





Mine Safety: Sharing Solutions

<u>The Bingham Canyon Slope Failure</u> Bradley J. Ross	<u>Panel: Different Voices React to a Crisis</u> MSHA: Larry Corte External lawyer: Donna Pryor In-house lawyer: Matt Bingham Environmental Manager: Kathy Arnold Insurance Carrier/Risk Management: Denis Smith
<u>MSHA 101</u> David Lauriski	<u>Engineering/Technical: Brad Ross</u> <u>Communications: Kyle Bennett</u> <u>Safety Manager: Paul Yslas</u>
<u>Critical Risk Management</u> Bryan Pett	
<u>Why is Information Not Shared?</u> Donna Pryor	<u>A Search for Independent Expertise</u> Mary Poulton



Mine Safety: Sharing Solutions

The Bingham Canyon Slope Failure
Brad Ross



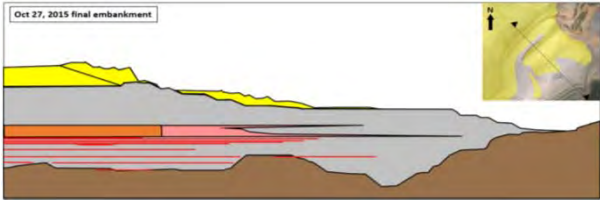
Sharing Critical Controls

2018 Mining Law Summit

Brad Ross, PhD, PE
Geotechnical Center of Excellence
Lowell Institute for Mineral Resources




Zero Harm Share
Failure of the Fundão Dam



- 17 people killed
- 60 million cubic meters of iron ore waste
- 3500 acres covered
- Bento Rodrigues destroyed
- Downstream water shortages

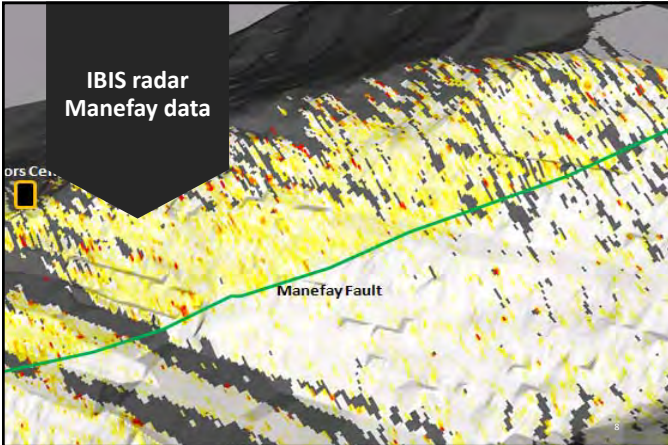
Goals

- Part of NIOSH grant
- Case Study
- Identify material unwanted events.
- Share Critical Controls
- Document and share
- Refine the process



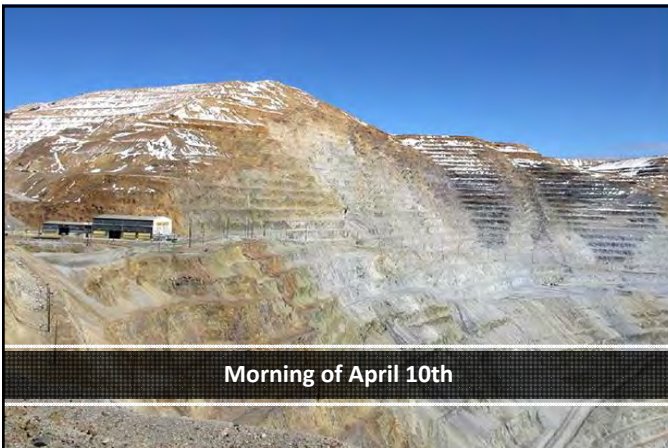


Rio Tinto Kennecott – Bingham Pit Mine (2013)



