

# The GARD Guide Best Practices for ARD Management & Prevention



## Part 3 - Application of GARD Guide Principles

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# GARD Guide - Principles

- Characterization and Prediction (Chapter 4 and 5)
- Prevention and Mitigation (Chapter 6)
  - Treatment (Chapter 7)
- Management and Performance Assessment (Chapter 9)
  - ARD Management Plan Development and Implementation
- Monitoring (Chapter 8)

# Rio Tinto's ARD Prediction and Control Standard - Principles

- **Clause 1.5 Maintain an ARD prediction program**
- **Clause 1.8 - Develop an ARD Management Plan that includes:**
  - The ARD management strategy and procedures for its implementation
  - Ongoing ARD characterization, monitoring and data collection requirements.
- **Clause 2.1 - Implement the ARD Management Plan**

# Barneys Canyon Gold Mine

- One of more than 20 mines and projects managed by Rio Tinto that require active ARD management worldwide
- Mined between 1989 and 2001
- 147 million tons of waste rock and 27 million tons of ore
- 5% of waste rock was un-oxidized and posed an ARD risk (>10% towards end of mine life)
  - Strongly net acid generating with high arsenic

# Melco Pit



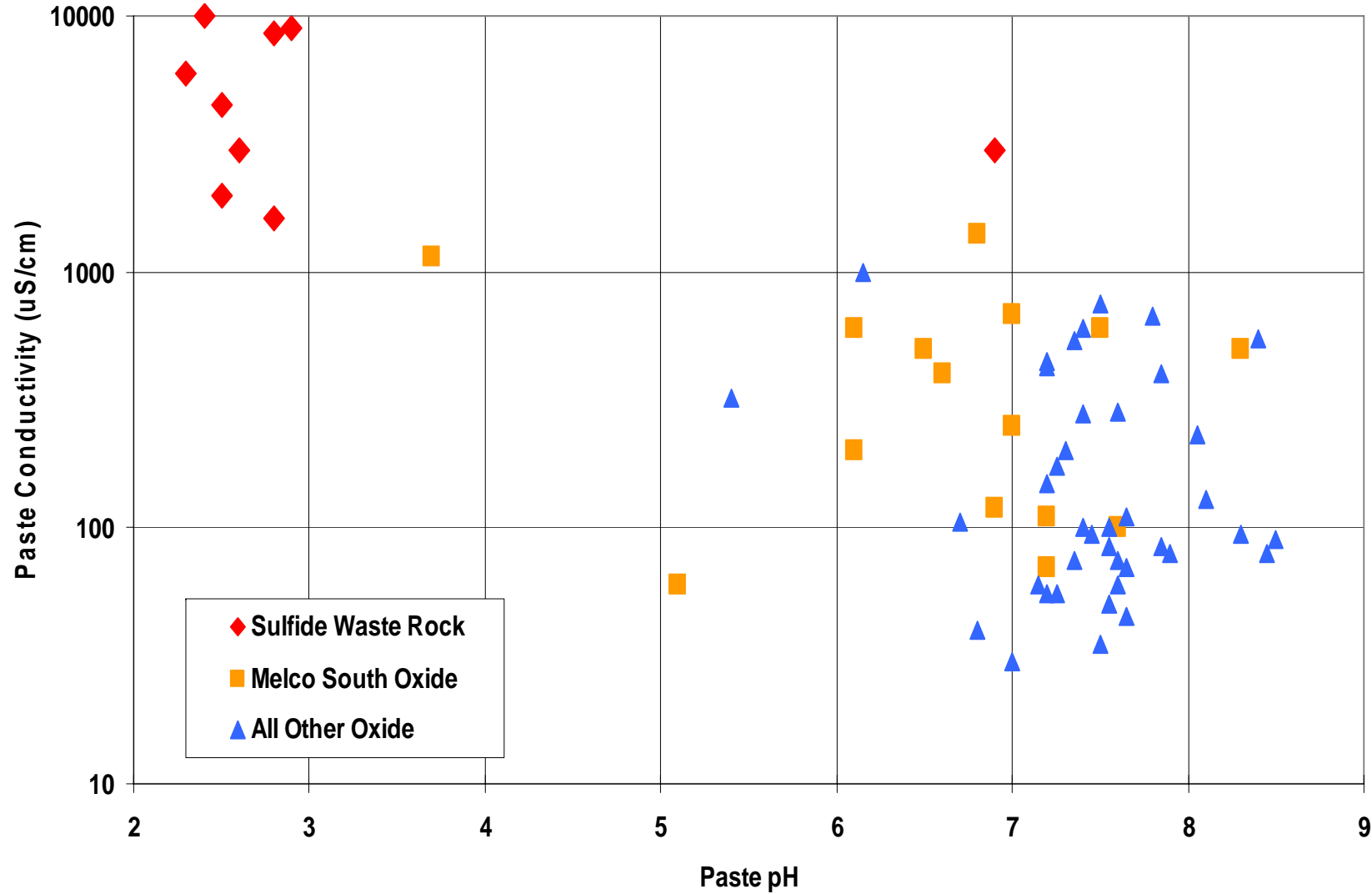
# ARD Management at Barneys Canyon

- Waste Rock segregation implemented in the 1994 after characterization work indicated the need for active management
- Based upon a simple visual classification of the waste
  - Grey and black rock sent to sulfide repository
  - Yellow, brown, red and orange rock sent to oxide dumps
- Follow-up sampling confirmed that mean sulfur concentrations increased from 0.3% to 1.3% on average immediately across the sharp color transition (<1.5 m)
- Designation was made by trained loader operators
  - If greater than 25% of a truck load contained unoxidized rock that load was sent to a sulfide repository
  - Periodic visual inspection of oxide dumps

