 At the completion of construction, dispose of used silt fence as non-Hazardous Waste in accordance with Section 02315 – Grading. Dispose of used absorbent boom in accordance with Section 02090 – Hazardous Material.
- .6 Unused Erosion, Sediment and Drainage Control supplies shall remain the property of the Engineer until the completion of the Contract.

9

Measurement for Payment

- .1 Include all direct costs for the supply and transport of the specified Environmental Protection Supplies including the silt fence and the sorbent booms and all necessary stakes and connecting hardware in the lump sum price for Environmental Protection Supplies, Item 01561-1, as indicated in the Basis of Payment Schedule.
- .2 Provision of Environmental Protection Supplies is considered incidental to the work and will not be measured separately.
- .3 Work of this Section, other than that described in Clause 9.1 above, will not be measured. Include all costs in Balance of Project Complete in the Basis of Payment Schedule.

1 General

- .1 The work specified in this section comprises the provision of all labour, equipment and materials, and the performance of all work necessary for mobilization to and demobilization from the CAM-F site.
- .2 Mobilization shall include transportation to the site of the Contractor's labour, equipment, and materials in readiness to start work, all in accordance with the approved site Restoration program. Mobilization includes the construction camp as described in Section 01592 – Construction Camp.
- .3 Demobilization shall include the dismantling and removal from the site of all of the Contractor's equipment and materials, Restoration of the site, and transportation of labour from the site. De-mobilization includes the construction camp as described in Section 01592 – Construction Camp.
- .4 Do not mobilize to the site without written authorization from the Engineer.
- .5 Construction Restoration activities are those activities described in this Contract up to the satisfactory Restoration of the site, removal from the site of the construction camp, equipment and materials, and submission to the Engineer of all Contractor submittals.

2 Measurement for Payment

- .1 All direct costs for mobilization and demobilization of all equipment and materials, are to be included in the lump sum prices for Mobilization and Demobilization, as indicated in Basis of Payment Schedule.
- .2 Payment for Mobilization shall be in two parts; lump sum price upon receipt of manifest on the Sealift, Item 01591-1, including the equipment, material and shipping costs; and, Item 01591-2 as the lump sum price that will be paid upon installation and start-up at the site. Mobilization shall include the provision and storage of 75,000 litres of diesel fuel for the camp generator.
- .3 All costs for Demobilization, including removal of all equipment and materials from the site, and submission to the Engineer of all Contractor submittals, are to be included in the lump sum price for Demobilization, Item 01591-3 in the Basis of Payment Schedule. The lump sum price for Demobilization is also to include the transport of all CEPA soils and/or containers of Hazardous materials from the temporary storage area at Sarcpa Lake to Hall Beach.

- .4 All indirect costs associated with the lump sum work described above including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in Balance of Project Complete in the Basis of Payment Schedule.

1 General

- .1 Provide support for the Construction Contractor, including transportation of the camp from Hall Beach, set up on site, transportation for provisions, personnel and fuel for the camp generator. The supply and operation of the camp will be by the Camp Contractor.
- .2 The location of the construction camps must be approved by the Engineer prior to site set up.
- .3 Unless otherwise indicated, the camp and associated facilities remain the property of the Camp Contractor at the conclusion of the contract.
- .4 Provide air transportation for provisions for the construction camp and movement of personnel for the Contractor, Camp Contractor, Engineer and Engineer's Representatives from Iqualuit. Provide diesel fuel for the camp generator.
- .5 Mobilize the construction camp from where the sealift unloads the equipment at Hall Beach to the CAM-F site. Provide temporary storage in Hall Beach and security until mobilization to the CAM-F Site via CAT Train. Assist the Camp Contractor with the setup of the camp. For camp setup, provide equipment and personnel to grade the site, build gravel pads, as necessary, and excavate the sewage lagoons, as directed by the Engineer. Provide a portable water tank and transport potable water to the camp on an as required basis.
- .6 Assist the Camp Contractor with the breakdown of the camp at the completion of the Contract. Demobilize and remove the construction camp from the site to Hall Beach. Grade as necessary to match surrounding terrain and to ensure positive drainage as directed by the Engineer. The camp and equipment remain the property of the Camp Contractor upon return to Hall Beach.

2 Erection of Camp

- .1 Provide equipment and personnel to the Camp Contractor to assemble the camp buildings and facilities so as not to interfere with any construction, Restoration or other site activities. Camp location and layout shall be such that snow-drifting onto permanent facilities will be minimized.
- .2 Obtain Engineer's approval for location of construction camp. The camp shall be located on-site unless otherwise approved in writing by the Engineer.
- .3 Carry out all work necessary to protect the environment, such as constructing gravel pads (if required) prior to actual installation of camp facilities.

3 Maintenance

- .1 Provide and transport diesel fuel for the camp generator to the site.
- .2 Provide equipment support to the camp on a periodic basis as directed by the Engineer.

4 Vehicle Parking

- .1 Provide sufficient space adjacent to camp to park vehicles.

5 Access to the Work

- .1 Be responsible for the transport of personnel and equipment to the various work areas on the site.
- .2 Provide a crew truck to support the Camp Contractor for the transport of provisions from the airstrip to the construction camp as required.

6 Transportation

- .1 Provide return air transportation services for the Camp Contractor, Engineer and the Engineer's Authorized Personnel and equipment from Iqaluit to the CAM-F site. Air transportation shall be provided by a twin engine aircraft.
- .2 Provide return air transportation services on a weekly basis for the provisions (food) supplied by the Camp Contractor, from Iqaluit to the CAM-F site. The supply and transportation of provisions (food) to Iqaluit will be provided by the Camp Contractor.
- .3 It is anticipated that air transport of all personnel will be scheduled to coincide with the transport of the Contractor's work force to and from the site. Provide air transportation for Engineer's personnel at a minimum frequency of two return trips per month, and two additional trips per month during the construction period scheduled according to Engineer's request.
- .4 The Engineer will advise the Contractor of Engineer's and Engineer's personnel air transportation requirements one week in advance of trip departure.

7

Measurement for Payment

- .1 The provision of air transportation from Iqualuit to CAM-F of Contractor, Camp Contractor, Engineer and Engineer's authorized personnel will be reimbursed to the Contractor, based on Provisional Cost Sum Item 01592-1 in the Basis of Payment Schedule. The aircraft used is to have a minimum capacity of 10 passengers).
- .2 The provision of air transportation from Iqualuit to CAM-F for the Camp Contractors provisions (food), will be reimbursed to the Contractor, based on Provisional Cost Sum Item 01592-2 in the Basis of Payment Schedule.
- .3 At the beginning of each construction season, the aircraft type, cost of air transportation and schedule will be negotiated between the Engineer and Contractor.
- .4 Expend each Provisional Cost Allowance described in this Section, as directed by the Engineer. Submit invoices and any supporting documentation required by the Engineer with progress claim.
- .5 Each cash allowance described in this section will be adjusted to the actual cost by the Engineer.
- .6 The provision and storage of 75,000 Litres of fuel for the camp generator will be measured for payment as a lump sum item and paid under Item 01592-3 in the Basis of Payment Schedule. This cost will include storage tanks for the fuel. Mobilization of the fuel for the camp generator will be included in Items 01591-1 and 01591-2 in the Basis of Payment Schedule.
- .7 Provide support for the Camp Contractor. The costs for Camp Contractor Support will be negotiated with the Engineer using the Contractor's Labour and Equipment rates provided in the Potential Extra Work Schedule.

The scope of work for the Camp Contractor Support is to include:

- .1 All grading requirements for the approved camp site, including the preparation of a granular pad, as required by the Camp Contractor.
- .2 The provision of heavy equipment and labour, as required, for the set up of the camp facility.
- .3 The construction and decommissioning of the camp sewage lagoon.
- .4 Other support required for the provision and operation of the camp, as directed by the Engineer.
- .8 All other costs not specified above will not be paid separately and shall be included in Balance of Project Complete in the Basis of Payment Schedule.

1 Vehicles

- .1 Supply two crew cab 4-wheel drive pickup trucks for use by the Engineer and Engineer's Authorized Personnel for the duration of this project.
- .2 Vehicles to be in new condition, having been driven for not more than 30,000 kilometres.
- .3 Equip vehicles with heater, defroster, right and left hand mirrors, windshield washers, permanent type anti-freeze, spare wheel, jack, wheel wrench, snow tires on drive wheels and spare, directional signals with two-way flasher, full width front seat and license in accordance with Territorial regulations.
- .4 Make available on site for exclusive use by the Engineer and the Engineer's support personnel, two new, motorized quad-track vehicle equipped with a minimum engine size of 400 cc, standard double seat, two helmets (medium and large), a baggage rack, a trailer, and a tire repair kit.
- .5 The use of these vehicles will not be shared with the Contractor.
- .6 Supply one ATV per wildlife monitor to facilitate his duties specified in Section 01351 – Site Specific Health and Safety for Contaminated Sites.
- .7 Vehicles provided for purposes of this contract are accepted at risk of supplier whether in possession of supplier or Engineer.

2 Delivery

- .1 Deliver vehicles to location designated by Engineer at the site.
- .2 Engineer may return vehicles during work shutdown periods.
- .3 Winterize and store vehicles in accordance with manufacturer's recommendations.
- .4 Upon written request from Engineer, redeliver or replace returned vehicles.

3 Maintenance

- .1 Maintain vehicles in good running order for duration of project. If vehicles are out of commission for any period of time, provide other replacement vehicles.
- .2 Repair and maintain vehicles expeditiously.

4 Fuel and Lubricants

- .1 Provide and pay for all fuel and lubricants required to operate the vehicles for the duration of the project.

5 Measurement for Payment

- .1 Work for this section will not be measured. Include all costs in Balance of Project Complete. Indicate the cost of this work as a separate line item in the cost breakdown specified in Section 01110 – Summary of Work.

1 General

- .1 Use new material and equipment acceptable to the Engineer unless otherwise specified.
- .2 Within 7 days of written request by Engineer, submit the following information for materials and equipment proposed for supply:
 - .1 name and address of manufacturer,
 - .2 trade name, model and catalogue number,
 - .3 performance, descriptive and test data,
 - .4 manufacturer's installation or application instructions,
 - .5 evidence of arrangements to procure.
- .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .4 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.
- .5 Provide material and equipment of specified design and quality, performing to published ratings, and for which replacement parts are readily available.

2 Manufacturers' Instructions

- .1 Unless otherwise specified, comply with manufacturers' latest printed instructions for materials and installation methods.
- .2 Notify Engineer in writing of any conflict between these specifications and manufacturers' instructions. Engineer will designate which document is to be followed.

3 Delivery and Storage

- .1 Deliver, store and maintain packaged material and equipment with manufacturers' seals and labels intact.
- .2 Prevent damage and soiling of material and equipment during delivery, handling and storage. Remove rejected material and equipment from site.
- .3 Store material and equipment in accordance with suppliers' instructions. Keep materials identified as requiring heated indoor storage in such an environment until they can be stored or installed in the permanent facilities.

- .4 Touch-up damaged factory finished surfaces to Engineer's satisfaction. Use primer or enamel to match original. Do not paint over name plates.

4 Conformance

- .1 When material or equipment is specified by standard or performance specifications, upon request of Engineer, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

5 Measurement for Payment

- .1 Work under this section will not be measured. Include all costs in Basis of Payment Schedule - Balance of Project Complete.

1 Qualifications of the Surveyor

- .1 Qualified land surveyor, acceptable to Engineer.

2 References

- .1 Engineer's identification of existing survey control points and property limits.

3 Survey Reference Points

- .1 Existing base horizontal and vertical control points are designated on drawings.
- .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Engineer.
- .4 Report to Engineer when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control

4 Survey Requirements

- 1 Establish additional temporary bench marks on site in each major area of work, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels locate and lay out, by instrumentation.
- .3 Stake for grading all fill for earth structures.
- .4 Stake slopes and berms.

5 Records

- .1 Maintain a complete, accurate log of control and survey work as it progresses.

6 Setting Out of Work

- .1 Existing survey control data required for layout of the work is shown on the drawings.

- .2 Install additional permanent survey control monuments as indicated on the drawings or where approved by the Engineer, in accordance with Section 02510 – Instrumentation of the Specifications.
- .3 Employ fully qualified and experienced survey personnel to provide all survey control required for the work.
- .4 Set grades and lay out work in detail from control points and grades given by the Engineer and shown on the Drawings.
- .5 Notify Engineer immediately of any discrepancies between existing ground elevations and design ground lines.
- .6 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .7 Provide devices, instruments and labour needed to lay out and construct work.
- .8 Supply survey equipment as specified in Section 01500 – Temporary Facilities to facilitate Engineer's inspection of work.
- .9 Supply fluorescent orange paint, stakes, marker posts, flagging and other survey markers required for laying out work and for the Engineer's use in checking survey.
- .10 Provide and pay for survey rodperson when required to assist the Engineer with survey work associated with the contract. The requirement for this assistance will be limited to an average of eight hours per week during the Restoration construction period at the site.
- .11 Provide all survey information to the Engineer within one month of collection. Include electronic copies of data files.
- .12 Protect existing survey stakes, benchmarks and monuments. Re-establish benchmarks and monuments disturbed by the Contractor at no cost to the Engineer.

7

Submittals

- .1 Submit name and address of Surveyor to Engineer.
- .2 On request of Engineer, submit documentation to verify accuracy of field engineering work.

- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform to Contract Documents.

8 Measurement for Payment

- .1 Include all direct costs for the work required to complete the Survey in the Basis of Payment Schedule, Balance of Project Complete.

1 General

1.1 Inspection and Declaration

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Engineer in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Engineer's Inspection.
- .2 Engineer's Inspection: Engineer and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Work is complete and ready for Final Inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by the Engineer and Contractor. If Work is deemed incomplete the Engineer, complete outstanding items and request re-inspection.

1.2 Measurement for Payment

- .1 Include all direct costs for the work required to complete the inspections in the Basis of Payment Schedule, Balance of Project Complete.

1 Format

- .1 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 mm x 279 mm with spine and face pockets.
- .2 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .3 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .4 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Text: Manufacturer's printed data, or typewritten data.
- .7 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .8 Provide 1:1 scaled CAD files in dxf or dwg format on CD.
- .9 Organize data in the form of an instructional

2 Contents – Each Volume

- .1 Table of Contents: provide title of project;
 - .1 date of submission; names,
 - .2 addresses, and telephone numbers of Contractor with name of responsible parties
 - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified.

3

As-Built and Samples

- 1 In addition to requirements in General Conditions, maintain at the site for Engineer one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Engineer.

4

Recording Actual Site Conditions

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Engineer.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

-
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
- .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
- .5 References to related shop drawings and modifications. .
- .1 Area extent and depth of contaminated soil excavated.
 - .2 Location and elevation (survey coordinates) of groundwater wells and ground temperature cables.
 - .3 Location(s) used for the disposal of effluent.
 - .4 Topography of the existing ground surface prior to placement of granular material at regraded landfills and debris areas, Non-Hazardous Waste Landfill, Secure Soil Disposal Facility and other areas.
 - .5 Areal extent and finished contours of granular material placed on regraded landfills and areas.
 - .6 A minimum of three surveyed cross sections of each regraded area, Non-Hazardous Waste Landfill, Secure Soil Disposal Facility; also survey break lines (distinct changes in slope such as top and toe of berms).
 - .7 Location and depth of the key trench at the Secure Soil Disposal Facility.
 - .8 Location, depth and description of the following materials disposed in landfills by the Contractor:
 - .1 metal material;
 - .2 asbestos containing materials;
 - .3 PCB-amended painted materials (<50 ppm); and
 - .4 all other materials.
 - .9 Location and description of containerized hazardous waste materials.
 - .10 Survey coordinates and elevation of post-landfill construction/closure sampling locations as indicated by the Engineer.
 - .11 Survey coordinates for the perimeter of all sewage lagoon cells.
 - .12 Field changes of dimension and detail.
 - .13 Changes made by Change Order or Field Order.
 - .14 Survey coordinates for the crest and toe of the Completed Type 4 Granular Fill at the Secure Soil Disposal Facility.
 - .15 Survey coordinates for the finished surface of the Tier II contaminated soil in the Secure Soil Disposal Facility.
 - .16 Areal extent of developed borrow areas.

- .6 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .7 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

5 Final Survey

- .1 Submit final site survey certificate in accordance with Section 01720 – Preparation-Survey, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

6 Record Drawings

- .1 Engineer will provide to Contractor, two sets of white prints for record drawing purposes.
- .2 Maintain project record drawings and record accurately deviations from Contract documents on one set of prints.
- .3 Record changes in red.
- .4 The information identified in Clause 4.3 above forms part of the overall survey information requirements that will be submitted to the Engineer. The information shall accurately document the various components of work, including but not limited to landfill construction, instrumentation, borrow areas, and any other information required to establish measurement for payment. Additional survey information requirements may be requested by the Engineer during construction.
- .5 Provide survey data in one of the following electronic formats or an approved equivalent:
 - .1 AutoCAD File (.dxf or .dwg)
 - .2 Excel File (.xls)
 - .3 ASCII File.
- .6 All survey files must include the following information:
 - .1 Location, description and date of survey data sets (e.g. Non-Haz Ldfl - Final Berms (Date).xls, Lower Site - Regraded Ground (Date).xls, etc.).

.2 Point information including Northing, Easting, Elevation, Point Number and Descriptor (e.g. ground, topslope, botslope, control point, etc.).

.7 At completion of project and prior to final inspection, neatly transfer record notations to second set of drawings and submit both sets to Engineer. Forward information on completed areas at the end of each construction season.

.8 Reference survey coordinates and elevation to existing control points as indicated on the Drawings. In the event that monuments have been removed or destroyed, re-establish control monuments.

7 Manufacturer's Data Books

.1 Provide all manufacturers' data as specified in the relevant sections to the Engineer for distribution.

.2 Within 120 days of completion of the work, consolidate a set of approved product data in one document, and submit five copies to the Engineer.

8 Other Records

.1 Submit all survey data monthly or more often upon Engineer's request.

.2 Within 45 days of completion of the work, submit the following to the Engineer:

.1 Copies of all documents and permits obtained by the Contractor.

.2 Results of all testing carried out by the Contractor.

.3 All survey information in electronic format.

.4 Any other pertinent information.

.5 Copies of all shipping documents identifying the shipper, the receiver and all carriers involved in the transport of materials.

.3 Consolidate the above information in one document, and submit five copies to the Engineer.

9 Measurement for Payment

.1 Include all direct costs for the work required to complete the Record Drawings in Item 01780-1 in Basis of Payment Schedule.

1 General

1.1 Description

- .1 This section specifies the requirements for the supply and installation of non-woven geotextiles for the Secure Disposal Facility in conjunction with geomembrane liners.

1.2 References

- .1 CAN/CGSB-4.2-M88, Textile Test Methods.
- .2 CAN/CGSB-148.1-M85, Methods of Testing Geotextiles and Geomembranes.
- .3 ASTM D4751-87, Test Method for Determining the Apparent Opening Size of a Geotextile.
- .4 ASTM D4632 - Elongation at Failure.
- .5 ASTM D3786 - Mullen Burst Strength.
- .6 ASTM D4533 - Trapezoid Tear Strength.
- .7 ASTM D3787 - Puncture Strength.

1.3 Manufacturer's Certification and Warranty

- .1 Provide to the Engineer, prior to shipment of the material to site, a signed manufacturer's certification that the material to be shipped to the site has test values for each property listed in Clauses 2.1.1.1 to 2.1.1.7 of this section, that meet or exceed the property values specified for that material.
- .2 These certificates shall be signed by the Manufacturer's Product Manager or Quality Control Manager.
- .3 Provide a written warranty from the geotextile manufacturer against defects or deficiencies in the quality of the geotextile material supplied.

1.4 Measurement for Payment

- .1 Include all direct costs for the supply, transport to the site, on-site storage and transport of Non-Woven Geotextile in the lump sum price for Non-Woven Geotextile Supply, Item 02072-1, as indicated in the Basis of Payment Schedule. The total area of Non-Woven geotextile to be supplied is 11,000 square metres. This area excludes any allowance for material overlap requirements.

- .2 All indirect costs associated with work described in this section, including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in the Basis of Payment Schedule, Balance of Project Complete.
- .3 The unit of measurement for the installation of Non-Woven Geotextile to the lines and dimensions indicated on the Drawings and including all labour, materials, tools, supervision, and on-site transport will be measured for payment by the square metre of non-woven geotextile installed. No extra payment shall be made for material overlap requirements or for patches over damaged material. The installation of Non-Woven Geotextile will be paid under Item 02072-2 of the Basis of Payment Schedule.
- .4 Excavating and backfilling necessary to install and anchor the geotextile beneath the original ground surface will be measured for payment as indicated in Section 02315 - Grading.
- .5 Unused geotextile remains the property of the Engineer until completion of the project. The Contractor will transport and dispose of unused geotextile off-site upon completion of the project.

2 Products

2.1 Materials

- .1 Non-Woven Geotextile: The geotextile shall be a non-woven fabric consisting only of continuous chain polymeric filaments or yarns of polyester, formed into a stable network by needle punching. The fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew and rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, and conform to the properties listed below. The minimum average roll value (weakest principal direction) for strength properties of any individual roll tested from the manufacturing lot or lots of a particular shipment shall be in excess of the minimum average roll value (weakest principal direction) stipulated below.
 - .1 Thickness – Typical (ASTM D5199) 4.0 mm
 - .2 Grab Tensile Strength (ASTM D4632): 1650 N.
 - .3 Elongation at Failure (ASTM D4632): 50 %.
 - .4 Trapezoidal Tear Strength (ASTM D4533): 330 N.
 - .5 Apparent Opening Size (ASTM D4751) 150 microns
 - .6 Puncture (ASTM D4833): 1060 N.
 - .7 Weight – Typical (ASTM D5261): 540 g/m²
- .2 Seams: overlapped in accordance with manufacturer's recommendations.

- .3 Type 5 Granular Fill as per Section 02300 – Granular Materials and Section 02315 - Grading.

2.2 Shipping, Handling and Storage

- .1 Provide the geotextile in rolls wrapped with protective covering to protect the fabric from mud, dirt, dust, and debris. The fabric shall be free of defects or flaws which significantly affect its physical properties. Label each roll of fabric in the shipment with a number or symbol to identify that production run.
- .2 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris, rodents and water.

2.3 Conformance Testing

- .1 Conformance testing of the geotextile is not required; verification of the manufacturing quality control documentation for the production run, as per Clause 1.3 of this Section, will be sufficient for determination of material conformance.

3 Execution

3.1 Quality Assurance

- .1 All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications and shall be subjected to strict quality assurance monitoring as detailed herein. The installed systems shall conform to the Drawings and Specifications, except as otherwise authorized in writing by the Engineer.

3.2 Underlying Surface Preparation

- .1 Ensure that the surface underlying the geotextile is graded smooth and is free from angular rocks, debris and protrusions. Remove all particles greater than 75 mm in diameter.

3.3 Deployment

- .1 Do not begin installation of geotextile until the base has been approved by the Engineer.
- .2 Deploy the geotextile by unrolling onto the prepared surface in orientation, manner and locations indicated. No securing pins are permitted to secure non-woven geotextiles.

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- .3 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
 - .4 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
 - .5 Overlap each successive strip of geotextile a minimum of 600 mm over previously laid strip. Do not use securing pins when placing geotextile material over geomembrane material.
 - .6 Employ sufficient temporary anchorage to hold geotextile in place during placement of other elements of the liner system or during backfilling.
 - .7 Heat track or glue geotextile overlaps prior to placing granular fill cover to prevent lifting or separation of overlap.
 - .8 Protect installed geotextile material from displacement and damage until, during and after placement of additional material layers.
 - .9 Repair rips or tears with a patch to cover a minimum of 1 metre on each side of the rip or tear.

3.4 Anchorage

- .1 Anchor the geotextile at the perimeter of the landfill as indicated on the Drawings. Temporary anchorage can be provided by sandbags.
- .2 If a key trench is used for anchorage, place the geotextile into the trench extending down the inside face and across the bottom of the trench.
- .3 Place the geotextile into this trench extending down the inside face and across the bottom of the trench.
- .4 Secure the geotextile by placing uniform lifts of granular fill material as shown on the Drawings, not exceeding 200 mm in loose thickness, and compact to 95 percent of Maximum Dry Density in accordance with ASTM D698. Compact backfill in such a manner as to not damage the geotextile/liner system.

3.5 Protection

- .1 Do not permit passage of any vehicle directly on geotextile at any time.

1 General

1.1 Description

- .1 This section specifies the requirements for the supply and installation of Textured (both sides) HDPE Geomembrane Liner to be installed at the Secure Soil Disposal Facility.

1.2 References

- .1 ASTM D4437-84 Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
- .2 ASTM D2487, Classification of Soils for Engineering Purposes.
- .3 CGSB 148.1, No. 112 (Draft), Air Pressure Test.
- .4 National Sanitation Foundation Listing Services, Standard Number S4 - Flexible Membrane Liners (NSF-S4).

1.3 Definitions

- .1 Embedment Material: Type 5 material placed below (base layer) and above the geomembrane/geotextile liner system (cover layer), where indicated.

1.4 Manufacturer's Certification and Warranty

- .1 The geomembrane manufacturer shall have at least two years of continuous experience in the manufacture of textured HDPE geomembrane rolls and/or experience totalling 4,000,000 square metres of manufactured textured HDPE geomembrane.
- .2 Provide to the Engineer, prior to shipment of materials to the site, the following:
- .1 Name of the manufacturer and information on the manufacturer's factory size, equipment, personnel, number of shifts per day and capacity per shift.
- .2 Manufacturer's quality control program and manual, or descriptive documentation.
- .3 List of material properties and liner samples.
- .4 A signed manufacturing certification that the materials to be shipped to the site have test values for each property listed in 2.0 - Products in this section that meet or exceed the property values specified for that material. These certificates shall be signed by the Product Manager or Quality Control Manager of the geomembrane manufacturer.

- .5 Resume of the qualifications of the Installation Supervisor and Master Seamer to be assigned to the project.
- .3 Provide a written 20 year warranty against defects or deficiencies in the quality of the HDPE liner material supplied.

1.5 Geomembrane Installer

- .1 The geomembrane shall be installed by an approved Geomembrane Installer trained and licensed by the geomembrane manufacturer to install the manufacturer's geomembrane. Installation shall be performed under the constant direction of the Contractor's field Installation Supervisor who shall remain on site and be responsible, throughout the liner installation, for liner activities by the Installer. This Installation Supervisor shall have installed or supervised the installation and seaming of a minimum of 3,000,000 square metres of HDPE geomembrane. The Installation Supervisor shall remain on site until all Type 5 cover material has been placed over the entire geomembrane.
- .2 Actual seaming shall be performed under the direction of a Master Seamer who has seamed a minimum of 3,000,000 square metres of HDPE geomembrane. The Master Seamer, who may also be the Installation Supervisor, shall be present whenever seaming is performed.
- .3 Provide as part of the bid document the following information regarding the Geomembrane Installer:
 - .1 Brief historical background.
 - .2 Insurance coverage.
 - .3 Welding procedures.
 - .4 Information on equipment and personnel.
- .4 Provide adequate proof of qualification of the Installation Supervisor, including a list of at least five completed facilities, totalling a minimum of 200,000 square metres for which the Supervisor has installed or supervised the installation of HDPE geomembrane. For each installation, the following information shall be provided:
 - .1 Name and purpose of facility, its location and date of installation.
 - .2 Name of Owner and Design Engineer.
 - .3 Thickness of geomembrane and surface area of the installed geomembrane.
 - .4 Type of seaming, patching and tacking equipment.

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- .5 Provide prior to liner installation:
 - .1 Proposed installation panel layout identifying seams and details. The drawings shall conform to the requirements specified in Section 01330 – Submittal Procedures. The drawings shall indicate roll number, sizes, and position of rolls and shall be subject to the approval of the Engineer.
 - .2 Any proposed variance or deviation from the specified guidelines. Submit changes in writing to the Engineer a minimum of seven working days prior to the scheduled start of geomembrane installation. Acceptance or rejection by the Engineer shall be provided prior to the start of installation activities.

1.6 Geomembrane Acceptance

- .1 Retain ownership and responsibility for the geomembrane until acceptance by the Engineer.
- .2 The geomembrane liner shall be accepted by the Engineer when all of the following conditions are met:
 - .1 Installation of the entire liner is finished.
 - .2 Verification of the adequacy of all field seams and repairs, including associated testing, is complete.
 - .3 Certification, as described in this Section and including record drawings, is provided by the Contractor to the Engineer.

1.7 Workmanship Warranty

- .1 Warranty the liner installation to be free of defects in materials and workmanship for a period of 2 years following the date of acceptance by the Engineer or its representative.
- .2 Make any repairs or replacements made necessary by defects in materials or workmanship in the work that became evident within said warranty period. No additional reimbursement will be made for these repairs.
- .3 Make repairs and replacements promptly upon receipt of written order from the Engineer. If the Contractor fails to make repairs and replacements promptly, the Engineer may do so and the Contractor is responsible for the cost of such repairs and replacements.

1.8 Measurement for Payment

- .1 Include all direct costs for the supply, transport to the site and on-site storage of Textured Geomembrane Liner, including all tools in the lump sum price for Textured Geomembrane, Item 02073-1, as indicated in the Basis of Payment Schedule.

The total area of Textured Geomembrane to be supplied at the site is 5,500 square metres. This area excludes any allowance for material overlap requirements.

- .2 The installation of Textured Geomembrane to the lines and dimensions indicated, including all labour, materials, tools and supervision, will be measured for payment by the square metre of Textured Geomembrane Installed and will be paid under Item 02073-2 of the Basis of Payment Schedule. No extra payment shall be made for material overlay requirements or for patches over damaged or failed material.
- .3 All indirect costs associated with work described in this section, including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in the Basis of Payment Schedule – Balance of Project Complete.
- .4 Excavating and backfilling necessary to install the Geomembrane beneath the original ground surface will be measured for payment as indicated in Section 02315 - Grading.
- .5 Unused geomembrane remains the property of the Engineer until the completion of the project. Store geomembrane in accordance with Clause 2.3 of this section. The Contractor will transport and dispose of unused geomembrane off-site upon completion of the project.

2 Products

2.1 Materials

2.1.1 Textured Geomembrane Liner

- .1 The physical properties of the Textured (both sides) HDPE Geomembrane shall be in accordance with ASTM D1248 where applicable. The material shall have the minimum properties specified as follows:

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|----|---|--------------------|
| .1 | Thickness – Typical (ASTM D5199) | 1.42 mm (57 mil) |
| .2 | Tensile Strength – Stress at Break (ASTM D638
- Modified Type IV Die): | 15.8 kN/m (90 ppi) |

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- | | | |
|-----|---|-------------------|
| .3 | Tensile Strength – Stress at Yield (ASTM D638 - Modified Type IV Die): | 22 kN/m (126 ppi) |
| .4 | Tensile Strength – Strain at Break – 50 mm gauge (ASTM D638 - Modified Type IV Die): | 100% |
| .5 | Tensile Strength – Strain at Yield – 33 mm gauge (ASTM D638 - Modified Type IV Die): | 12% |
| .6 | Tear Resistance (ASTM D1004): | 187 N (42 lbs) |
| .7 | Puncture Resistance (ASTM D4833): | 375 N (84 lbs) |
| .8 | Carbon Black Content ASTM D1603: | 2% |
| .9 | Notched Constant Load - ESCR (ASTM D5897): | 200 hr. |
| .10 | Low Temperature (ASTM D746): | <-60°C (<-76°F) |
| .11 | Asperity Height (Average) (GRIGM12) | 0.175 mm (7 mil) |
| .12 | Coefficient of Friction (Peak and Residual)
Geomembrane and Non-Woven Geotextile
(ASTM 5321): | 18 Degrees |
- .2 The HDPE geomembrane shall be formulated from resin incorporating a flexible modifier, and consisting of approximately 98% polyethylene, 2.0% carbon black, and trace amounts of antioxidants and heat stabilizers.
- .3 The HDPE geomembrane shall incorporate a co-extruded textured surface on both sides to increase the friction between the liner and the material on which it is placed.
- .4 The geomembrane shall be designed for flexible geomembrane applications, resistant to UV radiation, and suitable for exposed conditions.
- .5 The HDPE geomembrane shall be capable of being heat sealed or solvent welded for making field splices, seams and repairs.

2.1.2 Geotextiles

- .1 Non-woven geotextiles as per Section 02072 - Geotextiles, Subsection 2.1.1.

2.2 Manufacturing Quality Control

- .1 Provide certification from the geomembrane manufacturer prior to shipment to site that the geomembrane supplied for this project is in conformance with the Specification.
- .2 Provide certification from the geomembrane manufacturer prior to shipment to site that sampling and testing of the material, in accordance with ASTM D1248 have been carried out. At minimum, the geomembrane manufacturer shall perform the applicable tests every 7,500 square metres to assure conformance with the values listed in Clause 2.1.1.1.1 to 2.1.1.1.12 of this Section.

2.3 Shipping, Handling and Storage

- .1 Ship the geomembrane in conformance with the requirements of the geomembrane manufacturer, but in any event shall be carried out in a manner which shall protect the material from damage in transit. Place a protective cover on each package to protect the material against damage during shipping, handling and storage.
- .2 Move geomembrane(s) about the site in a manner that will not damage the material.
- .3 Store geomembrane(s) on site in a secure location that will minimize the potential for damage due to the proximity of working equipment, vandalism, etc. In some cases, geomembrane can be marshalled at various locations to minimize transit distances and delays during deployment.

3 Execution

3.1 Quality Assurance

3.1.1 Contractor Construction Quality Control

- .1 Carry out a visual inspection of the liner panels and joints as the installation progresses and again upon completion of the liner. Clearly mark and repair defective and questionable areas. Repair all areas identified to the satisfaction of the Engineer.
- .2 Test all joints and repairs in the HDPE liner by vacuum testing or pressurized dual seams testing (for double hot wedge welds only). Carry out all testing in the presence of or with knowledge of the Engineer. Repair all defective areas detected to the satisfaction of the Engineer.
- .3 Perform a vacuum test on all extrusion welded seams and repairs, in the following manner:
 - .1 The area to be tested shall be cleaned of all dirt, debris, and other foreign matter and then a soap and water solution shall be applied.
 - .2 A gasket vacuum box (American Parts and Service Company, Alhambra, California, Series #A100 or approved equal) assembly consisting of a rigid housing, a clean transparent viewing window, and a vacuum gauge shall be immediately placed, in a manner to ensure a seal over the area of the liner to be tested.
 - .3 A vacuum of 3 to 6 psi shall be induced and held for a minimum of 5 seconds or long enough for the area to be thoroughly examined.

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- .4 Examine the geomembrane through the viewing window for the presence of soap bubbling; all areas where leaks are identified shall be marked and repaired.
 - .5 Any portion of an extrusion seam or repair that can not be vacuum tested must be pick tested.
- .4 Perform pressurized testing of all double wedge weld seams, regardless of length, in the following manner:
- .1 A needle with pressure gauge, or other approved pressure feed device equipped with a pressure gauge, shall then be inserted into the channel produced in the middle of the double wedge weld.
 - .2 The channel shall be pressurized to 45 psi to allow the seam to stretch and stabilize. The pressure shall then be dropped to 35 psi and sustained for five minutes.
 - .3 If the loss of pressure exceeds two (2) psi or does not stabilize, then the seam will either be repaired entirely or the faulty area will be located and marked for repair.
 - .4 If blockage is present, locate and test seam on both sides of blockage.
 - .5 Remove needle or other approved pressure feed device and seal all penetration holes by extrusion welding.

3.1.2 Destructive Testing

Qualification Welds:

- .1 Conduct destructive tests in accordance with ASTM D4437-84 on qualification welds to verify that seaming conditions and equipment are satisfactory.
- .2 Test seams at the beginning of each seaming period, if welding has ceased for a period of 2 hours or more for each seaming apparatus used that day when climatic conditions cause wide changes in geomembrane temperature ($\pm 5^{\circ}\text{C}$ in 1 hour) or other conditions that could affect seam quality.
- .3 Make all qualification welds at a location selected by the Engineer in the area of the seaming and in contact with the base material. The qualification welds shall be a minimum of 1 metre long with the seam centred lengthwise. Cut specimens from each opposite end of the test seam and test for shear and peel. If a test seam fails to meet field seam specifications, the seaming apparatus and/or seam shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful full test seams are achieved. A seam pass is achieved when the seam exhibits the following properties:

- .1 Completed seams shall have a minimum strength in shear of at least 90% of the specified parent material tensile strength at yield when tested in accordance with ASTM D4437-84, or approved equal.
- .2 Completed seams shall have a minimum strength in peel of at least 80% of the specified parent material tensile strength at yield, and break as a film tear bond or a minimum of 10% adhesion break when tested in accordance with ASTM D4437-84, or approved equal.

Field Seams:

- .1 Destructive testing of field seams is not required. Verification of the integrity of field seams by destructive testing of test strips and the non-destructive testing of field seams will be sufficient for determination of conformance.