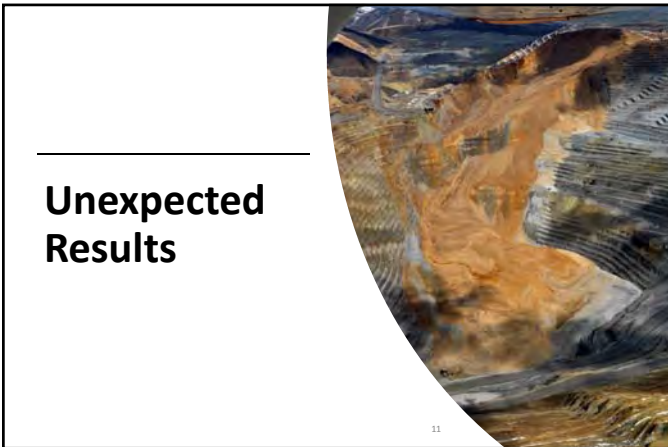
IBIS radar Manefay data

Manefay Fault

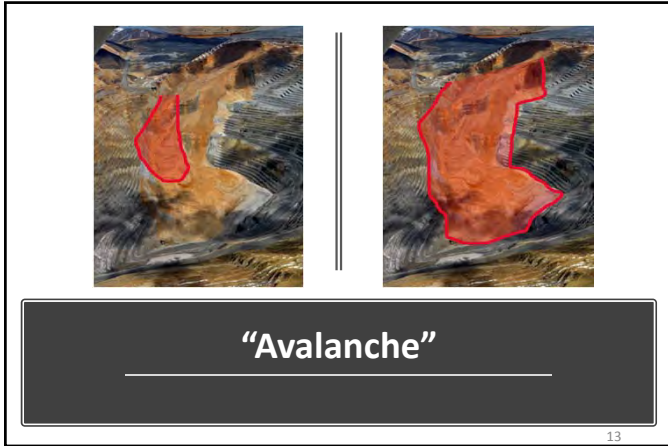


Morning of April 10th







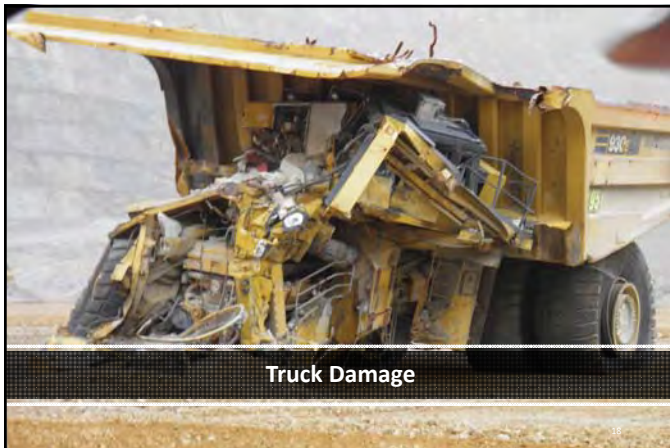




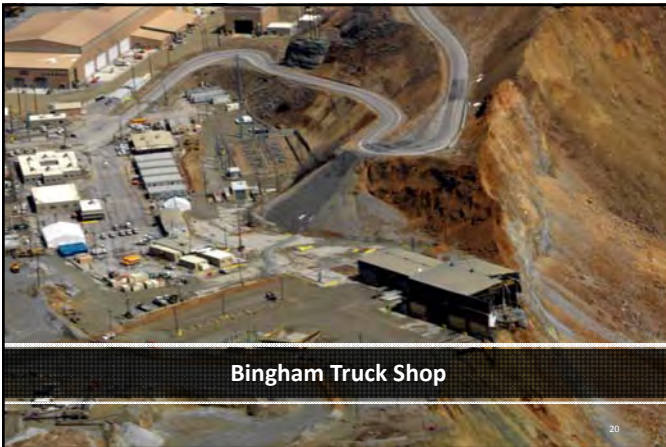










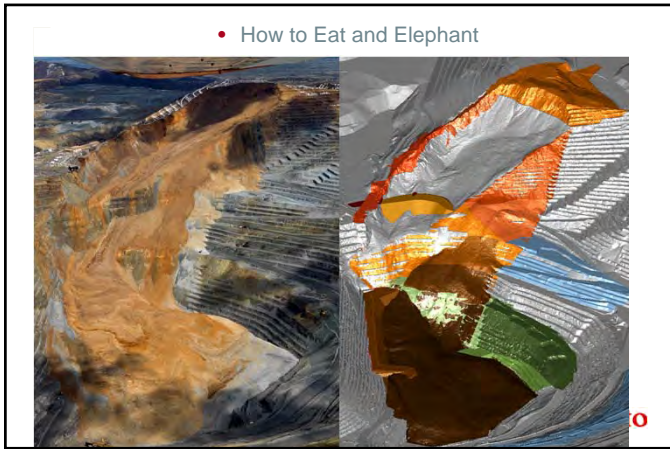


NO INJURIES
NO FATALITIES

Disaster
or
Crisis?

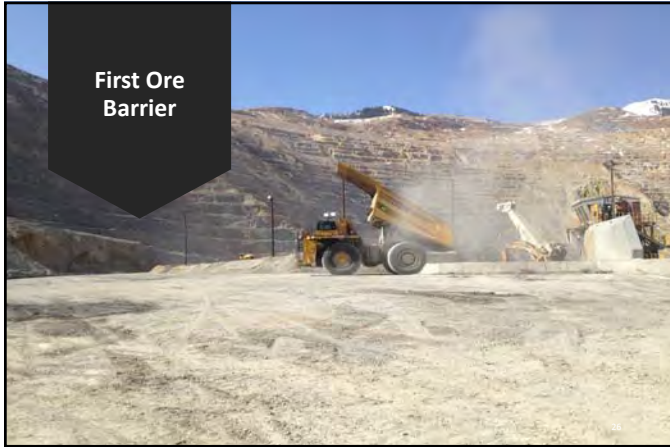
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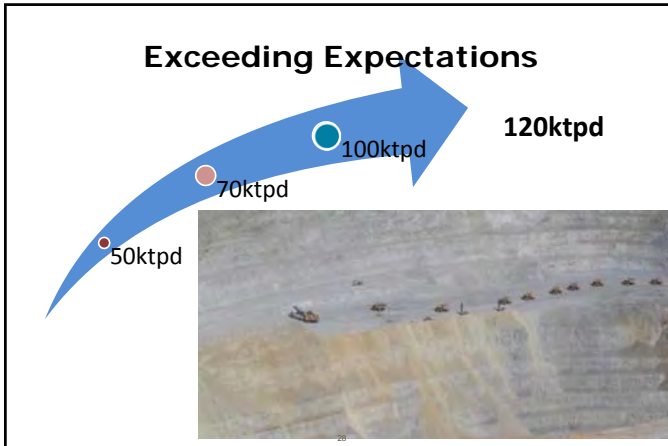








