

Indian and Northern Affairs -
Clinton Creek Channel Stabilization

MN-012/DA
159

SPECIFICATIONS

JOB NO. 4440 042 02 01

DATE August 22, 2002

INDIAN AND NORTHERN AFFAIRS CANADA
SPECIFICATIONS FOR
CLINTON CREEK CHANNEL STABILIZATION
AT THE
CLINTON CREEK MINE SITE, YUKON TERRITORY



UMA Engineering Ltd.
Engineers and Planners

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Material Suppliers

The list of material suppliers we intend to use on the Work is as follows:

<u>Material</u>	<u>Supplier</u>
Geotextile	_____
Gabion Baskets	_____
Gabion Mat	_____
Other:	
_____	_____
_____	_____
_____	_____

Equipment Schedule

The equipment we intend to use on the Work is as follows:

Excavation _____

Backfilling _____

Compaction _____

Trucking _____

Other:

Sub-Contractors

The list of Sub-Contractors (if any) we intend to use on the Work is as follows:

<u>Description of Work</u>	<u>Subcontractor</u>	<u>Address</u>
Excavation and Backfill:	_____	_____
Material Delivery (Trucking):	_____	_____
Gabion Drop Structure Construction:	_____	_____
Other:	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Schedule of Work

FOR: CLINTON CREEK CHANNEL STABILIZATION,
CLINTON CREEK MINE SITE, YUKON TERRITORY

Items of Work	Percentage of Work Completed				
	Start Date 0%	25%	50%	75%	Completion 100%
1) Site Preparation					
2) Lake Diversion/Siphon					
3) Material Processing					
4) Channel Grading					
5) Gabion Drop Structures					
6) Hudgeon Lake Outlet Stabilization					

CONTRACTOR'S PROPOSED COMMENCEMENT DATE _____ 20

Estimated Material Quantities

Item	Description	Quantity	Unit
1.	Gabion Baskets	500	per basket
2.	Gabion Mats	1	per mat
3.	Non-Woven Geotextile	3000	square metres
4.	Gabion Fill	750	cubic metres
5.	Channel Fill	7200	cubic metres
6.	Channel Rip rap	400	cubic metres
7.	Side Slope Grading	3000	cubic metres

Clinton Creek Channel Stabilization

UNIT PRICES					
ITEM NO.	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Demobilization and Preparation of Work Areas	L.S.	1		
2	Channel Rip Rap and Gabion Fill List of equipment and rates:	hourly basis			
3	Geotextile	m ²	3000		
4	Channel Excavation and Backfilling List of equipment and rates:	hourly basis			
5	Gabion Drop Structures				
5.a	Supply and delivery	L.S.	1		
5.b	Construction of gabion drop structures	per unit	500		
6	Hudgeon Lake Outlet Stabilization and Fjord Crossing	L.S.	1		
TOTAL BID PRICE (GST extra) (in figures)				\$ _____	
(in words)					

Name of Bidder

SP:1 CLINTON CREEK CHANNEL STABILIZATION

This Specification covers all aspects of the channel stabilization work.

1.1 General Information

The purpose of the work is to mitigate the potential for a breach of the outlet from Hudgeon lake which could result in flash flooding in the Clinton Creek Valley downstream of the mine site. The work involves stabilization of the outlet and a short portion of the Clinton Creek channel immediately downstream of the outlet.

1.2 Description of Work

The intent of the work is to stabilize the outlet from Hudgeon Lake and upto 150 metres of the channel downstream of the outlet. The outlet will be stabilized by removing the existing culverts and placing a 0.3 metre thick gabion mat over the outlet to minimize the potential for erosion. A fjord crossing will be constructed just upstream of the gabion mat. Downstream of the outlet upto four (4) gabion drop structures will be built to flatten the grade of the channel between the drop structures. The drop structures will be constructed using gabion baskets filled with clean rock. The existing channel will be filled as required to construct the drop structures.

The water elevation in Hudgeon Lake must be maintained at a level close to or below the level measured at the onset of construction. In any case, the lake levels shall not be permitted to rise to an elevation that jeopardizes the stability of the outlet. To facilitate construction, the flow from Hudgeon Lake shall be diverted around the work area using a pipe siphon of sufficient capacity to maintain the lake level and provide a minimum flow of about 0.2 cubic metres per second. The work should proceed in a manner that flow can be temporarily increased by using more siphons or be temporarily re-instated into the channel to account for increased flows from the lake as a result of precipitation events.

1.3 Regulations

All activities shall be conducted in accordance with all applicable Federal, Territorial, and local. Indian and Northern Affairs – Canada (DIAND) – Waste Management Program, Yukon Region, is identified as the Project Authority, and is conducting this work under the authority of the Yukon Waters Act. DIAND authorizes its designated agents, contractors, employees etc. to access the site and implement the described construction works and other activities directly associated with this project. The Contractor shall be responsible for conducting the work in accordance with all Labour, Workers Compensation and any and all other applicable regulations.

1.4 Materials

The Contractor shall be responsible for the supply of all materials. It is expected that delivery of the gabion baskets, gabion mat and geotextile will likely take about 10 to 14 days. Potential granular borrow areas have been identified near the confluence of Clinton and Wolverine Creeks. Any geotextile and gabion materials purchased for this work but not used during construction shall be returned to the Owner (INAC) for later use. The materials shall be stored at a location defined by the Owner (INAC).

1.4.1 Handling and Storage of Materials

All material shall be handled, stored, and/or stockpiled in a careful and workmanlike manner.

1.4.2 Approval

Materials supplied under this Specification shall be subject to inspection by the Contract Administrator. A representative sample of all granular materials will be submitted to the Contract Administrator prior to placement.

1.4.3 Geotextile

The geotextile shall be a non-woven AMOCO 4510, ARMTEC 300 or an approved equal that meets the following specifications:

PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUE
Puncture Resistance	ASTM D-4833	670 Newtons
Mullen Burst Strength	ASTM D-3786	3,400 kilopascals
Grab Tensile Strength	ASTM D-4632	1,100 Newtons
Permeability	ASTM D-4491	0.30 centimetres per second
UV Resistance	ASTM D-4355*	70 percent @ 500 hrs.**

* Fabric Conditioned as per ASTM D-4355

** Percent of Minimum Grab Tensile After Conditioning

1.4.4 Gabion Baskets and Mats

The gabion baskets and mats shall be manufactured by Maccaferri Canada Ltd. and shall be made of PVC coated, galvanized wire. The size of the gabion baskets for the drop structures shall be 0.5m x 1.0m x 3.0m. The gabion mat size shall be 0.3m x 3.0m x 30.0m

1.4.5 Channel Fill

Channel fill material will be well graded and free of deleterious material, and **unfrozen**.

Channel fill shall conform to the following gradation:

Equivalent Stone Diameter		Gradation Limits Percent Passing by Weight
Metric Sieve (mm)	U.S. Standard	
150	6 inch	100
100	4 inch	75-90
25	1 inch	50 max

1.4.6 Channel Rip Rap and Gabion Fill

The channel rip-rap and gabion fill materials shall consist of hard, dense, durable rock fragments or field stone free from cracks, seams, or other defects that would tend to increase their susceptibility to destruction by water and frost.

The channel rip rap and gabion fill shall conform to the following gradation:

Equivalent Stone Diameter		Gradation Limits Percent Passing by Weight
Metric Sieve (mm)	U.S. Standard	
200	8 inch	100
150	6 inch	50
75	3 inch	0

1.5 Construction Requirements

1.5.1 Construction Sequencing

The work shall be completed in a sequence mutually agreed upon by the Contractor and the Contract Administrator, except that the flow from Hudgeon Lake must be diverted around the work area before any channel earth work is initiated.

1.5.2 Preparation of Work Areas

The Contractor shall prepare the work areas as necessary to complete the specified work. Work platforms or benches may be prepared on the south side and north side of the Clinton Creek channel, if required. Spoil material from this operation may be used as channel fill.

1.5.3 Hudgeon Lake Flow Diversion

The contractor shall be responsible for the design and construction of a suitable cofferdam and siphon to allow the flow from Hudgeon Lake to be diverted around

the work area. The proposed cofferdam and siphon construction shall be reviewed at the pre-construction meeting.

The level of Hudgeon Lake will be monitored daily. Should the lake level begin rising it may be necessary to temporarily re-instate flow in the channel to draw the lake down or the addition of more siphoning capacity may be required. At no time shall the Contractor allow the lake level to rise to a point that overtopping of the cofferdam or lake outlet is imminent or jeopardizes the stability of the cofferdam or the lake outlet.

1.5.4 Gabion Drop Structure Construction

The location of the gabion drop structures on the drawings is approximate. Final locations will be determined in the field based on survey data and constructability issues.

(1) Preparation of Structure Base

Where the gabions are placed in a cut area, level any ridges left from excavation and fill in the low spots. Compact the surface until the finished surface is smooth, level and conforms to the design outline.

Where the gabions are placed in a fill area, place the channel fill material in lifts not exceeding 200mm. Compact the fill in accordance with SP: 1.5.6 or to the satisfaction of the Contract Administrator. The finished grade shall be smooth, level and conform to the design outline.

Place the geotextile on the finished surface as shown on the drawings and in the manner described under SP:1.5.5 Geotextile Placement.

(2) Drop Structure Assembly

Assembly of the gabion baskets shall be done in accordance with the manufacturer's installation instructions. Stainless steel rings, at 80 to 120mm spacing, shall be used to interconnect and close the baskets.

For each tier of the drop structure, start by assembling and placing the gabion baskets on the horizontal structure floor. Install the lowest row of gabion baskets on the side slopes before starting the placement of gabion fill in the baskets on the structure floor. Complete the filling and closing of the gabion baskets on the structure floor before placing the remaining baskets on the side slopes. Fill and close the gabions on the side slopes.

Before placing the baskets for the next highest tier, pull the geotextile up so it covers the vertical upstream side of the gabion baskets, then place and compact the channel fill for the next highest tier. Following preparation of the base for the next highest tier, place the geotextile on the prepared surface in the manner described under SP:1.5.5 Geotextile Placement and according to the drawings before proceeding with placement of the baskets.

After all the gabions in one tier have been completed and the base for the next highest tier has been prepared, place loose material on top of the completed gabions. Manually strike off the material with a piece of lumber to fill the voids in the filled gabions. Exercise caution in doing so to prevent damage to the PVC coating on the baskets.

1.5.5 Geotextile Placement

Geotextile placement shall be as follows:

- (i) Place the geotextile by unrolling onto the prepared surface and retain in position with weights or pins
- (ii) Place geotextile smooth and free of folds, wrinkles, and creases.
- (iii) Place geotextile perpendicular to the channel alignment (seams perpendicular to flow).
- (iv) Overlap seams a minimum of 1000 millimetres wide. The geotextile panels shall be placed in an upstream direction so that the upstream panel overlaps the downstream panel at the location of the seam.
- (v) Protect installed geotextile from displacement and damage until, during, and after placement of the overlying rip-rap.
- (vi) Repair rips or tears with a patch to cover a minimum of 1 metre on each side of the rip or tear.
- (vii) The geotextile shall be anchored at the upstream and downstream ends of the drop structures as shown on the Drawings. The geotextile at the top of the channel slopes shall be wrapped around the vertical upslope face of the last row of baskets, as shown on the drawings.

1.5.6 Channel Excavation, Backfilling and Side Slope Grading

Prior to initiating excavation or backfill activities clear the channel of any debris including trees and other deleterious material. Large boulders shall be moved aside for later use as channel armouring.

Excavate and backfill the channel as directed by the Contract Administrator. Channel side slopes and waste rock side slopes shall be re-graded as shown on the drawings.

Excavated waste rock material can be used as channel fill provided all oversize material is removed.

The backfill shall be placed and compacted in 200 mm lifts. The level of compactive effort or number of passes of the compaction equipment will be determined in the field.

1.5.7 Placement of Channel Rip-Rap

Channel rip-rap material shall be placed such that the underlying geotextile is not disturbed or damaged. Armouring of the channel between the drop structures shall be completed as directed by the Contract Administrator.

1.5.8 Hudgeon lake Outlet Stabilization and Fjord Crossing

Due to the increased potential for a breach to occur during this component of the work, this work shall not be undertaken until the channel stabilization works have been completed. Stabilization of the lake outlet requires removal and disposal of the existing culverts. Before the culverts are removed the Contractor shall have ready some geotextile and a suitable stockpile of material to fill in the outlet in the event that piping conditions occur.

The outlet will be stabilized by placing a gabion mat just above the invert of the existing culverts, as shown on the drawings. The final elevation of the gabion mat may change based on the conditions at the outlet when the work is undertaken. A fjord crossing shall be constructed just upstream of the gabion mat and the side slopes shall be re-graded as required.

1.5.9 Restoration of Flow From Hudgeon Lake

The natural creek flow shall be restored once the stabilization work in the channel and at the outlet from Hudgeon Lake have been completed. The flow from the lake shall be restored in a manner mutually agreed upon by the Contract Administrator and the Contractor. The objective of restoring flow is to prevent any sudden release of water into the channel, prevent erosion of the outlet and minimize any sediment load. If the lake level is not high enough to flow over the outlet upon completion of the work, the siphon(s) shall be redirected into the stabilized channel and allowed to flow until such time that the lake flow over the outlet has been restored naturally.

1.6 Quality Control

1.6.1 Inspection

Workmanship and materials furnished under this Specification are subject to inspection by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

1.6.2 Access

The Contract Administrator shall be afforded full access for the inspection of materials, both at the site of Work and any borrow site used for the supply of

materials, to determine whether the material is being supplied in accordance with this Specification.

1.6.3 Materials

Materials supplied under this Specification shall be subject to approval by the Contract Administrator in accordance with SP:1.4.2 – Approval.

1.6.4 Corrective Action

The Contractor shall at his own expense, correct such work or replace such materials found to be defective under this Specification.

1.7 Method of Measurement and Basis of Payment

1.7.1 Method of Measurement

(1) Mobilization, Demobilization and Preparation of Work Areas

Preparation of work areas for execution of the specified Work will be measured on a lump sum basis. This work shall include: all mobilization and demobilization, the supply, installation and maintenance of the siphon, any site preparation work required to facilitate construction, the supply and upkeep of the decontamination trailer, the supply of safety gear required for working in an airborne asbestos environment, the provision of a construction camp for the Contractor's work force, the restoration of flow over the Hudgeon Lake outlet and any site clean-up required after construction is finished.

(2) Gabion Drop Structures

The supply and delivery of the gabion baskets to the work site will be measured on a lump sum basis.

Construction of the gabion drop structures will be measured on a per unit basis for each gabion basket installed. The amount paid for each basket installed shall include all costs associated with assembling, placing and interlocking the baskets, filling the baskets with gabion fill material, and placing loose material (fines) over the installed baskets.

(3) Geotextile

The supply and installation of the non-woven geotextile, will be measured for payment on a square metre basis for installed geotextile.

(4) Channel Excavation and Backfilling

Measurement for payment of channel excavation and backfilling activities will be measured on a time basis for the equipment used to complete the work. The Contractor shall provide hourly rates for all the equipment

used on site. This will include any material hauled to site for the sole purpose of backfilling the channel.

(5) Channel Rip Rap and Gabion Fill

Measurement for payment for producing the channel rip rap and gabion fill will be measured on a time basis for the equipment used to complete the work. This will include hauling the material to the work site for placement in the channel and the gabion baskets. The Contractor shall provide hourly rates for all the equipment used on site.

(6) Hudgeon Lake Outlet Stabilization and Fjord Crossing

Stabilization of the outlet and construction of the fjord crossing will be measured on a time and materials basis.

1.7.2 Basis of Payment

(1) Mobilization, Demobilization and Preparation of Work Areas

Payment will be made at the Contract Lump Sum Price, which shall be payment in full for performing all operations herein described and all other items incidental to the work for this item.

(2) Gabion Drop Structures

Payment for the supply and delivery of the gabion baskets to the work site will be made at the Contract Lump Sum Price, measured as specified herein.

Payment for the construction of the gabion drop structures will be made at the Contract Unit Price per basket installed which shall be payment in full for performing all operations herein described and all other items incidental to the work for this item.

(3) Geotextile

Payment will be made at the Contract Unit Price, which shall be payment in full for performing all operations herein described and all other items incidental to the work for this item.

(4) Channel Excavation and Backfilling

Payment will be made based on the hourly rates provided by the Contractor for the equipment used for the channel excavation and backfilling activities, which shall be payment in full for performing all operations herein described and all other items incidental to the work for this item.

(5) Channel Rip Rap and Gabion Fill

Payment will be made based on the hourly rates provided by the Contractor for the equipment used for the production and hauling of the channel rip rap and gabion fill, which shall be payment in full for performing all operations herein described and all other items incidental to the work for this item.

(6) Hudgeon Lake Outlet Stabilization and Fjord Crossing

Payment will be made based on the hourly rates provided by the Contractor for the labour and equipment used. Geotextile shall be paid as specified in SP:1.7.2(3) and the gabions shall be paid as specified in SP:1.7.2(2). This shall be payment in full for performing all operations herein described and all other items incidental to the work included in this specification.

APPENDIX A
HEALTH AND SAFETY PLAN

CLINTON CREEK PROJECT OCCUPATIONAL AND ENVIRONMENTAL HEALTH AND SAFETY ISSUES AND EMERGENCY RESPONSE PLAN

Introduction

The purpose of the work is to mitigate the potential for a breach of the outlet from Hudgeon lake which could result in flash flooding in the Clinton Creek Valley downstream of the mine site. The work involves stabilization of the outlet and a short portion of the Clinton Creek channel immediately downstream of the outlet. The material forming the channel may contain some asbestos fibres that could become airborne during construction activities.

The Health and Safety Program is designed to anticipate, recognize, evaluate, and control adverse environmental conditions and physical hazards that may result in injury, impairment, or the exposure to toxic substances. The Emergency Response Plan provides a response to minimise the impact of an accidental release of substances that may affect the well-being of workers, and the local environment.

