NOAMI : A Workshop to Explore Perspectives on Risk Assessment

November 13-14, 2008
Managing Risk at the Former Kerr Addison Mine in McGarry Township North-Eastern Ontario
Location
Virginiatown

- The Kerr Mine is located on Highway 66 in Virginiatown within the Township of McGarry
- Hwy 66 is part of Trans-Canada Connecting Highway 11 with Highway 117 in Quebec
North Virginiatown
Background (continued)

- Mine was developed in the 1930’s
- Closed in 1995 due to bankruptcy
- Produced over 41 million tons of ore containing > 11 million ounces of gold
- One of the biggest gold producers in Ontario
- Closure plan was developed but never accepted and no Financial Assurance was ever secured
Background (continued)

• In or around 1996 the Township of McGarry seized surface facilities for back taxes
• Subsequently sold off surface buildings for scrap – including mill and mine head-frame
• Redevelopment of site now less likely
Background (continued)

Township was advised by MNDM not to auction off the site for scrap.

Removal of surface infrastructure made property less desirable for prospective buyers.
Moving forward 10 years

Township of McGarry contacted MNDM in October of 2005

Concerns over excessive number of water main breaks in North Virginiatown

Also concerns over Arena and Highway

Ministry Staff inspect site (Oct 2005)
Background (continued)

Kerb Lifting Along Hwy and Burst Water Mains
Cracks along the Arena floor were evident.
Next Steps

• Needed more data
• Some Plans obtained from RGP office in KL
• Site flown & aerial photos taken Nov-2005
• Photo-mosaic compiled and overlaid on plans of mine workings
• Concluded that no mine workings present beneath North Virginiatown
• January 2006 McGarry Township advised of preliminary findings.
Composite Site Plan
Discussions with Township

- Reports of recent rock bursts from residents
- Citizens concerned whether mine activity will impact the highway
- Fencing around mine site in poor condition
- Litigation by mineral right holder
- Concerns over their tax base
- What was the Ministry going to do
Discussions with Surface Rights & Mineral Rights Holders

• Surface Rights Acquired from the Township for $1 by former mine employee
• Subsequently acquired by small numbered company
• Past Conflicts between surface and mineral rights holders regarding the removal of Green Carbonate rock
• Do not appear to fully understand the hazards posed by the surface or near surface workings
• Have limited financial means to rehabilitate the site in accordance with the Mine Rehabilitation Code of Ontario.
Discussions with Surface Rights & Mineral Rights Holders (continued)

Quarrying activity on the site in 2003
Significant Hazards Within the Mine Site

Subsidence can occur without any warning

Crown Pillar and Wall Rock Failures
Significant Hazards Within the Mine Site (Continued)

Sudden drop-offs and high steep walls pose dangerous fall hazards
Further Data Review

• Potential of Impacting Highway seen as a distinct possibility
• History of rockbursts (seismicity) at the site
• Recent crown pillar failures within the mine property
• Highway constructed along the main Lader Lake Break (geological fault).
MTO Involvement

- Due to the proximity of the highway and ongoing activity within the mine MTO was notified in May of 2006.
- Subsequently MTO increased highway patrols in the area and set up survey controls.
Ongoing Data Acquisition

• In the fall of 2006 MNDM finally gained access to the Mineral rights holder’s storage where the old Kerr mine plans and records were kept
• Plans were recovered from a flooded basement and relocated to an upper floor to dry out
• Many were damaged or destroyed by mould
• Some plans recovered and scanned for further study
Salvaging Mine Plans
Geotechnical Analysis

- February 2007 MNDM commissions a study for a preliminary geotechnical stability analysis of the Kerr Mine
- To address concerns of Township, MTO and MNDM regarding potential effects of Mine Stability impacting Highway 66
Consultant’s Site Visit

Surface Cracks (SW side of building) in asphalt appear to be coincident with ground subsidence.
Preliminary Findings of Geotechnical Analysis