Factory Fabrication Seams:

- .1 Use heat welding techniques for shop fabrication such that all shop welds will provide a "Full Tear Bond" as outlined in ANSI/NSF 54 Annex A, Part 5, Peel Adhesion, to the requirements listed in Clause 2.1.1.1.1 to 2.1.1.1.12 of this Section.
- .2 Test factory fabrication welding for bonded seam strength and peel adhesion at a rate of 3 samples for every 900 metres of welded seam.

3.1.3 Recording of Results

- .1 Provide daily documentation of all testing to the Engineer. This documentation shall identify all seams that initially failed the test and include evidence that these seams were repaired and successively retested.

3.2 Defects and Repairs

- .1 Inspect all seams and non-seam areas of the installed geomembrane for defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. Brush, blow, or wash the geomembrane surface, if required for inspection. The Engineer shall decide if cleaning of the geomembrane is needed to facilitate inspection. This inspection shall be done immediately after placement of the liner.
- .2 Non-destructively test each suspect location in seam and non-seam areas, as appropriate, in the presence of the Engineer. Mark each location that fails the non-destructive testing, and repair accordingly.

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- .3 Make a vacuum box available on site in the event that non-destructive testing of non-seam areas is required.
 - .4 Adhere to the following procedures in completion of geomembrane repairs:
 - .1 Restart/reseam defective seams as described in these Specifications.
 - .2 Repair holes and/or tears by patching. Where the tear is on a slope or an area of stress and has a sharp end it must be rounded prior to patching.
 - .3 Repair blisters, large holes, undispersed raw materials, and contamination by foreign matter by patching.
 - .4 Patches shall be round or oval in shape, made of the same geomembrane, and extend a minimum of 150 mm beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. Patches shall be applied using approved methods only.
 - .5 Non-destructively test each repair, except when the Engineer requires a destructive seam sample obtained from a repaired seam. Repairs that pass the non-destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.
 - .6 Carry out field patching operations at temperatures below +10°C by heat welding only.

3.3 Weather Conditions

- .1 Do not proceed with seaming when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. The Installer shall demonstrate that acceptable seaming can be performed by completing trial welds acceptable to the Engineer. Geomembrane seaming shall not be done during any precipitation, in the presence of excessive moisture (e.g. fog, rain, dew) or in the presence of excessive winds as determined by the Engineer.

3.4 Base Preparation

- .1 Prepare 150 mm of Type 5 granular fill base layer by levelling and compacting the layer to 95% of Maximum Dry Density in accordance with ASTM D698. Do not begin installation of the geomembrane until the base layer has been approved by the Engineer.

3.5 Deployment

- .1 Ensure that:
 - .1 No equipment or tools damage the geomembrane by handling, trafficking or other means.

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- .2 No personnel working on the geomembrane wear damaging shoes or engage in other activities that could damage the geomembrane.
 - .3 The method used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting soil or underlying geotextile.
 - .4 The method used to place the panels minimize wrinkles (especially differential wrinkles between adjacent panels).
 - .5 Slack for thermal contraction is well distributed, and in accordance with the manufacturer's recommendations.
 - .6 All defects are marked and documented for repairs. Defects are defined as any abnormalities that affect the physical properties of the geomembrane material. If greater than ten defects per 500 m² exist, then replace or repair damaged geomembrane areas at the discretion of the Engineer.
 - .7 Use sand bags or other appropriate measures to prevent movement of the geomembrane panels.

3.6 Field Seaming

- .1 Perform field seaming only when weather conditions are favourable, or where seaming operations can be protected from unfavourable weather conditions.
- .2 Make field seams between sheets of liner material using approved welding systems, equipment and techniques. Acceptable welding systems include extrusion fillet welding and hot wedge welding using a double wedge welder. All wedge welders shall be specifically designed for a compatible with the liner material and recommended by the manufacturer. Only repairs and detail welds shall be extrusion welded.
- .3 Clean the contact surfaces of the materials of dirt, dust, moisture, or other foreign materials.
- .4 Lay the materials to be field seamed flat against one another. Align the materials with sufficient overlap, and bond in accordance with the manufacturer's recommended procedures. Prior to seaming, match wrinkles to avoid fishmouths.
- .5 Make seams so there are no loose edges.
- .6 Where possible, orient seams on the slopes perpendicular to the toe of the slope; i.e. oriented down, not across the slope.
- .7 Seams which parallel the toe of the slope shall have the top sheet overlap the bottom sheet.

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- .8 Cross and toe seams shall be staggered a minimum of one metre.
 - .9 An overlap line a minimum of 150 mm from the edge of the underlying sheet will be clearly identified on every fusion seam.
 - .10 The overlap shall be sufficient to leave a loose flap of geomembrane at least 25 mm wide adjacent to both sides of the seam.

3.7 Anchorage

- .1 Anchor the geomembrane into the trench to the lines and dimensions as shown on the Drawings.
- .2 If a key trench is used for anchorage, place the geomembrane into the trench extending down the inside face and across the bottom of the trench.

3.8 Cover Material

- .1 Install geotextile cover in accordance with Section 02072 - Geotextiles.
- .2 A minimum of 300 mm of Type 5 cover between low ground pressure equipment and the liner is required at all times. Refer to equipment restrictions in Clause 3.9, Section 02315 - Grading.
- .3 Avoid undue stress on the liner at all times. Push cover material up side slopes, not down.
- .4 Remove all rocks, stones, roots, or other debris that could cause damage to the liner.
- .5 Avoid sharp turns or quick stops with equipment that could pinch and tear the liner.
- .6 Place material ahead of the leading edge of the fill in such a fashion as to prevent stressing the geomembrane. Do not slide cover material over the liner.
- .7 Report any damage to the Engineer immediately and perform repairs without needless delay.
- .8 Place and maintain cover in a uniform thickness, free of ruts and irregularities.
- .9 Do not work wet cover material that cannot support equipment.

1 General

1.1 Description

- .1 This section specifies the requirements for the removal, containerization, on-site transport, and temporary storage of hazardous waste.
- .2 A listing of potential waste materials that may exist at the site is included in Clause 2.8 of Section 01110 – Summary of Work.

1.2 Regulatory Agencies

- .1 Environment Canada.
- .2 Transport Canada.
- .3 Department of Indian Affairs and Northern Development (INAC).
- .4 Government of Nunavut
- .5 Government of the Northwest Territories (GNWT).
- .6 Canada Coast Guard.

1.3 Definitions

- .1 Hazardous Waste Materials: Wastes materials that are designated as “hazardous” under Nunavut and Northwest Territorial or Federal legislation; or as “dangerous goods” under the TDGA. The following items, typical of DEW line sites, are designated as “hazardous” in accordance with the aforementioned legislation:
 - .1 Asbestos (refer to Sections 13281, 13282 and 13283)
 - .2 Batteries
 - .3 Solvents
 - .4 PCB Containing Oils
 - .5 Petroleum Distillates, including free product that may be recovered during contaminated soil excavation work.
 - .6 Tank Sludge
 - .7 Soils and paint chips containing PCBs at concentrations greater than 50 mg/kg.
 - .8 Material, including wastewater, groundwater and surface water, identified to be hazardous as the result of testing.
 - .9 Electrical equipment including, but not necessary limited to, capacitors, transformers, and regulators which contain or are suspected to contain PCBs at concentrations in excess of 50 mg/kg.

- .10 Miscellaneous Hazardous Materials defined as those materials not classified as 1 to 9 above but suspected to fall under the definition of Hazardous Wastes and Materials as stated in Clause 1.4.1 of this Section.
- .2 Debris: Visible debris on the existing ground surface, or material that has been identified on the Drawings as debris, consisting of hazardous and non-hazardous material.
- .3 “Processing” refers to the sampling, testing, packaging, and containerization of hazardous materials.
- .4 “Packaging Container” refers to the type of container necessary to contain the hazardous material placed in it, as required by the TDGA.
- .5 “Shipping Container” refers to the container into which the “packaging containers” are placed for purposes of shipping to a disposal facility.
- .6 “Temporary Storage Area” refers to the designated area, approved by the Engineer, for the storage of packaging and/or shipping containers prior to transport off-site. Requirements for the Temporary Storage Area are outlined in Section 02315 - Grading.
- .7 “Contaminated Groundwater” refers to groundwater encountered during contaminated soil, debris or landfill excavation that contains free product or does not conform to the Wastewater Discharge Criteria outlined in Section 01561 - Environmental Protection.
- .8 “Free Product” refers to a measurable layer of separated phase liquid petroleum hydrocarbon product.
- .9 “UXOs and Explosives” refers to unexploded ordinances and explosives such as ammunition and dynamite that pose a risk of exploding or detonating.

1.4 Qualifications and Personnel Protection

- .1 Be thoroughly familiar with and knowledgeable about existing site conditions, scope of work and requirements of the Specification.
- .2 Only Contractor's personnel capable of demonstrating a history of satisfactory experience in the area of hazardous waste management and can satisfy Federal and Territorial requirements will be permitted to supervise and direct the work of this Section. The Contractor's Superintendent responsible for the work of this Section shall have a minimum of five years of experience in the area of hazardous waste management.

- .3 Follow at all times, guidelines such as those established in Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: NIOSH Publication No. 85-115, or Hazardous Waste Worker Training Manual: Canadian LIUNA - Contractors Training Council, 1992.
- .4 All activities involving the handling of hazardous materials shall be directly supervised by Contractor's personnel who have successfully completed a 40 hour training course for Hazardous Waste Activities in compliance with OSHA 29 CFR 1910.120 or other approved equivalent training courses such as the Canadian Hazardous Waste Workers Program.
- .5 Contractor's personnel trained as described in Clause 1.4.4 of this Section shall instruct and direct all workers with respect to the waste management procedures and labour and safety practices to be followed in carrying out the work.
- .6 Provide workers with protection appropriate to the potential type and level of exposure. Establish specific safety protocols prior to commencing Restoration activities.
- .7 Provide suitable safety clothing and equipment as required during the course of the work. Supply sufficient quantities of protection equipment to fit all site personnel including the Engineer, Engineer's staff, and site visitors.
- .8 Carry insurance that includes appropriate coverage for the handling and transport of hazardous material.
- .9 Provide a contact company, name and phone number for UXO and Explosives work that can be mobilized to site if UXOs or Explosives are encountered. This information shall be provided to the site engineer prior to commencing any work on site.

1.5 Measurement for Payment

- .1 Costs for the collection and containerization of unknown hazardous waste material will be negotiated with the Engineer using the Contractor's Labour and Equipment rates provided in the Potential Extra Work Schedule. The scope of work for the Collection and Containerization of Unknown Hazardous Waste Material includes the following:
 - .1 Costs for the supply and transport of containers to the site.
 - .2 Equipment and labour costs for the containerization and on-site transportation of unknown hazardous waste materials to the Temporary Storage Area at CAM-F and to Hall Beach.
 - .3 Collection, sorting, and classification of unknown hazardous demolition and site debris for disposal requirements.

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- .4 Collection of contaminated surface water, groundwater and/or waste water encountered during contaminated soil excavation, landfill excavation, hydrocarbon contaminated soil treatment operations, or generated during Restoration operations.
 - .5 Testing associated with the disposal of contact water.
 - .6 Supply and transport to the site of containers for unknown hazardous waste materials.
 - .7 Supply and transport to the site of detergents and solvent, required for barrel processing.
 - .8 On-site transport of unknown hazardous waste materials to the CAM-F Temporary Storage Area following confirmation that the material is classified as hazardous by the Engineer.
 - .9 Off-site transport of unknown hazardous waste materials to the Temporary Storage Area at Hall Beach.
 - .9 Disposal of empty barrels resulting from the collection and consolidation of hazardous waste materials.

Unknown hazardous material is that material designated as hazardous in accordance with the definition of hazardous waste material in Clause 1.3.1 of this Section, and which has not been specifically identified for collection and disposal as part of other work components.

- .2 Include all indirect costs associated with the work described in this section as indicated in Clause 6.4 of Section 01110 – Summary of Work.
- .3 As part of the Potential Extra Work, Unknown Hazardous Material shall include:
 - .1 Hazardous debris scattered over the site area.
 - .2 Hazardous material excavated from the designated landfill areas.
 - .3 Hazardous barrel contents.
 - .4 Unknown hazardous material encountered during demolition operations that is not identified in the Demolition Inventory in the Appendix.
 - .5 Free product collected during contaminated soil excavation.
- .4 As part of the Potential Additional Work, Unknown Hazardous Materials shall not include:
 - .1 Materials from facilities to be demolished that are contaminated with PCB-amended paint at PCB concentrations in excess of 50 mg/kg.
 - .2 Asbestos containing materials from facilities to be demolished.
 - .3 Fuel and fuel residual product from fuel tanks and pipelines to be demolished.
 - .4 Sewage and sewage sludge from sewage tanks and lines to be demolished.

- .5 Hazardous Contaminated Soil as defined in Section 02190 - Contaminated Soil Remediation.
- .6 Any hazardous material identified in the Demolition Inventory in the Appendix, or elsewhere in these Specifications.

Costs for the collection and containerization (including supply of containers), as required, for the above items shall be included in the demolition costs for the various facility components and the hazardous contaminated soil costs for the Hazardous Contaminated Soil.

- .5 Grading associated with the removal of debris will be measured for payment as indicated in Section 02315- Grading.
- .6 Preparation of the Temporary Storage Area, including the supply, placement, and compaction of granular fill, as required, will be measured for payment as described in Section 02315 - Grading.
- .7 The Engineer shall carry out baseline soil sampling and analyses of the Temporary Storage Area prior to placement of any Hazardous Material Containers. Responsible for any soil contamination resulting from the improper storage and handling of hazardous materials over the duration of primary Restoration activities. In the event of such contamination, submit to the Engineer a plan for site remediation in accordance with all Federal and Territorial Regulations to be enacted upon immediately following approval by the Engineer. All Restoration costs will be borne by the Contractor.

2 Products

2.1 Hazardous Waste Material Containers:

- .1 For packaging and containerization requirements of hazardous waste materials, all requirements of the TDG Act and Regulations must be met. Assume that transport of the waste from the site to licensed southern disposal facilities by others will be by marine and ground transportation.
- .2 Contain asbestos in accordance with Section 13281 - Asbestos Abatement – Minimum Precautions, Section 13282 - Asbestos Abatement – Intermediate Precautions or Section 13283 - Asbestos Abatement – Maximum Precautions, as appropriate.
- .3 For transport by cargo vehicle or vessel, package liquids containing PCBs at concentrations greater than 50 mg/kg in accordance with TDG Act and Regulations in a combination packaging where the inner package is made of earthenware, plastic or metal, and is leak-proof, and the outer packaging is a

drum or box made of steel, aluminum, plywood, fibre or plastic. Provide sufficient absorbent material between the inner and outer packaging to prevent any liquid from escaping. There is no quantity limit per package for cargo vehicle or vessel transport. Label containers as specified in Section 02222 – Demolition of Structures.

- .4 For sea or land transport, package hazardous contaminated soils in Hazardous Contaminated Soil Containers described in Section 02190 - Contaminated Soil Remediation.
- .5 Provide access for the Engineer to inspect all Hazardous Material Packaging.

2.2 Detergent (Barrel Washing)

- .1 General purpose, phosphate-free. Prior to shipment to the site, submit to the Engineer Material Safety Data Sheets (MSDS). The detergent shipped to the site shall remain the property of the Contractor.

2.3 Solvent (Barrel Rinse)

- .1 Minimum flash point 60°C. Prior to shipment to the site, submit to the Engineer Material Safety Data Sheets (MSDS). The detergent shipped to the site shall remain the property of the Contractor.

3 Execution

3.1 General Requirements

- .1 Conduct all work in accordance with all appropriate Federal, Territorial and Provincial legislation, and international conventions.
- .2 Individuals shipping and receiving hazardous waste materials are to be licensed under the TDGA and Regulations, and appropriate territorial environmental Acts and regulations.
- .3 Only trained individuals or individuals working under the direct supervision of trained persons shall handle or transport dangerous goods.
- .4 Coordinate containerization of hazardous waste materials with Waste Broker contract through the Site Engineer.

3.2 Protection

- .1 Avoid releasing any hazardous materials into the environment during handling of hazardous waste materials.

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- .2 Develop for the Engineer's approval, an emergency response plan for response to spills and other emergencies during hazardous waste material recovery operations.
 - .3 In the event of a spill, invoke the emergency response plan and take appropriate action.
 - .4 Provide a full range of Restoration and protective equipment at the site to contain and Restoration spills, and protect personnel, as required. The Restoration equipment is to include booms (sorbent and containment), sorbents for Restoration, fire extinguishers for A-B-C fires, overpacks for contaminated soils, pumps, hand shovels, picks and containment barriers, such as plastic sheeting. Personnel protective equipment is to include clothing, protective suits, respirators, etc. to comply with potential emergency conditions and in accordance with NIOSH guidelines.
 - .5 Site personnel handling hazardous waste material are required to wear environmental protection equipment in accordance with NIOSH guidelines.
 - .6 Establish a Hazardous Material Processing Area for the placement of potentially hazardous waste materials for inspection, testing, classification and packaging, as well as for the consolidation and packaging of barrel liquids and sediments, and for the cleaning of barrels. Refer to Clause 3.3 of this Section.
 - .7 Establish two Temporary Storage Areas, subject to approval by the Engineer, to provide a secure area for hazardous waste material prior to shipment for disposal as described in Clause 3.9 of this Section. A temporary storage area is required at Sarcpa Lake and a second area is required at Hall Beach.
 - .8 Handle materials containing asbestos in accordance with Section 13281 - Asbestos Abatement – Minimum Precautions, Section 13282 - Asbestos Abatement – Intermediate Precautions or Section 13283 - Asbestos Abatement – Maximum Precautions, as appropriate.
 - .9 The release of all water resulting from the cleaning of fuel tanks, pipelines and barrels shall conform to the Wastewater Discharge Criteria outlined in Section 01561 - Environmental Protection. Dispose of any liquid effluent not conforming to the guidelines as hazardous waste material in accordance with the requirements of this Section. Refer to Clause 3.5.5 and 3.5.6 of this section.

3.3 Hazardous Waste Material Processing Area

- .1 Establish a Hazardous Waste Material Processing Area for the purpose of:
 - .1 Sorting, packaging, sampling, and processing hazardous waste materials;
and

- .2 Consolidation of compatible liquids and sediments, packaging for shipment, and cleaning of barrels.
- .2 Establish the Hazardous Waste Material Processing Area to:
 - .1 be of sufficient size and capacity to accommodate the volume of material and number of barrels to be processed at any one time;
 - .2 provide for the sampling, testing, and packaging of hazardous waste materials, barrel contents and wash water;
 - .3 minimize the handling of hazardous waste materials;
 - .4 isolate hazardous materials, barrel contents and wash water from other work operations;
 - .5 provide access for consolidation, packaging, cleaning of barrels, and transporting containers to the Temporary Storage Area;
 - .6 be leak-proof and to contain all runoff water, spills, and leaks so as not to contaminate the environment.
- .3 Immediately clean up any spills, leaks, or other releases of liquid or sediment from this area using appropriate techniques.
- .4 Submit details of the Hazardous Waste Material Processing Area to the Engineer for review and approval prior to commencing clean up activities.

3.4 Removal and Sorting of Hazardous Waste Materials

- .1 Continually monitor the Restoration operation to identify potentially hazardous material.
- .2 Immediately suspend the operation if suspected hazardous material or debris is identified and allow visual confirmation of the nature of the material or debris to be established.
- .3 Remove hazardous waste materials classified as "loose debris" from their place of origin, place in containers, and transport containers to the Temporary Storage Area.
- .4 Remove free product and hazardous waste materials derived from their place of origin, place in containers, and transport containers to the Hazardous Waste Material Processing Area.
- .5 Remove hazardous materials derived from demolition work from their place of origin in accordance with Section 02222 – Demolition of Structures, place in containers, and transport containers to the Temporary Storage Area.
- .6 Remove and sort barrels as described in Clause 3.5 of this Section.

- .7 Remove asbestos in accordance with Section 13281 - Asbestos Abatement – Minimum Precautions, Section 13282 - Asbestos Abatement – Intermediate Precautions or Section 13283 - Asbestos Abatement – Maximum Precautions, as appropriate.
- .8 Avoid releasing any hazardous materials into the environment during the handling of hazardous waste materials.
- .9 Invoke the approved emergency response plan and take the appropriate action in the event of a spill or other emergency situation.
- .10 Have available, a full range of Restoration and protective equipment at the site of debris removal to contain and Restoration spills, and protect personnel as required. The Restoration is to include booms (sorbent and containment), sorbents for Restoration, overpacks for barrels and contaminated soils, pumps, hand shovels, and picks. Personnel protective equipment is to include clothing, protective suits, respirators, etc. in accordance with NIOSH Guidelines and to comply with anticipated and potential emergency conditions.
- .11 Site personnel in the vicinity of the debris removal operations or handling hazardous material are required to wear environmental protection equipment in accordance with NIOSH guidelines.
- .12 Advise the Engineer of any stained soils encountered during debris removal operations. Excavate stained and contaminated soil areas, identified during debris removal operations, in accordance with the requirements of Section 02190 - Contaminated Soil Remediation. Testing for classification will be carried out and paid for by the Engineer.
- .13 Submit details of the containers for handling and disposal of hazardous waste materials to the Engineer for review prior to commencement of Restoration activities. Include all required approvals, as well as a description of the type and volume of containers.

3.5 Barrel Processing

- .1 A flow diagram for the methodology for the processing, Restoration and disposal of barrels is shown on Figure 02090-1 at the end of this Section.
- .2 Inspection:
 - .1 All barrels shall be inspected by the Engineer and Contractor. The purpose of the inspection is to identify the process for opening, sampling, testing and handling of the barrels. The inspection is to address the following items as a minimum:

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- .1 Symbols, words, or other marks on the barrel that identify its contents, and/or that its contents are hazardous; e.g. radioactive, explosive, corrosive, toxic, flammable.
 - .2 Symbols, words, or other marks on the barrel that indicate that it contains discarded laboratory chemicals, reagents, or other potentially dangerous materials in small-volume containers.
 - .3 Signs of deterioration such as corrosion, rust, or leaks at seams, rims, and V grooves.
 - .4 Evidence of spills or other contamination on the top and sides of the barrel.
 - .5 Signs that the barrel is under pressure such as bulging and swelling.
- .3 Test areas around barrels that show evidence of holes, rust points, or openings using a total hydrocarbon vapour detector instrument prior to movement. If levels exceed 20 percent Lower Explosive Limit (LEL) as measured by the detector, conduct all handling, storage, and transportation operations in accordance with the appropriate sections of the National Institute for Occupational Safety and Health (NIOSH) guidelines, National Fire Code of Canada, and the TDGA for flammable and combustible materials.
- .4 Barrel opening:
- .1 Pressurized barrels are extremely hazardous. Open with extreme caution. Use only non-sparking equipment to open barrels. Provide all personnel responsible for opening barrels with appropriate safety equipment and clothing. Open barrels in accordance with the procedures outlined in the Occupational Safety and Health Administration (OSHA) Code of Federal Regulations Title 29, Part 1910, Section 120 (29 CFR 1910.120) Hazardous Waste Operations and Emergency Response (HAZWOPER).
 - .2 If the bungs of a barrel can be readily moved, then open the barrel slowly, allowing time for any pressure in the barrel to be released before the bungs are fully removed.
 - .3 If the bungs of a barrel cannot be readily moved, or if barrel inspection suggests that opening of the barrel may present a special hazard, vent the barrels remotely to relieve any internal pressure that may be present prior to opening. Conduct remote barrel venting using a suitable device such as a sharp weighted spear dropped from an appropriate height or released from a tube housing a spring to penetrate the barrel. Drive the spear into the barrel such that the barrel pressure is vented.
 - .4 Conduct the remote venting operation at a safe distance from other site operations, and from behind suitable walls or barricades.
 - .5 All barrels shall be clearly numbered by the Engineer, and cross-referenced to sample numbers.

- .6 Do not transport barrels until it has been determined by the Engineer that they are not pressurized, do not leak, and are sufficiently sound for transport.
- .5 Sampling and testing of barrel contents:
 - .1 Samples of the contents of all barrels shall be extracted by the Engineer using a drum thief.
 - .2 Combine barrel contents with less than a 50 mm depth of liquid with contents of other barrels with similar colour and viscosity prior to sampling.
 - .3 Consolidate barrel contents in the Hazardous Waste Material Processing Area.
 - .4 Do not consolidate barrel contents consisting of black oil.
 - .5 Barrel contents inferred to contain only water based on visual examination, shall be tested by the Engineer prior to consolidation to confirm the presence of glycol and/or alcohol.
 - .6 Liquid samples shall be inspected and classified by the Engineer as containing water or organic materials.
 - .7 Based on the results of the analysis by the Engineer, treat barrel contents in accordance with the requirements detailed in Figure 02090-1 and described in Clause 3.5.6.
- .6 Disposal of barrel contents:
 - .1 Dispose of barrels containing rust and sediment as empty barrels as described in Clause 3.5.7.5 below.
 - .2 Transfer the contents of barrels containing only water with less than 2 percent glycol or alcohol to an oil-water separator. For small volumes, agitation with oil-absorbent material to remove any organic material, is an acceptable alternative.
 - .3 Collect wastewater for disposal in accordance with wastewater discharge criteria, Section 01561 – Environmental Protection.
 - .4 Test used oil-absorbent material to determine treatment and disposal requirements. Incinerate oil-absorbent material meeting the following criteria on-site (in accordance with site permit requirements) or package for disposal off-site at a licensed disposal facility:
 - .1 PCBs < 2 mg/kg
 - .2 Chlorine < 1,000 mg/kg
 - .3 Cadmium < 2 mg/kg
 - .4 Chromium < 10 mg/kg
 - .5 Lead < 100 mg/kgPackage oil-absorbent material containing contaminants in excess of the above criteria in accordance with TDGA regulations, as required, and package for disposal off-site at a licensed disposal facility.

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- .5 Incinerate the contents of barrels containing water with glycol and/or alcohol or organic phases, and meeting the criteria indicated in Clause 3.5.5.4 above, on-site or package for off-site disposal at a licensed disposal facility.
 - .6 Package the contents of barrels containing materials in excess of the concentrations indicated in Clause 3.5.5.4 above, in accordance with TDGA regulations, as required, for disposal at an off-site licensed disposal facility. Contents may be combined with compatible materials for shipping purposes in accordance with TDGA regulations, as required.
 - .7 A Toxicity Characteristic Leaching Procedure (TCLP) test shall be carried out by the Engineer on the solid residual material resulting from the incineration process. Landfill materials found not to be leachate toxic as Tier II contaminated soil as described in Section 02190 - Contaminated Soils. Package leachate toxic material in accordance with TDGA regulations, as required.
- .7 Cleaning and disposal of barrels:
- .1 Steam clean empty barrels resulting from the consolidation of barrel contents. Clean to remove oil, sludge, wax, tar and other fuel residue adhering to the surface.
 - .2 If residue remains, apply a detergent cleaning solution by spray or brush and allow to soak for approximately 30 minutes. For heavily oil-soaked surfaces, a second application may be required. Steam clean barrels after detergent application.
 - .3 Only in the event that two-time detergent application proves ineffective, utilize an appropriate solvent rinse for residue removal. Solvent rinsate material shall be tested by the Engineer to determine disposal requirements. If the solvent rinsate meets the criteria indicated in Clause 3.5.6.3 above, incinerate the material on site. If the solvent rinsate is in excess of the criteria, package the material in accordance with TDGA regulations, as required, for disposal off-site at a licensed disposal facility.
 - .4 Recycling of steam cleaning rinsate is permitted. Direct steam cleaning rinsate to an oil-water separator. Removal of oily waste residue by agitation with oil-absorbent material to remove any organic material is permitted.
 - .5 The resulting rinsate shall be tested by the Engineer for the Wastewater Discharge Criteria – Section 01561 Environmental Protection. If the concentrations of these elements are greater than the indicated levels, then package the rinsate in accordance with TDGA regulations, as required, for disposal off-site at a licensed disposal facility.
 - .6 Dispose of the used oil-absorbent material and/or oily liquid waste in excess of the concentrations indicated in Clauses 3.5.6.4 and 3.5.6.5.

- .7 Crush or shred all empty barrels prior to disposal in the designated on-site landfill. Crush the barrels in a manner to reduce the total original barrel volume by a minimum of 75 percent. Landfill empty barrels as non-hazardous waste in accordance with Section 02315 – Grading.

3.6 Cleaning of Fuel Tanks and Pipelines

- .1 The Contractor is advised that fuel tanks to be demolished may contain fuel.
- .2 Prior to the demolition and removal of fuel tanks and pipelines:
 - .1 Drain and flush all products in connected piping in a manner as to prevent spillage.
 - .2 After initial draining, remove all residual fuel by passing a "Teflon Ring Pig" through the line.
 - .3 Isolate the line to prevent the passage of vapours using a standard plumber's plug on the end of a tee handle.
 - .4 Cut the pipe for eventual disposal in an on-site landfill.
 - .5 Incinerate all liquids contained in the tank. Incinerate in a container to prevent ground or water contamination, in an oxygen-rich environment to promote complete combustion, and in accordance with Section 01351 - Site Specific Health and Safety for Contaminated Sites.
 - .6 Rinse tanks with water to remove any residual product. Filter the wash water through an oil-absorbent material.
 - .7 Test the used oil-absorbent material to determine disposal requirements. Incinerate oil-absorbent material meeting the following criteria on-site or package for disposal off-site at a licensed disposal facility:
 - .1 PCBs < 2 mg/kg
 - .2 Chlorine < 1000 mg/kg
 - .3 Cadmium < 2 mg/kg
 - .4 Chromium < 10 mg/kg
 - .5 Lead < 100 mg/kgDispose of remaining waste wash water in accordance with the Wastewater Discharge Criteria outlined in Section 01561 - Environmental Protection.
 - .8 Package oil-absorbent material containing contaminants in excess of the above criteria in accordance with TDGA regulations, as required, for disposal off-site at a licensed disposal facility.
 - .9 Degas all tanks in accordance with the requirements of Report 88-5 (December 1988) of the Petroleum Association for Conservation of the Canadian Environment (PACE). Use nitrogen for degassing, as required, if ventilation and purging methods fail. Monitor area surrounding tanks and pipelines for vapour build up during degassing.
 - .10 Following degassing, interior explosive vapour concentrations shall be less than 20 percent LEL prior to demolition.

3.7 Cleaning of Sewage Tanks and Lines

- .1 Prior to demolition of sewage lines, rinse lines with wash water. Sample and analyse the liquids, including wash water, in accordance with the Waste Water Discharge Criteria outlined in Section 01561 – Environmental Protection. Package material in excess of these criteria in accordance with TDGA regulations as required.
- .2 Analyse sewage sludge in accordance with the contaminated soil criteria described in Section 02190 – Contaminated Soil Remediation. Dispose of this material in accordance with the requirements of Section 02190.

3.8 Packaging and Labelling

- .1 Package and label each "hazardous material" in accordance with the "Class" and "Packaging Group" as per the TDGA.

3.9 Temporary Storage Areas

- .1 Temporary Storage Areas are required at Sarcpa Lake and at Hall Beach. The Engineer will obtain permits for the storage area at Hall Beach.
- .2 Refer to Section 02315 - Grading and Section 02222 – Demolition of Structures for the requirements of the Temporary Storage Area.
- .3 Establish the location and size of the Temporary Storage Area(s) to minimize the handling of materials, isolate materials from other work operations and to provide for the collection and removal of these materials from the site
- .4 Segregate materials within the Temporary Storage Area(s) as follows:
 - .1 Containerized PCB-amended demolition material (refer to Section 02222 – Demolition of Structures). Maintain a distance of 10 m between these materials and the others.
 - .2 CEPA Contaminated Soil (refer to Section 02190 – Contaminated Soil Remediation)
 - .3 Other Hazardous Contaminated Soil (refer to Section 02190 – Contaminated Soil Remediation)
 - .4 Containerized Barrel Contents
 - .5 Other Containerized Hazardous Waste Materials.
- .5 Store hazardous waste materials in their appropriate packaging containers in accordance with the TDGA requirements.
- .6 For storage of hazardous waste material, no stacking of containers will be allowed.

- .7 In accordance with Section 01780 – Closeout Submittals, submit to the Engineer a detailed inventory of the Temporary Storage Area indicating the location and contents of each container and assigned Environment Canada Registration numbers (as required) and packaging configuration.

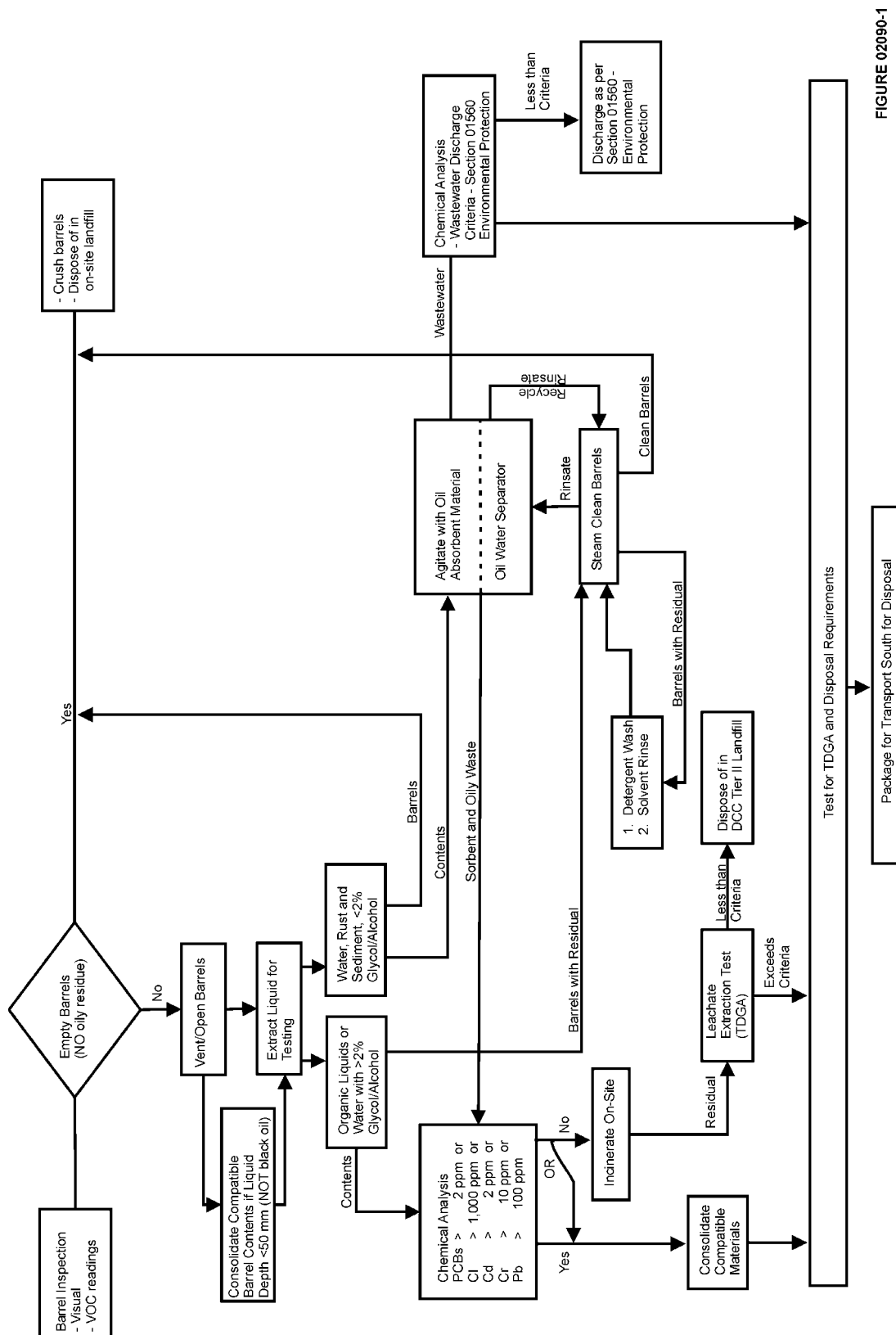


FIGURE 02090-1

Package for Transport South for Disposal

1 General

1.1 Description

- .1 This Section specifies the requirements for the excavation, handling and disposal or containerization and off-site transport of contaminated soils, including hydrocarbon contaminated soils.

1.2 Definitions

- .1 Inorganic Elements: arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc.

- .2 Tier I Contaminated Soil: Soils containing concentrations of any or all contaminants listed as follows:

Lead	- 200 to 500 mg/kg
PCBs	- 1 to 5 mg/kg.

- .3 Tier II Contaminated Soils: Soils containing concentrations equal to or greater than any or all of the contaminants listed as follows:

Arsenic	- 30 mg/kg
Cadmium	- 5 mg/kg
Chromium	- 250 mg/kg
Cobalt	- 50 mg/kg
Copper	- 100 mg/kg
Lead	- 500 mg/kg
Mercury	- 2 mg/kg
Nickel	- 100 mg/kg
Zinc	- 500 mg/kg
PCBs	- > 5 mg/kg; < 50 mg/kg

- .4 Hazardous Contaminated Soil: Contaminated soil is classified as hazardous in accordance with the Transportation of Dangerous Goods Act and Regulations (including CEPA and leachable soil).