Location

The Clinton Creek Asbestos Mine is located 100 km northwest of Dawson City in the Yukon Territory. The location is at 64° 22' 23" N and 140° 42' 50" W adjacent to Clinton Creek approximately 9 km upstream of its confluence with the Forty Mile River. Porcupine and Wolverine Creeks are local tributaries of Clinton Creek. The project site is located at a failed waste rock deposit on the north-facing slope of the Clinton Creek valley. The failure created a landslide dam now referred to as Hudgeon Lake. The waste rock channel stabilization work will occur along Clinton Creek for a distance of approximately 150 metres downstream from the outlet of Hudgeon Lake.

Abbreviations

The following abbreviations and definitions are used in this document:

1. ANSI American National Standards Institute. Publishes consensus standards on a wide variety of subjects, including safety equipment, procedures, etc.
2. CEPA Canadian Environmental Protection Act
3. CSA Canadian Standards Association, the national consensus standards association for Canada is roughly the Canadian equivalent of ANSI in the US

4. DIAND Department of Indian Affairs and Northern Development
5. ERP Emergency Response Plan
6. HEPA High Efficiency Particulate Air filter. At least 99.97% efficient in the filtration of air borne particles 0.3 microns in diameter or greater
7. MSDS Material Safety Data Sheet provided by chemical manufacturers
8. MSHA Mine Safety and Health Administration, an agency of the US Department of Labour
9. NIOSH National Institute for Occupational Safety & Health. An arm of the US Centres for Disease Control, it does research and suggests guidelines for exposure control, but is not a regulatory agency
10. OSHA Occupational Safety & Health Administration, a part of the US Department of Labour, it regulates many job safety issues, including chemical handling and storage; also Occupational Safety & Health Act, the US Federal legislation which created OSHA (the Administration) and NIOSH
11. RMO Resource Management Officer
12. TDGA Transport of Dangerous Goods Act
13. WHMIS Workplace Hazardous Materials Information System. This program is legislated by the Canadian government, which requires, among other things, the creation and availability of material safety data sheets

Time Table (tentative)

August 19 to September 30, 2002.

Communication

A satellite phone will be available on site for communication and emergency calls.

Hazard Identification

1. Asbestos Hazards - inhalation of asbestos fibres by workers resulting from disturbance of the waste rock during excavation and backfilling activities.
2. Chemical Hazards - fuels used on site
3. Explosion or Fire - ignition of explosive or flammable liquids

4. Physical Hazards - mechanical equipment, sharp objects
 - increased risk of injury to personnel when wearing protective gear (if required) that may impair agility, stamina, hearing, and vision
 - electric shock when using power equipment in wet location or using poorly grounded tools
5. Wildlife - moderate risk (bears)

General Health and Safety Measures

1. All work will be conducted, as a minimum, in strict compliance to all applicable laws, ordinances, rules, regulations and orders and general practices for the safety of persons or property. The applicable requirements include any general safety rules and regulations of Yukon Workers' Compensation Health and Safety Board, WHMIS and Occupational Health and Safety legislation.
2. The Environmental Monitor / Safety Training Supervisor will be responsible for the Health and Safety legislation.
3. The Contractor shall provide wildlife monitors, acceptable to the Engineer, equipped with firearms to protect the safety of all workers including the Engineer, and Engineer's support staff during site operations.
4. Prior to the start of the work, all team members will participate in a mandatory safety briefing session to become familiar with all aspects of the Safety Program and Emergency Response Plan. Specific instructions on actions to be taken in case of safety violations, accidents, personal injury and emergencies will be provided.
5. Prior to commencement of specific work activities, all team members will be briefed on the following safety issues:
 - a. safety equipment and use
 - b. clearing, excavation and backfilling operations
 - c. contaminants on site
 - d. emergency measures in case of an accident or fire
6. A "buddy system" will also be used as a protective measure in particularly hazardous situations so that team members can keep watch on one another to provide quick aid if needed.
7. Contacts for emergency will include the DIAND project authority, the RCMP detachment and the nursing station in Dawson City, Yukon, and the Yukon Fuel and Oil Spills Report Line.

Waste Rock Excavation and Backfilling

1. The potential consequences of planned construction activities, such as excavating and backfilling, at the site will be considered prior to each action. Personnel assigned to work around the operating equipment will have the appropriate safety training.
2. Any persons within 800 metres of the work site while waste rock is being handled shall take necessary precautions to prevent exposure to airborne asbestos fibres.
3. There will be no eating, drinking or smoking near the work site.

Site Controls

Site controls minimize the potential contamination of personnel, protect the public from the site's hazards and prevent vandalism.

The work zone are divided into three general areas outlined below:

- **Exclusion Zone;** the contaminated area (asbestos).
- **Contamination Reduction Zone;** the area where personnel and equipment decontamination occurs.
- **Support Zone;** the uncontaminated area where personnel should not be exposed to Hazardous conditions.

The Contamination Reduction Zone shall include a **Decontamination Trailer;** the worker decontamination trailer shall comprise of three interconnecting rooms as follows:

1. Provide a set of curtain doorways between each room, and at both dirty and clean entrances to enclosure systems.
2. **Equipment and Access Room:** Build room between wash-up room and asbestos work area. Install waste receptor, and storage facilities for worker's shoes and any protective clothing to be reworn in asbestos work areas. Equipment and access room shall be large enough to accommodate specified facilities, and other equipment needed, and at least one worker allowing sufficient space to undress comfortably. Minimum size 3 m² (30 sq ft).
3. **Wash-up Room:** Build room between clean room and equipment and access room. Provide fresh water supply. Provide piping with water tight connections and connect to water sources and drains. Provide soap, clean towels and garbage disposal containers. Direct waste water to storage tank for appropriate disposal. Install water heater, if

required. Install ground fault protected power supply and hooks and shelves for storage of towels etc..

4. Clean Room: Build room between wash-up room and clean areas outside of enclosures. Provide hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment.

Site Safety Meetings and Inspections

To ensure that the Site Safety Plan is being followed, the Safety Officer will conduct a safety meeting prior to initiating each site activity and at the beginning of each workday.

The purpose of the meetings is to:

- describe assigned tasks and their potential hazards;
- co-ordinate activities;
- identify methods and precautions to prevent injuries;
- plan for emergencies;
- describe any changes to the Site Safety Plan;
- get worker feedback on conditions affecting safety and health;
- get worker feedback on how well the Site Safety Plan is working.

The Site Safety Officer will also conduct frequent inspections of site conditions, facilities, equipment and activities. The Site Safety Officer and personnel will be responsible for inspecting the condition of their personal protective equipment and ensuring its operational condition.

First Aid

First Aid will be administered on site by the Environmental Monitor / Safety and Training Supervisor. According to the Yukon Workers' Compensation Health and Safety Board (1992), Class "A" hazards were identified for the Clinton Creek Channel Stabilization Project. The requirements for First Aid made available on site are met by an attendant with a Standard First Aid certificate, a # 2 Unit First Aid Kit (St. Johns Standard), a stretcher, and three emergency blankets. In addition to the basic requirements, a spinal board, cervical collars and a Scott Air Pack will also be on site. In case of an accident, a casualty will be

transported to Dawson City, Yukon or depending on weather conditions, to the nearest nursing station via rotor wing. Emergency phone numbers are provided in the ERP. Every incident requiring First Aid will be recorded in an accident report.

Fires

The fire safety program includes fire prevention, fire protection and fire fighting.

1. As a preventative measure there will be no fires or burning of rubbish at the work site.
2. A person discovering a fire will report the incident to the Project Superintendent.
3. Fire extinguishers will be located on site and in each supervisor's vehicle.
4. Smoking will not be permitted in hazardous areas and care will be exercised in the use of smoking materials in non-restricted areas.
5. The current National Fire Code of Canada shall govern the handling, storage and use of flammable liquids such as gasoline. Flammable liquids such as gasoline will be stored in approved safety cans.
6. Disposal of flammable liquids will be in accordance with all applicable environmental regulations.

Personal Protective Equipment

1. Workers will use protection appropriate to the potential type and level of exposure. The protective equipment will be fitted to cold weather conditions and meet CSA, ANSI, and NIOSH standards and guidelines.
2. Team members will be made aware that the equipment alone does not eliminate the hazard. If the equipment fails, exposure will occur, as such, hazard awareness will be a paramount component of the field program.
3. All equipment will be properly fitted and maintained in a clean and serviceable condition.
4. If at any time during the project the protective equipment is damaged, then the team member will remove, dispose and replace the damaged item.
5. Before entering asbestos work area, instruct workers and visitors in use of respirators, dress, showers, entry and exit from asbestos work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by Competent Person as defined by Occupational Health and Safety Act.
6. **Respirators:** Workers shall wear 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. Respirators

shall be acceptable to Occupational Health Branch of Ministry of Labour. 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.

7. **Protective Clothing:** Provide workers and visitors with full body disposable coveralls with integral hoods. Once coveralls are worn in asbestos work area, treat as asbestos contaminated waste and dispose of appropriately. Workers and visitors shall also wear other protective apparel as required by construction regulations (e.g. safety boots, hard hats, gloves, etc.).
8. Before entering asbestos work area(s) remove street clothes in clean change room and put on respirator with new or tested filters. Proceed to the equipment and access room where the workers shall dress in work clothing, clean coveralls and head covers before entering the asbestos work area. Store street clothes, uncontaminated footwear, towels etc. in clean change room.
9. Persons leaving asbestos work area(s) shall remove gross contamination from clothing. Proceed to equipment and access room of the decontamination trailer and remove all work clothing, except the respirator. Place contaminated worksuit in receptacles for disposal with other asbestos contaminated materials or store as directed for re-use. Footwear, clothing, hardhats, protective eye wear, etc., shall be left in equipment and access area to dry for later use. Clean respirator to ensure that visible contamination is removed. Still wearing respirator proceed to the wash-up room.
10. Once in the wash-up room, thoroughly wash hands, arms and face with soap and water proceed to the clean room, still wearing respirator.
11. Once in the clean room, re-dress in clean (street) clothes and footwear.
12. When leaving the work site for the day, keep respirators on for the duration of the ride back to the Contractor's camp site and have a shower immediately upon arrival to remove all asbestos fibres from the body and hair. Remove filters and dispose of in container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary. Wet clean inside of respirator. Respirators shall be put on prior to entering the equipment and access room at start of next shift. If re-entry to asbestos work area is to take place after having left for eating, drinking, or smoking, follow procedures in 9. above.
13. Upon completion of work in asbestos area(s), dispose of footwear as contaminated waste or clean before removing from equipment and access area, or carry in sealed plastic bag to next contaminated site.
14. All equipment used in the asbestos work area(s) shall be decontaminated by thorough washing before leaving the site.

Environmental Monitoring/Sampling

1. The employer shall ensure any required medical examinations are completed in accordance with the Yukon Health and Safety Act.
2. Air samples will be taken from commencement of work until completion in asbestos work area(s) with NIOSH 7400 procedures, or with Fibrous Aerosol Monitor.
3. Co-operate in collection of air samples, including requiring workers to wear sampling pumps for up to half shift periods. Workers shall exercise care not to damage air sampling equipment.
4. An MSA Escort Elf portable sampling pump is used to draw air through a 25 mm, 0.8 um pore size, cellulose ester filter at a constant flow rate for a sufficient period of time to collect a representative sample of air for personnel in the work area. The air sample(s) are then retrieved and sent to a qualified laboratory for analysis by Phase Contrast Microscopy (PCM).
5. If air monitoring shows airborne fibre levels exceed 10X the time-weighted average exposure criteria (TWAEC) of 0.1 fibres per cubic metre of air (f/cc) for personal exposure, then workers will be required to use powered air purifying respirators (PAPRs) with full-face piece and HEPA filters.
6. All sampling results will be kept on site and made available to workers for their review.

Head Protection

Head protection against impact blows will be provided when required in the form of a protective hat with a liner, which will be able to resist penetration and absorb the shock of a blow. The hat will meet CSA standard Z94.1.

Foot Protection

For protection against falling or rolling objects, sharp objects, wet, slippery surfaces workers will use appropriate insulated safety shoes or boots. Safety shoes will be sturdy, have an impact-resistant toe and meet CSA Standard Z195 or ANSI standards. In case of an emergency spill, team members responding will wear protective boot covers.

Eye and Face Protection

When required, protection will be based on the kind and degree of hazard present. Available equipment will include goggles, safety glasses, and face shield. The eye protectors will meet the requirements of CSA Z94.3 or ANSI standards.

Ear Protection

To avoid exposure to high noise levels disposable phone earplugs or earmuffs will be made available.

Respiratory Protection

It is anticipated that exposure to harmful concentrations of air contaminants may result from temporary or emergency conditions. In such a scenario, the exposed team members will wear protective respiratory equipment to prevent breathing air contaminated with harmful dusts (including asbestos), fumes, gases and vapours. The selection of protective respirators equipment will be made according to the guidance of NIOSH or MSHA or ANSI Practices for Respiratory Protection and will include Air Purifying Respirator with HEPA cartridge and chemical cartridge.

Arm and Hand Protection

Absorption of chemicals, cuts and burns are examples of hazards associated with arm and hand injuries. Insulated rubber gloves and leather gloves will be provided for protection from these hazards. These gloves will conform to CSA and ANSI standards.

Body Protection

Full body hooded chemical-resistant disposable coveralls will be made available for emergency response. A variety of other protective clothing including vests, jackets, aprons and insulated coveralls will be used by team members.

EMERGENCY RESPONSE PLAN

This Emergency Response Plan (ERP) includes actions to be taken to reduce the impact of spillage for release of, or substantial threats of release of hazardous materials and non-aqueous phase liquids from barrels and other containers encountered during drilling and test pit excavation. A list of emergency contacts, including those for medical emergencies and emergency reporting are given below.

Project Management:

Brett Hartshorne (INAC)	(867) 667-3268
HAN Construction Ltd.	(867) 993-5520
Gil Robinson (UMA Engineering)	on-site
Yukon Fuel and oil Spills Report Line:	(867) 667-7244
Dawson City, Community Nursing Station:	(867) 993-4444
Ambulance: Dawson City, Yukon	(867) 993-4444 or 1-800-661-0408
Trans North Helicopters	(867) 993-5494 or 668-2177
Fireweed Helicopters	(867) 993-5700
Resource Management Officer (RMO):	
Todd Pilgrim	(867) 993-5468
RCMP Dawson City, Yukon:	(867) 993-5555 or 667-5555

INCIDENT: HAZARDOUS MATERIAL OR NONAQUEOUS PHASE LIQUID SPILL

The response measures include:

1. Contain spill source and prevent from spreading.
2. Air monitor for explosive or toxic gases. If a hazardous condition is found, the appropriate protective equipment will be used.
3. Mobilize spill control kit. The kit will include:
 - Personal protective equipment
 - Recovery drum
 - Absorbent material
 - Hand shovel
 - Small pail for scooping up liquid
 - Plastic sheeting
4. Recover spill and contaminated material and place in recovery drum.
5. Ensure spill is secure.
6. Implement a decontamination procedure before any employee or equipment leaves the area of potential hazardous exposure.
7. Transport recovery drum to temporary storage area. A polyethylene drop sheet will be secured to the ground at the temporary storage area
8. The sorting, packaging, transportation and disposal of all hazardous materials and waste encountered will be in accordance to all applicable regulations including the TDGA and CEPA.
9. Prepare spill report.
10. Call the Yukon Fuel and Oil Spill Report Line.

INCIDENT: SERIOUS INJURY

1. Call for help.
2. Assess hazards at the site; if necessary make area safe.
3. Initial First Aid.
4. Evacuate casualty to the nursing station in Dawson City, Yukon
5. Prepare report.

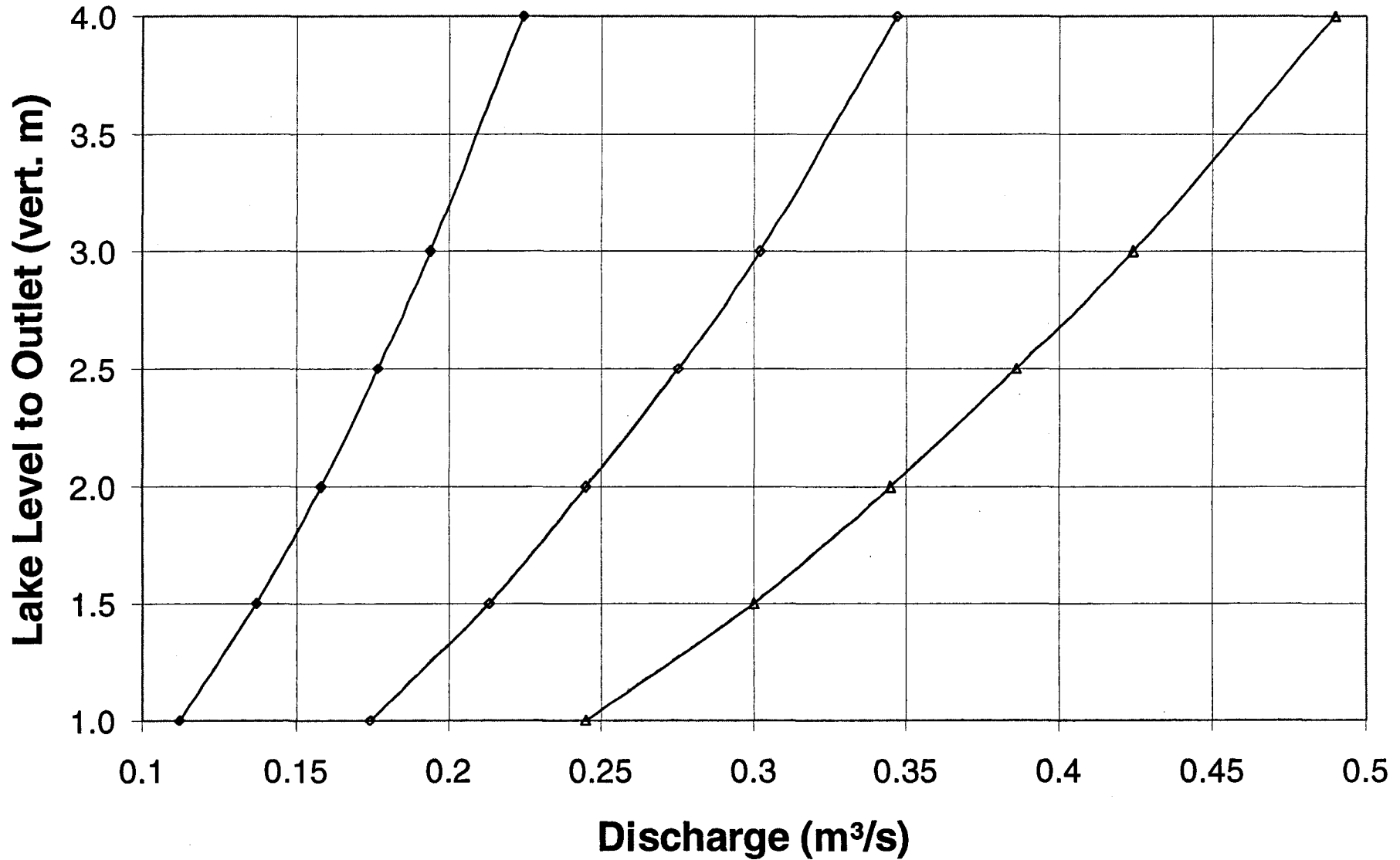
INCIDENT: FIRES

1. A person discovering a fire will report the incident to the Project Manger.
2. Fire suppression equipment will be made available. If a fire is not promptly extinguished, the RMO in Dawson City, Yukon will be notified immediately.

