Innovative Closure Concepts for Xstrata Nickel Onaping Operations

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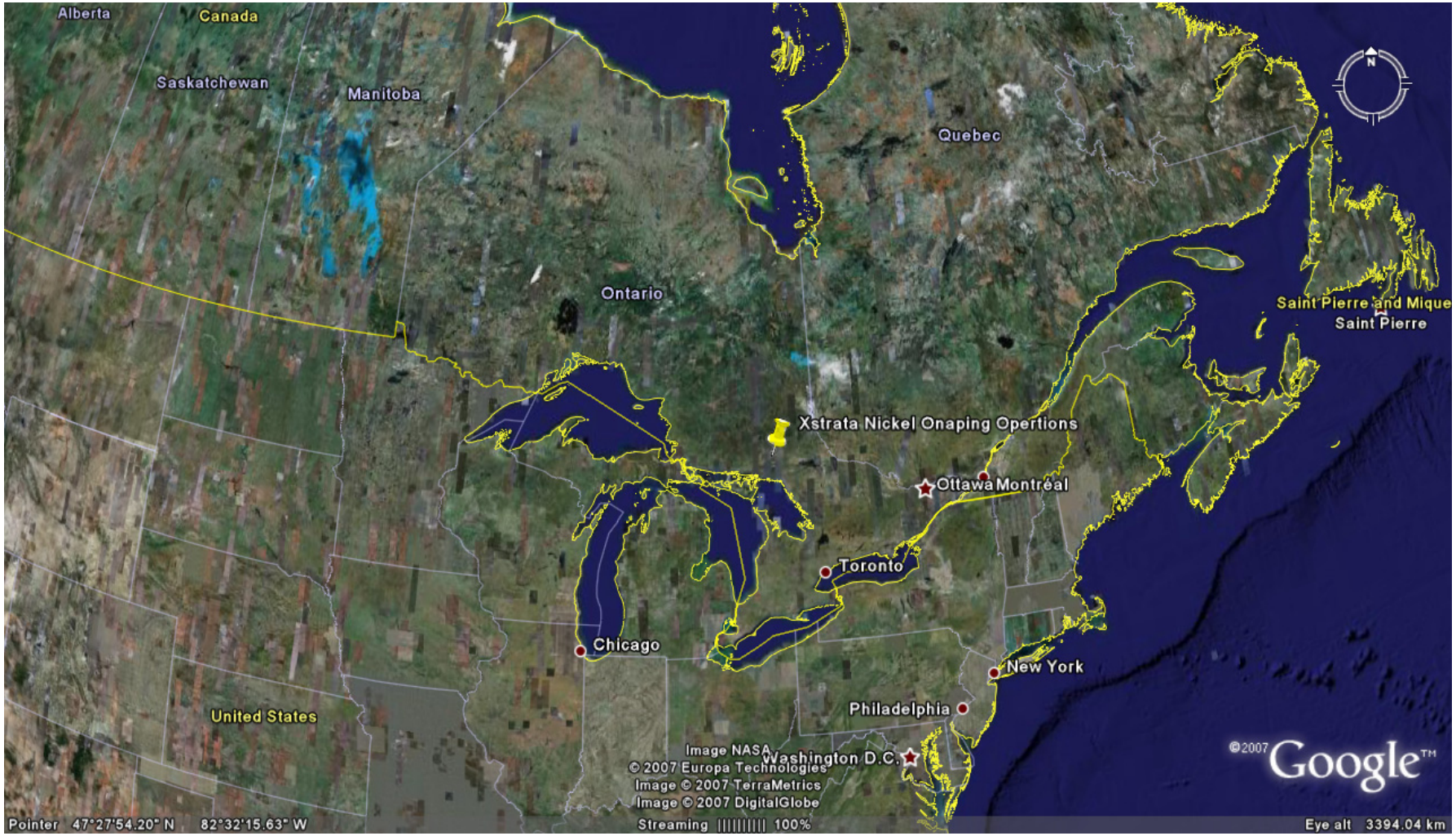


Xstrata Nickel – Onaping Operations

Scope or "The Challenge"

