Mineral Exploration, Mining and Economic Development for Aboriginal Communities: The Mining Sequence

J. Louis Causse, Geologist-Economist
caussejl@gmail.com – (CANDO - Toronto, Ontario) October 26, 2015
CANDO sponsored a one day workshop titled “Mineral Exploration, Mining and Economic Development for Aboriginal Communities” on October 26, 2015 in Toronto, Ontario.

The audience consisted of First Nations economic development officers, other Aboriginal people interested in mining, and representatives of industry and government.

Danielle Lightning, Special Projects Coordinator, CANDO, and Catherine Peltier Mavin, Aboriginal Policy & Promotion Advisor, NRCan were the leads for the Workshop. Danielle.Lightning@edo.ca, (780) 990-0303 and, Catherine.PeltierMavin@nrcan-rncan.gc.ca, (613) 995-8839

The workshop was facilitated by J. Louis Causse, a geological consultant based in Ottawa, Ontario who provided photographs and content “caussejl@gmail.com”.

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Information Tools

- Mining Video: *Our Community...Our Future: Mining and Aboriginal Communities* [(www.nrcan.gc.ca/mms)](http://www.nrcan.gc.ca/mms)
- Information bulletins on mining and Aboriginal peoples [(www.nrcan.gc.ca/mms/prod-serv/fs_e.htm)](http://www.nrcan.gc.ca/mms/prod-serv/fs_e.htm)
- Map of Agreements [(http://www2.nrcan.gc.ca/mms/map-carte/MiningProjects_cartovista-eng.html)](http://www2.nrcan.gc.ca/mms/map-carte/MiningProjects_cartovista-eng.html)

*VISIT: http://www.nrcan.gc.ca/aboriginal_engagement_in_mining*
Workshop Outline

. Introduction
  1. Prospecting and Exploration
  2. Mine Development/Construction
  3. Mine Operation
  4. Mine Closure and Reclamation
  . Review, Conclusions and Evaluation

Please ask questions during the presentation
Many Aboriginal communities are located within 200 km of producing mines and 2500 exploration properties across Canada.
Introduction
Mining by Aboriginal People

- Western Lake Superior can find stone tools, such as spear points and axe heads, dating from 11,000 years ago.

- Indigenous people mined copper 4,000 to 5,000 years ago to make beautiful copper fish hooks, knives, gaffs and other implements.

- Traded copper implements for flint from North Dakota and shells from the Atlantic Coast.

http://www.thunderbay.ca/Living/culture_and_heritage/tbay_history.htm
Introduction
The Minerals and Metals Sector in Canada

- Long History of Exploration and Mining
- Significant economic contribution across Canada
  - Mineral production: $50B (extracting and processing)
  - Producing more than 60 minerals and metals
  - More than 200 producing mining establishments; 50 non-ferrous smelters, refineries and steel mills
- Employs 320,000 Canadians (2011)
- Mining is a major employer of Aboriginals
- 185 mining reliant communities
- Among highest average wages in Canada

Weekly Earnings:
http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labr73a-eng.htm
Mining’s Importance to Aboriginal Communities

- Mineral exploration and mining can be a key concern for Aboriginal communities with respect to environmental impacts on Traditional Territories and social impacts on people.

- Mining is the #1 employer of Aboriginal people in Canada and Ontario.

- Aboriginal people hold 10% of Ontario mining jobs.

- A key sector for Aboriginal businesses.

- Right location, small to large scale opportunities.

- Some mining companies forging partnerships with Aboriginal communities.
## Earnings, average weekly, by industry (All industries)

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<th>Industry</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td>All industries excluding unclassified enterprises</td>
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<td>852.07</td>
<td>872.82</td>
<td>894.71</td>
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<td>Forestry, logging and support</td>
<td>852.83</td>
<td>946.96</td>
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<td><strong>Mining and oil and gas extraction</strong></td>
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<td>1,643.66</td>
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<td>Manufacturing</td>
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<td>Wholesale trade</td>
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<td>Administrative and support, waste management and remediation services</td>
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<td>Health care and social assistance</td>
<td>770.73</td>
<td>788.02</td>
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<td>Arts, entertainment and recreation</td>
<td>514.32</td>
<td>553.50</td>
<td>550.88</td>
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<td>Accommodation and food services</td>
<td>334.94</td>
<td>354.16</td>
<td>357.53</td>
<td>368.12</td>
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<td>Public administration</td>
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<td>Other services</td>
<td>686.52</td>
<td>700.45</td>
<td>710.59</td>
<td>732.98</td>
<td>751.61</td>
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Module 1: Exploration

- What is Mineral Exploration?
- What Are the Stages?
- Who Are the Main Players?
What is Mineral Exploration?