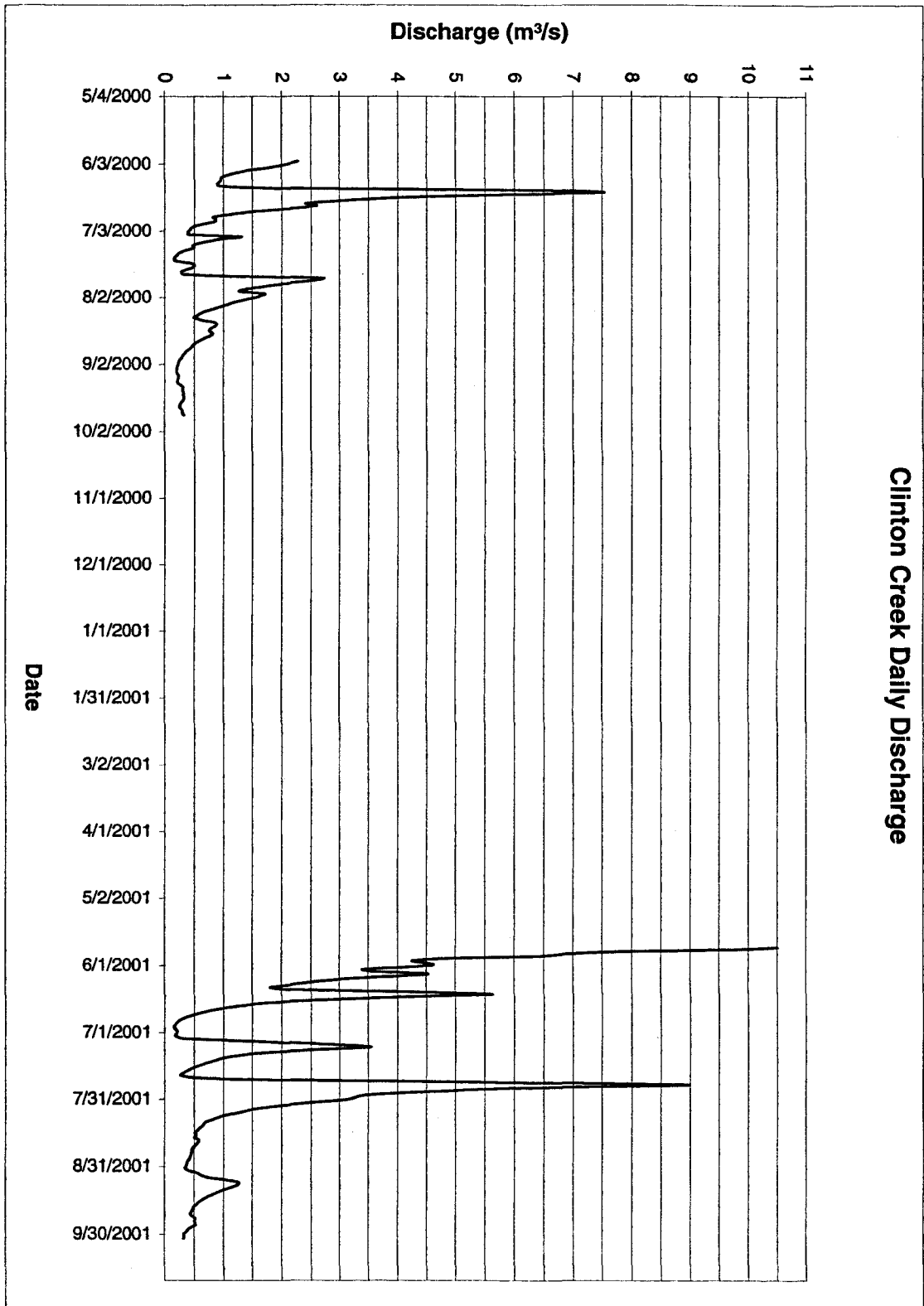
APPENDIX B
SIPHON CAPACITIES AND CREEK FLOWS

Siphon Discharge - 25 m Pipe Length

◆ 200 mm SDR41 ◆ 250 mm SDR41 ▲ 300 mm SDR41



Clinton Creek Daily Discharge



Remediation of Aishihik Airstrip Yukon Territory

Prepared by

Environmental Sciences Group
Royal Military College
Kingston, Ontario



EXECUTIVE SUMMARY

The Aishihik Airstrip in the Yukon Territory was built during the early years of World War II by the United States, handed to Canadian control in 1955, and eventually closed down in 1966. Recently the Champagne-Aishihik band has renovated the site.

Concerns arising from an Environment Canada survey reporting PCBs at the site prompted Indian and Northern Affairs Canada (DIAND) to commission an environmental assessment at the site. This work, carried out in June 1994 by the Environmental Sciences Group and reported in 1995, characterized the physical and chemical status of the area, assessed the environmental impact, and made recommendations for the cleanup of the site.

Under an agreement between DIAND and the Champaign-Aishihik Band, a cleanup based on these recommendations was undertaken at the site in the summer of 1995. The Environmental Sciences Group was the Scientific Advisor, and members of the group were involved in: delineation of contaminated areas; removal of soils contaminated with PCBs and lead; confirmatory sampling and testing; removal of paint and debris containing high concentrations of PCBs (over 50 ppm) from the powerhouse; solvent-washing of the contaminated building interiors; and packaging contaminated materials.

Elevated concentrations of PCBs had been previously identified at two areas around the powerhouse. These were excavated after delineation; confirmatory testing showed that no PCBs remained. Two battery stains in a dump were also excavated after the extent of lead contamination was delineated; confirmatory tests showed that the excavations were successful. A previously identified stain near the garage was delineated but not excavated because the low concentration of lead was restricted to an isolated area.

The powerhouse, which was highly contaminated with PCBs, was taken down to its foundations, and the materials disposed of appropriately. Excavated areas around the powerhouse were backfilled, and the solvent-washed concrete pad was covered to ensure isolation from the environment.

All soils and materials found to be contaminated in ^{ex}access of the criteria have now been removed. This report describes the cleanup procedure, outlines the cleanup criteria, and includes the results of assessment, delineation and confirmatory testing at Aishihik Airstrip.

ACKNOWLEDGMENTS

This project was supported by the Action on Waste component of the Arctic Environmental Strategy. We would like to acknowledge the confidence and support of several individuals in Indian and Northern Affairs Canada, in particular: Mr. Mark Palmer, Regional Manager, Mr. Brett Hartshorne, Project Manager and Mr. Rick Seaman and Ms Dorothy McLeod of the Action on Waste Program Office in Whitehorse. Mr. Rick Seaman is also thanked for his assistance in the preparation stages of the site visit, as well as his endless and creative assistance during and after the site visit. Thanks are also due to the members of the Champagne-Aishihik Band for their keen and competent assistance and for making the facilities available for accomodation and analyses during the site visit.

This project was conducted by the Environmental Sciences Group at Royal Military College, headed by Dr. Ken Reimer who assumes overall editorial responsibility. The field program was conducted by Drs Wayne Ingham and Matt Dodd, both of whom contributed to the report. Dave Pier did an excellent job of producing the maps. In addition Doug Noonan provided logistical support for the field work, Pat Fortin managed the data, and Deborah Reimer administered the project. Thanks are also due to Marjorie Cahill and John Poland for their endless editorial assistance.

The analytical work was conducted by the Analytical Services Unit at Queen's University and by AXYS Analytical Services. These labs, as they have in the past, demonstrated high professional standards which facilitated the production of this report. Particular thanks are due to Yvonne Fried, Cathy Sudeith, Katherine Kaye, Dale Hoover, Brenda Dunn, Wendy Leslie, Laurie Phillips and the laboratory technicians at AXYS, and to Paula Whitley, Mary Andrews and the laboratory technicians at the Analytical Services Unit.

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I. INTRODUCTION

A. Background

The Aishihik Airstrip was built in the early 1940s as part of the Northwest Staging Route, in order to improve air transportation to the North in support of the war effort. The airstrip was handed from U.S. to Canadian control in 1955 and was operated by the Department of Transport until 1966 when it was transferred to the Territorial Government. The Champagne-Aishihik band, which has a land claim in the area, has renovated the site for use as a cultural camp and for meetings (Photograph I-1 and Photograph I-2).

A limited environmental survey carried out by Environment Canada and reported in March 1994¹ showed that polychlorinated diphenyls (PCBs) were present on the floor of the powerhouse. The Aishihik Airstrip was visited on two occasions by the Environmental Sciences Group (ESG)², 11 June 1994 and 7 - 10 July 1994, and an environmental assessment report was submitted to Indian and Northern Affairs Canada (DIAND) in March 1995³. The main observations made by the field team were:

- most of the original facilities had been demolished, leaving only the powerhouse, garage, and airways building. Small cabins had been constructed to house summer camps and the airways building had been extended;
- physical debris around the building was limited to small pieces of pipe, wood and three transformer cases;
- barrels were cached in one area of the site and some contained fluid; and
- the landfills were not engineered and contained exposed debris.

¹ Fax message from Brian Laird (A & ES Technical Services) to Harold Kane (Champagne-Aishihik Enterprises) dated 11 Mar 1994. DIAND file 2.4.22.1.

² The Environmental Sciences Group relocated to Royal Military College (RMC), Kingston, Ontario in August 1995.

³ Environmental Sciences Group (1995) An Environmental Study of the Aishihik Airstrip Yukon Territory, prepared for Indian and Northern Affairs Canada.



Photograph I-1: Entrance to the Aishihik airstrip grounds.



Photograph I-2: The Aishihik River valley.

Chemical contamination at the site was assessed in terms of the DEW Line Cleanup Criteria (DCC)⁴, the Canadian Council of Ministers of the Environment (CCME) interim Residential/Parkland (R/P) criteria and the Canadian Environmental Protection Act (CEPA).

A review of the analytical results indicated that contamination was limited to the powerhouse, and stains around the garage and at a dump site. The samples containing contaminants in excess of the applicable environmental criteria were as follows:

- three samples (one soil, two paint) taken from the interior of the powerhouse contained PCBs at concentrations over 50 parts per million (ppm). PCB concentrations in substrate that are over 50 ppm are regulated under legislation arising from the Canadian Environmental Protection Act (CEPA) which governs the storage of PCBs. (Soils containing PCBs at concentrations which violate this regulation will be referred to as CEPA soils.) The soil sample also contained levels of copper, lead and mercury in excess of DCC-II and CCME R/P criteria;
- one paint sample taken from inside the powerhouse, and one soil sample obtained from the south side of the powerhouse, contained PCBs in excess of the CCME R/P and DCC-II criteria;
- three soil samples taken from a stained area south of the powerhouse contained PCBs in excess of DCC-I;
- a soil sample taken in a stain near the garage contained lead in excess of DCC-II and CCME R/P criteria; and
- a soil sample taken in one of the dumps also contained lead in excess of DCC-I.

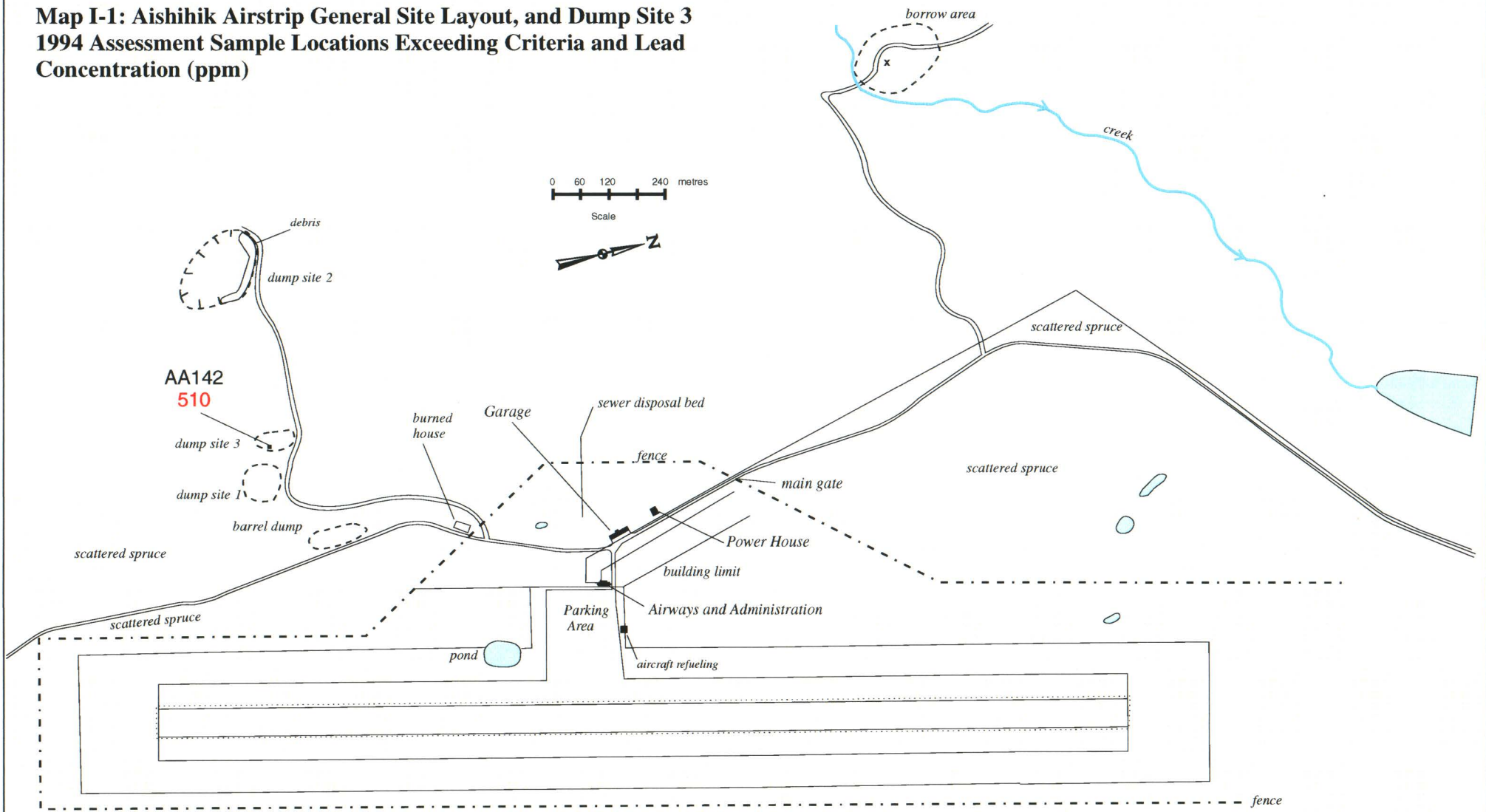
Levels of all other contaminants were generally quite low and the results from analyses of plant tissues indicated that uptake was only of concern at locations near the powerhouse and adjacent to some lead-containing batteries in one of the dumps.

⁴ The DEW Line Cleanup Criteria (DCC) are a combination of the CCME R/P and Quebec B criteria, developed specifically to be protective of the Arctic environment.

Map I-1 and Map I-2 give the general site layout and include the sample locations from the 1994 investigation. The results from this investigation are summarized in Table I-1, and the a summary of the recommendations which were presented in the 1995 ESG report is given below.

The powerhouse is clearly contaminated with PCBs and should be thoroughly cleaned before any further decision is made on the future use of the building. The extent of PCB contamination in the areas around the powerhouse should be delineated using PCB test kits and the soil disposed of in an appropriate fashion. The potable water well adjacent to the powerhouse should be tested for contamination and, if any is found, a groundwater investigation should be initiated. Other soils containing contaminants at concentrations in excess of the criteria should be removed, and the three dumps should be consolidated at one location. The oil drums in the barrel cache should be removed, using the guidelines described in the DEW Line Cleanup protocol for barrels.

