



Mine Design, Operations & Closure Conference, 2015

Are We *Really* Designing for Closure?

micon | mineral
INTERNATIONAL LIMITED | industry
consultants



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Conference Call Invitation/Agenda

Good-to-Go Gold Project Pre-Feasibility Study

**Kick-off Meeting Agenda
May 7, 2015 – 10:30 AM MDT**

Conference Call-In Details:

Local: 406-867-5309

Toll-free dial-in number: 1 800-867-5309

Pass Code: 1342924#

GoToMeeting ID: 123456789

Attendees: **Cat Dreesbach, Project Manager and Mining Engineering Consultant**
 Lisa Kirk, Geochemist and Environmental Consultant
 About 10 other people whose sole purpose is to make the call as long as possible...

1. Introduction (CD)
2. Mine Design (CD)
3. Environmental Concerns (LK)
4. Guidelines for NI 43-101 compliant report (CD)
5. Closure Issues (LK)
6. Discussion of Economic analysis



Good to Go Gold Mine Proposal

- A sustainable design for closure
 - Underground gold project developing skarn mineralization, with locally massive sulfide.
 - Flotation with dry stack tailings due to steep topography.
 - Soil stockpile, encapsulation of sulfide waste rock in inert rock
 - Water treatment plant for tailing dewatering water.
 - River runs above deposit. Down-gradient water use for human consumption and agriculture.



NI 43-101

Purpose: Prevent erroneous or fraudulent mineral resource disclosure.

Technical Report: Discussion of “reasonably available information.”

Economic Analysis:

- Focus on grade, capital and operating costs, NPV, IRR
- No mention of closure, environmental, or social factors

JORC

Purpose: Establish minimum standards for public reporting of exploration results and mineral resource and ore reserve estimates.

Word search turns up “environment” two times. No mention of closure.

For pre-feasibility it just states that assessments of environmental and social issues will be advanced.

SEC Industry Guide 7

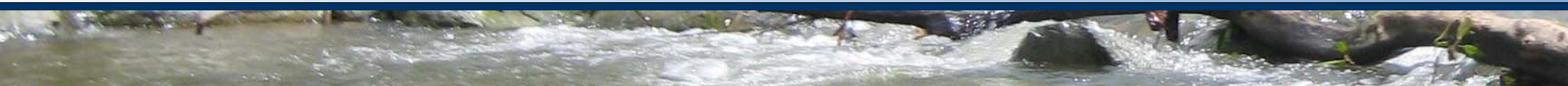
Purpose: “Description of Property by Issuers... Engaged in Significant Mining Operations.”

No mention of environmental issues AT ALL!

2014 SME Guide

SME recommends this be used as a minimum standard for disclosure of mineral resources.

Only requires a discussion of environmental matters – mentions “reasonably available information” mirroring NI 43-101.



