

Landfill Remediation at Former Military Radar Sites

NATO- CCMS

Cardiff, U.K. May 23-26, 2004

Michael Nahir &

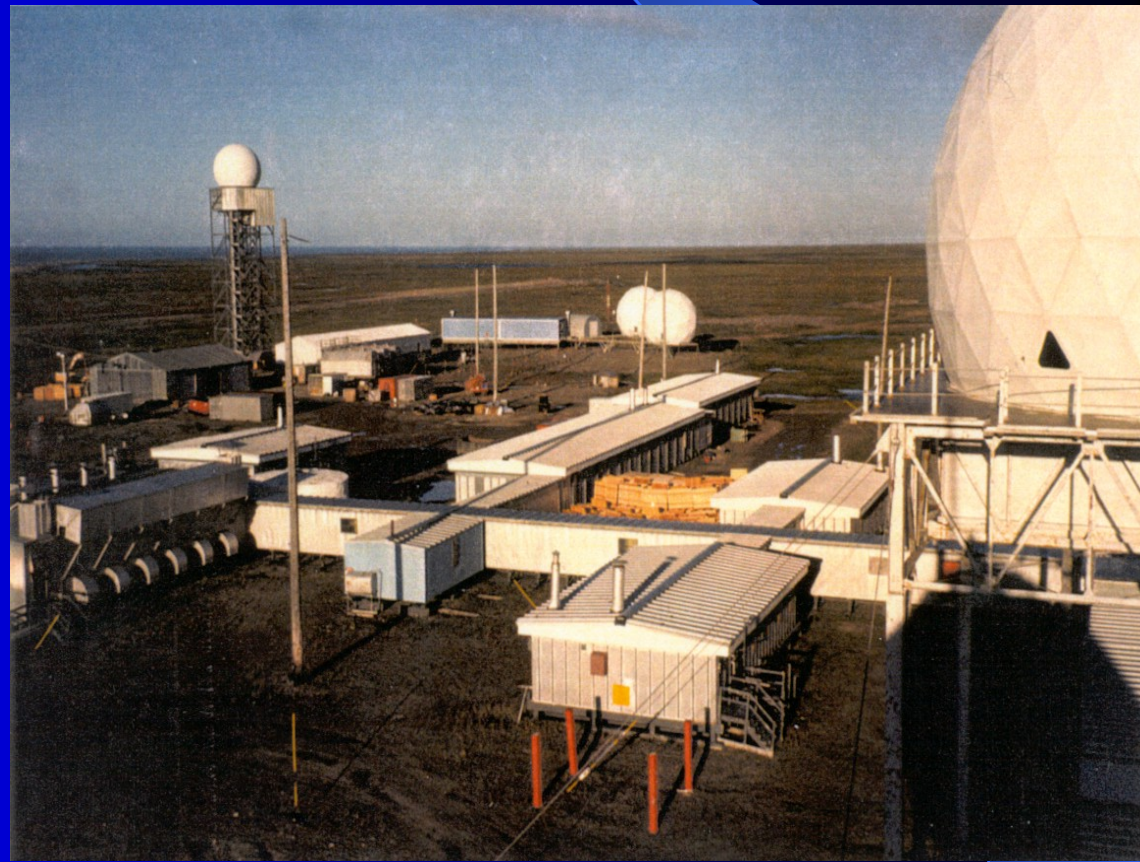
Joanna Ankersmit

Northern Affairs,

Government of Canada

Wayne Ingham

WESA Consulting



Outline

- Background information
- Remediation Standard Development
- Example Sites
- Technical and Logistical Challenges
- Landfill Assessment and Remediation
- Landfill Monitoring
- Acknowledgements