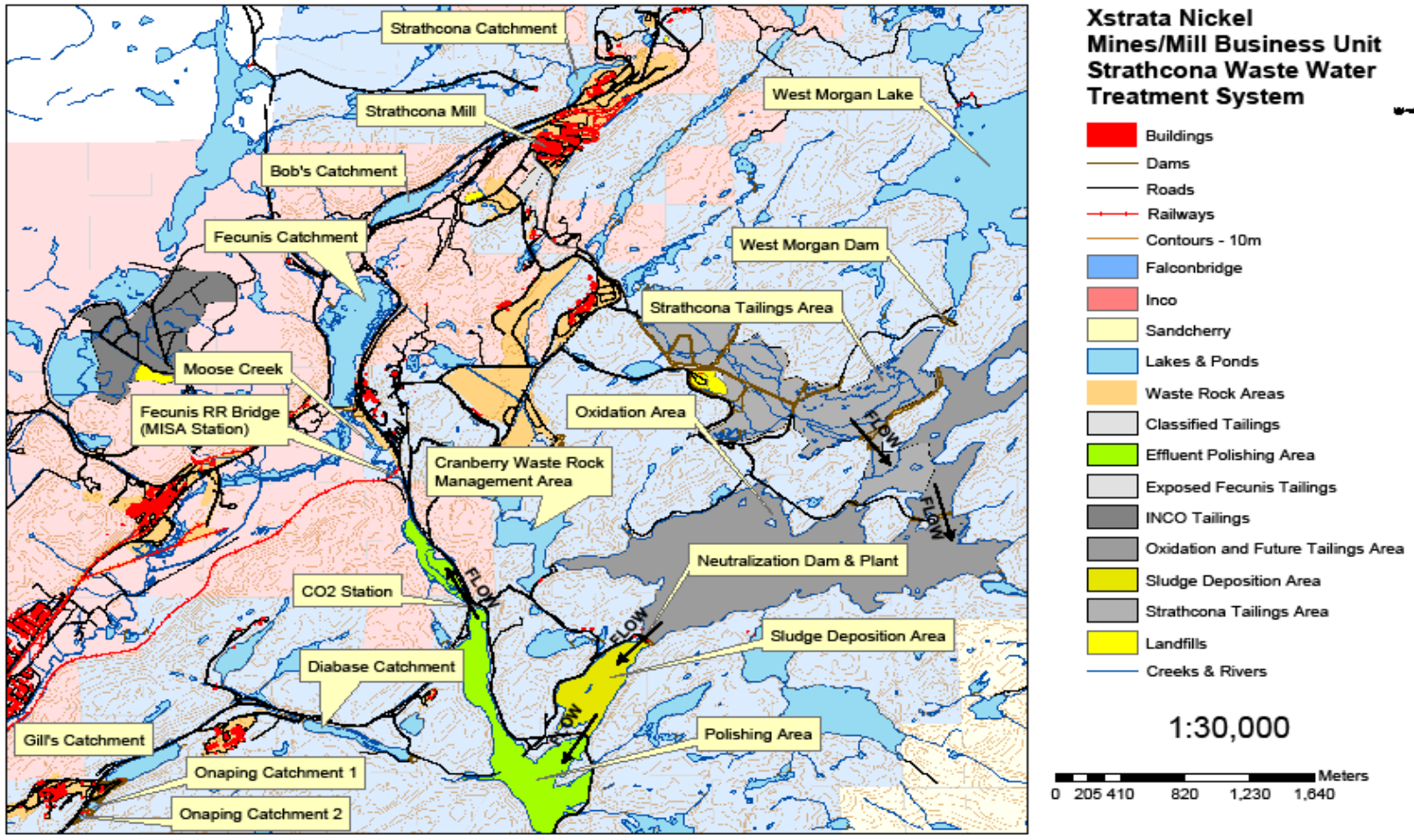
- Four operating Mines - Fraser, Strathcona, Craig, Onaping; Two Non-operating Mines – Fecunis & Longvack (mid-1950's)
- Operating Concentrator - Strathcona Mill (1967)
- Active Tailings Deposition Area
  - Strathcona Tailings Treatment System (STTS)
  - Treats all Onaping Area Mine/Mill water from Xstrata Nickel, CVRD INCO Levack Operations, FNX Mining Operations
- Includes subaerial & subaqueous tailings deposition areas, oxidation pond, lime plant, precipitate settling area, & CO2 pH adjustment; water management issues
- Also includes waste rock management area with seepage collection discharging to central treatment basin

