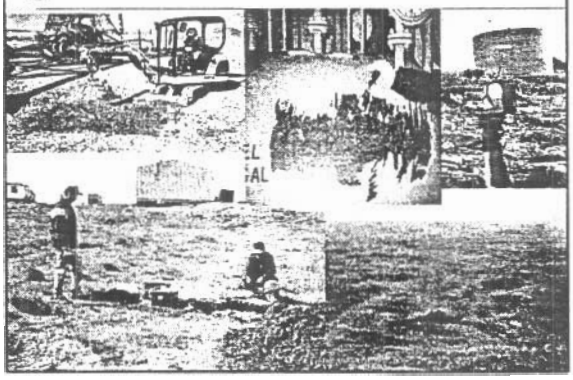
The DEW Line Clean Up Criteria (DCC):

Contaminant	DCC Tier I (ppm)	DCC Tier II (ppm)
Arsenic		30
Cadmium		5.0
Chromium		250
Cobalt		50
Copper		100
Lead	200	500
Mercury		2.0
Nickel		100
Zinc		500
Polychlorinated Biphenyls (PCBs)	1.0	5.0

The DEW Line Clean Up Protocol: Acceptance

- Protocol was reviewed by several Canadian government agencies, and accepted in 1991.
- Was subsequently reviewed and revised at meetings in 1993 and 1994.

Investigation

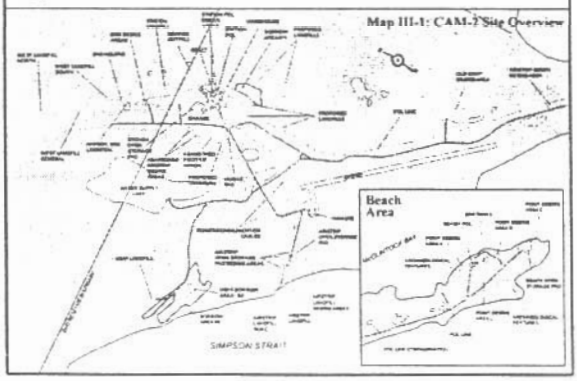


Investigation Phase

- Determine the extent of contamination
- Assess landfills
- Survey of infrastructure and debris
- Quantify gravel sources

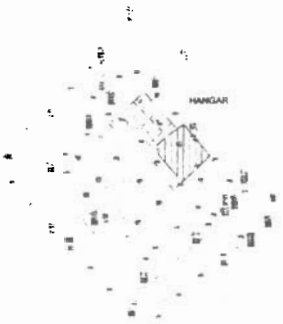
Investigation of the CAM-2 DEW Line Site

CAM-2 DEW Line Site

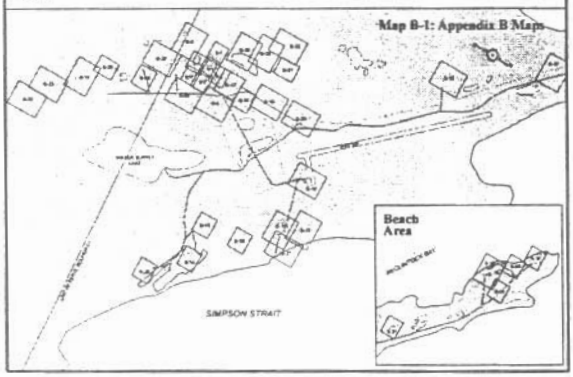


ESG Site Visits to CAM-2

- 1992 initial site investigation
- 2001 detailed site investigation



CAM-2 DEW Line Site



Site Investigation Results

- Contaminants found:
  TPH, PCBs, cadmium, chromium, copper, lead, nickel and zinc
- Contamination is consistent with patterns at other DEW Line sites

Site Investigation Results

- Predominantly contamination associated with fuel storage facilities (TPH, Pb, Zn)
- PCB contamination mainly in areas where power-generating equipment was used and on building materials (paint)
- Inorganic elements found at landfills, debris areas and sewage outfall.

Landfill Evaluations

- Environmental Working Group (DND/NTI) evaluates landfills in a consistent manner using a matrix approach
- Source, Pathway and Receptors are taken into account for risk evaluation

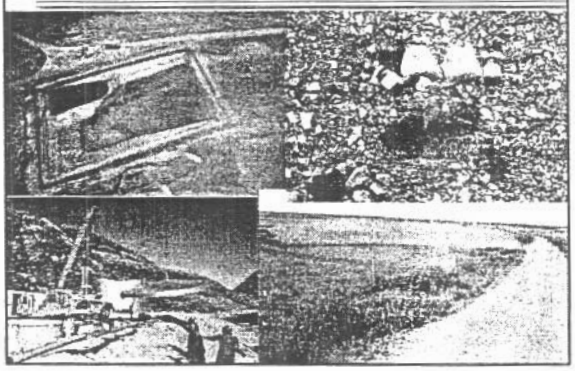
Landfill Remediation

- High Risk Landfills
  → Excavate
- Moderate Risk Landfills
  → Leachate contain or excavate (monitoring)
- Low Risk Landfills
  → Regrade (monitoring)

Landfills at CAM-2

- *West Landfill North:* Low to Moderate Risk – Partial Excavation and Regrade
- *West Landfill Central:* Low Risk - Regrade
- *West Landfill South:* Low Risk - Regrade
- *Station Landfill:* Low Risk - Regrade
- *Airstrip Landfill:* Moderate to High Risk -Excavate
- *USAF Landfill:* Low Risk - No Action

Construction



Where do contaminated materials go?

- Building materials and debris:
  – debris is sorted
  → non-hazardous: buried in engineered landfill on site
  → hazardous: shipped South

Where do contaminated materials go?

- Barrels:
  → crush or shred *empty* barrels
  – analyze contents
  → incinerate or ship South

Where do contaminated materials go?

