Can Environmental Stewardship be Profitable?

Advancing Solutions for a New Legacy
EPA Hard Rock Mining Conference
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What You Will Hear

- The legacy of the past
  - Sustaina-what?
- Why Change?
  - Regulatory Drivers
  - Corporate Responsibility
- The new legacy
  - Design for Closure
  - Life-Cycle-Profatability
- How it works
The Legacy of the Past

- Narrow profit margins dictated corporate environmental policy
- Low front end costs
- High closure liability
The Legacy of the Past

- Philosophy of “perpetual care” (containment) vs. real “closure”
- Environmental resource inventory not considered
- The value of natural resources not considered into life-cycle profit analysis
- Plant decommissioning fails to consider value of equipment to support closure activities
Geosyntec consultants

Why Change?
Why Change?

**Regulatory Trends**

- Permitting requirements trending toward stricter environmental controls
- Closure/Remediation focus on “Source control and Removal”
- Long-term “management” not accepted
- CERCLA Bonding requirements
  - Requiring “Worst Case” scenarios
  - Requiring care in perpetuity
Why Change?

SEC Regulation Trends

- Environmental liability estimating requirements
- Liability reporting requirements

Mining Industry Trends

- Focus toward “responsible mining”
- Positive public perception
- Balancing performance with risk
- Investor pressure to maximize profits
The New Legacy
Environmental Stewardship
The New Legacy – Think Different

The New

- Philosophy of Life-Cycle accountability
- Mine “conversion” vs. “closure”
- View environmental resources as ASSETS not liabilities
- Integrate effective links between exploration, production, closure, and conversion
- All processes centered around Environmental Stewardship

The Old

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- Environmental resource inventory not considered
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“Respect for the environment is central to our approach to sustainable development. Wherever possible we prevent, or otherwise minimise, mitigate and remediate, harmful effects of the Group's operations on the environment.”
(http://www.riotinto.com/ourapproach/17194_environmental_stewardship)

“...our goal is to minimize our environmental footprint and safeguard the environment, now and for future generations. Responsible environmental management is central to our success as a leading gold mining company and we seek to continually improve our performance.”
(http://www.barrick.com/CorporateResponsibility/Environment/default.aspx)

“Our employees are committed to responsible mining practices that protect and enhance air and water quality and biodiversity. Hecla will continue to be a leader in environmental practices by implementing appropriate energy conservation and waste reduction programs.”
(http://www.hecla-mining.com/responsibility/responsibility_stewardship.php)
Stewardship Elements – A wide range of approaches

Respect for the Environment

- Take inventory
  - Air, water, land, ecology
- Assess impacts
  - Resource consumption
  - Resource modifications
- Operations response
  - Reduce, reuse, recycle, reclaim
- Closure restoration
  - Leave no footprint behind

Minimize Environmental Footprint

- Quantify inventory
  - Develop metrics
- Calculate impacts
  - Establish performance goals
- Value engineering
  - Balance performance/risk
- Design operations
  - Build-operate environmental controls
- Monitor performance
- Reclaim and restore
The Opportunities for the Future

Better planning => increased project life-cycle profits

- Increased planning, capital, and compliance costs $$\textdolar$$
- Reduced environmental impact (liability) $$\textdolar$$
- Reduced Environmental Footprint $$\textdolar$$
- (retained PROFIT)
How It Works
Environmental Stewardship
The Old Legacy

- Key to success is taking a **Life-Cycle Perspective** of all elements of environmental stewardship.

- **Traditional Approach:**
  - **Exploration**
    - Pre-Feasibility Exploration
    - Feasibility Studies
    - Conceptual Planning
  - **Mining**
    - Design
    - Permit
    - Operate
  - **Closure**
    - Decommissioning/Demolition
    - Closure
    - Restoration
The New Legacy - Think Different

State of the practice Approach:

- Exploration
- Environmental Stewardship
- Mining Operations
- Conversion
- Closure
Step 1: Develop a Vision

- Environmental resource assessment
- Mining vision
- Closure, restoration, “End-State Vision”
Step 2: Identify critical mining operation facilities

- Waste rock dump
- Tailings pond
- Heap leach pad
- Process water treatment system
- Process water disposal pond
- Storm water runoff management pond
- Ore conveyance system
Step 3: Identify/Quantify environmental impacts

- Greenhouse gas emissions
- Wastewater discharges
- Sensitive species
- Stormwater runoff
- Groundwater resources
Step 4a: Operations “Design for Closure”

- Integrate environmental controls
- Compliance with permit conditions
- Minimize releases to environment
- Minimize waste generation
- Maximize reuse and recycling
Step 4b: Value engineering

- Reduce overall environmental resource damage, closure cost, and toxic tort liability
- Maximize resource reuse/recycling
- Water recycling-reduce reliance on groundwater
- Recycle-reuse waste rock overburden
- Minimize generation of hazardous waste
- Material management
- Protect groundwater resources
- Coordinate transition from operation to conversion
- Maximize value of deployed assets
Step 5: Develop Closure Plan and Cost Estimate

- Realistic Case scenario vs. worst case scenario
- Integrate operational controls with closure elements
- More robust environmental program results in lower closure cost; reduced toxic tort liability
- Compatible with long term benefits
Properly designed impoundments

- Reduces releases to the environment
  - Groundwater remediation cost lower
  - Less loss of product
- Reduces operational costs
  - Fewer emergency responses
- Facilitates closure
  - Integrated design
Surface Water Management

- Emphasize in-situ and natural processes
  - Constructed wetlands
  - Flow through gravel bed reactors
- Treat at source not property line
  - Reduces impact zone
- Capture, recycle, reuse
Water treatment and recycling

- Develop water management plan
  - Identify needs and resources
  - Groundwater supply
  - Surface water supply
  - Waste water recycling

- Water treatment technologies
  - State of the art treatment technologies
  - Minimize operational requirements
  - Minimize waste by products
Conclusions

Environmental Stewardship

- Reduced closure cost and bonding
- Reduced toxic tort exposure
- Better governmental and public relations
- INCREASED PROFITS
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