

A stylized world map in shades of blue and yellow, serving as a background for the text.

# **INAP AND GLOBAL ALLIANCE UPDATE**

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**19th BC/MEND ML/ARD Workshop**

***28-29 November 2012 – Vancouver, BC***

# Acknowledgements



- Bruce Kelley, Rio Tinto
- Rich Borden, Rio Tinto
- Suzanne Davis-Hall, Newcrest Mining
- J. A. M. M. Esper, Kinross Gold
- A. L. Nepomuceno, Kinross Gold
- Kris Hemlein, Kinross Gold
- M. A. Morais, Kinross Gold
- Bill Upton, Barrick Gold
- Gregg Wagner, Newmont

# Summary

- Who is INAP and the Global Alliance
- What we are doing
- The GARD Guide & how it is used
- Examples of best practice
- ARD Management is Improving



# INAP



RioTinto



With Support from the Global Alliance

# The Global Alliance

**INAP**

Acid Drainage Technology Initiative

**PADRE**

**CNAMD**

**INAD**

**SANAP**

**SMI**

Knowledge Transfer

**Water Research Commission**



# 9<sup>th</sup> ICARD - Ottawa

- Outstanding Program
- Great Venue
- Well Organized
- Well Attended
- Congratulations!





# INAP/GA “Path Forward” Symposium

- 70 attendees
- 18 presentations
- 4 Discussion Groups
- Summary Meeting
- Recommendations



# INAP Torch Award

- Keith Ferguson
- Gilles Tremblay





# Global ARD Guide

[www.GARDGuide.com](http://www.GARDGuide.com)

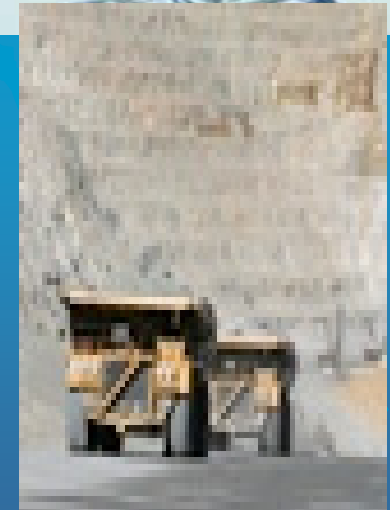


- An international guide of best practice in the prevention and mitigation of acid drainage.
- The guide is becoming the preferred reference document for AMD and waste management issues.

# How to Get Value from the GARD Guide



- Prevent ARD rather than treat it
  - Minimize and characterize disturbed material
  - Plan and design for closure from the start
  - Integrate the GARD into operations
  - Update closure costs regularly
  - Engage all stakeholders





# Barrick's Use of the GARD Guide

- Assess environmental & financial risks from mines
- Include ARD prediction & prevention in new mines
- Integrate ARD management into mine operations
- Training link between future and current operations
- Used as a Standard of Practice through-out Barrick



# Proactive ARD Management Strategies at Rio Tinto



RioTinto

- Forward-looking characterization & prediction
- Site specific management strategies
- Solutions designed before ARD develops
- ARD treatment costs integrated into mine plan
- ARD strategies compatible with operations
- ARD mitigation requires engaging entire mine