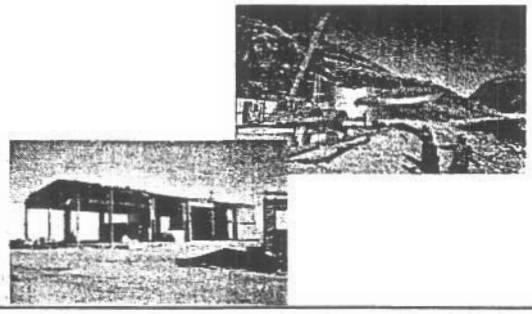
- Contaminated soil:
  - PCB level > 50 ppm (CEPA) → Ship South
  - > DCC Tier II but < CEPA → Bury in Tier II/I Disposal Facility
  - > DCC Tier I but < DCC Tier II → Bury in Non hazardous Debris Landfill.

Post Excavation Work

- Collect Soil Samples
- Analyze for contaminants
- Establish area is clean or continue excavation

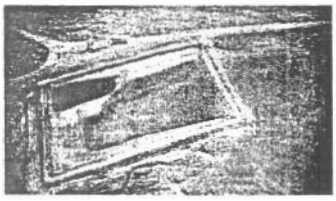
Cleanup Work

- Demolition of all unnecessary infrastructure at the site



Cleanup Work

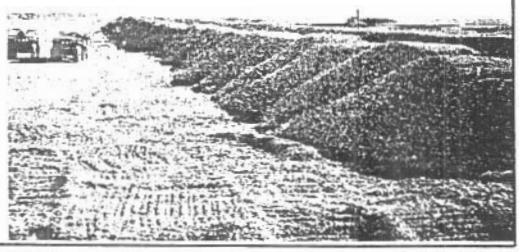
- Construction of a landfarm to treat hydrocarbon contaminated soil
- Landfill monitoring program to be put in place
- Baseline sampling for soil storage areas



Cleanup Work- Landfills

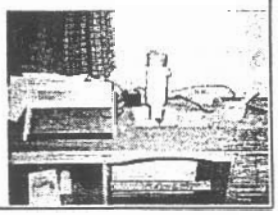
- Partial/complete excavation or regrading of landfills (if required)
- Construction of new landfills for disposal of contaminated soil and non-hazardous demolition waste

Soil Stockpile Classification

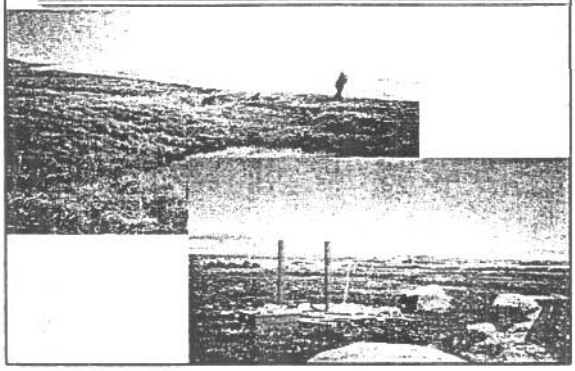


QAQC - Field Analyses

- PCB test kits
- TPH test kits
- Inorganic Elements by X-Ray Fluorescence



Landfill Monitoring



Landfill Monitoring Requirements

Landfill Classification	Visual	Active Layer Groundwater Sampling	Soil Sampling	Thermal Monitoring
High Risk – Existing Landfills	Not required, as landfill to be excavated			
Moderate Risk –Existing Landfills	✓	✓	✓	✓
Low Risk –Existing Landfills	✓		✓	
New Landfills – Non-Hazardous Wastes	✓	✓	✓	
New Landfills – Tier II soil Disposal Facility	✓	✓	✓	✓

Monitoring Parameters

Soil and Active Layer Water:

- Baseline/background assessment
- Contaminant evaluation:
  PCB, TPH, inorganic elements (arsenic, cadmium, chromium, cobalt, copper, lead, nickel, and zinc)

Monitoring Parameters

Active Layer Water:

- Color, odor, pH, conductivity, temperature
- Additional parameters if landfill is close to **and** upgradient of a drinking water source

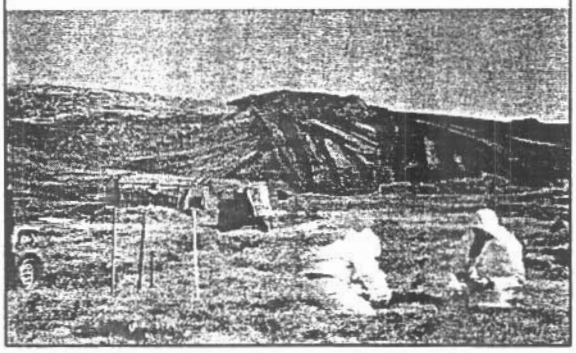
How often will the landfills be monitored?

- *Phase I: First 5 Years*
  Confirmation that landfill is performing.
- *Phase II: Years 6-25*
  Confirmation of stable conditions
- *Phase III:*
  Monitoring for long term issues.

Landfill Monitoring Frequency

Landfill Classification	Phase I	Phase II
High Risk – Existing Landfills	Not required, as landfill to be excavated	
Moderate Risk – Existing Landfills	year 1, 2, 3, 4, 5	year 7, 10, 15, 25
Low Risk – Existing Landfills	year 1, 3, 5	year 7, 10, 15, 25
New Landfills, Non-Hazardous Wastes	year 1, 3, 5	year 7, 10, 15, 25
New Landfills Tier II Soil Disposal Facility	year 1, 2, 3, 4, 5	year 7, 10, 15, 25

Cleanup - Landfill Monitoring



Conclusion

- A detailed environmental investigation of the CAM-2 DEW Line site was conducted by ESG
- A detailed engineering design for the cleanup of the site was prepared based on the results of this investigation.

Questions?

DEW Line Clean-up Project

ENGINEERING AND DESIGN

CAM-2

GLADMAN POINT

UMA Engineering Ltd.