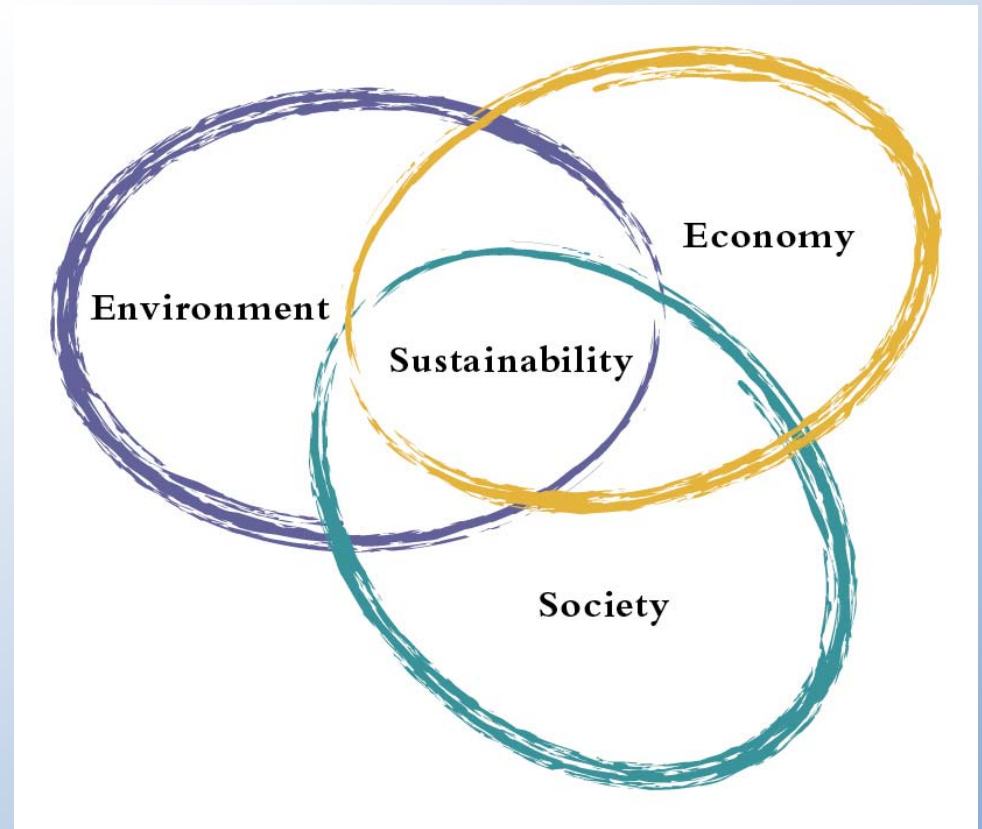
Form 43-101F1 Guidelines for Section 20

- (a) A summary of the results of any environmental studies and a discussion of any known environmental issues that could materially impact the issuer's ability to extract the mineral resources or mineral reserves;
- (b) Requirements and plans for waste and tailings disposal, site monitoring, and water management both during operations and post mine closure;
- (c) Project permitting requirements, the status of any permit applications, and any known requirements to post performance or reclamation bonds;
- (d) A discussion of any potential social or community related requirements and plans for the project and the status of any negotiations or agreements with local communities; and
- (e) A discussion of mine closure (remediation and reclamation) requirements and costs.



Sustainable Projects

- Environmental Liability
- Regulatory Liability/
Social Responsibility
- Project Costs

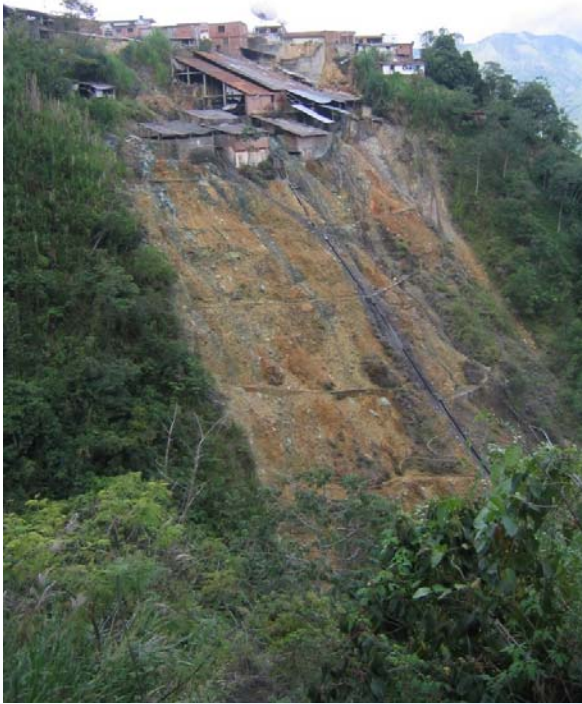


What questions is the geochemist having?

- How to assess water quality impacts while developing data?
- How to estimate related costs?
- Rising social and regulatory expectations?