Strathcona Tailings Treatment System - History

Scope or "The Challenge" (Continued)

- Inactive Fecunis Mine/Tailings Area (1950's)
- Active Industrial/Domestic Landfill Site, a couple historical landfills
- Potable Water Supply serving a municipality
- Encompasses a watershed area of approximately 4000 hectares: includes several sub watersheds
- Workforce includes approximately 1200 employees
- No exceedances of regulated limits in over 17 years, annual Ni average of 0.06-0.08 mg/L (regulated monthly average= 0.50 mg/L),
- No failed toxicity tests over same period
- Environmental Management System (EMS) ISO 14001 certified

Strathcona Tailings Treatment System - System Overview



Onaping Area - Closure Planning

- **Process of planning for closure began in 1990 with changes to the Mining Act in Ontario**
- **Involved multi-disciplinary team from, Xstrata and CVRD-INCO , consultants, researchers**
- **Planned submitted in early 2001 as one of the province's first joint plans**
- **Focus of Xstrata was working toward a "walk-away" scenario for our site**
- **Involved new concepts for closure**

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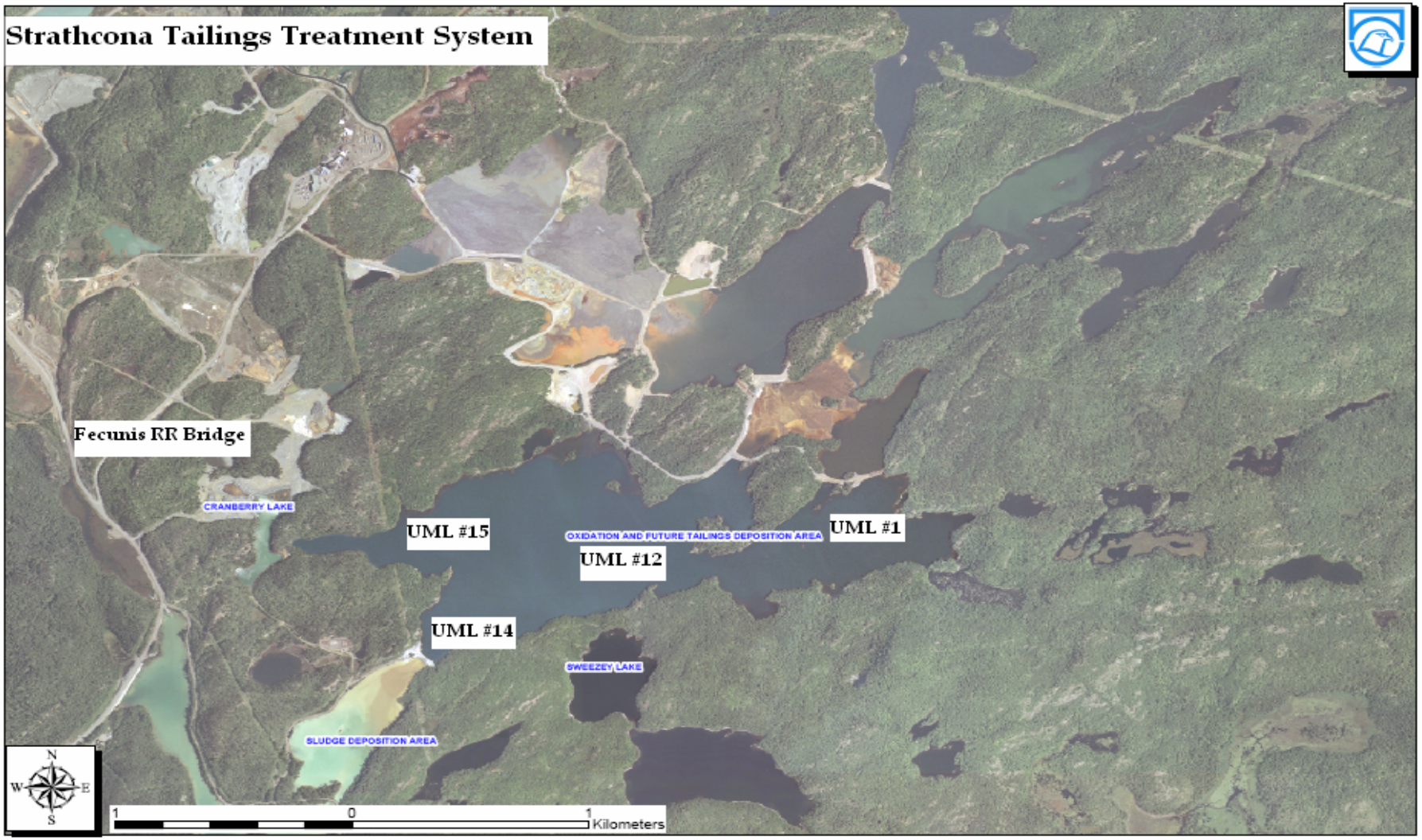