- .5 CEPA Contaminated Soil: Soil containing concentrations of PCBs equal to or in excess of 50 mg/kg. Materials contaminated with PCBs at concentration levels equal to or in excess of 50 mg/kg are legislated as hazardous materials. Storage, handling, and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act. Comply with all applicable regulations.

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- .6 Leachable Soil: Soil containing contaminants, that when subject to the leachate test prescribed in the TDGA and Regulations, leaches contaminants in excess of the concentrations listed in Part V of the regulations. Handling and disposal are regulated under Federal, Territorial and Provincial Regulations. Comply with all applicable regulations.
 - .7 Petroleum Hydrocarbons: Hydrocarbon products described by laboratory analyses as lubricating oil and grease, fuel oil, diesel and/or gasoline.
 - .8 Hydrocarbon Contaminated Soil: Soil containing concentration of Total Petroleum Hydrocarbons (TPH) in excess of the CCME Canada Wide Standards for Petroleum Hydrocarbons (CWS PHC) Residential Parkland Criteria for fine grained soils.
 - .9 Free Product: The presence of a layer of separated phase liquid petroleum hydrocarbon product.
 - .10 F1/F2 Contaminated Soil: Hydrocarbon contaminated soil in which the primary petroleum hydrocarbon product present in the soil as determined by laboratory analysis consists of fuel oil, and/or diesel, and/or gasoline. F1/F2 and combinations of Tier I and F1/F2 contaminated soil shall be excavated and disposed of to the Secure Soil Disposal Facility. Combinations of F1/F2 and Tier I soils shall be considered and referred to as F1/F2 contaminated soil.
 - .11 F3/F4 Contaminated Soil: Hydrocarbon contaminated soil in which the primary petroleum hydrocarbon product present in the soil as determined by laboratory analysis consists of lubricating oil and grease. For remedial purposes, F3/F4 contaminated soil shall be treated as Tier I contaminated soil containing hydrocarbon contamination.
 - .12 Clean Soil: Soil that has been sampled, analyzed, and determined to have contaminant concentrations below Tier I and Tier II contaminant levels, TPH less than CWS PHC, and lead and PCBs at concentrations of less than 200 mg/kg and 1 mg/kg, respectively.
 - .13 Tier I Soil: Includes Tier I and F3/F4 contaminated soil, or any combination thereof. These soils are indicated on the Drawings as Tier I Soil.
 - .14 Tier II Soil: Includes Tier II and combinations of Tier II and F1/F2 contaminated soil. These soils are indicated on the Drawings as Tier II Soil.

1.3 Qualifications

- .1 Be thoroughly familiar with and knowledgeable about existing site conditions, scope of work and requirements of the Specification.
- .2 Only Contractor's personnel capable of demonstrating a history of satisfactory experience in the area of hazardous waste management and who can satisfy Federal and Territorial requirements will be permitted to carry out the work of this Section. The Contractor's Superintendent responsible for the work of this Section shall have a minimum of five years of experience in the area of hazardous waste management.
- .3 Follow at all times, guidelines such as those established in Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: NIOSH Publication No. 85-115, or Hazardous Waste Worker Training Manual: Canadian LIUNA - Contractors Training Council, 1992.
- .4 All activities involving the handling of hazardous materials, including Hazardous Contaminated Soils, shall be directly supervised by the Contractor's personnel who have successfully completed a 40 hour training course for Hazardous Waste Activities in compliance with OSHA 29 CFR 1910.120 or other approved equivalent training courses such as the Canadian Hazardous Waste Workers Program.
- .5 Contractor's personnel trained as described in Clause 1.3.4 of this Section shall instruct and direct all workers with respect to the waste management procedures and labour and safety practices to be followed in carrying out the work.
- .6 Provide workers, the Engineer and the Engineer's staff when required with protection appropriate to the potential type and level of exposure. Establish specific safety protocols prior to commencing clean up activities.
- .7 Provide suitable safety clothing and equipment as required during the course of the work.
- .8 Trained and certified personnel are required to complete all Transportation of Dangerous Goods Act (TDGA) documentation and recording requirements.

1.4 Erosion, Sediment and Drainage Control Plan

- .1 Submit an Erosion, Sediment and Drainage Control Plan to the Engineer for review and approval prior to commencing specifically address the protection of bodies of water adjacent to the construction areas in accordance with Section 01561 – Environmental Protection.

1.5 Site Conditions

- .1 The approximate locations of known service or utility lines and buried objects are as indicated on the Drawings. Ensure that services, not designated for demolition, are not damaged as a result of excavation work. Repair any services, utilities, or objects damaged by his actions at no cost to the Engineer
- .2 Suspend operations whenever climatic conditions are unsatisfactory for excavating or regrading to conform with this Specification.
- .3 After occurrence of heavy rains, do not operate equipment in designated areas until the material has dried sufficiently to prevent excessive rutting.
- .4 The Contractor is advised that the ground in low-lying areas may often be saturated. Dewater saturated ground and ponded areas as required, complying with Clause 1.6.3 of this Section.
- .5 The Contractor is advised that groundwater may be present in any of the hydrocarbon contaminated areas during excavation and that free product may be encountered. Groundwater conditions, as measured at the time of the site investigation in these areas (2004), have been presented on the Drawings. Advise Engineer upon encountering free product. Dewater excavations in compliance with Clause 1.6.3 of this Section.
- .6 Prior to the commencement of the work, remove debris, snow, ice and standing water from areas to be excavated and regraded.
- .7 During excavation of contaminated soil, maintain a stable excavation and dewater as required or as directed by the Engineer.
- .8 Information included in Table 02190-1 at the end of this Section indicates the concentration levels of contaminants in each of the contaminated areas. This information is based on the results of site investigation and laboratory testing programs carried out up to August 2004 by the Queens University and/or Earth Tech Canada Inc.

1.6 Protection

- .1 Prevent damage to benchmarks, existing buildings, surface and underground service and utility lines not designated for demolition, as well as to instrumentation excavations. Immediately repair or replace any damage to the above, at no cost to the Engineer.

- .2 Environmental protection measures shall be in accordance with the requirements specified in Section 01561 - Environmental Protection. Follow the accepted Erosion, Sediment and Drainage Control Plan.
- .3 The release of all water resulting from the dewatering of ponded contaminated soil areas and the decontamination of excavation equipment shall conform to the Wastewater Discharge Criteria outlined in Section 01561 - Environmental Protection.

1.7 Personnel Protection

- .1 Some areas designated for Restoration under this contract involve soils and hazardous materials which contain PCBs, inorganic elements, hydrocarbons, and other contaminants which are considered hazardous to human health.
- .2 Polychlorinated biphenyls (PCBs) at concentrations equal to or in excess of 50 mg/kg are considered to be hazardous substances. Storage, handling and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act. Comply with all applicable regulations.
- .3 When working with inorganic elements, PCB containing materials, hydrocarbons, and other contaminants, workers shall wear protective clothing and equipment acceptable to Labour Canada or Territorial Labour Department as suitable for exposure in the work area. Follow National Institute for Occupational Safety and Health (NIOSH) guidelines in providing protection for on-site personnel including contract employees and subcontractor, the Engineer and other authorized site personnel. Provide details of protective clothing and equipment required for each work area in the Site Specific Health and Safety Plan as required by Section 01351 – Site Specific Health and Safety for Contaminated Sites.
- .4 Supply sufficient quantities of designated protection equipment to fit all site personnel including the Engineer and authorized visitors. Educate workers as to risks, and train in safe work practices.
- .5 No separate pay item shall apply to the work practice requirements, including personnel protection, of this Section. Costs shall be included in the applicable payment items to which this Section applies.

1.8 Measurement for Payment

- .1 The excavation of Tier I, F3/F4 and Tier I – F3/F4 contaminated soil, from all site areas, will be measured for payment by the cubic metre based on the product of the predetermined surface area and depth of excavation as indicated on the Drawings. Excavation of Tier I, F3/F4 and Tier I – F3/F4 contaminated soil will be paid under Item 02190-1 of the Basis of Payment Schedule.
- .2 The scope of work for Payment Item 02190-1 (Tier I - F3/F4 Contaminated Soil Excavation - Site Areas) shall include:
 - .1 Excavation of Tier I – F3/F4 contaminated soil from all site areas.
 - .2 On-site transport and disposal of the soil within the designated Non-Hazardous Wastes Landfill.
 - .3 The regrading, including supply, placement and compaction of granular fill to replace the excavated contaminated soil to original grade, as indicated on the Drawings.
- .3 The excavation of Tier II contaminated soil, from all site areas, will be measured for payment by the cubic metre of soil based on the product of the predetermined surface area and actual depth of excavation. Excavation of Tier II contaminated soil will be paid under Item 02190-2 of the Basis of Payment Schedule.
- .4 The scope of work for Payment Item 02190-2 (Tier II Contaminated Soil - Site Areas) shall include:
 - .1 Excavation of Tier II Contaminated Soil from all site areas.
 - .2 On-site transport and disposal of the soil within the designated Secure Soil Storage Facility.
 - .3 The regrading, including supply, placement and compaction of granular fill to replace the excavated contaminated soil to original grade, as indicated on the Drawings.
- .5 The excavation of hazardous contaminated soil from all site areas will be measured for payment by the cubic metre of soil as placed in containers. Excavation of hazardous contaminated soil will be paid under Item 02190-3 of the Basis of Payment Schedule.
- .6 The scope of work for Payment Item 02190-3 (Hazardous Contaminated Soil Excavation - Site Areas) shall include:
 - .1 Excavation of hazardous contaminated soil from all site areas.
 - .2 Handling and containerization into Hazardous Soil Containers of the contaminated soil.

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- .3 On-site transport and placement of containers at the CAM-F Temporary Storage Area.
 - .4 The regrading including supply, placement and compaction of granular fill to replace the excavated contaminated soil, as indicated on the Drawings.
 - .7 The supply and transport to the site of containers for hazardous contaminated soil, including leakproof liners, will be measured for payment by the cubic metre based on the interior volume of the container. Hazardous Contaminated Soil Containers will be paid under Item 02190-4 in the Basis of Payment Schedule. Payment will not be made until written approval of containers by Transport Canada has been submitted to the Engineer.
 - .8 The excavation of F1/F2 hydrocarbon contaminated soil from all site areas will be measured for payment by the cubic metre based on the product of the predetermined surface area and depth of excavation as indicated on the Drawings or as directed by the Engineer. Excavation of F1/F2 hydrocarbon contaminated soil will be paid under Item 02190-5 of the Basis of Payment Schedule.
 - .9 The scope of work for Payment Item 02190-5 (F1/F2 Hydrocarbon Contaminated Soil Excavation - Site Areas) shall include:
 - .1 Excavation of F1/F2 hydrocarbon contaminated soil from all site areas.
 - .2 Handling, on-site transport, and placement of hydrocarbon contaminated soil within the Secure Soil Disposal Facility.
 - .3 The reshaping or regrading, including the supply, placement and compaction of granular fill to replace the excavated contaminated soil, as indicated on the Drawings.
 - .10 The supply and transport to the site of hydrocarbon resistant liners to be used in containers for hazardous contaminated soil containing hydrocarbon contamination will be measured for payment by the cubic metre based on the volume of hazardous contaminated soil as placed into the containers. Hydrocarbon resistant liners will be paid under Item 02190-6 in the Basis of Payment Schedule
 - .11 No extra payment will be made for soil removed from beyond the specified limits of excavation, unless such removal has been specifically directed by the Engineer. No extra payment will be made for excavation beyond the specified limits of excavation due to sloughing or unstable ground conditions resulting from saturated conditions. The volume of contaminated soil excavation beyond the specified limits that have been approved by the Engineer will be determined by the surveyed area and depth.

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- .12 Grading of the Temporary Storage Area at CAM-F, including the supply, placement, and compaction of granular fill, as required, will be measured for payment as described in Section 02315 - Grading.
- .13 The following activities are considered incidental to the work and will not be measured separately:
- .1 Provision of signage at the hazardous contaminated soil storage areas.
 - .2 Placement of liners into the Hazardous Contaminated Soil containers.
 - .3 Preparation of records indicating the contents of soil containers.
 - .4 Equipment decontamination including preparation and operation of the equipment decontamination area.
 - .5 Dewatering of ponded contaminated soil areas, as required.
 - .6 Provision of all necessary safety equipment and clothing.
 - .7 Removal of exposed surficial boulders greater than 300 mm in diameter.
 - .8 Installation of environmental controls, such as silt fences etc.

Costs for these activities are to be included in the unit prices for the elements of work described in this Section.

- .14 Dewatering of groundwater will not be measured. Include all costs for dewatering in the Basis of Payment Schedule - Balance of Project Complete.
- .15 All indirect costs associated with work described in this section, including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in the Basis of Payment Schedule - Balance of Project Complete.

2 Products

2.1 Materials

- .1 Hazardous Contaminated Soil Container:
- .1 Containers shall satisfy the requirements of the latest edition of the Transportation of Dangerous Goods Act and Regulations, and in particular, the requirements for Intermediate Bulk Containers for marine transport of hazardous materials.
 - .2 Submit details of the containers to the Engineer for review prior to commencement of the work. These details shall include written confirmation from Transport Canada that the Contractor's proposed containers satisfy TDGA regulatory requirements for marine transport.
 - .3 Containers shall include all necessary liners to satisfy the TDGA requirements for marine transport.

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- .2 Type 3 Granular Fill, as indicated on the Drawings, in accordance with Section 02300 –Granular Materials.
 - .3 Hydrocarbon Resistant Liners: Reinforced Polyethylene (Oil-Resistant) OR RPE 25, to the following requirements:
 - .1 High strength, oriented-tape high density polyethylene (HDPE) scrim coated on both sides with an impervious HDPE coating for oil resistance.
 - .2 Thickness: 20 mil; 0.51 mm nominal.
 - .3 Coating Thickness: 2 mil 0.05 mm nominal.
 - .4 Tensile Strength (ASTM D751): 1512 N (340 pounds)
 - .5 Elongation (ASTM D751): 15 percent.
 - .6 Tear Strength (ASTM D751 Tongue Tear): 222 N (50 pounds).
 - .7 Low Temperature Bend (ASTM D2136): -55 degrees C.
 - .8 Burst Strength (ASTM D751): 4140 kPa.
 - .9 UV Resistance (G53-84; 2000 hours): > 80 percent.
 - .4 Environmental Protection Supplies: as per Section 01561 – Environmental Protection.

3 Execution

3.1 Removal and Disposal of Contaminated Soil (Excluding Hazardous Contaminated Soil)

- .1 Lay out and excavate areas of contaminated soil to the limits defined on the Drawings. In contaminated soil areas containing boulders, remove all organic materials and fine grained materials from the boulders. The use of hand excavation tools may be necessary for this work. All layouts are to be field verified by the Engineer prior to excavation.
- .2 Remove all surface debris prior to excavation. Remove all debris from excavated soil, sort, and dispose of appropriately.
- .3 Suppress dust generated during excavation operations with a water spray. Prevent surface water from entering the excavated area.
- .4 Dewater ponded contaminated soil areas, as required. Maintain soil excavations free of standing water during soil removal, confirmatory sampling and backfilling activities. Comply with the requirements of the Waste Water Discharge Criteria indicated in Section 01561 - Environmental Protection.
- .5 Transport the Tier I and/or F3/F4 soil in a manner such that no soil or liquid will be spilled during transport to the designated site landfill.

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- .6 Place the Tier I-F3/F4 soil as intermediate fill (Type 6) in the Non-Hazardous Waste Landfill as per Section 02315 - Grading.
 - .7 Transport Tier II contaminated soil in a manner such that no soil or liquid will be spilled during transport to the CAM-F Temporary Storage Area.
 - .8 Transport F1/F2 hydrocarbon contaminated soil to the Secure Soil Disposal Facility such that no soil or liquid will be spilled during transport.
 - .9 Place F1/F2 hydrocarbon contaminated soil in the Secure soil Disposal Facility Area in accordance with Clause 1.8 of this Section.
 - .10 Excavation shall not be permitted within 2 metres of any water course or permanent water body. The Engineer shall confirm the limit of excavation and setback from the high water mark at the time of excavation.
 - .11 When excavating in the vicinity of a drainage course or a body of water, erect silt fences, floating silt curtains and/or containment berms to prevent the release of sediment and deleterious materials into the water.
 - .12 Clean the excavating equipment including the bucket, tracks, etc., of soil lumps and particles prior to mobilizing to the next contaminated soil area. Collect and dispose of the removed material in accordance with the contaminated soil designation. Take special precautions to mitigate the tracking of contaminated soil over the site area.
 - .13 Decontaminate the equipment used for the excavation of Tier II and F1/F2 contaminated soil in accordance with Clause 3.4 before commencing contaminated soil excavation at another location.
 - .14 Replace excavated material with granular fill (as indicated on the Drawings), compact, and grade to match existing ground surface. Do not commence backfilling or regrading of the excavated contaminated soil areas until confirmatory testing has been completed by the Engineer, and the requirement for possible additional contaminated soil excavation is determined.
 - .15 Do not operate equipment in contaminated soil areas that have been excavated until the Engineer has confirmed, based on the results of confirmatory testing, that no further excavation of contaminated soil in the area is required.

3.2 Excavation of Hazardous Contaminated Soil

- .1 Layout and excavate the hazardous contaminated soil to the limits defined on the Drawings. In areas containing boulders, remove all organic materials from the boulders. The use of hand excavation tools may be necessary for this work. All layouts are to be field verified by the Engineer prior to excavation.
- .2 Prior to placing hazardous contaminated soil in containers, remove all boulders and rocks greater than 200 mm in maximum dimension. Remove hazardous contaminated soil from these materials. Boulders and rocks shall be used as backfill in the excavation.
- .3 Suppress dust generated during excavation operations with a water spray. Prevent surface water from entering the excavated area.
- .4 Dewater ponded contaminated soil areas. Maintain soil excavations free of standing water during soil removal, confirmatory sampling and backfilling work activities. Comply with the requirements of the Waste Water Discharge Criteria indicated in Section 01561 - Environmental Protection.
- .5 Place the hazardous contaminated soil in containers as described in Clause 2.1 of this Section. Place hazardous contaminated soil containing hydrocarbon contamination in containers with hydrocarbon resistant liners.
- .6 Transport the soil in its container to the designated on-site Temporary Storage Area. Prior to transport of materials, ensure that the hazardous contaminated soil containers are leakproof. If containers show any evidence of leakage, remove the contents from the container and re-containerize in a leakproof container, as required.
- .7 Develop a numbering system for the identification of each hazardous contaminated soil container. Based on this numbering system, mark on the containers, the number and contents (e.g. CEPA Soil, CEPA F1/F2 Soil) of the container. Submit to the Engineer, a listing of the numbered containers, their contents, and the Hazardous Contaminated Area designation from where the soil was excavated.
- .8 Clean the excavating equipment including the bucket, tracks, etc., of soil lumps and particles prior to mobilizing to the next contaminated soil area. Collect and dispose of the removed material in the contaminated soil containers. Take special precautions to mitigate the tracking of contaminated soil over the site area.

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- .9 Decontaminate the equipment used for the excavation of hazardous contaminated soil in accordance with Clause 3.4 before commencing contaminated soil excavation at another location.
 - .10 Replace excavated material with granular fill (as indicated on the Drawings), compact, and grade to match existing ground surface. Do not commence backfilling or regrading of the excavated contaminated soil areas until confirmatory testing has been completed by the Engineer, and the requirement for possible additional contaminated soil excavation is determined.
 - .11 Do not operate equipment in contaminated soil areas that have been excavated until the Engineer has confirmed, based on the results of confirmatory testing, that no further excavation of contaminated soil in the area is required.

3.3 Erosion, Sediment and Drainage Controls

- .1 Prior to commencement of the work, install temporary erosion, sediment and drainage controls to prevent siltation and disruption of water bodies in accordance with Clause 1.5 of this Section and Section 01561 - Environmental Protection.
- .2 Erosion, sediment and drainage controls shall be maintained during all stages of work.
- .3 At the completion of contaminated soil excavation or the conclusion of the work season, remove the erosion, sediment and drainage controls, as directed by the Engineer. Dispose of all non-granular erosion, sediment and drainage control materials into the designated Non-Hazardous Waste Landfill.
- .6 Restore and grade all areas affected by erosion, sediment and drainage controls in accordance with Section 02315 - Grading.

3.4 Equipment Decontamination

- .1 Decontaminate equipment which comes into direct contact with the contaminated soils by steam cleaning or other means acceptable to the Engineer in a secure area capable of containing the waste generated by the washing operation.
- .2 Collect and dispose of any contaminated soil that leaks, spills or otherwise leaves the piece of equipment during transport from the area of work to the decontamination area.

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- .3 Filter liquid waste resulting from the decontamination operation through an oil-absorbent material. The disposal requirements for the oil-absorbent material are dependent on the results of testing to be carried out by the Contractor. If test results indicate:
- PCBs < 2 mg/kg;
 - Chlorine < 1,000 mg/kg;
 - Cadmium < 2 mg/kg;
 - Chromium < 10 mg/kg; and
 - Lead < 100 mg/kg,
- then incinerate the oil-absorbent material on-site. Package oil-absorbent material containing contaminants in excess of the above criteria in accordance with TDGA and dispose off-site at a licensed disposal facility.
- .4 Dispose of liquid waste in accordance with the Wastewater Discharge Criteria outlined in Section 01561 - Environmental Protection.
- .5 Treat any waste soil resulting from the decontamination procedure as Tier II, hydrocarbon or hazardous contaminated soil, depending on the source of the material, and handle accordingly.

3.5 Temporary Storage Area

- .1 Store the hazardous contaminated soil containers in a single designated area, approved by the Engineer, to facilitate loading of the containers onto off-site transport equipment. Requirements for the Temporary Storage Area are described in Section 02300 - Grading.
- .2 Within the Temporary Storage Area, store hazardous contaminated soil containers separately from any other shipping containers.
- .3 For storage of hazardous waste materials, no stacking of containers will be allowed.
- .4 Provide and erect signage as described in Section 02090 – Hazardous Waste Materials.
- .5 Provide Engineer with a detailed inventory of the Temporary Storage Area indicating the location and contents of each container, the container and the assigned Environment Canada Registration numbers and packaging configuration, as required.
- .6 Permit only authorized personnel to enter the Temporary Storage Area.

**TABLE 02190-1
CONTAMINATED SOIL CONCENTRATIONS**

Area Designation	Drawing Reference	Contaminant Concentration (mg/kg)
Module Station	413334-C03 413334-C10	PCBs: <1 to 36 HC: <10 to 342 (F1 Fraction) HC: <10 to 5,420 (F2 Fraction) Boron: <1 to 3.2 Naphthalene: <1 to 27.5
Stain NW of Module Station	413334-C03 413334-C09	PCBs: <1 to 20 HC: <10 to 5,880 (F3 Fraction) HC: <10 to 11,600 (F4 Fraction)
Sewage Outfall	413334-C03 413334-C09	PCBs: <1 to 36 Boron: <1 to 3.8 Copper: <1 to 842 Tin: <1 to 53 Zinc: <1 to 432
Warehouse	413334-C03 413334-C09	PCBs: <1 to 8.5 HC: <10 to 2,760 (F2 Fraction)
Garage	413334-C03 413334-C09	PCBs: <1 to 25 HC: 10 to 9,760 (F2 Fraction) HC: <10 to 7,050 (F3 Fraction)
Vehicle Pile	413334-C03 413334-C10	PCBs: <1 to 2.8 HC: <10 to 2,400 (F2 Fraction) HC: <10 to 4,860 (F3 Fraction) Lead: <1 to 354 Zinc: <1 to 22,600
West Barrel Cache	413334-C03 413334-C10	HC: <10 to 557 (F1 Fraction) HC: <10 to 6,760 (F3 Fraction) Naphthalene: <1 to 43.1
POL tanks	413334-C03 413334-C11	HC: <10 to 1,570 (F1 Fraction) HC: <10 to 13,300 (F2 Fraction) HC: <10 to 2,770 (F3 Fraction) Naphthalene: <1 to 4.6
DUMP A	413334-C03 413334-C11	PCBs: <1 to 25.2 Barium: <1 to 735 Boron: <1 to 3.3 Zinc: <1 to 79.6

TABLE 02190-1 CONTAMINATED SOIL CONCENTRATIONS		
Area Designation	Drawing Reference	Contaminant Concentration (mg/kg)
DUMP B	413334-C03 413334-C10	PCBs: <1 to 11.8 Boron: <1 to 2.3 Copper: <1 to 437 Zinc: <1 to 315 HC: <10 to 17,300 (F3 Fraction) HC: <10 to 68,000 (F4 Fraction)
Construction Camp	413334-C05 413334-C09 413334-C10	HC: <10 to 1,440 (F1 Fraction) HC: <10 to 1,8300 (F3 Fraction) Naphthalene: <1 to 5.1 Cadmium: <1 to 720 Lead: <1 to 1,020 Copper: <1 to 4,020 Zinc: <1 to 2,340

Notes:

1. HC: Hydrocarbon Concentration
2. Parameters for analysis in any specific contaminated area were determined by the Earth Tech Canada Inc. (2004) and Queens University 1996.
3. All analytical results provided by Earth Tech Canada Inc. (2004) and Queens University (1996).
4. Only contaminant concentrations in excess of Restoration Criteria are reported for a specific parameter.

1 General

1.1 Description

- .1 This Section specifies the requirements for the excavation, removal, sorting, handling, and transport of buried, partially buried and scattered debris over the site area.
- .2 The Site Photographs show some of the site debris areas as observed during the 2004 field investigation program. These photographs provide information on the general location, nature and extent of site debris, and are not intended to depict the total scope of work.

1.2 Definitions

- .1 Known Debris: Scattered visible debris on the existing ground surface, including open storage areas, or visible, partially buried debris within 0.5 metres of the existing ground surface, consisting of hazardous and non-hazardous material, and that:
 - .1 has been identified on the Drawings as debris to be removed; or
 - .2 is located within 50 metres of any access road, airstrip or POL line on the site.
- .2 Unknown Debris: Scattered debris on the existing ground surface and/or partially or suspected fully buried debris consisting of hazardous and non-hazardous material other than the Known Debris described in Clause 1.2.1 above.
- .3 Hazardous Waste Materials: Waste materials that are designated as hazardous under Nunavut Territorial or Federal Legislation or as dangerous goods under the TDGA or CEPA (See Section 02090 - Hazardous Waste Material).
- .4 Non-Hazardous Waste Materials: Waste materials that are not designated as hazardous under Nunavut Territorial or Federal Legislation and can be disposed of on-site in designated landfill areas.

1.3 Measurement for Payment

- .1 Include all direct costs for the removal of known non-hazardous debris, in all site areas, in the lump sum price for Known Debris Removal, Item 02219-1, as indicated in Basis of Payment Schedule. The volume of debris (including demolition and crushed barrels) at the CAM-F site is estimated to be 3,050 cubic metres.

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- .2 Include all indirect costs associated with the work described in this section as indicated in Clause 5.4 of Section 01110 – Summary of Work.
 - .3 The removal of unknown non-hazardous debris from all site areas will be measured for payment by the cubic metre of compacted debris as determined by truck box measurement as described in Clause 1.6.2 of Section 02315 - Grading, and paid under Item 02219-1, Unknown Debris Removal, of the Basis of Payment Schedule. The capacity of the truck box will be measured by the Engineer. Compacted barrels and tanks are defined as those crushed to a state that reduces the total original volume by a minimum of 75%.
 - .4 The following work items will be incidental to the work described in this Section, and will not be measured separately:
 - .1 Collection and sorting, as required of all non-hazardous debris.
 - .2 Cutting, crushing and placement in layers and compaction of this material in the on-site landfill.
 - .3 Reshaping associated with the removal of debris.
 - .5 Backfill of Type 3 granular fill required as a result of debris removal and approved by the Engineer will be measured for payment by the cubic metre and paid under Item 02315-5 of the Basis of Payment Schedule. The cubic metre measurement will be by truck box measurement as described in Clause 1.6.2 of Section 02315 - Grading.
 - .6 Excavation of debris identified to contain hazardous materials will be paid under Unknown Hazardous Waste Material Collection as indicated in the Basis of Payment Schedule.
 - .7 Costs for the supply and transport of containers to the site and the on-site transport and containerization of debris consisting of unknown hazardous waste material will be measured for payment as indicated in Section 02090 - Hazardous Waste Material.

2 Products

2.1 Materials

- .1 Containers for hazardous waste materials in accordance with Section 02090 - Hazardous Waste Material.

3 Execution

3.1 Protection Procedures

- .1 When excavating in the vicinity of a drainage course or a body of water, erect silt fences, floating silt curtains and/or containment berms to prevent the release of sediment or deleterious materials into the water.
- .2 Environmental protection measures shall be in accordance with the requirements specified in Section 01561 - Environmental Protection. Follow the Erosion, Sediment and Drainage Control Plan submitted in accordance with Clause 7.1 of Section 01561.

3.2 Removal and Sorting

- .1 Examine the area(s) to assess the material type and nature of the debris.
- .2 Proceed with the collection and removal of debris if, based on the visual assessment, the debris is determined to be non-hazardous.
- .3 Continually monitor the operation to identify potentially hazardous material.
- .4 Immediately suspend the operation if suspected hazardous material or debris is identified and allow visual confirmation of the nature of the material or debris to be established.
- .5 Completely remove partially buried debris unless otherwise indicated on the Drawings or directed by the Engineer.
- .6 Advise the Engineer of any stained soils encountered during debris removal operations. If authorized by the Engineer, excavate stained and contaminated soil areas, identified during debris removal operations, in accordance with the requirements of Section 02190 - Contaminated Soil Remediation. Testing for classification will be carried out and paid for by the Engineer.

3.3 Disposal

- .1 Dispose of non-hazardous debris at the on-site landfill as per Section 02315 - Grading.
- .2 Containerize and/or dispose of any hazardous and suspected hazardous waste material, including barrels and barrel contents, in accordance with Section 02090 - Hazardous Waste Material.

- .3 Dispose of or containerize contaminated soil in accordance with Section 02190 - Contaminated Soil.

3.4 Grading

- .1 Following collection and removal of debris, backfill, regrade and/or reshape area to the limits indicated on the Drawings or as directed by the Engineer.

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Approximate # of Barrels	Estimated Crushed Debris Volume (m³) (excluding barrels and hazardous materials)	Comments
Garage	C03	Aluminium claddings, structural steel, scrap wood and steel, cement mixer, barrels (concrete floor to remain in place).	15	15	- access from road
Warehouse	C03	2 fuel tanks (1,080 L), structural steel, aluminium cladding, scrap wood and steel, barrels, wooden stairs (concrete floor to remain in place).	2	12	- access from road
Module train	C03	Building materials (wood, cladding, timbers, flooring insulation etc.), empty high pressure cylinders, office furnishing, small fuel tanks.	0	177	- access from road
Outfall area	C03	Pipe, cable and misc. domestic waste.	0	4	- access from road
Quonset Building	C03	Building materials (wooden remains from other Quonsets), weathered canvas, empty heating oil tank (1,400 L). Bags of asbestos.	0	24	- access from road
Antenna Base area	C03	135 m antenna, cables, scattered wood and metal debris (concrete footing to remain in place).	0	86	- access from road
Inuit house area	C03	Building materials, stoves, house contents, concrete footings, scrap steel and wood.	20	28	- access from road
Fuel storage area	C03	2-75,000 L AST's, concrete tank pad, piping, pump house, scattered debris including barrels, bombardier track, flat bed trailer etc.	250	50	- access from road
Stained area NW of Module train	C03	Steel cable, barrels, scattered wood and metal debris.	15	6	- access from road
Vehicle pile (south of warehouse)	C03	Approximately 30 empty barrels, heavy equipment and miscellaneous metal.	30	35	- access from road
West Barrel Cache	C03	Includes approximately 5,000 barrels.	5,000	0	- access from road
Debris near runway	C03/C02	Debris scattered near the runway and aircraft crash site.	115	29	- access from road
West borrow area 3 site	C03	Empty barrels.	40	0	- Scattered barrels, road washed out last 500 m in creek bed
Dump A	C03	Steel debris, misc. electrical equipment, wood.	585	1,066	- access to debris
Dump B	C03	Cable, wood and metal debris, cat tracks, vehicle parts, domestic waste	200	141	- access to material on top, some material down on lower bench.

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Approximate # of Barrels	Estimated Crushed Debris Volume (m³) (excluding barrels and hazardous materials)	Comments
Vehicle dump north of Dump B	C03	Heavy equipment (grader, truck, 150 scattered barrels etc.) pushed off a small bedrock ledge.	150	23	- Difficult access; some debris pushed over a 10 m cliff.
Former construction camp	C05	Two small areas of contaminated soil require excavation, backfilling and regrading. Includes approximately 2,040 barrels road construction equipment etc.	2,040	74	- access from road
Domestic Garbage Dump.	C02	Mainly domestic refuse including 700 barrels, glass, wire, wood crates.	700	164	- access from road
Sarcpa Lake Borrow Areas	C02	Approximately 175 empty barrels in east borrow area across lake.	175	0	- Difficult access; across lake, requires boat. Scattered locations.
			9,337	1,934	

1 General

1.1 Description

- .1 This section specifies the requirements for the demolition, removal and containerization or disposal of all structures and utilities as indicated on the Drawings.

1.2 Definitions

For the purposes of this Specification, the following definitions shall apply:

- .1 PCB-Amended Painted (PAP) Material: Material that is coated with PCB-amended paint, and has been analyzed and the materials (including the paint) determined to contain PCB concentrations greater than 50 mg/kg.

1.3 Reference Standards

- .1 National Building Code of Canada, Current Edition.
- .2 CSA-S350-M1980, Code of Practice of Safety in Demolition of Structures.
- .3 SOR/92-507, Storage of PCB Material Regulations.
- .4 Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: NIOSH Publication No. 85-115
- .5 Hazardous Waste Worker Training Manual: Canadian LIUNA Contractors Training Council, 1992
- .6 Conduct all work in accordance with all appropriate Federal and Territorial legislation, and international conventions including:
- .1 Transportation of Dangerous Goods
- .2 Guideline for the Management of Waste Lead and Lead Paint, Northwest Territories.
- .3 Guidelines for the packing of cargo, other than bulk cargo into or onto cargo transport units (CTU's) applicable to transport operations by all surface and water modes of transport.

1.4 Work Description

- .1 Demolition, removal and disposal or containerization of all structures and utilities as indicated on Demolition Plans and/or as indicated in the Demolition Tables in the Appendix (and related ancillary facilities) including the following:

- .1 Supply and transport to the site of containers, bracing, dunnage, and polyethylene sheets required for the containerization of PCB-amended painted material.
- .2 Removal and containerization or disposal of all contents of buildings identified for demolition and including storage tanks.
- .3 Removal, segregation and containerization of building facility components coated with PCB-amended paint (PAP) that contain PCB concentration levels in excess of 50 mg/kg.
- .4 Removal and disposal of asbestos material in accordance with Specification Sections 13281, 13282 and 13283.
- .5 Removal and placement of hazardous waste material in containers in accordance with Section 02090 - Hazardous Waste Material.
- .6 Removal and disposal of creosote-treated timbers.
- .7 Removal and disposal of drainage culverts, including culvert excavation, where indicated, or as directed by the Engineer.
- .8 Backfilling of any areas excavated to facilitate demolition requirements, including the backfilling of holes from which timber piles were removed.
- .9 Disconnecting and capping of services as indicated or as directed by the Engineer.
- .10 Establishment of a Temporary Storage Area and on-site transportation of containerized hazardous and designated painted materials to this area.
- .11 Application of appropriate labelling and placards for the containers. Labels illustrated in Figures 02222-1 and 02222-2 at the end of this Section will be supplied by the Engineer.
- .12 Restoration and grading of all areas affected by demolition work in accordance with Section 02315 - Grading.
- .13 Preparation of an inventory list of containers and their contents.
- .14 Provision of a photographic record of the internal contents of all completed containers prior to closure.

1.5

Existing Conditions

- .1 The information presented on the Drawings and in the Specifications that describes the structures and utilities to be demolished is based upon site conditions during the 1995/1996 field investigation program conducted by UMA Engineering, Royal Roads College, the Analytical Services Unit of Queens University, and Earth Tech Canada (2004).
- .2 Take over structures and utilities to be demolished based on their condition on the date that the Contractor mobilizes to the site.
- .3 Structural Detail Drawings and the information presented in Appendix A provide brief descriptions an asbestos inventory, floor plans and/or building sections and details, for structures and facilities to be demolished. These tables and drawings indicate only the major construction details and building systems, and are not to be construed as exact for final demolition requirements. Responsible for all work

as described in Clause 1.4 of this Section, which includes the complete demolition, removal and disposal or containerization of all facilities and structures designated for demolition. Further details on demolition, hazardous building materials and asbestos inventory is provided in the Phase III Environmental Site Assessment and Waste Audit report by Earth Tech as described in Clause 3.3 of Section 01110.