- Finding new resources of metals, minerals and rocks in the ground
- Copper, gold, flint, building stone, salt, ...
- The starting point for the mineral industry
- All existing mines have a lifetime and need to be replaced
How Does Exploration Start?

- Same process as moose hunting
- Near an existing mine
- Similar types of rocks (geology) to an area with mines
- Prospecting finds in new areas
- With an idea to examine an area that may have undiscovered mineral resources

If you know where to find a big moose, you aren’t telling other hunters!
Governments’ Role (in Canada)

- Provincial and territorial governments support mineral exploration by:
  - Creating geological, geophysical and geochemical maps and reports to guide prospectors and companies to areas with minerals
  - Supporting special programs to train prospectors and field workers
  - Administering mineral claims and exploration activities

- No Federal government involvement for exploration, except:
  - On Reservations and other lands where Aboriginal Peoples control the mineral rights
Exploration Path

- Prospecting/Geology
- Geophysics
- Geochemistry
- Drilling
Mineral Explorationists
Incurable Optimists

- Key ingredient in a high risk industry.
- Similar to research (i.e. space program)
- One in 10,000 properties staked becomes a major metal mine
- Requires “promotion” of opportunities to raise investment
Main Players – Prospectors/ Junior Companies

- Make discoveries of many metals and industrial minerals
- Often work alone spending own $ or, “grubstake”
- Hike through the bush, walk new logging roads, follow creek beds, etc.
- Use tools like a rock hammer, GPS locator, gold pan, grub hoe, …..
- Collect rock, soil and stream silt samples looking for evidence of gold, copper, nickel, diamonds and other metals and minerals
- Hope to find a property to sell or “option” (& Net Smelter Return) to a company
1) Igneous rocks:
   a. Plutonic/Granitic;
   b. Volcanic/Basaltic

2) Sedimentary rocks:
   Limestone

3) Metamorphic rocks:
   Gneiss

Photos from Andreas Lichtblau
Oceanic-continental Convergence

**Tectonic Plates:**
Oceanic plate is pushing into and being subducted under the continental plate.
Arial Geophysical Surveys

- Literature search/ Mineral inventory
- Reconnaissance surveys:
  - a. Magnetic (Mag)
  - b. Electromagnetic (EM)
  - c. Radiometric
Ontario Mining “CLAIMaps”

Ontario mining CLAIMaps

http://www.geologyontario.mndmf.gov.on.ca/website/claimapsiii/viewer.asp
Ontario Mining Claims Information
http://www.mci.mndm.gov.on.ca/claims/clm_mdva.cfm

Mining Claims Information Main Menu

The Mining Claims Information at this site is normally updated **Every Night**. This information was last updated on the night of **October 16, 2014**

You may search the Mining Claims Database for a Listing of Cancelled Mining Claims in the last 180 days, Active Mining Claims, Client Reports and Work Report Summaries by Mining Division:

<table>
<thead>
<tr>
<th>Posted Mining Claims:</th>
<th>Cancelled Mining Claims:</th>
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<tbody>
<tr>
<td>Posted claims which can be searched back to a period of 180 days</td>
<td>Cancelled claims which can be searched back to a period of 180 days</td>
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</table>

<table>
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<tr>
<th>Active Mining Claims:</th>
<th>Client Reports:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current active mining claims in Ontario</td>
<td>Listing of Active Claims by mining division and by client/company name</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Reports:</th>
<th>Mining Claim Maps:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of Assessment Work which has been filed by individuals or companies</td>
<td>Claim maps internet application</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dispositions:</th>
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<tbody>
<tr>
<td>Current dispositions in Ontario</td>
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</table>
Ontario Ring of Fire Mining Properties
Line Cutting, Ground Geophysics, Drilling