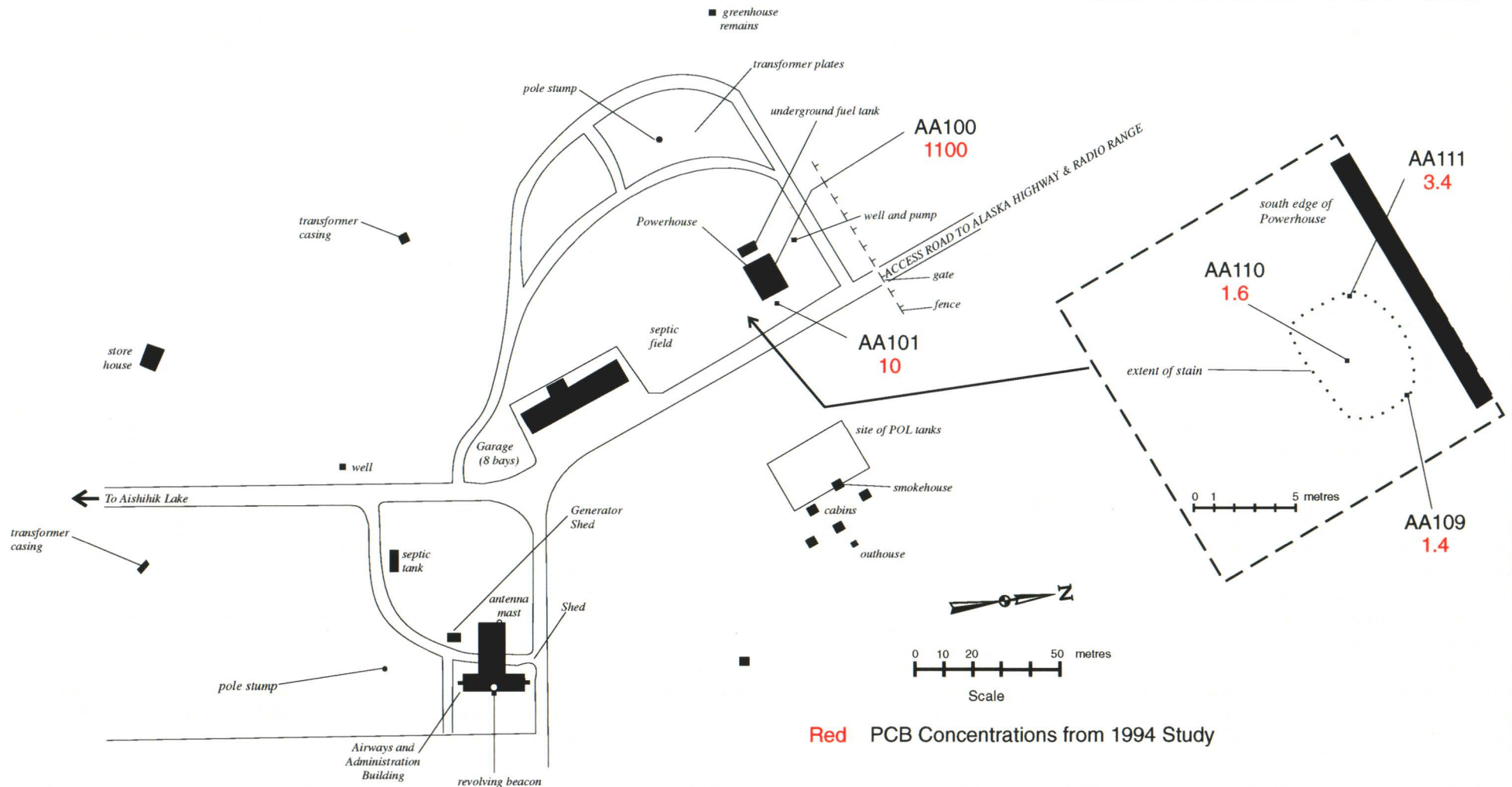
**Map I-1: Aishihik Airstrip General Site Layout, and Dump Site 3
1994 Assessment Sample Locations Exceeding Criteria and Lead
Concentration (ppm)**



Map adapted from DND Construction Engineering Branch DWG, No. AK-0-3. 29/Nov/1949

Map I-2: Aishihik Airstrip Site, 1994 Assessment Sample Locations Exceeding Criteria and PCB Concentrations (ppm)

At the same location as AA100:
 AAPC01: 22000
 AAPC02: 26
 AAPC03: 126



Red PCB Concentrations from 1994 Study

AIRSTRIP PARKING AREA

Map adapted from DND Construction Engineering Branch DWG, No. AK-0-3, 29/Nov/1949

Table I-1: Samples Exceeding Cleanup Criteria at Aishihik from the ESG 1994 Environmental Assessment

Sample	Location	Substance	Sample Concentration ($\mu\text{g/g}$ or ppm)	Criterion Value ($\mu\text{g/g}$ or ppm)	Applicable Criteria
AA100	Interior floor of powerhouse, 30 cubic cm hole in floor of room adjacent to generator room	PCBs	1100	50	CEPA
		Cu	118	100	CCME R/P, DCC-II
		Pb	620	500	CCME R/P, DCC-II
		Zn	2020	500	CCME R/P, DCC-II
AAPC01	concrete bench in southwest room of powerhouse	PCBs	22000	50	CEPA
AAPC02	floor of southeast room of powerhouse	PCBs	26	5.0	CCME R/P, DCC-II
AAPC03	floor of main powerhouse generator room	PCBs	126	50	CEPA
AA101	2 m east of large door on east side of powerhouse in slight depression in front of entrance	PCBs	10	5.0	CCME R/P, DCC-II
AA109	Northeast side of stain 2 m south of powerhouse	PCBs	1.4	1.0	DCC-I
AA110	North side of stain 2 m south of powerhouse	PCBs	1.6	1.0	DCC-I
AA111	Northwest side of stain 2 m south of powerhouse	PCBs	3.4	1.0	DCC-I
AA116	1.5 m northeast of creosote pole, 15 m west of centre of garage	Pb	200	200	DCC-I
AA142	Dump 3, easternmost pile of broken batteries, 8 m north of old truck, by metallic debris	Pb	510	500	CCME R/P, DCC-II

Note:

CEPA refers to the Storage of PCB materials regulation under the Canadian Environmental Protection Act.

CCME R/P refers to the Canadian Council of Ministers of the Environment Interim Remediation Criteria for Residential/Parkland use.

DCC refers to the DEW Line Cleanup Criteria prepared for the remediation of radar stations in the Canadian Arctic.

B. Objectives of this Report

Under an agreement between DIAND and the Champaign Aishihik Band, a cleanup of the Aishihik Airstrip was carried out in the summer of 1995. The recommendations outlined in the ESG 1994 study and listed in the previous section were used as a guideline for the implementation of a remediation program. Members of the Environmental Sciences Group were involved in various aspects of this project including:

- delineation of contaminated areas;
- removal of contaminated soils containing PCBs and lead;
- confirmatory sampling and testing after removal of contaminated soils;
- removal of paint and debris containing PCBs at concentrations exceeding 50 ppm from the powerhouse;
- cleaning of contaminated walls and concrete floors by solvent washing; and
- packaging of the contaminated materials.

DIAND contracted a local organization to perform the remaining site cleanup including the closure and capping of the water well near the powerhouse and the removal of debris from around the site.

Soil samples were collected from locations containing substrate in excess of the cleanup criteria and analyzed in the field. Based on the results, the areas of contamination were marked and soils were excavated from these locations. In order to confirm that cleanup was successful, samples were collected and analyzed after the removal of contaminated soils. This report describes the sampling and analytical methods (Chapter II) and presents the analytical results (Chapter III). The methods and procedures used in the remediation of the powerhouse are described (Chapter IV). All QA/QC data are given in Chapter V.

II. SAMPLING AND ANALYTICAL METHODS

This chapter provides information on sampling and analytical methods used for soils, paint chips and the concrete floors during the cleanup. Soil samples were analyzed in the field with immunoassay test kits and a portable X-ray fluorescence analyzer. Standard atomic absorption and gas chromatographic methods were used to determine levels of PCBs and inorganic elements in the laboratory. Details of the experimental procedures are described below, and all analytical results are presented in Chapters III and IV.

A. Sampling

1. Soils

A probabilistic approach, which involved laying out a grid and sampling at some chosen coordinates, was used to obtain samples from locations containing substrate in excess of the cleanup criteria. Two types of samples were collected; the first set (delineation samples) was to define the areas of contamination and the second set (confirmatory samples) was used to confirm that the cleanup was successful.

Soil samples from areas with inorganic element contamination and those marked for delineation were collected using plastic scoops and placed in Whirl Pak™ bags. Confirmatory samples destined for laboratory PCB analyses were obtained with stainless steel scoops (which had been pre-washed, baked and stored in baked aluminum foil to prevent organic contamination) and deposited in 1 litre amber jars fitted with Teflon-lined lids. These jars were obtained commercially (I-CHEM Ltd.) and were certified free of organic materials.

Soil samples were generally restricted to the upper 10 cm. In order to determine the depth of contamination, test pits were also dug and samples collected at specific intervals. The total number of samples collected at each location depended on the extent

of contamination; maps and photographs, depicting some of the sampling locations, are given in Chapter III.

Confirmatory samples designated for laboratory analyses were shipped by truck to Whitehorse and by guaranteed air freight either to Queen's University for inorganic analysis or to AXYS Analytical for PCB analysis. In order to conform with regulations regarding sample control, a rigorous chain of custody was maintained. For each sample, chain-of-custody forms were filled out and checked before shipment from Whitehorse, and the contents of shipments were verified upon receipt in the laboratory. The relevant documentation is available on request. Upon receipt in the laboratory, the samples were kept frozen whilst awaiting analysis.

2. *Concrete Floors*

Floor scrapings were collected with a scoop and placed in a Whirl Pak™ bag. These samples were shipped to Queen's University and analyzed for PCBs by Gas Chromatography with Electron Capture detection (GC/EC). The results obtained are given in Chapter IV.

3. *Paint*

Flakes of paint were removed from the floors of the powerhouse by means of a stainless steel scoop, placed in Whirl Pak™ bags and shipped to Queens University for analyses. The results are given in Chapter IV.

B. Field Analysis

1. *Polychlorinated Biphenyls (PCBs)*

Field analyses of PCBs were performed with Millipore EnviroGard™ PCB Test Kits. The kits utilize the enzyme-linked immunoabsorbent assay (ELISA) technique

which is based on antibodies that are specifically designed to bind to PCB molecules. These antibodies are bonded onto polystyrene coated test tubes. When solutions containing PCBs are incubated in the tube, the PCBs bind to the antibodies. After incubation, the test tube is washed thoroughly with water, and an enzyme-PCB conjugate added. The conjugate then binds to the unoccupied antibody binding sites. Other reagents, substrate and chromogen, are added which interact with the bound enzyme conjugate to form a coloured product. The amount of coloured product, which can be quantified by its intensity, is inversely proportional to the PCB concentration in the original sample in the test tube.

The immunoassay was carried out at Aishihik according to the manufacturer's instruction with a few minor modifications. A subsample was spread out on absorbent paper towels and allowed to air dry overnight following which a 5 g portion was weighed and extracted with 5 mL methanol. The soil-methanol mixture was filtered and a 25 μ L aliquot of the extract used for subsequent analysis. Results from the previous ESG investigation indicated Aroclor 1254 was the principal constituent. As such Aroclor 1254 standards were used for calibration, rather than the Aroclor standards supplied by the manufacturer.

Results are reported as obtained by the immunoassay method assuming 100% extraction of PCBs by methanol; in the GC/ECD method described below, incomplete extraction efficiency is corrected for by the use of an internal standard. Therefore, it is expected that the immunoassay test kits would generally give lower results than the GC/ECD method. The manufacturer's standards as supplied with the immunoassay test kits are in fact 50% lower in concentration than indicated to compensate for this discrepancy. In this study, uncorrected values were obtained but interpreted to allow for incomplete PCB extraction into methanol. Thus a result of 30 ppm or more was interpreted as being >50 ppm.

2. *Inorganic Elements*

A TN Technologies, Inc. Spectrace 9000 Field Portable X-Ray Fluorescence Analyzer (FPXRF) was used for all inorganic element analysis at Aishihik. This FPXRF is equipped with a high resolution solid state (mercuric iodide) detector and fundamental parameters quantitative analysis software. Fundamental parameters quantitative analysis involves measuring all major elements present and compensating for the effects of the interferences on one another by computer calculations. This allows for a good estimate of inorganic element concentrations for all soil matrix types without the necessity for several standard samples having the same general concentrations and matrix; pure elements or standard reference materials are used for calibration standards.

The FPXRF employs three radioactive sources for X-ray generation; the sources and acquisition times used for analysis are given in Table II-1. As recommended by the manufacturer, the operation of the instrument was monitored periodically during analysis with pure element and teflon standards.

Table II-1: Count Times for FPXRF Sources

Source	Measurement Time (sec)	
	Calibration	Analysis
Fe-55	50	100
Cd-109	50	300
Am-241	50	50
Total Time	150	450

The soil samples were analyzed as follows. Subsamples were spread out on absorbent paper towels and allowed to air dry overnight. Large stones and pebbles were removed and the sample ground with a pestle and mortar. The ground sample was placed in the sample cup and covered with a Mylar film and ring. The filled sample cup was

inverted (Mylar side down), tapped gently to settle and compact the contents, placed on the probe and analyzed. Detailed results are given in Chapter III.

The limit of detection for each element - defined as the analyte concentration giving a signal equal to the blank, plus two standard deviations of the blank - was determined by using the standard deviations of analyte samples which gave concentrations close to the blank. Detection limits are given in Table II-2.

Table II-2: Detection Limits for the Determination of Copper, Lead and Zinc by FPXRF

Element	Detection Limits (ppm or $\mu\text{g/g}$)
Copper	50
Lead	20
Zinc	30

C. Laboratory Analysis

1. Polychlorinated Biphenyls (PCBs) in Soils

a) Summary

The above analysis was conducted by AXYS Analytical Services Ltd. of Sidney, B.C. using gas chromatography with electron capture detection (GC/ECD).

Each sample was clearly labelled and locked in a secure frozen storage area until retrieved by the analyst. The soil sample was thoroughly homogenized and a subsample taken for the determination of wet weight/dry weight ratio. The wet soil sample (10 - 15 g), to which an aliquot of surrogate standard (2,4,5,6-tetrachloro-m-xylene, PCB 209 and d₄-alpha endosulphan) had been added, was extracted once with 80 mL of 1:1

dichloromethane/methanol by shaking on a shaker table for 30 minutes. The extraction procedure was repeated using 80 mL of dichloromethane. The extracts were combined, washed with solvent-extracted water, dried over anhydrous sodium sulphate and concentrated by Kuderna Danish techniques. After the addition of activated copper to remove sulphur, the extract was separated on a Florisil column.

The extract was quantitatively transferred to a Florisil column and eluted with three solvent systems consisting of hexane (Fraction-1), 85:15 dichloromethane/hexane (Fraction-2) and 50:50 dichloromethane/hexane (Fraction-3). An aliquot of surrogate standard was added to each of Fraction-2 to allow quantification since the surrogate standard added at the beginning of the procedure eluted into Fraction-1 and Fraction-3. Each fraction was concentrated, transferred to a microvial, and an aliquot of recovery standard (4,4'-dibromooctafluorobiphenyl and PCB 204 to Fraction-1 and Fraction-2 and ^{13}C -PCB 153 to Fraction-3) added prior to analysis by GC/ECD.

A Hewlett Packard HP 5830A gas chromatogram equipped with a ^{63}Ni electron capture detector (GC/ECD), a 60 m DB-5 column (0.25 mm i.d x 0.1 μm film thickness) and HP 3392 integrator was used to analyze Fraction-1 for PCBs as Aroclors and PCB congeners simultaneously. Chromatographic conditions were as follows - Initial Temp: 100°C; Injection: splitless, 1 min; Initial time: 2 min; Ramp: 10 °C/min to 150 °C, 3 °C/min to 300 °C; Final time: 5 min. Column conditions were: Carrier gas, helium; Pressure, 21 psi; Flow rate, 60 mL/min; and Split ratio, 15:1. The instrument was calibrated using a solvent blank and standards of Aroclor 1242, Aroclor 1254 and Aroclor 1260. For each Aroclor, the sum of the areas of three characteristic peaks was used to calculate its response factor against the internal standard. The area of the same three peaks was used to determine the concentration of each Aroclor in the sample.

2. *Polychlorinated Biphenyls (PCBs) in Paint Chips and Concrete Samples*

The concentration of PCBs in paint chips and concrete samples was determined by GC/ECD at the Analytical Services Unit, Queen's University, Kingston, Ontario.

Samples were analyzed by taking approximately 5 g, spiking it with an internal standard solution (decachlorobiphenyl) and extracting with approximately 300 mL dichloromethane in a soxhlet extractor for six hours. The sample was concentrated to 1-2 mL, solvent exchanged for hexane and applied to a Florisil column (Supelco SPE tube). The resulting eluent was then analyzed using an HP 5890 gas chromatograph equipped with electron capture detector. A 30 mm DB5 capillary column was used and the instrument was calibrated with Aroclor 1254 standards. The detection limit for Aroclor 1254 was 0.3 ppm.

3. *Inorganic Elements in Soils*

Inorganic elements were analyzed by atomic absorption spectroscopy (AAS) at the Analytical Services Unit, Queen's University, Kingston, Ontario.

The analyses were carried out using the following procedure. Samples were air-dried and ground to a fine powder with a mortar and pestle; large stones were removed as they would not be expected to contain any anthropogenic environmental contamination. Approximately 0.5 g of this dried material was heated with 2 mL HNO₃ and 6 mL HCl overnight so that the volume was reduced to 1-2 mL. The resulting solution was then made up to 25 mL and analyzed by AAS. While it is recognized that the digestion procedure used may not bring all metals into solution (some metals may be locked into silicate minerals), it was felt that the metals released into solution are of greater environmental significance than true total metals. Analyses were done in batches of 36 which comprised 28 samples, 2 blanks, 4 duplicates and 2 samples of reference material (National Research Council standard reference material BCSS-1). The limits of detection for the metals were 3 ppm for copper, 10 ppm for lead and 1 ppm for zinc.

D. Quality Assurance/Quality Control (QA/QC)

A quality assurance/quality control program was implemented to allow monitoring of data quality. Functions carried out included replicate analyses, spiked

standard reference materials and comparison of field results to laboratory data. Aspects relevant to soil analyses are given in Chapter V.