DEW Line Clean-up Project

- Role of UMA
- Engineering and Design for CAM-2, Gladman Point

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Role of UMA

- Engineering Site Investigations
- Landfill Remediation Design
- New Landfill Design
- Demolition and Debris Details
- Contaminated Soil Remediation
- Construction Quality Assurance
- Post Construction Landfill Monitoring

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Role of UMA

Engineering Site Investigations

- Design Concerns
- Geophysics
- Building Materials
- Site Conditions

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Engineering and Design

- Introduction – CAM-2 DEW Line Site
- Existing Landfills - Remediation
- New Landfills and Landfarm
- Demolition and Debris
- Contaminated Soils

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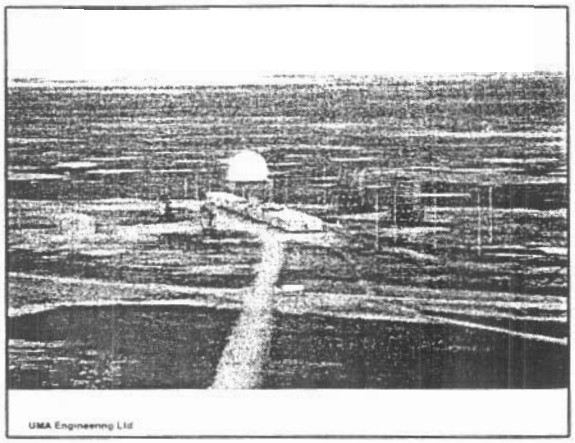

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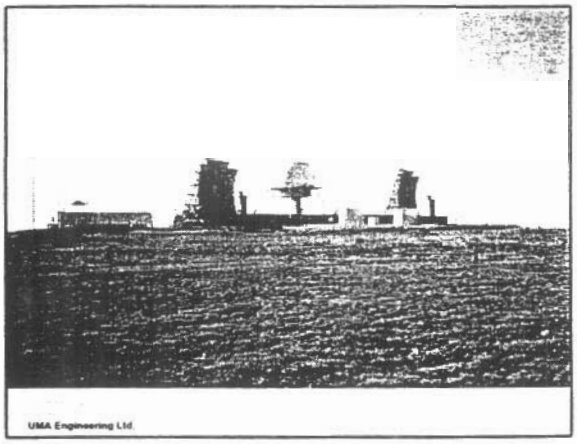

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Existing Landfills

- Evaluation of Existing Landfills
- Remediation Design

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Existing Landfills

- Evaluation of Existing Landfills
  - Landfill Evaluation Matrix
  - Geophysical Data
  - Soil and Groundwater Sampling Data
  - Site Reconnaissance

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Existing Landfills

- Remediation of Existing Landfills
  - •High Potential Environmental Risk
    - →Landfill Excavation
  - •Moderate Potential Environmental Risk
    - →Leachate Containment
  - •Low Potential Environmental Risk
    - →Landfill Regrading

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Existing Landfills – CAM-2

- USAF Landfill
- Airstrip Landfill
- West Landfill
- Station Landfill

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Existing Landfills – CAM-2

USAF Landfill – Low risk

→ Cover with 0.5 m granular fill

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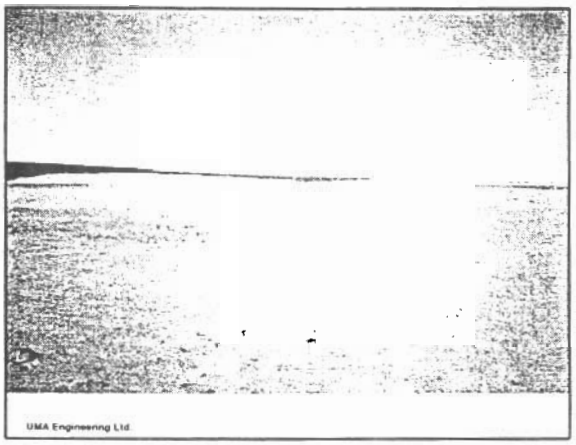

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Existing Landfills – CAM-2

Airstrip Landfill – medium to high risk

→Excavate

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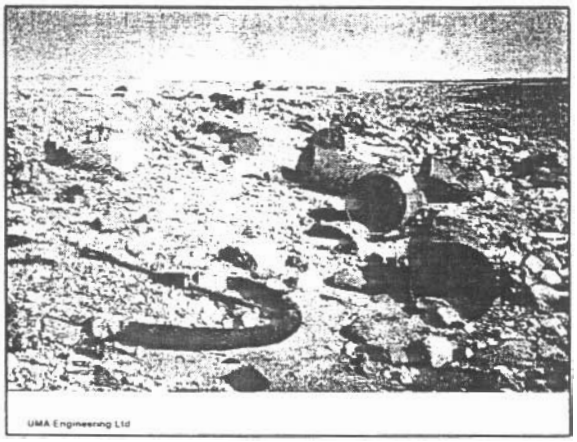

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Existing Landfills – CAM-2

West Landfill - low risk

→Many Distinct Lobes

→Cover with 0.75 m Type 2 Granular Fill

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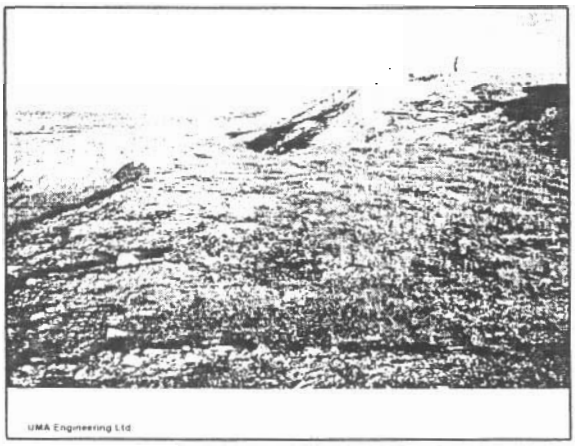

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Existing Landfills – CAM-2

- Station Landfill - low risk
  - → on the edge of a 7 meter cliff
  - →Cover with 0.75 m Type 2 Granular Fill