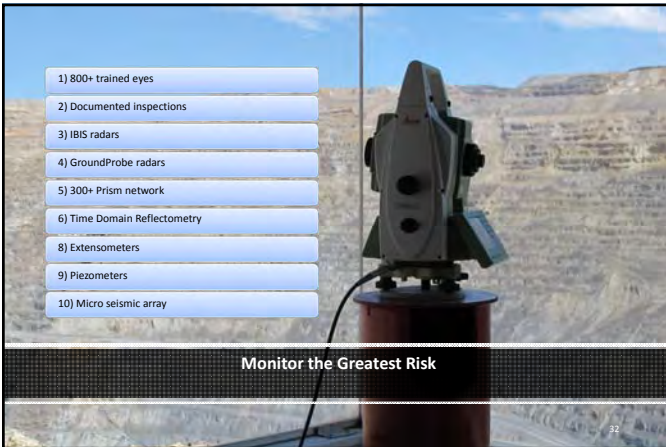














Communications

Daily Manefay Status Update

Thursday, April 4, 2013

Daily Manefay Status Update

Friday, April 5, 2013

- C
- C
- C
- A

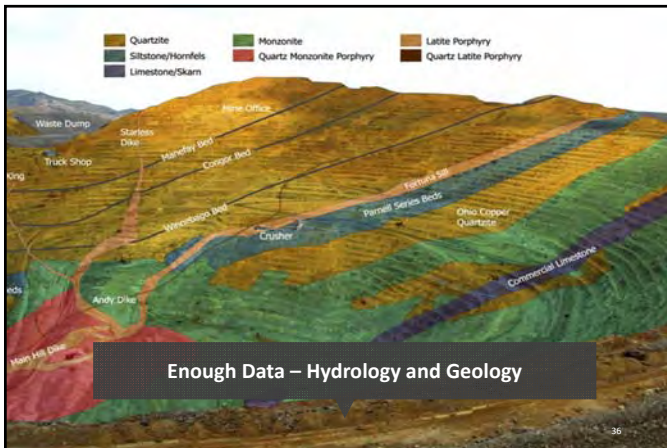
Daily Manefay Status Update

Wednesday, April 10, 2013

Current Manefay Response Level is ORANGE

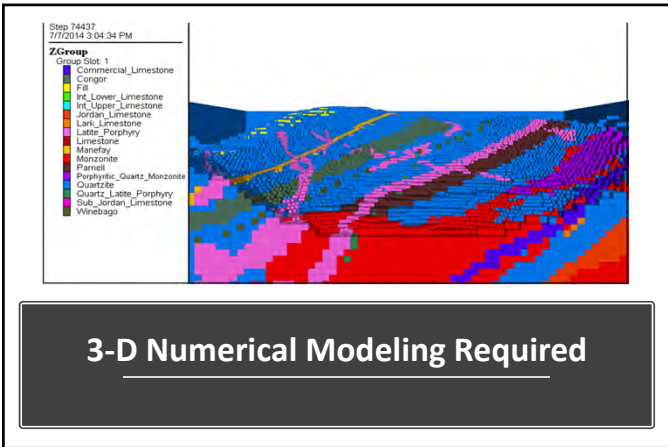
- Current 'Upper Manefay' overall movement rates are **2.6"/day**
- Current 'Lower Manefay' overall movement rates are **2.6"/day**
- Current Movement Trend: Increasing acceleration with localized rockfall
- Actions Required:
 - Close the upper 10% to all traffic
 - Evacuate the lower pit and suspend mining until further notice
 - Close the mine access road from the notch to 5190
 - Route essential traffic through the 4H road
 - Maintain spotters and sentries at key locations
 - Prioritize activities in alignment with Orange response







Independent Review



3-D Numerical Modeling Required



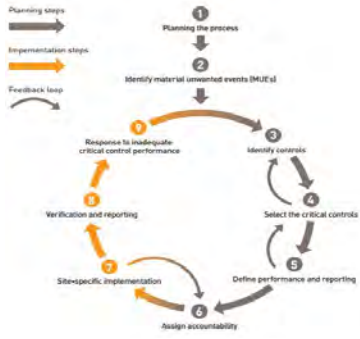
Additional Geotechnical Resources Needed

Sharing Critical Controls

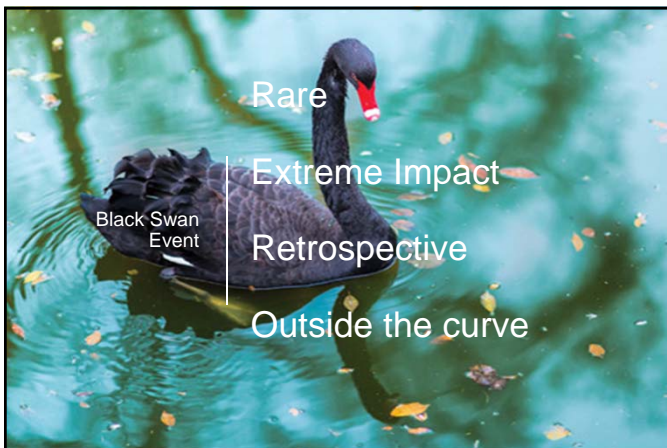


Sharing Critical Controls

NIOSH Grant



Source: Health and Safety Critical Control Management – Good Practice Guide - ICM



Rare

Extreme Impact

Retrospective


Outside the curve


Black Swan Event

If Only We Had Known

- Similar to Manefay
- Fast moving
- Covered pit bottom
- Destroyed equipment


Photo: not of unnamed highway failure





Why Don't We Share

- Liability
- Penalty
- Reputation



The Problem With Rock Bursts

Evert Hoek

- Deep underground mines
- Many miners killed
- Embarrassment to companies
- Begin work in 1965
- Not much written
- **Still not resolved**

Questions for the Summit

How do we document?

When can we share?

How do we prevent being penalized?

How to we make safety more important than reputation?



Mine Safety: Sharing Solutions

MSHA 101
David Lauriski

MINING LAW SUMMIT 2018
JAMES E. ROGERS COLLEGE OF LAW
UNIVERSITY OF ARIZONA

DAVE D. LAURISKI
ASSISTANT SECRETARY OF LABOR FOR MSHA

FORMER

M 1
S 0
H 1
A

**GENERAL BACKGROUND
HISTORY OF MINE SAFETY IN THE U.S.**

• Early History

- First statute in 1891
 - Ventilation requirements for coal mines
 - No children under the age of 12
- 1900 – 1910 - Average of 2,000 coal mining deaths annually
- 1910 - Bureau of Mines established (no inspection authority)
- 1941 – Bureau of Mines empowered to enter and inspect coal mines
- 1947 – Congress authorized the first Code of Federal Regulations for mine safety

**GENERAL BACKGROUND
HISTORY OF MINE SAFETY IN THE U.S**

• Federal Coal Mine Safety Act of 1952

- Provided for annual inspections of certain coal mines
- Bureau of Mines granted limited authority
 - Issuing violation notices
 - Withdrawing miners from imminent danger
 - Assessing civil penalties for non-compliance with withdrawal orders or for refusing to give inspectors access
- 1952 Act amended in 1966 to extend coverage to all underground coal mines

**GENERAL BACKGROUND
HISTORY OF MINE SAFETY IN THE U.S**

• Federal Metal and Nonmetallic Act of 1966

- First federal statute regulating non-coal mines
- Provided for:
 - Promulgation of safety standards
 - Inspections of mines
 - Investigations of accidents
- Enforcement authority minimal

**GENERAL BACKGROUND
HISTORY OF MINE SAFETY IN THE U.S**

- **Federal Coal Mine Health and Safety Act of 1969**
 - Most comprehensive and stringent of all previous Acts
 - Covers both underground and surface coal
 - Enforcement powers greatly enhanced
 - Monetary penalties for ALL violations
 - Criminal penalties for knowing and willful violations
 - Safety standards strengthened and health standards adopted
 - Provided compensation for miners disabled with "black lung"
 - Created the Mining **Enforcement** and Safety Administration (MESA)
 - Bureau of Mines relegated to research and mineral resource development

