



# Giant Mine Remediation Project



Canada

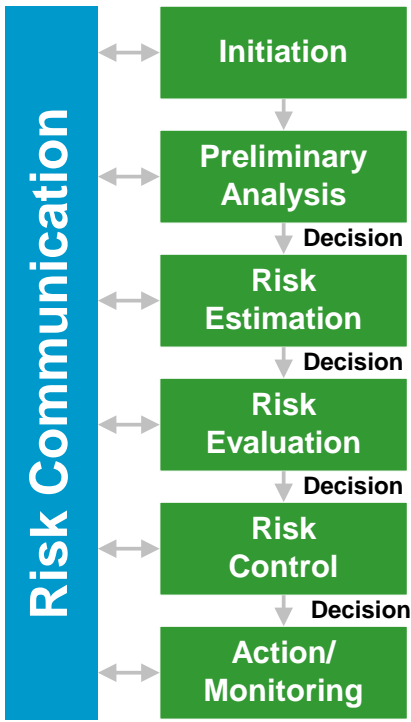


# Failure Modes Risk Assessment

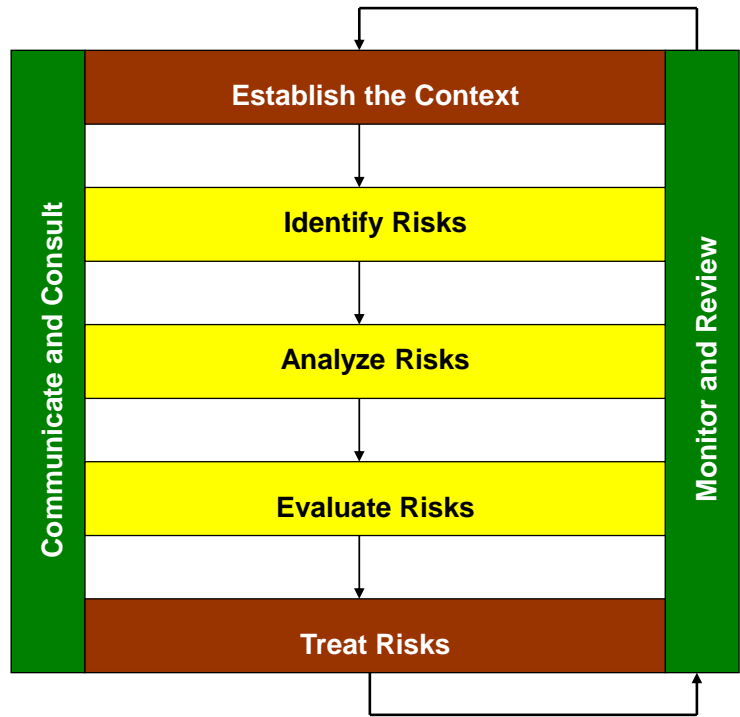
AECOM Doc No. 321-IR-22-PP-0007-Rev2\_20110930

GAL Doc No. 118

**Giant Mine Remediation Project**  
 Risk Management Process

(CAN/CSA-Q850-97)