- .4 The information presented in the Appendix A/B indicates types and quantities of hazardous waste materials that have been previously identified, and must be removed and disposed of in accordance with the Specifications. Should other potentially hazardous waste material, other than that already identified, be encountered in the course of demolition work, stop work immediately, and notify the Engineer. Do not proceed until written instructions have been received from Engineer.
- .5 The Site Photographs in the Appendix C show the condition of the facilities and structures during the 2004 field investigation program. These photographs are intended to provide information on the general condition of the facilities and structures to be demolished. Photographs are of a selected group of structures, and are not intended to depict the total scope of work. The Engineer cannot guarantee the accuracy of and are not responsible for the interpretation of this information.
- .6 The Contractor is advised that site buildings to be demolished have been in a cold-soaked condition, and as a result, paint flaking/chipping and mould may be extensive. Paint flakes/chips are to be removed as per Clause 3.5.1 of this Section

1.6 Qualifications

- .1 Be thoroughly familiar with and knowledgeable about existing site conditions, scope of work and requirements of the Specification.
- .2 Only Contractor's personnel capable of demonstrating a history of satisfactory experience in the area of hazardous waste management and who can satisfy Federal and Territorial requirements will be permitted to carry out the work of this Section. The Contractor's Superintendent responsible for the work of this Section shall have a minimum of five years of experience in the area of hazardous waste management.
- .3 Follow at all times, guidelines such as those established in Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: NIOSH Publication No. 85-115, or Hazardous Waste Worker Training Manual: Canadian LIUNA - Contractors Training Council, 1992.

- .4 All activities involving the handling of hazardous materials shall be directly supervised by the Contractor's personnel who have successfully completed a 40 hour training course for Hazardous Waste Activities in compliance with OSHA 29 CFR 1910.120 or other approved equivalent training courses such as the Canadian Hazardous Waste Workers Program.
- .5 Contractor's personnel trained as described in Clause 1.6.4 above shall instruct and direct all workers with respect to the waste management procedures and labour and safety practices to be followed in carrying out the work.
- .6 Provide workers with protection appropriate to the potential type and level of exposure. Establish specific safety protocols prior to commencing clean up activities.
- .7 Provide suitable safety clothing and equipment as required during the course of the work.
- .8 Trained and certified personnel are required to complete all Transportation of Dangerous Goods Act (TDGA) documentation and recording requirements.

1.7 Demolition Drawings

- .1 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details showing sequence of disassembly work or supporting structures and underpinning. Submissions to bear stamp of qualified professional engineer registered in the Northwest Territories.
- .2 Do not commence demolition work, including asbestos abatement and paint removal, until the Contractor has demonstrated to the Engineer that all required permits to be acquired by the Contractor for the work have been obtained.

1.8 Protection

- .1 Prevent movement, settlement or damage of adjacent structures, services, roadways, and parking areas to remain. Provide bracing, shoring and underpinning required. Make good damage and be liable for injury caused by demolition.
- .2 Take precautions to support structures and, if safety of building being demolished or adjacent structures or services appear to be endangered, cease operations and notify the Engineer.
- .3 All personnel engaged in demolition activities shall wear and use protective clothing and equipment. Protect the environment from fugitive waste materials resulting from demolition activities.

- .4 Prevent damage and minimize stripping of natural terrain, features and vegetation. Make good all damage.
- .5 Ensure safe passage of persons around area of demolition.
- .6 Prevailing weather conditions and weather forecast shall be considered. Do not proceed with demolition work when weather conditions constitute a hazard to the workers and site.
- .7 Cover and wet down dry materials, ash and rubbish to prevent blowing dust and debris. Provide dust control for existing and temporary roads.

1.9 Fires

- .1 Fires and burning of demolition materials on site are not permitted unless specifically indicated in these Specifications or as authorized in writing by the Engineer.
- .2 Burning of any painted materials is strictly prohibited.
- .3 Where fires or burning are permitted, prevent staining or smoke damage to structures, materials or vegetation which are to be preserved. Restore, clean and return to new condition stained or damaged work.
- .4 Provide supervision, attendance and fire protection measures in accordance with Section 01351 – Site Specific Health and Safety for Contaminated Sites.

1.10 Measurement for Payment

- .1 Include all direct costs for the following work items in the lump sum price for Demolition, Items 02222-1 to 02222-6 for each facility to be demolished as indicated in Basis of Payment Schedule:
 - .1 Removal and disposal of asbestos materials.
 - .2 Demolition, removal, and disposal of non-hazardous demolition debris, including culverts.
 - .3 Demolition and removal of PCB-amended painted demolition wastes, including concrete.
 - .4 Removal, segregation and placement of PCB-amended painted materials into intermediate containers and subsequent consolidation of intermediate containers and larger demolition materials into barge containers, including the installation of bracing, locks, dunnage and drip trays within the containers, as required. Supply and placement of locks and application of appropriate labelling and placards on the containers.

- .5 The placement in layers and compaction of asbestos and non-hazardous demolition debris, excluding PCB-amended painted materials into the designated on-site Non-Hazardous Waste Landfill.
- .6 Removal and disposal of the culverts, as indicated.
- .7 The demolition, removal and disposal of creosote-treated timbers, including the supply and placement of granular material used to backfill the holes from which creosote-treated timber piles were removed.
- .8 The removal and disposal or containerization, including the supply of containers, of fuel and fuel residual product from fuel tanks, POL pipelines, and disposal of fuel tanks and pipelines, including line supports, marker posts and barrels.
- .9 The removal, draining and packaging of transformers and oil, including the supply of containers.
- .10 The demolition, removal and disposal and containerization as required, including the supply of containers, of sewage and sewage sludge from sewage tanks and sewage lines to be demolished, including line supports and marker posts and barrels.
- .11 Supply and placement of granular backfill material in areas excavated to facilitate demolition requirements, including holes from which timber piles were removed.
- .12 General site grading of areas disturbed by demolition operations, including culvert removal.
- .13 On-site transportation of hazardous waste materials, including containers of PCB-amended painted materials, to the on-site Temporary Storage Area.
- .14 Provision of a photographic record.

The above work items will not be measured for payment.

- .2 The Contractor is advised that the Engineer reserves the right to remove from the demolition requirements of this Contract, any item listed to be demolished. Payment for demolition, as described in Clause 1.10.1 of this Section, will be made only if the facility is demolished and demolition debris is landfilled on site, and/or containerized, as required.
- .3 All indirect costs associated with the work described in this Section including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in Basis of Payment Schedule - Balance of Project Complete.
- .4 The supply and transport to the site of barge containers, including identification labels, signage and materials to be placed within the base of the barge containers to serve as a means for containing materials within the container (drip trays), and all bracing, locks, dunnage and strapping, will be measured for payment by the number of containers supplied and transported to the site. Supply of Barge Containers - PCB-Amended Painted Materials will be paid under Items 02222-7 in the Basis of Payment Schedule.

- .5 The supply and transport to the site of containers for the intermediate containerization of PCB-amended painted materials will be measured for payment by the number of containers supplied and transported to the site. Supply of Intermediate Containers - PCB-Amended Painted Materials will be paid under Item 02222-8 in the Basis of Payment Schedule.
- .6 The sorting, handling, containerization, and on-site transport of unknown hazardous demolition materials shall be measured and paid for as indicated in Section 02090 - Hazardous Waste Material.
- .7 Include all costs for other elements of work not specifically described herein in the appropriate unit price or lump sum cost items described above.
- .8 Responsible for all costs associated with any additional repackaging of container contents resulting from the failure by the Contractor to properly pack and secure the container contents.
- .9 The placement of fill for the grading of the Temporary Storage Area will be paid under items included in Section 02315 - Grading. The development of the Temporary Storage Area, including signs and barricades, will not be measured for payment. Include all costs for signs and barricades in Basis of Payment Schedule - Balance of Project Complete.
- .10 The supply, transport, placement and compaction of granular fill associated with the disposal of materials in landfills shall be measured and paid for as indicated in Section 02315 – Grading.
- .11 Responsible for any soil contamination resulting from the removal, storage, handling and disposal of hazardous materials from the site. In the event of such contamination submit to the Engineer a plan for site remediation in accordance with all Federal and Territorial regulations to be enacted immediately upon approval by the Engineer. Bear all costs for remediation. The Engineer will carry out sampling of the storage area.

2 Products

2.1 Materials

- .1 Hazardous Waste Material Containers: In accordance with all requirements of the TDG Acts and Regulations submit details of the containers to the Engineer for review prior to commencement of the work in accordance with Section 01610 – Basic Product Requirements.

-
- .2 A listing of the components of each facility that are to be containerized is presented in the Appendix. Not all painted surfaces of facilities and structures to be demolished have been sampled and tested for PCBs. If painted materials are identified that are not included in the tables in the Appendix, assume that these materials are to be containerized unless otherwise directed by the Engineer.
 - .3 Polyethylene sheeting:
 - .1 6 mil (0.15 mm) minimum thickness for containing PAP material paint particles.
 - .4 Intermediate Containers for the storage of PAP materials (>50 mg/kg PCBs):
 - .1 Wooden Containers, with dimensions of 1.2 m (4 ft) by 1.2 m (4 ft) by 1.83 m (6 ft) Sea-Can Containers, or approved TDG equivalent.
 - .2 The Containers are to be in NEW condition.
 - .3 Provide approval from Transport Canada for the use of containers for the transportation of PCB-Amended Painted Materials.
 - .5 ISO Barge Containers for the Storage of PAP materials (>50 mg/kg PCBs) and the consolidation of Intermediate Containers.
 - .1 Containers are to be of steel plate construction, with sufficient support to withstand the vertical and lateral pressures exerted by the materials placed in them. The containers are to be leakproof, of sufficient durability to prevent the PCB materials from being affected by the weather and suitable for transport by sea barge, ship, semi-trailer roadway vehicles, and rail, and for international shipment requirements.
 - .2 Containers are to be in new condition, with dimensions of 8 feet by 8 feet by 20 feet (2.44 metres by 2.44 metres x 6.10 metres).
 - .3 Containers shall include sufficient lashing fittings, attached to the frame members or panels, in order to secure cargo.
 - .4 Containers shall have drip trays composed of metal or polyethylene with plywood protection as described in Clause 2.1.6.
 - .5 Prior to shipment to site, provide documentation indicating the steel barge containers were inspected and certified by Transport Canada.
 - .6 Containers are to be designed to support full gross weight for bottom lift by forklift.
 - .7 Containers shall be end-loading type. Seal opening to prevent the escape of paint chips, flakes, and/or dust upon opening of the container.
 - .8 Submit details of the containers to the Engineer for review, including all required approvals, as well as a description of the type, volume and number of containers, prior to commencement of the work.
 - .9 The barge containers shall maintain a current Transport Canada inspection certification.

- .10 Securely affix to the entrance of the barge container, a black and white weatherproof label measuring 150 mm by 150 mm in the form illustrated in Figure 1 (specific to the type of material containerized) at the end of this specification section and translated into the local dialect.
 - .11 Securely affix to a visible side of the barge container, a black and white weatherproof label measuring 76 mm by 76 mm bearing the unique Environment Canada Registration number. Do not obstruct the view of the barge container number or Environment Canada Registration number. Environment Canada PCB labels to be provided by the Engineer. The label shall be in the form illustrated in Figure 2 (specific to the type of material containerized) at the end of this specification section.
 - .12 These containers remain the property of the Engineer.
- .6 Provide drip tray material for all on-site ISO barge containers consisting of 60 mil high-density polyethylene (HDPE) or 6 mil (0.15 mm) polyethylene with minimum 12.5 mm thick plywood for protection.
 - .7 Provide dunnage, locks, and bracing material for securing PAP material placed in steel containers.

3 Execution

3.1 Work

- .1 Before commencing demolition, remove all hazardous materials and asbestos-containing products. Hazardous material and asbestos removal work must be completed and accepted by the Engineer prior to the start of demolition.
- .2 Before commencing demolition of fuel storage tanks, remove and dispose of remaining contents and tank sludge, and clean tanks, in accordance with Section 02090 - Hazardous Waste Material.
- .3 Pump out existing water and sewage tanks prior to demolition. Clean water and sewage tanks and lines in accordance with Section 02090 – Hazardous Waste Material.
- .4 Remove and containerize/dispose of demolition debris as specified in this Section and in Section 02315 - Grading.

3.2 Environmental Protection

- .1 Perform work in an environmentally acceptable manner. Comply with requirements of Section 01561 - Environmental Protection, the Land Use Permit and the Water Use License.

3.3 Safety and Personnel Protection

- .1 Unless otherwise specified, carry out demolition work in accordance with Section 01110 – Summary of Work and Section 01351 – Site Specific Health and Safety for Contaminated Sites.
- .2 Some areas designated for demolition under this contract involve materials which contain PCBs and lead-based paints, as well as other contaminants which are considered hazardous to human health. PCBs at concentrations in excess of 50 mg/kg are considered to be hazardous substances. Storage, handling, and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act. Comply with all applicable regulations.
- .3 During the removal of PCB-amended painted materials, follow the Personnel Protection Requirements specified for the removal of asbestos materials as indicated in Section 13282 - Asbestos Abatement – Intermediate Precautions. Use respirators with organic vapour - HEPA combination filters. Wear appropriate eye protection (goggles, face shields, safety glasses) during paint scraping operations.
- .4 When working with PCB-containing materials, lead-based paints, asbestos, and other contaminants, workers shall wear protective clothing and equipment acceptable to Labour Canada or Territorial Labour Department as suitable for exposure in the work area. Follow National Institute for Occupational Safety and Health (NIOSH) guidelines in providing protection for on-site personnel including contract employees, subcontractors, the Engineer, Engineer's staff, and other authorized personnel.
- .5 Fluorescent lamp ballasts are to be handled, and general safety precautions followed, as stated below:
 - .1 Some ballasts in the buildings to be demolished may contain PCB-filled capacitors.
 - .2 Wear gloves while handling ballasts and dispose of gloves with ballasts. Avoid breaking or damaging ballast cases.
 - .3 Refer to Environment Canada Publication, "Identification of Fluorescent Lamp Ballasts Containing PCBs".

3.4 Preparation

- .1 Inspect site and verify with the Engineer items designated for demolition.
- .2 Locate and protect all utility and service lines to remain. Preserve in operating condition, active utilities and services traversing the site.

- .3 Disconnect electrical service lines entering buildings to be demolished in accordance with rules and regulations of authorities having jurisdiction. Post warning signs on electrical/ communication lines and equipment that must remain energized to serve other facilities during period of demolition.
- .4 Disconnect and cap underground services outside of buildings scheduled for demolition.
- .5 Confirm that electrical equipment containing PCBs has been removed.

3.5 Removal of PCB-Amended Painted Materials

- .1 Prior to dismantling structures and facilities, remove all loose paint and place in a polyethylene bag. The use of heat to remove loose paint is not permitted. Place bags of loose paint materials in the Hazardous Waste Material Containers specified in Clause 2.1 of this Section.
- .2 During facility dismantling operations, contain paint particles and dust by the use of polyethylene sheets or other measures to seal facilities. Use drop sheets, as required, to collect paint particles that become removed from surfaces during dismantling operations. Establish a control area around these activities to ensure unprotected personnel are not exposed to airborne paint particles. Construct control area to ensure no paint chips can escape.
- .3 The use of heat (e.g. cutting torches) to cut or dismantle facilities containing paint materials is not permitted unless the paint has been removed from the areas to be cut.

3.6 Containerization of PCB-Amended Painted Materials

- .1 Place dismantled PCB-amended painted materials in the containers described in Clause 2.1.5 of this section, in a manner to minimize voids within the container. Sort and provide separate containers for the various components coated with PCB amended as follows:
 - .1 Segregation and placement of PCB amended painted materials into Intermediate containers:
 - .1 Segregate and place all PCB-amended materials into separate Intermediate Containers, designated for that type of hazardous waste.
 - .2 Place into Intermediate containers, all material that is sized or that can be easily sized to fit within the lined Intermediate containers.
 - .3 Place the material in the Intermediate container such that no movement of the material will occur during normal conditions of transport.

- .4 Securely affix to the entrance of the barge container, a black and white weatherproof label measuring 150 mm x 150 mm in the form illustrated in Figure 2222-1 (Specific to the type of material containerized) at the end of this specification section and translated into the local dialect.
- .5 Securely affix to a visible side of the barge container, a black and white weatherproof label measuring 76 mm by 76 mm bearing the unique Environment Canada Registration number. Environment Canada PCB and Lead Registration labels to be provided by the Engineer. The label shall be in the form illustrated in Figure 02222-2 (specific to the type of material containerized) at the end of this specification section.
- .6 Lock or place barge containers within the Temporary Storage Area in a manner that prevents access to the contents by unauthorized personnel.
- .7 Remove gross contamination from clothing before leaving work areas containing PCB-amended or lead painted materials before leaving work area, and place in polyethylene bags. Remove outer clothing before leaving work area and place in doubled polyethylene bags. Place bags in Hazardous Waste Material Containers specified in Clause 2.1 of this Section.
- .8 Decontaminate all equipment that comes into direct contact with PCB-amended and lead based paint. Place all rags or cloths used during the equipment decontamination in polyethylene bags. Place bags in the Hazardous Waste Material Containers specified in Clause 2.1 of this Section.
- .9 Prior to their removal from the facility, spray or dampen with water all drop cloths placed to collect paint particles that become removed during dismantling operations. Place the drop cloths in polyethylene bags, and place the bags in the Hazardous Waste Material Containers specified in Clause 2.1 of this Section.

3.7

Demolition

- .1 Collect all paint chips and loose paint from structures prior to demolition. Containerize all paint in accordance with Section 02090 – Hazardous Waste Material.
- .2 Demolish complete structures where indicated. Where physical cutting is required, collect all cuttings and sawdust associated with demolition of structures in accordance with Section 02090 – Hazardous Waste Material.
- .3 Segregate PCB-amended painted (PAP) materials from non-PAP materials. Containerize all PAP materials in accordance with Clause 3.6 of this Section and Section 02090 – Hazardous Waste Material. Landfill all non-hazardous (non-PAP) materials in the Non-Hazardous Landfill in accordance with Section 02315 – Grading.

- .4 Remove existing equipment, services, finishes and furnishings from buildings.
- .5 Disconnect piping before tank removal and empty tanks as specified.
- .6 Remove and dispose of all piping above ground as indicated on the Drawings and described in Section 02090 - Hazardous Waste Material.
- .7 Purge and seal ends of underground piping to remain.
- .8 Pump out fuel storage tanks, and dispose of contents as specified in Section 02090 - Hazardous Waste Material.
- .9 Purge harmful and flammable vapours from fuel storage tanks in accordance with referenced standards prior to cutting tanks. Upon request, submit the Lower Explosive Limit (LEL) results of hydrocarbon vapour detector testing to the Engineer.
- .10 Cut structural steel and bulk fuel tanks in accordance with referenced standards.
- .11 Collect and dispose of fibreglass insulation material and place in polyethylene bags.
- .12 Cut non-hazardous materials in such shapes and sizes as to minimize voids when material is landfilled.
- .13 Vent non-ventilated gas cylinders in a remote and safe area acceptable to the Engineer. Stockpile empty and ventilated gas cylinders as non-hazardous demolition debris. Do not explode or vent cylinders known or suspected to contain any ozone depleting substance including chlorodifluoromethane (Freon) or halon. Containerize these materials in accordance with TDGA packaging standards.
- .14 Structures are to be demolished to the top of the concrete foundation level. Concrete pads with exposed honeycomb grating will be regraded with 300 mm of Type 2 granular fill above the pad surface. Remove completely or cut off all creosote-treated timber foundations at 300 mm below ground level. Cut off all other timber foundations at ground level. Cut off, flush with top of remaining foundations, any anchor bolts, reinforcing steel, columns or other projections.
- .15 Completely wrap the removed creosote-treated timbers in polyethylene sheeting as specified in Clause 2.1.3 of this Section. Bind the polyethylene sheeting with tape or other materials as required. It is not necessary to wrap each timber individually.

- .16 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements at all times.
- .17 Demolish to minimize dusting. Keep dusty materials wetted with water only.
- .18 Demolish masonry and concrete walls in small sections. Remove and lower structural framing and other heavy or large objects in a safe manner.
- .19 Submit to the Engineer upon completion of demolition activities, a detailed inventory of all copper components removed from facilities to be demolished. The information shall include a description and dimensions of each copper component.

3.8 Salvage of Demolition Material

- .1 Contractor is advised that the facilities and structures to be demolished may have salvage value. The Contractor may, where appropriate, propose that certain materials be considered for reuse or recycling where savings to the Engineer could be obtained. Reuse and recycling proposals must be submitted to the Engineer for approval prior to demolition. Should the Engineer approve a reuse/recycling proposal from the Contractor, the Contractor shall be responsible for the disposal of materials for reuse/recycling.

Fuel storage tanks designated for disposal will not be considered for reuse or salvage.

- .2 The Engineer shall consider the following criteria when reviewing the Contractor's proposal for reuse/recycling:
 - .1 The reuse/recycling of these materials shall not leave the Crown with future liability. (Third party liability waivers will be required for reuse proposals);
 - .2 The reuse/recycling can be performed in a manner that results in cost savings to the Crown;
 - .3 Should the Engineer accept a reuse/recycling proposal from the Contractor, the Contractor will be required to sign a Waiver Form.

3.9 Removal of Drainage Culverts

- .1 Excavate, as required, to facilitate culvert removal.
- .2 Following culvert removal, trim back slopes of excavation to a maximum slope of 10H:1V, or as directed by the Engineer, to provide a stable channel for drainage flow and to provide for the safe passage of vehicles through the area.

- .3 Reuse excavated material for general site regrading operations, or as directed by the Engineer.

3.10 Disposal of Demolition Materials

- .1 Dispose of asbestos and other hazardous materials in accordance with Sections 13281, 13282 and 13283 (Asbestos Abatement) and Section 02090 – Hazardous Material.
- .2 Dispose of non-hazardous demolition debris, including pipe culverts, creosote timbers, non-hazardous painted materials, and concrete contaminated with PCBs less than 50 mg/kg in the on-site Non-Hazardous Waste landfills in accordance with Section 02315 – Grading.
- .3 Segregate metal, asbestos and creosote treated materials from other material when placed in the Non-Hazardous Waste Landfill. Review with the Engineer the proposed location of each of these waste materials. Record the specific location and depth of these materials on the Project Record Drawings.

3.11 Temporary Storage Areas

- .1 Establish Temporary Storage Areas at Sarcpa Lake and at Hall Beach for the storage of hazardous materials generated during demolition operations at a location approved by the Engineer. The Temporary Storage Areas shall be located as follows:
 - .1 More than 100 m away from any water body or drainage course.
 - .2 On stable ground not subject to flooding or seasonal saturation.
 - .3 In an area not routinely accessed or essential to the Contractor's workforce or site personnel.
 - .4 More than 30 m away from flammable materials.
- .2 Establish the location and size of the Temporary Storage Areas to minimize the handling of materials, isolate materials from other work operations and to provide for the collection and removal of these materials from the site. Refer to Section 02315 - Grading, Clause 3.8 for the granular requirements of the Temporary Storage Area.
- .3 Segregate materials within the Temporary Storage Area as follows:
 - .1 Containerized PCB-amended building materials.
 - .2 Containerized CEPA and other hazardous contaminated soil (refer to this section and Section 02190- Contaminated Soil).
 - .3 Containerized Hazardous Waste Materials.

- .4 Provide the Engineer with a detailed inventory of the Temporary Storage Area indicating the location and contents of each container, the container and assigned Environment Canada Registration numbers and packaging configuration.
- .5 Provide and erect signage at access points to the CAM-F Temporary Storage Area used for the storage of containerized PCB painted materials. Signage shall be visible from all sides of the area. The English version of the sign shall read:

CAUTION
PCB STORAGE AREA
TRESPASSING IS PROHIBITED.

- .6 Signage must be posted in English, and Inuktitut (local dialect). All lettering shall conform to CAN3-Z321-77, or latest edition thereof. All lettering shall be black, not less than 100 mm high, with a 25 mm wide stroke, on a white background.
- .7 Keep PCB storage containers locked and secured to prevent unauthorized access to stored materials.
 - .1 Permit only authorized personnel to enter the PCB storage area.
 - .2 Make PCB storage containers accessible to authorized inspectors as required by the Engineer.
- .8 Place rows of storage containers at a minimum of 1 m offset so that Container and Environment Canada Registration numbers remain visible.
- .9 Store sufficient sorbent materials or an approved spill kit near the Temporary Storage Area for an emergency clean up.

3.12 Site Grading and Restoration

- .1 Upon completion of demolition work, remove debris and leave work sites clean to a condition satisfactory to the Engineer.
- .2 Reuse excavated material from culvert removal for general site regrading operations or as directed by the Engineer.
- .3 Grade building sites and restore all areas affected by demolition work in accordance with Section 02315 - Grading.
- .4 Reshape the area surrounding concrete and timber foundations to remain such that the top of the gravel is flush with the top of the foundation. Fill any voids or holes in the surface of the concrete with gravel.

- .5 Reshape or backfill with Type 3 Granular Fill, areas excavated to facilitate demolition requirements. Place Type 3 Granular Fill in holes from which timber piles were removed.

FIGURE 1

A T T E N T I O N	
CONTAMINATED WITH PCBs (CHLOROBIPHENYLS)	CONTAMINÉ PAR BPC (BIPHÉNYLES CHLORÉS)
THE CONTENTS OF THIS EQUIPMENT ARE CONTAMINATED WITH PCBs. A TOXIC SUBSTANCE LISTED IN SCHEDULE I OF THE CANADIAN ENVIRONMENTAL PROTECTION ACT. IN CASE OF AN ACCIDENT OR A SPILL OR FOR DISPOSAL INFORMATION, CONTACT THE NEAREST OFFICE OF ENVIRONMENTAL PROTECTION, ENVIRONMENT CANADA.	LE CONTENU DE CET EQUIPEMENT EST CONTAMINE PAR DES BPC, SUBSTANCE TOXIQUE INSCRITE Á L'ANNEXE I DE LA LOI CANADIENNE SUR LA PROTECTION DE L'ENVIRONNEMENT EN CAS D'ACCIDENT OU DE DEVERSEMENT, OU POUR SAVOIR COMMENT L'ELIMINER, CONTACTER LE BUREAU DE LA PROTECTION DE L'ENVIRONNEMENT, ENVIRONNEMENT CANADA, LE PLUS PROCHE.
PCB CONCENTRATION (parts per million) CONCENTRATION DE BPC (parties par million) _____	
DATE ANALYSED DATE D'ANALYSE _____	
COMPANY NAME NOM DE LA COMPAGNIE _____	
AUTHORIZED COMPANY OFFICIAL AGENT OFFICIEL AUTORISE _____	

FIGURE 2



1 General

1.1 Description

- .1 This Section specifies general requirements for the processing of aggregates to be incorporated into the work as granular fill.
- .2 It is anticipated that there will be no requirement for crushing of granular materials to satisfy gradation specifications. There are requirements to select, blend, and/or screen granular materials to satisfy gradation specifications as indicated in this Section. There are requirements to dry material from several borrow areas. A summary of the CAM-F borrow sources, including estimated quantities from each source, is provided along with the test pit logs in Appendix D - Geotechnical Information.

1.2 Source Approval

- .1 Source of materials to be incorporated into work requires approval by the Engineer.
- .2 Use borrow sources located on INAC Reserve prior to using borrow sources located off of the Reserve.
- .3 The work of this project is to cause minimum disruption to the environment. Consequently, existing borrow pits and stockpiles are to be used. Approval to excavate borrow material from a previously undisturbed area will be granted by the Engineer only when all previously developed sources are depleted or determined by the Engineer to be unsuitable.
- .4 The existing operational pads and roadways at the CAM-F Site are not to be used as a granular material borrow source.
- .5 Inform Engineer of proposed source of aggregates and provide access for sampling and samples at least seven days prior to commencing production. Engineer will conduct confirmatory testing of borrow material, if required, to determine if any contamination is present.
- .6 If, in the opinion of the Engineer, materials from the proposed source do not meet, or cannot reasonably be processed to meet specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .7 Should a change of material source be proposed during work, advise Engineer one week in advance of proposed change to allow sampling and testing.

.8 Acceptance of a material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

.9 Test pit information and the results of laboratory analyses of soil samples obtained from the site are included with the Geotechnical Information in the Appendix. The locations of the test pits are indicated on the Drawings.

1.3 Production Sampling

.1 Aggregate will be subject to continual sampling by Engineer during production.

.2 Provide Engineer with ready access to source and processed material for purpose of sampling and testing.

1.4 Measurement for Payment

.1 Location and development of aggregate sources including stripping, processing, handling, stockpiling, replacement of organics, and any necessary restoration will be incidental to the work of Section 02315 - Grading, and will not be measured separately.

2 Products

2.1 Materials

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material or other deleterious substances.

.2 Flat and elongated particles are those whose greatest dimension exceeds five times their least dimension.

.3 Fine aggregates satisfying requirements of applicable section shall be one, or a blend of the following:

.1 Natural sand.

.2 Manufactured sand.

.4 Coarse aggregates satisfying requirements of applicable section shall be one of following:

.1 Crushed rock.

.2 Gravel composed of naturally formed particles of stone.

.5 Clause not used.

.6 Type 2 Granular Fill:

.1 Type 2 Granular Fill is well-graded sand and gravel with a trace of fines, and is to be used for construction of landfill berms and cover and regrading requirements.

.2 Gradations to be within the following limits when tested to ASTM C136 and ASTM C117, sieve sizes to CAN/CGSB-8.1:

Sieve Designation (mm)	% Passing by Weight
200	100
50	60 to 90
5	30 to 75
0.425	10 to 30
0.08	5 to 20

.7 Type 3 Granular Fill:

.1 Type 3 Granular Fill is selected material obtained from excavations or other sources approved by the Engineer, generally consisting of pit-run, screened stone, gravel or sand in an unfrozen state and free from rocks larger than 300 mm, waste or other deleterious material.

.2 Type 3 Granular Fill is generally used for:

- .1 regrading low areas as indicated on the Drawings;
- .2 backfill for contaminated soil and landfill waste excavations;
- .3 general site grading requirements.

.3 Type 3 Granular Fill may be designated by the Engineer as a suitable alternative for other material types.

.4 Type 2 Granular Fill may be designated by the Engineer as a suitable alternative for Type 3 Granular Fill.

.8 Type 4 Granular Fill:

.1 Type 4 Granular Fill is to be a non-saline, well-graded sand and gravel with some fines.

.2 The water content of Type 4 Granular Fill is to be adjusted to achieve a minimum degree of saturation of 90%.

.3 It may be necessary to add water or to air-dry to achieve the necessary water content and compaction. Alternatively it may be necessary to blend materials sources to achieve a workable silty granular fill.

.4 The water content shall be maintained after placement to ensure that the material does not dry out.

- .5 The material shall have a corrected salinity of less than 5 ppt in accordance with ASTM D4542. The corrected salinity is determined as the product of the measured salinity and the ratio of the tested in-place water content.
- .6 Gradations to be within the following limits when tested to ASTM C136 and ASTM C117; sieve sizes to CAN/CGSB-8.1.

Sieve Designation (mm)	% Passing by Weight
100	100
50	80 to 100
12.5	55 to 95
5	45 to 90
2	35 to 80
0.425	25 to 70
0.08	20 to 40

.9 Type 5 Granular Fill:

- .1 Type 5 Granular Fill is to be used as an embedment material for geomembranes.
- .2 Gradations to be within the following limits when tested to ASTM C136 and ASTM C117; sieve sizes to CAN/CGSB-8.1.

Sieve Designation (mm)	% Passing by Weight
25	100
12.5	75 to 100
5	50 to 100
2	30 to 60
0.425	10 to 40
0.08	0 to 8

- .3 The material should be free from crushed or angular particles, waste or other deleterious materials.

.10 Type 6 Granular Fill:

- .1 Type 6 Granular Fill is selected material from excavations or other sources approved by the Engineer, generally consisting of screened stone, gravel or sand in an unfrozen state.
- .2 Type 6 Granular Fill is generally used as an intermediate cover within landfills.
- .3 The maximum particle size of the material is to be 150 mm with less than 8 percent of the material, by weight, passing the 0.08 mm sieve.

- .4 Tier I or F3/F4 contaminated soil may be used as Type 6 Intermediate Fill as directed by the Engineer.

- .11 Materials classified as unsuitable will include:

- .1 Non-uniform material of widely varying moisture density characteristics.
- .2 Soils with moisture content exceeding optimum moisture by 5% or more.
- .3 Soils containing organic material, snow, ice or other deleterious material.

3 Execution

3.1 Development of Aggregate Source

- .1 Remove any debris (known or unknown) from the area, as described in Section 02219, prior to excavating borrow materials.
- .2 Any significant deposits of organic material, as determined by the Engineer, are to be avoided and left undisturbed during development of an aggregate source.
- .3 Strip an area ahead of excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
- .4 When excavation is completed, dress sides of excavation to achieve gentle slopes which fit local topography, and provide swales or ditches as required to prevent surface standing water.
- .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
- .6 Trim, backblade and restore borrow areas to a condition acceptable to the Engineer.

3.2 Processing

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregates if required to obtain gradation requirements specified. Use approved methods and equipment.
- .3 Blending to decrease percentage of flat and elongated particles is permitted.
- .4 When operating in stratified deposits use excavation equipment and methods that will produce uniform, homogeneous aggregate.

- .5 Moisture condition aggregate, as required to achieve the specified density and/or degree of saturation.
- .6 Dry aggregate, as required to provide ease of handling during freezing temperatures or to place and compact according to this Specification.

3.3 Handling

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.4 Stockpiling

- .1 If required, stockpile aggregates on site in locations indicated or designated by the Engineer. Stockpiles shall not be located on undisturbed tundra.
- .2 Stockpiling sites shall be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .3 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of the aggregate, or stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.
- .4 Separate aggregate stockpiles far enough apart to prevent intermixing.
- .5 Reject intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Engineer within 48 hours of rejection.
- .6 Stockpile materials in uniform layers of 1 m maximum thickness.
- .7 Complete each layer over the entire stockpile area before beginning next layer.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Coning of piles or spilling of material over edges of pile will not be permitted.
- .10 During winter operations, prevent ice and snow from becoming mixed into stockpile.

3.5 Stockpile Restoration

- .1 Leave stockpile site in a tidy, well drained condition, free of standing surface water to satisfaction of the Engineer.
- .2 Leave any unused aggregates in neat compact stockpiles or as directed by Engineer.

1 General

1.1 Description

- .1 This Section specifies requirements for:
 - .1 the grading of designated areas including existing landfills, granular borrow areas, site debris areas, depressions created by the removal of debris and contaminated soil, and general site areas requiring regrading and reshaping; and
 - .2 the supply and placement of granular fill materials.
- .2 Individual Drawings should be referred to for a description of the designated area(s), design grades, contours, elevations or cover soil thicknesses.
- .3 Refer to Table 02315-1 at the end of this Section for a summary of grading work items for Payment Items 02315-1 to -6 of the Basis of Payment Schedule.

1.2 Definitions

- .1 Reshaping: The levelling and grading, to a maximum depth of 600 mm, including the movement of boulders, of designated areas to blend in with the natural terrain and provide positive drainage. Reshaping does not require the supply and placement of additional granular fill material. Excavation of the terrain to a depth greater than 600 mm during reshaping operations shall be considered as unclassified excavation.
- .2 Scarifying: The disturbance or loosening of a soil to a minimum depth of 300 mm to allow for compaction or aeration.
- .3 Regrading: The supply and placement of granular fill in designated areas to blend in with the natural terrain and provide positive drainage.
- .4 Unclassified Excavations: Excavation of materials of whatever nature encountered in the work to a depth greater than 600 mm.
- .5 Granular Fill: Type 2, Type 3, Type 4, Type 5 and Type 6 material as specified in Section 02300 – Granular Materials.
- .6 Berm: Granular fill, type as indicated on the Drawings, placed above the original ground up to the design elevation.
- .7 Intermediate Cover: Tier I, F3/F4, Tier I-F3/F4 contaminated soils and Type 6 Granular Fill, as designated by the Engineer, used to cover each waste layer and fill void spaces within the landfilled waste.

