Environment Canada Environnement Canada

Canada

Overview of Northern Incineration

IEMA – Ekati AQ Workshop
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Contents

- Background
- Northern Incineration
- Environmental Concerns
- Management Tools

Waste Management – Incineration

- Proper incineration can be an effective and environmentally sound method of waste disposal in remote locations
- Proper incineration is neither cheap nor easy.
  - Appropriate equipment must be used; and
  - Must be operated correctly

Incineration Emissions

- Poor equipment and operation can lead to the emission of:
  - Persistence Organic Pollutants (POPs – e.g. dioxins and furans)
  - PAHs (e.g. Benzene)
  - Metals (e.g. Mercury)
  - Criteria Air Contaminants (e.g. Particulate matter)
  - Others

Dioxins & Furans

- Product of incomplete combustion
  - Organic matter + chlorine
- Incineration of Municipal Solid Waste (MSW) is the largest source in Canada
- Persistent in the environment
- Bioaccumulate
- Toxic

CCME Canada-Wide Standards (CWS)

- Canada-wide Standards for Dioxins and Furans
- Canada-wide Standards for Mercury Emissions
  - Canada and GNWT are signatories
- CWS focus on:
  - Emission limits for incineration
  - Demonstration through:
    - Determined efforts
    - Stack testing

Technical Document for Batch Waste Incineration

- Achieve the CWS by:
  - Using appropriate incineration equipment, and
  - Best management practices

  ➔"Determined Efforts"

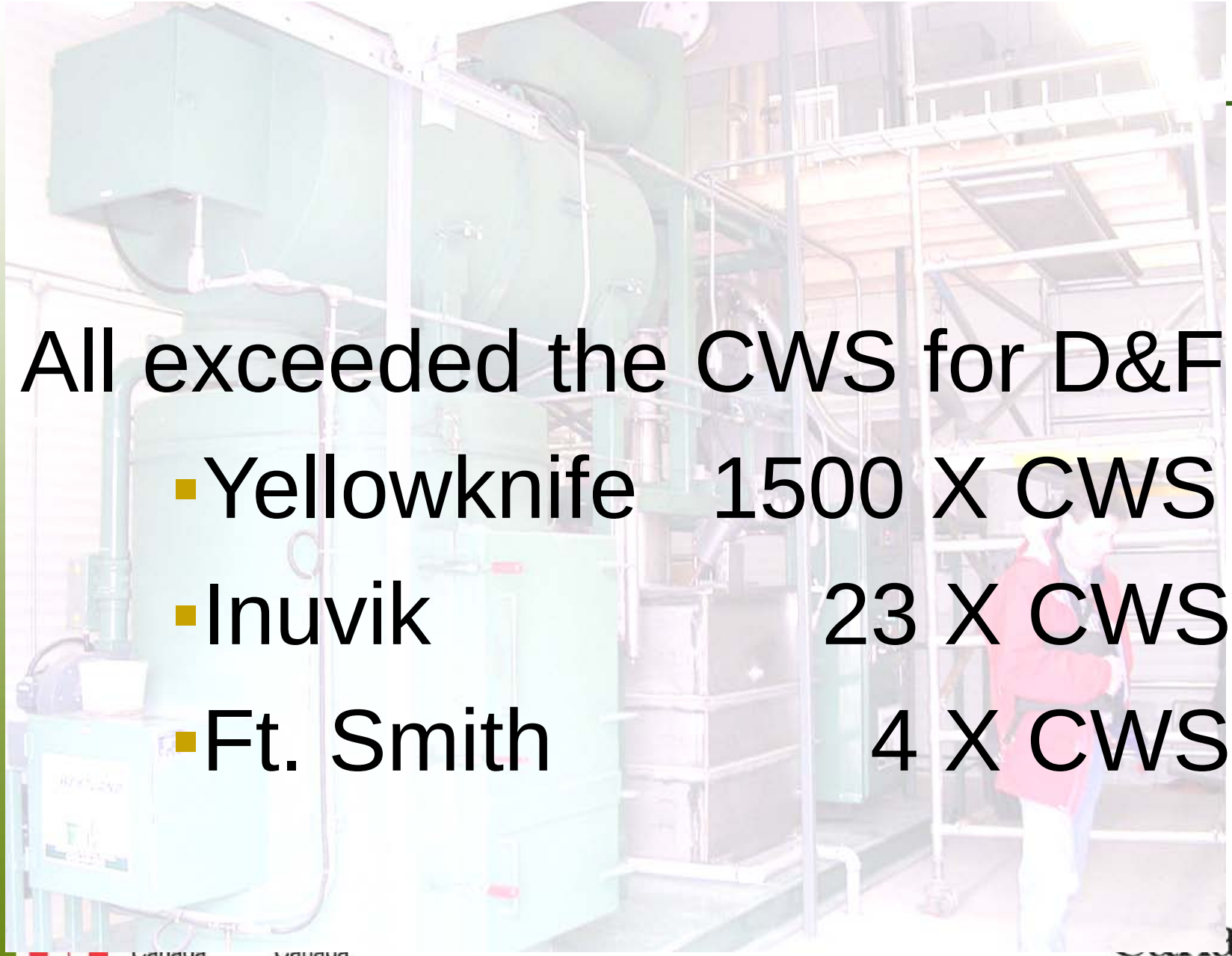
- Provide consistent advice for incineration management