Tailings Management for Closure

Challenge: How to plan closure for a large active tailings area where tailings had been co-deposited for 25 years from a single end-spill location

- **Material Consisted of Two tailings streams**
  - Po tailings +/- 30% S
  - Total Tailings +/- 5% S
- **Resulted in 1500 metre long beach at +/- 15% S**
- **Approximately 65 million tonnes placed since 1967 with depths exceeding 20 metres at active tailings area**
- **Additional 5 million tonnes at inactive site , 35 hectares**

- **Life of Mine projections indicated 18 years in 1990**

Tailings Management for Closure

Options for Tailings Closure included:

- **Perpetual treatment**
- **Wet Covers**
- **Dry Covers**
- **Utilization of Tailings for alternate purposes**

Solution:

- **Combination of 3 latter strategies based on a variety of constraints including mine life**
- **Segregation of Total tailings streams**
- **Cyclone UF (Fill) used UG for support (comprises about 25% of total tailings generated)**
- **Cyclone OF (Slimes) used as dry cover for historically placed tailings – minimum 1.5 metres thickness**
- **Utilize waste Kiln dust from a lime supplier as an "Insurance Policy" to ensure nonacid generating over long term >200years based on modeling**
- **Po tailings have been subsequently flooded or placed subaqueously**

Strathcona Tailings Treatment System - Tailings Area

Challenge:

- **Potential Issue of Acid generation >200 yrs based on modeling**
- **Segregation of low sulphur slimes cover material**
- **Inconsistent cover thickness**
- **Limited mine life**
- **Limited capacity to produce slimes cover**

Strathcona Tailings Treatment System - Slimes Thickener

Solution:

- **Construction of slimes thickener to produce 40% solids**
- **Addition of a waste lime kiln dust product from a producer 200 km west**
- **Placement at desired cover thickness, with minimal segregation of particles**
- **Division of area into cells**
- **Maximize utilization of slimes cover material**

Strathcona Tailings Treatment System-Slimes Cover Placement

Challenge:

- **Confirming minimal 1.5 m. cover thickness was achieved**
- **Confirming ABA characteristics in field**

Solution:

- **Elevation boards placed in area to be "slimed" prior to deposition**
- **Confirmatory field sampling for ABA, %S**

Strathcona Tailings Treatment System
Subaqueous Disposal of Tailings

Challenge: What to do with the high Sulphur Po tails

- **Filled in lowest cell with Po tails and then built two dams to flood these reactive tailings**
- **Since 2001 Po tailings placed subaqueously in deep basin (+/-52m)**
- **Dredged remnant tailings beach under water**