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- .8 Final Cover: Type 2 Granular Fill, or as indicated on the Drawings, placed over the existing landfills to be regraded and over landfill waste.
- .9 Surficial Boulders: visible rocks with a nominal diameter of 300 mm or greater.
- .10 General Fill: Type 3 Granular fill used for regrading low areas and to replace excavated contaminated soil.
- .11 Erosion Protection: Type 1 Granular fill used for erosion protection in landfill areas.
- .12 Waste Material: Excavated material unsuitable for use in work or surplus to requirements.
- .13 Borrow Material: Material obtained from approved areas and required for regrading requirements.
- .14 Specific classifications of granular materials are described in Section 02300 – Earthworks – Borrow Materials.
- .15 Maximum Dry Density is determined by the Standard Proctor Method in accordance with ASTM D698. It is applicable if less than 30% of the material is retained on the ASTM 19 mm sieve.
- .16 Corrected maximum dry density is applicable if more than 30% of the material is retained on the ASTM 19 mm sieve. It is defined as:
- .1
$$D = \frac{D1 \times D2}{(F1)(D2) + (F2)(D1)}$$
- .2 Where:
- D = corrected maximum dry density kg/m³
- F1 = fraction (decimal) of total field sample passing ASTM 19.0 mm sieve
- F2 = fraction (decimal) of total field sample retained on ASTM 19.0 mm sieve (equal to 1.00 - F1)
- D1 = maximum dry density, kg/m³ of material passing ASTM 19.0 mm sieve determined in accordance with Method C of ASTM D698 or latest edition thereof.
- D2 = bulk density, kg/m³ of material retained on ASTM 19.0 mm sieve, equal to 1000 G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127-84, or latest edition thereof.

1.3 Site Conditions

- .1 Suspend operations whenever climatic conditions are unsatisfactory for grading to conform with this Specification.
- .2 Do not operate equipment in work areas until the material has dried sufficiently to prevent excessive rutting.
- .3 Areas to be graded are to be free from debris and excessive snow, ice or standing water.
- .4 The Contractor is advised that soft ground conditions may be prevalent at the site during periods of maximum thaw of the permafrost. Schedule and carry out work to minimize disturbance to permafrost soils.

1.4 Protection

- .1 Prevent damage to benchmarks, existing buildings, surface or underground service or utility lines which are to remain. Immediately repair any damage to the above or replace the above in the event of damage, at no cost to the Engineer.
- .2 Protect all monitoring wells and ground temperature cables. Repair or replace, at no cost to the Engineer, any monitoring wells or ground temperature cables damaged by the Contractor's operations.
- .3 Protect archaeological sites from construction and construction traffic.
- .4 Protect unanticipated archaeological resources encountered during construction, suspend all activities in that area and notify the Engineer immediately.
- .5 Protect and do not disturb spawning beds and breeding grounds during construction.
- .6 Environmental protection measures shall be in accordance with the requirements specified in Section 01561 - Environmental Protection. Follow the approved Erosion, Sediment and Drainage Control Plan submitted in accordance with Clause 7.1 of Section 01561.

1.5 Samples

- .1 Submit samples in accordance with Section 01610 – Basic Product Requirements.
- .2 At least four weeks prior to commencing work, inform Engineer of proposed source of fill materials and provide access for sampling.

1.6 Measurement for Payment

- .1 For items to be measured for payment by the average end area survey method, survey cross sections of the area to receive granular fill following removal/stripping (if required) of surface material. Cross sections shall be surveyed at significant breaks in the original ground surface grade, incorporating at minimum the cross section locations indicated on the Drawings. The maximum distance between cross sections shall not exceed 20 metres unless otherwise indicated by the Engineer. Survey measurements shall be to the nearest 0.1 metre. Following placement of granular fill material, the cross sections be re-surveyed by the Contractor. The volume measurement of granular material for payment will be determined as the difference in area of the original and the final cross section survey multiplied by the average distance between adjacent cross section locations.
- .2 For items to be measured for payment by truck box measurement, the Engineer will measure the capacity of the gravel hauling vehicles. The measurements will be to the nearest 0.1 m³ capacity, and the capacity of the vehicle once measured shall not be changed without the consent of the Engineer. The gravel shall be levelled, using a strike-off method, by the Contractor before measurement. No heaping or mounding of the load above the top of the box level will be allowed. Once the capacities of the truck boxes have been established, the Engineer may, at his own discretion, determine the granular material volume without enforcing the strike-off method. Truck boxes used in the haul of gravel shall be thoroughly cleaned when unloading.
- .3 The unit of measurement for reshaping within designated areas and to authorized limits indicated on the Drawings or as directed by the Engineer will be the square metre as measured by survey. Reshaping associated with regrading operations will not be included in the square metre measurement for reshaping. Reshaping will be paid under Item 02315-1 of the Basis of Payment Schedule. Reshaping will include any scarifying requirements, as indicated on the Drawings.
- .4 All indirect costs associated with work described in this section, including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in the Basis of Payment Schedule, Balance of Project Complete.
- .5 The supply, placement, moisture conditioning, and compaction of all granular fill material (except for cover including Type 2, Type 4 and Type 5) above existing ground at the Secure Soil Storage Facility will be measured for payment by the cubic metre as determined by the average end area method or digital terrain analysis, and will be paid under Items 02315-2 of the Basis of Payment Schedule. Payment for cover material is described in Item 02315-5.

- .6 The excavation and granular backfill of the trench at the perimeter of the Secure Soil Storage Facility will be measured for payment by the lineal metre of excavation as measured by survey and paid under Item 02315-3 of the Basis of Payment Schedule as follows:

- .1 02315-3: Trench Excavation, 1.5 metre depth, 4 metre width.
.2 For excavation depths less than or greater than 1.5 m by more than 0.1 m, as directed by the Engineer, the Unit Cost for trench excavation will be multiplied by the following factor:

Depth of Excavation (metres)	Multiplication Factor 4.0 metre Wide Trench Excavation
0.7 – 1.0	0.50
1.0 – 1.3	0.72
1.3 – 1.6	1.00
1.6 – 2.9	1.22
1.9 – 2.2	1.50

- .3 The depth of excavation shall be taken as the average of four equally spaced measurements over a lineal distance of 30 metres from original ground to the base of the excavation.

- .7 The scope of work for Payment Item 02315-3 (Trench Excavation for Liner Installation – Secure Soil Storage Site) shall include:

- .1 Excavation of anchor trench and installing and anchoring the geotextile and geomembrane below ground surface to the depth of excavation as indicated on the Drawings, or as directed by the Engineer.
.2 Dewatering of the excavation, as required.
.3 Testing of water collected from dewatering operations.
.4 Disposal of the excavated material in a location as directed by the Engineer.
.5 Supply, placement, and compaction of Type 4 and Type 2 granular fill to the specified depth as indicated on the Drawings.

- .8 No extra payment will be made for soil excavated from beyond the specified limits of the trench excavation as described in Clause 1.6.7 above, unless such removal has been specifically directed by the Engineer. No extra payment will be made for the disposal of soil resulting from the over-excavation of the trench, and/or backfilling of the excavation to the specified depth.

- .9 The supply, placement and compaction of Type 2 Granular Fill for the following work items will be measured for payment by the cubic metre as determined by the average end area survey method or digital terrain analysis described in Clause 1.6.1. Type 2 granular fill will be paid under Items 02315-4 of the Basis of

Payment Schedule for the following areas:

- .1 Secure Soil Storage Facility
 - .2 Stain NW of Station Debris Area
 - .3 Dump B Debris Area
 - .4 Module Station Debris Area
 - .5 Garage Debris Area
 - .6 Warehouse Debris Area
 - .7 Perimeter berms for Non-Hazardous Waste Landfill
- .10 The supply, placement and compaction of Type 2 Granular Fill for cover of the Non-Hazardous Waste Landfill and the Secure Soil Disposal Facility will be measured for payment by the cubic metre as determined by the product of the surveyed surface area and the depth of granular fill placement as indicated on the Drawings. Type 2 granular fill will be paid under Item 02315-5 of the Basis of Payment Schedule.
- .11 The processing, loading, hauling, placement and compaction of Type 6 intermediate granular fill for the Non-Hazardous Waste Landfills will be measured for payment by the cubic metre as determined by truck box measurement described in Clause 1.6.2. Tier I and/or F3/F4 contaminated soil shall be used as Type 6 intermediate fill as directed by the Engineer. Additional Type 6 granular fill requirements will be paid under Item 02315-6 of the Basis of Payment Schedule.
- .12 Excavation required for the following work items will be measured for payment by the cubic metre as determined by survey measurement, and paid under Item 02315-7 of the Basis of Payment Schedule:
- .1 Excavation of the terrain to a depth greater than 600 mm during reshaping operations.
 - .2 Excavation required for the closure or development of on-site landfills.
 - .3 Excavation as specifically indicated on the Drawings or as directed by the Engineer.
 - .4 Excavation of clean soils over contaminated soils.
- .13 The excavation and backfilling of test pits, including restoration of original ground, as directed by the Engineer, using adequate mechanical excavating equipment, to a maximum depth of 3.0 metres will be measured for payment by the operating hours for the excavating equipment utilized, and paid under unit cost items for labour and equipment Item 02315-8 of the Basis of Payment Schedule.

The unit price for the excavation equipment is to include all ownership, operating and supervisory costs including costs for the equipment operator, fuel, lubricants, labour, and parts necessary to maintain the equipment.

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- .14 The following work items will be incidental to the work described in this Section, and will not be measured separately:
- .1 Stripping, stockpiling and replacement or placement to a new location of organic material from the borrow areas as directed by the Engineer, and where required from construction areas upon where granular material is to be placed.
 - .2 Disposal of waste material from the borrow areas.
 - .3 Removal of surficial boulders over 300 mm in diameter from landfill construction areas.
 - .4 Mining, separating, processing, screening, and stockpiling of borrow materials.
 - .5 Grading of borrow area upon completion.
 - .6 Removal and disposal or burial of utility lines exposed by the Contractor during the excavation of granular materials.
 - .7 Loading, hauling and haul road construction, maintenance and rehabilitation.
 - .8 Water for moisture conditioning, compaction and dust control.
 - .9 Supply and installation of witness grade stakes to monitor the depth of granular material placement.
 - .10 Surveying and calculation of granular material quantities for progress payment purposes.
 - .11 Reshaping and regrading of Contractor's laydown areas including the supply, placement and compaction of granular material.
 - .12 Draining of wet areas prior to regrading operations.
 - .13 Removal and disposal or burial of abandoned utility lines exposed by the Contractor during the excavation or granular materials.
- .15 No measurement for payment will be made for:
- .1 Rejected material.
 - .2 Surplus material.
 - .3 Excavation, and stripping and replacement of organic material beyond specified limits.
 - .4 Excavation to prove borrow sources.
 - .5 Placement of granular fill beyond the limits and depths specified, unless specifically authorized by the Engineer.
- .16 The placement in layers and compaction of contaminated soils and non-hazardous waste into the on-site landfills will be measured separately under one of the following sections:
- .1 Section 02222 - Demolition.
 - .2 Section 02190 - Contaminated Soils.

2 Products

2.1 Materials

- .1 Fill materials in accordance with Section 02315 – Granular Materials
- .2 Fill materials require the approval of the Engineer.
- .3 Fill materials shall be pit-run or screened stone, gravel or sand consisting of hard durable particles free from clay lumps, cementation, organic material, snow, ice and other deleterious materials. It is anticipated that there will be no requirement for crushing of granular materials to satisfy gradation specifications.
- .4 There is a requirement to selectively acquire, blend and/or screen granular materials to satisfy gradation specifications as indicated in Section 02300 – Granular Materials.

2.2 Liner Materials

- .1 Geotextile as per Section 02072 - Geotextiles.
- .2 Geomembrane as per Section 02073 - Geomembranes.

3 Execution

3.1 Site Preparation

- .1 Unless specifically indicated on the Drawings, do not remove existing topsoil or organic materials from embankment construction areas. Remove exposed surface boulders over 300 mm in diameter that are located in areas to receive granular fill. Dispose of boulders by placing on embankment side slopes.
- .2 Borrow Excavation:
 - .1 Obtain from potential borrow areas located within the INAC Reserve as shown on Drawings, or provide from own sources, all required fill material.
 - .2 The existing operational pads and roadways at the CAM-F Site are not to be used as a granular material borrow source.
 - .3 Advise Engineer of selected borrow areas seven days in advance of excavation operations for appropriate testing to be performed.
 - .4 Notify Engineer whenever unsuitable materials are encountered in borrow areas.

- .5 Borrow material cannot be obtained from existing granular pads beneath facilities to be demolished, unless authorized in writing by the Engineer.
 - .1 Remove and dispose of any abandoned utility lines in these areas in accordance with Section 02222 - Demolition; or
 - .2 Cap and bury abandoned utility lines as directed by the Engineer. Costs for the removal and disposal, or burial of these utility lines shall be considered incidental to the work described in this Section, and will not be measured or paid for separately.
- .6 Stripping, stockpiling and replacement or placement to a new location of organic material and stripping and disposal of waste material found when excavating existing granular fills to be as directed by the Engineer.
- .7 Final grading of borrow area upon completion to be tidy, in a well drained condition, free of standing water to the satisfaction of the Engineer.
- .8 Upon completion of final grading, leave all slopes in a stable condition and spread all stripped organics.
- .9 Transport aggregate from borrow areas to the work areas via existing access routes where available. Maintain and provide for dust control on the access route between the borrow area and the work areas.

3.2 Protection of Existing Utilities

- .1 Pay for all costs of repairs or replacement of buried culverts, utilities or surface utilities that are to remain and which were damaged by the Contractor's work.

3.3 Placement, Moisture Conditioning, and Compaction of Granular Fill Material

- .1 Set grades and lay out work in detail from control points in areas of granular fill placement. Advise Engineer sufficiently in advance of granular fill placement operations to enable original ground cross-sections to be surveyed and verified.
- .2 Haul granular fill material from borrow sites to designated areas.
- .3 Place granular fill material to the lines, grades, elevations and dimensions indicated on the Drawings, or agreed to with the Engineer.
- .4 Do not place granular fill on snow or surface ice.
- .5 Maintain natural drainage patterns, unless otherwise directed, and fill depressions to avoid any ponding of water adjacent to embankments.
- .6 All fill material shall be placed in an unfrozen state. Fill material to be free from debris, snow and ice. Do not place granular fill if the outside air temperature is below 0°C, unless otherwise directed by the Engineer.

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- .7 Maintain a crowned surface during construction to ensure ready runoff of surface water. Do not place material in free standing water. Drain low areas, before placing material. Follow all requirements specified in the Water Use License and Land Use Permit.
 - .8 Do not dump fill material over the side slopes of berms.
 - .9 Place and compact fill material in horizontal lifts.
 - .10 Cease construction at any sign of movement or bulging in the embankments to allow assessment by the Engineer.
 - .11 For fill depths greater than 500 mm, place granular material in lifts not exceeding 250 mm in loose thickness. For fill depths greater than 200 mm and less than 500 mm, place material in two lifts of equal depth. For fill depths less than 200 mm, place material in one lift. Place intermediate fill as described in Clauses 3.9.5.9 to 3.9.5.14 of this Section.
 - .12 Moisture condition granular fill as required to meet compaction requirements. Provide a water truck capable of efficiently placing water on Granular Fill. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
 - .13 Compact Type 2, Type 3 and Type 4 Granular Fill material to a minimum of 95 percent of Maximum Dry Density in accordance with ASTM D698 or as determined from a Control Strip Density. The method for determining the maximum dry density will be established by the Engineer.
 - .14 Control Strip Density:
 - .1 A Control Strip is a lift of granular material placed over a minimum 300 m² area that requires regrading.
 - .2 To determine the Control Density, moisture and density readings shall be taken by the Engineer during the compaction process until a maximum dry density is attained.
 - .3 The density and moisture content of the Control Strip shall be measured by the Engineer after each pass of the compaction equipment to determine the type of equipment and number of passes required to obtain the specified density.
 - .4 A new Control Strip will be required if, as established by the Engineer, the material type, moisture content, or subgrade of the area to be regraded is significantly different than that of the Control Strip.
 - .5 Proofroll areas compacted in accordance with the Control Strip Density upon completion of grading and compaction or as requested by the Engineer.

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- .6 Use a fully loaded tandem axle gravel truck for the proofrolling operation. The speed of the vehicle is not to exceed 4 kilometres per hour during proof rolling. The Engineer may authorize the use of alternative proofrolling equipment.
 - .7 Make sufficient passes with the proofrolling equipment to subject every point on the surface to three separate passes of a loaded tire.
 - .8 Where proofrolling reveals areas of defective granular fill, remove and recompact the granular fill, and modify the compaction process, as required.
 - .9 The Control Strip Density method for compaction is not intended to relax the specified compaction requirements, but to reduce compaction testing requirements.
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- .15 Compact Type 4 Granular Fill material to a minimum of 95 percent of Maximum Dry Density wet of optimum. Adjust water content to achieve a minimum 90 percent degree of saturation in accordance with ASTM D698. Moisture condition the granular fill prior to compaction to the required water content to achieve the specified degree of saturation. Limit the lift thickness to a maximum of 200 mm. do not allow the Type 4 material to dry out after compaction. The surface of the Type 4 material must not be left exposed for more than 1 day.
 - .16 If granular fill has dried out prematurely due to weather conditions, scarify surface, adjust moisture condition and recompact at the Engineer's discretion. No extra payment will be made for extra costs incurred as a result of any extra work.
 - .17 Compaction equipment must be capable of obtaining required densities uniformly in materials on project. Hand equipment must be available for compaction in areas where large equipment can not access and around instrumentation.
 - .18 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
 - .19 Following compaction of Type 2 and Type 3 material placed on slopes, travel in a direction parallel to the slope direction with a cat-track to create small ridges in the slope. In soft ground, travel in a direction parallel to the toe of the slope with a cat track.
 - .20 Shape finished surface to required cross-section and grade, or as directed by the Engineer.

3.4 Regrading

- .1 Supply place, blade and trim Type 2 or Type 3 granular fill material to elevation, grades, and cross-section dimensions indicated or directed by the Engineer.
- .2 Supply and install witness grade stakes in areas to be regraded to monitor the depth of granular material. The grade stakes shall be placed on a grid spacing approved by the Engineer for each specific regrade area. Immediately replace all grade stakes that are damaged or displaced by Contractor operations.
- .3 Compact Type 2 or Type 3 granular fill material to obtain specified density.
- .4 Dry out material or apply water as necessary during compaction to obtain specified density.

3.5 Reshaping

- .1 Blade and trim material to elevation, grades, and cross-section dimensions indicated or directed by the Engineer.
- .2 Make use of material within the area designated for reshaping to provide a surface that is smooth and compact with firm slopes.
- .3 Remove or cover debris exposed during reshaping with a minimum depth of Type 2 granular fill as directed by the Engineer.
- .4 Blend the final reshaped surface with the natural terrain and provide positive drainage.

3.6 Excavating

- .1 Lay out work in detail from control points in areas of excavation. Advise Engineer sufficiently in advance of excavation operations to enable original ground cross-sections to be surveyed and verified.
- .2 Excavate to lines, grades, elevations and dimensions as indicated on the Drawings or designated by the Engineer.
- .3 Keep excavations free of water while work is in progress. Protect open excavations against flooding and damage due to surface run-off. Dispose of water in a manner not detrimental to work completed or under construction. The release of all water resulting from the dewatering of open excavations shall conform to the Wastewater Discharge Criteria outlined in Section 01561 - Environmental Protection.

- .4 Dispose of excavated material at approved locations. Do not obstruct flow of surface drainage or natural watercourses. Use suitable excavated material from within the key trench area of the Tier II Disposal Facility for construction of the Tier II Disposal Facility berms.
- .5 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .6 Notify Engineer when bottom of excavation is reached. Obtain Engineer's approval of completed excavation.
- .7 The final depth of trench excavation shall be determined in the field by the Engineer based on acceptable soil, groundwater, and bedrock conditions, if encountered.
- .8 Where required due to unauthorized over-excavation, fill under areas with Type 2 or Type 4 granular material, as directed by the Engineer, compacted to a minimum 95 percent of Maximum Dry Density in accordance with ASTM D698.
- .9 Hand trim, make firm, and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.7 Backfilling

- .1 For backfilling operations, use compaction equipment capable of obtaining required densities in materials on project.
- .2 Do not proceed with backfilling operations until Engineer has inspected and approved excavation.
- .3 Areas to be backfilled are to be free from debris, snow, ice and water.
- .4 Commence backfilling of excavated soil areas within 1 day of receipt of confirmatory sampling results indicating no further excavation in the area is required. Costs for any extra work caused as a result of leaving excavations open longer will be the responsibility of the Contractor.
- .5 Place specified backfill material in uniform horizontal layers in depths as indicated in Clause 3.3 of this Section up to grades indicated. Compact each layer before placing succeeding layer.
- .6 No trenches or excavations are to be left open during the winter.

3.8 Temporary Storage Area

- .1 Develop a Temporary Storage Area for the storage of containerized hazardous waste materials and contaminated soil.
- .2 Prepare the Temporary Storage Area to comply with the following:
 - .1 Provide easy access to the off-site transport equipment.
 - .2 Allow the containers to be level and distribute the weight of the containers evenly to the supporting surface.
 - .3 The area shall be free of standing water.
 - .4 Surface water run-on to the area must be minimized. The area must not be subject to flooding, excessive snow drifting, and/or seasonal saturation.
 - .5 Sufficiently compact the area so as to prevent the containers from settling into the soil. Supply, place and compact additional granular fill as required.
 - .6 Locate at least 100 m from any body of water.
 - .7 In an area not routinely accessed or essential to the Contractor's workforce or site personnel.
 - .8 More than 30 metres away from flammable materials.
- .3 Confirm the location of the Temporary Storage Area with the Engineer at least one week prior to commencing operations to allow for baseline sampling by the Engineer.
- .4 Within the Temporary Storage Areas, segregate the various types of containerized materials as described in Section 02090 - Hazardous Materials.
- .5 Provide signage for Temporary Storage Area in accordance with Section 02090 – Hazardous Waste Materials.

3.9 Landfilling

- .1 Lay out work in detail from survey control points. Advise Engineer one week in advance of any excavation and/or granular fill placement to allow ground surface cross-sections to be surveyed and verified.
- .2 Where indicated on the Drawings, excavate a key trench for placement of Type 4 granular fill in accordance with Clause 3.6 of this section.
- .3 Construct perimeter berms of Type 2 and/or Type 4 granular fill to the dimensions as shown on the Drawings in accordance with Clause 3.3 of this Section.

.4 Liner Systems

- .1 Where installation of a geomembrane/geotextile lining system is indicated on the Drawings, place base layer of Type 2 and/or Type 5 granular fill to the depths as indicated on the Drawings in accordance with Clause 3.3 of this Section, and compact to a minimum of 95% of Maximum Dry Density.
- .2 Notify Engineer when base layer preparations are complete. Do not begin installation of the geomembrane/geotextile lining system until Engineer's approval has been obtained.
- .3 Install liners as indicated on the Drawings and in accordance with Sections 02072 - Geotextiles and 02073 - Geomembranes, respectively of the Specifications.
- .4 Place Type 5 granular fill over the liner system as indicated on the Drawings.
- .5 The first lift of granular fill immediately over the liner system shall be 300 mm in thickness. Carry out granular fill placement using low ground pressure equipment acceptable for a fill thickness less than or equal to 300 mm over a liner system.
- .6 Prevent damage to the liner during granular fill placement. The following are provided as guidelines for equipment traffic.

Backfill Thickness over Liner	Allowable Ground Pressures/Placement Equipment
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)
Greater than 300 mm	29.0 kPa to 59.9 kPa (D4 to D6 Style CAT)
600 mm	72.8 kPa to 109 kPa (D7 to D9 Style CAT)
900 mm	Loaded Scrapers, Motor Graders
900 to 1,200 mm	Loaded Tandem Axle Trucks

.5 Landfilling Non-Hazardous Wastes

- .1 Place non-hazardous material in the designated area(s) in uniform, horizontal lifts between and against the berm as shown on the Drawings. The thickness of each waste lift shall be such that all voids within the waste can be filled with intermediate cover. The maximum thickness of each waste lift shall not exceed 0.5 metre.

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- .2 Compact waste during placement with a double steel drum compactor or approved alternative during placing and spreading of the waste material. The equipment must be capable of crushing demolition debris.
 - .3 For placement in landfills, cut all demolition material and debris as required:
 - .1 to minimize displacement and lifting of landfilled materials resulting from landfill compaction operations;
 - .2 so that the maximum depth of any one material component within the landfill does not exceed 0.5 metre; and
 - .3 to satisfy the overall landfill dimension requirements as indicated on the Drawings.
 - .4 Cut structural steel materials into separate members prior to placement in landfills. Place large materials including structural steel members, timbers, communication dishes, etc. on the base of the landfill or on the base of an intermediate cover layer so that the materials lay on a compacted, flat surface. Cut hollow components or objects, such as tanks, as required, to allow for nesting of materials. As a minimum, hollow components are to be cut in half parallel to the lengthwise axis. Within the landfill, support the underside of nested materials with intermediate cover or other debris material to minimize displacement and lifting of materials.
 - .5 Segregate all metal demolition material and debris from other material when placed in the landfill. The proposed location of the metal waste area within the landfill shall be reviewed by the Engineer. Record the specific location and depth of this material on the project Record Drawings.
 - .6 Segregate all asbestos material from other material, and consolidate in one single location within the landfill. The proposed location of the asbestos waste within the landfill shall be reviewed by the Engineer. Record the specific location and depth of this material on the Project Record Drawings.
 - .7 Hand place double bagged asbestos in the landfill. Provide daily intermediate cover of minimum 150 mm Type 6 fill on asbestos waste. Do not operate equipment directly on asbestos waste containers. Replace ripped or torn asbestos waste bags.
 - .8 Crush, cut or shred barrels to be landfilled on site to reduce the total original barrel volume by a minimum of 75 percent.
 - .9 Place F3/F4 and Tier I contaminated soil or Type 6 granular fill as intermediate cover to a maximum loose thickness of 150 mm over each layer of non-hazardous material or as required to infill voids within the waste layer, and compact with the random action of tracked equipment. Make sufficient passes with the tracked equipment to subject every point on the surface to a minimum of three separate passes.

- .10 The use of Type 6 Granular Fill as intermediate cover shall be authorized by the Engineer only when all of the Tier I contaminated soil has been used, or has been determined by the Engineer to be unsuitable for use as intermediate cover. Tier I soil co-contaminated with Total Petroleum Hydrocarbons (TPH) with concentrations of TPH in excess of CWS PHC and in which the primary hydrocarbon component consists of fuel oil, and/or diesel, and/or gasoline cannot be used as intermediate cover material.
- .11 The number of layers of 150 mm deep intermediate cover to be placed within the landfill is dependent on the total depth of waste material to be placed as follows:

<u>Total Waste Material Depth</u>	<u>Number of Intermediate Cover Layers</u>
<0.5	1
≥ 0.5 metre, < 1.0 metre	2
≥ 1.0 metre, < 1.5 metres	3
≥ 1.5 metres, < 2.0 metres	4
≥ 2.0 metres, < 2.5 metres	5
≥ 2.5 metres, < 3.0 metres	6

- .12 Place additional Type 6 material on the final lift of debris to a level that all debris is covered with Type 6 prior to placement of Type 2 cover.
- .13 Stockpile Type 6 - Intermediate Fill adjacent to landfilling operations. Ensure that a stockpile is continuously maintained.
- .14 Place and compact to a minimum of 95 percent of Maximum Dry Density, additional intermediate cover material, as required, to completely infill voids within the waste layer prior to proceeding with the placement of the next overlying waste layer and prior to placement of final cover.
- .15 Take special care to place and compact intermediate cover material against exposed rock faces and areas inaccessible to tracked compaction equipment to specified requirements.
- .16 Do not place final cover, type 2 fill, until engineer has determined that there is sufficient type 6 intermediate cover.
- .17 Construct final cover over landfill to the specified thicknesses and grades as indicated on the Drawings.

.6 Landfilling Tier II Contaminated Soil

- .1 Install ground temperature cables at the locations as indicated on the Drawings or as directed by the Engineer, in accordance with Section 02510 - Instrumentation.

- .2 Place Tier II contaminated soil in the landfill in lifts not exceeding 200 mm in loose thickness. Compact with the random action of tracked equipment or compactor.
- .3 Place Type 6 granular fill as intermediate fill to a maximum loose thickness of 200 mm over each layer of highly organic Tier II contaminated soil. Organic soil may be encountered in the Sewage Outfall. Compact Type 6 granular fill with a compactor to subject every point on the surface to a minimum of three separate passes.
- .4 Construct the final cover over the landfill to the specified thicknesses and grades, including the installation of geomembrane lining systems as indicated on the Drawings and in accordance with Sections 02072 - Geotextiles and 02073- Geomembranes.

3.10 Testing

- .1 Testing of materials and compaction testing will be carried out and paid for by the Engineer.
- .2 Frequency of testing will be determined by the Engineer.

3.11 Finishing and Tolerances

- .1 All areas to be covered with granular material shall be uniform without projections or depressions exceeding 100 mm in 3 m.
- .2 Granular fill surfaces to be within 100 mm of design elevations but not uniformly high or low.

3.12 Maintenance

- .1 Maintain finished surfaces in a condition in accordance with this Section until succeeding material is applied or until acceptance.

TABLE 02315-1
SUMMARY OF PRIMARY GRADING WORK ITEMS
 (FOR PAYMENT ITEMS A.02315-1 to -6)

Drawing #	Work Area	Granular Fill Type	Payment Item	Payment Clause	Measurement Method	Measurement Clause
C08	Secure Soil Disposal Facility - Fill (Above Ground)	2, 4, 5	02315-2	02315-1.6.5	Volume by survey	02315-1.6.1
C07	Secure Soil Disposal Facility - Trench Excavation	4	02315-3	02315-1.6.6	Lineal metre by survey	02315-1.6.1
C06	Non-Hazardous Waste Landfill - Berms	2	02315-4	02315-1.6.9	Volume by survey	02315-1.6.1
	Landfill and Debris Area Regrading	2	02315-4	02315-1.6.9	Volume by survey	02315-1.6.1
C06	Non-Hazardous Waste Landfill - Cover	2	02315-5	02315-1.6.10	Volume by survey area (survey area x design depth)	02315-1.6.13
	Non-Hazardous Waste Landfill and Secure Soil Disposal Facility - Intermediate Fill	6	02315-6	02315-1.6.11	Volume by truck box	02315-1.6.2
	Site Reshaping	n/a	02315-1	02315-1.6.3	Area by survey	02315-1.6.3

1 General

1.1 Description

- .1 This section specifies the requirements for the supply and installation of survey control monuments, monitoring wells, and ground temperature cables complete with data loggers. These instruments are used to monitor and ground temperatures within landfills and groundwater. Instrumentation shall be installed under the supervision of the Engineer's Authorized Personnel who will prepare the Installation Reports.
- .2 Complete the installation of the background monitoring wells as indicated on the Drawings prior to September 15, 2006.

1.2 Measurement for Payment

- .1 The drilling of boreholes, as required for the installation of monitoring wells, select thermistors, ground temperature cables and permanent survey control, including all drilling supplies and temporary borehole casing, will be measured for payment by the metre drilled (to the nearest 0.1 m), as determined by field measurement. The drilling of boreholes will be paid under Item 02510-1 in the Basis of Payment Schedule.
- .2 The supply and installation of monitoring wells, including protective covers, stainless steel pipe, bentonite seals, filter sand, grout, painting, barricades, and all accessories will be measured for payment by the number of monitoring wells supplied and installed as specified herein. The supply and installation of monitoring wells will be paid under Item 02510-2 in the Basis of Payment Schedule.
- .3 The supply and installation of ground temperature cables (thermistors) including thermistor strings, cables, splitter boxes, data loggers, switchbox and multimeter, PVC pipe, grout, granular bedding material, painting, barricades and all accessories will be measured for payment by the number of complete installations supplied and installed as specified herein. The supply and installation of ground temperature cables will be paid under Item 02510-3, as indicated in the Basis of Payment Schedule. The Engineer will test the thermistors prior to their installation.
- .4 The supply and installation of permanent survey control monuments, including all accessories, will be measured for payment by the number of survey control monuments supplied and installed as specified herein. The supply and installation of survey control monuments will be paid under Item 02510-4 as indicated in the Basis of Payment Schedule.

- .5 All indirect costs associated with work described in this section, including supervision, overhead, profit, etc., as well as fixed camp costs shall be included in Basis of Payment Schedule, Balance of Project Complete.

2 Products

2.1 Drilling Equipment

- .1 The drilling equipment shall be capable of accessing the required locations.
- .2 The drilling equipment shall be capable of drilling 125 mm diameter holes.
- .3 The drilling equipment shall be capable of penetrating unfrozen and frozen overburden soils including granular and ice rich soils, saturated soils, and bedrock.

2.2 Monitoring Well Pipe

- .1 38 mm (nominal diameter), Schedule 10 #304 stainless steel pipe with watertight end cap (top and bottom).
- .2 38 mm (nominal diameter), Schedule 10 #304 stainless steel screen, 1.0 metre maximum section length with flush threads both ends. Screen slot size to be 0.5 mm.
- .3 All pipe and screen to remain in protective polyethylene wrapping until installation.
- .4 Filter sock as cover over monitoring well screen.

2.3 Ground Temperature Cable Protective Pipe

- .1 50 mm (nominal diameter), Schedule 80 PVC, or ductile iron pipe with pre-threaded connections, flexible couplings and watertight end cap, as required to make the complete installation.

2.4 Survey Control Monuments

- .1 25 mm (nominal diameter), steel pipe, threaded/welded as required to provide the lengths given on Drawings.
- .2 The steel pipe shall have a flange welded to the base. The flange size should be no less than the hole diameter less 50 mm.
- .3 Grease to be an acceptable "food grade" product.

2.5 Ground Temperature Cables

- .1 Thermistor Beads: with a 0.2°C accuracy, and a nominal resistance of 5,000 ohms at 25°C.
- .2 Cable: stranded copper conductors, 20 conductor and 24 gauge with a Kevlar jacket.
- .3 Connectors: Cable to be supplied with an Amphenol connector comprising: a shell end (97-3057-1012-1); male insert (9720-29P); male shell (97-3106A-20); and a screw cap (9760-20P) with a chain attachment to the shell end. A set screw shall be drilled and tapped into the connector to prevent the connector from being unscrewed from the cable.
- .4 Thermistor Moulding: Heat injection polyurethane moulding, to seal the thermistor beads. The outside diameter of the moulding is to be compatible with installation in a 50 mm diameter PVC pipe (Clause 2.3). The cable is to remain watertight under a water head of 100 m.
- .5 Identification Tag: to be permanently installed, indicating the site name and the ground temperature cable serial number.
- .6 Cable Fabrication: Cable length and bead spacing details are shown on Drawings. Additional cable fabrication details are as follows:
 - .1 Beads to be spaced on the cable within 10 mm of the indicated location.
 - .2 Wire the cables using the following wiring code (note that the number of beads varies as indicated on the drawings. For cables with less than 16 beads, numbering shall begin with Bead 1 and Terminal A, common shall be on Terminal Letter M):

<u>Thermistor Bead Number</u>	<u>Terminal Letter on Connector</u>
1(top of cable)	A
2	B
3	C
4	D
5	E
6	F
7	G
8	H
9	J
10	K
11	L
12	N

-
- | | | |
|--|----------------------|---|
| | 13 | P |
| | 14 | R |
| | 15 | S |
| | 16 (bottom of cable) | T |
| | Common | M |
-
- .3 Mark the identification and serial number of each cable permanently onto the body of the connector.
 - .4 Provide all beads with a common lead. Solder the beads to the common lead and to the cable harness.
 - .5 Prepare the cable harness by removing a 25 to 35 mm length of cable jacket (jacket cutouts) at each bead location, and extracting the appropriate wire for the bead location and the common wire for the cable.
 - .6 Solder the beads to both wire with some slack incorporated into the wiring and placed on the outside of the cable bundle. During soldering, protect the beads to keep their temperature below the manufacturer's recommended limit.
 - .7 Cover the beads with a layer of heat reflective tape with the adhesive side of the tape not in contact with the bead. Place a second layer of heat reflective tape with the adhesive side down, on either side of the jacket cutout.
 - .8 Cover each bead with injection moulding extending a minimum of 40 mm above and below the bead location.
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- .7 Thermistor Calibration:
- .1 Provide copies of calibration data to the Engineer prior to shipping to site.
 - .2 Verify that each ground temperature cable is functioning properly, and calibrate the thermistor beads and data logger.
 - .3 Immerse into an ice bath, each section of the cable with a thermistor bead. Once thermal equilibrium is reached, record the resistance reading using a digital multimeter and the temperature reported on the cable's associated data logger. Also report the temperature provided by the data logger assigned to the specific ground temperature cable.
 - .3 Repeat the process a minimum of three times, and determine the average 0°C connection for each bead.

2.6 Switch Box and Multimeter

- .1 Switchbox: A metal or plastic box to house a rotary switch; a 17 pin Amphenol female connector to couple the switchbox to the installed ground temperature cable; and a 2 pin, 0.6 m long cable with a strain relief connector for connection to a digital multimeter. The rotary switch is to be a 75 mm diameter rotary selector switch with 16 settings and a standard round grip, or approved equivalent.
- .2 Multimeter: digital with two decimal place display at 30 kilo ohms, an accuracy of +0.5% and a resolution of 0.01 kilo ohms.