**GENERAL BACKGROUND
HISTORY OF MINE SAFETY IN THE U.S**

- **Federal Mine Safety and Health Act of 1977**
 - Current authorizing legislation that governs U.S mine safety and health
 - Consolidated all mines under one Act – coal and **ALL** non- coal mines
 - Strengthened and expanded rights of miners and protections for exercising those rights
 - Transferred responsibility from Interior to Labor and renamed agency to the Mine Safety and Health **Administration**
 - Established an independent Commission to review MSHA enforcement actions
 - Established training requirements for all miners
 - Act amended in 2006 to include emergency response plans for coal mines and added regulations regarding emergency notifications, mine rescue teams, refuge chambers and sealing of abandoned mining areas

**EXERCISE OF AUTHORITY
U.S. MINE SAFETY AND HEALTH**

- **Federal Mine Safety and Health Act of 1977**
 - Congressional declaration
 - Priority: "the first priority and concern of all in the coal or other mining industry must be the health and safety of its most precious resource--the miner"
 - Need to improve working conditions and practices
 - Responsibility for safety - "operator with assistance from miners ..."
 - Cost of poor safety
 - Mines subject to Act
 - "Each coal or other mine, the products of which enter commerce, or the operations or products of which affect commerce, and each operator of such mine, and every miner in such mine shall be subject to the provisions of this Act."

EXERCISE OF AUTHORITY
U.S. MINE SAFETY AND HEALTH

- Federal Mine Safety and Health Act of 1977 Cont'd
 - Strict Liability Statute
 - Mine Safety and Health Administration
 - Nine program areas responsible for exercising MSHA authority
 - Office of the Assistant Secretary for MSHA
 - Coal Mine Safety and Health
 - Metal and Nonmetal Safety and Health
 - Program Evaluation and Information Resources
 - Administration and Management
 - Technical Support
 - Education Policy and Development
 - Standards, Regulations and Variances
 - Assessments

EXERCISE OF AUTHORITY
U.S. MINE SAFETY AND HEALTH

- Broad powers
- Primary duties
 - Inspections
 - Investigations
 - Recordkeeping
 - Education and Training
- Regulations (Safety and Health)
 - Development
 - Purpose
 - Public input
- Enforcement
 - Citations
 - Orders

EXERCISE OF AUTHORITY
U.S. MINE SAFETY AND HEALTH

- Penalties
 - Civil
 - Each violation for which a citation has been issued – up to \$70,000
 - Failure to abate – up to \$7,500 per day
 - Operator knowingly violates or fails or refuses to comply and upon 1st conviction – up to \$25,000 and/or imprisonment up to one year
 - Any subsequent conviction up to \$50,000 and/or imprisonment up to five years
 - Making a false statement – up to \$10,000 and/or imprisonment up to five years
 - Giving advance notice of an inspection – up to \$1000 and/or imprisonment up to six months
 - Smoking or carrying of smoking materials – up to \$375

EXERCISE OF AUTHORITY U.S. MINE SAFETY AND HEALTH

- Criminal
 - Individual convicted of a felony or misdemeanor as a result of death - up to \$250,000 (organization up to \$500,000)
 - Individual convicted of a misdemeanor not as a result of death - up to \$1000,000 (organization up to \$200,000)
 - Subject to Alternate Sentencing Provisions found at 18 USC 3571
- Technical Assistance
 - Provide assistance to Improve miner safety and health (internal and external)
 - Assist MSHA Inspectorate in investigations and emergencies

TODAY'S MINING INDUSTRY

- 20,085 mines in 1978 vs. 13,015 at the end of 2017
- 544,165 miners in 1978 vs. 319,465 miners at end of 2017
- ±1940 MSHA employees in 1978 vs. 2,152 in 2017
- MSHA budget of ±\$158,100,000 in 2017 of \$375,172,000
- 242 mine related deaths in 1978 vs. 28 in 2017
- Fatal incident rate of 0.0515 in 1978 vs. 0.0104 in 2017
- All injury incident rate of 8.85 in 1978 vs. 2.15 in 2017
- 18 mining related deaths YTD 2018 (15 MNM - 3 Coal)

QUESTIONS



Dave Lauriski
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Mine Safety: Sharing Solutions

Critical Risk Management
Bryan Pett

RioTinto

Critical risk management (CRM)

Presentation for University of Arizona Mining Law Summit
November 9, 2018



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Outline

- Why CRM?
- Layered system design
- Journey so far
- Learnings



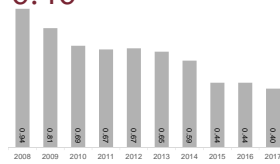
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A safety story in two parts

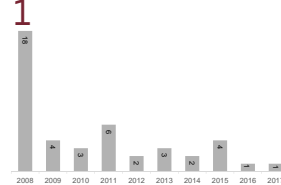
Reduction in injury rates

All injury frequency rate
Per 200,000 hours worked
0.40



But cannot eliminate fatalities.
Why?

Fatal incidents
Number
1



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CRM is a key element of fatality elimination
in our safety strategy



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Rio Tinto's fatality risk management journey



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CRM objective - a step towards zero fatalities

CRM provides a means to verify that critical controls are well designed, understood, in place and working at the front line – where the risk exists.

CRM involves:



Standardised process and content, enables efficiencies and learning

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CRM fundamentals - every person plays a role

Each layer is reinforcing and ultimately supports the frontline to STOP work if the critical controls are not in place or working.



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Layered verifications & accountabilities

- Critical Control verification standard (CCVS)** - is used by the site leadership to verify that the design, implementation and training aspects of a critical control are in place / effective
- Critical Control Field Verification (CCFV)** - is used on a shift-by-shift basis by the Supervisor to verify the correct implementation of the critical controls associated with the work
- Critical Control Checklist (CCC)** - is used on a task-by-task basis where a task involves exposure to a credible fatality risk. The tool is designed as a self assessment checklist to confirm the critical controls are in place

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CRM Portal – To capture, control content and enable real time data

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Journey so far ...