Photos from Andreas Lichtblau
What Does Drilling Tell Us?
(Assessment work reports approved by Geologist)

Continuous veins

Discontinuous veins

Schematic representation of the importance of a valid geological model in resource estimates. In this example, the interpreted geological model (top) indicates zones of continuous veins, whereas the actual mineralized zones (bottom) are smaller and discontinuous (called en-echelon veins) suggesting they would not be economic (adapted from Stone and Dunn, 1996)
Exploration

- Acts and regulations
  - Jurisdictions (Provincial & Territorial Mining Acts, Federal Mining Acts)
  - Mining Claims, Permits required
Exploration

- Environmental and social impacts
  - Description of impacts and mitigation
    - Ontario Environmental Assessment Act; CEAA & RA; Advanced Exploration Closure Plan
  - Guidelines (e.g. PDAC’s E3Plus)
    - Due diligence; Consultation & accommodation; Baseline environmental studies
  - Opportunities for community participation
Example of Required Information

- Soils, Geology and Terrain
- Climate and Air Quality
- Noise
- Water Resources
- Fisheries and Aquatic Resources
- Wildlife
- Vegetation and Plant Communities
- Archaeology and Heritage Resources
- Socio-Economic
- Traditional Knowledge and Traditional Land Use
- Non-traditional land use
- Visual and Aesthetic Resources
- Human Health
- Environmental Health
- Navigable Waters
- Alternative Means of Carrying out the Project
Exploration

- Employment and other economic opportunities
  - Employment
    - Field assistants, camp staff, line cutters, prospectors, samplers, geologists, security, heavy equipment operators,…
  - Business & Joint Venture
    - Equipment rental, tree planting, construction of camps, catering, drilling, expediting, freight, site reclamation, first aid, security
  - Training
    - MiHR’s Mining Essential Program
Sandy Lake First Nation
Diamond Drillers Helper Program

- 20 days of training at the Outland Firesteel Camp west of Upsala, Confederation College
- In partnership with the Sandy Lake Ontario Works Program
- Funded by the Ministry of Economic Development Trade and Employment
Exploration Community experiences

- **Wabauskang FN Agreement:**
  - Goldcorp Inc. and Wabauskang First Nation signed a Collaboration Agreement (January 30, 2015)
  - Paves the way for long-term economic prosperity. Goldcorp’s sixth First Nation partnership in Canada

- **Lac Seul FN Agreement:**
  - Lac Seul First Nation and Goldcorp Inc. sign a Collaboration Agreement (August 19, 2013)
  - A framework for continued consultation and support for Red Lake Gold Mines and defining the long-term benefits for the First Nation
Dragon’s Den/ Exploration Group Exercise

- Use flip charts
- Choose a scribe to record on the flip charts
- Choose a group reporter

1. Diamond “Grubstaking”, or:
2. Metallic Minerals “Option”:

Use maps and/or rock sample(s) available to present your mining property portfolio to Junior company officials. You seek their participation ($) in furthering your economic development/exploration venture. List all steps (Exploration path) already done, or planned, to identify or evaluate new prospects on your traditional lands.
Module 2: Mine Development

- What is Mine Development and Construction?
- What are the Activities?
- Who Are the Main Players?
What is Mine Development?

- For a mine to be built, the proponent must demonstrate that it will:
  1. Make a profit (Bulk sampling, Ore reserves, Feasibility study);
  2. Meet gov’t requirements;
  3. Protect the environment and mitigate impacts; and
  4. Receive First Nations and community support (Consultation & accommodation)
Currently, Mineral industry is dealing with low metal prices and limited investment in exploration:
- In 2014, Ontario had:
  . 43 operating mines
  . 35 advanced mineral projects
  . 400 projects being explored by ~265 companies

Marc Leroux, MNRM, 2015
A CPC is a “shell company” used by investors to raise a pool of seed capital that will later be used to buy an operating business.

The CPC conducts an Initial Public Offering (“IPO”) to raise the needed “seed money” and after selling sufficient shares is permitted to list on the TSX Venture Exchange (the “TSX-V”). Once the CPC is listed, it has 24 months to identify and acquire a qualifying target business.