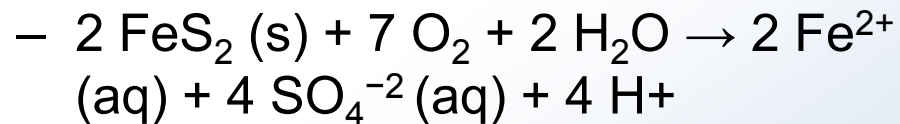


Corporate Legacy

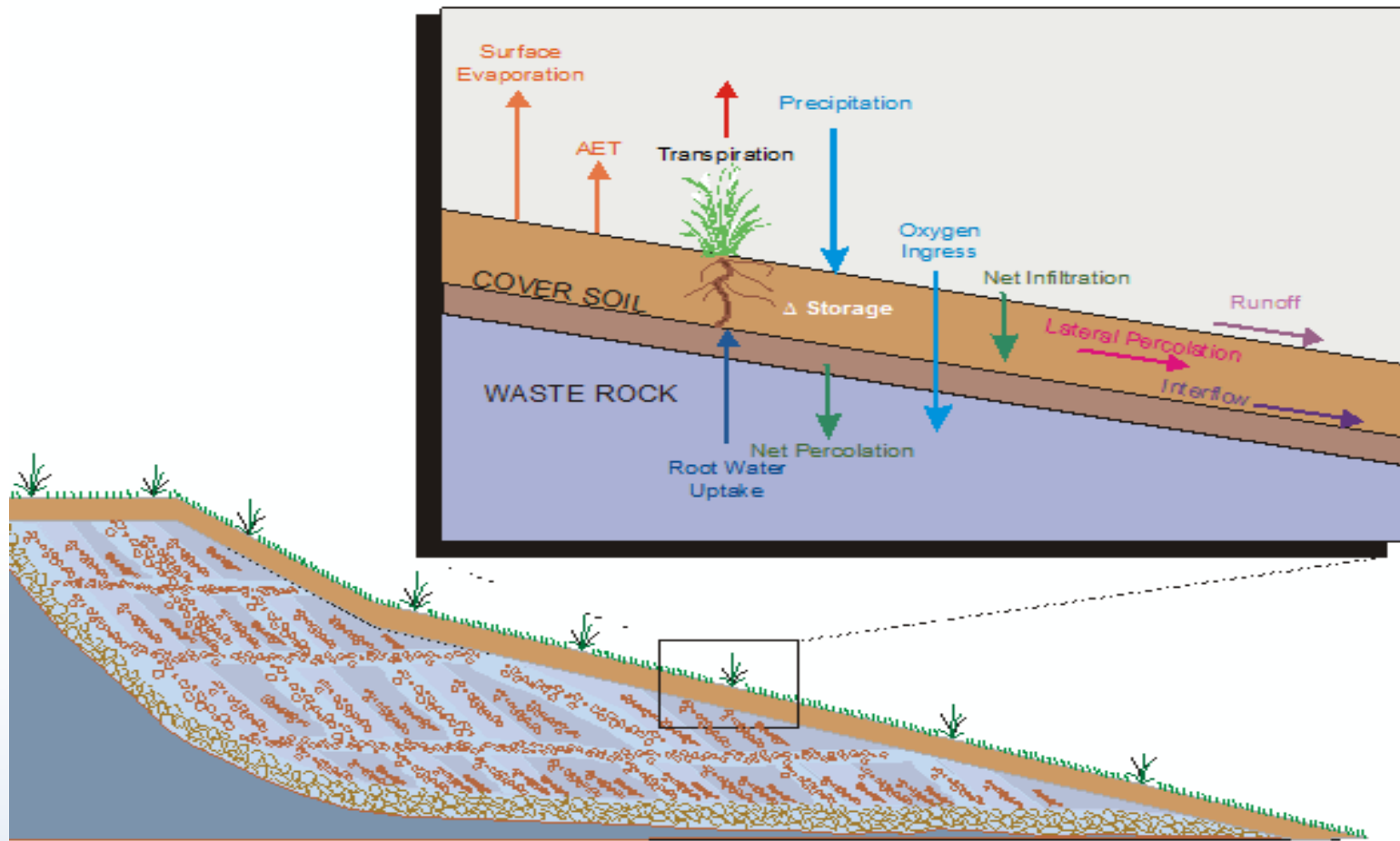


Possibility of Acid Rock Drainage

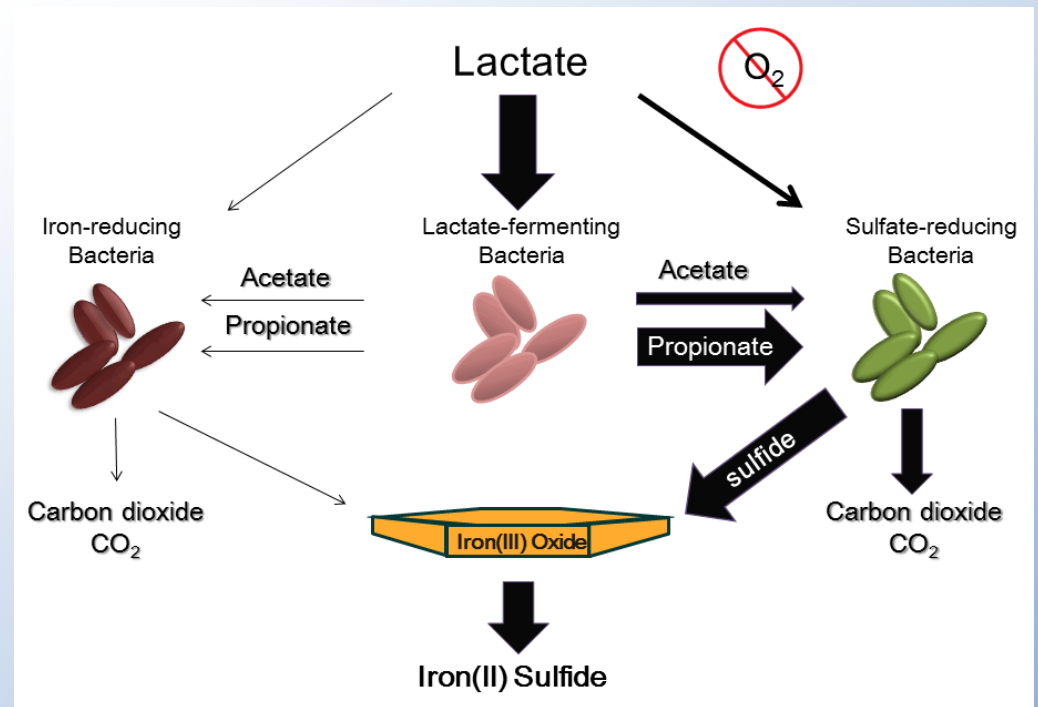
Formed by oxidation of sulfide minerals (e.g. pyrite)



Need for Segregation and Encapsulation - \$??



Water Treatment \$\$\$\$\$



http://www.bio.anl.gov/images/environbio/subsurface/reduction_iron.gif



But....compounded conservatism in feasibility
can kill a project...



Happily Swimming Kids!!

