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Secondary Gold Recovery & Reclamation of Historic Mine Properties

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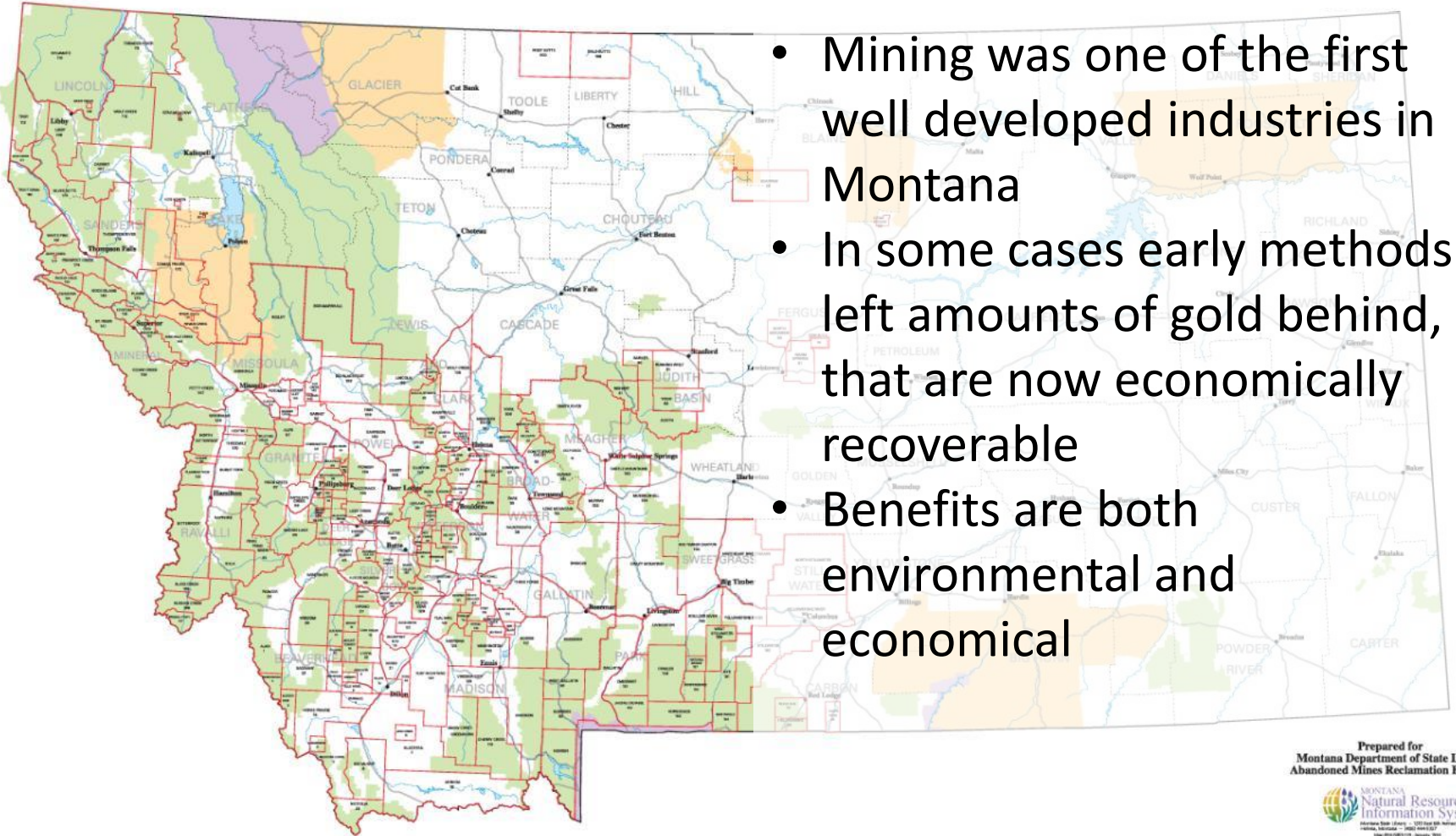


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Historic Mining

- Mining was one of the first well developed industries in Montana
- In some cases early methods left amounts of gold behind, that are now economically recoverable
- Benefits are both environmental and economical



