Catastrophic Dam Failures Path Forward

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Why This Paper

- Continuing interest in corporate governance
- Could not answer the question why some companies could not get their act together
- What did I want? – Stop talking, Put on paper
- Why public record – to encourage, empower, motivate and/or force further thought and action and most importantly to reduce complacency
Expand perspective – View as a responsibility framework

How mining companies should be organized to fulfill their responsibilities?

What more do companies need from you?
Path Forward – Geotechnical

- How can we use the ideas, energy, etc at this conference to expand bodies of knowledge and management practices to drive future progress:
Presentation Outline

- Strategic Intent (4.0 & S8–10)
- Acceptable risk – (9.1 & S13&47)
- Approval process (5.2.8 & 6.1)
- Meaningful engagement (5.2.7 & S17)
- Demonstrated Commitment (9.2 & S19, 29 & 34)
- Corporate governance (5.1 & S24)
- Independent tailings advisory board (5.2.4)
- Performance audits (8.5)
- Annual integrity report (S42–46)
- Summary & Path Forward (10.0 & S54)
Path Forward

Nothing to do with catastrophic failures
More about getting things right
- Move beyond the easy answers – what we already know
- Identify the gaps and hidden flaws that will contribute to the chance of future failures
- Have to look beyond the obvious and look at the overall framework
- Breaking the “catastrophic failure investigation” cycle
Path Forward

Everything to do with;
- Demonstrated corporate commitment (9.2)
- Effective government oversight (6.0)
- Geotechnical excellence
  - Proven technology – improvement
  - New technologies – development
  - Application of technology
  - Professional services
How To Get There?

- Strategic Intent: If you do not know where you are going, you will never get there.
  - Robust & resilient
  - Getting to zero
  - Leading Practices

- All part of moving forward

- Do not have to wait for the next failure to figure it out what to do next

- Start now
What Path Not To Take – Average

- **Prevailing** level of care, skill and diligence
  - By others
  - Similar services
- Care, diligence and skill
  - Reasonably prudent person
  - Comparable circumstances
- Bare minimum
What Path Not To Take

- Good & Best Practices
- Emerging practices
- Contemporary practices
- Generally accepted practices
- Appropriate norms
- Backward looking leading practices
Responsibility Framework

TECHNICAL GUIDANCE

COMPANY

GOV'T

GEOTECH

Dam Safety?

COMMUNITY
9.1 Dam Safety
Current Rationalizations

- The technology exists to build safe dams
- BAT (best we can design)
- Dam safety studies
- Safe & sound
- Our dams are being effectively managed
- Doing all (I) (We) (They) can
- Designs are to standards generally accepted in the industry
9.1 Safety vs Acceptable Risk

- Dam safety is only an objective
- Can a dam be judged to be “reasonably safe”?
- Can a dam be “acceptably safe”?
- Can risks be managed within acceptable levels?

What is an acceptable or reasonable?
- Acceptable failure consequences
- Acceptable likelihood of failure
  - Write it down/talk to staff/present to Directors
  - Homework: Write how you would judge what constitutes acceptable risk
Acceptable Risk

TECHNICAL GUIDANCE

COMPANY

GEOTECH

GOV’T

ACCEPTABLE RISK

COMMUNITY
How to get to acceptable risk

- Transparent process
- Meaningful engagement
- Demonstrated commitment – earn trust
- Informed opinions
- Final decision Government – not company
Public Engagement

- When the public...are fully informed and *participate in decision-making* related to the public interest. (WMI 1993)

- Meaningful Engagement provides the public with the opportunity to *participate in and influence decisions* that may affect them. (MAC 2015)

- A ‘social licence to operate’ can only be earned ...by incorporating *meaningful consultation* with...host communities. (AUS 2016)
5.2.7 Meaningful Engagement

Spectrum

- Inform – provide information
- Consult – obtain feedback/discuss
- Accommodate – act on what we hear
- Collaborate – participate & influence
- Empower – public decides
Informed Opinions

- Meaningful Communications that provide:
  - Consequence study results;
  - Justification for the proposed deposition method;
  - Demonstration of corporate commitment;
  - Demonstration of government oversight;
9.2 Demonstrated Commitment