- Available online: http://www.ec.gc.ca/gdd-mw/default.asp?lang=En&n=5F6E5596-1

Northern Incineration

NWT Medical Waste Incinerators

NWT Medical Waste Incinerators



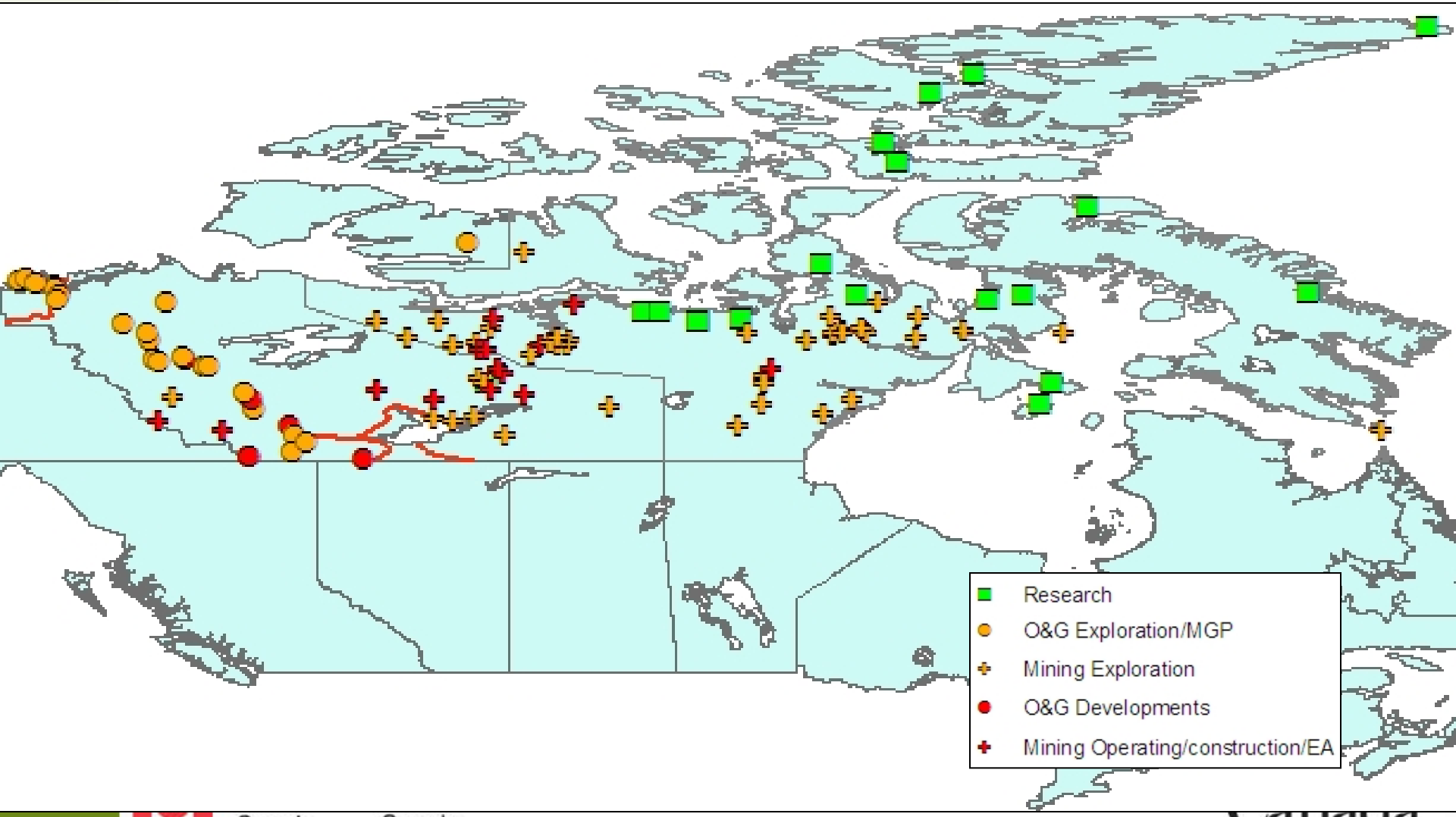
All exceeded the CWS for D&F

- Yellowknife 1500 X CWS