2.7 Data Loggers

- .1 Data Storage Unit. Provide one data logger for each ground temperature cable (thermistor) installation.
- .2 Data logger to include:
 - .1 16 channel terminal board and multiplexer.
 - .2 Resistor RMIOKSIP (2 per data logger required).
 - .3 Lithium Battery Model UL-16.
 - .4 19 mm diameter, 2.5 m long grounding rod strap between rod and weatherproof housing.
 - .5 Nema 4 Aluminum Enclosure.
 - .6 UL-MX-64K Memory Expansion.
- .3 Provide one Com Cable Model No. UCC-7 and one USB to serial adaptor.
- .4 The data logger shall have a female Amphenol multi-pin connector compatible with the thermistor cable described in Clause 2.4 of this Section.
- .5 Program data loggers to read cables once every 12 hours. Provide Windows Dataview plus software on site to monitor, retrieve data and reset the data logger. Software to be registered to the Engineer and specific project site. Provide specific project format files for the data loggers.
- .6 Provide to the Engineer, three copies of the Operations and Maintenance Manuals for the data loggers.
- .7 Each data logger should be clearly labelled with an identification number.
- .8 Each data logger shall be installed together with the same thermistor cable that was calibrated to.

2.8 Ground Temperature Cable (Thermistor) Protective Casing

- .1 Provide a 1.8 m long, 200 mm diameter data housing unit coated with electrostatic paint and with a locking cap.
- .2 Keyed pad-locks to be provided by the Engineer.

2.9 Monitoring Well Protective Casing

- .1 150 mm diameter galvanized, Schedule 40 steel pipe, threaded as required.
- .2 Threaded, locking steel cap for monitoring wells only.
- .3 Keyed padlock to be provided by the Engineer.

2.10 Filter Sand

- .1 Inert and organic free #20 - #40 Silica Sand.

2.11 Bentonite Seal

- .1 Bentonite product certified as polymer and organic free; granular form.

2.12 Grout

- .1 Sika Grout Arctic 100 or Set 45 Grout.

2.13 Paint

- .1 Fluorescent orange.

3 Execution

3.1 Installation of Monitoring Wells

- .1 Advise the Engineer a minimum of 10 days in advance of drilling program to allow scheduling of inspection services by the Engineer. The Engineer or designated representative will be in attendance for the duration of the drilling program.
- .2 Layout monitoring wells at locations as indicated on the Drawings and confirm the location with the Engineer.
- .3 Install monitoring wells at the locations and to the depths as indicated on the Drawings or as directed by the Engineer.

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- .4 Use a suitable drill rig to drill 125 mm diameter holes for the monitoring wells.
 - .5 Make available on site, temporary hole casing material. Install hole casing material in the drill hole as required to prevent sloughing of the hole.
 - .6 Grout the pipe in place at the depth indicated on the Drawings using Arctic Grout according to manufacturer's recommendations. Place grout in the hole so as not to contaminate the upper portion of the hole, or the slotted section of the pipe.
 - .7 Record the depth of the top of the grout.
 - .8 Backfill remainder of the hole with clean filter sand to a depth of 200 mm above the screened portion of the pipe. Gradually remove hole casing material during backfilling operations.
 - .9 Place granular bentonite around the pipe to fill the annulus from ground surface to a depth of 300 mm. Mound ground surface material to a height of approximately 150 mm around the perimeter of the well to promote hydration of the bentonite pellets.
 - .10 Measure stick up of pipe from ground surface.
 - .11 Place the protective casing and lockable cap over the pipe.
 - .12 Paint metal casing, cap and marker posts with fluorescent orange paint.
 - .13 Final locations of the monitoring wells to be determined in the field by the Engineer.

3.2 Installation of Ground Temperature Cables (Thermistors)

- .1 Install ground temperature cables at the locations and to the depths indicated on the drawings or as directed by the Engineer.
- .2 Take precautions not to damage liner materials when installing ground temperature cables.
- .3 Use a suitable excavator or drill rig to install vertical thermistors below the original ground surface. Compact granular fill material to 95% of Maximum Dry Density in accordance with ASTM D698. Use hand equipment to ensure compaction requirements are met.

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- .4 If drilling is to be used to install ground temperature cables, confirm in advance that there is no evidence of buried debris by the excavation of test pits. If excavation is used to install the ground temperature cables in landfill areas, use suitable precautions in excavating of the landfill. If debris is encountered, stop immediately. Proceed as directed by the Engineer.
 - .5 Make available on site hole casing material. Install hole casing material in the drill hole as required to prevent sloughing of the hole.
 - .6 Grout the pipe in place according to grout manufacturer's recommendations.
 - .7 Place the data housing and lockable cap over the pipe.
 - .8 Paint caps with fluorescent orange paint.
 - .9 Install the data logger in the data housing so that it can be easily removed and replaced.
 - .10 Install grounding rod 2.5 m below ground surface and connect grounding rod to data logger and data housing.
 - .11 Final locations of the ground temperature cables are to be determined in the field by the Engineer.
 - .12 The Engineer will complete the ground temperature cable installation report. Advise the Engineer 96 hours prior to the installation. Provide required information for completion of report, upon Engineer's request.
 - .13 The Engineer will confirm the data logger and ground temperature cable operation by downloading data after 100 hours of operation and by taking manual thermistor readings using the switch box and multimeter. Repair at no expense to the Engineer any malfunctions.

3.3 Installation of Permanent Survey Control Monuments

- .1 Install permanent survey control monuments at locations as indicated on the Drawings, or as directed by the Engineer, to a minimum of 5 metre depth.
- .2 If bedrock is encountered, the minimum depth may be reduced, at the Engineer's discretion, to maintain 2 metres embedment.
- .3 Use a suitable drill rig to drill holes for the pipe which serves as permanent survey control.

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- .4 Make available on-site, hole casing material. Install hole casing material in the drill hole, as required, to prevent sloughing.
 - .5 Apply “food-grade” grease to the 25 mm steel pipe before installation.
 - .6 Grout the control monument in the hole for the lower 2 metres ONLY. Use Sika Grout Arctic 100 or Set-45 according to manufacturer’s recommendations. Fill the remaining voids with sand.
 - .7 The control monument shall be flush with ground surface following completion. Ensure positive drainage away from the survey control monument.
 - .8 Following set-up of the grout, tie-in survey control monuments to the site survey coordinate system. Survey horizontal accuracy to be within 0.1 cm and vertical accuracy to be less than 1 cm. Mark with a drill hole or punch the top of the 25 mm steel pipe. Provide coordinates and elevation data at this mark to the Engineer for each monument installed.
 - .9 Construct clearly visible markers around the survey control monuments, to prevent damage and to facilitate identification.
 - .10 Final locations of the survey control monuments to be determined in the field by the Engineer.

3.4 Protection of Ground Temperature Cables (Thermistors) and Monitoring Wells

- .1 Construct clearly visible barricades to protect the installed ground temperature cables and monitoring wells. Immediately replace, at Contractor’s cost, any existing and installed monitoring wells and ground temperature cables damaged by the Contractor.
- .2 Provide access to any monitoring well and ground temperature cable, and cooperate with the Engineer when the Engineer is obtaining groundwater samples, recording ground temperature and pore pressure readings.

1 General

1.1 Scope of Work

- .1 Comply with the requirements of this Section when performing Type 1 (Low Risk) Asbestos Removal for asbestos wall panels, asbestos duct cloth, flue stack covering, and vinyl asbestos floor tile from buildings scheduled for demolition.
- .2 Transport and containerize or stockpile all asbestos materials removed from buildings scheduled for demolition, from the collection and sorting of site debris, and/or as specified for removal as stated above.

1.2 Definitions

- .1 Airlock: A system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways at least 2 m apart.
- .2 Amended Water: Water to which a non-ionic surfactant has been added to reduce surface tension to allow thorough wetting of asbestos fibres.
- .3 Asbestos Containing Material: Any material which has been shown by laboratory analysis to contain more than 1% asbestos by weight or volume.
- .4 Asbestos Process: Any handling of material containing asbestos, including: the sawing, cutting, drilling, or abrasion of asbestos material; the packing or unpacking of asbestos; the installation, removal, encapsulation or enclosure of asbestos insulation or covering; the mixing or application of asbestos cement, plasters, putties, or similar compounds; the cleaning of asbestos-contaminated clothing; the storage, conveyance or disposal of material containing asbestos or; any maintenance of asbestos material that causes the release of asbestos fibres.
- .5 Asbestos Waste Receptacle: Two separate containers shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. The other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag, or rigid sealable container such as cardboard, fibre drum or wooden box. The container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. The container must be accepted by the environmental approving authority. All containers must be clearly labelled to identify asbestos waste.
- .6 Asbestos Work Area: Space bounded by containment barricades or enclosures in which asbestos process is being performed.
- .7 Authorized Visitor: The Engineer or his representative and persons representing regulatory agencies.

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- .8 Clean Area: An area which has been identified as not having airborne fibrous asbestos contamination which exceeds 0.05 fibres/cc.
- .9 Contaminated Area: An area which has been identified as having an airborne asbestos fibre count greater than 0.05 fibres/cc.
- .10 Curtained doorway: An arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of polyethylene over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. All free edges of polyethylene shall be reinforced with duct tape and the bottom edge shall be weighted to ensure proper closing. Each polyethylene sheet shall overlap openings not less than 1.5 m on each side.
- .11 Disposable Coveralls: Full-body, one piece poly-laminated type with permanently attached hood having elasticized tight fitting sleeves and leg cuffs. The waist and ankle junctions of the coveralls may be taped if necessary to prevent contamination of skin and underclothing without restricting physical movement.
- .12 Disposable Gloves: Eleven inch latex or rubber disposable gloves.
- .13 Friable Material: Material that is crumbled, pulverized or powdered or that when dry can be crumbled, pulverized or powdered by hand pressure.
- .14 Glove Bag: Prefabricated, 0.25 mm (10 mil) minimum thickness polyvinyl chloride bag with integral 0.25 mm (10 mil) thick polyvinyl chloride gloves and elasticized ports. The bag is equipped with a reversible double-pull double throw zipper on top to facilitate installation on pipe and progressive movement along pipe and with straps for sealing ends of bag around pipe.
- .15 Glove Bag Knife: Knife with full retractable blade for use inside Glove Bag.
- .16 Ground Fault Panel: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Installed by licensed electrician.
- .17 HEPA Vacuum: High Efficiency Particulate Aerosol filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in diameter at 99.97% efficiency.

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- .18 Isolate or Enclose: Placing an impermeable barrier between the friable asbestos material and the working area.
- .19 Material Decontamination Facilities: Shall be comprised of a Decontamination Room, Holding Room and Transfer Room as follows:
- .1 Decontamination Room: Decontamination Room to be located between the Asbestos Work Area and Holding Room with two curtained doorways, one to the Asbestos Work Area and one to the Holding Room. Provide high pressure low volume sprays for washing of drums and equipment. Pump wastewater through 5 micrometre filter system before directing into drains. Provide piping and connect to water sources and drains.
 - .2 Holding Room: Holding Room to be located between the Decontamination Room and the Transfer Room, with two curtained doorways, one to the Decontamination Room and one to the Unloading Room. The Holding Room shall be of sufficient size to accommodate at least two barrels and the largest item of equipment used.
 - .3 Transfer Room: Transfer Room to be located between the Holding Room and the outside, with two curtained doorways, one to the Holding Room and one to outside.
- .20 Minor Removal: Minor removal of friable asbestos corresponds to Type 2 Asbestos Removal. This is limited to 6 m or less of asbestos pipe insulation or equivalent friable surface area material. Beyond these limits Type 3 Asbestos Removal is required.
- .21 Negative Pressure System: A system which extracts air directly from the work area, filters it through a HEPA filtering system, and discharges it directly outside the work area to the exterior of the building. This system shall maintain a minimum pressure differential of 5 Pa relative to adjacent areas outside of work areas and shall be equipped with an alarm to warn of system breakdown. In partially occupied buildings, an instrument is to be provided to monitor and record pressure differences. The rated total capacity of units with filters in place shall be sufficient to provide complete air exchange in work area every 15 minutes.
- .22 Personnel Decontamination Facilities: Shall be comprised of an Equipment Room, a Shower Room, and a Clean Room, as follows:
- .1 Clean Room: Clean Room to be located between the Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of facilities and one to Shower Room. Provide lockers or hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install a

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- mirror to permit workers to fit respiratory equipment properly, and sufficient hangers and hooks.
- .2 Equipment Room: Equipment Room to be located between Shower Room and work areas, with two curtained doorways, one to the Shower Room and one to work areas. Provide waste receptor and storage facilities for workers' shoes and any other protective clothing to be reworn in work areas. The Equipment Room shall be large enough to accommodate specified facilities, any other equipment needed, and at least one worker allowing him sufficient space to undress comfortably.
- .3 Shower Room: Shower Room to be located between the Clean Room and Equipment Room, with two curtained doorways, one to the Clean Room and one to the Equipment Room. Provide one shower for every five workers. Provide a constant supply of hot and cold or warm water. No water containing fibres other than from showering shall enter the drains. Provide soap, clean towels and appropriate containers for disposal of used respirator filters.
- .23 Polyethylene Sheeting: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.
- .24 Rip-Proof Polyethylene: 0.24 mm (8 mil) fabric made up from 0.13 mm (5 mil) weave and 2 layers 0.04 mm (1.5 mil) poly-laminate, in sheet size to minimize joints.
- .25 Safety Foot Wear: Construction safety (leather or rubber) boots acceptable to the territorial ministry of labour.
- .26 Securing Straps: For glove bag, reusable nylon straps at least 25 mm wide with metal tightening buckle for sealing ends of bags around pipe and/or insulation.
- .27 Slow Drying Sealer: Non-staining, clear, water dispersible type that remains tacky on surface for at least 8 hours and is designed for the purpose of trapping residual asbestos fibres. Sealer shall have a flame spread and smoke development rating less than 50.
- .28 Sprayer: Garden type, low velocity, portable manual sprayer, capable of producing fine spray.
- .29 Tape: Tape suitable for sealing polyethylene to surface encountered under wet and dry conditions.

- .30 Type 1 Asbestos Removal: An asbestos removal technique which applies only to material which can be removed intact, or in pieces or sections, without producing crumbled, pulverized or powdered waste, and includes these materials which may be coated with PCB-amended paint. Materials such as asbestos-containing plasters, texture finishes and fireproofing which, during the removal procedure become pulverized or powdered waste, are covered under Type 2 or Type 3 removals as applicable.
- .31 Wetting Agent: Non-sudsing surface active agent; mixed with water in concentration to provide thorough wetting of asbestos fibre.

1.3 Regulatory Requirements

- .1 Comply with the following regulations pertaining to asbestos. If these requirements or specifications conflict, the more stringent requirement shall apply:
 - .1 Nunavut Government Safety Regulations Handbook
 - .2 Transportation of Dangerous Goods Act.

1.4 Submittals

- .1 The Asbestos Abatement Plan is to include and/or address, but is not necessarily limited to:
 - .1 Supply of containers and/or method for handling and disposing of asbestos.
 - .2 An asbestos transport plan showing mode of on-site transport.
 - .3 A description of the methods for the handling and separation of PCB-amended painted materials from asbestos waste.
 - .4 A copy of instructions as provided to all workers describing the hazards of asbestos exposure, respirator use, clothing, use of showers, entry and exit from work areas, and all other aspects of work procedures and protective measures.
 - .5 Layout of proposed enclosures.
 - .6 Details of the Site Specific Health and Safety plan including the experience and qualifications of personnel to carry out the asbestos abatement requirements, and training programs to be implemented prior to commencing the work.
 - .7 Record keeping and reporting methods.
 - .8 Work schedule.
 - .9 Compliance with all regulations.
 - .10 Any other items that are pertinent to the Work.

1.5 Existing Conditions

- .1 General information pertaining to material containing asbestos to be handled, removed, or otherwise disturbed during this project is noted on the Drawings and in the Demolition Tables in the Appendix.
- .2 Notify the Engineer of friable material discovered during the work which was not apparent from the Drawings or Specifications pertaining to the work. Do not disturb such material pending instructions from the Engineer.

1.6 Instruction and Training

- .1 The Contractor's Superintendent shall have attended a minimum 48 hour asbestos abatement course approved by the Engineer and have a minimum two years of experience in Type 1 removal techniques.
- .2 Instruction and training related to asbestos abatement shall include:
 - .1 Demonstration and instruction in the use of all protective equipment, including:
 - .1 The limitations of the equipment.
 - .2 The inspection and maintenance of the equipment.
 - .3 The fitting of the equipment.
 - .4 The decontamination of the equipment.
 - .2 Safe handling and proper disposal of asbestos.
 - .3 Health education information.

1.7 Personnel Protection Requirements

- .1 Type 1 Asbestos Removal:
 - .1 Respirators are not mandatory for work with non-friable asbestos-containing materials. If workers request, provide non-powered, half-face air purifying respirators with high efficiency (HEPA) cartridge filters. Provide proper instruction to workers in use of respirators including qualitative fit testing. Replace filters as necessary, according to manufacturer's instructions.
 - .2 Provide at minimum, two full-face respirators for personnel who cannot be satisfactorily fitted with half-face respirators.
 - .3 Provide facilities for all workers for washing of hands and face when leaving Asbestos Work Area. Prohibit smoking, eating and drinking in Asbestos Work Area.

.2 PCB-Amended Painted Asbestos Materials:

- .1 Some areas designated for asbestos abatement under this contract involve materials which contain polychlorinated biphenyls. PCBs at concentrations in excess of 50 ppm are considered to be hazardous substances. Storage, handling and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act. Comply with all applicable regulations.
- .2 When working with PCB containing materials, workers shall wear protective clothing and equipment acceptable to Labour Canada or Territorial Labour Department as suitable for exposure in the work area. Follow National Institute for Occupational Safety and Health (NIOSH) guidelines in providing protection for on-site personnel including contract employees and subcontractor, the Engineer and Engineer's authorized site personnel.
- .3 Supply sufficient quantities of designated protection equipment to fit all site personnel including the Engineer and authorized visitors. Workers shall also be educated as to risks, and be trained in safe work practices.
- .4 No separate pay item shall apply to the work practice requirements, including personnel protection, of this Section. Costs shall be included in the applicable payment items to which this Section applies.

1.8 Environmental Protection

- .1 Environmental protection measures shall be in accordance with Section 01561 - Environmental Protection.

1.9 Notification

- .1 Prior to commencement of asbestos abatement work, meet with Nunavut Government officials (Chief Safety Officer) to discuss asbestos removal requirements. Provide the Engineer with a copy of minutes from this meeting.
- .2 Provide a written schedule to the following agencies 30 days prior to commencement of asbestos abatement work:
 - .1 The appropriate Regional or Zone Director of the Medical Services Branch, Health and Welfare Canada.
 - .2 Regional Office of Human Resources Development Canada, Labour Program.
 - .3 Nunavut Government Chief Safety Officer.
- .3 Submit to the Engineer a copy of all notifications prior to the start of work.

1.10 Work Schedule

- .1 The asbestos removal Contractor will have complete control over the affected work area during asbestos removal.
- .2 Do not commence asbestos abatement work until:
 - .1 Minutes from the meeting between the Contractor and Territorial regulatory authorities been provided to the Engineer.
 - .2 Written approval of the Contractor's Asbestos Abatement Plan has been provided by the Nunavut Government. Provide a copy of the written approval to the Engineer.
 - .3 Arrangements have been made for filtering wastewater through a 5 micrometre filter prior to discharge.
 - .4 Wet vacuuming of dust has been completed.
 - .5 Work and decontamination areas are effectively segregated.
 - .6 Tools, equipment and material waste receptors are readily available.
 - .7 Arrangements have been made for daily inspections by the Contractor.
 - .8 All other preparatory steps have been taken.
 - .9 All permits have been obtained.
 - .10 All warning signs have been mounted at work access locations.
- .3 The Engineer reserves the right to order an immediate stop to all work if it is considered that practices are violating pertinent regulations or endangering workers.

1.11 Signs

- .1 Signage: Display signs in all work areas where access to a contaminated area is possible. The English version of the signs shall read:

**CAUTION, ASBESTOS HAZARD AREA.
UNAUTHORIZED ENTRY PROHIBITED.
WEAR PROTECTIVE EQUIPMENT.**

Post a similar sign in the language of the local dialect.

- .2 Sign letters: all lettering shall be HELVETICA Medium font. The letter size shall be:

English:

Caution, Asbestos Hazard Area.

25 mm

Unauthorized entry prohibited:

19 mm

Wear Protective Equipment

19 mm

1.12 Measurement for Payment

- .1 The removal, separation, packaging and disposal of asbestos from buildings, structures and facilities to be demolished will be measured for payment as described in Section 02222 – Demolition of Structures. Costs shall include:
 - .1 Supply of all materials, labour, and equipment necessary to perform the work in accordance with these specifications, including the supply and transport to the site of asbestos waste containers.
 - .2 Construction of temporary enclosures.
 - .3 Handling, separation and disposal of asbestos materials coated with PCB-amended paint.
 - .4 Preparation of asbestos inventory.
- .2 Include all indirect costs associated with the work described in this section as indicated in Clause 5.4 of Section 01110 – Summary of Work.

2 Products

2.1 Materials

- .1 For Type 1 asbestos abatement work, the following materials are required:
 - Asbestos Waste Receptors
 - HEPA Vacuum
 - Sprayer
 - Polyethylene Sheeting
 - Tape
 - Wetting Agent
 - Amended Water

3 Execution

- .1 Prepare an asbestos inventory for each building to be demolished. Identify, as applicable, location of asbestos, asbestos type (i.e. wall board, duct cloth, vermiculite and pipe insulation), and dimensions. Submit to the Engineer the asbestos inventory at the conclusion of asbestos removal operations.

3.1 Type 1 Asbestos Removal Procedures

- .1 The following procedures apply to the removal of non-friable asbestos containing materials carried out prior to demolition. Damage to non-friable asbestos during removal and/or demolition operations will constitute a cleanup requiring Type 3 Asbestos Removal Procedures at Contractor's expense.

.2 Preparation:

- .1 Before disturbing non-friable asbestos materials, except those used as flooring, cover floor and furnishings below work area with polyethylene sheeting.
- .2 Wherever dust on surface within Asbestos Work Area is likely to be disturbed, remove beforehand with HEPA vacuum or damp cloth.

.3 Removal of Vinyl Asbestos Floor Tile: It is not a mandatory requirement to remove asbestos floor tiles from sub-floor structures of facilities to be demolished. The floor tiles can be removed with the sub-floor structures in conjunction with the facility demolition operations. If floor tiles are removed, comply with the following:

- .1 Remove tiles using heavy duty hand tools without breaking individual tiles into smaller pieces. Place removed tiles into asbestos waste receptors.
- .2 Hot air guns or heaters may be used to heat the tile to soften the tile adhesive.
- .3 Do not use powered electric scrapers.
- .4 After removal of a small area of tiles, remove adhesive remaining on floor with hand scraper, hot air gun or infrared heater until only a thin smooth film remains. Deposit adhesive scrapings into asbestos waste receptors.
- .5 Upon completion of area, clean floor with HEPA vacuum.

.4 Removal of Asbestos Wall Panels, Duct Cloth and Flue Stack Coverings:

- .1 Where possible wet all materials to be disturbed.
- .2 As necessary, use hand-powered tools or power tools with HEPA filtered dust collection device attached for cutting of asbestos containing materials.
- .3 Immediately place waste in asbestos waste receptor. Clean area frequently during work with HEPA vacuum or with wet methods.
- .4 Undo fasteners if necessary to remove material. Whenever possible, remove materials intact. Break only if unavoidable. If broken, immediately wet freshly exposed edges.
- .5 Wet material and use hand scrapers to remove material adhering to substrate.
- .6 Immediately place removed material in asbestos waste receptor. Clean surrounding surfaces and asbestos work area frequently with HEPA vacuum or with wet methods.
- .7 Dispose of drop sheets as asbestos waste. Do not reuse.
- .8 Dispose of asbestos wastes in accordance with Clause 3.5 of this Section.

3.2 Disposal

- .1 In preparation for disposal, adequately spray asbestos wastes (including asbestos wastes coated with PCB-amended paint prior to separation) with a wetting agent prior to bagging in two heavy duty, 0.15 mm polyethylene bags or other suitable impermeable containers. Take special care to prevent the bags or containers of asbestos material from puncturing during placement within the containers. Replace any bags or containers that are ripped or punctured during handling operations. Seal all waste filled bags or containers and provide identifying tags or labels clearly indicating the contents as being asbestos waste hazardous to human health. Exercise care to prevent bags or other containers from rupturing when being containerized and transported to the stockpile area. It is imperative that transportation of asbestos waste be conducted in a manner that does not release airborne asbestos fibres.
- .2 During demolition operations, separate PCB amended painted materials from asbestos containing materials including doors and mechanical insulation. Remove and dispose of PCB amended painted materials in accordance with Section 02090 – Hazardous Waste Material.
- .3 Transport double bagged non-painted asbestos wastes to the Non-Hazardous Waste Landfill for disposal.
- .4 Segregate asbestos waste in the landfill as described in Section 02315-Grading. Record location of asbestos wastes for inclusion on Record Drawings as indicated in Section 01770 – Closeout Procedures.
- .5 Containerize PCB-amended painted materials separated from asbestos waste in accordance with Section 02222 – Demolition.
- .6 Transport asbestos waste receptors to the Temporary Storage Area.
- .7 Within the Temporary Storage Area, store asbestos waste receptors separately from other shipping containers.
- .8 Stack waste receptor containers to a maximum of two waste receptors in a staggered arrangement.

3.3 Final Cleanup and Demobilization

- .1 Remove and containerize all asbestos waste at the work site.
- .2 Include work areas and all areas of decontamination facilities in cleanup procedures.

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- .3 Vacuum and wash all asbestos control tools and equipment.
 - .4 Dispose of all non-reusable materials and contaminated barrier sheeting materials, as asbestos waste. Wipe down barrier sheeting used to protect walls and floor, and spray barrier sheeting with sealer.
 - .5 Remove polyethylene seals, tapes and enclosures, folding inwards and placing in double waste bags and into asbestos containers.
 - .6 Conduct inspection with Engineer upon completion of abatement operations, to ensure no dust or debris remains.
 - .7 Submit to the Engineer a detailed asbestos removal inventory which includes building source, component description and location in building.

1 General

1.1 Scope of Work

- .1 Comply with the requirements of this Section when performing Type 2 (Moderate Risk) Asbestos Removal for minor removal of friable asbestos containing materials and removal of false ceilings where a significant quantity of friable material containing asbestos is likely to be lying on the surface of the false ceiling in buildings scheduled for demolition.
- .2 Transport and containerize or stockpile all asbestos materials removed from buildings scheduled for demolition, from the collection and sorting of site debris, and/or as specified for removal as stated above.

1.2 Definitions

- .1 Airlock: A system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways at least 2 m apart.
- .2 Amended Water: Water to which a non-ionic surfactant has been added to reduce surface tension to allow thorough wetting of asbestos fibres.
- .3 Asbestos Containing Material: Any material which has been shown by laboratory analysis to contain more than 1% asbestos by weight or volume.
- .4 Asbestos Process: Any handling of material containing asbestos, including: the sawing, cutting, drilling, or abrasion of asbestos material; the packing or unpacking of asbestos; the installation, removal, encapsulation or enclosure of asbestos insulation or covering; the mixing or application of asbestos cement, plasters, putties, or similar compounds; the cleaning of asbestos-contaminated clothing; the storage, conveyance or disposal of material containing asbestos or; any maintenance of asbestos material that causes the release of asbestos fibres.
- .5 Asbestos Waste Receptacle: Two separate containers shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. The other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag, or rigid sealable container such as cardboard, fibre drum or wooden box. The container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. The container must be accepted by the environmental approving authority. All containers must be clearly labelled to identify asbestos waste.
- .6 Asbestos Work Area: Space bounded by containment barricades or enclosures in which asbestos process is being performed.

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- .7 Authorized Visitor: The Engineer or his representative and persons representing regulatory agencies.
- .8 Clean Area: An area which has been identified as not having airborne fibrous asbestos contamination which exceeds 0.05 fibres/cc.
- .9 Contaminated Area: An area which has been identified as having an airborne asbestos fibre count greater than 0.05 fibres/cc.
- .10 Curtained doorway: An arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of polyethylene over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. All free edges of polyethylene shall be reinforced with duct tape and the bottom edge shall be weighted to ensure proper closing. Each polyethylene sheet shall overlap openings not less than 1.5 m on each side.
- .11 Disposable Coveralls: Full-body, one piece poly-laminated type with permanently attached hood having elasticized tight fitting sleeves and leg cuffs. The waist and ankle junctions of the coveralls may be taped if necessary to prevent contamination of skin and underclothing without restricting physical movement.
- .12 Disposable Gloves: Eleven inch latex or rubber disposable gloves.
- .13 Friable Material: Material that is crumbled, pulverized or powdered or that when dry can be crumbled, pulverized or powdered by hand pressure.
- .14 Glove Bag: Prefabricated, 0.25 mm (10 mil) minimum thickness polyvinyl chloride bag with integral 0.25 mm (10 mil) thick polyvinyl chloride gloves and elasticized ports. The bag is equipped with a reversible double-pull double throw zipper on top to facilitate installation on pipe and progressive movement along pipe and with straps for sealing ends of bag around pipe.
- .15 Glove Bag Knife: Knife with full retractable blade for use inside Glove Bag.
- .16 Ground Fault Panel: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Installed by licensed electrician.

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- .17 HEPA Vacuum: High Efficiency Particulate Aerosol filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in diameter at 99.97% efficiency.
- .18 Isolate or Enclose: Placing an impermeable barrier between the friable asbestos material and the working area.
- .19 Material Decontamination Facilities: Shall be comprised of a Decontamination Room, Holding Room and Transfer Room as follows:
- .1 Decontamination Room: Decontamination Room to be located between the Asbestos Work Area and Holding Room with two curtained doorways, one to the Asbestos Work Area and one to the Holding Room. Provide high pressure low volume sprays for washing of drums and equipment. Pump wastewater through 5 micrometre filter system before directing into drains. Provide piping and connect to water sources and drains.
 - .2 Holding Room: Holding Room to be located between the Decontamination Room and the Transfer Room, with two curtained doorways, one to the Decontamination Room and one to the Unloading Room. The Holding Room shall be of sufficient size to accommodate at least two barrels and the largest item of equipment used.
 - .3 Transfer Room: Transfer Room to be located between the Holding Room and the outside, with two curtained doorways, one to the Holding Room and one to outside.
- .20 Minor Removal: Minor removal of friable asbestos corresponds to Type 2 Asbestos Removal. This is limited to 6 m or less of asbestos pipe insulation or equivalent friable surface area material. Beyond these limits Type 3 Asbestos Removal is required.
- .21 Negative Pressure System: A system which extracts air directly from the work area, filters it through a HEPA filtering system, and discharges it directly outside the work area to the exterior of the building. This system shall maintain a minimum pressure differential of 5 Pa relative to adjacent areas outside of work areas and shall be equipped with an alarm to warn of system breakdown. In partially occupied buildings, an instrument is to be provided to monitor and record pressure differences. The rated total capacity of units with filters in place shall be sufficient to provide complete air exchange in work area every 15 minutes.

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- .22 Personnel Decontamination Facilities: Shall be comprised of an Equipment Room, a Shower Room, and a Clean Room, as follows:
- .1 Clean Room: Clean Room to be located between the Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of facilities and one to Shower Room. Provide lockers or hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install a mirror to permit workers to fit respiratory equipment properly, and sufficient hangers and hooks.
 - .2 Equipment Room: Equipment Room to be located between Shower Room and work areas, with two curtained doorways, one to the Shower Room and one to work areas. Provide waste receptor and storage facilities for workers' shoes and any other protective clothing to be reworn in work areas. The Equipment Room shall be large enough to accommodate specified facilities, any other equipment needed, and at least one worker allowing him sufficient space to undress comfortably.
 - .3 Shower Room: Shower Room to be located between the Clean Room and Equipment Room, with two curtained doorways, one to the Clean Room and one to the Equipment Room. Provide one shower for every five workers. Provide a constant supply of hot and cold or warm water. No water containing fibres other than from showering shall enter the drains. Provide soap, clean towels and appropriate containers for disposal of used respirator filters.
- .23 Polyethylene Sheeting: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.
- .24 Rip-Proof Polyethylene: 0.24 mm (8 mil) fabric made up from 0.13 mm (5 mil) weave and 2 layers 0.04 mm (1.5 mil) poly-laminate, in sheet size to minimize joints.
- .25 Safety Foot Wear: Construction safety (leather or rubber) boots acceptable to the territorial ministry of labour.
- .26 Securing Straps: For glove bag, reusable nylon straps at least 25 mm wide with metal tightening buckle for sealing ends of bags around pipe and/or insulation.
- .27 Slow Drying Sealer: Non-staining, clear, water dispersible type that remains tacky on surface for at least 8 hours and is designed for the purpose of trapping residual asbestos fibres. Sealer shall have a flame spread and smoke development rating less than 50.

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- .28 Sprayer: Garden type, low velocity, portable manual sprayer, capable of producing fine spray.
 - .29 Tape: Tape suitable for sealing polyethylene to surface encountered under wet and dry conditions.
 - .30 Type 2 Asbestos Removal: An asbestos removal technique which applies to minor handling of friable asbestos in any given area. This work is classified by the following two types applicable to DEW Line Cleanup work:
 - .1 Ceiling Entry which may disturb friable asbestos containing materials above the ceiling system; and
 - .2 Minor Removal of friable asbestos containing material including asbestos pipe and duct insulation.

This removal technique also applies to the above materials which may be coated with PCB-amended paint.
 - .31 Wetting Agent: Non-sudsing surface active agent; mixed with water in concentration to provide thorough wetting of asbestos fibre.

1.3 Regulatory Requirements

- .1 Comply with the following regulations pertaining to asbestos. If these requirements or specifications conflict, the more stringent requirement shall apply:
 - .1 Nunavut Government Safety Regulations Handbook
 - .2 Transportation of Dangerous Goods Act.

1.4 Submittals

- .1 The Asbestos Abatement Plan is to include and/or address, but is not necessarily limited to:
 - .1 Supply of containers and/or method for handling and disposing of asbestos.
 - .2 An asbestos transport plan showing mode of on-site transport.
 - .3 A description of the methods for the handling and separation of PCB-amended painted materials from asbestos waste.
 - .4 A copy of instructions as provided to all workers describing the hazards of asbestos exposure, respirator use, clothing, use of showers, entry and exit from work areas, and all other aspects of work procedures and protective measures.

- .5 Layout of proposed enclosures.
- .6 Details of the Site Specific Health and Safety Plan including the experience and qualifications of personnel to carry out the asbestos abatement requirements, and training programs to be implemented prior to commencing the work.
- .7 Record keeping and reporting methods.
- .8 Work schedule.
- .9 Compliance with all regulations.
- .10 Any other items that are pertinent to the Work.

1.5 Existing Conditions

- .1 General information pertaining to material containing asbestos to be handled, removed, or otherwise disturbed during this project is noted on the Drawings and in the Demolition Tables in the Appendix.
- .2 Notify the Engineer of friable material discovered during the work which was not apparent from the Drawings or Specifications pertaining to the work. Do not disturb such material pending instructions from the Engineer.

1.6 Instruction and Training

- .1 The Contractor's Superintendent shall have attended a minimum 48 hour asbestos abatement course approved by the Engineer and have a minimum two years of experience in Type 2 asbestos removal techniques.
- .2 Instruction and training related to asbestos abatement shall include:
 - .1 Demonstration and instruction in the use of all protective equipment, including:
 - .1 The limitations of the equipment.
 - .2 The inspection and maintenance of the equipment.
 - .3 The fitting of the equipment.
 - .4 The decontamination of the equipment.
 - .2 Safe handling and proper disposal of asbestos.
 - .3 Health education information.