# ARD Hazard Screening Program



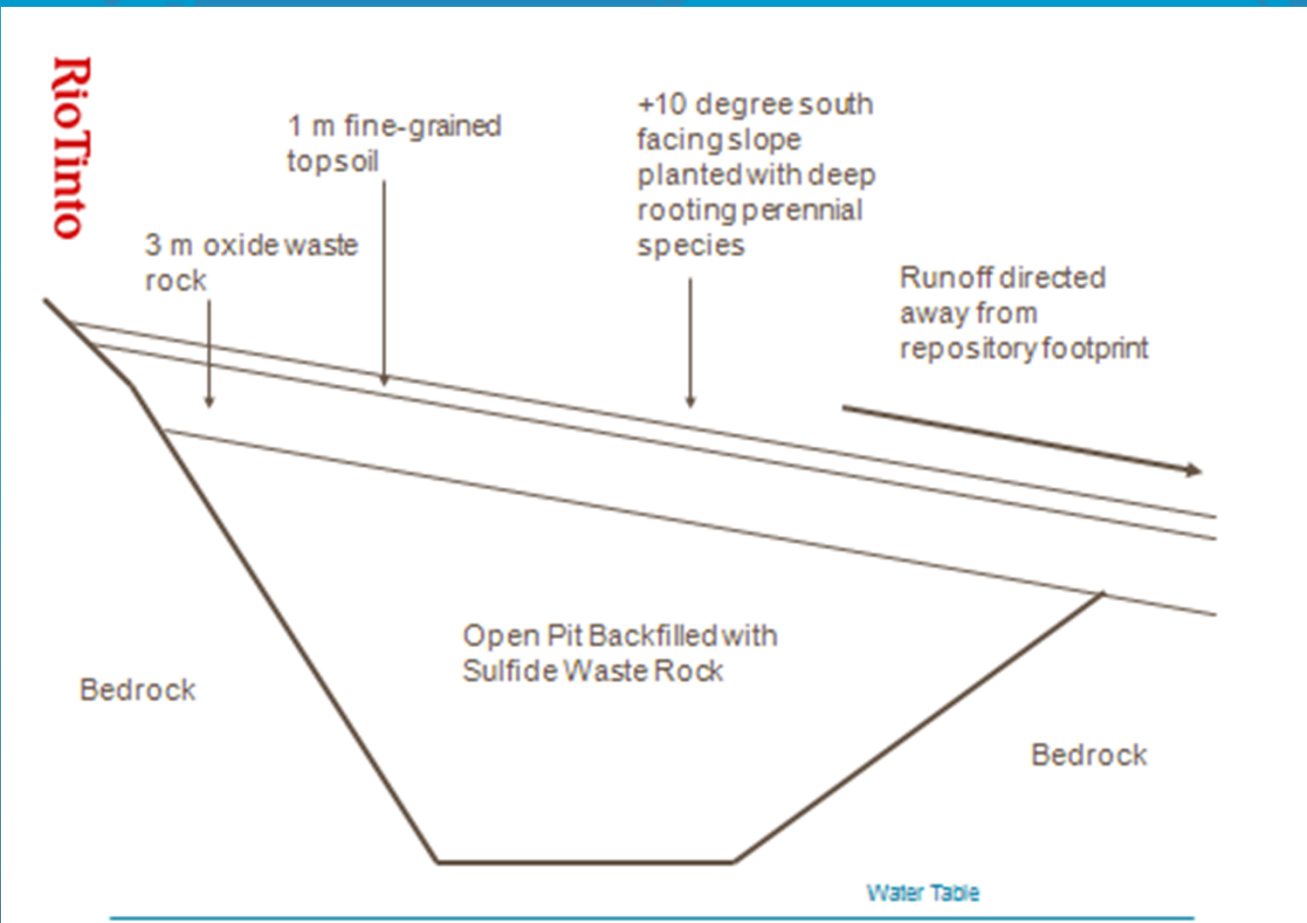
- Based on input from internal and external experts - refined in 2009
- Ranks ARD ore body hazard on
  - Geology (45%) and ARD Risk (5%)
  - Scale of Disturbance (25%)
  - Transport Pathways (10%) and Receiving Environments (15%)
- ARD Hazard correlate with closure costs
- The ARD Hazard score ranks the risk

# Barneys Canyon Waste Rock Management

- Waste Rock segregation program started in 1994
- Based upon characterization/visual classification
- Grey and black rock sent to sulfide repository
- Yellow, brown and orange rock sent to oxide dumps
- Sampling confirmed sulfur followed the color
- Sulfur concentrations in fully oxidized rock  $<0.1\%$
- Transition zones were very sharp ( $<2\text{m}$  across)
- Designations made by trained loader operators



