Implementing GIS Practices in Evaluating Human Well-Being Surrounding Gold Mines
CURRENT USE OF GIS IN MINING

- Through GIS it is possible to monitor:
  - Water and air quality
  - Terrestrial and aquatic environments
  - Archeological sites

- MMER – Metal Mining Effluent Regulations
  - Government document outlining environmental regulations to be followed by mining companies
GIS AND WATER QUALITY

- River/Stream water gauging stations monitor:
  - Runoff/Seasonal high and low flows
  - Chemical composition
    - Total/dissolved metals, cyanide, sulphate, etc.
  - pH

Streamflow Stations in the Lynn Lake Area

- Satellite imagery aids in pinpointing streamflow station locations
- Gauging stations are situated adjacent to Hughes and Keewatin rivers
Surface water flows are determined and mapped to ensure proper placement of sample sites.

Sediment baseline studies are also conducted, detecting such things as:
- Ammonia
- Phosphate
- Metal composition
Air surrounding mine sites tested for particulate matter, sulfur dioxide, nitrogen oxide, etc.

Particulate matter contains both organic and inorganic compounds, including:
- Smoke
- Soot
- Dust
- Pollen

AQUATIC/MAMMAL MONITORING

- Mammal cameras amongst other applications are used to monitor animal habitats
- Aquatic animals undergo tissue studies to identify contaminants present in waterways

LYNN LAKE MAMMAL CAMERA

- Brown Bear, May 31 2015 (Top Right)
- Moose, June 20 2015 (Bottom Right)
- Wolverine, April 23 2015 (Above)
Equipment and buildings removed

Building foundations are excavated, crushed and deposited into waste dumps

Harmful waste rock deposits are relocated to waste pit
  • Area from which waste rock is removed is reseeded

Oil and other toxic chemical waste are removed from site

Roads leading into site are revegetated
Tailings Ponds: Deconstructed

- Basin-like structures that are designed to contain mine waste
- Tailings ponds are covered in water to prevent chemical exposure to the air/environment
- Ponds can also be lined to prevent toxins leaching into groundwater, etc.

Tailings Ponds: Examples

‘Tailings are the most significant long term liability created by mining projects’
– Ontario Nature (Mining in Ontario)

- Tailings Pond in Utah (Left)
- Detour Gold Tailings Pond (Below)


Tailings are the most significant long term liability created by mining projects – Ontario Nature (Mining in Ontario)
More than 80 years of silver mining has lead to arsenic contamination in water ways

Arsenic concentrations in the area range from 0.004ppm to 17.8ppm

Canadian Water Quality Guidelines specify concentration of 0.005 ppm to ensure aquatic life remains protected.
Located in Northern Manitoba, Canada

Town was originally founded due to copper mining

Mineral exploration continues in the area

Lynn Lake is home to 674 individuals and 295 private dwellings

Lynn Lake lacks clean, drinkable tap water

Metallic particles are present in drinking water samples

Causes include poor filtration and tailings contamination
In 2014 value of Canadian mineral production was $44.7 billion.

Royalties and taxes from 2003-2012 equalled $71 billion.

Mineral producers and governments have the potential to reinvest earnings into monitoring human health and well-being.
THANK YOU

Any questions?