Prepared for
Montana Department of State Lands
Abandoned Mines Reclamation Bureau

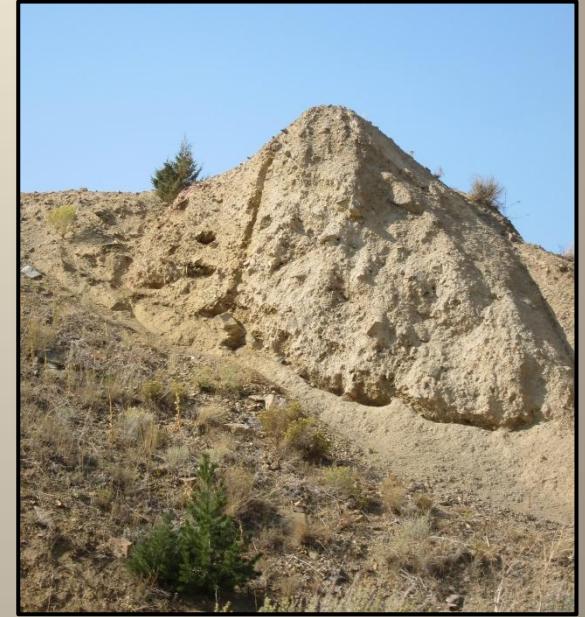


Implementing GSM Outside Ore Program

- Former mine manager Mark Esto started the program in 2007-2009, until the mill shut down. In May 2011 Tim Dimock and John Childs / Childs Geoscience Inc. restarted the program.
- Expansion of the program has continued successfully through the present.

Mine Dumps

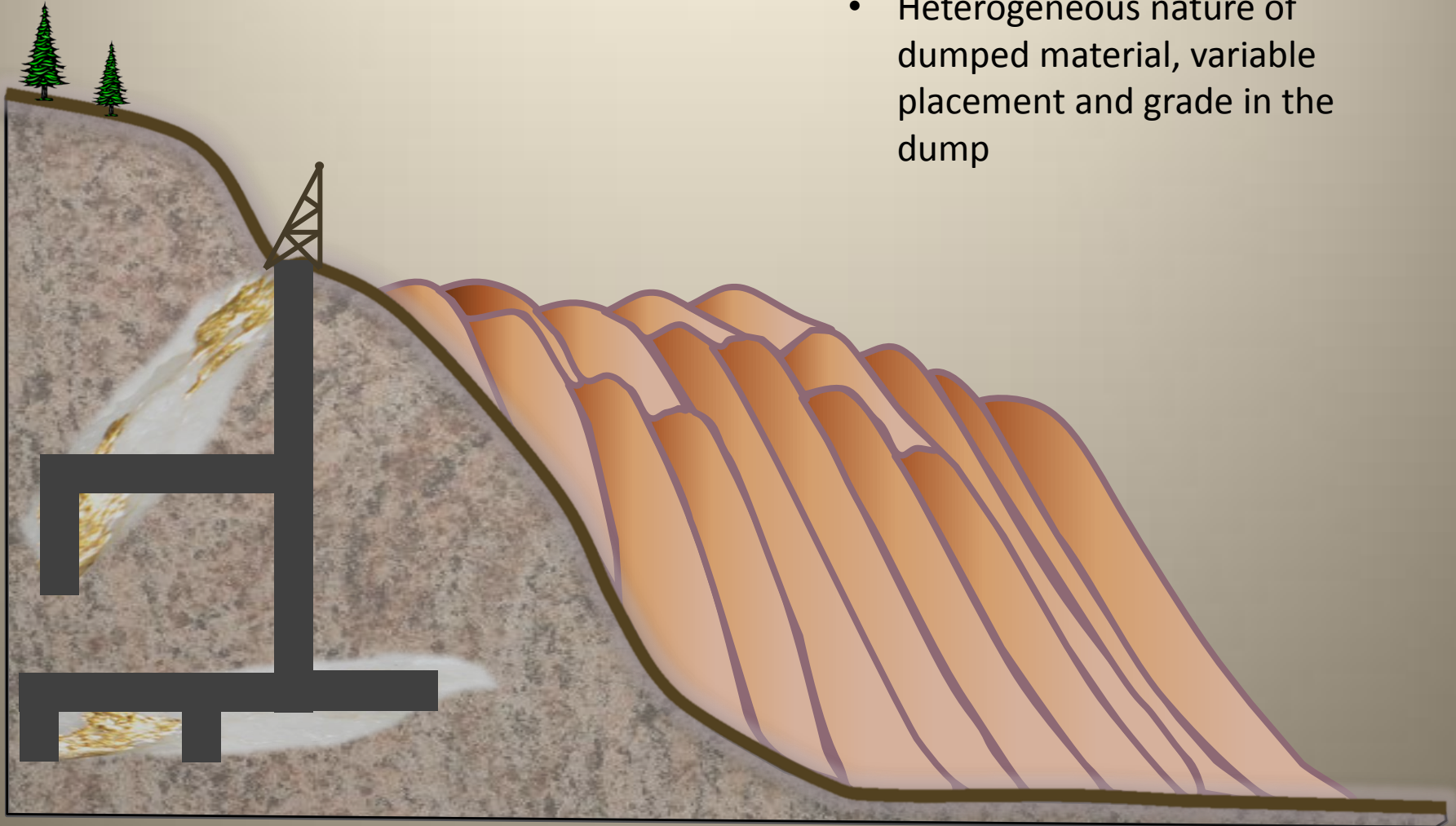
- Vary in size and shape
- Grades vary between and within dumps