- Inuvik 23 X CWS
- Ft. Smith 4 X CWS

Large Industrial Developments

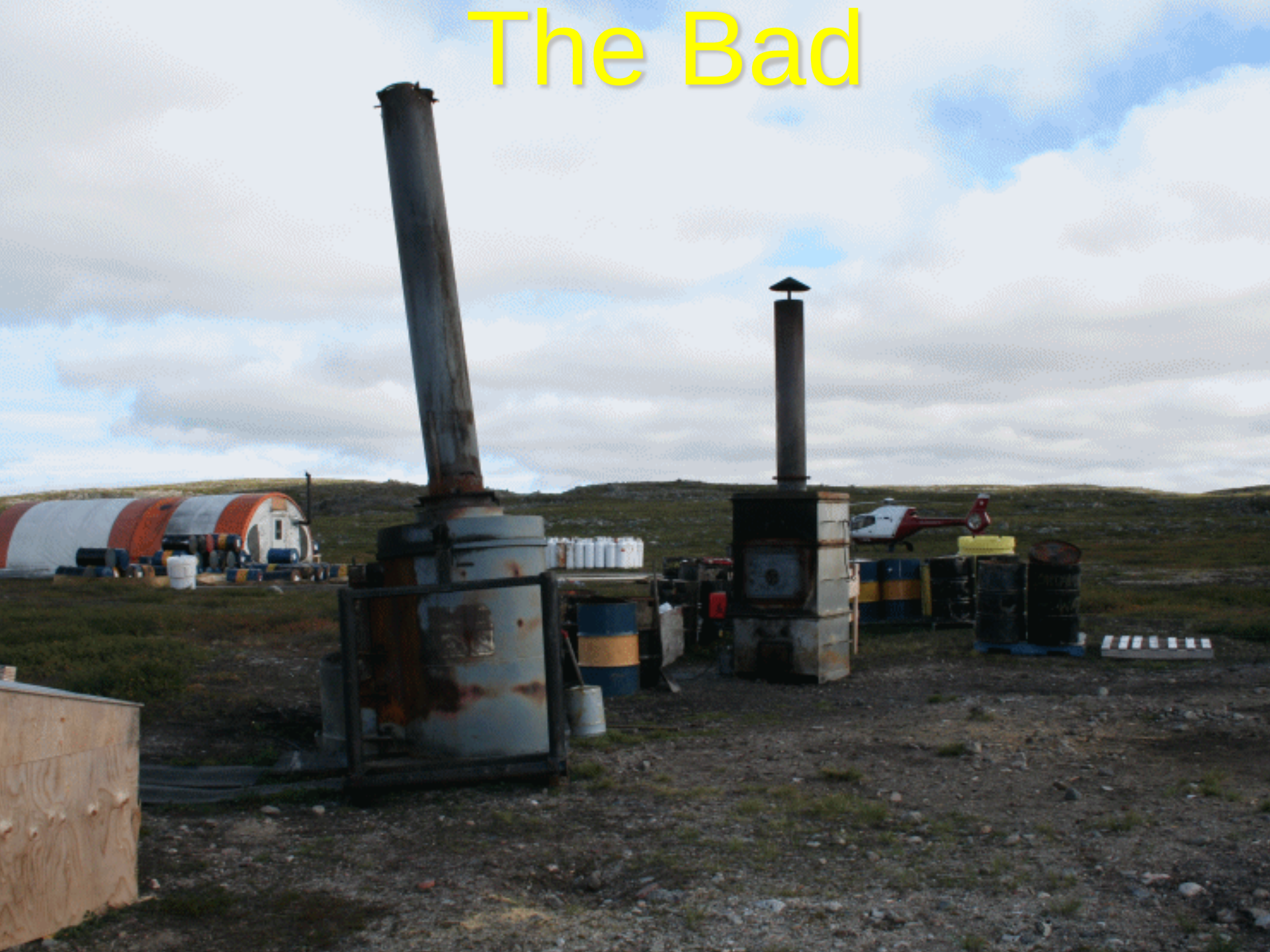
Small Exploration Camps

Northern Remote Camps



The Good

The Bad



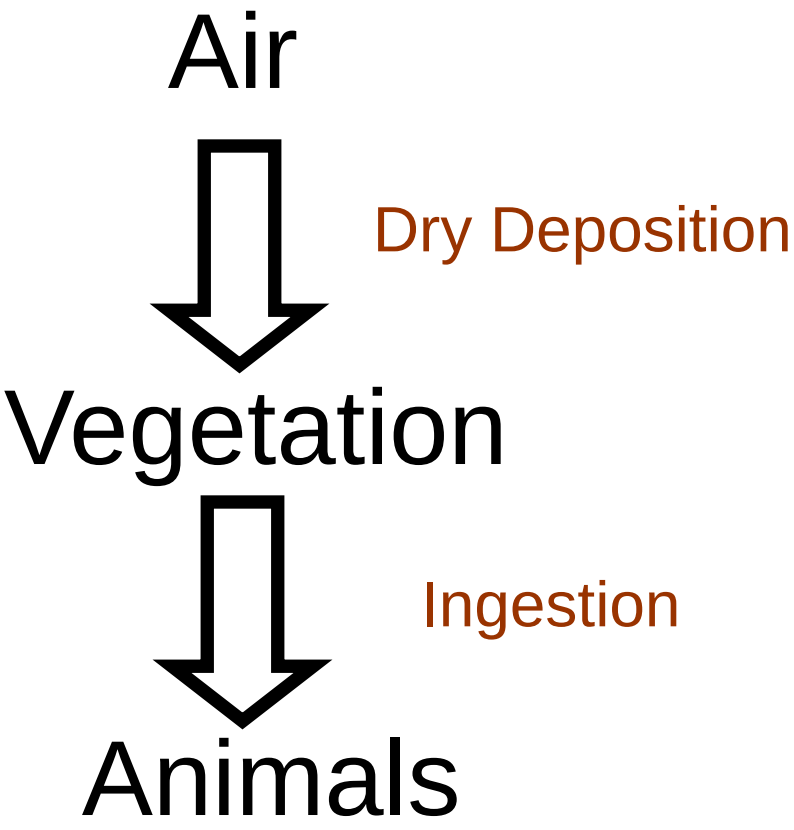
And the Ugly

Environmental Concerns