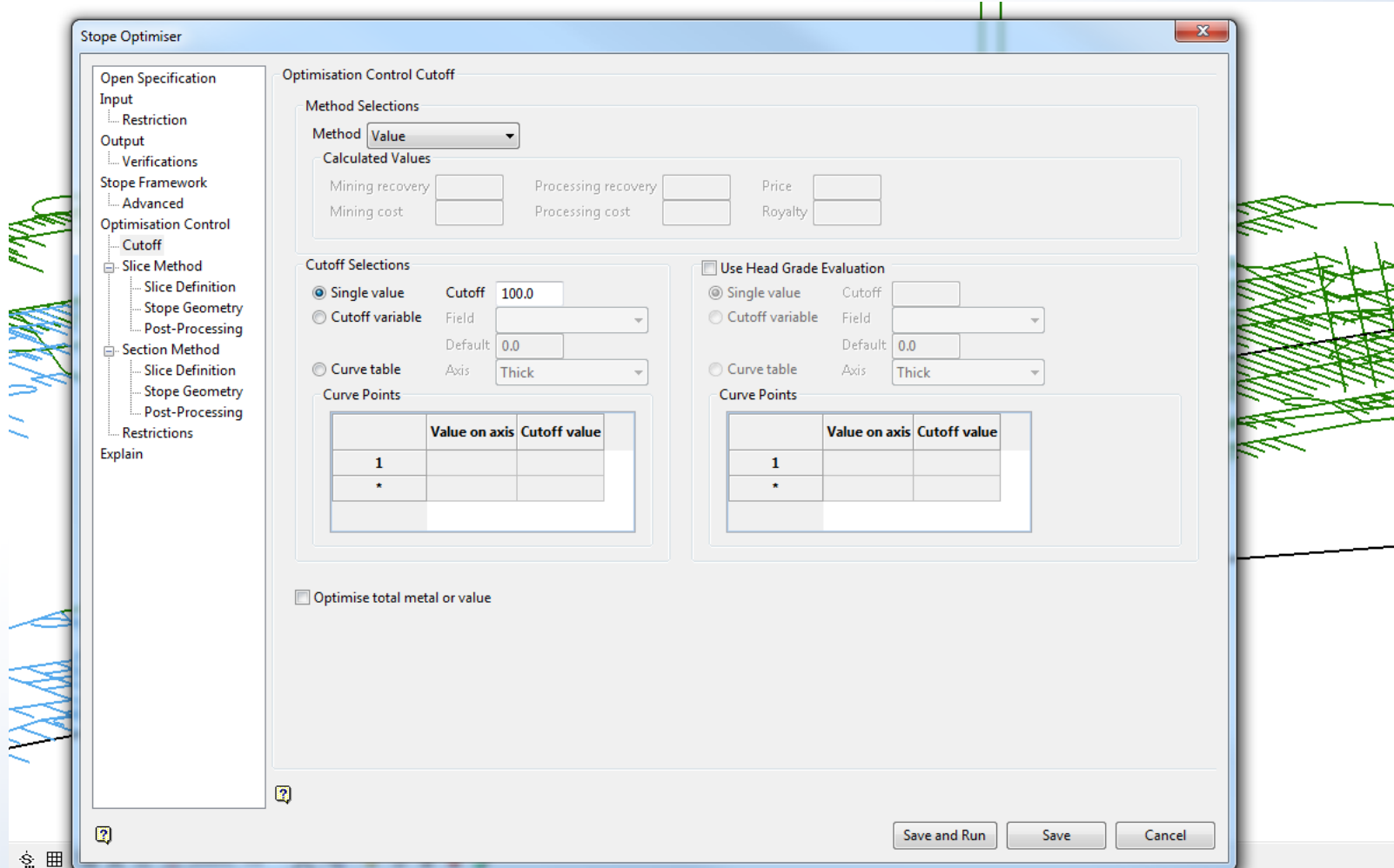


Closure Costs in Life Cycle

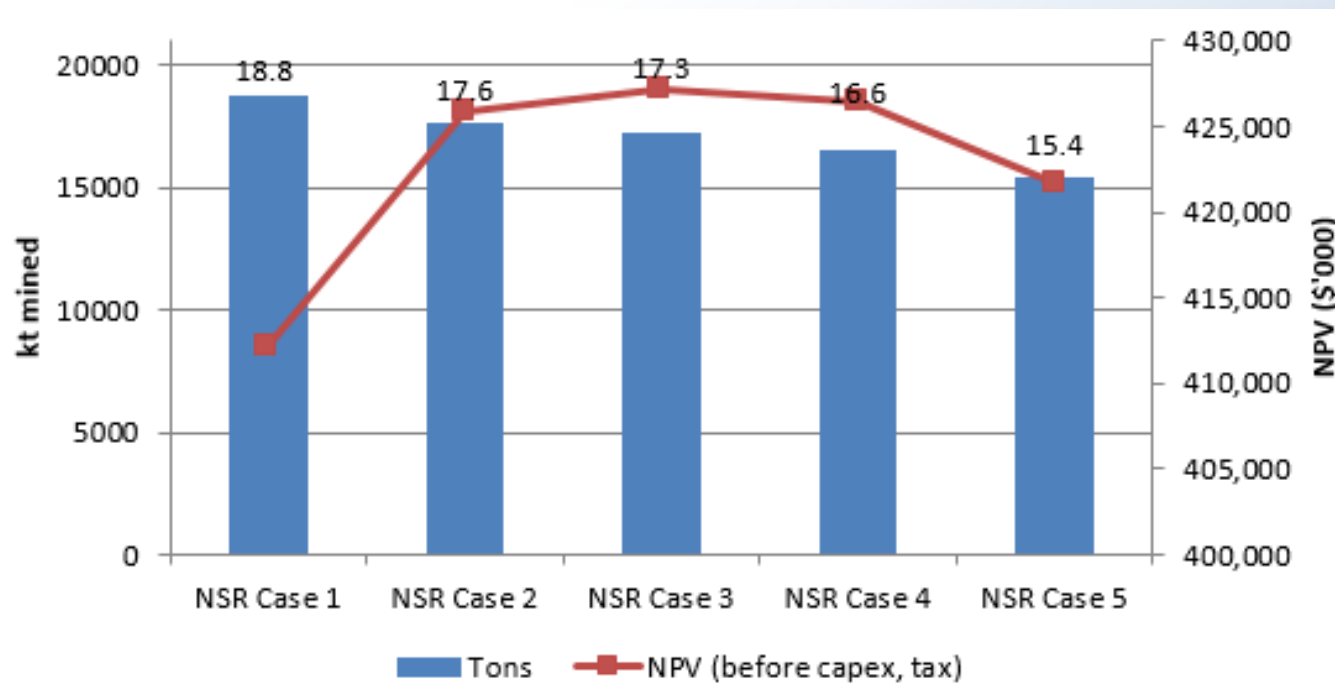
- NPV suggests defer closure costs til year Y instead of year X to maintain positive cash flow
 - Leaves closure to point in life cycle when cash flow is negative
- How does this relate to wealth preservation on the life cycle?