III. DELINEATION, EXCAVATION AND CONFIRMATORY TESTING OF CONTAMINATED SOILS

This chapter describes sampling procedures and analytical results for samples used to delineate the extent of contamination, and those used to confirm the removal of contaminated substrate. Samples were collected from locations where contaminant concentrations in substrate were in excess of the cleanup criteria. These were analyzed at Aishihik for PCBs and metals by using immunoassay test kits and a field portable X-ray fluorescence analyzer, respectively. Based on the results, the extents of contamination were marked and soils were excavated from these locations. Samples were collected after the removal of contaminated soils, and analyzed in the field to confirm cleanup. A selected number of samples were reanalyzed in the laboratory in order to correlate field data with laboratory results. A map of the site, and tables indicating samples exceeding the criteria are presented in Chapter I. Details of the sampling and analytical procedures are given in Chapter II.

Excavated CEPA soils and waste were placed in 205 L metal barrels and appropriately labelled. Excavated soils and waste determined to be in excess of CCME R/P criteria, or DCC-II were also placed in labeled 205 L barrels. Filled barrels were shipped to Whitehorse and then to a waste disposal facility. Excavated soil and waste determined to be less than CCME R/P criteria, or DCC-II was placed in the landfill on site.

A. Location AA101

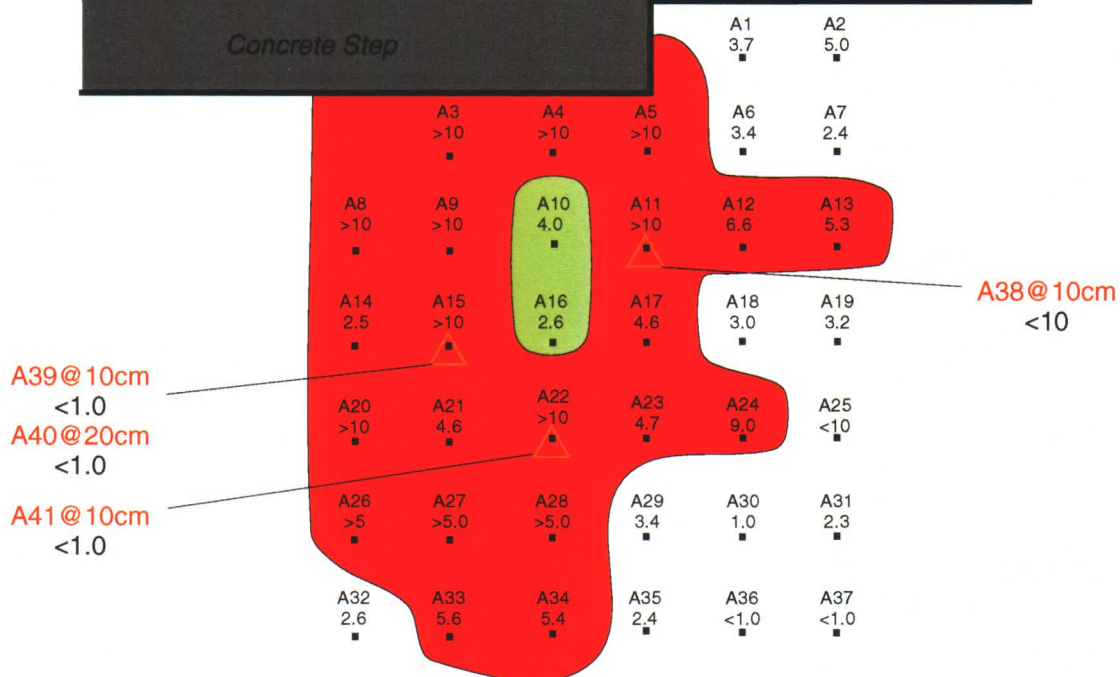
1. Previous Investigation

Location AA101 was a slight depression in front of the entrance of the large door on the east side of the powerhouse. Substrate at this location contained 10 ppm of PCBs, which exceeded the CCME R/P criteria or the DCC-II.

2. *Delineation*

Forty-one samples (A1- A41) were taken along a 1 m grid and analyzed with the immunoassay test kit in the Yukon to delineate the extent of contamination at this location. These included four subsurface samples (A38 - A41) taken at depths of up to 20 cm. The sample locations are shown on Map III-1. Based on the results (Table III-1) the area of contamination was marked with pegs and flag tape (Photograph III-1).

Map III-1: Delineation Sample Locations and PCB Concentrations (ppm) at AA101, the Powerhouse East Stain



- DCC I
- DCC II/CCME R/P
- Delineation Sample
- Sample Taken at Depth



Table III-1: Concentration of PCBs in Soil Samples Used to Delineate Contamination at AA101

Sample #	Concentration of PCBs (ppm or $\mu\text{g/g}$)	Sample #	Concentration of PCBs (ppm or $\mu\text{g/g}$)
A1	3.7	A21	4.6
A2	5.0	A22	>10
A3	>10	A23	4.7
A4	>10	A24	9.0
A5	>10	A25	<1.0
A6	3.4	A26	>5.0
A7	2.4	A27	>5.0
A8	>10	A28	>5.0
A9	>10	A29	3.4
A10	4.0	A30	1.0
A11	>10	A31	2.3
A12	6.6	A32	2.6
A13	5.3	A33	5.3
A14	2.5	A34	5.4
A15	>10	A35	2.4
A16	2.6	A36	<1.0
A17	4.6	A37	<1.0
A18	3.0	A38	<1.0
A19	3.2	A39	<1.0
A20	>10	A40	<1.0
		A41	<1.0

3. *Excavation and Confirmatory Sampling*

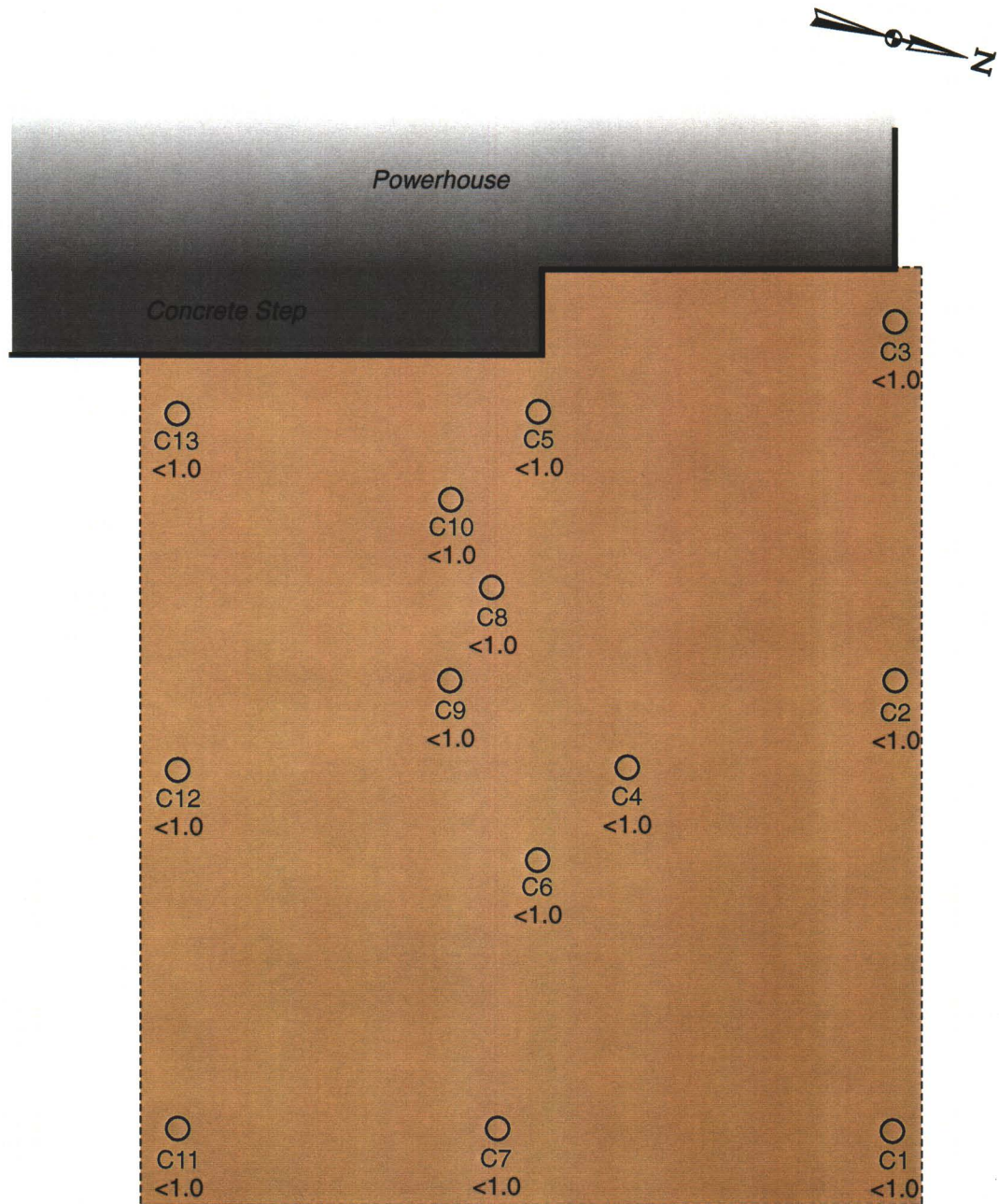
Soils containing PCBs in excess of DCC-II (1.8 m³) were excavated using shovels and placed in barrels (Photograph III-2) prior to shipping off site. DCC-I soils were excavated with a front-end loader. All the DCC-I excavated soils (36 m³) were placed in the landfill on site. An area of 9 m by 9 m, to a maximum depth of 40 cm, was removed (Photograph III-3), and all excavated areas were backfilled.

Thirteen soil samples (C1 to C13) were collected after soil removal and prior to backfilling, and analyzed with the test kits; eight of these were later analyzed in the laboratory by gas chromatography with electron capture detector (Table III-2). The confirmatory sample locations (C1 to C13) and actual area of soil removed are presented on Map III-2. All excavated areas were filled. These results indicated that the PCB-contaminated soil at the east entrance of the powerhouse (AA101) had been removed.

Table III-2: Concentration of PCBs in Samples Collected from AA101 after Removal of PCB-Contaminated Soils

Sample #	Conc. of PCBs (ppm or $\mu\text{g/g}$)	
	Field Test Kit	GC/ECD
C1	<1.0	
C2	<1.0	<0.1
C3	<1.0	<0.1
C4	<1.0	
C5	<1.0	
C6	<1.0	0.08
C7	<1.0	0.04
C8	<1.0	
C9	<1.0	0.6
C10	<1.0	
C11	<1.0	0.1
C12	<1.0	0.07
C13	<1.0	

Map III-2: Confirmatory Testing Sample Locations and PCB Concentrations (ppm) at AA101, the Powerhouse East Stain



○ Confirmatory Sample

■ Excavated Area



Scale



Photograph III-1: Delineation and demarcation of contaminated area at AA101, the powerhouse east stain.



Photograph III-2: Excavation and barrel containment of DCC-II/CCME R/P PCB-contaminated soils at AA101, the powerhouse east stain.



Photograph III-3: Excavated area at AA101, the powerhouse east stain, after removal of DCC-I contaminated soil.

B. Locations AA108 to AA115

1. Previous Investigation

Samples were collected from a stained area south of the powerhouse, in an area containing eight pole stumps which were previously used for a transformer stand. Three of the samples contained PCBs at concentrations (up to 3.4 ppm) in excess of the DCC-I.

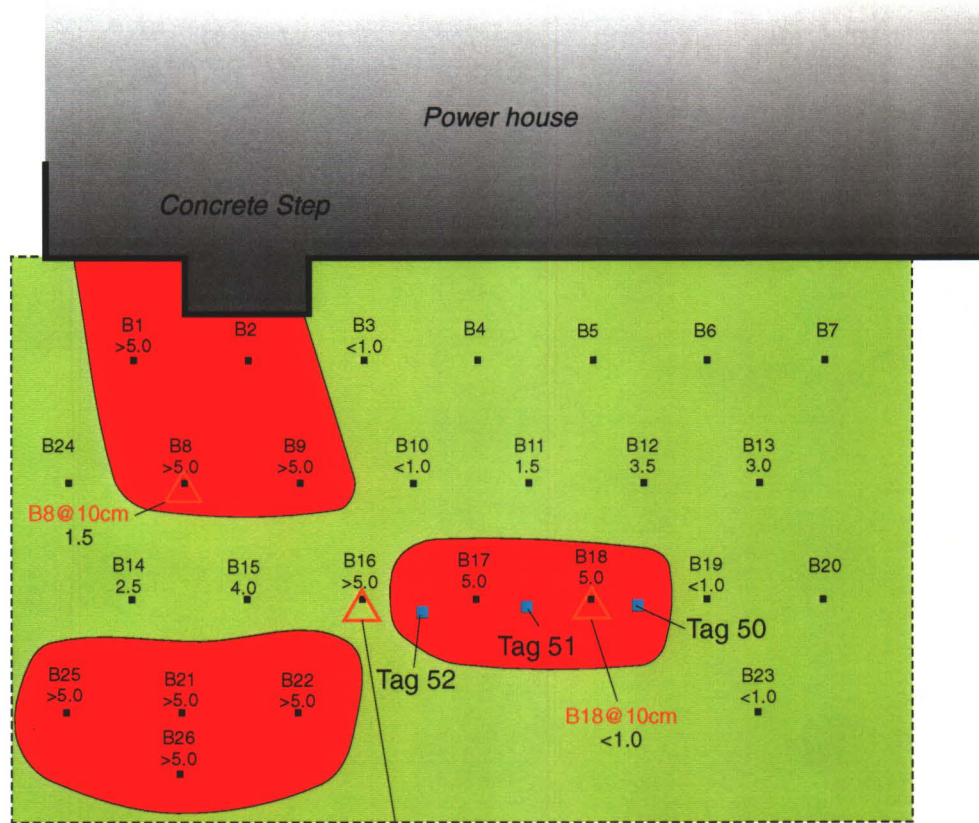
2. Delineation

Samples (B1 to B26) were collected from various coordinates along a 2 m by 1 m grid (Photograph III-4). Three test pits were also dug and samples taken at various depths. All the samples were analyzed at Aishihik using immunoassay PCB test kits. Sampling points are indicated on Map III-3. The concentrations of PCBs in the samples are shown on Map III-3 and in Table III-3.

Table III-3: Concentration of PCBs in Soil Samples Used to Delineate Contamination at AA108 to AA115

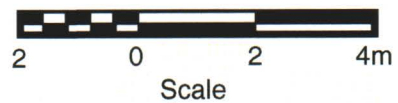
Sample #	Concentration of PCBs (ppm or $\mu\text{g/g}$)	Sample #	Concentration of PCBs (ppm or $\mu\text{g/g}$)
B1	>5.0	B16, 15 cm	1.0
B3	<1.0	B16, 20 cm	<1.0
B8	>5.0	B17	5.0
B8, 10cm	1.5	B18	5.0
B9	>5.0	B18, 10 cm	<1.0
B10	<1.0	B19	<1.0
B11	1.5	B21	>5.0
B12	3.5	B22	>5.0
B13	3.0	B23	<1.0
B14	2.5	B24	>5.0
B15	4.0	B25	>5.0
B16	>5.0	B26	>5.0

Map III-3: Delineation Sample Locations and PCB Concentrations (ppm) at AA108 and AA115, the Powerhouse South Stain



- DCC I
- DCC II/CCME R/P
- 1994 Assessment Sample
- Delineation Sample
- Sample Taken at Depth

B16@15cm
1.5
B16@20cm
<1.0



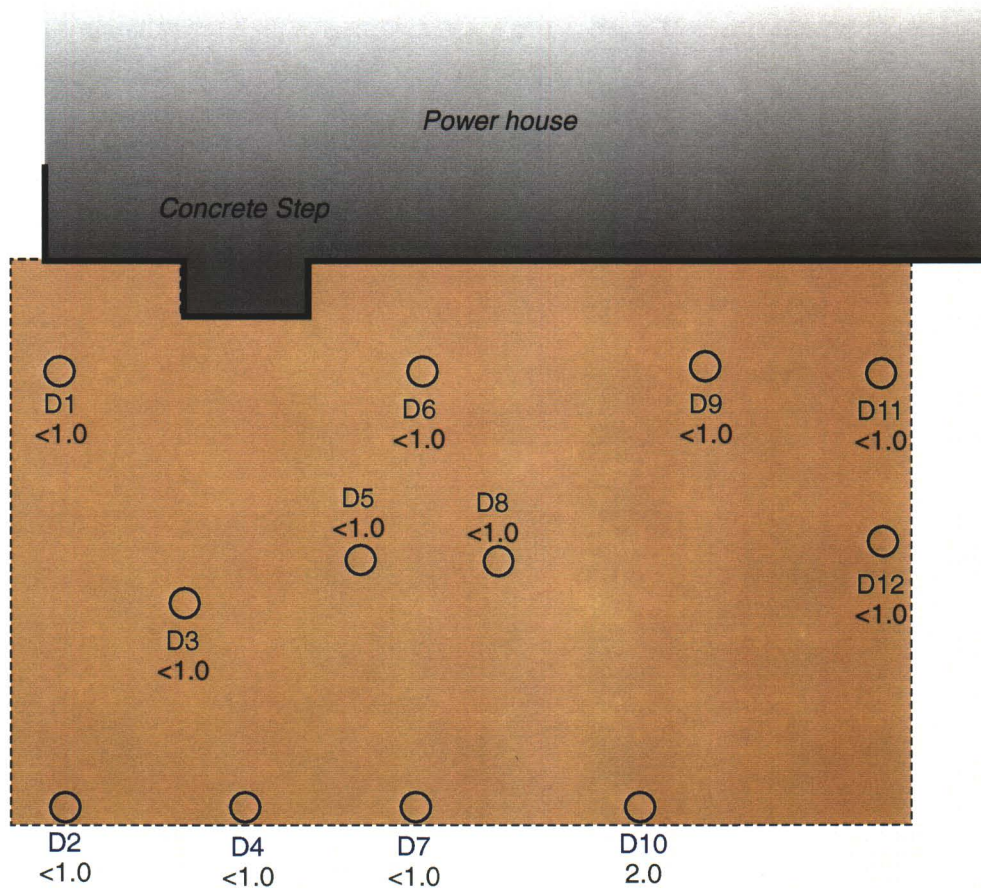
3. *Excavation and Confirmatory Sampling of DCC Tier II Contamination at AA108 to AA115*

The DCC Tier II /CCME R/P contaminated soil (4.6m³) was removed to a maximum depth of 10 cm and placed in barrels. The DCC-I soils were then removed with a front-end loader and placed in the landfill. An area of 14 m by 4 m to a maximum depth of 0.6 m was excavated. Following this, 12 samples (D1 to D12) were taken and analyzed with the test kits; six of these were later analyzed by GC/ECD in the laboratory. The results obtained (Table III-4) indicated that the DCC Tier II soils had been successfully removed, but that DCC-I contaminated soils were still present on the west side of the excavated area. The transformer poles on the west boundary of the excavated area were removed and a front-end loader was used to extend the excavated area a further three metres to 14 m by 7 m and to a depth of 0.6 m (60 m³) to ensure contaminant removal to levels below DCC-I. The area excavated and the sample locations are shown in Map III-4 (Photograph III-5). All excavated areas were backfilled.