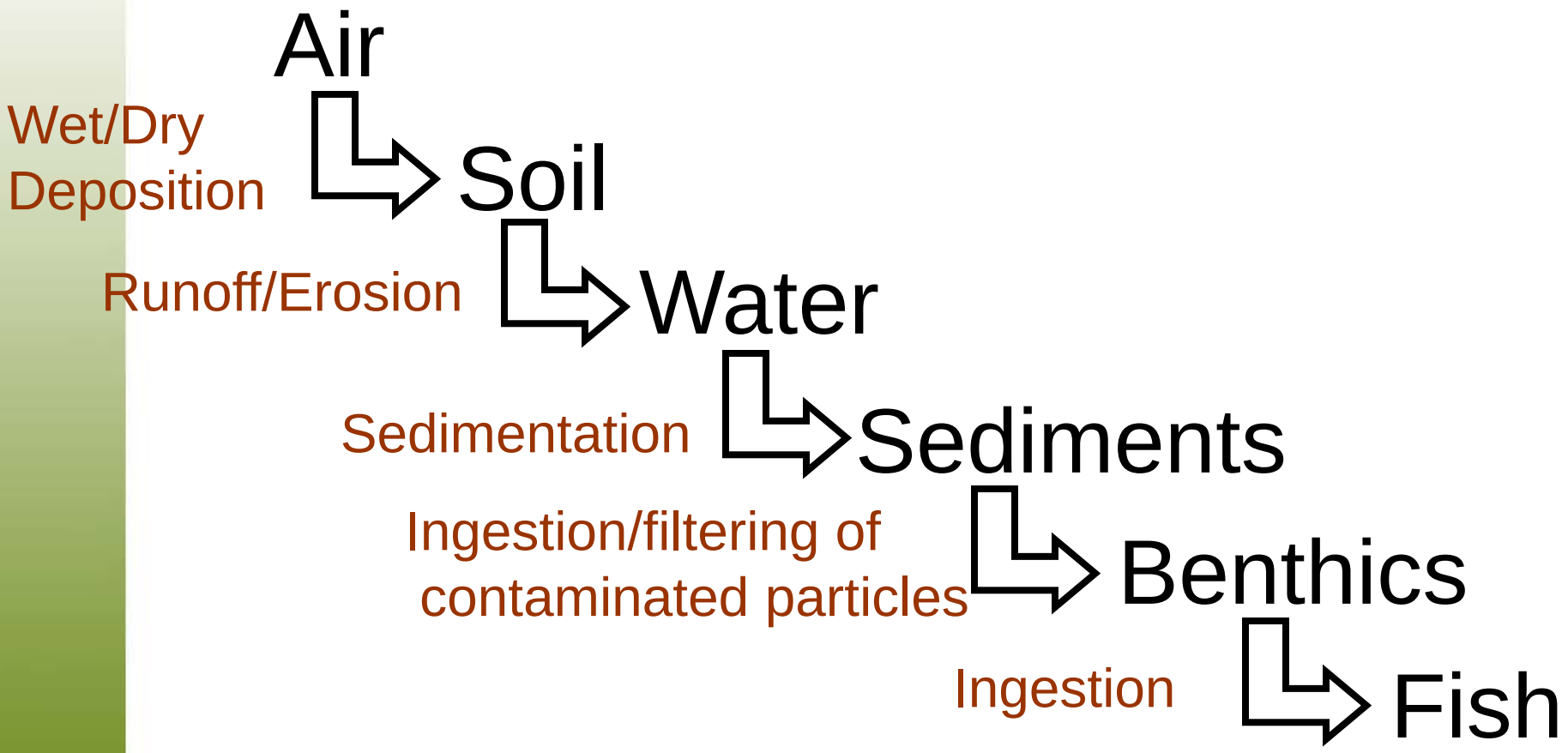
Environmental Fate of Incineration Contaminants

- Incineration is not solely an air quality issue
- Dominant exposure pathways for incineration contaminants are:
  - Sediments;
  - Water column;
  - Vegetation; and
  - Soil.