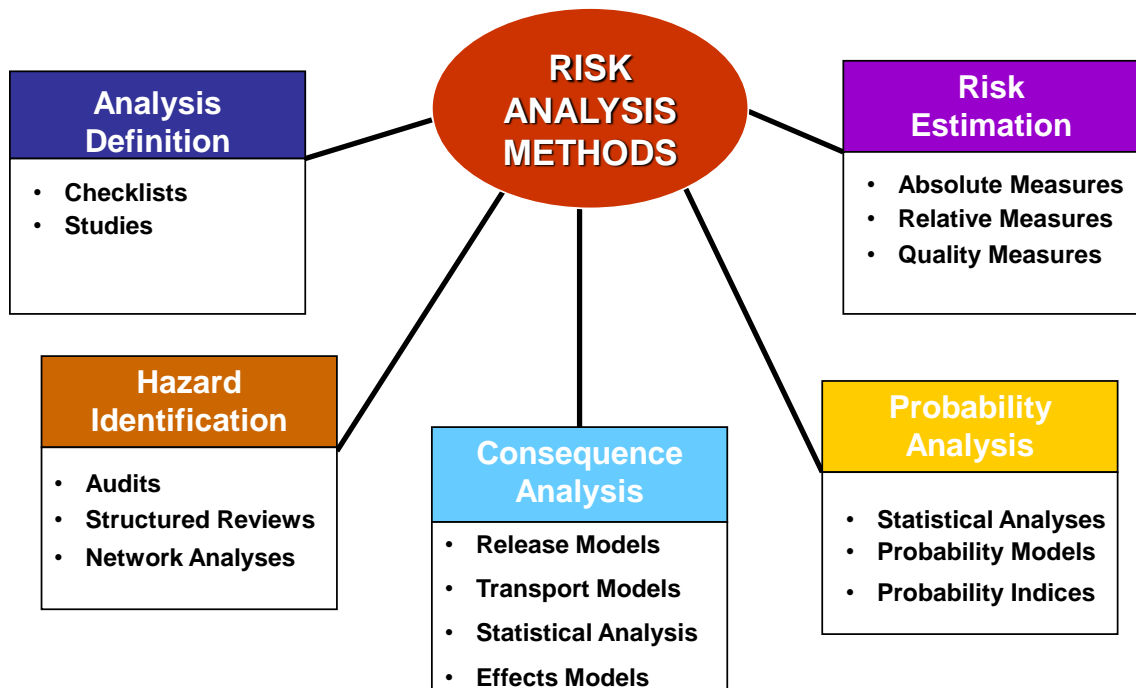


(ISO 31000:2009 / Guide 73:2009)

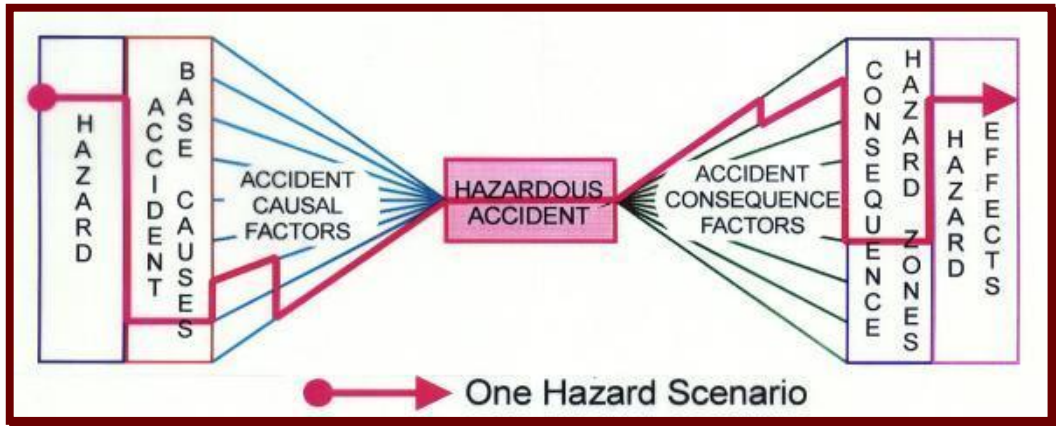


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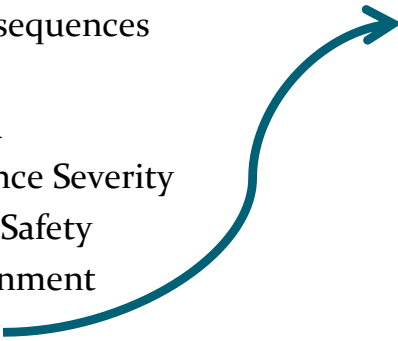
## Overview of Risk Analysis Methods



# Giant Mine Remediation Project Hazard Scenario





- Component
  - Subcomponent
  - Risk Issue / Failure
  - Event / Causes
  - Potential Consequences
  - Risk Estimate
    - Likelihood
    - Consequence Severity
      - Public Safety
      - Environment
      - Cost
- 
- Planned Mitigation / Controls / Management Measures
  - Risk Estimate Re-evaluation
    - Likelihood
    - Consequence Severity
      - Public Safety
      - Environment
      - Cost