Table III-4: Concentration of PCBs in Samples Collected from AA108 - AA115 after Removal of Contaminated Soils

Sample #	Conc. of PCBs (ppm or µg/g)	
	Field Test Kit	GC/ECD
D1	<1.0	
D2	<1.0	<1
D3	<1.0	<1
D4	<1.0	
D5	<1.0	
D6	<1.0	0.2
D7	2.0	
D8	<1.0	<1
D9	<1.0	
D10	2.0	
D11	<1.0	0.1
D12	<1.0	<1

Map III-4: Confirmatory Testing Sample Locations and PCB Concentrations (ppm) at AA108 and AA115, the Powerhouse South Stain



- Confirmatory Sample
- Excavated Area





Photograph III-4: Delineation and demarcation of contaminated area at AA108 and AA115 the powerhouse south stain.



Photograph III-5: Excavated area at AA108 and AA115, the powerhouse south stain after removal of DCC-I contaminated soil.

C. **Dump Site 3: Battery Stain**

1. *Previous Investigation*

Dump site 3, located between two larger dump sites on the south side of the site, contained engine parts, an old vehicle and airstrip rollers in a small flat depression. Two large battery stains (west battery stain and east battery stain) were noted in this area of the site.

2. *Delineation*

Prior to performing any delineation sampling the visible battery fragments as well as the surface 3 cm of soil was removed from both battery stains and placed in barrels (Photograph III-6 and Photograph III-7).

a) **West Battery Stain Delineation**

Ten samples (E1 - E10), including one depth sample, were collected from in and around the area, defined by the scattered battery fragments, at random locations. All the samples were analyzed using the PFXRF at Aishihik. Four samples at the outer edge of the stained area (E6, E7, E7 and E9) had concentrations of lead that exceeded DCC-I. The concentrations of lead in the remaining samples ranged from 666 ppm to 50,080 ppm, all in excess of DCC-II. Sample locations are indicated on Map III-5 and the concentrations of copper, zinc and lead are shown in Table III-5 (Photograph III-8).

Table III-5: Concentrations of Metals in Soils Collected from West Battery Stain

Sample	Concentration (ppm or $\mu\text{g/g}$)		
	Copper	Zinc	Lead
E1	< 50	103	666
E2*	63	155	13,231
E3	< 50	167	48,450
E4	< 50	128	50,080
E5	< 50	82	2820
E6, 10cm	< 50	89	320
E7*	56	95	438
E8	77	88	2383
E9	74	103	226
E10*	< 50	147	872

*Analysis performed in duplicate.

b) East Battery Stain Delineation

Thirteen samples (F1 - F13), including one depth sample, were collected from in and around the area, defined by the scattered battery fragments, at random locations. All the samples were analyzed using the PFXRF at Aishihik. Three samples (F12, F12* and F13), located on the edge of the stained area, contained concentrations of lead below DCC-I. Six samples (F1, F6, F8, F8, F9 and F11) had concentrations of lead that exceeded DCC-I. The concentrations of lead in the remaining samples (F1, F2, F3, F4, F5, F7 and F10) ranged from 564 ppm to 68,810 ppm, all in excess of DCC-II. Sample locations are shown on (Map III-6) and the concentrations of copper, zinc and lead are displayed in Table III-6.

Table III-6: Concentration of Metals in Samples Collected to Delineate Contamination at East Battery Stain

Sample	Concentration (ppm or $\mu\text{g/g}$)		
	Copper	Zinc	Lead
F1	23	103	564
F2	< 50	140	68,810
F3*	62	120	1316
F4	< 50	358	27,170
F5	86	298	3267
F6, 10cm	< 50	69	201
F7	< 50	434	1125
F8*	54	128	237
F9	< 50	120	499
F10	58	561	601
F11	< 50	90	4739
F12*	54	112	156
F13	< 50	128	115

*Analysis performed in duplicate.

3. *Excavation and Confirmatory Sampling*

a) West Battery Stain

The high level DCC-II contaminated soils (1.2 m^3) were placed in barrels with the battery fragments. Contaminated soil was excavated using a front-end loader, from an area 6 m by 6 m to a depth of 0.6 m (22 m^3) and placed in a landfill on site. After excavation of the contaminated soil, six samples (G1 - G6) were taken from the perimeter and bottom of the excavated area and analyzed using the PFXRF. The results (Table III-7) indicated that the lead-contaminated soil in the West Battery Stain area had been successfully removed to below the detection limit (20 ppm). The confirmatory sample

locations and actual area of soil removed are shown in Map III-5 (Photograph III-10). All excavated areas were backfilled.

Table III-7: Concentration of Metals in Samples Collected from West Battery Stain After removal of Contaminated Soils

Sample	Concentration (ppm or $\mu\text{g/g}$)		
	Copper	Zinc	Lead
G1	<50	102	<20
G2	< 50	69	<20
G3	<50	68	<20
G4	<50	38	<20
G5	72	40	<20
G6	< 50	32	<20

b) East Battery Stain

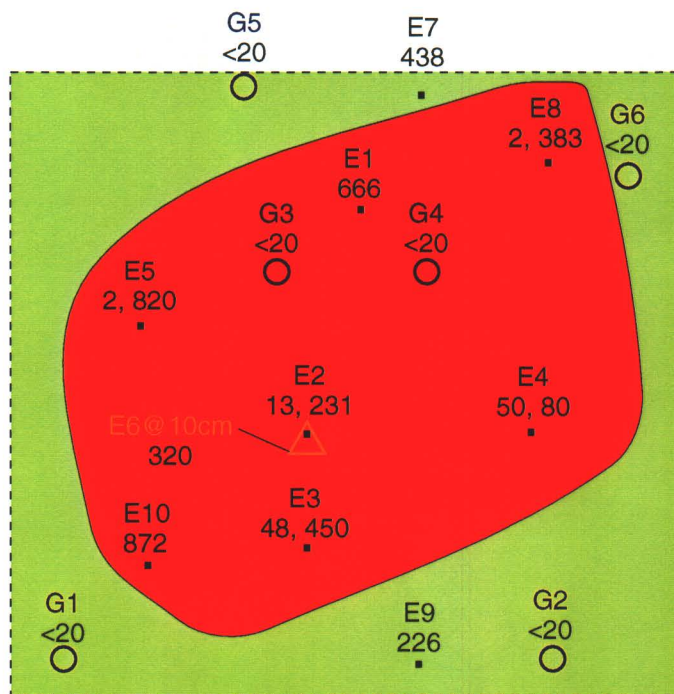
The surface layer of DCC-II contaminated soil (0.5 m^3) was placed in barrels with the battery fragments. Contaminated soil was excavated from an area 7 m by 6 m to a depth of 0.6 m (0.5 m^3), using a front-end loader, and placed in a landfill on site. After excavation of the contaminated soil, seven samples (H1 - H7) were taken from the perimeter and bottom of the excavated area and analyzed using the PFXRF. The results (Table III-8) indicated that the lead-contaminated soil in the East Battery Stain area had been successfully removed to below DCC-I in all cases and below the detection limit (20 ppm) in most cases. The confirmatory sample locations and actual area of soil removed are shown in Map III-6 (Photograph III-11). All excavated areas were backfilled.

**Table III-8: Concentration of Metals in Samples Collected from Battery Pile East
After removal of Contaminated Soils**

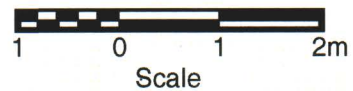
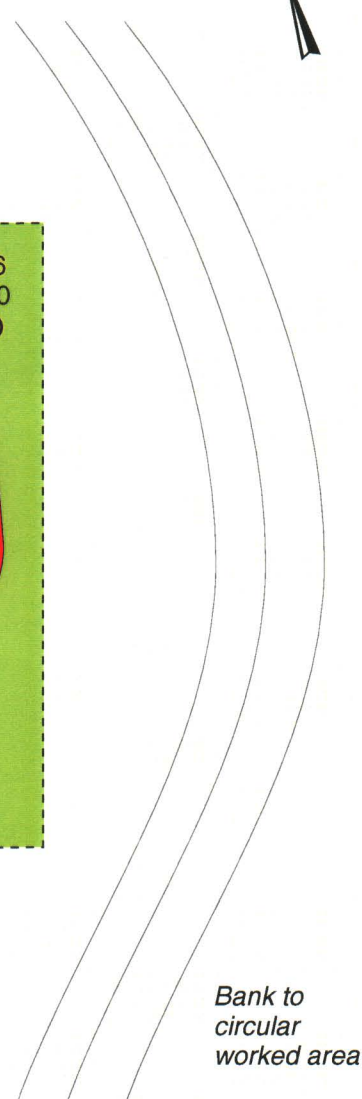
Sample	Concentration (ppm or $\mu\text{g/g}$)		
	Copper	Zinc	Lead
H1	<50	67	<20
H2	<50	58	<20
H3	<50	<30	<20
H4	<50	88	<20
H5	<50	56	<20
H6	<50	<30	<20
H7*	<50	41	<20

*Analysis performed in duplicate.

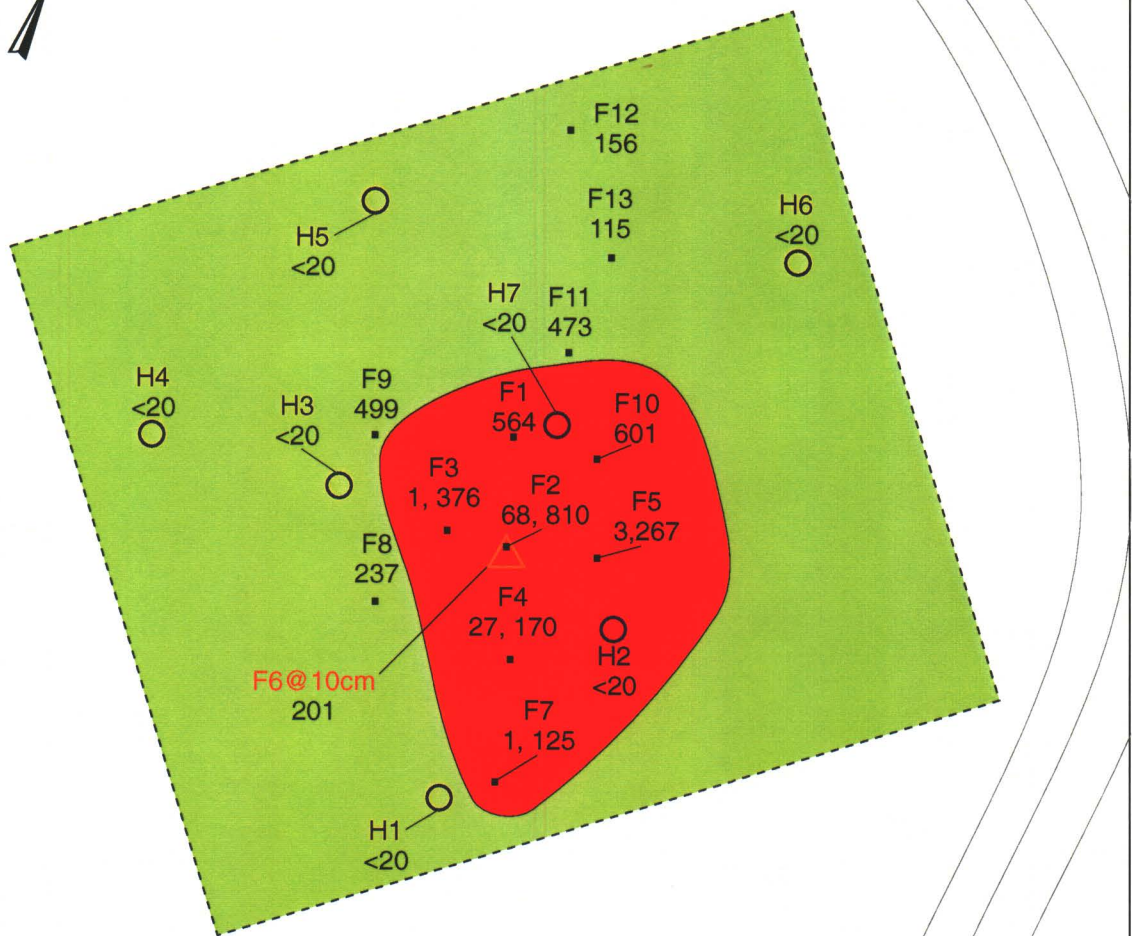
Map III-5: Delineation and Confirmatory Testing Sample Locations and Lead Concentrations (ppm) for West Battery Stain



- DCC I
- DCC II/CCME R/P
- Delineation Sample
- Confirmatory Sample
- Sample Taken at Depth
- Excavated Area



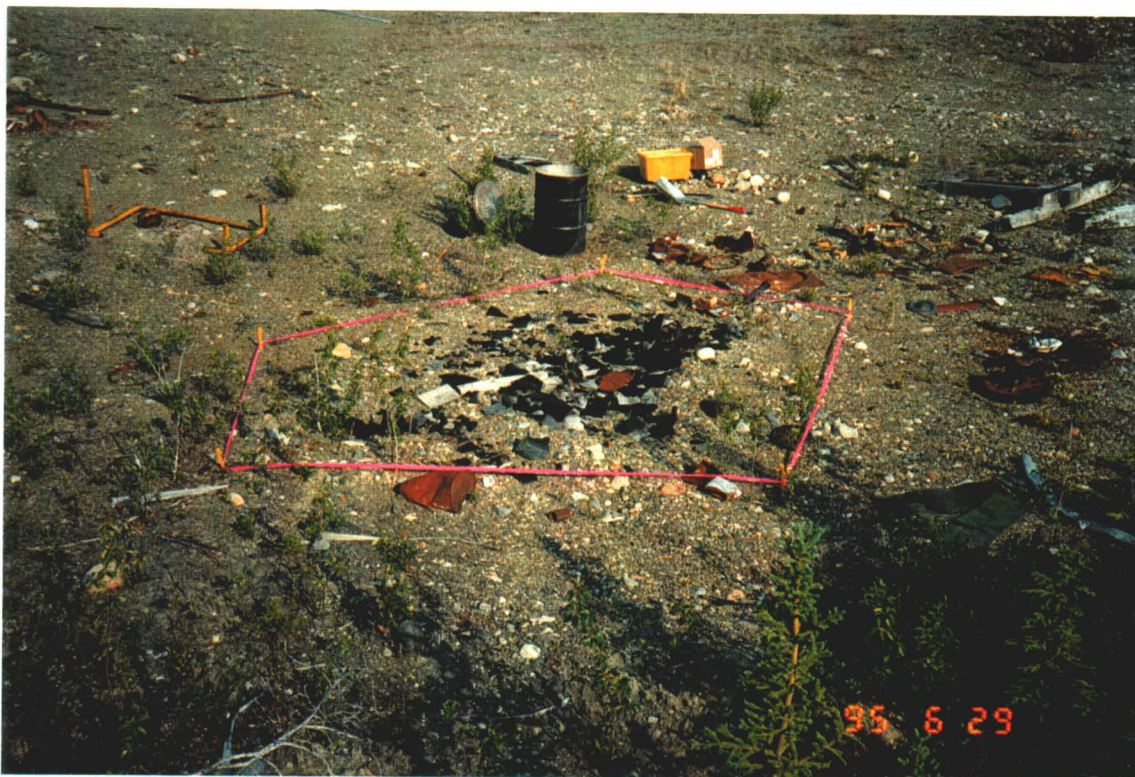
Map III-6: Delineation and Confirmatory Testing Sample Locations and Lead Concentrations (ppm) for East Battery Stain



- DCC I
- DCC II/CCME R/P
- Delineation Sample
- Confirmatory Sample
- Sample Collected at Depth
- Excavated Area

Bank to circular worked area





Photograph III-6: West battery stain before containing battery fragments in barrels.



Photograph III-7: West battery stain after containing battery fragments in barrels.



Photograph III-8: Delineation sample locations for the west battery stain.



Photograph III-9: Delineation sample locations for east battery stain.



Photograph III-10: Confirmatory sampling at the west battery stain.



Photograph III-11: Confirmatory sampling at the east battery stain.

D. Location AA116

1. Previous Investigation

Sample AA116, collected 1.5 m northeast of a creosote-treated pole located 15 m west of the centre of the garage, contained lead (200 ppm) comparable to the DCC Tier I.

2. Delineation

One sample (I1) was collected from the original sample location and four more (I2 - I5) were collected 1 m from I1 in order to determine the extent of lead contamination. These samples were analyzed by using the FPXRF at Aishihik. The concentration of lead at I1 (208 ppm) was comparable to DCC-I; however, the remaining four samples contained lead at low levels. (Table III-9). This indicated that the lead contamination was restricted to a small isolated area, and therefore no further work was carried out at this location.