Environmental Fate: Terrestrial

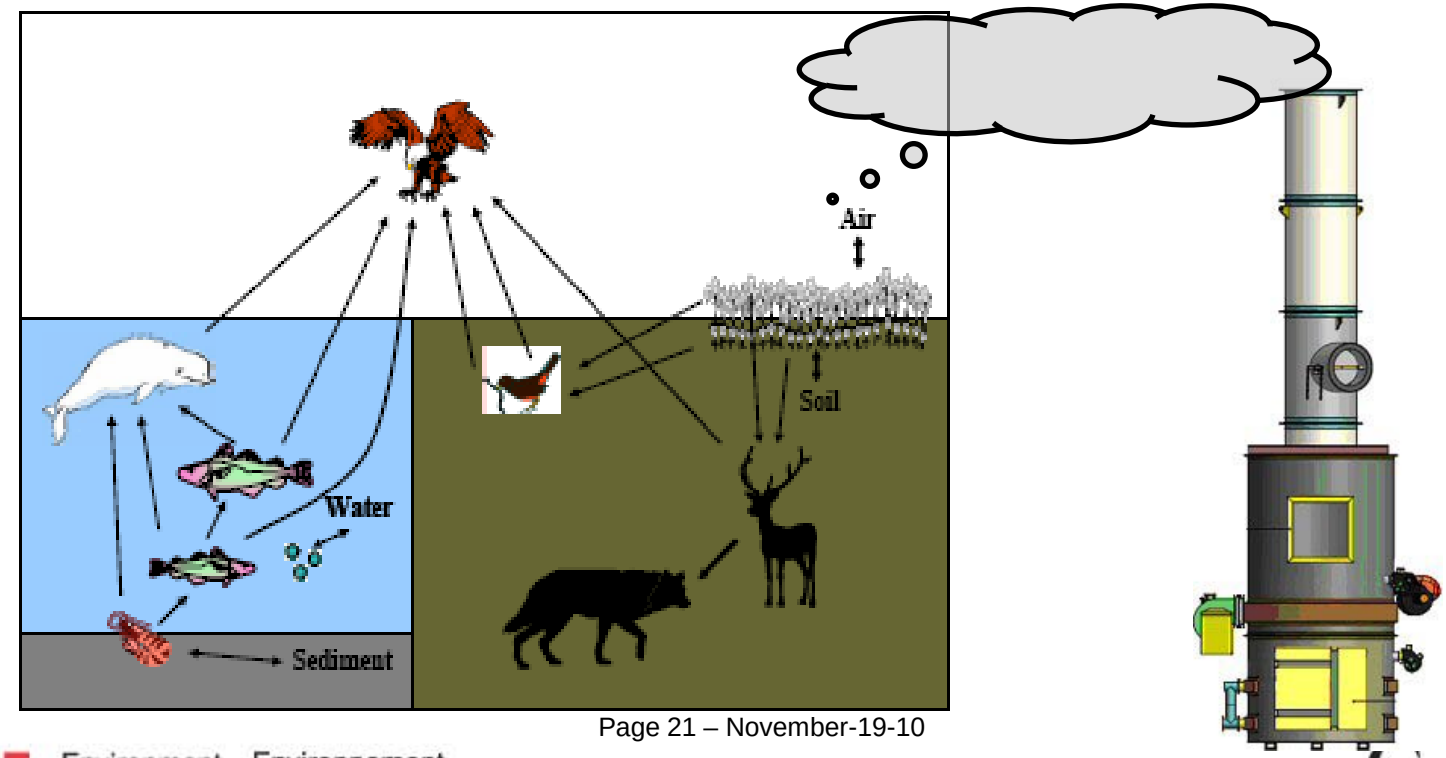


Environmental Fate: Aquatic



Environmental Fate: Modelling

Trent University modelled incineration emissions from a typical northern camp through the food chain.



Environmental Fate: Modelling

Trent University modelled incineration emissions from a typical northern camp through the food chain.

Model Results

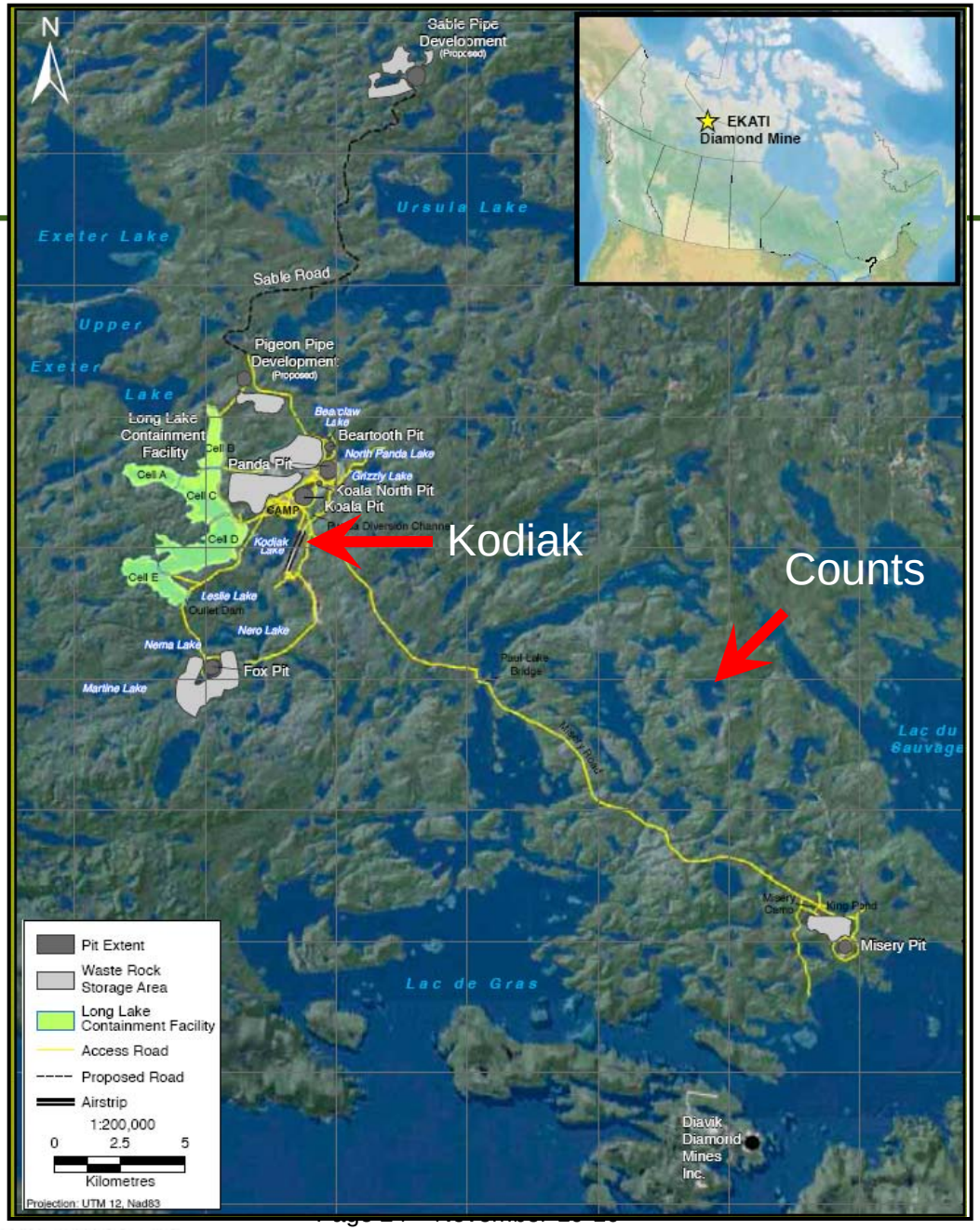
- Good incineration – achieves CWS
  - ➔ Emissions -- **9.5µg TEQ/tonne MSW** (Chandler)
  - ➔ adverse impacts are unlikely

- Poor incineration
  - ➔ Emissions -- **3,500µg TEQ/tonne MSW** (UNEP)
  - ➔ potential for adverse impacts to soil, water, fish and wildlife