Strathcona Tailings Treatment System - Dam Construction & Tailings Dredging

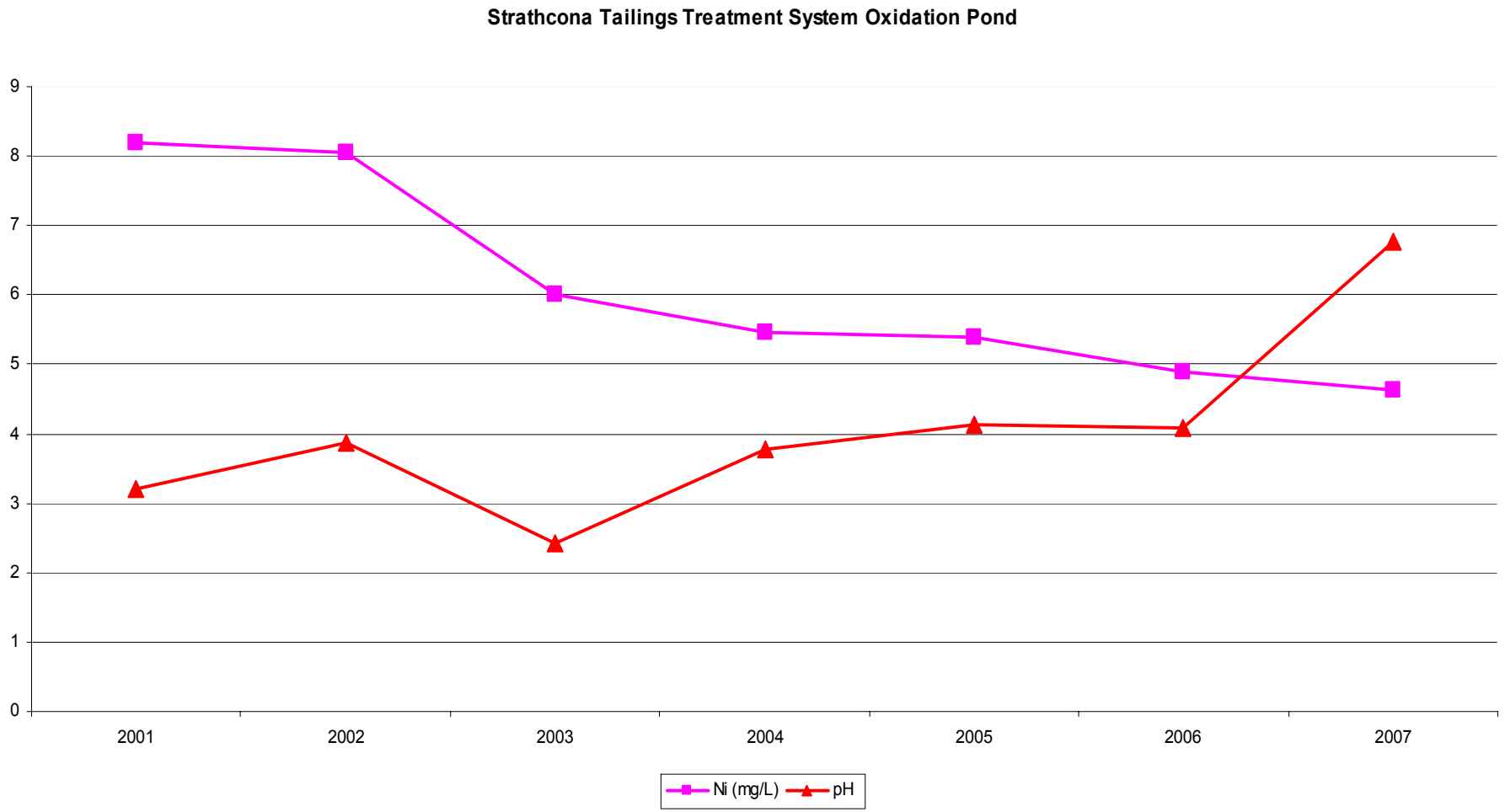
Strathcona Tailings Treatment System
Progressive Rehabilitation