3-6 investors who have demonstrated a positive association as a director or officer with at least one public company and are willing to incorporate the CPC and act as founding directors.

Acquisition of assets or a business that could qualify as the target business. $100,000 and $500,000 in total seed capital to put forth at the time of incorporation (minimum of $5,000 contribution by investor).

Acquisition should take place within 24 months of CPC’s listing on the TSX-V.

The CPC issues “seed shares” to the founding investors, which are priced at the greater of $0.05 or 50% of the price at which the IPO shares will be offered (minimum of $0.10).

The CPC prepares a prospectus outlining the intention of management to raise between $200,000 and $1,900,000 through the sale of additional CPC shares to identify and evaluate potential new acquisitions.
Mine Development

- Acts and regulations
  - Jurisdictions (60 Laws, Regs, etc.: Provincial & Federal Mining Acts, Forest Acts)
  - Licences, permits required (180 instruments)
  - Mining lease (10 to 20 years)
Mine Development

- Environmental and Social Impacts
  - Description of impacts and mitigation (Design tailing pond, Wastewater, Closure plan)
  - What is an environmental assessment?
    - (Prov. Env. Impact Assessment; Fed. CEAA, Metal Mining Effluent Regs)
      - Traditional knowledge
  - Monitoring
  - Community participation
Environmental Assessment Process Chart

Diagram One: Environmental Assessment Process Chart

1. Project Description
   - Determine Whether the Project Requires an Environmental Assessment

2. Scope and Process for Review Determined
   - Public Comment Period

3. Application Information Requirements Determined

4. Application Prepared and Submitted

5. Application Evaluated for Completeness
   - Public Comment Period

6. Application Review

7. Assessment Report

8. Project Decision by Ministers
   - Certificate Issued - project authorized to permitting stage
     - Approved
     - Not Approved
     - Certificate Refused or Additional Study Ordered

9. Pre Application Stage (no timelines)

10. Working Group review
11. First Nation Consultation

12. Application Review Stage (180 days)
13. Decision (45 days)
Federal Environmental Acts/Regs

- Canadian Environmental Assessment Act
- Canada Water Act
- Canada Wildlife Act
- Expropriation Act
- Statistics Act
- Canadian Environmental Protection Act
- National Fire Code of Canada 1995
- Fisheries Act
- Nuclear Safety and Control Act
- Transportation of Dangerous Goods Act, 1992
- Transport of Dangerous Goods Regulations
- Ozone-Depleting Substances Regulations
- Comprehensive Study list Regulations
- Exclusion list Regulations
- Inclusion List Regulations
- Migratory Birds Regulations
Provincial Regulations

- Mining Act (Ministry of Northern Development, Mines and Forestry)
- Environmental Protection Act (Ministry of the Environment)
- Ontario Waters Resource Act (Ministry of the Environment)
- Occupational Health & Safety Act (Ministry of Labour)
- Public Lands Act (Ministry of Natural Resources)
- Lakes & Rivers Improvement Act (Ministry of Natural Resources)
- Crown Forest Sustainability Act (Ministry of Natural Resources)
- Technical Standards and Safety Act (Technical Standards and Safety Authority)
- Planning Act (Ministry of Municipal Affairs and Housing / Ministry of Health)
- The Health Protection & Promotion Act (Ministry of Health)
- Environmental Assessment Act (Ministry of the Environment)
- Public Transportation and Highway Improvement Act (Ministry of Transportation)

Hinz, Ministry of Northern Development, Mines and Forestry, 2011 presentation
Mine Development

- Economic opportunities:
  (contract mining, construction services, trucking, catering, site services, recycling/waste disposal, road maintenance, laboratory services, supply of oil/gas, safety equipment...)

- Employment:
  (warehouse technicians, trades, safety, geologists, accountants, heavy equipment operators, housekeeping...)