Table III-9: Concentration of Metals in Soils Collected near AA116

Sample	Concentration (ppm or $\mu\text{g/g}$)		
	Copper	Zinc	Lead
11*	<50	233	208
12	58	106	48
13	<50	126	<20
14*	<50	115	<20
15	<50	297	79

*Analysis performed in duplicate

IV. REMEDIATION OF CONTAMINATED POWERHOUSE

A. Previous Investigation

Samples taken from the powerhouse indicated that it was contaminated with PCBs. Highly elevated concentrations (1100 ppm) were found in one soil sample (AA100) taken from one of two generator sumps in the main room of the powerhouse. One paint sample obtained from the same area of the powerhouse also contained elevated levels (154 ppm), and a second, taken from a concrete bench in the southwest room of the powerhouse contained highly elevated levels (21,900 ppm) in violation of CEPA. A paint sample taken from the southeast room of the powerhouse contained PCB concentrations in excess of DCC-II (26 ppm) but less than CEPA. Swab samples taken from the three rooms had low levels ($<100 \text{ ng}/10 \text{ cm}^2$) indicating that the PCBs were "locked" in the paint.

Elevated levels of inorganic elements (lead, 620; zinc, 2020; and copper, 118 ppm) were also present in soil sample AA100 taken from the generator sump.

B. Remediation, Confirmatory Testing and Demolition

Due to the high levels of PCBs on the floor and in the paint on the walls of the building a decision was made to remove the building entirely. The waste generated with concentrations in excess of CEPA, and that generated by the paint stripping process, were segregated in labelled barrels, which were removed from the site for shipment to a waste disposal facility. The non-hazardous waste generated by the demolition of the powerhouse was buried in the landfill on site. The remediation of the powerhouse was conducted according to Health and Safety Plan prepared by Phoenix OHC, Inc., Kingston (Annex A).

Contaminated debris scattered on the floor of the powerhouse was consolidated and placed in labelled barrels (Photograph IV-1). The south section of the roof and the

entire ceiling of the powerhouse were removed to allow effective ventilation of the powerhouse during solvent washing and chemical paint stripping processes. Waste material generated was placed in the non-hazardous waste landfill.

1. *Generator Sump*

Soils containing PCBs in excess of CEPA and DCC-II were excavated from both generator sumps to a depth of 40 cm and placed in labelled barrels. A soil sample was taken and analyzed with test kits, and later analyzed by GC/ECD in the laboratory. The results obtained from the west and east sumps (2.5 ppm and 1.4 ppm respectively) were below DCC-II and indicated that sufficient soil had been removed to permit landfilling of the residual low level contaminated soil (Photograph IV-2).

2. *Powerhouse Walls and Concrete Floor and Bench*

The powerhouse floor, concrete bench in the southwest room and two radiators in the powerhouse main room, were washed three times using Varsol and the washings absorbed with oil absorbant material (Oclansob). Four floor paint samples were taken, two from the main room and one each from the southwest and southeast rooms. Laboratory analysis for PCBs by GC/ECD indicated that the paint still contained elevated levels of PCBs ranging from 6,140 ppm to 11,860 ppm. Paint was dry scraped from all walls and concrete surfaces where possible. Painted areas on the floor and wooden shelving and edging which resisted the physical stripping process were treated with a commercial methylene chloride base paint stripper. The waste generated by these processes was removed and placed in appropriately labelled barrels (Photograph IV-3 and Photograph IV-4).

The two radiators were removed from the building and placed in the landfill. The building was demolished and the debris placed in the landfill. Two concrete floor samples were taken from the main room of the powerhouse, obtained as fine powders by drilling

the surface of the concrete floor with a masonry drill bit, and analyzed in the laboratory for PCBs. The concentrations of PCBs (6.5 ppm and 36 ppm) in these two samples were found to be below CEPA and no further treatment of the concrete surfaces was performed (Photograph IV-5). The concrete bench from the southwest room was removed to the landfill.

The buried diesel fuel tank was removed from the west side of the powerhouse and taken to the landfill. A stain at the bottom of the tank pit was sampled and analyzed for benzene, toluene, ethylbenzene and xylene (BTEX), pesticides and PCBs. Low levels of xylene (p,m-xylene (0.34 ppm) and o-xylene (1.8 ppm)) was detected. None of the other BTEX compounds were detected. Pesticide and PCB levels were below the detection limits. These results indicate that the levels and nature of the contamination are not deleterious to the environment. Further, the depth of contamination suggested that back-filling the tank pit with gravel provided a suitable remediation solution (Photograph IV-6 and Photograph IV-7).

A 3 m wide and 0.5 m deep trench of soil was removed from the west and south sides of the building (Photograph IV-8) using a front-end loader and placed in the landfill, in order to ensure that any near surface contamination, which may not have been detected in previous investigations, was removed. All excavated areas around the powerhouse were backfilled with soil and gravel from a local source. Soil was banked around and over the concrete pad to a depth of 0.5 m to ensure encapsulation and isolation of the pad from any environmental influence (Photograph IV-8 and Photograph IV-9).



Photograph IV-1: Scattered debris from powerhouse floor containment in barrels.



Photograph IV-2: Powerhouse generator sump soil excavation and containment in barrels.



Photograph IV-3: Powerhouse walls after physical paint stripping.



Photograph IV-4: Powerhouse wooden plank during chemical paint stripping.



Photograph IV-5: Concrete sample removed from the powerhouse generator foundations.



Photograph IV-6: Pit and tank after removal of the powerhouse diesel tank.

Photograph IV-7: Sample location at the base of the powerhouse diesel tank pit.



Photograph IV-8: Graded trench after removal of soil from around the powerhouse concrete pad.





Photograph IV-9: Barrels awaiting shipment off site, temporarily stored on powerhouse concrete pad.

V. QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

A. Inorganic Elements

For field measurements, the operation of the FPXRF was monitored with pure metal and Teflon standards in accordance with the manufacturer's instructions; analyses were only carried out after obtaining Mn and Co intensities of <0.003 as recommended by the manufacturer. Precision and reproducibility of the data were checked by analyzing a selected number of samples (20 %) in duplicate. Good agreement was obtained between replicate analyses (Table V-1: Concentration). The average relative standard deviation or coefficient of variation (standard deviation divided by the mean) expressed as a percentage for all replicate soil samples was 8.0 % for copper, 11 % for zinc and 10 % for lead.

The concentrations of copper, zinc and lead in soil samples analyzed by FPXRF in the field are compared to those obtained by laboratory AAS in Table V-2. A good correlation between the FPXRF and AAS results was obtained for confirmatory samples (G1, G4, G6, H1, H4 and H7); copper, lead and zinc levels were comparable and well below the DCC.

Table V-1: Concentration of Metals in Duplicate Analyses of Aishihik Airstrip Soil Samples by FPXRF

Sample	Concentration (ppm or $\mu\text{g/g}$)		
	Copper	Zinc	Lead
E2	75	205	14460
E2 dup	44	104	12003
Std. Dev.	16	50	2457
Rel Std. Dev. (%)	13	34	19
E7	62	100	437
E7 dup	< 50	90	438
Std. Dev.	6	5.0	0.5
Rel Std. Dev. (%)	11	5.3	.11
E10	<50	155	895
E10 dup	<50	139	849
Std. Dev.	-	8	23
Rel Std. Dev. (%)	-	5	3
F8	57	112	251
F8 dup	<50	144	223
Std. Dev.	4	16	14
Rel Std. Dev. (%)	7	12.5	6
F12	57	121	145
F12 dup	<50	103	166
Std. Dev.	4	9	10
Rel Std. Dev. (%)	7	8	6

Table V-1: Continued

Sample	Concentration (ppm or $\mu\text{g/g}$)		
	Copper	Zinc	Lead
H7	<50	51	<20
H7 dup	<50	<30	<20
Std. Dev.	-	10	-
Rel Std. Dev. (%)	-	26	-
I1	<50	233	208
I1 dup	<50	223	207
Std. Dev.	-	5	0.5
Rel Std. Dev. (%)	-	2	0.2
I4	<50	115	<20
I4 dup	<50	111	23
Std. Dev.	-	2	2
Rel Std. Dev. (%)	-	2	7
Average Rel. Std. Dev	8.0	11	10

Table V-2: Concentration of Copper, Zinc and Lead in Soils by using FPXRF and AAS

Sample	Concentration ($\mu\text{g/g}$ or ppm)					
	Copper		Zinc		Lead	
	XRF	AAS	XRF	AAS	XRF	AAS
G1	<50	37.2	67	57	<20	13
G4	<50	19.7	88	102	<20	<10
G6	<50	16.9	102	115	<20	<10
H1	<50	23.9	51	56	<20	<10
H4	<50	16.4	38	37	<20	<10
H7	<50	6.7	32	26	<20	<10

B. PCBs Analysis

Precision/reproducibility of the immunoassay test kits was monitored by analyzing four samples in duplicate. Good agreement was obtained between replicate analyses (Table V-3); the maximum relative standard deviation obtained was 8.3%.

Table V-3: Concentration of PCBs in Duplicate Analyses of Aishihik Airstrip Soil Samples

Sample	Concentration of PCBs (ppm or $\mu\text{g/g}$)
B9	39
B9 dup	35
Std. Dev.	2
Rel Std. Dev. (%)	5.4
B16	65
B16 dup	55
Std. Dev.	5
Rel Std. Dev. (%)	8.3
B22	35
B22 dup	33
Std. Dev.	1
Rel Std. Dev. (%)	2.9
B16, 15	1.7
B16, 15 dup	1.7
Std. Dev.	0
Rel Std. Dev. (%)	0
Average Rel. Std. Dev	4.2

The concentrations of PCBs in nine confirmatory samples determined by laboratory GC/ECD and immunoassay field test kits are shown in Table V-4. Good agreement was obtained between the field results and the laboratory data.

**Table V-4: Concentration of PCBs in Soils by Using by Gas Chromatography/
Electron Capture Detection (GC/ECD) and Immunoassay Test Kit**

Sample	Concentration of PCBs ($\mu\text{g/g}$ or ppm)	
	GC/ECD	Test kit
C2	<1.0	<1.0
C3	<1.0	<1.0
C6	0.08	<1.0
C7	0.04	<1.0
C9	0.6	<1.0
C11	0.1	<1.0
C12	0.07	<1.0

Annex A: The following pages contain the Phoenix OHC Health and Safety Plan submitted to the DIAND representative at Aishihik during the site cleanup.



HEALTH CONSIDERATIONS AND PROCEDURES RELATING TO THE REMOVAL OF PCB AND LEAD CONTAINING PAINT

AISHIHIK POWERHOUSE, YUKON

PREPARED BY: Tom Beardall, MHSc, CIH, ROH
ON: 1995.06.15

AS REQUESTED BY: Dr. Ken Reimer
REFERENCE NO.: 4577

1. SCOPE OF WORK

- 1.1 This project involves a clean-up of the floor, removal of the roof, removal of paint from the interior surfaces of the ceiling and walls, and PCB decontamination (with Varsol) of all interior surfaces of the Aishihik powerhouse. Paint will be removed with chemical paint stripper and by manual scraping of the treated material. After the waste has been removed to appropriately labelled collection barrels, surfaces will be washed with Varsol, and the washings contained and collected by means of hydrocarbon absorbent material.
- 1.2 The powerhouse is described as a small wooden building with a concrete floor. Doors and windows are no longer present in the existing frames. Although this could provide for a considerable degree of natural ventilation, it may not adequately reduce methylene chloride vapour levels during indoor paint stripping. Exposure to methylene chloride and methanol (the two components of the paint stripper) are not adequately controlled by air purifying respirators due to rapid breakthrough of charcoal and poor warning properties. Therefore, to maximize the level of natural ventilation, the roof of the powerhouse will be removed before any paint stripping is conducted.
- 1.3 Paint and floor debris samples have been determined analytically to contain up to 2.2% PCB and up to 2.0% lead (in addition to varying concentrations of other inorganic elements; results appended).

2. DEFINITIONS

- 2.1 CEPA: Canadian Environmental Protection Act
- 2.2 CSA: Canadian Standards Association
- 2.3 Chemical Paint Remover: Paint and Varnish Remover, manufactured by Recochem Inc. (MSDS appended)
- 2.4 Detector tubes: Glass tubes containing colorimetric reagents adsorbed on silica gel. A piston or bellows pumps is used to draw a precise volume of air through the tube. The reagents react quantitatively to specific gases or vapours to provide a length-of-stain indication of airborne concentrations. Manufacturers include Gastec Corporation and Drager Ltd.
- 2.5 Hydrocarbon absorbent material: Oclansorb™ or equivalent (MSDS appended)
- 2.6 MSDS: Material Safety Data Sheet
- 2.7 NIOSH: National Institute for Occupational Safety and Health (in the U.S.A.)
- 2.8 PCB: Polychlorinated Biphenyls
- 2.9 Transition Zone: The zone between the contaminated work area and the outdoor environment, (see section 5.4)
- 2.10 Waste load-out area: A staging area for waste filled containers to allow for the decontamination of their outer surfaces (if necessary) prior to transport (see section 5.5)
- 2.11 Wet methods: Manual disturbance of materials (e.g. with scrapers, brushes etc.) only after the materials have been "wetted" to near saturation, with liquid.
- 2.12 Work Area: The area delineated by the exterior walls of the powerhouse once the project set-up is completed (see section 5) and until the final clean-up is completed

3. GENERAL REQUIREMENTS

- 3.1 All work is to be conducted in strict compliance with the applicable legal requirements of the jurisdiction(s).
- 3.2 Prior to the start of work, all workers are to be informed of the hazards of the work and work area, and are to be trained in the proper care, use and limitations of their personal protective equipment.

4. HYGIENE AND PERSONAL PROTECTIVE EQUIPMENT

- 4.1 Anyone entering the work area must be wearing the personal protective equipment assigned for the particular phase of remediation (see sections 6, 7, 8 and 9)
- 4.2 There will be no eating, drinking or smoking inside the work area and workers will wash-up prior to eating, drinking or smoking away from the work area.
- 4.3 Prior to leaving the work area, personnel will remove visible contamination from their protective clothing and equipment (e.g. by wet wiping with a water soaked rag).
- 4.4 The work area will be exited into a transition zone (a 6 mil polyethylene drop sheet on the ground outside the door). The exiting sequence will consist of the following:
 - contaminated coveralls, boot covers, respirator cartridges and gloves will be removed and disposed in waste barrels,
 - non-contaminated protective clothing intended for reuse will be stored,
 - goggles and respirators will be cleaned and stored in sealed containers,
 - personnel will wash their hands and face, and if contaminated, any other skin surface.
- 4.5 If at any time during the project the protective equipment or clothing is damaged (e.g. torn) or penetration by the stripper or solvent is suspected, then the worker must exit the work area into the transition zone and remove, dispose and replace the affected item. Saranex coveralls and boot coverings may be penetrated by chemical stripper shortly after being contaminated with this liquid, and therefore, must be replaced immediately after such contamination.

5. PROJECT SET-UP

- 5.1 The project set-up reflects the fact that this is fundamentally an environmental abatement project, and is intended to provide a workable approach to the protection of workers and protection of the environment (through containment) but with worker protection being of paramount importance. Wet removal methods will minimize airborne PCB/lead dust levels, but may result in high airborne solvent levels. Therefore a high degree of natural ventilation is desirable; doors and windows must not be sealed off. Depending on the degree of natural cross-drafting available, portable fan(s) may also be useful or necessary for diluting airborne solvent levels. However, it is imperative that solvent vapour explosivity be precluded (e.g. by use of a solvent such as Varsol with a flash point well above ambient temperature) and ensuring that no source of ignition (e.g. fan motor) is present where there is any significant accumulation of solvent vapour.

After the floor is cleaned with Varsol and before any paint removal is conducted, the roof of the powerhouse will be removed, thereby maximizing the degree of natural ventilation present during paint stripping activities.

- 5.2 Warning signs (e.g. "Health Hazard, Keep Out") will be posted at the approaches to the work areas,
- 5.3 Polyethylene drop sheets will be secured to the ground outside the exterior doors and windows to provide for the clean-up of any debris falling through these openings during the remediation
- 5.4 A transition zone between the contaminated work area and the outdoor environment will be created. It will consist of a 6 mil polyethylene drop sheet secured to the ground at the entrance to the building (tent-like enclosure, optional) and having a waste receptacle for disposal of contaminated clothing, wash-up facilities, storage containers for respirators and goggles, a portable eye-wash and a first aid kit.
- 5.5 A waste load-out area will be created. It will consist of a 6 mil polyethylene drop sheet secured to the ground at a separate access point to the powerhouse. It must be of sufficient size to permit cleaning of waste collection barrels, if necessary, prior to transport.
- 5.5.1 All waste will be removed from the work area via the waste load-out area. The waste containers will be cleaned of all surface contamination and/or be inserted into second (clean) containers at this point. The waste load-out area is never to be used for entering or exiting the work area. That is to occur only through the transition zone.

6. FLOOR DECONTAMINATION

6.1 The cleanup of loose debris and sediment from the floor, washing of the floor with Varsol, absorbing of washings with hydrocarbon absorbent material and disposal of debris and contaminated materials in designated containers will be conducted with the following stipulations:

6.1.2 The following **personal protective equipment**, intended to minimize exposures to lead/PCB dust and Varsol vapour and splashes, must be worn:

- a half-face respirator with organic vapour cartridges and dust/mist prefilter (NIOSH approved),
- disposable full body Saranex® (or equivalent) coveralls with a hood,
- nitrile or Silvershield® gloves (disposable "surgical-type" glove coverings over the Silver Shields, used to improve dexterity, is optional)
- safety boots (CSA approved) with disposable Saranex® (or equivalent) boot covers,
- chemical-splash resistant goggles.

6.1.2 Remove any litter that is not associated with PCB and/or paint contamination from the work area, prior to the clean-up/decontamination activities.

6.1.3 Test the floor and floor debris for levels of contamination (as well as wall and ceiling surfaces and materials when appropriate)

6.1.4 Remove the PCB-contaminated sediment (previously found to exceed CEPA criteria) from depression in floor by wet methods (i.e. thoroughly wet the sediment with Varsol and wipe, scrape or sweep) and dispose in DCC-II waste receptacle

6.1.5 Remove any other debris from the floor by similar wet methods and dispose in the appropriate waste receptacle (DCC-I or DCC-II).