Waste Rock Management Challenge

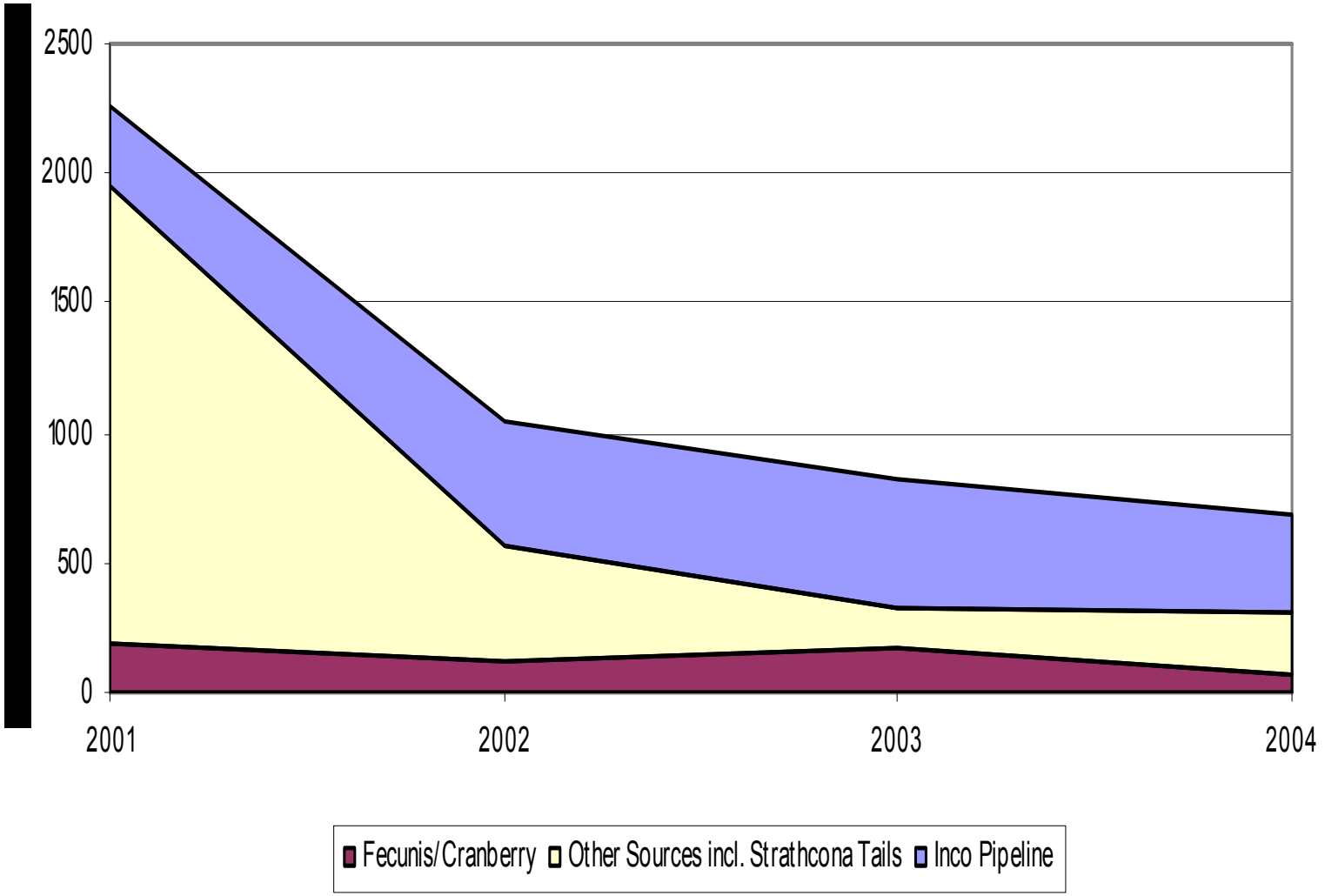
- **Estimated 6.5 million tonnes in rail bed, roads and yards**
  - Placement of waste rock into a central repository since mid-1980's approximately 10 million tonnes
  - Construction of dams within waste rock area to flood this material; capability to raise dams
  - Other material will be flooded in place by constructing series of dams upon closure
  - Ongoing waste rock removal campaigns

Cranberry Waste Rock Management Area

Strathcona Tailings Treatment System
Path Forward



Soluble Metal Acidity Loadings



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Challenge: Adherence to plan for operators

Solution:

- Environmental Management System (EMS) with Procedures, Nonconformity database, objectives and targets
- Significant Environmental Aspects (SEA)
  1. Air Emissions
  2. Spill/Incidents Releases
  3. Waste Management & Recycling
  4. Mine Rehabilitation
  5. Water Management