Figure 11: Aerial view of the Kerr Glory Hole (West end of property) and an inset showing the resulting 3D reconstruction undercutting the highway.
Figure 23. Plan view of site showing location of key or critical areas.
Preliminary Findings of Geotechnical Analysis

Figure 31: Evidence of ongoing progressive wall failure in the West Glory Hole.
Preliminary Findings of Geotechnical Analysis

Figure 32: Aerial photos showing progressive degradation of the Kerr Glory Hole and surface crown pillars.
History of Seismicity

Seismic events can affect the stability of the Mine
# History of Seismicity

**Table 1: List of recorded mining events at the Kerr-Addison mine (Earthquakes Canada, 2007).**

<table>
<thead>
<tr>
<th>Date</th>
<th>Universal Time</th>
<th>Lat</th>
<th>Long</th>
<th>Depth (km)</th>
<th>Mag</th>
<th>Region and Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 7, 2007</td>
<td>22:59:44</td>
<td>48.16</td>
<td>-79.56</td>
<td>1.0</td>
<td>2.3MN</td>
<td>Mining event</td>
</tr>
<tr>
<td>August 5, 1998</td>
<td>13:25:28</td>
<td>48.14</td>
<td>-79.58</td>
<td>1.0</td>
<td>2.7MN</td>
<td>DOUBLE ROCKBURST, KIRKLAND LAKE, ON. FELT IN VIRGINIATOWN AND MINE SITE FEEL PROBABLY ROCKBURST KIRKLAND LAKE.</td>
</tr>
<tr>
<td>September 30, 1997</td>
<td>13:12:20</td>
<td>48.14</td>
<td>-79.57</td>
<td>1.0</td>
<td>3.5MN</td>
<td>MIS EVENT, KERR ADDISON MINE</td>
</tr>
<tr>
<td>January 19, 1994</td>
<td>14:12:00</td>
<td>48.14</td>
<td>-79.58</td>
<td>0.0</td>
<td>1.9MN</td>
<td>MIS EVENT, KERR ADDISON MINE</td>
</tr>
<tr>
<td>January 19, 1994</td>
<td>14:10:12</td>
<td>48.14</td>
<td>-79.58</td>
<td>0.0</td>
<td>2.2MN</td>
<td>MIS EVENT, KERR ADDISON MINE</td>
</tr>
<tr>
<td>May 6, 1988</td>
<td>2:10:07</td>
<td>48.14</td>
<td>-79.58</td>
<td>1.0</td>
<td>1.5MN</td>
<td>MIS EVENT, KERR ADDISON MINE</td>
</tr>
<tr>
<td>April 23, 1988</td>
<td>4:54:05</td>
<td>48.14</td>
<td>-79.58</td>
<td>1.0</td>
<td>2.3MN</td>
<td>MIS EVENT, KERR ADDISON MINE</td>
</tr>
<tr>
<td>April 23, 1988</td>
<td>3:51:32</td>
<td>48.14</td>
<td>-79.58</td>
<td>1.0</td>
<td>2.3MN</td>
<td>MIS EVENT, KERR ADDISON MINE</td>
</tr>
<tr>
<td>April 14, 1986</td>
<td>5:52:18</td>
<td>48.14</td>
<td>-79.58</td>
<td>1.0</td>
<td>3.3MN</td>
<td>ROCKBURST AT KERR-ADDISON. FELT AT SITE</td>
</tr>
</tbody>
</table>