6.1.6 Wash the floor with Varsol

6.1.7 Absorb the washings with hydrocarbon absorbent material and dispose in appropriate waste receptacle

6.1.8 Allow the floor to dry

- 6.1.9 Completely cover the floor with 6 mil polyethylene drop sheet(s) secured with duct tape or glue (intended to facilitate an easier final clean-up). *Significant contact with methylene chloride (paint stripper) may well dissolve some of the plastic; however, the degree to which this may become problematic will need to be determined based on site conditions.*

7. ROOF REMOVAL

- 7.1 The roof will be removed according to methods prescribed by the site supervisor, with the following stipulations:

- 7.1.1 The following **personal protective equipment**, intended to minimize head, foot and eye injury during destruction activities as well as exposures to lead/PCB dust, must be worn:

- hard hat (CSA approved),
- safety boots (CSA approved),
- safety glasses or impact resistant goggles (CSA approved)
- disposable full body coveralls with hood,

and if there is likely to be significant paint dust generation then a NIOSH approved dust/mist respirator.

- 7.1.2 Internal ceiling surfaces requiring paint removal and/or decontamination with Varsol will be kept inside the building until completion of the next phase of remediation (section 8).

8. PAINT REMOVAL

- 8.1 Once the roof has been removed, the removal of paint from the walls and the disassembled ceiling, by means of chemical paint stripper and manual scraping, will be conducted with the following stipulations:

- 8.1.1 In addition to the requirements of section 3.2, the workers will be advised of the acute effects of methylene chloride on the eye, and be shown how to flush out the eyes in case of accidental contact.

- 8.1.2 The following **personal protective equipment**, intended to minimize skin and eye contact with chemical paint stripper and exposures to lead/PCB dust, must be worn:

- disposable full body Saranex® (or equivalent) coveralls with a hood,
- Silvershield® gloves,
- safety boots (CSA approved) with disposable Saranex® (or equivalent) boot covers,
- chemical-splash resistant goggles,

and if there is likely to be significant paint dust or mist generation (e.g. if flakes dry/crumble to a powder or if wire brushing becomes necessary such as in cracks and crevices) then a NIOSH approved dust/mist filtering respirator

NOTE: Air purifying respirators (e.g. with organic vapour cartridges) will not adequately protect against the vapours of the paint stripper and are therefore not recommended. Exposures are to be controlled with natural dilution ventilation, confirmed to be effective by means of a direct reading monitoring device for methylene chloride (see clause 8.1.3).

8.1.3 **Air monitoring** with detector tubes will be conducted by the site supervisor to confirm that methylene chloride levels are within the following acceptable limits:

- At no time may exposures to methylene chloride exceed 250 ppm,
- Short term exposures (30 minutes average levels) to methylene chloride shall not exceed 150 ppm,
- 8 hour average levels shall not exceed 50 ppm

If exposures inside the work area are likely to exceed these limits, then the area should be vacated until such time that airborne methylene chloride concentrations are within acceptable levels.

The detector tube system will provide "grab sample" type results not directly comparable to 30 minute and 8 hour averages. Therefore, interpretation of the results will be dependent on the user's judgement. Ideally, methylene chloride levels during worst-case periods (e.g. during and shortly after application of the stripper) would be well below the 30 minute limit and levels at the start of scraping (i.e. after the waiting period required for the stripper to take effect) would be below the 8 hour limit.

8.1.4 Follow the manufacturer's recommended procedure for paint removal. Multiple layers of paint may require multiple applications of the paint stripper.

8.1.5 While still damp, place the stripped paint in the appropriate waste collection barrel. Clean up waste materials at frequent intervals, at the end of the day and prior to any inclement weather.

9. WALL AND CEILING DECONTAMINATION / FINAL CLEAN-UP

- 9.1 The washing of the walls and ceiling with Varsol, absorbing of washings with hydrocarbon absorbent material, disposal of absorbed materials in designated containers, and final clean-up will be conducted with the following stipulations:
- 9.1.2 The following **personal protective equipment**, intended to minimize exposures to lead/PCB dust and Varsol vapour and splashes, must be worn:
- a half-face respirator with organic vapour cartridges and dust/mist prefilter (NIOSH approved),
 - disposable full body Saranex® (or equivalent) coveralls with a hood,
 - nitrile or Silvershield® gloves (and disposable "surgical-type" glove coverings over the Silver Shields, used to improve dexterity, is optional)
 - safety boots (CSA approved) with disposable Saranex® (or equivalent) boot covers,
 - chemical-splash resistant goggles.
- 9.1.3 Wash the walls and ceiling with Varsol
- 9.1.4 Absorb the washings with hydrocarbon absorbent material and dispose in appropriate waste receptacle
- 9.1.5 Fold up the plastic drop sheet (from the floor) in a manner that contains any residual material left on its surface and dispose in the appropriate waste receptacle
- 9.1.6 If necessary, based on any observed contamination and/or test methods, re-clean and/or wash the floor, absorb the washings and dispose of materials as described previously.
- 9.1.7 Fold up drop sheets from outside the windows and doors in a manner that contains any waste material and dispose in the appropriate receptacle.
- 9.1.8 Clean-up and disassemble the waste load out area and transition zone and dispose of any contaminated materials and drop sheets in the appropriate receptacle(s).

9.1.9 Generally accepted practice would require that workers remove any contaminated work clothes (i.e. that were worn under the disposable coveralls) for laundering, and then shower and change into clean "street clothes" before leaving the site. As this will not be possible, care must be taken not to contaminate living quarters (or other occupied areas). Upon returning to the home, workers should bag their work clothes (preferably "at the door"), set them aside for laundering, and then shower.



TB/95.06.15
removal.pcb

APPENDIX

G. Inorganic Element and PCB Results for Paint Samples

	Co ug/g	Cd ug/g	Cr ug/g	Cu ug/g	Zn %	Pb %	As ug/g	Ni ug/g	PCBs ug/g
ASPC1	107	3.4	208	58	1.46	0.28	0.45	<0.5	21915
ASPC2	66	3.1	1090	35	1.58	0.58	0.6	7.6	26
ASPC3	159	9.8	144	147	4.83	1.98	1.47	<0.5	154

RECOCHEM INC.
CONSUMER DIV. COMPLIANCE DEPT.
131 EAST DRIVE BRAMPTON, ONTARIO L6T 1R5
(905)791-1788

PRODUCT : PAINT AND VARNISH REMOVER



SECTION 01 : CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER.....RECOCHEM INC.
850, MONTRE DE LIESSE
MONTREAL, QUEBEC
514-341-3550

PRODUCT NAME.....PAINT AND VARNISH REMOVER.

SYNONYMS.....NOT APPLICABLE.

CHEMICAL FAMILY.....NOT APPLICABLE.

CHEMICAL FORMULA.....NOT APPLICABLE.

PRODUCT USES.....PAINT STRIPPING.

SECTION 02 : COMPOSITION/INFORMATION ON INGREDIENTS

%	C.A.S. / T.L.V.	LD/50, ROUTE, SPECIES	LC/50, ROUTE, SPECIES
METHYLENE CHLORIDE			
60 - 100	75-09-2 50 ppm	1500-2500mg/kg/RAT/ ORAL	NOT AVAILABLE
METHANOL			
7 - 13	67-56-1 200 ppm	13000mg/kg RAT/ORAL 20000mg/kg RABBIT/ DERMAL	64,000ppm RAT/ INHALATION

SECTION 03 : HAZARD IDENTIFICATION

EFFECTS OF ACUTE EXPOSURE.....

SKIN CONTACT.....CAN CAUSE IRRITATION OR DERMATITIS.

SKIN ABSORPTION.....MAY BE ABSORBED, BUT TOXICITY IS LOW.

INHALATION.....CAUSES NARCOSIS, NAUSEA, DIZZINESS, HEADACHES AND UNCONSCIOUSNESS.

INGESTION.....CAUSES ABDOMINAL PAIN. METABOLIZES IN BODY TO FORM CARBON MONOXIDE WHICH REDUCES OXYGEN CARRYING CAPACITY OF BLOOD.

EYE CONTACT.....CAUSES PAIN AND MODERATE IRRITATION, POSSIBLE TRANSIENT CORNEAL INJURY.

EFFECTS OF CHRONIC EXPOSURE.....CAUSES NARCOSIS AND NAUSEA; ANESTHESIA SIGNS OVER 900 PPM.

PRODUCT : PAINT AND VARNISH REMOVER

SECTION 04 : FIRST AID MEASURES

SKIN CONTACT.....WASH WITH SOAP AND WATER.

INHALATION.....REMOVE PATIENT TO FRESH AIR. GET MEDICAL ATTENTION.

INGESTION.....DO NOT INDUCE VOMITING. OBTAIN MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT.....FLUSH WITH COPIOUS AMOUNTS OF WATER. CALL A DOCTOR IMMEDIATELY.

SECTION 05 : FIRE FIGHTING MEASURES

FLASH POINT. (deg) METHOD.....NOT FLAMMABLE.

AUTO IGNITION TEMP. (deg).....605 C

UPPER FLAMMABLE LIMIT (% VOL).....22% @ 25 C

LOWER FLAMMABLE LIMIT (% VOL).....14.8% @ 25 C

EXTINGUISHING MEDIA.....WATER FOG.

HAZARDOUS COMBUSTION PRODUCTS...OPEN FLAME AND WELDING ARCS CAN CAUSE THERMAL DEGRADATION WITH THE EVOLUTION OF HYDROGEN CHLORIDE AND VERY SMALL AMOUNTS OF PROPYENE AND CHLORINE.

SENSITIVITY TO MECHANICAL.....NONE.

IMPACT

SENSITIVITY TO STATIC.....NONE.

DISCHARGE

SECTION 06 : ACCIDENTAL RELEASE MEASURES

LEAK/SPILL.....WIPE UP SPILLS OR CLEAN UP USING ABSORBENT MATERIAL. USE RESPIRATORY, SKIN AND EYE PROTECTION.

SECTION 07 : HANDLING AND STORAGE

HANDLING PROCEDURES.....HANDLE WITH CARE.

STORAGE NEEDS.....STORE IN A COOL WELL VENTILATED AREA. KEEP AWAY FROM CHILDREN. KEEP CONTAINER CLOSED WHEN NOT IN USE.

SECTION 08 : EXPOSURE CONTROLS / PERSONAL PROTECTION

PROTECTIVE EQUIPMENT.....FOR NORMAL USE CONDITIONS.

EYE/TYPE.....NOT APPLICABLE.

RESPIRATORY/TYPE.....NOT APPLICABLE.

GLOVES/ TYPE.....WEAR RUBBER GLOVES.

CLOTHING/TYPE.....NOT APPLICABLE.

FOOTWEAR/TYPE.....NOT APPLICABLE.

OTHER/TYPE.....NOT APPLICABLE.

VENTILATION REQUIREMENTS.....LOCAL EXHAUST - MECHANICAL.

SECTION 09 : PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE.....CLEAR COLOURLESS.

PHYSICAL STATE.....VISCIOUS LIQUID.

OCLANSORB™

MATERIAL SAFETY DATA SHEET

Product Name: OCLANSORB	Chemical Synonyms and Family: PEAT, SPHAGNUM	Material Use: ABSORBENT FOR OIL AND OIL-BASED CHEMICAL SPILLS
Manufacturer's Name: HI-POINT INDUSTRIES LTD.	Address: P.O. Box 779, Sunset Drive Bishop's Falls, Nfld. Canada AOH 1C0	
Telephone Number: (709) 258-6274	Emergency Telephone Number: (709) 258-5456	T.D.G. Classification: NONE
		T.D.G. Classification: NOT CLASSIFIED

I. INGREDIENTS OF PRODUCT

Components	Exposure Limits	% Wt / Wt
PEAT	ACGIH TLV	> 95%
SOIL	NONE ESTABLISHED (REGARDED AS A NUISANCE PARTICULATE) 10 mg/m ³	< 5%

II. PHYSICAL DATA FOR PRODUCT

Boiling Point °C, 760 mm Hg SOLID, NOT APPLICABLE	Melting Point °C NOT APPLICABLE	Vapour Pressure (mm Hg) NEGLECTIBLE
Vapour Density (Air = 1) SOLID, NOT APPLICABLE	Solubility in H ₂ O % by Wt. NOT SOLUBLE, WILL REPEL H ₂ O	Appearance, Odour BROWN,ODOURLESS POWDER MIXTURE
pH APPROXIMATELY 5	Percent Volatile by Wt NOT APPLICABLE	Evaporation Rate (NOT APPLICABLE = 1)

III. FIRE AND EXPLOSION DATA FOR PRODUCT

Flash Point (Test Method) NOT APPLICABLE		
Auto Ignition Temp. 265 - 289 °C	Lower Flammable Limits in Air % by Volume UNKNOWN	Upper Flammable Limits in Air % by Volume UNKNOWN
Fire Extinguishing Substances <input checked="" type="checkbox"/> WATER FOG <input checked="" type="checkbox"/> FOAM <input checked="" type="checkbox"/> CO ₂ <input checked="" type="checkbox"/> DRY CHEMICAL <input type="checkbox"/> OTHER (SPECIFY)		
OCLANSORB CAN BE EXTINGUISHED BY ANY FIRE EXTINGUISHING AGENT		
Unusual Fire and Explosion Hazards IN THE EVENT OF A FIRE WHILE OCLANSORB IS BEING USED AS AN ABSORBENT THE RECOMMENDED FIRE EXTINGUISHING MEDIA FOR THE SPILLED OIL OR OIL-BASED CHEMICAL SHOULD BE USED.		

IV. REACTIVITY DATA FOR PRODUCT

Incompatibility <input type="checkbox"/> WATER <input checked="" type="checkbox"/> OXIDIZING MATERIAL <input type="checkbox"/> ACID <input type="checkbox"/> BASE <input type="checkbox"/> OTHER		
If Other (Please Specify) NOT APPLICABLE	Materials to Avoid NONE	Hazardous Decomposition Products NOT APPLICABLE
Stability STABLE	Can Hazardous Polymerization Occur? NO	Storage Precautions STORE IN A DRY PLACE

V. HEALTH HAZARD INFORMATION FOR PRODUCT

Effects of Over Exposure (Both Chronic and Acute) (Inhalation, Ingestion, Eyes, Skin)	
INHALATION:	MAY BE SLIGHTLY IRRITATING AT VERY HIGH CONCENTRATIONS.
INGESTION:	NO KNOWN HEALTH HAZARD
EYES:	DUST PARTICLES MAY CAUSE EYE IRRITATION.
SKIN:	NO KNOWN HEALTH HAZARD
N.B. The above information is intended for unused OCLANSORB. Consult with chemical manufacturer for health hazard information for oil and oil-based chemical	

VI. TOXICITY DATA LD₅₀, LC₅₀ AND SPECIES FOR PRODUCT OR INGREDIENTS

A STATIC LT50 TOXICITY TEST WAS PERFORMED BY ENVIRONMENTAL PROTECTION SERVICES, ATLANTIC REGION, ENVIRONMENT CANADA (84.02.22)(FILE 4490-3). THE STATIC LT50 TOXICITY TEST EXPOSED FISH TO 1,000 AND 5,000 mg/l OF SEAWATER FOR A 96 HR. PERIOD. ALL FISH SURVIVED WITH NO OBSERVABLE ILL EFFECTS. THEREFORE AN LC50 TEST WAS NOT REQUIRED.

Emergency and First Aid Procedures (Inhalation, Ingestion, Eyes, Skin)	
INHALATION:	REMOVE TO FRESH AIR IF IRRITATION OCCURS. IMPLEMENT APPROPRIATE CONTROLS TO PREVENT FURTHER EXPOSURE.
INGESTION:	NORMALLY NOT NECESSARY TO INDUCE VOMITING. CONSULT A PHYSICIAN IF PAIN OR DISCOMFORT OCCURS.
EYES:	IF DUST ENTERS EYE, FLUSH EYES WITH RUNNING WATER TO REMOVE PARTICLES.
SKIN:	WASH AFFECTED AREAS WITH SOAP AND RUNNING WATER TO REMOVE PARTICLES.
N.B. This information is intended for unused OCLANSORB. Consult with manufacturer of spilled oil or oil-based chemical absorbed onto OCLANSORB for emergency and first aid information	

VII. SPILL OR LEAK PROCEDURES

Steps to be Taken Upon Release or Spillage (Including Neutralizing Chemicals) SHOVEL OR SWEEP UP UNUSED OCLANSORB
Waste Disposal Methods UNUSED OCLANSORB IS NOT A HAZARDOUS WASTE. CONSULT QUALIFIED PERSONNEL FOR DISPOSAL TREATMENT OF HYDROCARBON SATURATED OCLANSORB SINCE DISPOSAL OF HAZARDOUS WASTE IS CONTROLLED BY MUNICIPAL, PROVINCIAL, STATE AND FEDERAL LAWS. CONTACT THESE AUTHORITIES FOR GUIDANCE.

VIII. SPECIAL PROTECTION INFORMATION FOR PRODUCT

Ventilation Requirements (Local or General - Specify) LOCAL, GENERAL AND/OR NATURAL VENTILATION MUST KEEP DUST CONCENTRATIONS BELOW RECOMMENDED EXPOSURE LIMIT FOR NUISANCE DUSTS	
Respiratory Protection (Specify) NIOSH APPROVED DUST RESPIRATOR SHOULD BE USED IF CONCENTRATIONS EXCEED THE RECOMMENDED EXPOSURE LIMITS OR IF ANY RESPIRATORY IRRITATION OCCURS	
Eye Protection SAFETY GLASSES WITH SIDE SHIELDS	
Protective Gloves, Clothing PROTECTIVE GLOVES OR CLOTHING ARE NOT REQUIRED FOR OCLANSORB BUT MAY BE NECESSARY TO HANDLE ABSORBED MATERIAL	
Other Protection, Special Precautions, Comments NOT APPLICABLE	
References Used to Complete M.S.D.S. ALBERTA OCCUPATIONAL HEALTH AND SAFETY ACT CHEMICAL HAZARD REGULATIONS; ACGIH DOCUMENTATION OF TLVs; DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS, 6TH EDITION, N. IRVING SAX.	
Approval <i>Wayne Champion</i>	Approval
Approval <i>[Signature]</i>	Approval

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