## ARD Management at Barney's Canyon

- Six million tons of sulfide-bearing rock placed in two repositories
- Repositories cover 15 ha out of a 240 ha waste rock dump footprint
- Thick store and release covers constructed on repositories
- During final recontouring of the oxide dumps, any small pockets of black/grey rock were buried beneath at least 1.3 meters of oxide

# Paste pH and Conductivity in 1999 (Before Dump Recontouring and Capping)



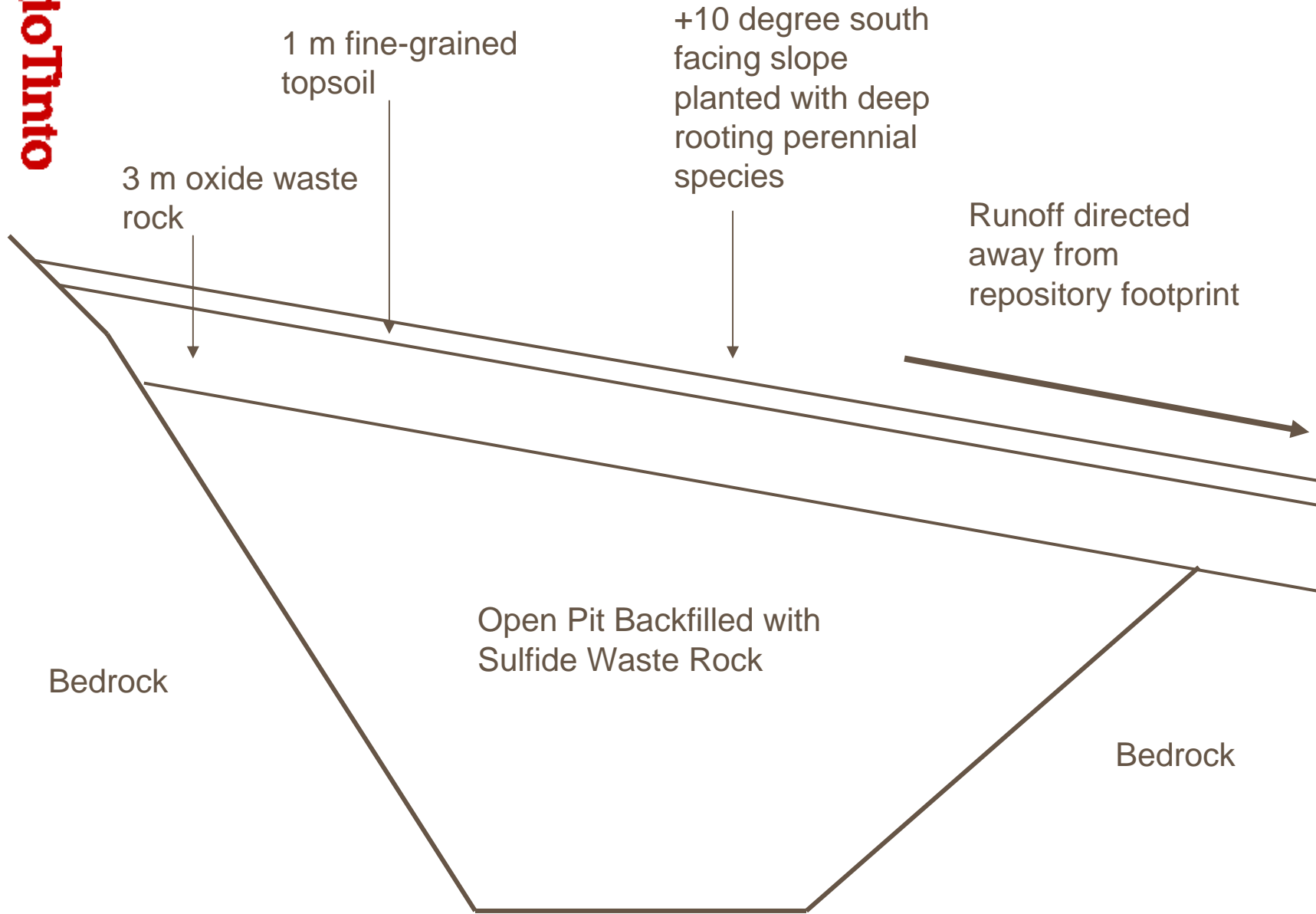
# Oxide Dumps (2000)



# Oxide Dumps Today – full vegetation cover, low metals in vegetation tissue, neutral pH and low TDS/metals in seepage



**Rio Tinto**



# NBCS Sulfide Repository Today



# Melco Sulfide Repository in Construction



# Melco Repository Today



# Implementation of Proactive ARD Management Strategies



- Forward-looking characterization and prediction programs are needed
- Management strategy must address site specific conditions and goals
  - Designed and implemented before a problem develops
- ARD management costs should be fully integrated into economic models used by long-term mine planning
- Strategies must be compatible with the life of mine plan and day to day operations
  - Consistent with short, intermediate and long term material balances
  - Can be implemented under actual field conditions on a daily basis – The Simpler the Better

# Implementation of Proactive ARD Management Strategies



- Successful proactive ARD management requires buy-in from entire mine
  - Environmental Department
  - Senior Management
  - Geologists
  - Short and Long Term Mine Planners
  - Road and Dumps Department
  - Equipment Operators
- Monitoring and feedback is required to ensure successful implementation and to ensure that the management strategy is leading to the intended results