Sediment Sampling near the Ekati Diamond Mine

- To look at the levels in an exposed site, EC collected sediment samples in April 2008 at the Ekati Diamond Mine

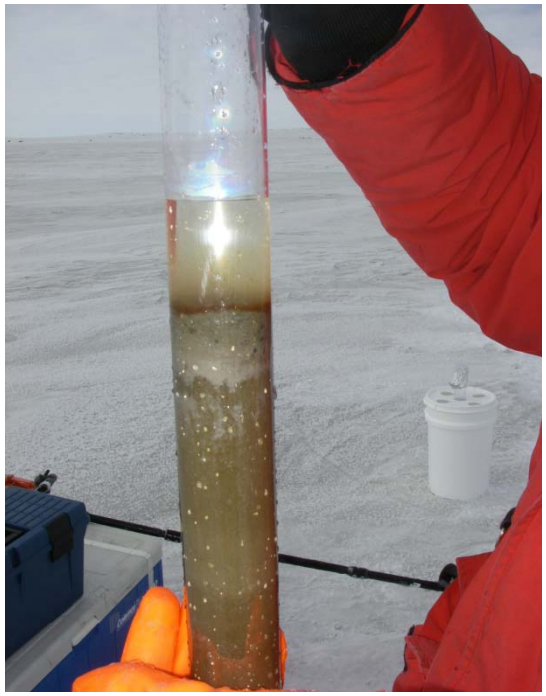
- The Ekati Diamond Mine has been in production since 1998, and used a single-chamber incinerator located on the shore of Kodiak Lake


N
Sable Pipe Development
(Proposed)
EKATI Diamond Mine
Ursula Lake
Exeter Lake
Sable Road
Upper Exeter Lake
Pigeon Pipe Development
(Proposed)
Bearclaw Lake
Long Lake Containment Facility
Cell B
Cell A
Cell C
Cell D
Cell E
Panda Pit
Beartooth Pit
North Panda Lake
Grizzly Lake
Koala North Pit
Koala Pit
CAMP
Kodiak Lake
Kodiak
Counts
Leslie Lake
Outlet Dam
Nero Lake
Nema Lake
Martine Lake
Fox Pit
Paul Lake Bridge
Misery Road
Lac du Sauvage
Misery Camp
King Pond
Misery Pit
Lac de Gras
Diavik Diamond Mines Inc.
Pit Extent
Waste Rock Storage Area
Long Lake Containment Facility
Access Road
Proposed Road
Airstrip
1:200,000
0 2.5 5
Kilometres
Projection: UTM 12, Nad83

The view from Kodiak Lake

Photo Credit:
Anne Wilson

Core Collection



- Samples were collected from comparable depths in Kodiak Lake (left) and the Count Lake reference site (right) for analysis of dioxin & furan congeners
- Analytical work was done by the Environmental Science and Technology Centre

Core Collection

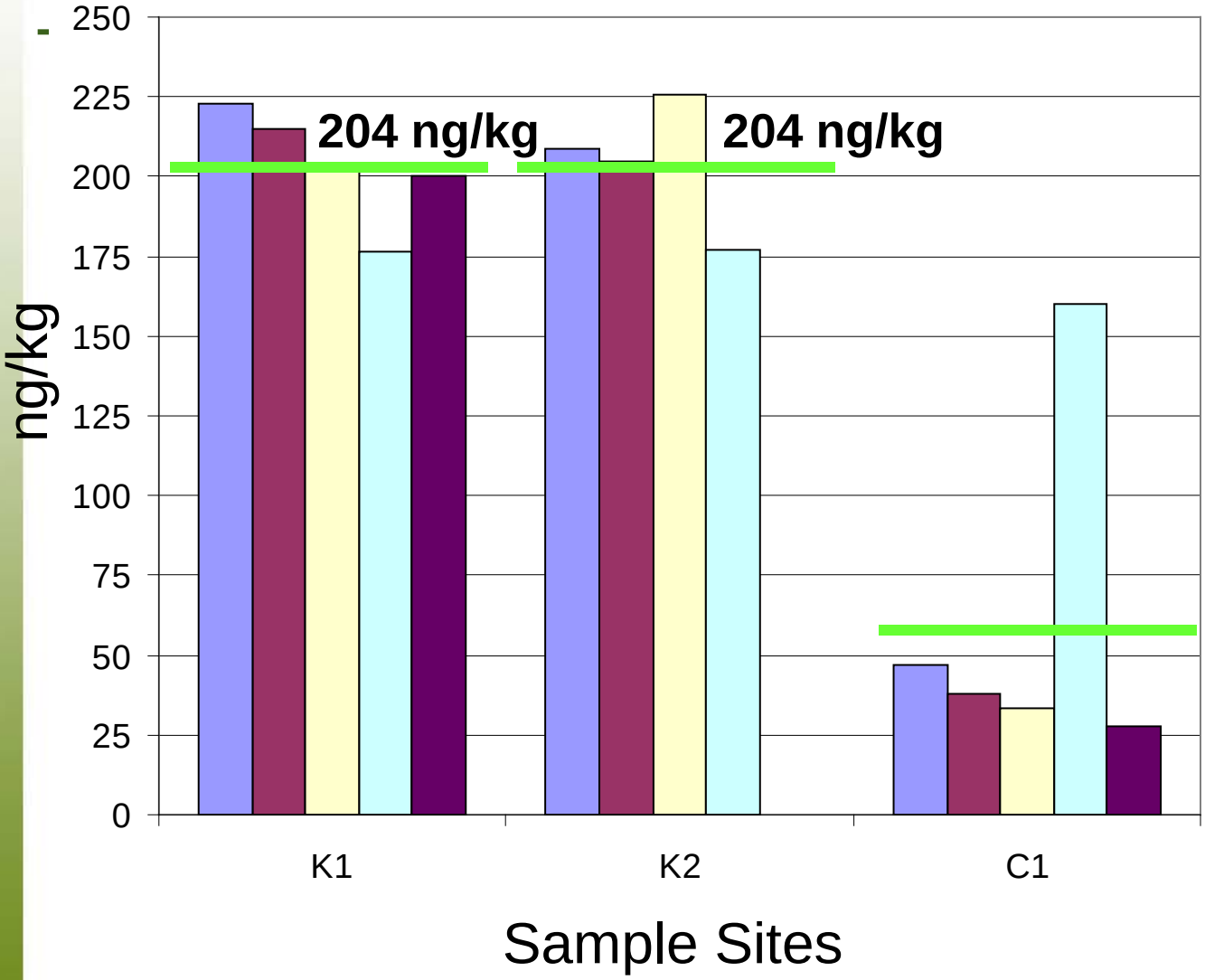
- Cores were frozen using ambient temperatures and dry ice
- Freeze deformation occurred, causing mounding that complicated sectioning of layers
- The analytical lab was able to distinguish layers consistently among the cores for the top layers, but this was difficult for the lower layers