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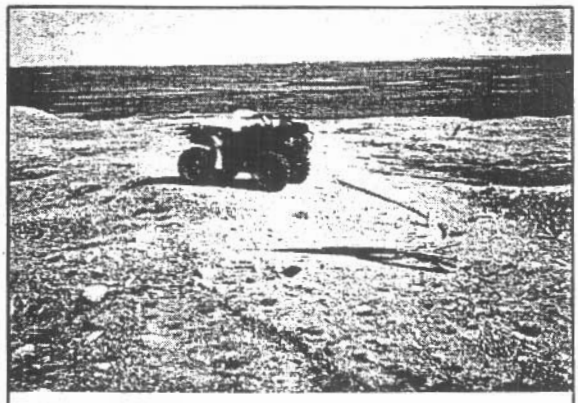

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New Landfills – CAM-2

- Non-Hazardous Waste Landfill
- Tier II Disposal Facility
- Landfarm

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New Landfills – CAM-2

- Non-Hazardous Waste Landfill
  - Non Hazardous Demolition Materials
  - Non Hazardous Debris
  - Double Bagged Asbestos
  - Tier I and Type A Contaminated Soils

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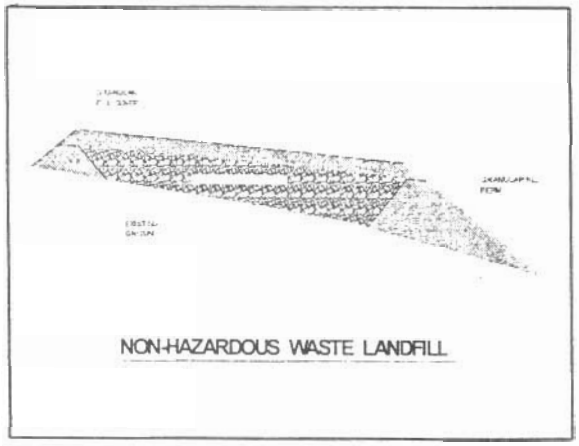
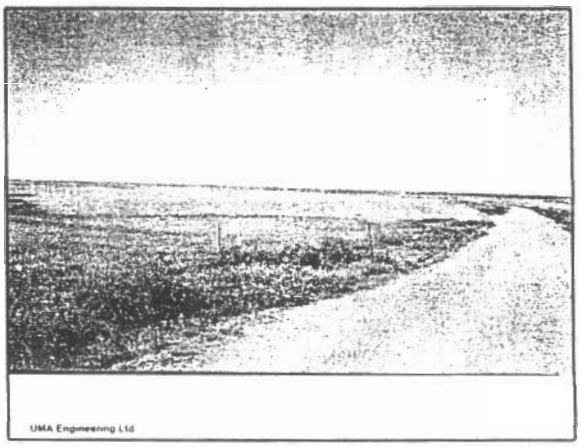


NON-HAZARDOUS WASTE LANDFILL



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New Landfills – CAM-2

- **Tier II Disposal Facility**
  - DCC Tier II Contaminated Soils
  - Designed for freeze-back of the contaminated soil
  - Frozen, icy berms
  - Incorporates an HDPE Liner System

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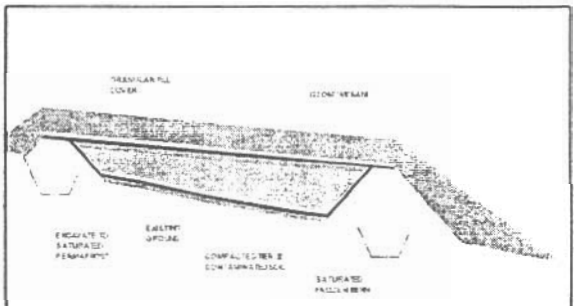

TIER II DISPOSAL FACILITY

New Landfills – CAM-2

- **Landfarm**
  - Bermed and Contained Area to treat fuel contaminated soils
  - Treatment consists addition of nutrient and tilling
  - Landfarm to be located southwest of Station

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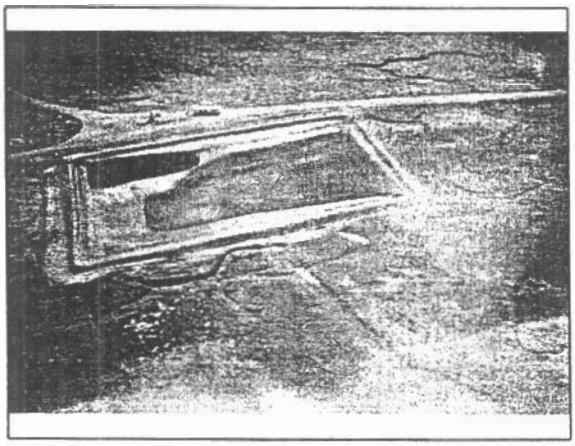
LANDFARM



Engineering and Design

Demolition and Debris Removal

- Demolition of buildings, tanks and structures
- Leaving 2 SRR tanks at Beach and SRR radar facilities
  - → Disposal in Non-Hazardous Waste Landfill
- Hazardous material placed in barge containers for disposal off-site

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Engineering and Design

Demolition and Debris Removal

Asbestos Demolition Materials

→ **Double-Wrapped in Plastic and Placed in Non-Hazardous Waste Landfill**

Debris Removal – sorted

- **Disposal in Non-Hazardous Waste Landfill**
- **Hazardous items are containerized**

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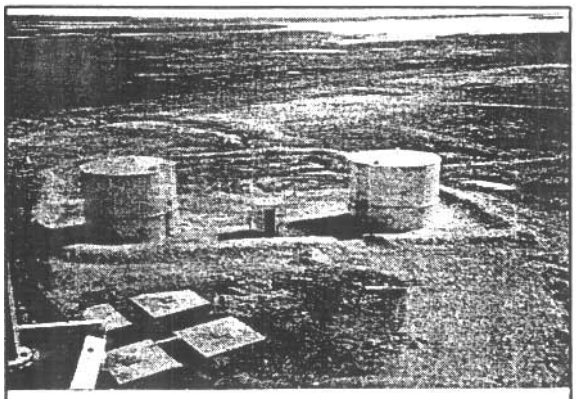