1.7 Personnel Protection Requirements

- .1 Type 2 Asbestos Removal:
 - .1 Before entering Asbestos Work Area(s), instruct workers and visitors in use of respirators, procedures for entry and exit from enclosures and all aspects of work procedures and protective measures. Qualitative fit testing of respirators shall be carried out prior to entering the Asbestos

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- Work Area. Instruction shall be provided by competent person as defined by the Nunavut Safety Act.
- .2 Provide respiratory equipment for all persons entering Asbestos Work Area enclosure including authorized visitors. When doing work which will or may disturb asbestos-containing materials, workers, supervisors, and authorized visitors must be supplied with and use non-powered, half-face respirators with high efficiency (HEPA) cartridge filters. Filters, once used, shall be replaced daily or tested according to manufacturer's specifications and replaced as necessary. No supervisor, worker or authorized visitor shall wear facial hair which affects the seal between respirator and face.
 - .3 Provide at minimum, two full-face respirators for personnel who cannot be satisfactorily fitted with half-face respirators.
 - .4 Provide workers and visitors with full-enclosure suits and full body coveralls with integral hoods. Once coveralls are worn in Asbestos Work Area, treat and dispose of as asbestos contaminated waste. Workers and visitors shall also wear other protective apparel as required under local construction regulations.
 - .5 Before entering enclosure(s), put on respirator with new or tested filters, clean coveralls and head covers. Wear coveralls with hoods up at all times.
 - .6 Workers may leave enclosure only after all disturbance of asbestos-containing materials is complete and enclosure has been cleaned up. When leaving enclosure, workers and visitors must use the HEPA vacuum to clean the exterior of their respirator to remove visible contamination, and remove gross contamination from coveralls and other protective equipment. Immediately upon leaving enclosure, workers and visitors shall remove coveralls and wash face and hands thoroughly with soap and water. The inside of each respirator shall be wetted and cleaned. Remove filters and dispose or test according to manufacturer's specifications. Place coveralls and used filters in receptacles for disposal with other asbestos-contaminated materials. Coveralls can be reused, to a maximum of 8 hours wear, as long as coveralls remain inside work area.
 - .7 Do not eat, drink, smoke or chew gum or tobacco in enclosures.
 - .8 Fully protect workers and visitors as specified herein whenever the possibility of disturbance of asbestos exists.
- .2 PCB-Amended Painted Asbestos Materials:
- .1 Some areas designated for asbestos abatement under this contract involve materials which contain polychlorinated biphenyls. PCBs at concentrations in excess of 50 ppm are considered to be hazardous substances. Storage, handling and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act. Comply with all applicable

regulations.

- .2 When working with PCB containing materials, workers shall wear protective clothing and equipment acceptable to Labour Canada or Territorial Labour Department as suitable for exposure in the work area. Follow National Institute for Occupational Safety and Health (NIOSH) guidelines in providing protection for on-site personnel including contract employees and subcontractor, the Engineer and other authorized site personnel.
- .3 Supply sufficient quantities of designated protection equipment to fit all site personnel including the Engineer and authorized visitors. Workers shall also be educated as to risks, and be trained in safe work practices.
- .4 No separate pay item shall apply to the work practice requirements, including personnel protection, of this Section. Costs shall be included in the applicable payment items to which this Section applies.

1.8 Environmental Protection

- .1 Environmental protection measures shall be in accordance with Section 01561 - Environmental Protection.

1.9 Notification

- .1 Prior to commencement of asbestos abatement work, meet with Nunavut Government officials (Chief Safety Officer) to discuss asbestos removal requirements. Provide the Engineer with a copy of minutes from this meeting.
- .2 Provide a written schedule to the following agencies 30 days prior to commencement of asbestos abatement work:
 - .1 The appropriate Regional or Zone Director of the Medical Services Branch, Health and Welfare Canada.
 - .2 Regional Office of Human Resources Development Canada, Labour Program.
 - .3 Nunavut Government Chief Safety Officer.
- .3 Submit to the Engineer a copy of all notifications prior to the start of work.

1.10 Work Schedule

- .1 The asbestos removal Contractor will have complete control over the affected work area during asbestos removal.
- .2 Do not commence asbestos abatement work until:
 - .1 Minutes from the meeting between the Contractor and Territorial

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- regulatory authorities been provided to the Engineer.
 - .2 Written approval of the Contractor's Asbestos Abatement Plan has been provided by the Nunavut Government. Provide a copy of the written approval to the Engineer.
 - .3 Arrangements have been made for filtering wastewater through a 5 micrometre filter prior to discharge.
 - .4 Wet vacuuming of dust has been completed.
 - .5 Work and decontamination areas are effectively segregated.
 - .6 Tools, equipment and material waste receptors are readily available.
 - .7 Arrangements have been made for daily inspections by the Contractor.
 - .8 All other preparatory steps have been taken.
 - .9 All permits have been obtained.
 - .10 All warning signs have been mounted at work access locations.
- .3 The Engineer reserves the right to order an immediate stop to all work if it is considered that practices are violating pertinent regulations or endangering workers.

1.11 Air Monitoring

- .1 From commencement of work until completion of cleaning operations, arrange for air monitoring both inside and outside of Asbestos Work Area enclosures where Type 2 removal work is undertaken.
- .2 Monitor air in accordance with NIOSH Method 7400, or with a fibrous aerosol monitor.
- .3 If air monitoring shows that areas outside work area enclosures are contaminated, then enclose, maintain and clean these areas in the same manner as that applicable to Asbestos Work Areas.
- .4 Use the results of air monitoring inside work areas to establish the type of respirators to be worn.
- .5 Workers may be required to wear asbestos sample pumps for up to full shift periods.
- .6 Air monitoring shall comply with the requirements of the Canada labour code, Hazardous Substances Regulations, Part X, which specifies a maximum occupational exposure standard of 0.1 fibres per cubic centimetre of air, as determined by the standard Phase Contrast Microscope Method.

1.12 Signs

- .1 Signage: Display signs in all work areas where access to a contaminated area is possible. The English version of the signs shall read:

**CAUTION, ASBESTOS HAZARD AREA.
UNAUTHORIZED ENTRY PROHIBITED.
WEAR PROTECTIVE EQUIPMENT.**

Post a similar sign in the language of the local dialect.

- .2 Sign letters: all lettering shall be HELVETICA Medium font. The letter size shall be:

English:

Caution, Asbestos Hazard Area.

25 mm

Unauthorized entry prohibited:

19 mm

Wear Protective Equipment

19 mm

1.13 Measurement for Payment

- .1 The removal, separation, packaging and disposal of asbestos from buildings, structures and facilities to be demolished will be measured for payment as described in Section 02222 – Demolition of Structures. Costs shall include:
- .1 Supply of all materials, labour, and equipment necessary to perform the work in accordance with these specifications, including the supply and transport to the site of asbestos waste containers.
 - .2 Construction of temporary enclosures.
 - .3 Handling, separation and disposal of asbestos materials coated with PCB-amended paint.
 - .4 Preparation of asbestos inventory.
- .2 Include all indirect costs associated with the work described in this section as indicated in Clause 5.4 of Section 01110 – Summary of Work.

2 Products

2.1 Materials

.1 For Type 2 asbestos abatement work, the following materials are required:

- Personnel Protective Equipment (Outlined in Clause 1.7.1 of this Section.)
- Polyethylene Sheeting
- Rip-Proof Polyethylene
- Tape
- Wetting Agent
- Amended Water
- Asbestos Waste Receptors
- Sprayer
- HEPA Vacuum
- Slow drying sealer

3 Execution

.1 Prepare an asbestos inventory for each building to be demolished. Identify, as applicable, location of asbestos, asbestos type (i.e. wall board, duct cloth, vermiculite and pipe insulation), and dimensions. Submit to the Engineer the asbestos inventory at the conclusion of asbestos removal operations.

3.1 Type 2 Asbestos Removal Procedures

.1 Preparation:

- .1 Move equipment, tools, furnishings, and stored materials which can be moved without disturbing asbestos-containing materials.
- .2 Remove below ceiling elements (demountable partitions, walls, doors, carpets, and similar items), which can be removed without disturbing ceiling space or friable asbestos material.
- .3 Shut off air handling and ventilation systems supplying or exhausting from asbestos work area enclosure(s). Ensure air handling systems remain shut off for duration of work.
- .4 Erect wood framing between Asbestos Work Area and remaining building area, as necessary to support polyethylene sheeting enclosures. Seal all openings in enclosures. Enclosures for access into ceilings shall extend to underside of ceiling system and may be supported from ceiling system. Free standing enclosures shall have a completely sealed polyethylene top.

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- .5 After isolation of work area, remove heating, ventilating, and air conditioning filters, pack in sealed plastic bags, 0.15 mm minimum thickness, and treat as contaminated asbestos waste. Remove ceiling mounted objects such as lights, partitions, other fixtures not previously sealed off, and other objects that interfere with asbestos removal. Do not remove items which require disturbance of asbestos, ceilings, or cladding enclosing asbestos until full protective measures are in place.
 - .6 Cover motors, heating units, fire apparatus, door closers, fans, tanks, benches, shelving, storage racks, valves, taps, controllers, lights, and other fixtures and furnishings within the enclosure with polyethylene sheeting. Clean previously contaminated surfaces with HEPA vacuum before covering with sheeting.
 - .7 If enclosure is used for more than one shift, construct an airlock for entry to and exit from enclosure. Clean enclosure prior to exiting at completion of each shift.
 - .8 Establish negative pressure in Asbestos Work Area. Operate negative pressure units or HEPA vacuums continuously from this time until completion of contaminated work.
 - .9 Provide soap, water and towels for washing of workers' face and hands when exiting enclosure.
 - .10 Maintain emergency and fire exits from Asbestos Work Area, or establish alternative exits satisfactory to the Engineer.
 - .11 Ensure existing power supply to Asbestos Work Area is isolated and disconnected where necessary.
 - .12 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
 - .13 Visually inspect enclosures at beginning of each working period.
 - .14 Dispose of asbestos wastes in accordance with Clause 3.5 of this Section.
 - .15 Ensure that tools, equipment and material waste receptors are inside enclosure.
 - .16 Ensure that signs are displayed in all areas where access to sealed asbestos work areas is possible. Signs shall be in accordance with Clause 1.13 of this Section.
 - .17 Where application of water is required for wetting asbestos-containing materials, shut off electrical power, provide ground fault interrupter circuits on power source for electrical tools and temporary lighting, in accordance with applicable CSA Standards. Ensure safe installation of electrical lines and equipment.
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- .2 Minor removal of Friable Asbestos and removal of Ceiling Tiles with friable asbestos on surface of tiles:
 - .1 Seal opening of enclosure with tape after entry of worker. Worker shall remain inside enclosure until removal of asbestos-containing materials is complete and enclosure has been effectively cleaned.

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- .2 Where necessary, remove ceiling materials to access ceiling space. Prior to beginning work, vacuum the top of ceiling systems, light fixtures etc. in proximity of ceiling entry.
 - .3 Perform work required inside enclosure.
 - .4 When removing minor amounts of asbestos-containing materials from systems or surfaces within enclosure, spray asbestos-containing material with amended water. Saturate asbestos to prevent release of airborne fibres during removal. Scrape fully saturated asbestos directly into waste containers. Do not allow asbestos to fall onto floor of enclosure.
 - .5 Remove minor amounts of asbestos-containing pipe insulation in layers, maintaining exposed surfaces of insulation or lagging in wet condition.
 - .6 Treat all materials removed as asbestos contaminated waste and dispose of as such.
 - .7 After removal of asbestos, clean surfaces from which asbestos has been removed with stiff bristle brushes, vacuum, or wet-sponge if appropriate, to remove all visible material.
 - .8 Carefully place asbestos waste in the inner bag of asbestos waste receptor. Clean inner bag of gross contamination and place in clean 6 mil outer bag. If waste is likely to tear inner bag, do not use outer bag, instead use fibre or metal drum, cardboard or wood box, or other suitably sturdy container.
 - .9 After brushing, wet-sponging or vacuuming to remove visible asbestos, wet clean entire enclosure, including equipment, floor, wall surfaces, ducts and similar items not covered with polyethylene sheeting. Apply heavy coat of sealer to all surfaces from which asbestos has been removed. Apply thinned coat (sufficient to coat all surfaces) to interior of polyethylene enclosure and uncovered surfaces scheduled for demolition.
 - .10 Arrange for air samples to be taken from commencement of work until completion of cleaning operations, both inside and outside of Asbestos Work Area(s) enclosures in accordance with NIOSH Method 7400 or with a Fibrous Aerosol Monitor.
 - .11 If air monitoring or visual inspection shows that areas outside current asbestos work area enclosures are contaminated above 0.05 fibre/cc, clean these areas in same manner as that applicable to Asbestos Work Areas.
 - .12 Dispose of asbestos wastes in accordance with Clause 3.5 of this Section.
- .3 Tear Down Protection:
- .1 When dismantling enclosure, carefully roll polyethylene toward centre of enclosure. As polyethylene is rolled away, immediately remove any visible debris with HEPA vacuum.

- .2 Place polyethylene sheeting seals, tape, cleaning material, coveralls, and other contaminated waste in asbestos waste receptors for transport. Remove any debris with HEPA vacuum.
- .3 Clean up asbestos waste receptors and equipment used in work, and remove from Asbestos Work Area(s) via drum and equipment decontamination enclosure systems, at appropriate time in sequence. Double bag waste immediately prior to transport from site.

3.2 Disposal

- .1 In preparation for disposal, adequately spray asbestos wastes (including asbestos wastes coated with PCB-amended paint prior to separation) with a wetting agent prior to bagging in two heavy duty, 0.15 mm polyethylene bags or other suitable impermeable containers. Take special care to prevent the bags or containers of asbestos material from puncturing during placement within the containers. Replace any bags or containers that are ripped or punctured during handling operations. Seal all waste filled bags or containers and provide identifying tags or labels clearly indicating the contents as being asbestos waste hazardous to human health. Exercise care to prevent bags or other containers from rupturing when being containerized and transported to the stockpile area. It is imperative that transportation of asbestos waste be conducted in a manner that does not release airborne asbestos fibres.
- .2 During demolition operations, separate PCB amended painted materials from asbestos containing materials including doors and mechanical insulation. Remove and dispose of PCB amended painted materials in accordance with Section 02090 – Hazardous Waste Material.
- .3 Transport double bagged non-painted asbestos wastes to the Non-Hazardous Waste Landfill for disposal.
- .4 Segregate asbestos waste in the landfill as described in Section 02315-Grading. Record location of asbestos wastes for inclusion on Record Drawings as indicated in Section 01770 – Closeout Procedures.
- .5 Containerize PCB-amended painted materials separated from asbestos waste in accordance with Section 02222 – Demolition of Structures.
- .6 Transport asbestos waste receptors to the Temporary Storage Area.
- .7 Within the Temporary Storage Area, store asbestos waste receptors separately from other shipping containers.
- .8 Stack waste receptor containers to a maximum of two waste receptors in a staggered arrangement.

3.3 Final Cleanup and Demobilization

- .1 Remove and containerize all asbestos waste at the work site.
- .2 Include work areas and all areas of decontamination facilities in cleanup procedures.
- .3 Vacuum and wash all asbestos control tools and equipment.
- .4 Dispose of all non-reusable materials and contaminated barrier sheeting materials, as asbestos waste. Wipe down barrier sheeting used to protect walls and floor, and spray barrier sheeting with sealer.
- .5 Remove polyethylene seals, tapes and enclosures, folding inwards and placing in double waste bags and into asbestos containers.
- .6 Conduct inspection with Engineer upon completion of abatement operations, to ensure no dust or debris remains.
- .7 Submit to the Engineer a detailed asbestos removal inventory which includes building source, component description and location in building.

1 General

1.1 Scope of Work

.1 Comply with the requirements of this Section when performing the following work:

- .1 Type 3 (High Risk) Asbestos Removal for removal of friable asbestos material other than minor removal including asbestos pipe insulation, vermiculite insulation and duct insulation from buildings scheduled for demolition. Where applicable, the Glove Bag Method may be used in place of Type 3 Asbestos Removal.
- .2 Removal of all asbestos pipe and duct insulation using the Glove Bag Method or optional pipe removal method.
- .3 Transport and containerization or stockpiling of all asbestos materials removed from buildings scheduled for demolition, from the collection and sorting of site debris, and/or as specified for removal as stated above.

1.2 Definitions

- .1 Airlock: A system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways at least 2 m apart.
- .2 Amended Water: Water to which a non-ionic surfactant has been added to reduce surface tension to allow thorough wetting of asbestos fibres.
- .3 Asbestos Containing Material: Any material which has been shown by laboratory analysis to contain more than 1% asbestos by weight or volume.
- .4 Asbestos Process: Any handling of material containing asbestos, including: the sawing, cutting, drilling, or abrasion of asbestos material; the packing or unpacking of asbestos; the installation, removal, encapsulation or enclosure of asbestos insulation or covering; the mixing or application of asbestos cement, plasters, putties, or similar compounds; the cleaning of asbestos-contaminated clothing; the storage, conveyance or disposal of material containing asbestos or; any maintenance of asbestos material that causes the release of asbestos fibres.

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- .5 Asbestos Waste Receptacle: Two separate containers shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. The other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag, or rigid sealable container such as cardboard, fibre drum or wooden box. The container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. The container must be accepted by the environmental approving authority. All containers must be clearly labelled to identify asbestos waste.
- .6 Asbestos Work Area: Space bounded by containment barricades or enclosures in which asbestos process is being performed.
- .7 Authorized Visitor: The Engineer or his representative and persons representing regulatory agencies.
- .8 Clean Area: An area which has been identified as not having airborne fibrous asbestos contamination which exceeds 0.05 fibres/cc.
- .9 Contaminated Area: An area which has been identified as having an airborne asbestos fibre count greater than 0.05 fibres/cc.
- .10 Curtained doorway: An arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of polyethylene over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. All free edges of polyethylene shall be reinforced with duct tape and the bottom edge shall be weighted to ensure proper closing. Each polyethylene sheet shall overlap openings not less than 1.5 m on each side.
- .11 Disposable Coveralls: Full-body, one piece poly-laminated type with permanently attached hood having elasticized tight fitting sleeves and leg cuffs. The waist and ankle junctions of the coveralls may be taped if necessary to prevent contamination of skin and underclothing without restricting physical movement.
- .12 Disposable Gloves: Eleven inch latex or rubber disposable gloves.
- .13 Friable Material: Material that is crumbled, pulverized or powdered or that when dry can be crumbled, pulverized or powdered by hand pressure.

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- .14 Glove Bag: Prefabricated, 0.25 mm (10 mil) minimum thickness polyvinyl chloride bag with integral 0.25 mm (10 mil) thick polyvinyl chloride gloves and elasticized ports. The bag is equipped with a reversible double-pull double throw zipper on top to facilitate installation on pipe and progressive movement along pipe and with straps for sealing ends of bag around pipe.
- .15 Glove Bag Knife: Knife with full retractable blade for use inside Glove Bag.
- .16 Ground Fault Panel: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Installed by licensed electrician.
- .17 HEPA Vacuum: High Efficiency Particulate Aerosol filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in diameter at 99.97% efficiency.
- .18 Isolate or Enclose: Placing an impermeable barrier between the friable asbestos material and the working area.
- .19 Material Decontamination Facilities: Shall be comprised of a Decontamination Room, Holding Room and Transfer Room as follows:
- .1 Decontamination Room: Decontamination Room to be located between the Asbestos Work Area and Holding Room with two curtained doorways, one to the Asbestos Work Area and one to the Holding Room. Provide high pressure low volume sprays for washing of drums and equipment. Pump wastewater through 5 micrometre filter system before directing into drains. Provide piping and connect to water sources and drains.
 - .2 Holding Room: Holding Room to be located between the Decontamination Room and the Transfer Room, with two curtained doorways, one to the Decontamination Room and one to the Unloading Room. The Holding Room shall be of sufficient size to accommodate at least two barrels and the largest item of equipment used.
 - .3 Transfer Room: Transfer Room to be located between the Holding Room and the outside, with two curtained doorways, one to the Holding Room and one to outside.
- .20 Minor Removal: Minor removal of friable asbestos corresponds to Type 2 Asbestos Removal. This is limited to 6 m or less of asbestos pipe insulation or equivalent friable surface area material. Beyond these limits Type 3 Asbestos Removal is required.

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- .21 Negative Pressure System: A system which extracts air directly from the work area, filters it through a HEPA filtering system, and discharges it directly outside the work area to the exterior of the building. This system shall maintain a minimum pressure differential of 5 Pa relative to adjacent areas outside of work areas and shall be equipped with an alarm to warn of system breakdown. In partially occupied buildings, an instrument is to be provided to monitor and record pressure differences. The rated total capacity of units with filters in place shall be sufficient to provide complete air exchange in work area every 15 minutes.
- .22 Personnel Decontamination Facilities: Shall be comprised of an Equipment Room, a Shower Room, and a Clean Room, as follows:
- .1 Clean Room: Clean Room to be located between the Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of facilities and one to Shower Room. Provide lockers or hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install a mirror to permit workers to fit respiratory equipment properly, and sufficient hangers and hooks.
- .2 Equipment Room: Equipment Room to be located between Shower Room and work areas, with two curtained doorways, one to the Shower Room and one to work areas. Provide waste receptor and storage facilities for workers' shoes and any other protective clothing to be reworn in work areas. The Equipment Room shall be large enough to accommodate specified facilities, any other equipment needed, and at least one worker allowing him sufficient space to undress comfortably.
- .3 Shower Room: Shower Room to be located between the Clean Room and Equipment Room, with two curtained doorways, one to the Clean Room and one to the Equipment Room. Provide one shower for every five workers. Provide a constant supply of hot and cold or warm water. No water containing fibres other than from showering shall enter the drains. Provide soap, clean towels and appropriate containers for disposal of used respirator filters.
- .23 Polyethylene Sheeting: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.
- .24 Rip-Proof Polyethylene: 0.24 mm (8 mil) fabric made up from 0.13 mm (5 mil) weave and 2 layers 0.04 mm (1.5 mil) poly-laminate, in sheet size to minimize joints.

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- .25 Safety Foot Wear: Construction safety (leather or rubber) boots acceptable to the territorial ministry of labour.
 - .26 Securing Straps: For glove bag, reusable nylon straps at least 25 mm wide with metal tightening buckle for sealing ends of bags around pipe and/or insulation.
 - .27 Slow Drying Sealer: Non-staining, clear, water dispersible type that remains tacky on surface for at least 8 hours and is designed for the purpose of trapping residual asbestos fibres. Sealer shall have a flame spread and smoke development rating less than 50.
 - .28 Sprayer: Garden type, low velocity, portable manual sprayer, capable of producing fine spray.
 - .29 Tape: Tape suitable for sealing polyethylene to surface encountered under wet and dry conditions.
 - .30 Type 3 or Glove Bag Asbestos Removal: Asbestos removal techniques for friable asbestos material (other than the minor removal). This work applies to the following DEW Line Clean Up work:
 - .1 Removal of friable asbestos pipe, vermiculite and duct insulation; and
 - .2 Manual excavation of asbestos from landfills.

This removal technique also applies to the above materials which may be coated with PCB-amended paint.
 - .31 Wetting Agent: Non-sudsing surface active agent; mixed with water in concentration to provide thorough wetting of asbestos fibre.

1.3 Regulatory Requirements

- .1 Comply with the following regulations pertaining to asbestos. If these requirements or specifications conflict, the more stringent requirement shall apply:
 - .1 Nunavut Government Safety Regulations Handbook
 - .2 Transportation of Dangerous Goods Act.

1.4 Submittals

- .1 The Asbestos Abatement Plan is to include and/or address, but is not necessarily limited to:
 - .1 Supply of containers and/or method for handling and disposing of asbestos.
 - .2 An asbestos transport plan showing mode of on-site transport.
 - .3 A description of the methods for the handling and separation of PCB-amended painted materials from asbestos waste.
 - .4 A copy of instructions as provided to all workers describing the hazards of asbestos exposure, respirator use, clothing, use of showers, entry and exit from work areas, and all other aspects of work procedures and protective measures.
 - .5 Layout of proposed enclosures.
 - .6 Details of the Site Specific Health and Safety Plan including the experience and qualifications of personnel to carry out the asbestos abatement requirements, and training programs to be implemented prior to commencing the work.
 - .7 Record keeping and reporting methods.
 - .8 Work schedule.
 - .9 Compliance with all regulations.
 - .10 Any other items that are pertinent to the Work.

1.5 Existing Conditions

- .1 General information pertaining to material containing asbestos to be handled, removed, or otherwise disturbed during this project is noted on the Drawings and in the Demolition Tables in the Appendix.
- .2 Notify the Engineer of friable material discovered during the work which was not apparent from the Drawings or Specifications pertaining to the work. Do not disturb such material pending instructions from the Engineer.

1.6 Instruction and Training

- .1 The Contractor's Superintendent shall have attended a minimum 48 hour asbestos abatement course approved by the Engineer and have a minimum two years of experience in Type 3 and glove bag asbestos removal techniques.
- .2 Instruction and training related to asbestos abatement shall include:
 - .1 Demonstration and instruction in the use of all protective equipment, including:

- .1 The limitations of the equipment.
- .2 The inspection and maintenance of the equipment.
- .3 The fitting of the equipment.
- .4 The decontamination of the equipment.
- .2 Safe handling and proper disposal of asbestos.
- .3 Health education information.

1.7 Personnel Protection Requirements

- .1 Glove Bag Removal of Pipe and Duct Insulation: This method may be used in place of Type 3 Asbestos Removal:

- .1 Before entering Asbestos Work Area(s), instruct workers and visitors in use of respirators, use of glove bags, and all aspects of work procedures and protective measures. Instruction shall be provided by a competent person as defined by the Nunavut Safety Act.
- .2 Workers performing glove bag removal shall wear as a minimum, non-powered half-face respirators with high efficiency (HEPA) cartridge filters. Provide approved respirators to visitors. Replace filters daily or test according to manufacturer's specifications and replace as indicated. Provide instruction to users in use of respirators, including qualitative fit testing. No user shall wear facial hair which affects seal between respirator and face. Maintain respirators in proper functioning and clean condition, or remove from site.
- .3 Provide at minimum, two full-face respirators for personnel who cannot be satisfactorily fitted with half-face respirators.
- .4 Provide workers and visitors with full body coveralls with integral hoods. Once coveralls are worn in the asbestos work area, dispose of as contaminated waste. Workers and visitors shall also wear other protective apparel as required under local construction regulations.
- .5 Do not eat, drink, smoke or chew gum or tobacco in Asbestos Work Area.

- .2 Type 3 Asbestos Removal: This method may be used in place of the Glove Bag Method:

- .1 Before commencing work, instruct workers in use of respirators, dress, showers, entry and exit from work areas, and all aspects of work procedures and protective measures.
- .2 Provide workers with personally issued and marked respiratory equipment acceptable to Labour Canada or territorial labour department as suitable for asbestos exposure in the work area.
 - .1 For wet removal of amosite or crocidolite asbestos, provide positive pressure, full-face piece, powered air purifying respirators (PAPR) with high efficiency filters. If only chrysotile

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- asbestos is present, non-powered half-face respirators with HEPA filters are acceptable for use during wet removal. Where friable asbestos cannot be wetted, a supplied air positive pressure, full-face piece respirator is required.
- .2 No worker, supervisor or authorized visitor may have facial hair which prevents a proper seal between respirator face piece and skin. All respiratory equipment used shall be approved and labelled for protection against asbestos fibres and shall meet the design and usage requirements of the National Institute of Occupational Safety and Health (NIOSH) or equivalent criteria. If disposable type filters are used, provide sufficient filters so that workers can install new filters following disposal of used filters and before re-entering contaminated areas.
- .3 Provide at minimum, two full-face respirators for personnel who cannot be satisfactorily fitted with half-face respirators.
- .3 Remove street clothes in clean change room of the personnel decontamination facility and put on clean coveralls, head covers, safety footwear, disposable gloves and a respirator with new filters or reusable filters that have been tested as satisfactory, before entering shower room. If reusable protective clothing is used, each worker shall remove all street clothes in clean room, proceed naked into shower room, don respirator only in shower room and proceed into the equipment room to dress into protective clothing prior to entering asbestos work area. All street clothes, uncontaminated footwear, towels, and similar uncontaminated articles shall be stored in clean change room only.
- .4 Remove gross contamination from clothing before leaving work area and proceed to the Equipment Room and remove all clothing except respirators. Place contaminated work suits in receptacles for disposal with other asbestos contaminated materials. Leave reusable items except respirator in Equipment Room. Still wearing the respirator, proceed naked to the showers. Clean outside of respirator with soap and water while showering; remove respirator; remove filters for testing or disposal in the container provided for this purpose; and wash and rinse the inside of the respirator. Test filters according to manufacturer's recommendations or dispose of filters daily. When not in use in the work area, store work footwear in Equipment Room. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from work area or from Equipment Room.
- .5 Following showering and drying off, proceed to Clean Change Room and dress in street clothes at the end of each day's work, or in clean coveralls if work area will be re-entered.

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- .6 For removal of materials from the Asbestos Work Area, enter the Transfer Room from outside dressed in clean coveralls to remove drums and equipment from the Holding Room of the material decontamination facility. No worker shall use this system as a means to leave or enter the work area.
 - .7 Workers shall be fully protected with respirators and protective clothing during all work which may disturb asbestos containing material, including work prior to commencing actual asbestos removal, encapsulation or enclosure.
 - .8 Provide and post in Clean Change Room and in Equipment Room the procedures described in Clauses 1.4 and 1.5 of this Section, in the English language plus the local dialect.
 - .9 Eating, drinking, chewing, and smoking, are not permitted in the Work Area.
- .3 PCB-Amended Painted Asbestos Materials:
- .1 Some areas designated for asbestos abatement under this contract involve materials which contain polychlorinated biphenyls. PCBs at concentrations in excess of 50 ppm are considered to be hazardous substances. Storage, handling and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act. Comply with all applicable regulations.
 - .2 When working with PCB containing materials, workers shall wear protective clothing and equipment acceptable to Labour Canada or Territorial Labour Department as suitable for exposure in the work area. Follow National Institute for Occupational Safety and Health (NIOSH) guidelines in providing protection for on-site personnel including contract employees and subcontractor, the Engineer and other authorized site personnel.
 - .3 Supply sufficient quantities of designated protection equipment to fit all site personnel including the Engineer and authorized visitors. Workers shall also be educated as to risks, and be trained in safe work practices.
 - .4 No separate pay item shall apply to the work practice requirements, including personnel protection, of this Section. Costs shall be included in the applicable payment items to which this Section applies.

1.8 Environmental Protection

- .1 Environmental protection measures shall be in accordance with Section 01561 - Environmental Protection.

1.9 Notification

- .1 Prior to commencement of asbestos abatement work, meet with Nunavut Government officials (Chief Safety Officer) to discuss asbestos removal requirements. Provide the Engineer with a copy of minutes from this meeting.
- .2 Provide a written schedule to the following agencies 30 days prior to commencement of asbestos abatement work:
 - .1 The appropriate Regional or Zone Director of the Medical Services Branch, Health and Welfare Canada.
 - .2 Regional Office of Human Resources Development Canada, Labour Program.
 - .3 Nunavut Government Chief Safety Officer.
- .3 Submit to the Engineer a copy of all notifications prior to the start of work.

1.10 Work Schedule

- .1 The asbestos removal Contractor will have complete control over the affected work area during asbestos removal.
- .2 Do not commence asbestos abatement work until:
 - .1 Minutes from the meeting between the Contractor and Territorial regulatory authorities been provided to the Engineer.
 - .2 Written approval of the Contractor's Asbestos Abatement Plan has been provided by the Nunavut Government. Provide a copy of the written approval to the Engineer.
 - .3 Arrangements have been made for filtering wastewater through a 5 micrometre filter prior to discharge.
 - .4 Wet vacuuming of dust has been completed.
 - .5 Work and decontamination areas are effectively segregated.
 - .6 Tools, equipment and material waste receptors are readily available.
 - .7 Arrangements have been made for daily inspections by the Contractor.
 - .8 All other preparatory steps have been taken.
 - .9 All permits have been obtained.
 - .10 All warning signs have been mounted at work access locations.
- .3 The Engineer reserves the right to order an immediate stop to all work if it is considered that practices are violating pertinent regulations or endangering workers.

1.11 Air Monitoring

- .1 From commencement of work until completion of cleaning operations, arrange for air monitoring both inside and outside of Asbestos Work Area enclosures where Type 2, glove bag and Type 3 removal work is undertaken.
- .2 Monitor air in accordance with NIOSH Method 7400, or with a fibrous aerosol monitor.
- .3 If air monitoring shows that areas outside work area enclosures are contaminated, then enclose, maintain and clean these areas in the same manner as that applicable to Asbestos Work Areas.
- .4 Use the results of air monitoring inside work areas to establish the type of respirators to be worn.
- .5 Workers may be required to wear asbestos sample pumps for up to full shift periods.
- .6 Air monitoring shall comply with the requirements of the Canada labour code, Hazardous Substances Regulations, Part X, which specifies a maximum occupational exposure standard of 0.1 fibres per cubic centimetre of air, as determined by the standard Phase Contrast Microscope Method.

1.12 Signs

- .1 Signage: Display signs in all work areas where access to a contaminated area is possible. The English version of the signs shall read:

**CAUTION, ASBESTOS HAZARD AREA.
UNAUTHORIZED ENTRY PROHIBITED.
WEAR PROTECTIVE EQUIPMENT.**

Post a similar sign in the language of the local dialect.

- .2 Sign letters: all lettering shall be HELVETICA Medium font. The letter size shall be:

English:

Caution, Asbestos Hazard Area.

25 mm

Unauthorized entry prohibited:

19 mm

Wear Protective Equipment

19 mm

1.13 Measurement for Payment

- .1 The removal, separation, packaging and disposal of asbestos from buildings, structures and facilities to be demolished will be measured for payment as described in Section 02222 – Demolition of Structures. Costs shall include:
 - .1 Supply of all materials, labour, and equipment necessary to perform the work in accordance with these specifications, including the supply and transport to the site of asbestos waste containers.
 - .2 Construction of temporary enclosures.
 - .3 Handling, separation and disposal of asbestos materials coated with PCB-amended paint.
 - .4 Preparation of asbestos inventory.
- .2 Include all indirect costs associated with the work described in this section as indicated in Clause 5.4 of Section 01110 – Summary of Work.

2 Products

2.1 Materials

- .1 For Type 3 asbestos abatement work, the following materials are required:
 - Personnel Protective Equipment (Outlined in Clause 1.7 of this Section.)
 - Polyethylene
 - Rip proof polyethylene
 - Wetting Agent
 - Asbestos Waste Receptors
 - Tape
 - Slow drying sealer
 - Sprayer
 - Electrical equipment
 - HEPA Vacuums
 - Negative Air Unit
- .2 For the optional Glove Bag Method, the following materials are required:
 - Personnel Protective Equipment (Outlined in Clause 1.7 of this Section.)
 - Glove bag
 - Polyethylene
 - Sprayers
 - Wetting agent
 - Amended Water
 - Asbestos Waste Receptors
 - Tape

- HEPA vacuum
- Securing straps
- Glove bag knife
- Slow drying sealer

3

Execution

- .1 Prepare an asbestos inventory for each building to be demolished. Identify, as applicable, location of asbestos, asbestos type (i.e. wall board, duct cloth, vermiculite and pipe insulation), and dimensions. Submit to the Engineer the asbestos inventory at the conclusion of asbestos removal operations.

3.1

Pipe and Duct Insulation Removal Using Glove Bag Method (Alternative)

- .1 The following procedures may be used for the removal of asbestos on pipe and ducting, as an alternative to the Type 3 Asbestos Removal procedures outlined in Clause 3.4 of this Section.
- .2 Glove Bag Method:
 - .1 Isolate Asbestos Work Area with tape, other barriers and with poster notices marking area as Asbestos Removal Area.
 - .2 Spray any areas of damaged jacketing with a mist of amended water. Tape over damage to provide temporary repair.
 - .3 Clean surface of pipe or minor amounts of fallen or damaged insulation by HEPA vacuuming or by damp wiping.
 - .4 Zip glove bag onto pipe and seal all openings to pipe with cloth securing straps. For valve bags, seal valve cover with wire tie or equivalent.
 - .5 Roll insulation carefully to minimize the possibility of ripping or puncturing glove bags. Arrange insulation in bag to obtain full capacity of bag.
 - .6 Insert nozzle of spray pump into bag through valve and wash down pipe and interior of glove bag thoroughly. Wet surface of insulation in lower section of bag and exposed ends of asbestos insulation remaining on pipe by spraying with water.
 - .7 If glove bag is to be removed from pipe for use on new section of pipe, seal interior plastic closure before removing from pipe. Re-install in new location before opening interior closure.
 - .8 If glove bag is to be moved along pipe, move bag, reseal to pipe using double-pull zipper to pass hangers. Repeat stripping operation.
 - .9 If glove bag is ripped, cut or opened in any way, cease work. If the rip, cut or opening is not easily repaired all workers in area shall put on protective clothing. All spilled material must be cleaned up and removed with HEPA vacuum.