- Agreements (e.g. IBAs)
Development and Underground Access Construction

Canada’s Natural Resources – Now and for the Future
Mine Development Community Experiences

- **Examples**

- **Obish Construction Limited Partnership:** La Seul First Nation and Moncrief Construction Limited Partnership, Ontario.
  - Construction: Roads, Excavations, Grading, Aggregates, Bridges, Clearing, Brushing, Power and Communication Lines
  - Sand and Gravel Mining and Quarrying

- **The Naicatchewenin Development Corporation (NDC), Rainy Lake (Ontario)**
  - 100% First Nation owned and operated
  - Engineering, consulting, and proposal development services

- **Nuna Group of Companies (51% Inuit-owned),**
  - Services includes drilling, heavy equipment simulator training contracts, winter road construction
  - Several partnerships and joint ventures with Aboriginal groups.
Module 3: Mine Operation

- What is the Mine Operation?
- What Are the Mine Operation Activities?
- Who Are the Main Players?

Mine Open-pit & Underground:
Mine Operation

- Process of producing a mineral product for the benefit of society, stakeholders and shareholders.
- A mine is operating when rock and/or “earth” is being excavated from the ground and in many cases passing to a processing plant to produce a valuable product.
Mines in Northern Ontario 2014

Northern Ontario Gold, PGE and Diamond Mines
Underground Mining

- Access by a elevator-like shaft or one-ended tunnel (decline)

- A decline is a sloping and often spiraling access

- Depth limitations due to mining costs, high temperatures and/or rock bursts
Open Pit Mining

- Near surface resource
- Suitable for processing large tonnages of rock with less contained metals or diamonds that can’t be mined in a more expensive underground mine
- Generate a higher proportion of waste rock to ore than u/g mines

Dome Mine, Timmins, Ontario
Open Pit and Underground Mine Cross Section

FIGURE 1.1 The underground mine—basic infrastructure
Victor Mine, De Beers, Ont.

Over 95 per cent of the diamonds found at Victor are classified as either gem or near gem.
Welder and Underground Miners, Williams Mine, Ont.
Mine Operation

- Acts and regulations:
  - Conditions of lease
  - Typically 21 years, can be renewed
  - Requires a Mine closure and reclamation plan
  - Security deposit
  - Yearly lease fee ($3 per hectare)
  - Conditions of licences and permits
  - Other instruments
  - Up to 180 instruments; 60 laws & regulations; 20 agencies involved
Mine Operation

- Environmental and social impacts
  - Description and mitigation:
    . Env. Planning (Notice of operations; Wastewater management; Post bonds for closure)
    . Traditional knowledge to mitigate potential impacts
  - Monitoring of tailing ponds and waste piles
Mine Operation

Mining Practices in Canada

- Environmental practices
  - Companies must meet all environmental standards and laws
  - The mining industry has adopted guidelines and protocols for responsible development

- Aboriginal engagement
  - Consultation, project review provide opportunities to Aboriginal peoples to express concerns, give input
  - Traditional knowledge can help with informed decisions on environmental protection
  - Early dialogue is the best way to achieve a successful partnership
Mine Operation

- Employment and other economic opportunities
  - Employment: Miners, pipe fitters, administrators, accountants, mechanics, welders, nurses, computer technicians, carpenters, cooks, security officers...
  - Training (MiHR)
  - Business opportunities and diversification
Mine Operation
Community Experiences

- **Lac des Mille Lacs First Nation**, Ont.
  - Project coordinator to advance partnerships with mining companies (**Lac des Iles Palladium mine**).
  - **Minfocus Exploration Corp.** has signed a “MOU” with LMLFN regarding exploration on their traditional territories.

- **Troilus Mine**, Qu.
  1. Located 120 km north of Chibougamau, Qu.
  2. Open-pit gold and copper mine, operated from 1997 to 2010,
  3. In 1994, Inmet and the Cree of Mistissini signed an IBA:
     a) 15% Cree employment (2007),
     b) $1M Fund for training programs and small business start-up;
  4) Economic benefits through procurement:
     a) $3.5 M operating contracts to local services, partnerships,
     b) Some Cree employees started their own trucking and logging businesses.
Module 4: Mine Closure and Rehabilitation

- What is Mine Closure?
- What Are the Mine Closure Activities?
- Who Are the Main Players?
Mine Closure

Mine closure is the period of time when the ore-extracting activities of a mine have ceased, and final decommissioning and mine reclamation are being completed.