- Typically Located downslope of the shaft, some occur in drainages
- Access to dump sites can be difficult and restricted by topography

Conceptual Dump Genesis

- Heterogeneous nature of dumped material, variable placement and grade in the dump

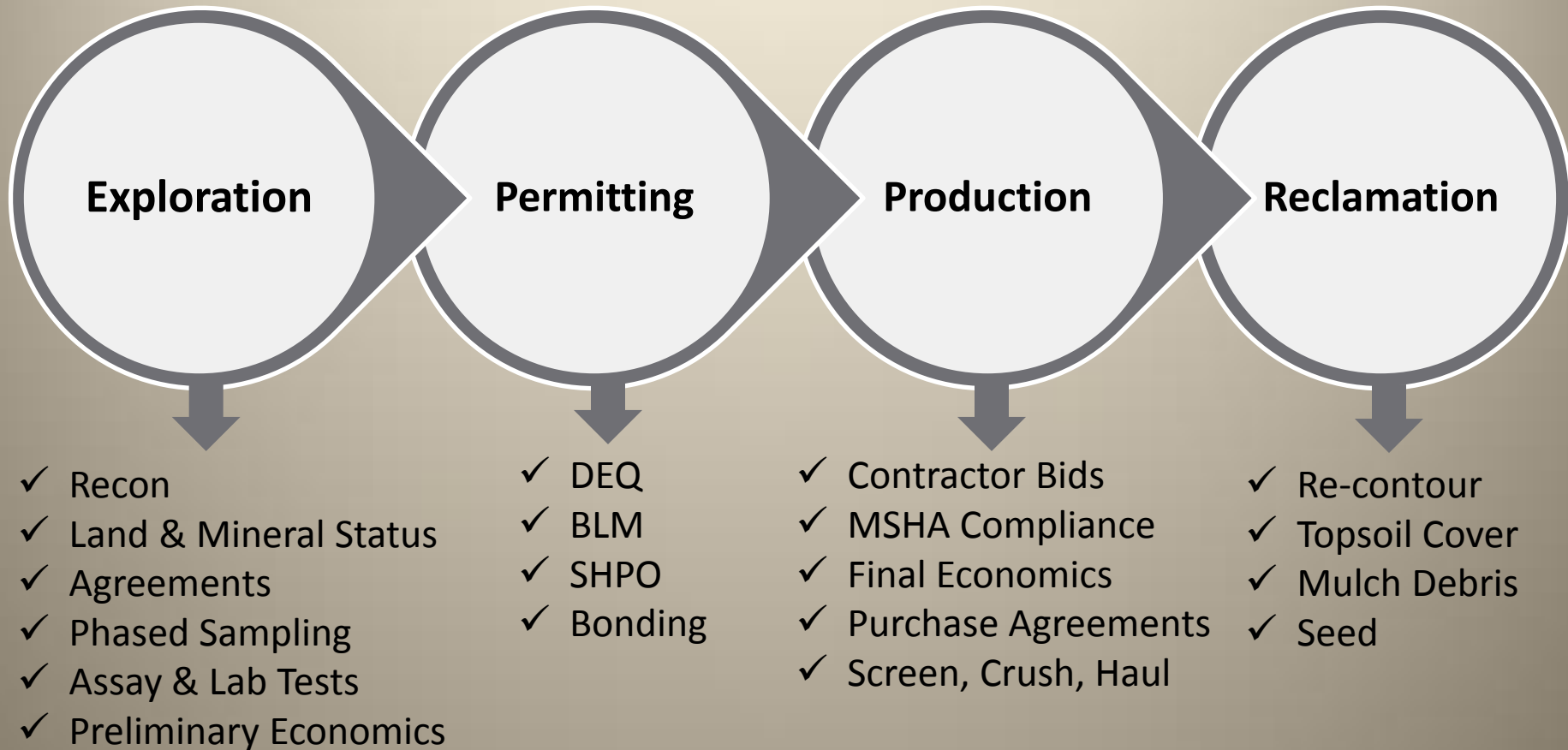


Benefits of Processing Mine Dumps

Economic & Environmental

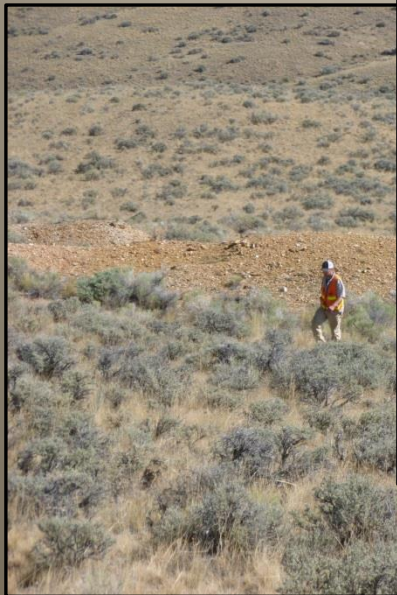
- Removal of historic waste from landscape
 - Waste deposited in modern tailings facility
 - Land reclaimed to nearly pre-mining state
- Positive economic impact
 - Employment of multiple mine industry positions, i.e. local contractors, geologists, etc.
 - Local influx of money via jobs and expenditures
 - Sites targeted as abandoned mine clean up projects save taxpayer money, by privately clearing the sites of dumps and tailings

Mining a Dump – General Process



Exploration

- Phase I – preliminary research, mapping of targets, tonnage/volume estimates, access agreements, field grab samples and lab assays
- Phase II – Data reconciliation, refining targets, trench sampling and lab assays



Data Analysis and Reconciliation

- Following exploration results, detailed analysis of collected data is undertaken.
- Bottle Rolls and multi-element analysis conducted at accredited laboratories.
- GSM Replicates the Bottle Rolls and multi-element before accepting an ore purchase agreement.
- Multi-element analysis results are given to DEQ for their ok, of the material being shipped.

Permitting

- Various phases of permitting
 - SMES or Exploration permit
 - Land owner agreements
- Agencies involved varies by claim type
 - Patented, Unpatented Claims
 - Land Surface & Mineral owners
 - DEQ, BLM, USFS, SHPO

Production

- Fractions of the dump include oversized coarse, coarse to crush, and fines
- Construct necessary temporary roads, remove possible debris from dump
- Crush and/or screen material & stockpile to ship
- Following mine plan/dig map & grade control
- Conduct check assays, ship to Golden Sunlight

Production



- Processing and screening in place at Reclaims' Boaz project

Production



- Articulated haul truck moving material from dump to staging area for screening and shipping from the Hard Cash project

Reclamation

- Reclamation was not required until after FLPMA (Federal Land Policy Management Act) was in place ~1979
- Processing, shipping and removing legacy dump material has in some cases resolved issues with historic mine dumps
- Example is the “Hard Cash” project which had a dump eroding into Keating Gulch, removal of that dump saved an estimated \$800,000 in taxpayer money

Reclamation



- Reclamation improves the landscape by removing historic legacy material, some of which have potential for ARD.
- Mitigates safety hazards on historic sites.