2014

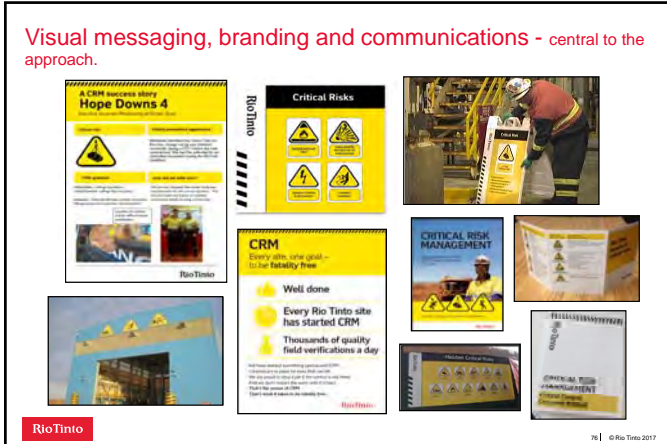
2015

▶

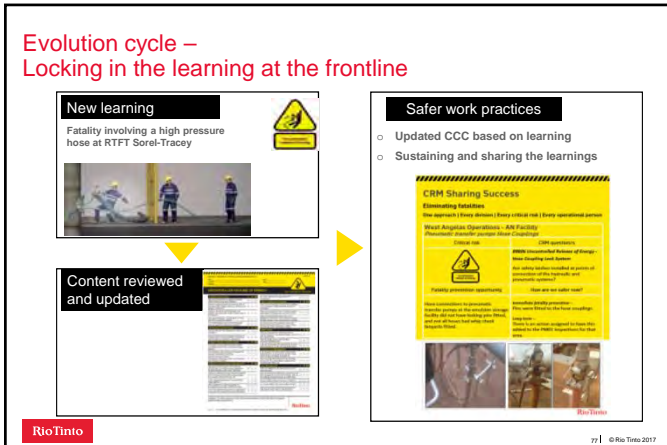
- Copper business discovered CRM model at Escondida
- Took what worked and adapted to Rio Tinto:
 - visual management
 - rigorous approach to verifications
 - 'embrace the red'
 - frontline focus
- Group adoption
- 24 month rapid implementation
- Strong PG adoption and sharing
- No one site or PG can claim the benchmark of best practice
- All PGs playing a part in CRM's evolution

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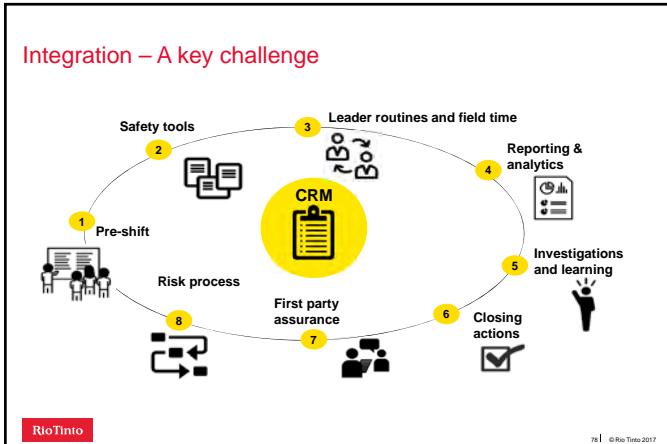
Visual messaging, branding and communications - central to the approach.



Evolution cycle – Locking in the learning at the frontline



Integration – A key challenge



Learnings for others ... based on our experience

We feel we have done well...

- ✓ Visible leader sponsorship (at all levels)
- ✓ Staying true to system design – but recognise the "tight vs loose"
- ✓ Road map and maturity model
- ✓ Fast tracking as appropriate
- ✓ Standardisation to drive efficiencies and effectiveness
- ✓ Treating technology as an enabler
- ✓ Collaboration

Our focus areas...

- ❑ Getting the context right and building the supporting culture
- ❑ Treat as cultural change - not just another system implementation
- ❑ Balance quantity with quality
- ❑ Integration – cannot be a "bolt on"
- ❑ Use the data to feedback and drive improvement

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Comments! Questions?



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Mine Safety: Sharing Solutions

Why is Information Not Shared?
Donna Pryor




HUSCH BLACKWELL

Why Is Information Not Shared?

Third Annual Global Mining Law Summit
November 9, 2018
James E. Rogers College of Law
The University of Arizona
By Donna Pryor, Husch Blackwell

How to Connect to the Polling Source Via Text

- Text HBEvent to 22333
- Text in answers to participate in polls



HUSCHBLACKWELL

POLL

How do you share information about near miss accidents or other safety matters?

- A. I share within the mine site only.
- B. I share across the board within the company and communicate with other company mine sites.
- C. I share within my company and among colleagues at other companies (via trade organizations or personal contacts within other companies).

HUSCH BLACKWELL

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I share within my company and among colleagues at other companies (via trade organizations or personal contacts within other companies).

HUSCH BLACKWELL

POLL

If you are reluctant to share information, why is that?

- A. It's a competitive industry. I'd rather not share.
- B. I'm concerned about liability.
- C. It's company policy to keep information confidential unless we have special permission to share the information.
- D. I'm not a sharer.

HUSCH BLACKWELL

If you are reluctant to share information, why is that?

It's a competitive industry. I'd rather not share.

I'm concerned about liability.

It's company policy to keep information confidential unless we have special permission to share the information.

I'm not a sharer.

HUSCH BLACKWELL

Why is information not shared?

You could waive the attorney-client privilege.

Even internal sharing (near miss reports, accident investigation reports) can result in a MSHA citation.

Concerns about potential litigation (plaintiff's lawyers)

Information might be proprietary.

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POLL

Do you share success stories?

A. Yes

B. No

HUSCH BLACKWELL

Do you share success stories?

Yes.

No.

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Liability Concerns

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Questions??



