Long Term Care and Maintenance at the Closed Uranium Mines in Elliot Lake

Presented to
Regulatory Supervision of Legacy Sites Workshop
IAEA/CNSC – Elliot Lake, Ontario, Canada
May 1, 2014
Outline

- History
- Decommissioning Plan Processes and selected plans for Denison Facilities
- Operating, Care and Maintenance Components
- Care and Maintenance Activities
- Costs
Uranium Mining in Elliot Lake

- 12 mines and 11 mills constructed between 1955 & 1958 following discovery of uranium.
- Most uranium produced under contracts with the U.S. Atomic Energy Commission.
- Following cancellation of the contracts most mines in the area closed in the 1960s.
- Denison Mine operated continuously supplying uranium to Ontario and Japan until closure in 1992.
- Diminishing ore grades resulted in the closure of the Denison Mine.
- The last remaining uranium mine in Elliot Lake was the Stanleigh Mine (Rio Algom) which closed in 1996.
Denison Property

• 16 km north of Elliot Lake.
• Developed in 1950s and ran from 1957-1992.
• Milled 63 million tonnes of ore.
• Consisted of underground mine, mill and two tailings management areas.
• TMA-1: 235 ha, 60 M tonnes tailings
• TMA-2: 36.3 ha, 3.3 M tonnes tailings
Stanrock Property

• 21 km NE of Elliot Lake.
• Stanrock: underground mine, mill and one tailings management area.
• Can-Met: underground mine and mill.
• Tailings from Stanrock and Can-Met both discharged into one tailings basin (52 ha, 5.7 M tonnes tailings).
Water cover option selected for Denison TMAs. Projects included:

- Relocation of ~4 million tons of tailings
- Reconstruction of dams to meet long term requirements
- New treatment plant constructed
- Other activities:
  - hazardous materials abatement,
  - demolition of facilities,
  - remediation of historical spills,
  - capping mine openings,
  - landscaping and site remediation to meet gamma targets.
In-situ management plan selected for the Stanrock site. Projects included:

• Construction of 4 low permeability dams to contain tailings and raise water table; rebuilding other dams; spillway construction
• Construction of new treatment plant
• Re-vegetation of tailings
• Cleanup of historical spills
• Capping of mine openings
Some decommissioning activities began concurrent with EA (FEARO) process

Key issues arising from EA Hearings:
- Control of acid generation
- Long term management and risk of catastrophic failure
- Mitigation measures
- Cumulative impacts on ecosystem
- Long term responsibility
- Ownership (Surrender of Title)
- Land use
Operating, Care & Maintenance at Closed Mine Sites

- Site Security and Public Health & Safety
- Inspections
- Maintenance of Site Infrastructure
- Water Treatment
- Environmental Monitoring
- Data Management, Review & Reporting
- Emergency Response
- Health & Safety
- Public Communication
- Permitting
Site Security and Public Health & Safety

- Signage
- Gates, fencing & barricades
- Frequent site visits
- 24 hour alarm intrusion monitoring
- Public communication

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Inspections

- Performed to ensure proper operation of all facilities
- Allows for early identification of non-routine maintenance requirements
- Inspection programs include:
  - TMA & Surface Facility Inspections
    - Treatment plants, dams, berms, spillways, culverts, channels, ditches, staff gauges, flow meters, dam instrumentation, roads, fences/gates, signage, electrical infrastructure, pipelines, etc.
  - Annual Geotechnical Inspections
    - Performed by Geotechnical Engineer
  - Capped and Backfilled Openings Inspections
- Inspections are documented and follow a prescribed frequency
Maintenance of Site Infrastructure

- Grading/clearing of access roads in all seasons
- Vegetation control on dams/roads
- Clearing of debris from water collection systems and spillways
- System maintenance for water treatment plants
Water Treatment

- Addition of BaCl$_2$ for treatment of Ra, and lime/caustic soda for treatment of acidity
- Ensure compliance with water quality discharge limits & manage Source/Receiver water level/flow
- Operational activities
  - Plant inspections
  - Checks/calibration of key process control instrumentation (e.g. pH probes, flow meters)
  - Pump/system maintenance and repair
  - Reagent management
  - Adjustment of operational settings to suit conditions
• Response to upset conditions (e.g. weather events)
Remote Monitoring