Reclamation



- Hard Cash Before and After
- Project on BLM ground that saved tax dollars slated for mine legacy material clean up

Reclamation



- Dump centered in photo was completely removed and topography re-contoured and seeded

Reclamation



- Debris is cleared off the site, disturbed vegetation is shredded and used as mulch spread back into the landscape

Interest in Accepting Outside Ore

- Reclamation of legacy dumps and tailings
- Reclamation of landscape
- Overall benefit to the region and Montana
- Builds a positive relationship and helps to support Montana communities



From the supplier:

- Proof of ownership
- Verification that it is not open pit ore.
- Assay, Recovery, and a multi-element analysis of a representative sample.

Barrick's additional testing

- The representative sample is assayed to verify grade.
- A bottle roll that mimics our mill process is performed.
- A 600 g sample is sent out for ICP analysis.

Barricks Constituents of Concern



BARRICK

Due to Barrick's safety concerns with transporting material with higher constituent values, we will only accept these elements up to these levels.

Constituent	Maximum Acceptable Level	Unit of Measure
Mercury	1	ppm
Arsenic	200	ppm
Lead	100	ppm
Zinc	200	ppm
Total Copper	1,000	ppm
Cyanide Soluble Copper	250	ppm
Selenium	1	ppm
Barium	500	ppm
Chromium	100	ppm
Cobalt	100	ppm
Nickel	100	ppm
Cadmium	1	ppm

Customer Evaluation Matrix



Safety	Does the operator have a worker safety plan?
	Does the site have the potential to impact residents?
Environmental	Does the site have the potential to impact surface water?
	Does the site have the potential to impact air quality?
	Reclamation
	Project duration
	Legacy material
Community	Employment Opportunity
	County
	Publically funded clean up
Production	Grade
	Recovery

- GSM evaluates each customer's Ore site for these criteria.
- The sites are then scored and prioritized based on this criteria.

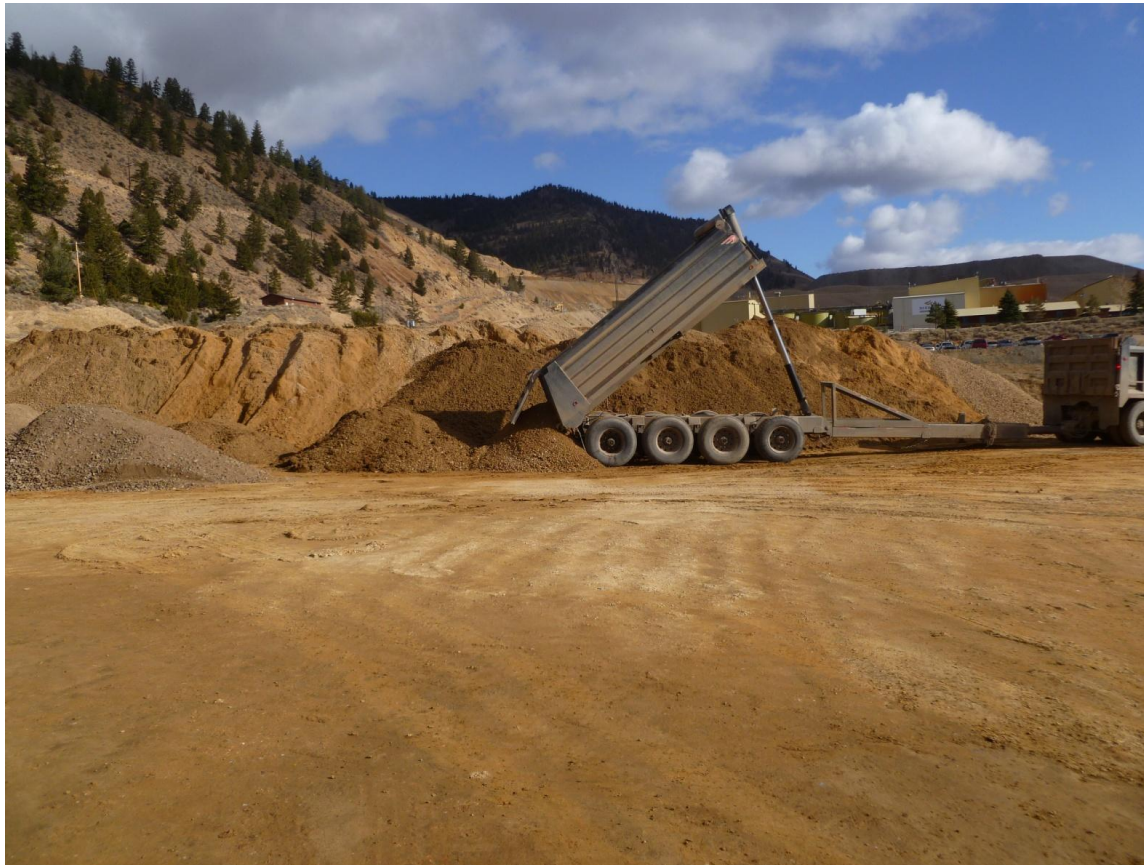
- Once the Ore is approved, the contracts are signed and the material must be crushed small enough to pass through a two inch screen.
- Hauling then commences, and the material is deposited on GSM's Toll Ore Pad for holding until it can be processed.
- The material must be free of organics and metal debris.

