

**GOLDER**

# **Anticipating the True Costs of Mine Closure Reclamation**

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# AGENDA

- **Safety Share**
- **Shortfalls of Typical Cost Estimates**
  - **Typical Cost Estimate Bases**
- **Why an Accurate Estimate is Important**
- **Components of Reclamation Cost Estimates**
- **Case Studies**
- **Conclusions**



# Primary Shortfalls of Reclamation Estimates

- Shortfalls observed in reclamation estimates:
  - Can be several years out of date.
  - Neglecting major cost categories.
  - Not based on a balanced regrade surface.
  - Using improper equipment allocation.
  - Not including requisite technologies like geomorphic recl.
  - Not including monitoring/liability period.
  - Not adjusting to work in a post-mine closure scenario.

# Typical Estimates Bases: Bond Estimates

- Bond Estimates:
  - Do not include bond premium costs.
  - Do not typically include monitoring & maintenance.
  - Assume contractor is performing work (Davis-Bacon).
  - Legacy overhead costs often not included.
  - Based on closure during current 5-year permit window.

# Typical Estimates Bases: AROs

- Asset Retirement Obligations (AROs):
  - Assume contractor is performing work (Davis-Bacon).
  - Satisfying minimum SEC requirements can result in failure to anticipate all costs likely incurred.
  - Can be internal pressures to limit liability estimate.
  - Productivities based on theoretical values, as opposed to engineered estimates.

# Why Maintaining an Accurate Estimate Matters

- Often reclamation is funded during mining operations.
- Once final reclamation begins, primary positive cash flow stops; obtaining additional funding can be difficult.
- Accurate planning reduces negative impacts to management, shareholders, & stakeholders.
- Insures funds are available to do the required work.

# Components of Typical Reclamation Estimates

- Primary earthworks - backfilling & grading
- Tailings facility management & other mitigation
- Final grading / geomorphic reclamation
- Topsoil replacement
- Revegetation/planting, irrigation
- Facility removal
- Monitoring & maintenance
- Other costs: bond premiums, permit compliance, & so forth
- Overhead & profit components
- Taxes & royalties

# Backfilling & Grading

- Proper Post Mining Topography & Final Surface Configuration:
  - Drainage, ramps, surface gradients, mass balance.
- Equipment Productivities:
  - Availability, utilization, productivity, maintenance.
- Equipment allocations:
  - Dozer, truck/loader, scraper? Use current fleet? Lease?
  - Is production fleet the best fit for the work?







# Tailings Facility Management & Other Mitigation

- Similar concerns to backfilling & grading.
- Tailings material compaction.
- Depth of cover material (minimum versus stability).
- Drainage controls.
- Long-term monitoring & maintenance.
- Underground subsidence mitigation.



# Final Grading, Topsoiling, & Revegetation

- Final grading & geomorphic reclamation:
  - Low Productivity, often includes rework
- TS Material Balance: stockpiled volume / disturbed area = average thickness. Greater than permit requirements?
- Topsoil haulage & spreading:
  - Proper equipment allocations – smaller than on site?
- Revegetation failure rates.
- Irrigation – none? 1 season? more?









# Facility Removal

- Some legacy items can have large remediation costs (Asbestos, PCBs, soil contamination, & so forth).
- Often performed by contractor.
- Minor satellite facilities often neglected in estimates.
- Particularly for underground mines, many small discrete areas can increase mobilization costs.

# Monitoring & Maintenance, Bond, Permitting, etc.

- Monitoring & Maintenance periods often lasts more than a decade based on state/federal requirements:
  - Some can last even longer, particularly water discharge
- Bond Premiums often underestimated in cost & duration.
- Permit compliance, engineering costs can continue.
- Taxes & royalties properly applied?
  - Some leases include royalties on reclamation costs.