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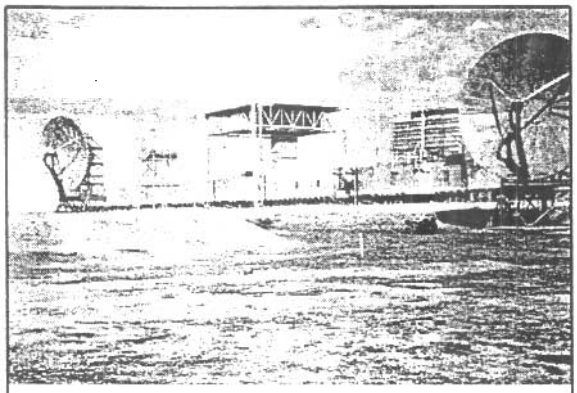

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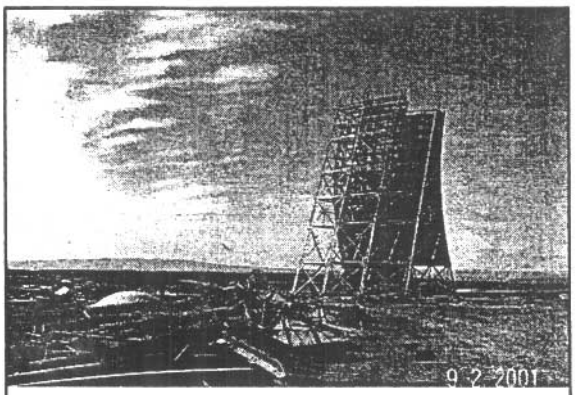

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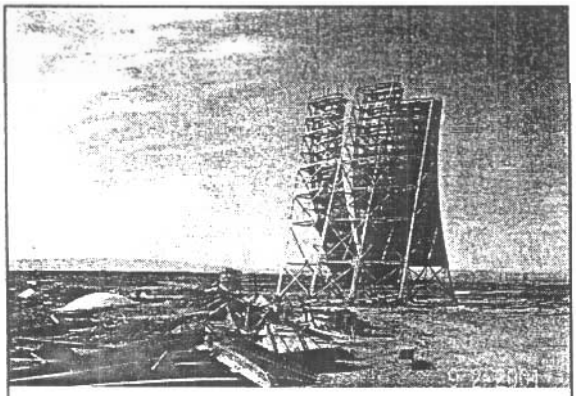

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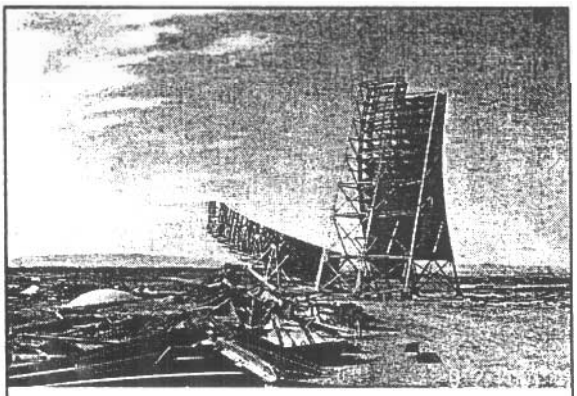

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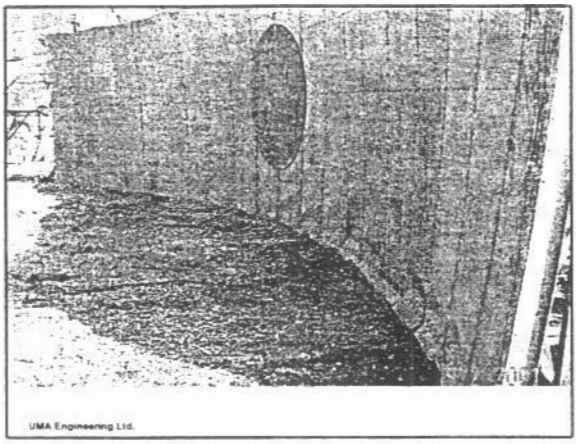

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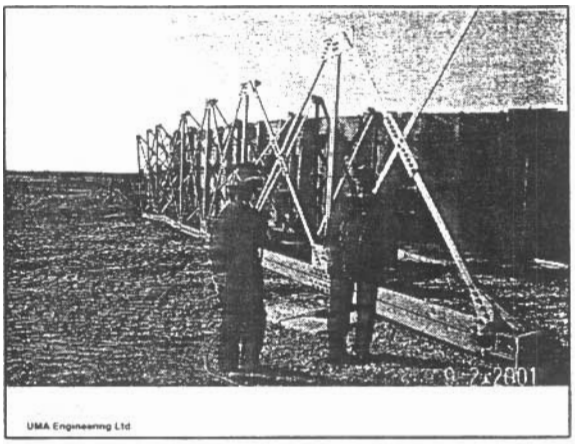

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Engineering and Design

- **Contaminated Soils**
  - **Hazardous Soil / Debris** - 2 cubic metres
    - → Containerized and Shipped South for Disposal
  - Tier II Contaminated Soils
    - → Disposal in Tier II Landfill
  - Tier I Contaminated Soils
    - → Intermediate Fill For Landfills

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Engineering and Design

Contaminated Soil

- Hydrocarbon Catontaminion (fuel and lube oils)
  - removed from areas at risk (beach and near water)
  - Placed in Landfarm or Landfills

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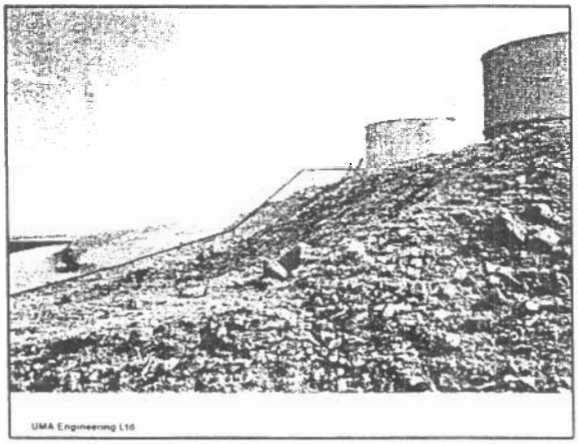