# Design of Barneys Sulfide Waste Rock Repository



# Melco Sulfide Repository in Construction





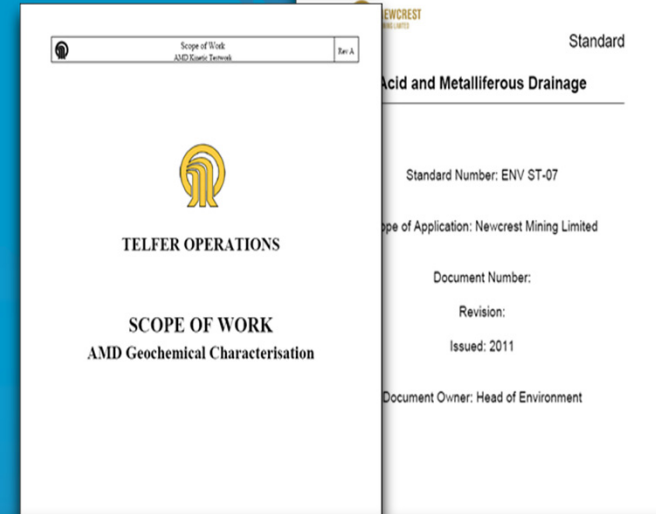
# Melco Repository Today



# Newcrest's use of the GARD Guide



- Develop AMD Standards /Guidelines
- Develop work plans for material geochemical assessments
- Text for junior staff training

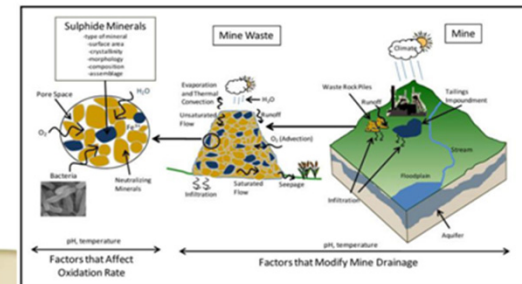


## Background

AMD is acidic water laden with metals resulting from sulphide minerals being exposed to the atmosphere.

Occurs as seepage from waste rock dumps, tailings dams or underground workings.

- Oxidation of pyrite is the greatest contributor to AMD
- $\text{FeS}_2 + 7/2\text{O}_2 + \text{H}_2\text{O} = \text{Fe}^{2+} + 2\text{SO}_4^{2-} + 2\text{H}^+ [1]$



# Newcrest's use of the GARD Guide con't



- Develop exploration sampling procedure
- AMD reference guide for all operations
- Develop an audit criteria for site reviews



# Example Application - Cadia Valley



- All waste and tailings have undergone geochemical characterisation
- All waste types identified and 46 column tests were run for 10 years
- PAF waste material encapsulated with a store and release cover
- Current research on constructed wetlands to treat potential drainage
- Monitoring – Ongoing since 2003 – measuring flow and water quality

# ARD & Arsenic Management at the Paracatu Mine Site

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# HISTORICAL MINING

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# Passive Treatment Systems

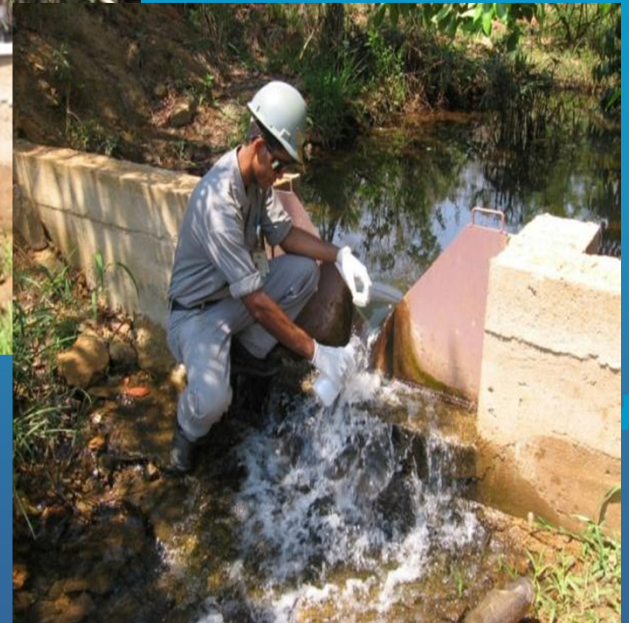


Limestone drains, rock channels,  
stabilization ponds, constructed  
and natural wetlands

# Monitoring Program

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# Community Engagement

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# Reclamation at Batu Hijau Mine



# What INAP is Doing



- Promoting and enhancing the GARD Guide
- Capacity building of stakeholders in developing regions
- Engaging partners



# Conclusions



- ARD management is critical to successful mining
- ARD management requires a ongoing plan throughout the mine life
- This ARD plan relies on management and operator commitment
- ARD management is improving