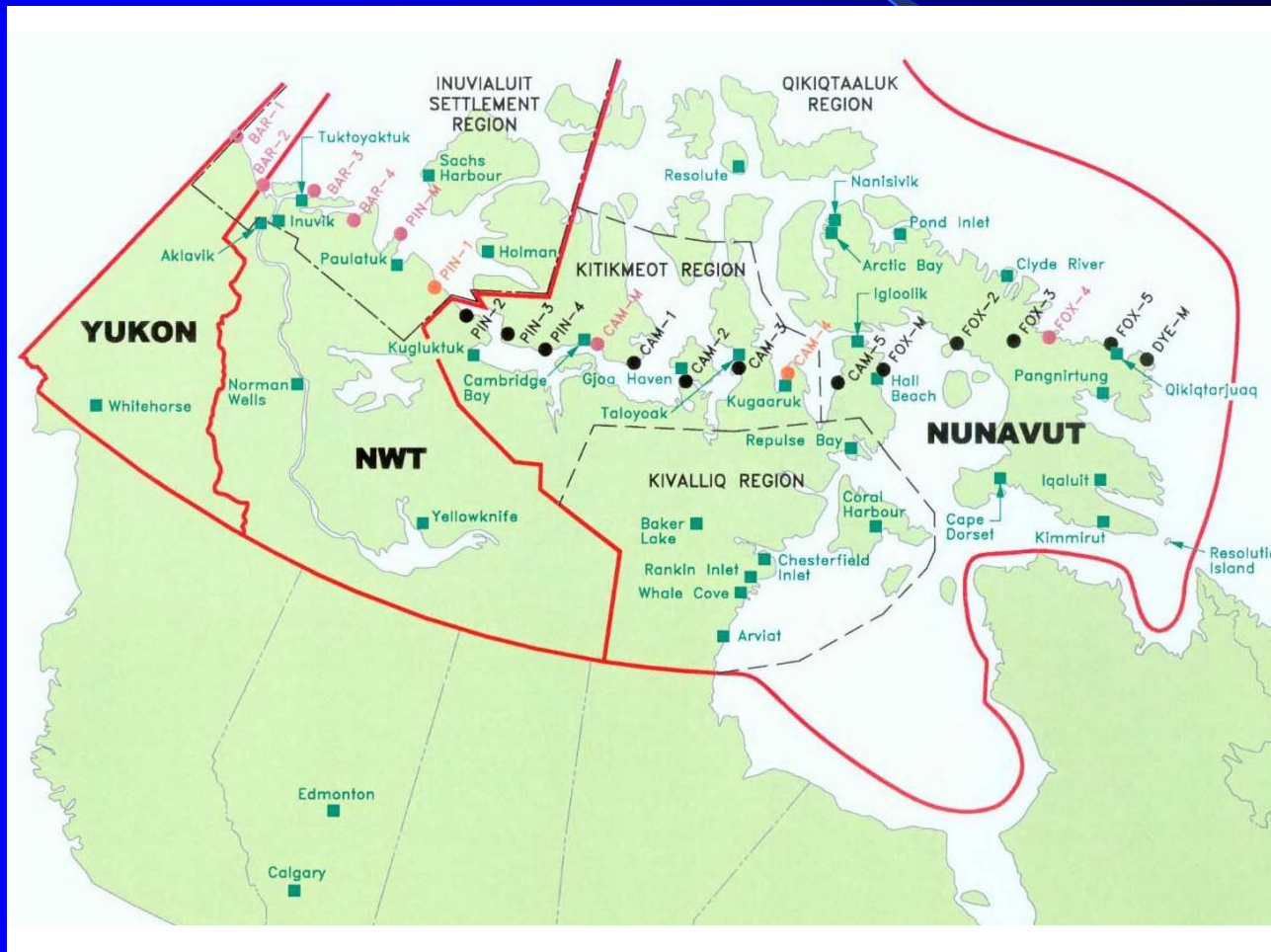


Background Information



- The DEW Line was built during the height of the Cold War.
- Radar sites:
 - 42 sites in Canada were operated between 1955 and 1985 by USAF & Canada
 - Replaced by the North Warning System.
 - 21 INAC sites, some abandoned since 1963.
 - INAC has responsibility for numerous similar sites