Required by

- Company directors
- Employees
- Regulatory authorities
- Public stakeholders
- Geotechnical professionals
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<tr>
<th>Stage</th>
<th>Management System</th>
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<tr>
<td>Clean &amp; Green</td>
<td>Proactive Best practices</td>
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5.2 Corporate Framework 2017

Board Governance
Corporate Policy
Governance Framework
Management System
Operating Manual
Documented Procedures
Verification
Demonstrated Commitment
5.1 Corporate Commitment

Board Governance
Corporate Policy

Plans & Procedures
Verification

Implementation

Demonstrated Commitment
5.1 Board Governance

- Board leadership – Absolute necessity
- Materiality – A legal requirement
- Tailings policy approval
- Board committees
  - Sustainable Development
  - Audit & Risk
Board Sustainability Committee

5.1.2

Review and assess:

- Risk management strategies for new projects
- Implementation of policies
- Performance
- Assurance reports
- Application of adequate resources
Tailings Governance Policy

5.1.3

Must include commitments related to;

- Meaningful engagement
- Meaningful communication of risks
- Risk acceptability
- Risk management
- Verification requirements
- Meaningful communication of performance
Tailings Governance Framework

5.2

- CEO – Executive office
  - Risk management function ISO 31000
  - Technical & operational support
  - Assurance activities

- Management system

- Operating manual

- Assurance activities

- Communications and engagement
Demonstrated Commitment
Executive Office – Project Approval Stage

- What are the consequences and public issues?
- What are the greatest hazards?
- How will we protect ourselves and the public from these hazards?
- What does our Independent Advisory Board have to say?
- What else could we do and what does it cost?
- Why should this risk be acceptable to me and the Board of Directors?
Demonstrated Commitment
Executive Office – Operating Stage

- Has the risk profile changed?
- Are we meeting all commitments and internal and regulatory requirements?
- What did the current assurance activities tell us?
- What are the current public issues?
- What possible risk improvements are we looking at?
Corporate Commitment

Board Governance
Corporate Policy

Plans & Procedures
Verification

Implementation

Demonstrated Commitment
9.2 Demonstrating Commitment

Plans & Procedures

- Identify the critical issues
- Develop the right procedures
- Write them down
- Make sure they are followed all the time

- Provides a solid base to demonstrate quality of risk protection programs & verify through detailed audits
Critical Control Management
ICMM Good Practice Guide; Implementation Guide

- These documents provide a disciplined approach for:
  - Identifying the critical controls
  - Assessing their adequacy
  - Assigning accountability
  - Site specific implementation
  - Verifying their application and effectiveness in practice.
8.5 Demonstrated Commitment

An example – Cyanide Code

- Cyanide a major hazard
  - Employees, communities, wildlife
- Industry lack of trust
- Fear of losing social license to transport and use
- Major disaster – Baia Mare – 2000
8.5 Cyanide Code

- So what is it
- The distinguishing features of the Cyanide Code are its focus on
  - The adequacy of an operation’s designs, procedures and systems,
  - Verifying actual adherence to those requirements in the workplace,
  - The public reporting of audits, and
  - Decertification based on tough assessments
Cyanide Code – Acceptance

2005 – 8 miners; 2 producers; 3 transporters

2016

- 46 signatory companies
- 102 mining operations
- 28 cyanide producers
- 139 transporters
- Located in 51 countries on 6 continents
Cyanide Code – Success Factors

Drives and maintains high performance;
- Principles, Standards of Practice & Audits
- Focused on design and procedures

Demonstrates commitment and performance;
- Certification & decertification

Earns trust;
- Disclosure of audit protocols and reports
- Performance reporting & Audit findings

A tool for governments
Cyanide Code – How

Gold Institute – vision
ICME – suggested multistakeholder mtg
UNEP
Paris
San Francisco
Multistakeholder Steering Committee
Independent Code

Jan 30 – mid 2000(SF) – 2005
Why

- Corporations need help
- High level expertise, experience and judgement

How to add value

- By providing advice
Why –

- Corporations need help –

How

- Should come in the form of advice

Who

- Recognized geotechnical and management experts
ITAB – Role

Independent Tailings Advisory Board

- Retained by and reports to the company
- Statement of purpose and scope of work
- Provide advice, recommendations, opinions, etc
- Should not direct the work or perform the work expected of the EOR
- Should not be expected to make statements such as the TSF “is designed, constructed and operated appropriately, safely and effectively”
Independent Tailings Advisory Board