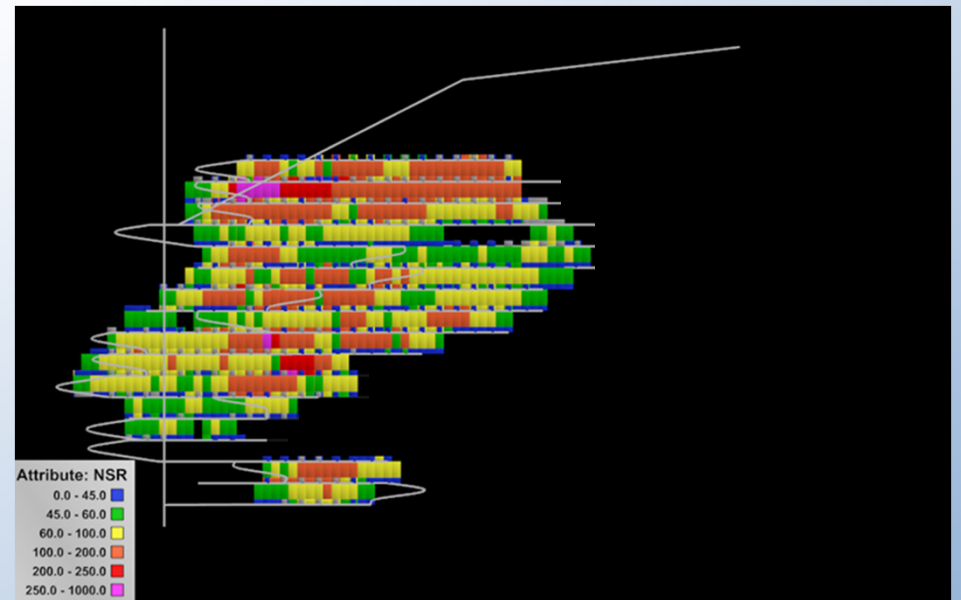
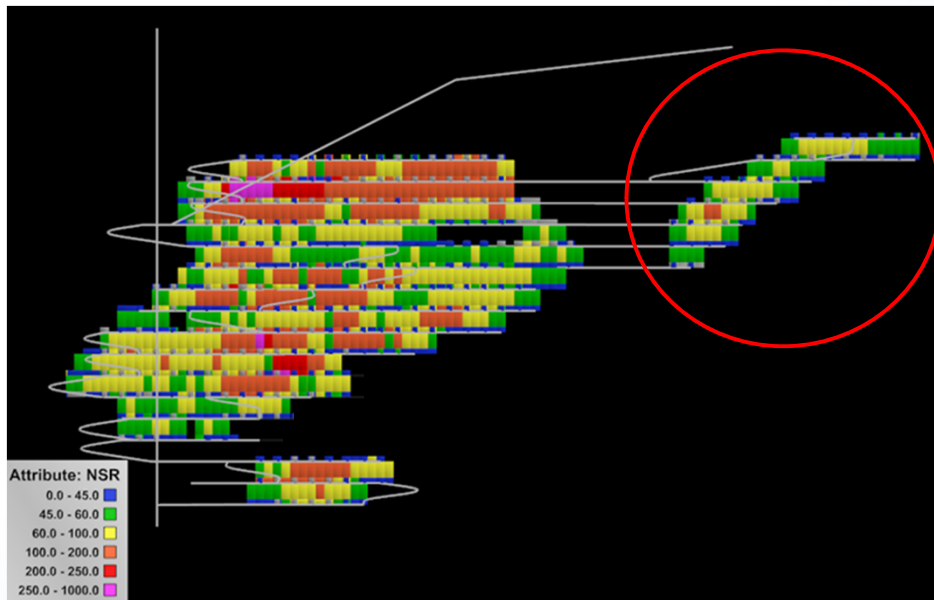
What if We Included Closure in the Optimization Process?



The NSR Cutoff Game



To mine or not mine the sulfide?