INTRODUCTION: DND DEW Line Sites





INAC DEW Line Sites

Background Information

- Waste disposal with little environmental consideration



DEW Line Cleanup Protocol

1989-93:

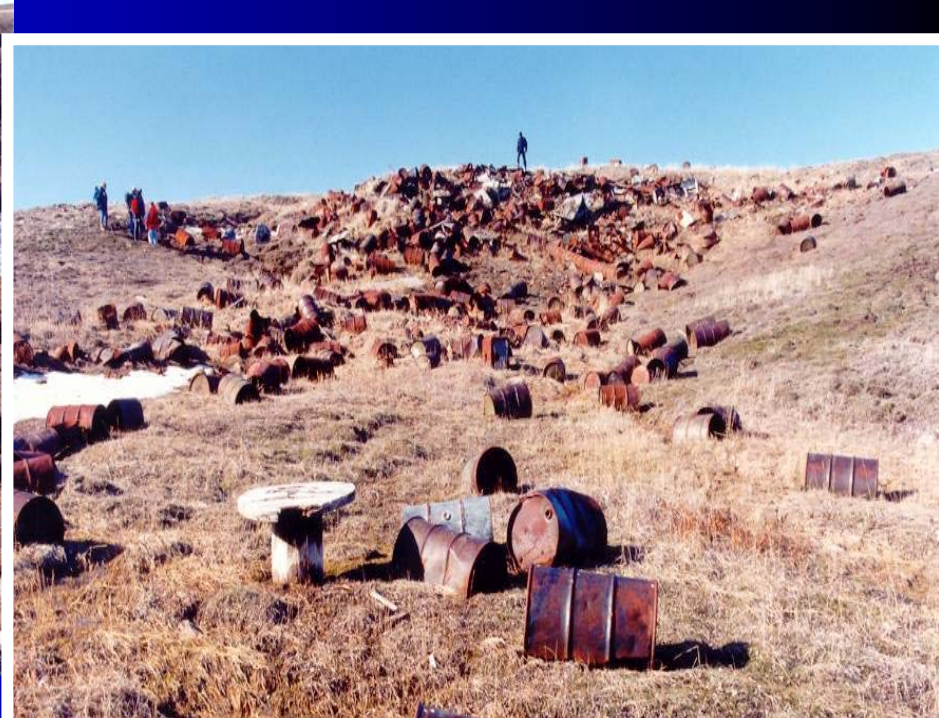
- Assessments took place at the DEW Line.
- Scientific investigations led to the development of a cleanup protocol for the DEW Line (including concept cleanup plans for contaminated soil and landfills).
- Cleanup criteria for contaminants were developed specifically for the Arctic - the DEW Line Cleanup Criteria (DCC).