# Giant Mine Remediation Project

## Risk Matrix – Human Health & Safety



CATEGORY	CONSEQUENCE SEVERITY				
	A) Low	B) Minor	C) Moderate	D) Major	E) Critical
I) Public Safety	Low-level short-term subjective symptoms/ No measurable physical effect/ No medical treatment	Objective but reversible disability/impairment and/or medical treatment injuries requiring hospitalization	Moderate irreversible disability or impairment to one or more people	Single fatality and /or severe irreversible disability or impairment to one or more people	Multiple fatalities
II) Environment	No impact	Minor localized or short-term impacts	Impact on valued ecosystem component	Impact on valued ecosystem component and medium-term impairment of ecosystem function	Serious longterm impairment of ecosystem function
III) Cost	< \$100,000	\$100,000 - \$1 Million	\$ 1.0 - \$ 10 Million	\$ 10 - \$ 50 Million	\$ >50 Million

LIKELIHOOD						
Index	Event/Years					
1)	More than once every 5 years					
2)	Once every 15 years					
3)	Once every 30 years					
4)	Once every 100 years					
5)	Once every 1000 years					



Risk Rating Low Moderate Moderately High High Very High



- Purpose
  - Develop sequences of events over the long term that may lead to component failures and consequential losses.
  
- Workshop 1:
  - March 22 to 24, 2011
- Workshop 2:
  - April 4 to 6, 2011
- Workshop 3:
  - May 30 and 31, 2011
  
- Workshop Participants:
  - GoC, Technical Advisor, and Engineering Team



- Short Term or Closure
  - Closure or short term risks, as defined for the purpose of this risk assessment, are risks which occur during the implementation of the Giant Mine Remediation project.
  
- Long Term or Post Closure
  - The risk of events which could occur after closure is achieved is defined as long term for the purpose of this assessment.





- Care and Maintenance
  - The scope of this risk assessment does not include the care and maintenance period and the risks which could occur before the start of the short term risk timeline.
  
- Permits
  - All required permits or other approvals are assumed to have been attained prior to the start of project implementation.
  
- Worker Health and Safety
  - Worker health and safety is not included in this assessment as is covered by HASP, NWT Mine Health and Safety Act and Training.



- Underground System
  - Bulkheads
  - Plugs
  - Crown Pillar
  - Sill Pillar
- Freeze System
  - Drill Holes
  - Active Freeze System
  - Frozen Shell
  - Frozen Block
  - Passive Cooling Infrastructure
- Baker Creek System
  - Baker Creek Channel Integrity
  - Creek Bed
  - Bank
- Institutional System
  - Governance
  - Regulatory

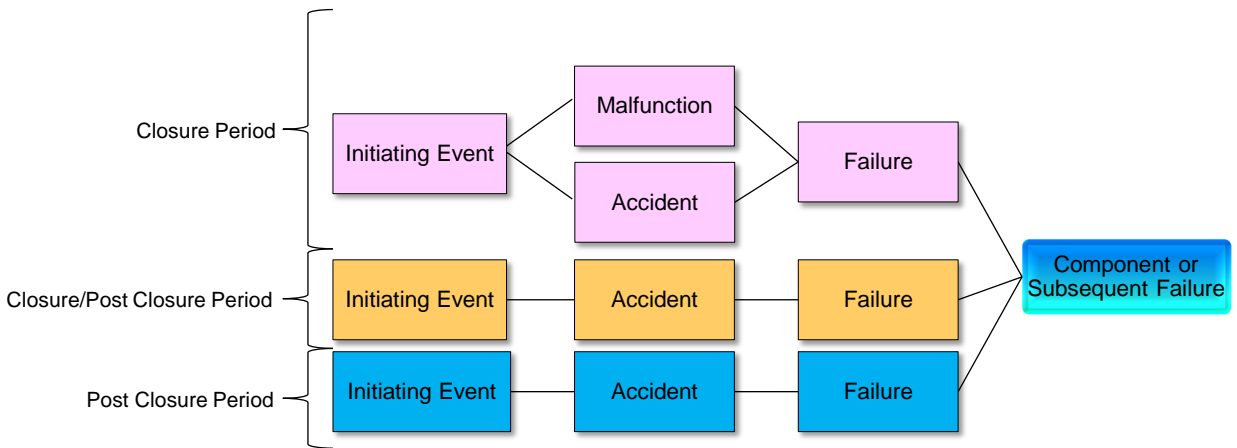


- Surface System
  - Dams
  - Ditches
  - Tailings Covers (including spillway)
  - Public Safety
- Water Management System
  - Existing Plant
  - Settling / Polishing
  - Underground Storage
  - Pumps
  - New WTP
  - Diffuser
  - Receiving Environment
- Infrastructure System
  - Buildings (e.g. Roaster, Mill)
  - Underground Equipment
  - Fuel Storage
  - Mine WTP