Analytical Results

Dioxins	Furans
2378-TCDD	2378-TCDF
12378-P5CDD	12378-P5CDF
123478-H6CDD	23478-P5CDF
123678-H6CDD	123478-H6CDF
1234678-H7CDD	123678-H6CDF
OCDD	234678-H6CDF
	123789-H6CDF
	1234678-H7CDF
	1234789-H7CDF
	OCDF

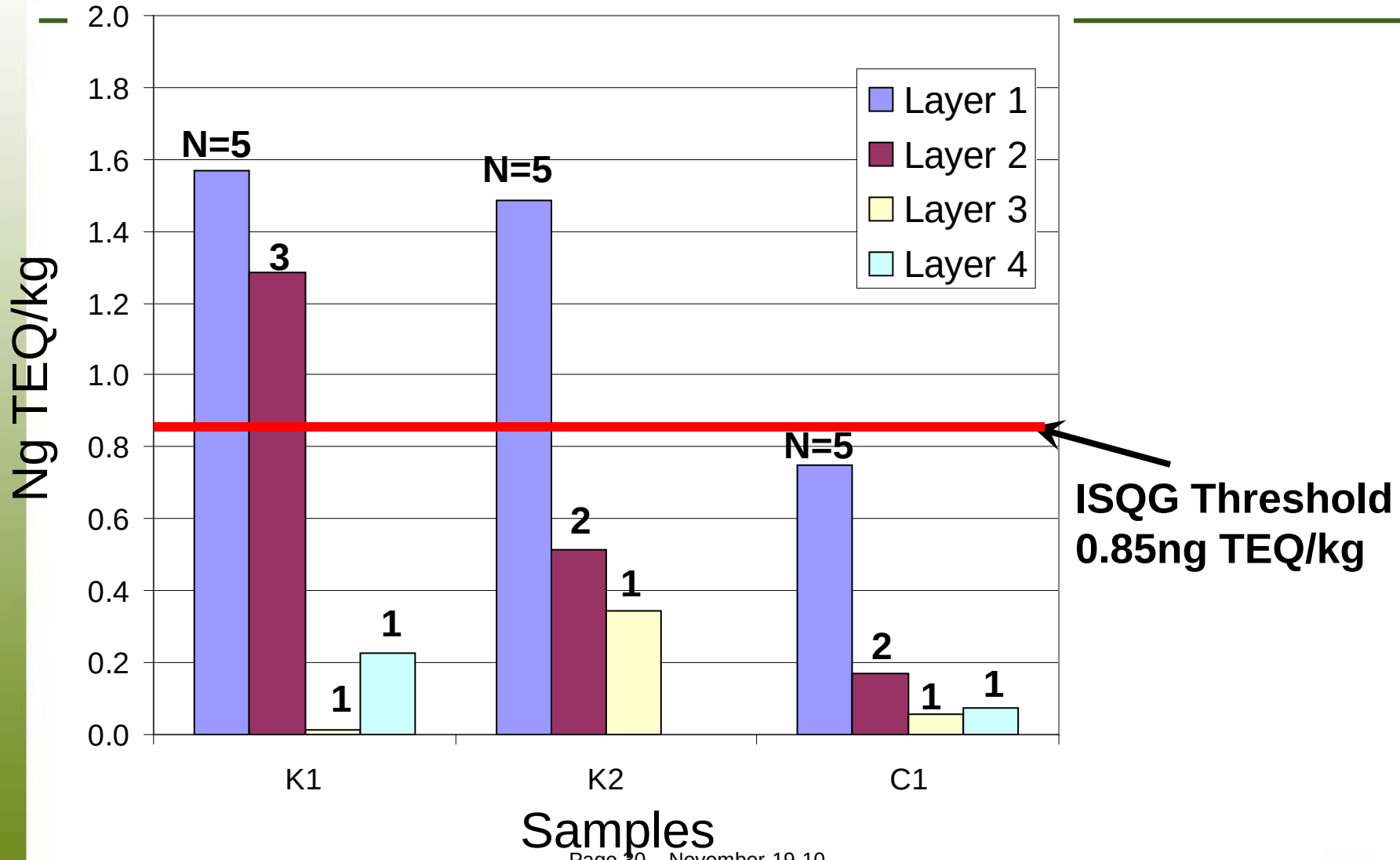
- Samples were analyzed for 17 dioxan and furan congeners
- Toxicity Equivalency factors (CCME 2004) were applied to the results to calculate toxic equivalencies (TEQs) which could be compared between sites and layers
- The CCME Interim Sediment Quality Guideline is 0.85 ng TEQ/kg