Should be used to provide advice related to:

- Tailings Governance Framework
- Method and site selection process
- Geotechnical and management issues
- Qualifications of service providers
- Risk identification and risk management
- Ongoing risk improvement
- Assurance activities & findings
EOR – Annual Integrity Report

- BC Annual Inspection Report
  - Good idea – narrowly conceived
  - Primarily a compilation of technical information
  - Cursory look at management system
- Should be a management document
- Should primarily focus on integrity of the dam design *(geotechnical)* and the application of the critical control procedures (management)
Annual Report – Purpose

- BC – “Review and evaluate the adequacy of the performance and operation of the overall facility, with specific attention on short-term physical condition and surveillance results.”

- Proposed Leading Practice: Review and evaluate the adequacy of the performance and operation of the overall tailings facility, with specific attention to the integrity of the dam design and the quality and application of the critical control measures.
Based on an inspection of the tailings dams at the XXX Mine and a review of operating, monitoring and surveillance records for the past 12 months, we find (1) that the facility is performing well within design tolerances and (2) that all critical control programs continued to be effectively applied throughout the year and have been effective in supporting the integrity of the dam design and operation. In particular we confirm....
Assurance – Annual Report

- Dam integrity
  - Confirmation of major design parameters
  - Performance measures – Changes in risk profile
  - Opportunities/Need for improvement

- Management effectiveness
  - Confirm adequacy of construction schedule; water balance; critical control programs, etc for the past and coming year
  - EOR to be supported by an accredited auditor for critical control issues
Continuous Improvement & Risk Acceptability Measures

Need site specific measures.
What gets measured, gets done.

Have to move beyond

- Blind trust
- Wordsmithing – doing all we can
- High sounding objectives – getting to zero
  - Safe & Stable & Robust & Resilient
- Factors of safety
- Solely relying on geotechnical judgement
Relative measures – Improvement

- Factor of safety – better
- Embankment height – lower
- Dam slope – flatter
- Crest width – wider
- Volume of water – less
- Freeboard – higher
- Beach – longer
- Phreatic line – further away

For each site, which are the critical measures and how can we measure and report these in terms of their impact on consequence and likelihood reduction and then use to drive continuous improvement?
Site specific strategic objectives

- Decide on what constitutes acceptable consequences
- Decide on what is required to achieve an acceptable likelihood of failure
- Design and operate to those objectives
Take The High Road – operations

Site specific strategic objectives

- Decide on what constitutes acceptable consequences (not extreme)
- Decide on what is required to achieve an acceptable likelihood of failure
- Establish a continuous improvement program based on;
  - The identification of critical hazards and the measures required to drive improvement.
  - The implementation of risk reduction programs
  - The reduction of the volume of water within the dam
- Report water volume monthly behind the main dam in comparison to target amount
Lower Risk Alternatives

- Use risk reduction as the driving force
  - Not BAT
- Promote enhanced slurry disposal
  - Robust & resilient
- Evaluate viable technical options
- Use a disciplined approach to identify important issues
- Site selection a factor
6.0 GOVERNMENTS

- Permit approval
- Permit amendments – change management
- Government oversight
- Compliance & enforcement
  - Administrative monetary penalties
  - Deferred action (do not increase risk)
- Transparency – website
Homework

- My paper – read it & distribute it to...
- Power point slides will be available
- Seabridge KSM Project Tailings Reports
- Cyanide Code –2 audit reports & Emergency Response Auditor Guidance (7&8.3);
- BC Annual Inspection Reports – how to make better
- Write a definition of acceptable risk for your project.
- Define measures of improvement for your project
Path Forward – List of things to think about

- Board of Directors – TOR
- Corporate governance framework – ICMM
- Critical control management – practical guide
- Annual Integrity Report – new approach
- ITAB – get the TOR right
- Comprehensive assurance program – CN Code
- Meaningful engagement – participate & influence
- Geotechnical – lower risk alternatives
- Government – get tough
- Tailings Responsibility Code – long-term vision
- Risk Improvement measures
- Transparency – audit reports, alternatives, etc
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