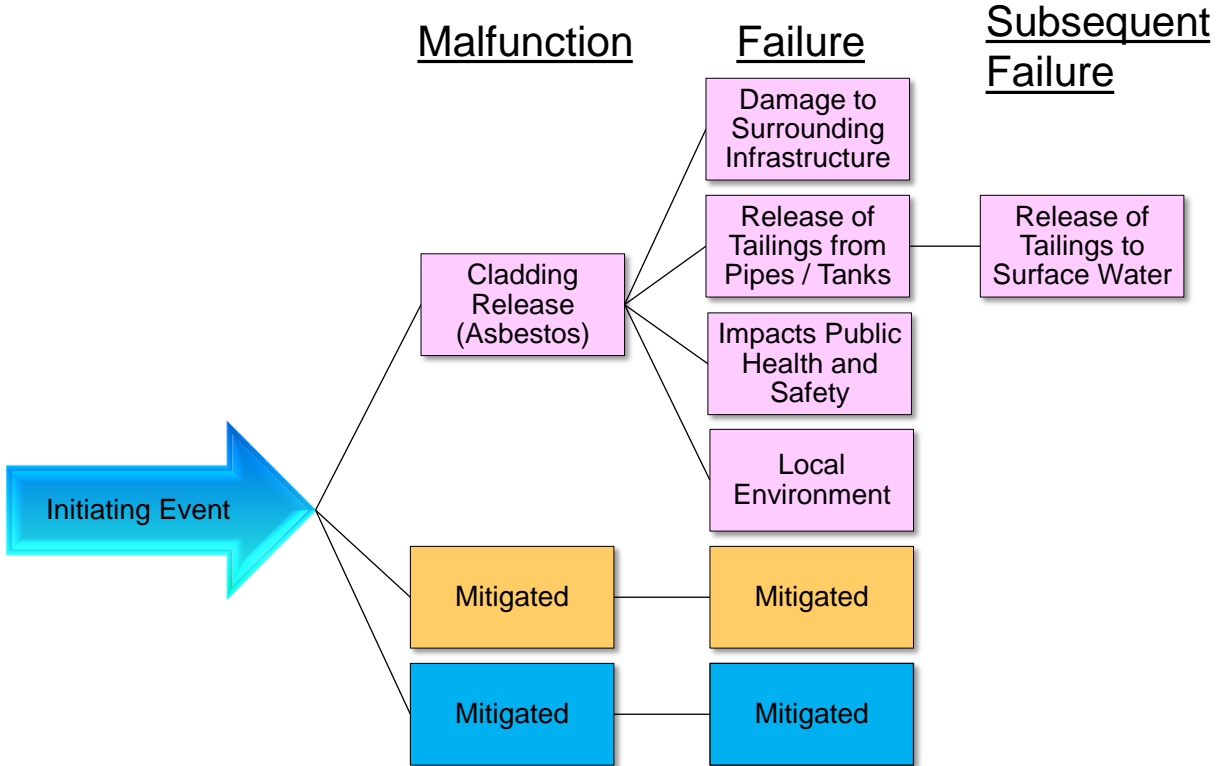


# Giant Mine Remediation Project

## Failure Tree – Risk Identification

**Giant Mine Remediation Project**  
**Failure Tree – Mill Building**





### Potential Consequences

- Strong wind results in building debris blown towards highway with the potential to injury.



### Potential Consequences

- Water would spill into the underground and flood underground workings.



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This assessment was to identify risks which impact the overall objective of the Giant Mine Remediation Project. The assessment considered:

- 102 risk / failure scenarios
- 6 cascading scenarios
- 5 multiple scenarios
  
- Summary of key higher risk scenarios was developed and the results are now part of on-going design and will be used to manage site risks in closure effort



This assessment was to identify risks which may impact the overall success of the Giant Mine Remediation Project,. These include:

- Assess project components / elements and identify the impacts to project success that could represent a risk to public safety and the environment
- Allows the operator and the owner to note high risk events to set priorities for mitigation and current maintenance
- Assist with planning and sequencing of the closure in efficient manner
- Assist in minimizing risk to public health and safety associated with buildings, opening pits, and other physical hazards at the site
- The short term high risk items have been noted and as outlined, efforts have been made to start to address some of these items