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Engineering and Design

- Construction Quality Assurance
  - Granular Fill Requirements
  - Compaction
  - Enough moisture for frozen berms
  - Landfill design intent
  - Instrumentation

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Engineering and Design

Construction Concerns

- Protection of Archaeology Features
- Environmental Protection

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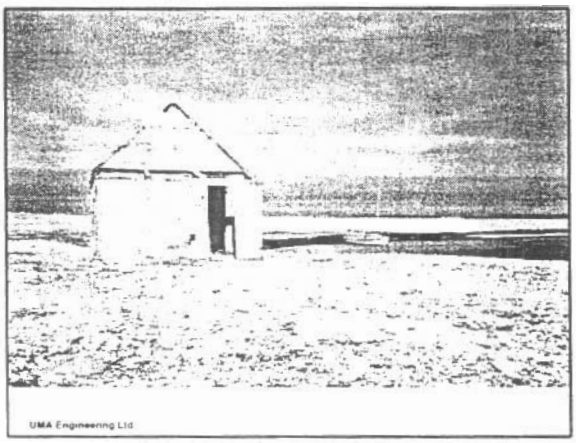

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Engineering and Design

- Post Construction Landfill Monitoring
  - Slope stability
  - Erosion
  - Freeze back
  - Settlement

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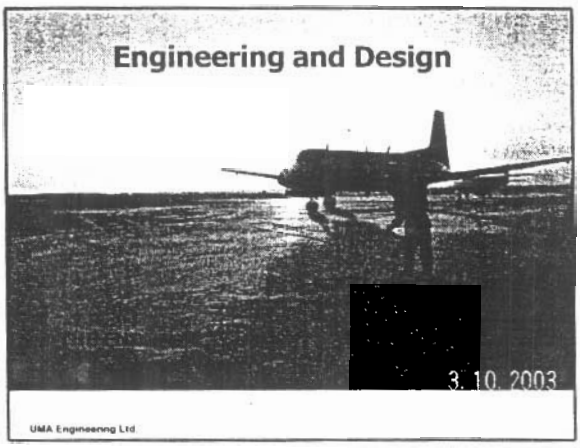
Engineering and Design



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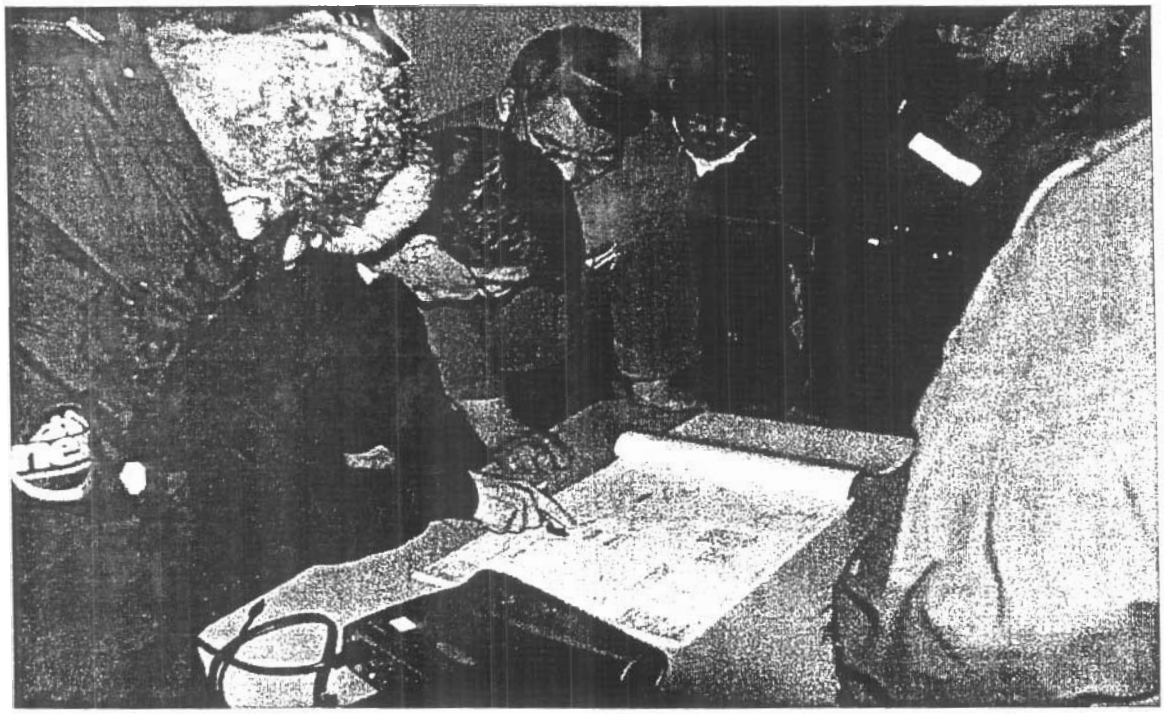
3. Group Discussion Summary