- Use a Supervisory Control and Data Acquisition (SCADA) System
- Remote ETP monitoring network using cell telemetry 24-hrs/7 days per week
- Monitor and control of key operating parameters
- Critical alarm dial-out system
- Operator interface for remote monitoring and response
- Useful for site security and treatment plant operation
In 1997 DMI and RAL implemented a comprehensive network of monitoring programs which have developed over time and now consist of the following:

1. TMA Operational Monitoring Program (TOMP) – tracks TMA performance and provides operational information
2. Source Area Monitoring Program (SAMP) – monitors water quality and quantity discharged from the TMAs
3. Serpent River Watershed Monitoring Program (SRWMP) – evaluates cumulative effects on the receiving environment (chemical and biological)
Data Management
• Achieved using emLine environmental database software, which allows for:
  • Scheduling of monitoring
  • Automated flagging of data
  • Customizable reports

Reporting
• Monthly Operations and Maintenance Reports
• Monthly SAMP, TOMP and SRWMP Reports
• Operating, Care and Maintenance Annual Report
• Serpent River Watershed Annual Water Quality Report
• 3rd Party Reports – SOE, SRWMP Interpretive Reports, DSR, Geotech

Data Review
• Comprehensive review program which includes:
  • Review of effluent data – comparison to:
    • Internal Investigation Limits
    • Action Limits
    • Compliance Limits
  • Data validation – comparison to high/low assessment values
  • Data assessment – comparison to effects-based environmental guideline/objective or background concentration
  • Quality control - comparison of quality control data to data quality objectives
• High quality dataset provides reliable risk management tool
Emergency Response

- Maintenance of Emergency Response Plans in case of:
  - Poor effluent quality
  - High rates of seepage
  - Tailings solids/liquid releases
  - Significant event – i.e. earthquake
- Emergency response plans elements include:
  - Potential failure scenarios and mitigation measures
  - Equipment/personnel requirements
  - Planning/implementation responsibilities
  - Communication plan (internal, regulatory, community, general public/media)
  - Reporting requirements
- Staff trained in emergency response
Public Communication

- Semi-annual presentations to Elliot Lake City Council (Offer also to SRFN)
- Annual newsletter
- Public bus tours of Closed Mines around the Canada Day weekend to coincide with the Uranium Heritage Festival weekend
- Special request tours of closed mines
  - Elliot Lake Waterfront Owners Association
  - Ontario Nature
  - Sault College
- Web site and Library with annual reports.
- Regular meetings with City Staff – Waterfront Development
Comprehensive Worker Health and Safety Program

- Worker Orientations
- Safety Meetings
- Workplace Inspections
- Job Observations
- Incident Accident Reporting
- Hazard Protection:
  - Radiation
  - Working Alone
  - Confined Space
  - Lock-Out Tag-Out
  - Excavation
  - Hot Work
  - Burning
  - Hazardous Materials
Licences and Permits

Federal
- Uranium Mine Decommissioning Licences (UMDL’s) issued by CNSC – one each for Denison and Stanrock
- Update of licences from UMDL to Waste Facility Operating Licence (WFOL) and accompanying Licence conditions handbook (LCH).

Provincial
- Certificates of Approval (CofA/ECA) – Operation of Effluent Treatment Plants

Municipal
- Building Permits

Internal (Client or Denison requirements)
- Safety permits – Lock out/Tag out; Working at heights.
Costs

Capital Costs

  - Demolition
  - Tailings relocation
  - Dam construction
  - Site landscaping
  - Capping of mine openings
  - Administration
  - Regulatory (EA hearings)
  - Ongoing treatment costs during decommissioning
Operating Costs

- Annual care and maintenance cost – variable. Includes:
  - Labour
  - Fuel and Utilities (gasoline, propane, electricity)
  - Reagents and Chemicals (Lime, Barium Chloride, Caustic Soda, Soda Ash)
  - Operating and maintenance supplies
  - Analytical fees
  - Professional Services
  - Regulatory fees (CNSC)
  - Capital (non-routine)
- Total annual cost - $750,000
Questions?
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