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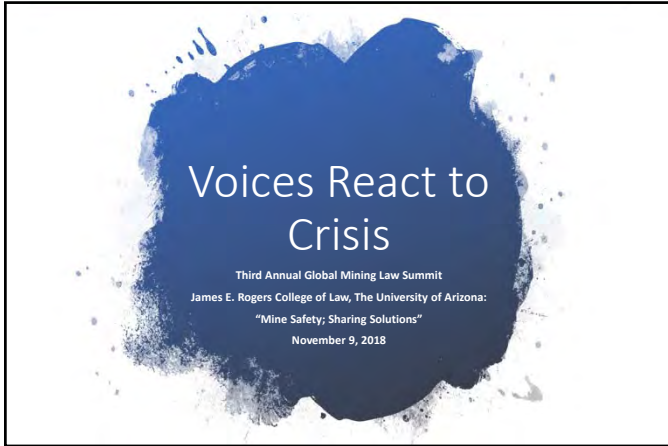
Panel: Different Voices React to a Crisis

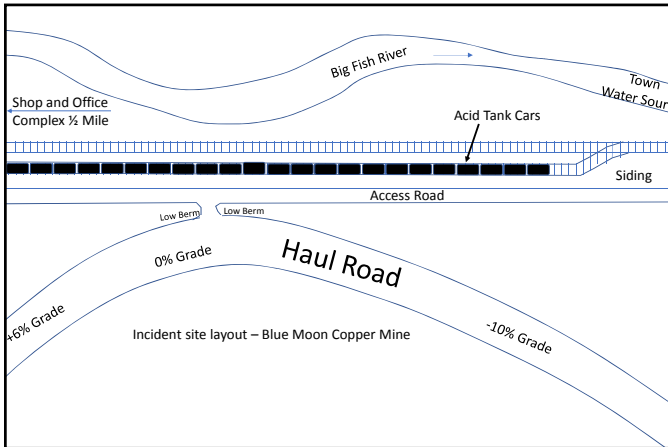
Factual Situation

Aftermath

Lessons

MSHA: Larry Corte
Safety Manager: Paul Yslas
External lawyer: Donna Pryor
Communications: Kyle Bennett
In-house lawyer: Matt Bingham
Engineering/Technical: Brad Ross
Environmental Manager: Kathy Arnold
Insurance Carrier/Risk Management: Denis Smith



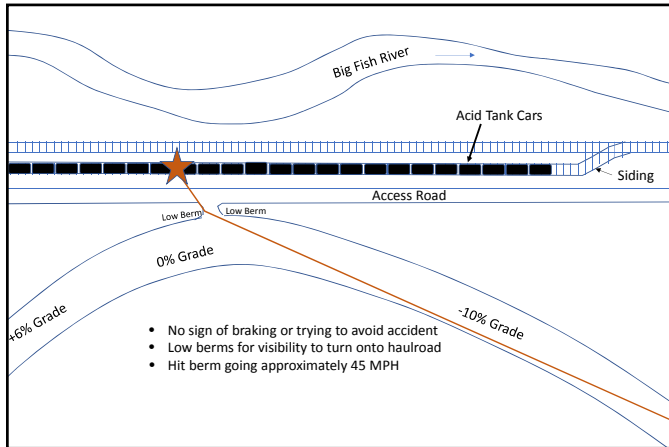


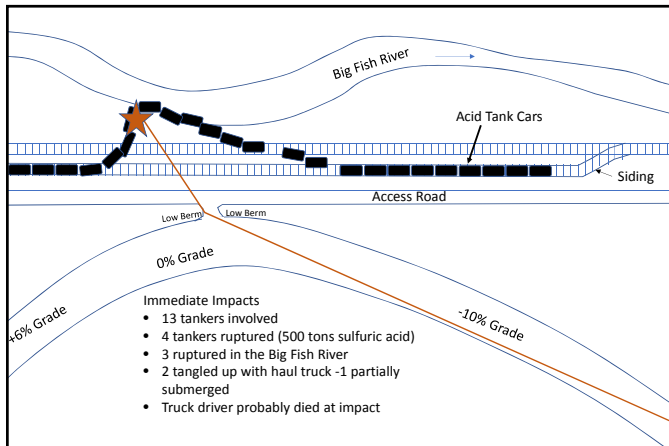
Blue Moon Copper Mine

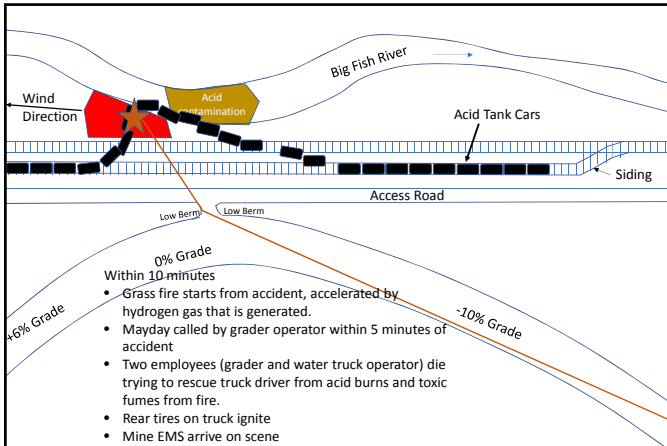
- Mining
 - Open pit copper mine in the western US.
 - The mine uses 240-ton haul trucks.
- Heap leach operation using sulfuric acid.
- Acid is brought to the mine in rail tank cars.
- Each rail tank car has 100 tons of sulfuric acid and there are 36 tank cars per train.

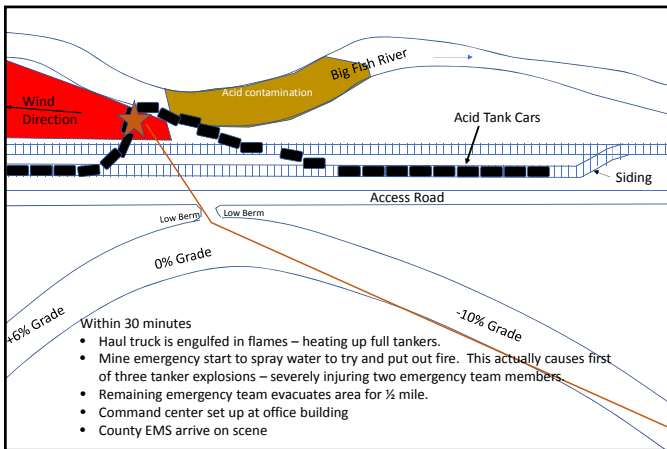
Site conditions

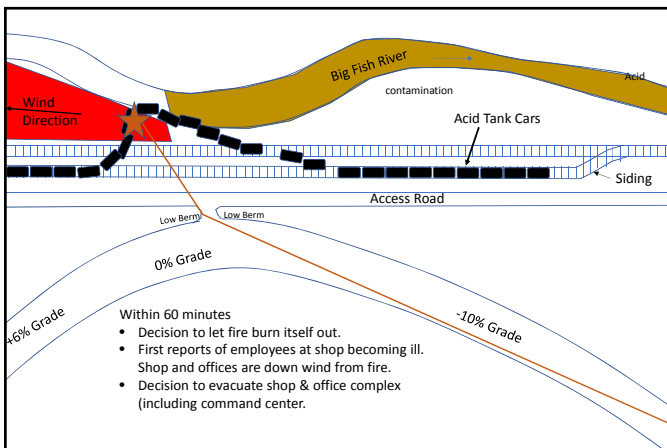
- Mountainous area.
- Unusually wet spring resulted in thicker than usual growth of grasses and weeds.
- Hot summer have created large fire hazard.
- The Big Fish River runs through property which is source for community water.
- Incident takes place at 3:00 am on July 5th.