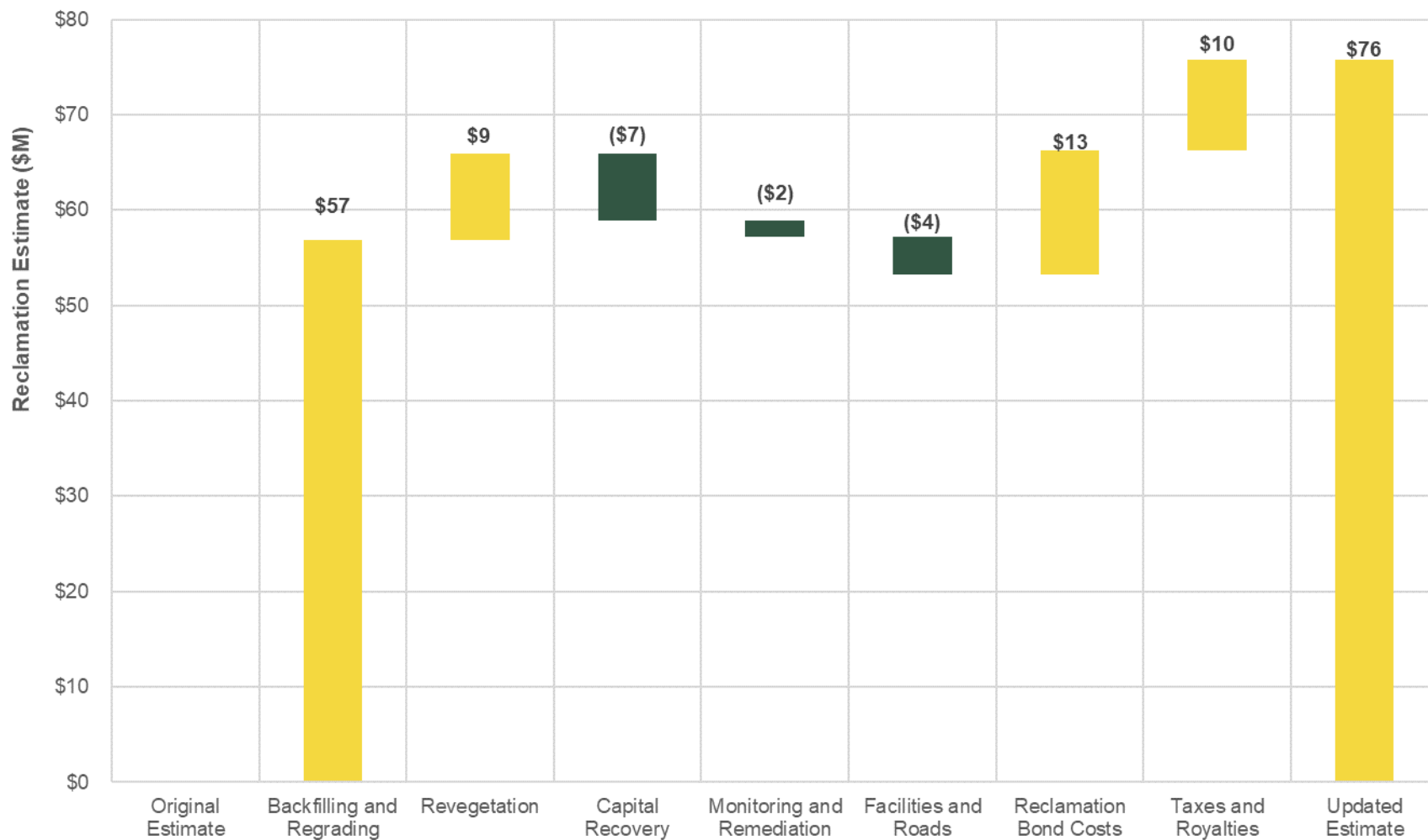
# Case Study A

- Last Internal final closure estimate before closure:
  - Based on production unit costs & productivities.
  - Did not have balanced surfaces.
  - Drainage construction/Final Grading not properly accounted for.
  - Facility closure & remediation not fully anticipated.
- Final Reclamation Cost has been approximately three times the initial, internal estimate.

# Case Study B

- External final closure estimate:
  - Volumes & units costs for grading underestimated.
  - Productivity & Availability during closure overestimated.
  - Revegetation work effort & costs underestimated.
  - Reclamation bond costs underestimated.
  - Taxes & Royalties underfunded because of above.
- New estimate is approximately \$76 Million more than the previous estimate.

# Case Study B Waterfall (\$M)



# Conclusions

- As mine closure approaches, proper reclamation planning & funding are critical.
- It's important to recognize that work conditions & productivities during final closure will differ from those experienced during production.
- Recognize all indirect costs during closure period.
- Fund toward life of asset scenarios.
- Optimistic balance sheets using underestimated mine closure liability loses appeal when faced with closure underfunding



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**Thank you. Questions?**