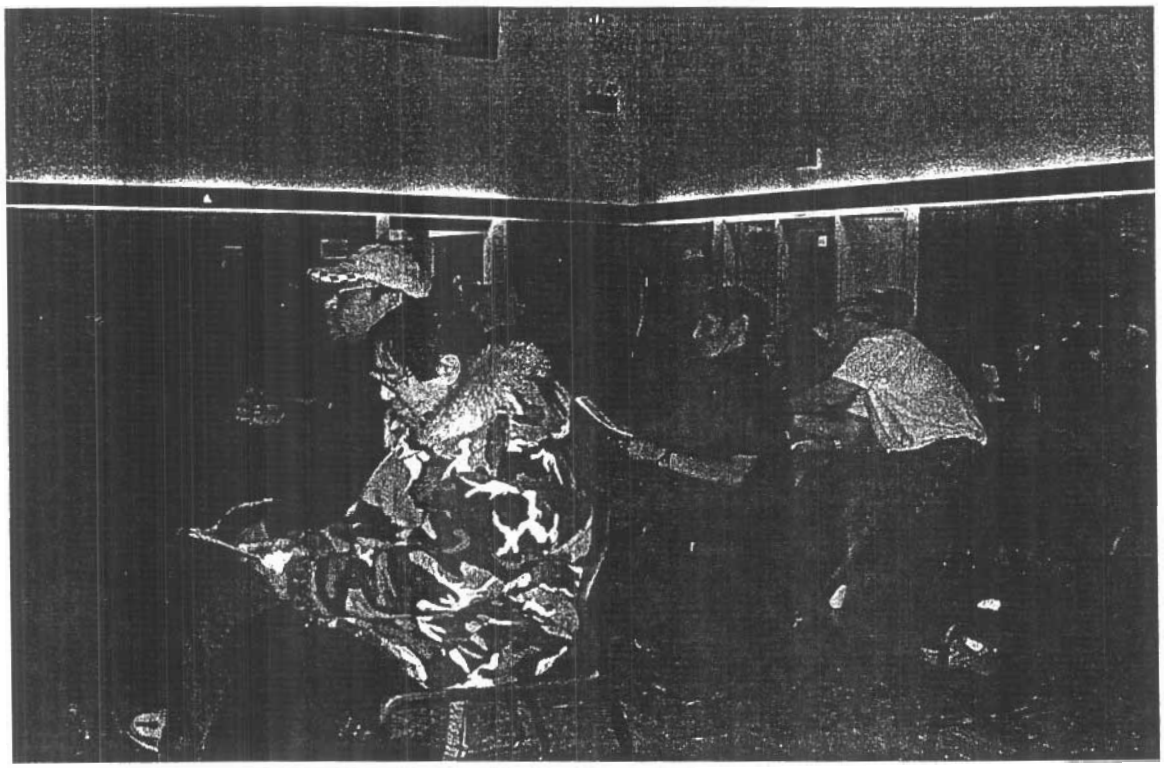
- The community asked if this project was going to clean up the smaller (intermediate) DEW Line Sites. The project stated that DND is responsible for the 21 of the remaining sites while the smaller intermediate DEW Line sites are the responsibility of DIAND.
- The community asked if the project had investigated the surrounding fishing areas for contamination as well as debris in the ocean. The project stated that during the completion of the site investigation people from the community were present on-site and pointed out areas of concern. The project also indicated that past scientific studies have shown that debris (mostly metal) does not harm the environment, fish and other sea animals. The project indicated that metal debris that is within 30 m of the shore or within 2 m depth would be removed because it is a navigational hazard.
- Members of the community who worked on the DEW Line had indicated that they knew that barrels of oil had been buried and were wondering if the project had located them all. The project felt they had done a thorough investigation on the land, but asked members of the community to point these areas out on a drawing (note, when viewing the drawing, it was determined that the areas in question had been identified during the site investigation and would form part of the clean up).
- Questions were asked if any of the contaminated soils or building materials were to be incinerated on-site. The project indicated that with the exception of camp waste, no materials would be incinerated on-site.
- Questions were asked relating to the level of employment and training opportunities. The project stated that DND gives $50,000.00 per site to the NTI for training as part of their agreement. In addition there are two mechanisms included in the contract to ensure that Inuit are employed during the cleanup, this would be through the hiring of Inuit labour and use of Inuit businesses.
- The community was asked if the contract for the clean up had been awarded yet and if the community could be notified about those bidding on the clean up. The project indicated that the contracting process had started but no contract had been awarded. The project also stated that they could provide the community with a list of contractors that were qualified to bid on the clean up.
- The community asked if there was any possibility to have some of the buildings (such as the radome) moved to the community for their use rather than demolishing them. Some buildings have high levels of contamination in the paint. When these buildings will be demolished the materials will be packed in barge containers and shipped away for disposal. Some buildings might be available for removal or salvage and be moved to a new location. A request would need to be made and to ensure safety, the available information for these buildings would be reviewed by scientists and engineers.

Presentations to the Community

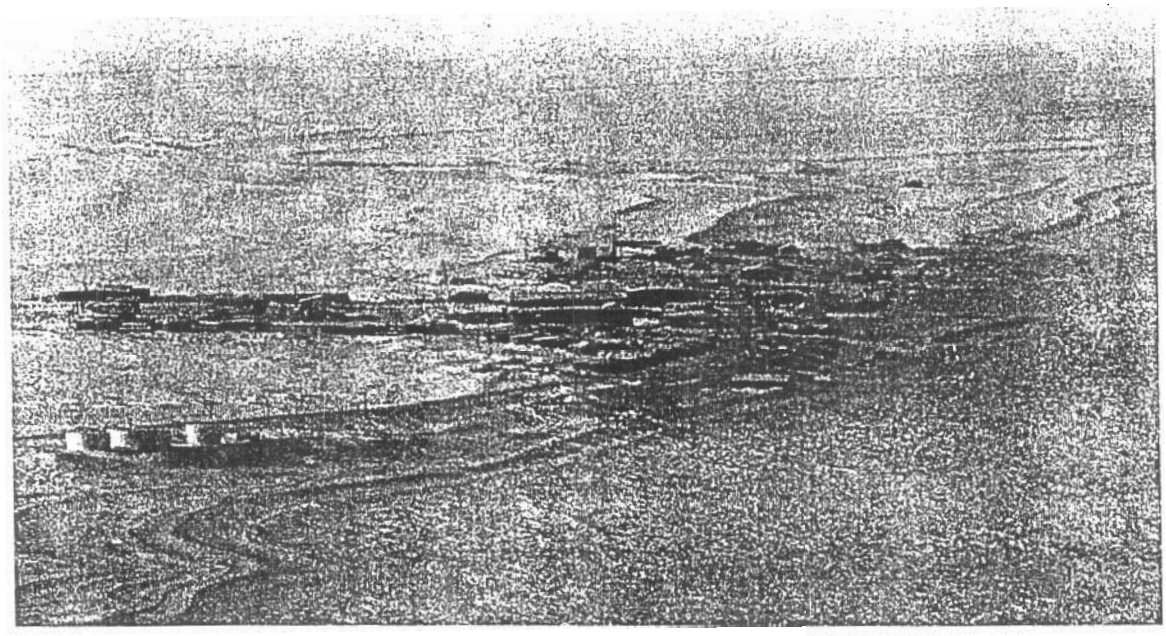
Showing members of the community areas that will be cleaned up as part of the project