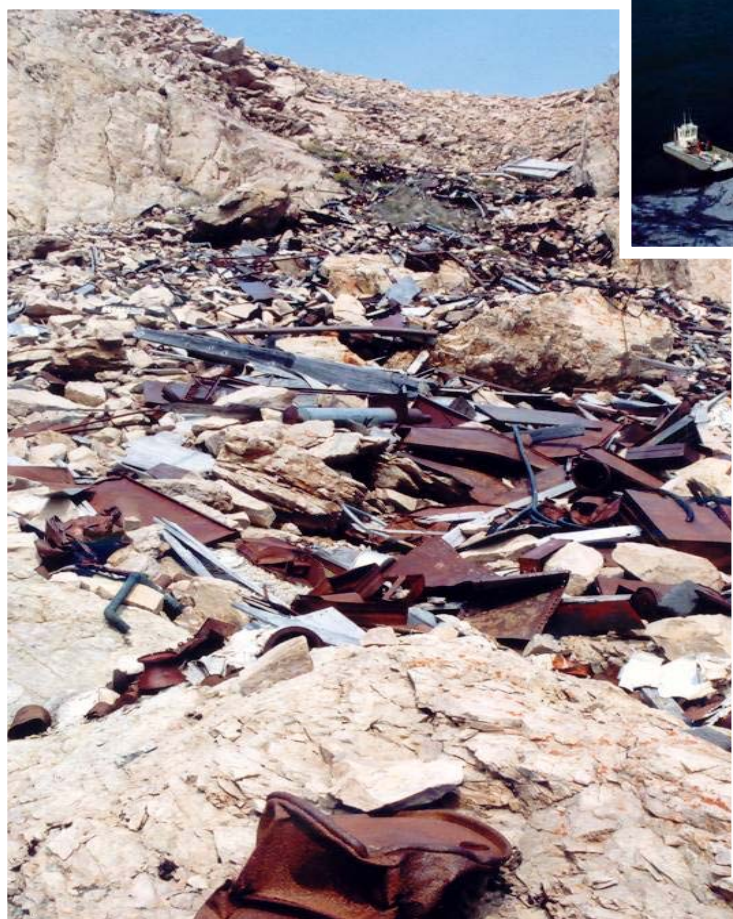
CAPE CHRISTIAN LORAN





HORTON RIVER DEW LINE





PEARCE POINT

ISACHSEN, NT





ISACHSEN, NT



Investigation Phase



Challenging Factors

- Construction Season
 - Limited to summer usually 3 –4 months
- Remote and isolated locations
 - Logistics, on-site analysis, supplies
- Resources
 - On-site resources: gravel, shale, bedrock, permafrost
 - Contractors and equipment
- Ecosystem
 - Linear foodchain
- Global Warming
 - Permafrost degradation









Permafrost degradation above equipment burial area.

Landfill Concept

- Remediation/Closure of Existing Landfills
 - Risk Evaluation
 - Excavate/Remediate
- Development of New Landfills
 - Non-hazardous
 - Contaminated Soil

Engineering Design

- The designs require;
 - demolition of facilities,
 - On-site disposal of site debris,
 - Off-site disposal of hazardous materials and contaminated soils,
 - *development and closure of landfills,*
 - use of permafrost,
 - use of existing granular material sources,
 - site grading.

Landfill Risk Evaluation

- Background information
 - Based on National Classification System
- Matrix factors
 - *Contaminant source*
 - *Pathways*
 - *Receptors*
 - Special considerations
 - Traditional knowledge
- Interpreting the score

Contaminant Source

- Landfill Extent
- Estimated Depth of Landfill
- Presence of Leachate
- Presence of Surface Contaminated Soil
- Presence of Surface Debris

Pathways

- Aerial Transport
- Water Transport
 - Topography
 - Cover material (type and depth)
 - Runoff potential
 - Precipitation
 - Distance to downgradient drainage channels

Receptors

- Downgradient Freshwater/marine habitat
 - Proximity, usage
- Terrestrial habitat
 - Extent, usage
- Landuse
 - Occupation, use of drinking water and food resources

Unique factors

- Special Considerations
 - Non-generic, site specific factors
 - Potentially worth 10% of each category
- Traditional knowledge
 - Site workers
 - Local community

Landfill Evaluation Score

Landfill Evaluation Score – Maximum = 150

Potential Environmental Risk Classification

| | |
|-----------|----------|
| >100 | High |
| >75, <100 | Moderate |
| <75 | Low |

Landfill Remediation

- High Risk Landfills
 - Excavate
 - Waste separated and classified
- Moderate Risk Landfills
 - Leachate contain or excavate component
 - More detailed assessment – eg. visual and thermal monitoring; and groundwater and soil sampling
- Low Risk Landfills
 - Regrade against erosion if necessary
 - visual monitoring and soil sampling