**Table 2: List of recorded blasts within a 20 km radius of the Kerr-Addison mine (Earthquakes Canada, 2007).**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time(UT)</th>
<th>Lat</th>
<th>Long</th>
<th>Depth (km)</th>
<th>Mag</th>
<th>Region and Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 26, 2007</td>
<td>06:08:23</td>
<td>48.13</td>
<td>-79.61</td>
<td>1.0</td>
<td>1.3MN</td>
<td>Probable blast</td>
</tr>
<tr>
<td>July 26, 2006</td>
<td>09:37:25</td>
<td>48.17</td>
<td>-79.52</td>
<td>1.0</td>
<td>1.4MN</td>
<td>Blast</td>
</tr>
<tr>
<td>February 24, 2004</td>
<td>05:31:13</td>
<td>48.22</td>
<td>-79.29</td>
<td>0.0</td>
<td>2.4MN</td>
<td>Blast</td>
</tr>
<tr>
<td>February 16, 2004</td>
<td>01:17:26</td>
<td>48.17</td>
<td>-79.35</td>
<td>0.0</td>
<td>1.5MN</td>
<td>Blast</td>
</tr>
<tr>
<td>August 3, 2001</td>
<td>21:40:22</td>
<td>48.27</td>
<td>-79.36</td>
<td>0.0</td>
<td>2.3MN</td>
<td>Probable blast</td>
</tr>
<tr>
<td>November 28, 1996</td>
<td>22:52:19</td>
<td>48.29</td>
<td>-79.50</td>
<td>1.0</td>
<td>2.1MN</td>
<td>MINING RELATED ACTIVITY</td>
</tr>
<tr>
<td>May 10, 1993</td>
<td>22:43:57</td>
<td>48.27</td>
<td>-79.65</td>
<td>1.0</td>
<td>2.1MN</td>
<td>MINE BLAST</td>
</tr>
</tbody>
</table>

**Table 3: List of recorded earthquakes within a 20 km radius of the Kerr-Addison mine (Earthquakes Canada, 2007).**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time(UT)</th>
<th>Lat</th>
<th>Long</th>
<th>Depth (km)</th>
<th>Mag</th>
<th>Region and Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 23, 2004</td>
<td>18:32:58</td>
<td>48.25</td>
<td>-79.61</td>
<td>18.0</td>
<td>2.1MN</td>
<td>30 km E from Kirkland Lake</td>
</tr>
<tr>
<td>November 23, 2004</td>
<td>17:04:08</td>
<td>48.14</td>
<td>-79.68</td>
<td>14.0</td>
<td>2.7MN</td>
<td>26 km E from Kirkland Lake</td>
</tr>
</tbody>
</table>
Recommendations

• Copies of report given to MTO and the Township of McGarry

• Main recommendations in the report were:

  ➢ No sudden failure of the highway expected
  ➢ Progressive failure of the “glory hole” walls was evident and expected to continue
  ➢ Real time monitoring in the short term
  ➢ Relocation of the Highway in the long term
Reassuring the Township

- MPAC called MNDM November 2007 re-assessing properties in North Virginiatown
- Structural damage to homes
- Mine subsidence not the issue
- Vibration from seismic events may have caused some settling in the soils
- Residents seeking remedy to their problems
Mitigating the Risk - 1

- MNDM works within the framework of the Mining Act.
- In Ontario the Mineral Rights Holder is responsible for the rehabilitation of Mine Hazards as per:

  - Section 139.1(1) Mining Act, R.S.O., 1990, Chapter M.14.
    - A proponent shall take all reasonable steps to progressively rehabilitate a site whether or not a closure has commenced or a closure plan has been filed.

  - And Section 153.3(1) Mining Act, R.S.O., 1990, Chapter M.14.
    - A lessee or patentee of mining right is, unless a contrary intention is shown, liable in respect of the rehabilitation under this Part of all mine hazards on, in or under the lands, regardless of when and by whom the mine hazards were created.
Mitigating the Risk - 2

- MNDM advised Mineral Rights Holder of his obligations under the Mining Act and requested a schedule for the rehabilitation of the hazards on the site.
- MNDM will consider issuance of a Director’s Order if the owner does not take effective action.
- Orders can be appealed and invariably are.
- Even if an appeal is overturned and the owner is charged the rehabilitation may still not be completed.
- As a last resort the Ministry can step in and rehabilitate the site and place a lien on the property for the cost of the rehabilitation.
Perception of Risk in the 1950’s

Good job we’re on solid ground

You Bet! No need for a risk assessment here