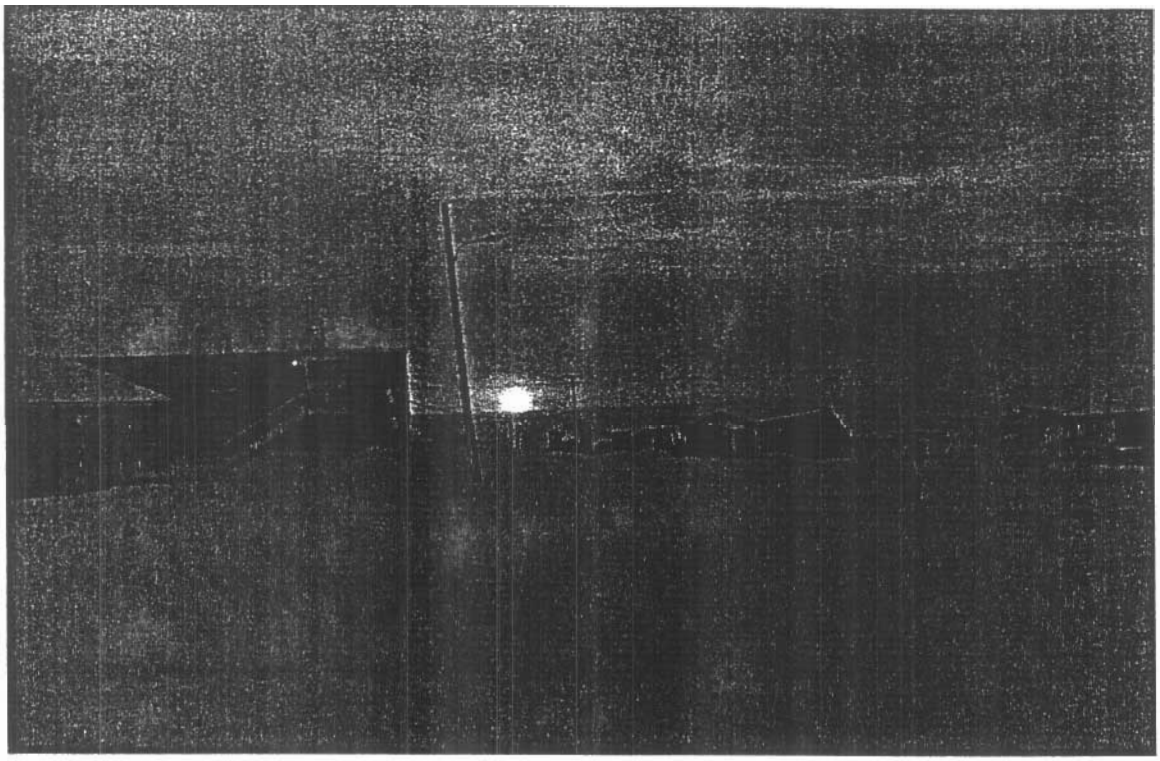


Members of the community in attendance at the meeting



Aerial view of the community of Gjoa Haven





CAM-2 (3.6)

Northwest Territories

NWT SPILL REPORT

(Oil, Gas, Hazardous Chemicals or other Materials)

24 - Hour Report Line
Phone: (867) 920-8130
Fax: (867) 873-6924

A Report date and time	B Date and time of spill (if known)	C ☒ Original report ☐ Update no. ___	Spill number
AUG 27/03	AUG 26/03		

D Location and map coordinates (if known) and direction (if moving)
CHADMAN POINT DEW LINE CAM 2

E Party responsible for spill
KITNUNIA PROJECTS INC CAMBRIDGE BAY

F Product(s) spilled and estimated quantities (provide metric volumes/weights if possible)
P-50 100-125 L

G Cause of spill
OVERFLOWED TANK DURING TRANSFER

H Is spill terminated?	I If spill is continuing, give estimated rate	J Is further spillage possible?	K Extent of contaminated area (in square metres if possible)
☒ yes ☐ no		☐ yes ☒ no	1.5 m^2

L Factors affecting spill or recovery (weather conditions, terrain, snow cover, etc.)	M Containment (natural depression, dikes, etc.)
NONE	DIKES AND RECOMMENDANCE

N Action, if any, taken or proposed to contain, recover, clean up or dispose of product(s) and contaminated materials
WILL BE CLEANED UP AND PLACED IN LAND FARM THAT IS BEING CONSTRUCTED TO REMEDIATE POL SOIL AT DEW LINE CAM SITE AS PART OF PROJECT

O Do you require assistance?	P Possible hazards to persons, property, or environment: eg: fire, drinking water, fish or wildlife
☒ no ☐ yes, describe:	NONE

Q Comments and/or recommendations
RECOMMENDED PERSONAL PAY
BETTER ATTENTION TO REDUCING
PUMP RATE AS FREE BOARD IS
ESTABLISHED

FOR SPILL LINE USE ONLY

Lead Agency

Spill significance

Lead Agency contact and time

Is this file now closed? ☐ yes ☐ no

Reported by	Position, Employer, Location	Telephone
JIM STEVENS	SITE SUPER	600-700-0477
Reported to DALE SIMPSON	Position, Employer, Location GEN SUPER	Telephone 867-983-7500