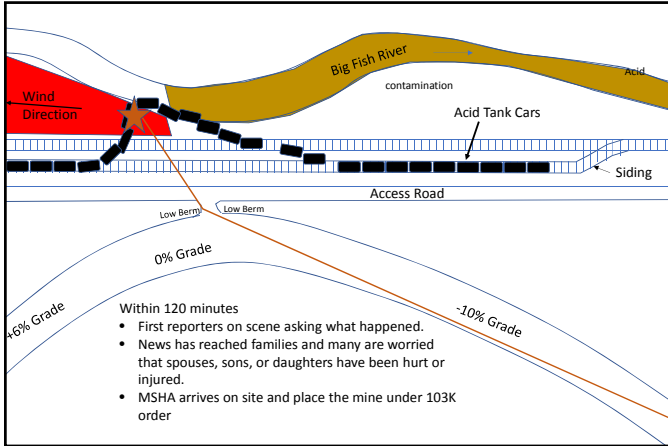


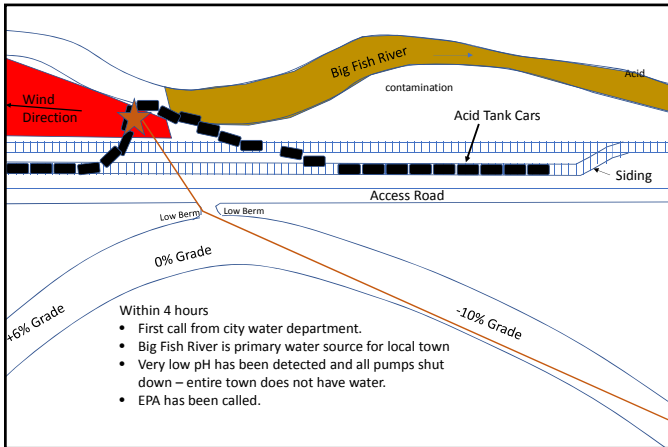


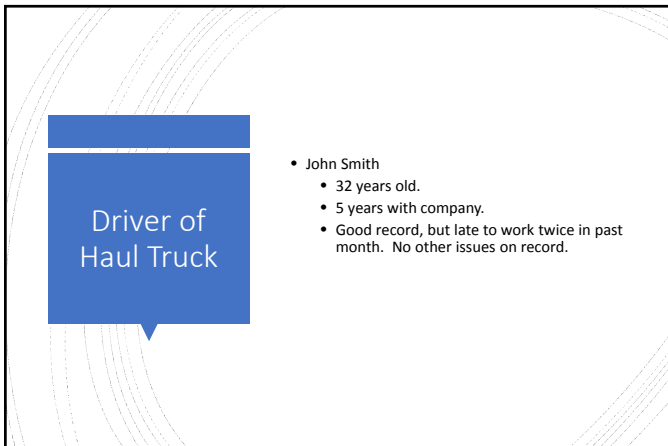












Short – Term Impact of Incident

- 3 Fatalities
- 2 Seriously injured
- 15 hospitalized from toxic smoke
- One haul truck and 10 tank cars destroyed
- 30 acres burned plus two small buildings

Immediate aftermath

- Resulting aftermath on ground
- Results of investigation
 - Driver
 - Truck


Mine shut down for 2 weeks for investigation

City water system shut down for 2 weeks

Long – Term Impact of Incident

Driver of Haul Truck
More Info

- John Smith
- Seen at 4th of July Celebration having a very "good time".
- Supervisor did not see any issues at start of shift
- Fellow employee said he had bloodshot eyes and hung head down during meeting.
- Reports that John was recently separated and was depressed.



Truck Mechanical Issues

- Long term complaints about brakes on that truck
- Rebuild performed by 3rd party

Lessons that should be Shared

- NEED FOR PROCESS SAFETY APPROACH
- TRAINING ON APPROACHING INCIDENT SCENES
- TRAINING ON FIRES INVOLVING SULFURIC ACID
- REPORTING PROCEDURES FOR ALL AGENCIES
- IMPORTANCE OF FITNESS FOR DUTY CHECK
- NEED FOR EMPLOYEE SUPPORT PROGRAMS

Different Industries

Airline Industry

- Lion Air Crash on 10/29
- Article 11/8
- “Boeing issues warning on potential instrument malfunction after Indonesia crash”

Mining Industry

- Highwall failure 10/30
- Article 11/7
- “The company released a statement Nov. 7 about the slide after a Facebook user posted a photo of the pit on a public page. The spokesperson said the mine is not releasing photos of that area of the pit.”