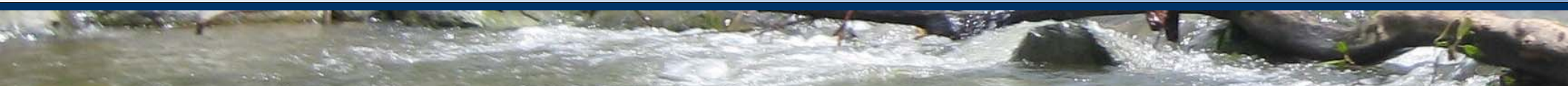
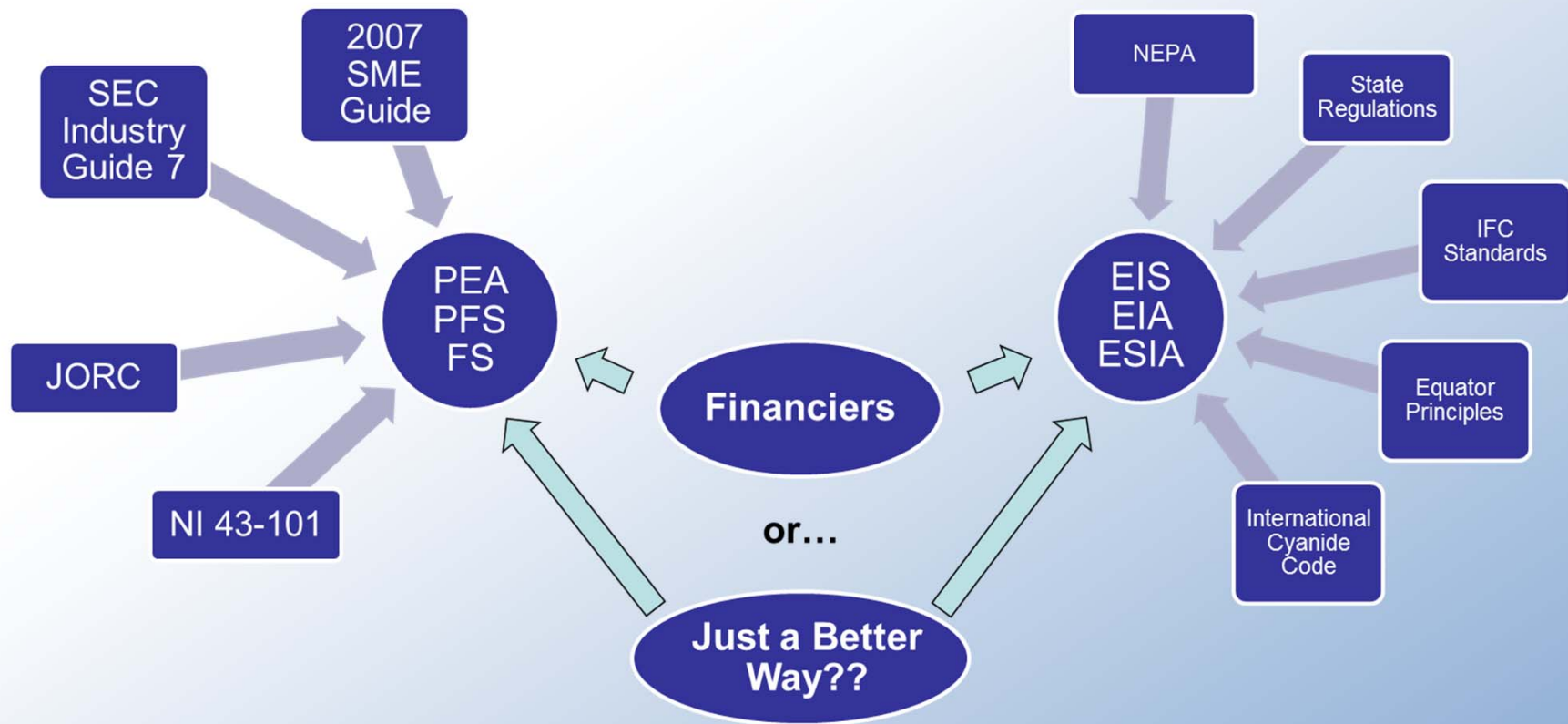


Is closure driving the design, or is the design driving closure?

- Planning engineers are pushed toward less footage, less waste development, streamlined design for operational and economic purposes, but closure is not fully in the picture.
- Goal of optimization is to maximize the value of the extracted mineral over the life of mine, but environmental and closure considerations must be factored into this process.
- The mine design is generally used to develop capital and operating costs, which can be extremely detailed right down to the amount of roof bolts used, but often lacks specifics on closures costs which can determine profitability.



We need to stop looking at these as two separate processes



Communicate and Optimize

- Improve communication to integrate environmental closure needs into early design
 - reduce unwanted expenses later in the life cycle
- Assess likely outcomes and manage risk for areas of particular concern



Disclaimer

- The mining company mentioned herein is fictitious. Resemblance to any other mining company is purely coincidental.
- All photos were taken from various real-life case studies.