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- .10 To remove bag after completion of asbestos removal, wash top section and tools thoroughly. Place all tools in one hand (glove), pull hand out inverted, twist to create a separate pouch and double tape to seal. Cut between tape and place pouch with tools in next glove bag or into a water bucket, open pouch underwater, clean, and then allow to dry.
 - .11 Pull 0.15 mm (6 mil) polyethylene bag over glove bag before removing from pipe. Remove securing straps. Unfasten zipper. Seal top of glove bag while removing from pipe.
 - .12 After removal of glove bag, ensure pipe is clean of all residue. If necessary, after removal of each section of asbestos, vacuum all surfaces of pipe, using HEPA filtered vacuum equipment or wipe with wet cloth. Ensure that surfaces are kept free of wet sludge which, after drying, could release asbestos dust into atmosphere.
 - .13 After asbestos has been removed from pipe, seal all pipe surfaces with slow drying sealer.
 - .14 Place cloths, mops, sponges, rags, wire brushes, disposable filters and protective clothing in double waste bags. Seal bags tightly.
 - .15 Vacuum all surfaces within work area including waste receptors, reusable equipment used to perform the work, shoes and soles of shoes.
 - .16 Thoroughly wash outside of respirators, eye protection, hard hats, hands and face.
 - .17 Dispose of asbestos wastes in an on site landfill in accordance with Clause 3.5 of this Section.
- .3 Optional Pipe Removal:
- .1 Remove 0.2 m of pipe insulation from lengths of pipe not exceeding 4 m using a Glove Bag Method.
 - .2 Clean and seal piping where asbestos was removed, and tape exposed insulation prior to removal of the glove bag.
 - .3 Cut each end of 4 m pipe section.
 - .4 Wrap pipe, with asbestos insulation intact, in two layers of 0.15 (6 mil) polyethylene and dispose in an on site landfill.
- .4 Cleanup:
- .1 Following the cleaning procedure specified above, and when air sampling shows that asbestos levels within the Asbestos Work Area do not exceed 0.05 fibres/cc, proceed with the final cleanup.
 - .2 Asbestos Work areas, Equipment Room, Decontamination Room, Shower Room and other enclosures that may be contaminated shall be included in the cleanup.
 - .3 Remove sealed bags, drums and all equipment used in the work from work areas, via the Material Decontamination Facility at an appropriate time in the cleaning sequence.

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- .4 Check to ensure that no dust or debris remains on surfaces as a result of dismantling operations. Air-monitor to ensure that asbestos levels in the building do not exceed 0.05 fibres/cc. Repeat cleaning using HEPA vacuum equipment, or wet cleaning methods where feasible, in conjunction with air sampling until levels meet this criteria.

3.2 Type 3 Asbestos Removal Procedures

- .1 The following procedures may be used for the removal of asbestos and as an alternative to the Glove Bag Method outlined in Clause 3.3 of this Section.
- .2 Preparation:
 - .1 Before beginning work, at each access to work area, install warning signs in accordance with Clause 1.12 of this Section.
 - .2 Before beginning work, remove visible dust from surfaces in the work area where dust is likely to be disturbed during the course of the work. Use HEPA vacuum, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate. Do not use compressed air to clean up or remove dust from any surface.
 - .3 Prevent the spread of dust from the work area using measures appropriate to the work to be done. Floors and walls need not be covered in buildings scheduled for demolition provided carpeting or other dust collecting materials are removed prior to work. Otherwise cover floor and wall surfaces with polyethylene sheeting sealed with tape. Use two layers of polyethylene on floors or one layer of rip-proof polyethylene. Cover floors first so that polyethylene extends at least 300 mm up walls, then cover walls to overlap floor sheeting.
 - .4 Seal off all openings such as corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting and seal with tape. Support polyethylene with wood framing, as required.
 - .5 Build triple contained decontamination enclosures at all entrances to and exits from work areas in accordance with Clauses 3.4.3 and 3.4.4 of this Section.
 - .6 Install a negative pressure system and operate continuously from the time the first polyethylene is installed to seal openings until final completion of the work including final clean up. Conduct monitoring of pressure difference between work area and remainder of building on a daily basis using an automatic recording instrument.

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- .7 After isolation of work area, remove heating, ventilating, and air conditioning filters, pack in sealed plastic bags, 0.15 mm minimum thickness, and treat as contaminated asbestos waste. Remove ceiling mounted objects such as lights, partitions, other fixtures not previously sealed off, and other objects that interfere with asbestos removal. Do not remove items which require disturbance of asbestos or ceilings or cladding enclosing asbestos until full protective measures are in place.
 - .8 Maintain emergency and fire exits from Work Areas, or establish alternative exits satisfactory to the Engineer.
 - .9 Where application of water is required for wetting asbestos-containing materials, shut off electrical power, provide ground fault interrupter circuits on power source for electrical tools and temporary lighting, in accordance with applicable CSA Standards. Ensure safe installation of electrical lines and equipment. After preparation of work areas and Decontamination Facilities, remove and dispose of ceiling panels, tiles and the entire suspension system within the work areas as contaminated asbestos waste.
 - .3 Decontamination Facilities:
 - .1 Prior to acquisition and installation of the Personnel and Material Decontamination Facilities, submit a general plan for the Facilities to the Engineer for review and approval. The submission shall demonstrate compliance with all codes and standards.
 - .4 Construction of Decontamination Facilities:
 - .1 Build suitable framing for Decontamination Facilities or use existing rooms where convenient, and line with polyethylene sheeting and seal with tape. Use two layers of polyethylene or one layer of rip-proof polyethylene on floors.
 - .2 Build curtained doorways between enclosures so that when people move through or when drums and equipment are moved through a doorway, one of the two closures comprising the doorway always remains closed.
 - .5 Maintenance of Enclosures:
 - .1 Maintain enclosures in tidy condition.
 - .2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
 - .3 Visually inspect enclosures at the beginning of each working period. Maintain a written record of inspections.
 - .4 Use smoke methods to test effectiveness of barriers when directed by Engineer.

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- .5 Do not commence asbestos removal or enclosure work until:
- .1 Arrangements have been made for disposal of waste.
 - .2 Work areas and decontamination enclosures and parts of the building remaining in use are effectively segregated.
 - .3 Tools, equipment and material waste receptors are on hand.
 - .4 Arrangements have been made for building security.
 - .5 Warning signs specified in Clause 1.13 of this Section are displayed where access to contaminated areas is possible.
 - .6 All notifications have been completed and other preparatory steps have been taken.
- .6 Asbestos Removal of Pipe, Vermiculite, and Duct Insulation:
- .1 Once preparation has been approved by Engineer, remove all asbestos-containing pipe insulation in layers, while maintaining all exposed surfaces of insulation or lagging in a wet condition. Full saturation of insulation will not be required if material is immediately bagged and not allowed to fall onto floor. Saturation of vermiculite insulation will not be required if material is immediately bagged.
 - .2 Remove the saturated asbestos material in small sections. Do not allow saturated asbestos to dry out. As it is being removed, pack the material in asbestos waste receptors for transport.
 - .3 Seal filled waste receptors and remove from immediate working area to Decontamination Room. Clean external surfaces thoroughly by wet sponging before moving to Holding Room. Place in second container and store in Holding Room pending removal to Transfer Room and outside. Ensure that waste receptors are removed from the Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.
 - .4 After completion of asbestos removal, wire brush and wet sponge all surfaces from which asbestos has been removed to remove all visible material. Keep surfaces wet during this work.
 - .5 Where Contractor determines that removal of asbestos-containing material is impossible due to obstructions such as structural members or major service elements or because asbestos-containing material was originally applied to asphaltic coating, provide written notification to the Engineer requesting approval for removal of obstructions prior to the complete removal of the asbestos-containing materials.
 - .1 All special provisions to be written instruction only.
 - .2 All care shall be taken to limit the extent of the work necessary to remove the obstruction.
 - .3 All obstructed waste is to be treated as asbestos waste unless direction to the contrary is given by the Engineer.
 - .6 Place cloths, mops, sponges, rags, wire brushes, disposable filters and protective clothing in double waste bags. Seal bags tightly.

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- .7 Vacuum all surfaces within work area including waste receptors, reusable equipment used to perform the work, shoes and soles of shoes.
 - .8 Thoroughly wash outside of respirators, eye protection, hard hats, hands and face.
 - .9 After Engineer has approved work, wash entire Asbestos Work Area including Equipment and Access Room, and equipment used in process. Floor and wall surfaces, ducts and similar items not covered with polyethylene sheeting must be completely washed with clean water. Following a further inspection and written acceptance, apply a slow drying sealer, at a minimum coverage rate of 12 m²/litre, to all surfaces from which asbestos has been removed. Apply a thinned coat (sufficient to coat all surfaces) to other surfaces in the Asbestos Work Area including all polyethylene and surfaces scheduled for demolition. Allow a minimum of 12 hours for fibre settling with no disturbance of Asbestos Work Area. Operate negative pressure air units during settling period.
 - .10 Dispose of asbestos wastes in accordance with Clause 3.3 of this Section.

3.3

Disposal

- .1 In preparation for disposal, adequately spray asbestos wastes (including asbestos wastes coated with PCB-amended paint prior to separation) with a wetting agent prior to bagging in two heavy duty, 0.15 mm polyethylene bags or other suitable impermeable containers. Take special care to prevent the bags or containers of asbestos material from puncturing during placement within the containers. Replace any bags or containers that are ripped or punctured during handling operations. Seal all waste filled bags or containers and provide identifying tags or labels clearly indicating the contents as being asbestos waste hazardous to human health. Exercise care to prevent bags or other containers from rupturing when being containerized and transported to the stockpile area. It is imperative that transportation of asbestos waste be conducted in a manner that does not release airborne asbestos fibres.
- .2 During demolition operations, separate PCB amended painted materials from asbestos containing materials including doors and mechanical insulation. Remove and dispose of PCB amended painted materials in accordance with Section 02090 – Hazardous Waste Material.
- .3 Transport double bagged non-painted asbestos wastes to the Non-Hazardous Waste Landfill for disposal.
- .4 Segregate asbestos waste in the landfill as described in Section 02315-Grading. Record location of asbestos wastes for inclusion on Record Drawings as indicated in Section 01770 – Closeout Procedures.

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- .5 Containerize PCB-amended painted materials separated from asbestos waste in accordance with Section 02222 – Demolition of Structures.
 - .6 Transport asbestos waste receptors to the Temporary Storage Area.
 - .7 Within the Temporary Storage Area, store asbestos waste receptors separately from other shipping containers.
 - .8 Stack waste receptor containers to a maximum of two waste receptors in a staggered arrangement.

3.4 Final Cleanup and Demobilization

- .1 Remove and containerize all asbestos waste at the work site.
- .2 Include work areas and all areas of decontamination facilities in cleanup procedures.
- .3 Vacuum and wash all asbestos control tools and equipment.
- .4 Dispose of all non-reusable materials and contaminated barrier sheeting materials, as asbestos waste. Wipe down barrier sheeting used to protect walls and floor, and spray barrier sheeting with sealer.
- .5 Remove polyethylene seals, tapes and enclosures, folding inwards and placing in double waste bags and into asbestos containers.
- .6 Conduct inspection with Engineer upon completion of abatement operations, to ensure no dust or debris remains.
- .7 Submit to the Engineer a detailed asbestos removal inventory which includes building source, component description and location in building.

Appendix A

Demolition Inventory

DEMOLITION REQUIREMENTS CAM-F: SARCPA LAKE							
Structure	Qty	Description	Hazardous Material	Building Contents (During Survey)	Systems (Mech.,Elect., Other)	Ref. Drawing	Remarks
Module Station	1	24 m L x 8.6 m W x 4.5 m H module station building on timber crib foundation. Wood frame construction.	PCB paint on interior surfaces. Asbestos on piping and water tanks. Minor quantities of liquid wastes, battery acid, used oil, fuel etc.	Miscellaneous furniture randomly stored. Sewage holding tank, lab supplies, day (fuel) fuel tanks, water tanks, metal cabinets, compressed gas tanks.	Some mechanical, pumps pipes, two days fuel tanks, water holding tank.	S01/S03	Approximately 50% of module train contains PCB amended paint or PCB impacted concrete.
Garage	1	12.6 m L x 8.9 m W x 6.6 m H on concrete footings. Structural steel braced frame with corrugated sheet steel reflector surface.	PCB paint on scrap aluminum cladding. Stained concrete with PCBs, minor quantities of waste oil and lubricants.	Scrap steel and metal cladding. Scrap wood, some structural steel, barrels cement mixer. Small shed.	None	S01	Garage partially disassembled. Small shed inside Garage frame.
Warehouse	1	12.6 m L x 8.9 m W x 6.6 m H on concrete footings. Structural steel braced frame with corrugated sheet steel reflector surface.	PCB Amended Paint: Floor and Walls	Minor amounts of misc. scrap wood and metal.	Two 1,080 L fuel tanks.	S01/S02	Paint on two day use fuel tanks. PCB amended paint on concrete floor and interior plywood.

DEMOLITION REQUIREMENTS CAM-F: SARCPA LAKE							
Structure	Qty	Description	Hazardous Material	Building Contents (During Survey)	Systems (Mech.,Elect., Other)	Ref. Drawing	Remarks
Inuit House	1	8.7 m L x 4.9 m W x 3.5 m H wood frame construction on timer crib foundation. Exterior corrugated sheet metal and/or fibreglass sheathing.	PCB Amended Paint: Walls	Miscellaneous furniture randomly stored.	None.	S01/S04	Interior painted surfaces with PCB and lead in paint.
POL Tanks and Pump house	2	20,000 US Gallon capacity. 5.5 m H. x 4.9 m D on concrete slab foundation	PCB Amended Paint: exterior tank surface		Mechanical pumps and piping.	S04/S05	Exterior surface painted with PCB amended paint.
Quonset	1	4.4 m x 7.6 m x 2.4 m wood frame Quonset style with insulated plywood and canvas covering on timber skid foundation.	Asbestos (in double bags)	12 m ³ of asbestos waste in bags	None	S01/S02	Small fuel tank.

ASBESTOS INVENTORY TABLE CAM-F: SARCPA LAKE¹

Structure	System	Location	Asbestos Pipe Insulation	Asbestos Insulation	Asbestos Tile
Module Station	Piping	Mechanical rooms	10 lineal metres		
	Insulation	Walls		12 m ²	
	Heating jacket around boiler	Boiler		2 m ²	
	Tiles	Floor			129 m ²
Warehouse	Piping		6 lineal metres		
	Insulation	Walls		8 m ²	
	Tiles	Floor			25 m ²
Quonset	Waste from Module Train abatement 1996	bags		12 m ³	

Notes: ¹ Based on Earth Tech Canada 2004 Phase III Environmental Site Assessment and Waste Audit.

Appendix B
PCB-Amended Painted Material Disposal Requirements

DEMOLITION REQUIREMENTS FOR CAM-F SARCPA LAKE

Structure	Major Components ¹	Construction Material	Disposal Requirements		Remarks
			Landfill	Containerize	
Module Station	Foundations	Wood	✓		
	Exterior wall, ceiling/roof and floors – primed and non painted components	Wood, metal and insulation	✓		
	Interior plywood	Wood		✓	PCB paints on interior plywood 940 m ² to containerize.
	Interior walls, partition, doors, accessories	Wood and metal	✓		Asbestos core doors.
	Floors in tank room and power room	concrete		✓	Top 1 cm of concrete to be removed from 5 m ² .
	Mechanical, electrical equipment	Metal	✓		Some asbestos removal required
	Piping, various, compressed gas cylinders	Metal	✓		Some asbestos removal required
	Fuel Tanks	Metal	✓		PCB paints 4 m ² to containerize.
	Ducting	Metal	✓		
Garage	Structure and building envelope	Metal and other	✓		
	Exterior metal cladding	Metal		✓	PCB paints on interior cladding 70 m ² to containerize.

Demolition Disposal Requirements
for Painted Major Components

Structure	Major Components ¹	Construction Material	Disposal Requirements		Remarks
			Landfill	Containerize	
	Interior metal cladding	Metal		✓	PCB paints on interior cladding 40 m ² to containerize.
	Scrap steel, parts, metal cladding	Metal and other	✓		
	Floor	Paint on concrete		✓	Top 1 cm of concrete to be removed from 40 m ² .
Warehouse	Structure and building envelope	Wood and metal	✓		
	Interior plywood	Wood		✓	PCB paints on interior plywood 90 m ² to containerize.
	Interior walls, partition, doors, accessories	Wood and metal	✓		Asbestos core doors.
	Floor	Paint on concrete		✓	Top 1 cm of concrete to be removed from 120 m ² .
	Steps	Wood	✓		
	Piping	Metal	✓		
	Fuel tanks	Steel		✓	PCB paints on exterior of tank 4 m ² to containerize.
Inuit House	Foundations	Wood	✓		
	Exterior wall, ceiling/roof and floors – primed and non painted components	Wood, metal and insulation	✓		

Structure	Major Components ¹	Construction Material	Disposal Requirements		Remarks
			Landfill	Containerize	
	Interior plywood	Wood		✓	PCB paints on interior plywood 100 m ² to containerize.
	Interior walls, partition, doors, accessories	Wood and metal	✓		Asbestos core doors.
POL Tanks and Pumphouse	Tank, pump house, piping, foundation.	Steel and insulation	✓		
	Paint on exterior of tank	Steel		✓	PCB paints on exterior of tank 300 m ² to containerize.
Quonset	Walls, floor, roof, timber crib foundation	Metal, wood, canvas and other	✓		12 m ³ of asbestos waste stored in building

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1. For components not listed in the table, assume that materials are to be landfilled unless otherwise directed by Engineer.

Appendix C

Demolition and Site Photographs

PHOTOGRAPHIC RECORDS



Photo 1: Module Station view south.



Photo 2: Module Station, fuel tanks inside generator room.

PHOTOGRAPHIC RECORDS



Photo 3: Stain NW of Station view north.



Photo 4: Warehouse view north east towards Module Station.

PHOTOGRAPHIC RECORDS



Photo 5: Warehouse fuel tanks.



Photo 6: Garage view looking north.

PHOTOGRAPHIC RECORDS



Photo 7: Garage view looking west.



Photo 8: Vehicle debris area south of garage view west.

PHOTOGRAPHIC RECORDS



Photo 9: West Barrel Cache view south east towards Station.



Photo 10: West Barrel Cache view northwest.

PHOTOGRAPHIC RECORDS



Photo 11: POL tanks view northwest.



Photo 12: Construction camp equipment and debris.

PHOTOGRAPHIC RECORDS



Photo 13: Dump A view south; debris removed and stockpiled in 1996/97.



Photo 14: Dump A stockpiled debris and wrangler bags.

PHOTOGRAPHIC RECORDS



Photo 15: Dump B view east on bench below POL tanks.



Photo 16: Dump B view west; POL tanks in background.

PHOTOGRAPHIC RECORDS



Photo 17: Equipment and debris north of Dump B area.



Photo 18: Domestic refuse and empty barrels.

PHOTOGRAPHIC RECORDS



Photo 19: Quonset building.



Photo 20: Asbestos containing materials inside Quonset building.

Appendix D

Geotechnical Information

Boulders are present throughout the site and borrow areas. Development of the borrow areas will require sorting of the borrow material to remove the boulders from the fill material prior to placement.

Table 4 summarizes estimated borrow materials available at the CAM-F DEW Line Site.

TABLE 4
SUMMARY OF CAM-F DEW LINE SITE GRANULAR BORROW SOURCES

Borrow Area	Available Granular Fill Type	Quantity Estimate			Comments
		Area (m ²)	Excavation Depth (m)	Volume (m ³)	
Borrow Area 1	Types 2, 3 and 4	83,000	0.3	24,900	Developed area.
Borrow Area 2	Types 2, 3 and 4	106,000	0.5	53,000	Undeveloped area
Borrow Area 3	Type 1	7,500	0.4	3,000	Developed area and
	Types 2 and 3	22,000	0.5	11,000	Undeveloped area.
	Types 2, 3, and 4	13,500	0.5	6,750	
Borrow Area 4	Types 2, 3 and 4	84,000	0.5	42,000	Developed area.
Borrow Area 5	Types 2, 3 and 4	128,000	0.5	64,000	Undeveloped area
Borrow Area 6	Types 5 and 6	Stockpile		1,000	Developed area.
Borrow Area 7	Types 2, 3, 4, 5, and 6	100,000	1.0	100,000	Developed area.

7.0 AIRSTRIP EVALUATION

The CAM-F airstrip is in poor condition. The airstrip is relatively soft and portions are covered with loose gravel. The First Air chief pilot inspected the runway in the mid 1990's and concluded it was only suitable for small aircraft.

Three test pits (TP-04-01 to 04-03) were excavated along the runway length to evaluate the surfacing structure at the CAM-F airstrip. A sand and gravel layer of 600 mm thickness was encountered over a silty gravel and sand till with a high percentage of sand and gravel in Testpits TP-04-01 and TP-04-02. Silty gravel and sand till was encountered

**CAM-F (SARCPA LAKE) DEW LINE SITE
2004 SITE INVESTIGATION
TESTPIT LOGS**

Testpit	Depth (m)	Description
TP-04-01		<u>Airstrip (northwest end, south crest)</u>
	0.0	GRAVEL and SAND – trace silt, some cobbles, occasional boulders, medium to coarse grained sand, maximum aggregate size 300 mm, sub-angular to rounded, damp, brown (Sample at 0.0 – 0.6, Sieve - Gravel = 53%, Sand = 44%, Silt/Clay = 3% M.C. = 4.7%)
	0.6	GRAVEL AND SAND (TILL) – some silt to silty, some clay, trace to some cobbles, subangular to rounded, wet, grey
	0.6	Water seepage (Sample at 0.8 – 1.0, M.C. = 11.7%)
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-02		<u>Airstrip (middle, south crest)</u>
	0.0	GRAVEL and SAND – trace silt, some cobbles, occasional boulders, well graded, maximum aggregate size 450 mm, sub-angular to rounded, damp, brown
	0.6	SAND (TILL) – silty, gravelly, trace clay, trace to some cobbles, subangular to rounded, grey
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-03		<u>Airstrip (southeast end, south crest)</u>
	0.0	SAND (TILL) – silty, gravelly, trace clay, trace to some cobbles, occasional boulder, subangular to rounded, maximum aggregate size 450 mm, damp, grey (Sample at 0.0 – 0.5, Sieve - Gravel = 25%, Sand = 39%, Silt = 26%, Clay = 10%, M.C. = 8.6%)
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-04		<u>Borrow Area 2 (east portion, south road edge)</u>
	0.0	ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, gravelly, trace to some clay, trace to some cobbles, occasional boulders, subangular to rounded, maximum aggregate size 450 mm, wet, grey (Sample at 0.3 – 0.5, M.C. = 9.0%)
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-05		<u>Borrow Area 2 (east portion, south road edge)</u>
	0.0	ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, gravelly, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, wet, grey (Sample at 0.3 – 0.4, M.C. = 9.4%)
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST

Testpit	Depth (m)	Description
TP-04-06		<u>West Access Road (north road edge)</u>
	0.0	ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace cobbles, subangular to rounded, damp, grey
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-07		<u>West Access Road (north road edge)</u>
	0.0	ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, occasional boulders, subangular to rounded, maximum aggregate size 300 mm, damp, grey (Sample at 0.8 – 0.9)
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-08		<u>Borrow Area 4 (west portion, south road edge)</u>
	0.0	ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 400 mm, damp, grey (Sample at 0.3 – 0.4, M.C. = 7.5%) (Sample at 0.9 – 1.0, M.C. = 7.3%)
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-09		<u>Borrow Area 4 (west portion, south road edge)</u>
	0.0	ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, moist to damp, grey (Sample at 0.4 – 0.5, M.C. = 6.6%) (Sample at 0.9 – 1.0, M.C. = 7.6%)
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-10		<u>Borrow Area 4 (centre portion, south road edge)</u>
	0.0	ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, some clay, trace to some cobbles, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-11		<u>Borrow Area 4 (centre portion, south road edge)</u>
	0.0	SAND (TILL) – silty, gravelly, trace to some clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 450 mm, damp, grey (Sample at 0.5 – 0.6, M.C. = 8.2%)
	1.1	END OF TESTPIT – REFUSAL ON BOULDER

Testpit	Depth (m)	Description
TP-04-12	0.0	<u>Borrow Area 4 (east portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp, grey
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-13	0.0	<u>Borrow Area 4 (east portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, damp to wet, grey
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-14	0.0	<u>Borrow Area 4 (centre portion, south road edge)</u> ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, gravelly, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 400 mm, moist, grey
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-15	0.0	<u>Borrow Area 5 (west portion, south road edge)</u> ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 500 mm, damp to wet, grey (Sample at 0.5 – 0.6, M.C. = 8.4%)
	1.25	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-16	0.0	<u>Borrow Area 5 (centre portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, subangular to rounded, damp, grey (Sample at 0.6 – 0.7, M.C. = 8.1%)
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-17	0.0	<u>Borrow Area 5 (centre portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 400 mm, damp, grey
	0.6	END OF TESTPIT – REFUSAL ON BOULDER
TP-04-18	0.0	<u>Borrow Area 5 (centre portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 250 mm, damp, grey (Sample at 0.4 – 0.8, M.C. = 7.4%)
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST

Testpit	Depth (m)	Description
TP-04-19	0.0	<u>Borrow Area 5 (east portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp, grey
	1.25	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-20	0.0	<u>Borrow Area 5 (east portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, subangular to rounded, damp, grey (Sample at 0.5 – 0.6, M.C. = 8.7%)
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-21	0.0	<u>Borrow Area 2 (west portion, offset from south road edge)</u> ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, occasional boulders, subangular to rounded, damp to wet, grey
	0.4	Moisture content increases with depth
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-22	0.0	<u>Borrow Area 2 (east portion, offset from south road edge)</u> ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace clay, some cobbles, occasional boulders, subangular to rounded, damp to wet, grey
	1.1	END OF TESTPIT – REFUSAL ON BOULDER
TP-04-23	0.0	<u>Borrow Area 2 (east portion, offset from south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, occasional boulders, subangular to rounded, maximum aggregate size 250 mm, damp to wet, grey
	1.0	END OF TESTPIT – REFUSAL ON BOULDER
TP-04-24	0.0	<u>Borrow Area 2 (centre portion, offset from south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, occasional boulders, subangular to rounded, damp, grey
	1.1	END OF TESTPIT – REFUSAL ON BOULDER
TP-04-25	0.0	<u>Borrow Area 2 (west portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp, grey
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-26	0.0	<u>Borrow Area 2 (west portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	1.15	END OF TESTPIT – REFUSAL ON PERMAFROST

Testpit	Depth (m)	Description
TP-04-27	0.0	<u>Borrow Area 2 (west portion, south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 400 mm, damp, grey (Sample at 0.4 – 0.5, M.C. = 8.0%)
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-28	0.0	<u>Borrow Area 2 (centre portion, offset from north road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp to wet, grey
	1.1	END OF TESTPIT – REFUSAL ON BOULDER
TP-04-29	0.0	<u>Borrow Area 2 (west portion, offset from north road edge)</u> ORGANICS – rootlets
	0.1	SAND (TILL) – silty, gravelly, some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, wet, grey (Sample at 0.5 – 0.6, M.C. = 9.7%)
	1.15	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-30	0.0	<u>Borrow Area 4 (west portion, offset from south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace cobbles, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	0.5	Moisture Content increases with depth
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-31	0.0	<u>Borrow Area 4 (center portion, offset from south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace cobbles, subangular to rounded, maximum aggregate size 200 mm, damp, grey
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-32	0.0	<u>Borrow Area 4 (center portion, offset from south road edge)</u> ORGANICS – rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp, grey
	1.15	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-33	0.0	<u>Borrow Area 4 (east portion, offset from south road edge)</u> GRAVEL AND SAND (TILL) – silty, trace to some clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST

Testpit	Depth (m)	Description
TP-04-34		<u>Borrow Area 5 (west portion, offset from north road edge)</u>
	0.0	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 250 mm, damp to wet, grey
	1.1	Water infiltration
	1.15	END OF TESTPIT – REFUSAL ON COBBLES
TP-04-35		<u>Borrow Area 5 (west portion, offset from north road edge)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, subangular to rounded, maximum aggregate size 200 mm, damp, grey (Sample at 0.4 – 0.5, M.C. = 9.3%)
	1.0	END OF TESTPIT – REFUSAL ON COBBLES
TP-04-36		<u>Borrow Area 5 (west portion, offset from south road edge)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 200 mm, damp to wet, grey
	0.9	Water infiltration
	0.9	END OF TESTPIT – REFUSAL ON BOULDERS
TP-04-37		<u>Borrow Area 5 (west portion, offset from south road edge)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND (TILL) – silty, trace to some clay, trace to some cobbles, trace boulders, subangular to rounded, maximum aggregate size 250 mm, damp to wet, grey
	1.0	Water infiltration
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-38		<u>Borrow Area 5 (west portion, offset from south road edge)</u>
	0.0	ORGANICS - rootlets
	0.05	SAND (TILL) – silty, gravelly, trace clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 250 mm, damp to wet, grey
	1.0	Water infiltration
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-39		<u>Debris Landfill 2 (west portion)</u>
	0.0	SAND and SILT (TILL) – gravelly, some clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp to wet, grey
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST

Testpit	Depth (m)	Description
TP-04-40		<u>Debris Landfill 2 (centre portion)</u>
	0.0	ORGANICS - rootlets
	0.1	SAND and SILT (TILL) – gravelly, some clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 250 mm, damp to wet, grey
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-41		<u>Debris Landfill 2 (east portion)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND (TILL) – silty, some clay, trace cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp to wet, grey
	1.2	Water infiltration (Sample at 0.3 – 0.4, M.C. = 15.6%)
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-42		<u>Debris Landfill 1 (at pt/211 of 1996 layout)</u>
	0.0	ORGANICS - rootlets
	0.05	SAND (TILL) – silty, gravelly, some clay, trace cobbles, subangular to rounded, wet, grey (Sample at 0.2 – 0.3, M.C. = 9.7%) (Sample at 0.8 – 0.9, M.C. = 9.7%)
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-43		<u>Old Camp Area (south portion)</u>
	0.0	ORGANICS - rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-44		<u>Old Camp Area (south portion)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND – trace silt, some cobbles, medium to coarse grained sand, subangular to subrounded, maximum aggregate size 200 mm, wet, brown
	0.4	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-45		<u>Old Camp Area (north portion)</u>
	0.0	ORGANICS - rootlets
	0.15	GRAVEL and SAND – cobbly, trace silt, well graded, subangular to subrounded, maximum aggregate size 250 mm, damp to wet, dark brown
	0.3	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp, grey
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST

Testpit	Depth (m)	Description
TP-04-46		<u>Old Camp Area (north portion)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 450 mm, moist, grey
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-47		<u>Old Camp Area (south portion)</u>
	0.0	ORGANICS - rootlets
	0.05	GRAVEL AND SAND –cobbly, trace silt, well graded, subangular to subrounded, maximum aggregate size 300 mm, damp to wet, dark brown
	0.6	Water infiltration
	1.0	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-48		<u>Old Camp Area (south portion)</u>
	0.0	ORGANICS - rootlets
	0.05	GRAVEL AND SAND – some cobbles, trace silt, well graded, subangular to subrounded, maximum aggregate size 250 mm, damp to wet, dark brown
	0.65	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, trace boulders, subangular to rounded, maximum aggregate size 300 mm, damp, grey (Sample at 0.4 – 0.5)
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-49		<u>Old Camp Area (south portion)</u>
	0.0	ORGANICS - rootlets
	0.05	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	1.1	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-50		<u>Old Camp Area (north portion)</u>
	0.0	ORGANICS – cobbles, rootlets
	0.15	GRAVEL and SAND –cobbly, trace silt, well graded, subangular to subrounded, maximum aggregate size 250 mm, damp, dark brown
	0.6	GRAVEL AND SAND (TILL) – silty, trace to some clay, some cobbles, subangular to rounded, maximum aggregate size 250 mm, damp, grey
	1.2	END OF TESTPIT – REFUSAL ON PERMAFROST
TP-04-51		<u>Borrow Area 3 (north portion, east of access road)</u>
	0.0	SAND and SILT (TILL) – gravelly, some clay, trace cobbles, occasional boulder, subangular to rounded, low plasticity, damp to wet, grey (Sample at 0.3 – 0.4)
	0.85	Gravel content increases
	1.0	END OF TESTPIT

Testpit	Depth (m)	Description
TP-04-52		<u>Borrow Area 3 (north portion, west of access road)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND (TILL) – silty, some clay, trace cobbles, occasional boulder, subangular to rounded, damp, grey (Sample at 0.3 – 0.45)
	0.85	END OF TESTPIT
TP-04-53		<u>Borrow Area 3 (south portion, east of access road)</u>
	0.0	ORGANICS - rootlets
	0.1	GRAVEL AND SAND (TILL) – silty, some clay, some cobbles, trace boulders, fine grained sand, subangular to rounded, damp, brown (Sample at 0.1 – 0.4)
	0.6	END OF TESTPIT
TP-04-54		<u>Borrow Area 3 (south portion, west of access road)</u>
	0.0	ORGANICS - rootlets
	0.1	SAND AND GRAVEL (TILL) – some silt, trace clay, some cobbles, trace boulders, fine grained sand, subangular to rounded, damp, brown (Sample at 0.4 – 0.5)
	1.0	END OF TESTPIT

**1996 SITE INVESTIGATION (AUGUST 3 TO AUGUST 6)
TESTPIT LOGS**

TP1 West Sarcpa Lake Borrow Area - Small Stockpile at east end of area

0.0 Sand (SW), some gravel, some cobbles, well graded, moist, brown (moisture content 3.6%)

0.4 End of testpit

TP2 West Sarcpa Lake Borrow Area - Native ground adjacent to stockpile at west end of area

0.0 Peat, organics, roots, grass, moist, brown

0.05 Sand and Silt (SW), some gravel, trace cobbles, moist, brown (moisture content 9.3%)

0.4 End of testpit

TP3 Borrow Area at Northwest end of Airstrip

0.0 Silt (Till), sandy, trace gravel, trace clay, trace cobbles, some boulders in vicinity (moisture content 8.3%)

0.3 End of testpit - Refusal on cobble

TP4 Dump A - south east of landfill boundary

0.0 Peat, organics roots, grasses, black, moist

0.05 Silt, sandy, trace clay, trace gravel, some cobbles and boulders in vicinity, wet, brown (moisture content 14.1%)

0.50 End of testpit

TP5 Dump A - east of landfill boundary

- 0.0 Organics, grasses, mosses roots - 6 mm diameter cable buried and intertwined with organic mat
- 0.02 Sand, silty, trace clay, trace gravel, wet, brown (boulders on surface nearby to testpit.
- 0.5 End of testpit - refusal on 200 mm diameter cobble.

Note: scattered debris on ground surface nearby to testpit

TP6 Dump A - 5 m south of landfill grid, up on slope crest

- 0.0 Organics, grasses, roots, blackish brown, moist
- 0.05 Sand, silty, fine grained, trace gravel, dry, brown
- 0.30 Cobble, 250 mm diameter
- 0.50 End of testpit

TP7 Borrow Area - South, Central Airstrip

- 0.0 Sand & Silt (Till), trace gravel, trace clay, occasional boulder, in the area (moisture content 5.7%)
- 0.50 End of testpit - refusal on cobble

Note: Some bedrock outcrops in area

TP8 Borrow - Northeast End of Airstrip

- 0.0 Sand & Gravel (Till), silty, some clay, well graded occasional boulder, in the area (moisture content 5.6%)
- 0.50 End of testpit

TP9 East End of Airstrip - Airstrip Surfacing Material

- 0.0 Sand & Gravel (Till), some silt, 50 mm minus (moisture content 4.3%)
- 0.3 End of testpit

Note: some 150 mm cobbles in airstrip surface material

TP10 Proposed Landfill Adjacent to fallen Tower

- 0.0 Organics, peat, grasses, mosses
- 0.10 Gravel, trace sand, 50 mm maximum, wet
- 0.15 Silt and Sand, very wet, grey
- 0.40 End of testpit, hole sloughing in

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TP11 Borrow - East of Station

- 0.0 Sand & Gravel (Till), silty, some clay, trace cobbles, well graded, moist, brown (moisture content 7.3%, salinity 1ppt)
- 0.90 Bedrock
- 0.90 End of testpit

TP12 Borrow - East of Station

- 0.0 Sand & Gravel (Till), silty, some clay, some cobbles and boulders, well graded, moist, brown
- 0.90 End of testpit - Note small Kubota excavator had difficult excavating due to cobbles and boulders

TP13 Borrow - East of Station

- 0.0 Sand & Gravel (Till), silty, some clay, some cobbles and boulders, well graded, moist, brown
- 0.75 End of testpit - Note small Kubota excavator had difficult excavating due to cobbles and boulders

TP14 Borrow - East of Station

- 0.0 Sand & Gravel (Till), silty, some clay, some cobbles and boulders, well graded, moist, brown
- 0.20 Boulder, 500 mm diameter
- 0.75 Bedrock
- 0.75 End of testpit - Note small Kubota had difficult excavating due to cobbles and boulders

TP15 Potential Landfill - Old Camp

- 0.0 Sand & Gravel, silty, trace clay, trace cobbles, moist, brown (moisture content 6.3%)
- 0.40 End of testpit

Note: Some boulders in area

TP16 Potential Landfill - Old Camp

- 0.0 Sand & Gravel (SM), silty, trace clay, trace cobbles, moist, brown (moisture content 9.3%)
- 0.40 End of testpit

Note: Some boulders in area

TP17 Sand and Gravel Stockpile at Old Camp

- 0.0 Sand & Gravel (GP) trace silt, 100 mm max, clean, moist, pinkish brown (moisture content 1.4%)
- 0.4 End of testpit

TP18 Below Dump B

- 0.0 Organics, grasses, mosses roots
- 0.05 Sand, silty, some gravel, well graded wet, grey brown (boulders and cobbles on surface nearby to testpit.
- 0.4 End of testpit - refusal on 200 mm diameter cobble.

Note: Depths in metres

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