Total PCDD + PCDF – First Layer



Mean 61 ng/kg

Mean TEQ – Vertical Profile

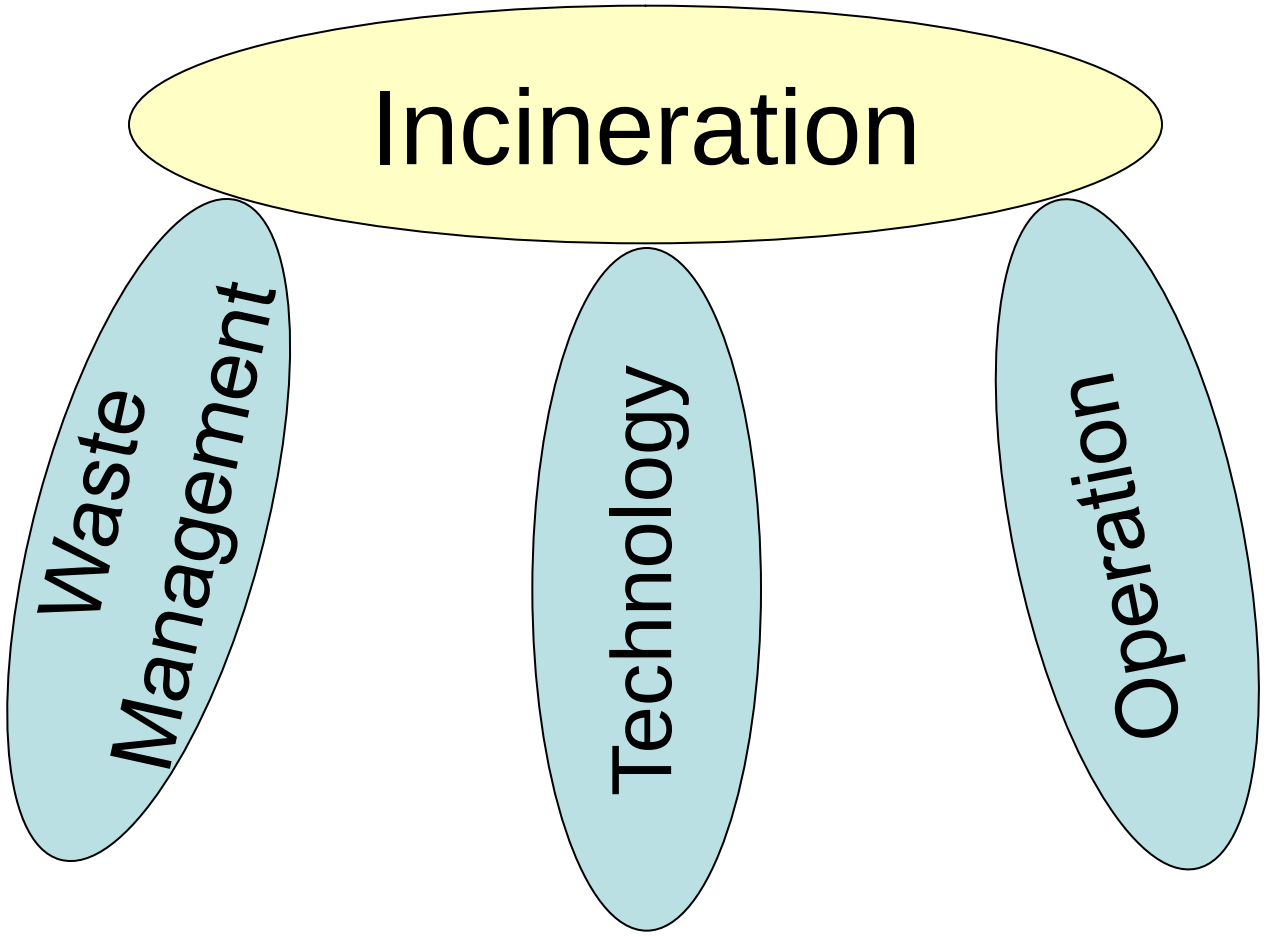


Using the Results

- Air quality is a regulatory gap in the North, but this study clearly demonstrates that incineration products are ending up in nearby waters.
- Water quality and general operations of mining developments are regulated under water licences and land use instruments in the NWT and NU
- By including waste management conditions which ensure the Canada-wide Standards for Dioxins and Furans are met, water licences help protect the surrounding environment from these contaminants

Incineration Management Tools

Fundamentals of Incineration



Technical Document for Batch Waste Incineration: 6-Steps

Step 1: Understand Your Waste Stream

Step 2: Select the Appropriate Incinerator

Step 3: Properly Equip and Install the Incinerator

Step 4: Operate the Incinerator for Optimum Combustion

Step 5: Safely Handle and Dispose Of Incinerator Residues

Step 6: Maintain Records and Reports

Incineration Management Plan

- Recycling/segregation waste program
- Waste audit -- quantities and types of waste to be incinerated
- Selection of incineration technology
- Operational and maintenance records
- Operator training
- Emission measurements
- Incinerator ash disposal
- Annual Report

MVLWB Water Condition for Tundra Mine

D.38. The Licensee shall submit to the Board for approval 45 days prior to incineration activities an incineration management plan that considers Environment Canada's "Technical Document for Batch Waste Incineration".

Thank you!

Questions?