Strathcona Tailings Treatment System
Operating Procedures

Central Services and Utilities - Strathcona Tailings Waste Water Treatment System Water Management Operating Procedures
Central Services and Utilities - Strathcona Tailings Watershed Reference Manual Cover_Index
Manual_Section 2_Functional Objective/Overview
Manual_Section 3_Contigency Plans
Manual_Section 4_Contingency Dilution Control Operating Procedures
Manual_Section 5_Emergency Phone Numbers
Manual_Section 6_Spill Reporting Procedures
Manual_Section 7_Reportable Operating Problems/Incidents
Manual_Section 8_Strathcona Tailings Treatmenst System Certificate of Approval
Manual_Section 9_Moose Lake Operating Strategy
Manual_Section 10_Moose Lake Neutralization Plant Operating Manual
Manual_Section 11_Moose Lake Control Station Operating Manual
Manual_Section 12_Operating Strategy-Fecunis Lake
Manual_Section 13_Fecunis Lake Pumphouse Operating Manual
Manual_Section 14_Fecunis RR Bridge pH and Flow Monitoring Systems
Manual_Section 15_Storage and Safe Handling - Carbon Dioxide
Manual_Section 16_Water Sampling Schedule
Manual_Section 17_MISA Regulation - Metal Mining Section
Manual_Section 18_Operator Checklists
Manual_Section 19_Strathcona Tailings Landfill Site Operating Manual
Manual_Section 1_Distribution List/Responsibilities
Manual_Section 20_Guideline for the Handling of Asbestos Waste in Bulk
Manual_Section 21_Blasting Caps/Explosives Handling Procedure
Manual_Section 22_Dumping Reagent Tanks for Maintenance Purposes
Manual_Section 23_Procedures for Disposal of Waste Alkali Material
Manual_Section 24_Tailings Area Security
Manual_Section 25_Onaping Waste Water Pumping and Collection
Emergency Response Plan - 1.0 Risk Analysis
Emergency Response Plan - 2.0 Distribution List
Emergency Response Plan - 3.0 Responsibilities
Emergency Response Plan - 3.1 Reportable Operating Problems and Incidences
Emergency Response Plan - 4.0 Functional Description
Emergency Response Plan - 5.0 Emergency Phone Numbers
Emergency Response Plan - 6.0 Contingency Plans for Strathcona Waste Water Treatment System
Emergency Response Plan - 7.0 Spill Response Reporting and Cleanup
Emergency Response Plan - 7.1 Spill Response First Aid Security
Emergency Response Plan - 8.0 Spill Response Equipment
Emergency Response Plan - 9.0 Training Plan
Emergency Response Plan - Index

Strathcona Tailings Treatment System Nonconformity/Corrective Action Database

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ISO 14001 Non-Conformity Incident ID 2005-MMBU-7

Submitted By:	Michael Wiebe	Date:	3/9/2005
Source of Non-Conformity:	SIR 2277	Incident Date:	2/25/2005
Site:	Strathcona Mill	Specific Location:	Mill - Tailings Pond
Description:	On the morning of February 25, the Water Systems Mechanic noted that the pH at the Lower Moose Narrows was unusually low (9.3). Troubleshooting of the treatment plant and lime addition rates commenced. Dam gate opening was reduced. Troubleshooting continued on Saturday, February 26 but ultimately the decision was to completely shutdown the system by 4:00 p.m. A bench slaking test in the Mill lab on Monday confirmed that the lime had low available CaO. Futher investigation also showed that the last tankerload of quicklime had 5 mt of kiln dust in it. A load of lime slurry was brought in on Monday afternoon to slug treat Lower Moose Lake. The remaining mixed lime and kiln dust in the silo was wasted by slaking through the ball mill with the gate closed.Daily sampling during the week of February 28th did show a spike in nickel/copper concentrations in Lower Moose Lake but the highest measurement at the MISA point was 0.39 ppm. (Daily peak is 1 ppm)		

Environmental Assessment

Type of Non-Conformity: (Hold Ctrl key and click items to select/deselect)	SEA:	Action Plan Required:
System Level Procedures Standard Operating Procedures Legal Requirements Policy Objectives, Targets and Programs	Choose the SEA	Yes

Corrective or Preventative Action

Assigned To:	Wiebe, Michael	Plan Required By:	3/18/2005	Plan Completed:	Yes
		Work Required By:	4/8/2005	Work Completed:	Yes
Preventative Corrective Action:	Is this the same issue as 2005-6? See email from JJ/JF to ISO 14001 mailbox April 22, 2005				

Update Record

Onaping Area Closure Plan
Future Challenges

- **Costs**
- **Refining predictions, reviewing models, ground truthing predictions**
- **Potential new mines increased life of operations**
  - Tailings deposition capacity
  - Excess slimes
  - Waste rock management
- **Climate change implications for covers**
- **Staffing issues**

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Thank You

Questions?