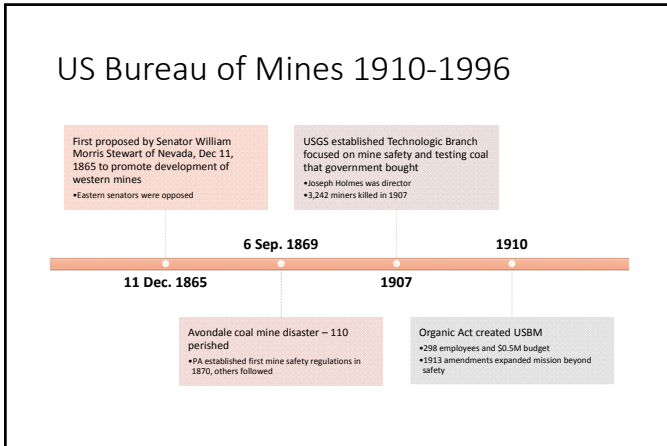


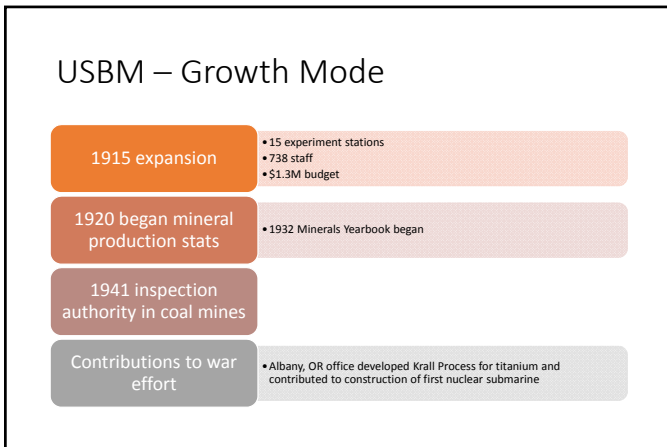
Mine Safety: Sharing Solutions

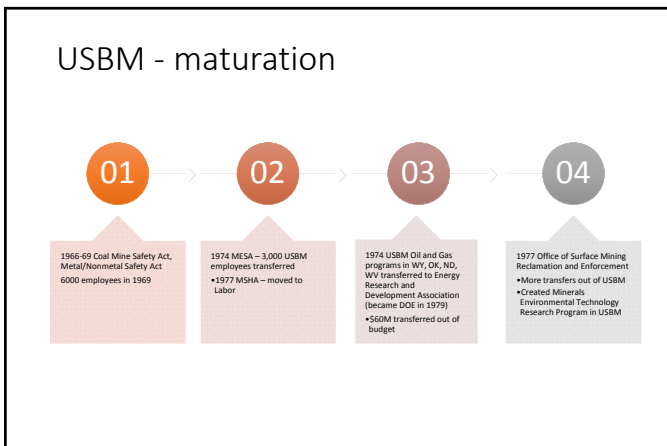
The 21st Century Mining Research Organization
Mary Poulton



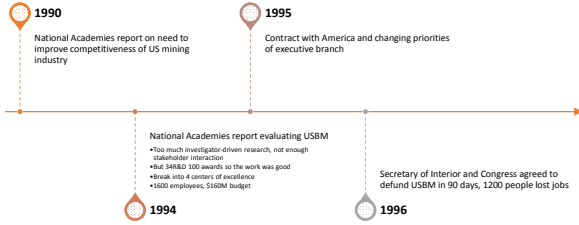
The 21st Century Mining Research Organization | The Mining Innovation Ecosystem
Dr. Mary Poulton







USBM - Demise





Stopgap measures

Able to save H&S functions and place in NIOSH Pittsburgh Lab and Spokane Lab

- Minerals Yearbook to USGS
- Fossil energy already in DOE

NMA lobbied for mining program in DOE Industries of the Future program focused on energy use in mining

- OIT created in 1993 for 7 industries with high energy and waste
- Mining added c. 1998, National Academies Road Map 2002
- Defunded around 2006?

Worked on Energy and Minerals Schools Re-Investment Act in Congress as way to allocate research support to mining programs

- Passed House in 2006, couldn't get through Senate
- Pay as You Go required

The Arizona approach

- US lacked a comprehensive, integrated approach to minerals research at federal level
- Science Foundation Arizona started in 2007 as public-private partnership for research and economic development
- Funding for Institute for Mineral Resources granted in 2008 – 2013
- Lowell endowment in 2009
- LIMR moving to advance AZ as the Silicon Valley of Mining

MINDS OVER MINERALS™



OUR MISSION

...is to advance responsible mining and use of minerals by catalyzing resources across the University of Arizona and around the globe.

MINDS OVER MINERALS™



OUR VISION

...will provide the framework for responsible mineral resource availability required to sustain generations to come.

MINDS OVER MINERALS™



A CATALYST FOR MINING INNOVATION

Connecting 26 disciplines within 10 UA Colleges:

- Engineering
- Science
- Business Management
- Education
- Public Health
- Law
- Social & Behavioral Sciences
- Pharmacy
- Agriculture & Life Sciences
- Architecture

MINDS OVER MINERALS™

THE UNIVERSITY OF ARIZONA
Lowell Institute for MINERAL RESOURCES

Developing Centers of Excellence in Areas of Key Risk

Centers elevate education and deliver innovation

- Geotechnical
- Safety
- Law
- Environment
- Economic Geology
- Mineral Processing
- Mine Operations

Some Centers are more developed than others.

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THE UNIVERSITY OF ARIZONA
Lowell Institute for MINERAL RESOURCES

A Track Record of Success

- Exploration:** Our ore deposit concepts have led to discoveries worldwide.
- Environment:** UA NIEHS Superfund Research program expanded to focus on mine tailings.
- Law:** We established the first mining law program in North America.
- Safety:** Our virtual reality software improves training and evaluation.
- Technology:** Created start-ups.
- Collaboration:** 250+ faculty, students, staff involved in 100+ research projects.

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AZ as the Silicon Valley of Mining

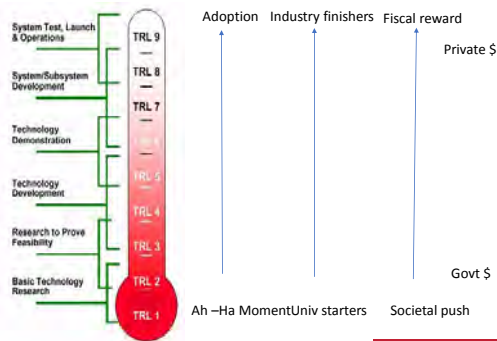
- Components of innovation ecosystem
 - Policy
 - ❖ Innovation ecosystem, entrepreneurial environment, engagement triple helix (education/government/industry)
 - Research to Development (RTD) funding
 - ✓ Human Capital
 - ✓ Clusters/networking
 - ✓ Regional attractiveness and infrastructure
 - ✓ Smart specialization



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Technology Readiness Levels



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21st Century Approach

- Federal support for centers of excellence for mineral resource readiness embedded in regional innovation ecosystems
 - 5-10 year emphasis areas for basic research
 - Responsive to multiple agencies
- State support for the innovation ecosystem
 - Fund knowledge and technology transfer
- University minerals program as the technopole
 - Interdisciplinary approach
- Industry as part of the triple helix
- Accountable for results and impact



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