Demolition of Facilities



Removal of Site Debris





Landfill Excavation





Landfill Excavation

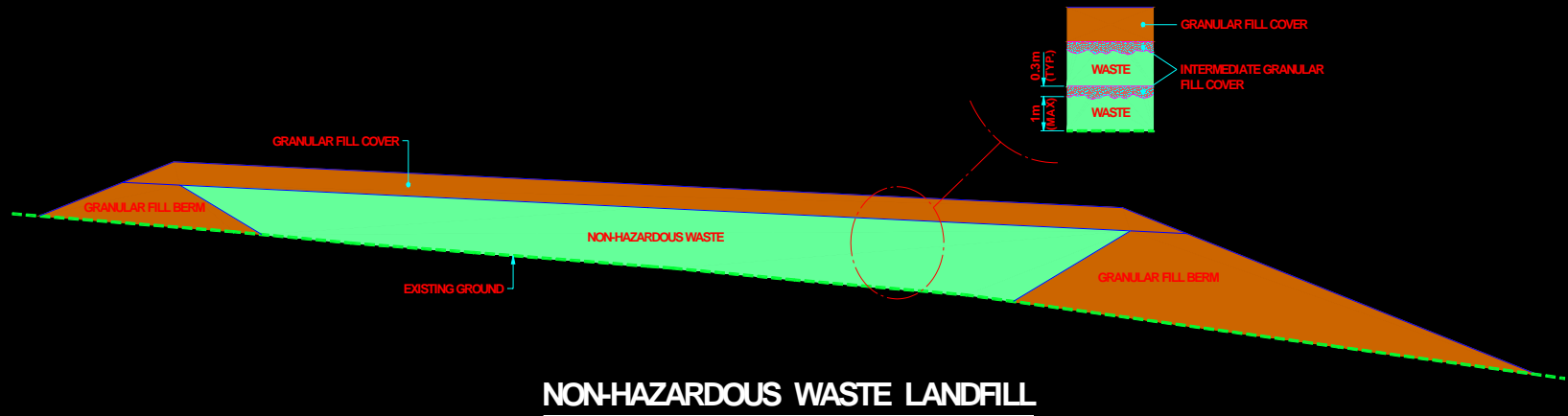
Verification Sampling



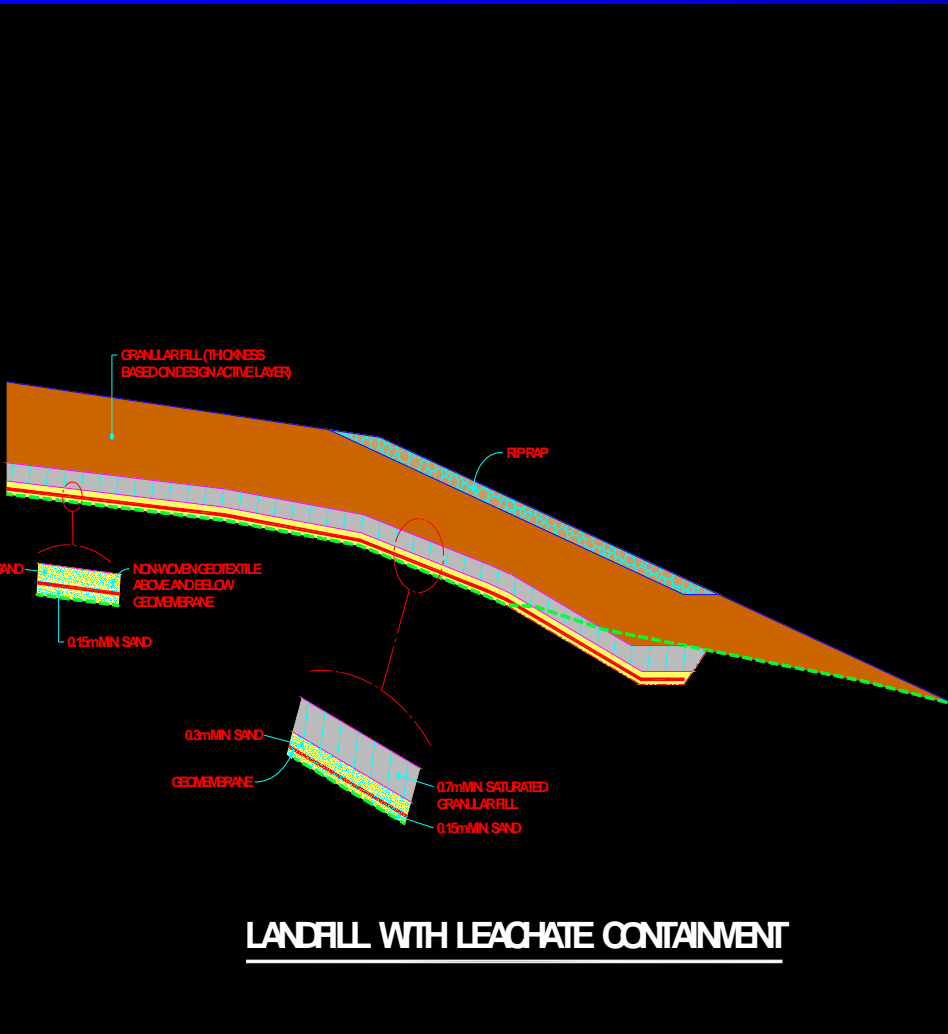
Waste Classification



Non-Hazardous Waste Landfill



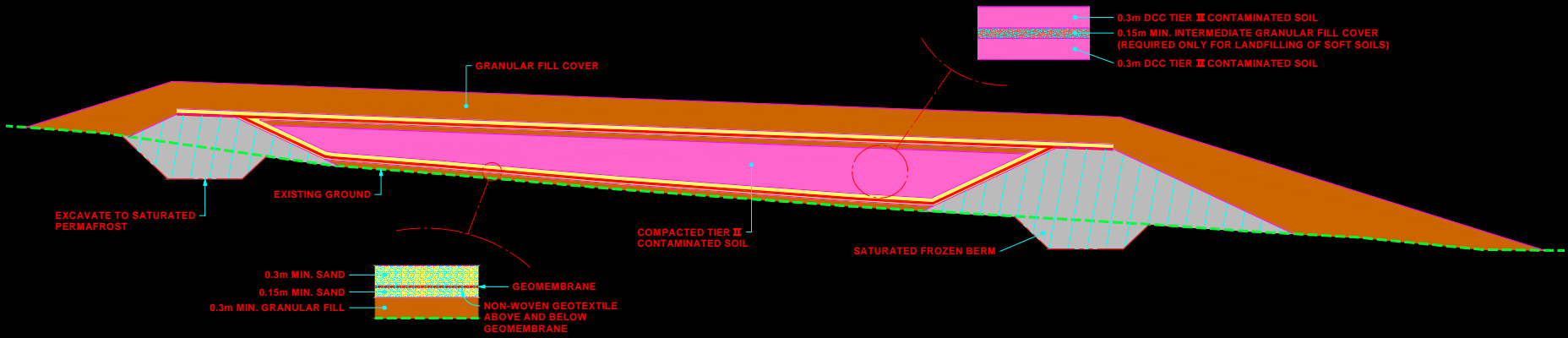
Leachate Containment Modification



LANDFILL WITH LEACHATE CONTAINMENT



Contaminated Soil Landfill



Landfill Monitoring

- visual
- soil/groudwater
- thermal



Acknowledgments

- Indian and Northern Affairs Canada
 - Ms Joanna Ankersmit (Contaminants Sites Program)
 - Dr Wayne Ingham (Water and Earth Science Associates)
- Department of National Defence
 - Dew Line Cleanup Team
- Environment Canada
 - Lisa Keller, Country Representative

Contact Information

Indian and Northern Affairs Canada
Les Terrasses de la Chaudiere
Room 616
10 Wellington St. Gatineau,
Quebec, Canada
K1A 0H4
ph: (819) 997-8413
fx: (819) 953-2590
nahirm@inac.gc.ca

Water and Earth Science Associates
The Woolen Mill, 4 Cataraqui St.
Kingston, ON, Canada
K7K 1Z7
ph: (613) 531 2725
Fx: (613) 531 1852
wingham@wesa.ca