- Reduced employment levels, which can have a significant negative impact on local economies.
- Some mines can last for more than 50 years, others may only last for a few years
- Close due to different reasons, most commonly because
  - Running out of ore
  - Declining commodity prices
Closure Planning – Ont.

In planning for closure, there are four key objectives that must be considered:

- 1. Protect public health and safety;
- 2. Alleviate or eliminate environmental damage;
- 3. Achieve a productive use of the land, or a return to its original condition or an acceptable alternative; and,
- 4. To the extent achievable, provide for sustainability of social and economic benefits resulting from mine development and operations.
North Coldstream Mine
Site Revegetation

North Coldstream Mine Site
- Removal of Surface Infrastructure
- Site Revegetation

Before

After

Chris Hamblin, MNDM
Mine Closure and Rehabilitation

- Acts and regulations
  - Who governs mine closure?
  - Mining related acts and regulations
  - Conditions of licenses and permits

All mines sites must be reclaimed according to applicable governmental regulations
Closure Plan Overview (Ontario)

- Closure Plan developed before a new mine is approved
- The proponent must conduct public notice and consult with “affected Aboriginal people”
- Public document is reviewed by relevant provincial and federal government ministries and agencies and affected Aboriginal people and municipalities
- Review begins when suitable financial assurance is deposited with Ontario by the proponent
- Comments by all reviewers are compiled by MNRM staff during a legislated 45 day review period
- May require revisions to address reviewers’ concerns
- If acceptable, the closure plan comes into effect on acknowledgment by Director of Mine Rehabilitation
Mine Closure and Rehabilitation

- Environmental and social impacts
  - Description and mitigation
  - Monitoring
  - Orphaned/Abandoned mines
Mine Rehabilitation Code (Ont.)

- The 9 parts of the Mine Rehabilitation Code are:
  1. Protection of openings to surface
  2. Open pits
  3. Stability of crown pillar, room and pillar operations
  4. Tailings dams and other containment structures
  5. Surface water monitoring
  6. Ground water monitoring
  7. Metal leaching and acid-rock drainage requirements
  8. Physical stability monitoring
  9. Revegetation
Shaft Capped

MacMillan Mine Site, Willisville: Shaft Capping

Before

AMIS #05329

After

Chris Hamblin, MNNDM
Porcupine Gold Mines (PGM) received its final environmental approval from the province (Dec 2014), paving the way for work to start on its Hollinger open pit:

. The environmental compliance approval (ECA) focused on noise, vibration and dust

. Adjacent to Timmins’ downtown core, the repurposing of an underground mine (~1930 to 1968).

. PGM has spent $8 million to fill subsidence areas and other hazards

. Eliminate the remaining hazards by creating one large open pit

. Recover the remaining gold over 8 yrs
Proposed Reclamation Hollinger Open Pit, Ont.

- Conceptual drawing of how the Hollinger Pit project may eventually look once the pit is mined out and the land is rehabilitated. Photo Credit: Goldcorp.
Abandoned Mines in Ontario

- “Sites where advanced exploration, mining or mine production has ceased without rehabilitation having been completed”

- Can have public health and safety, environmental and aesthetic concerns
- More than 6,000 abandoned mine sites
- Have a public provincial inventory (database and google files)
- Potential impacts vary dramatically with type of mine and often are related to the size
- Some sites will have no concerns
Mine Closure and Rehabilitation

- Community employment and economic opportunities:
  - Jobs: Trades personnel, equipment operators and mechanics, security & First aid...
  - Business opportunities: Site reclamation, tree planting, drainage systems, water sampling and analysis, security services...

*Through training and experience, the skills acquired in the mining industry can be transferable to other economic activities, often within the same community*
Casino Lac Leamy, Qu.  
(Old Quarry Site)
Butchart Garden, B.C.  
(Old Quarry Site)
Troilus Mine, Qu.

- Developed its final closure plan with the Cree community and provincial regulators
  - Troilus Agreement Implementation Committee
- Helped transition workers to new employment
- Consideration given to future hunting needs
- Successfully closed Troilus site in 2010 meeting all environmental and safety requirements.
- Inmet involved Environment Canada to help establish biodiversity as part of the revegetation program.
- Closure team responsible for reclamation, maintenance, inspection and monitoring the property on an ongoing basis.