Receiving Trucks:

A truck Gross weight is recorded when the trucks arrive on site loaded with Toll Ore materials.

The Tare (empty) weight of the truck is subtracted from the Gross weight to calculate the total net Ore received for that truck.

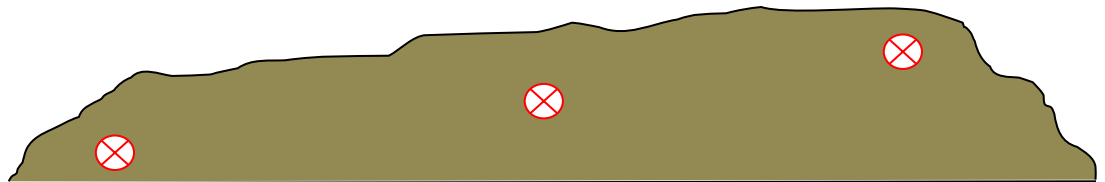




Example of an End-dump truck delivering Ore.

Ore Sampling

- A 20-30 lb. sample is taken by using small scoops from high, middle, and low points of the ore pile, as shown below.
- This is done on each side of the pile.
- A total of six or more scoops will make up the sample.
- With the shovel, the outer material is scraped away before taking a sample at each of the six locations on the ore pile.





Example of an empty haul truck, recording the Tare weight of the truck as they leave the site.

Truck Sample Processing



Samples are crushed and pulverized to 75% passing a 200 mesh screen, and placed into sample cups to be "fired."

These samples are then weighed at 1 Assay ton (29.17g) in triplicate and are individually fluxed and "fired" in a 2000 degree F oven, to melt the silica and metals.



Truck Sample Processing



After an hour in the furnace, the samples are poured (shown on the right); producing a lead button and slag.



The slag and the lead button are poured into molds and the slag is knocked off, and the lead buttons are cupelled.



Truck Sample Processing



The cupellation process yields a ~ 1 mg Pd/Au/Ag bead that is digested in aqua regia and diluted to 20 mLs to read on the AA (Atomic Absorption) Spectrometer.

These samples are then read on the AA and the average of each truck sample is reported to the customers, along with tonnage, oz contained, and % moisture of each truck received.



End of Month Testing



All of the months truck samples are compiled into a composite (weighted average) for bottle roll testing.

- The bottle rolls are a 48 hour leach with a CN solution that mimics the Golden Sunlight Mine mill process.
- This test gives us the recovery % for that material.



End Of Month Testing



The solutions and the solids are tested for Gold and silver content for calculating the recovery of the Ore.



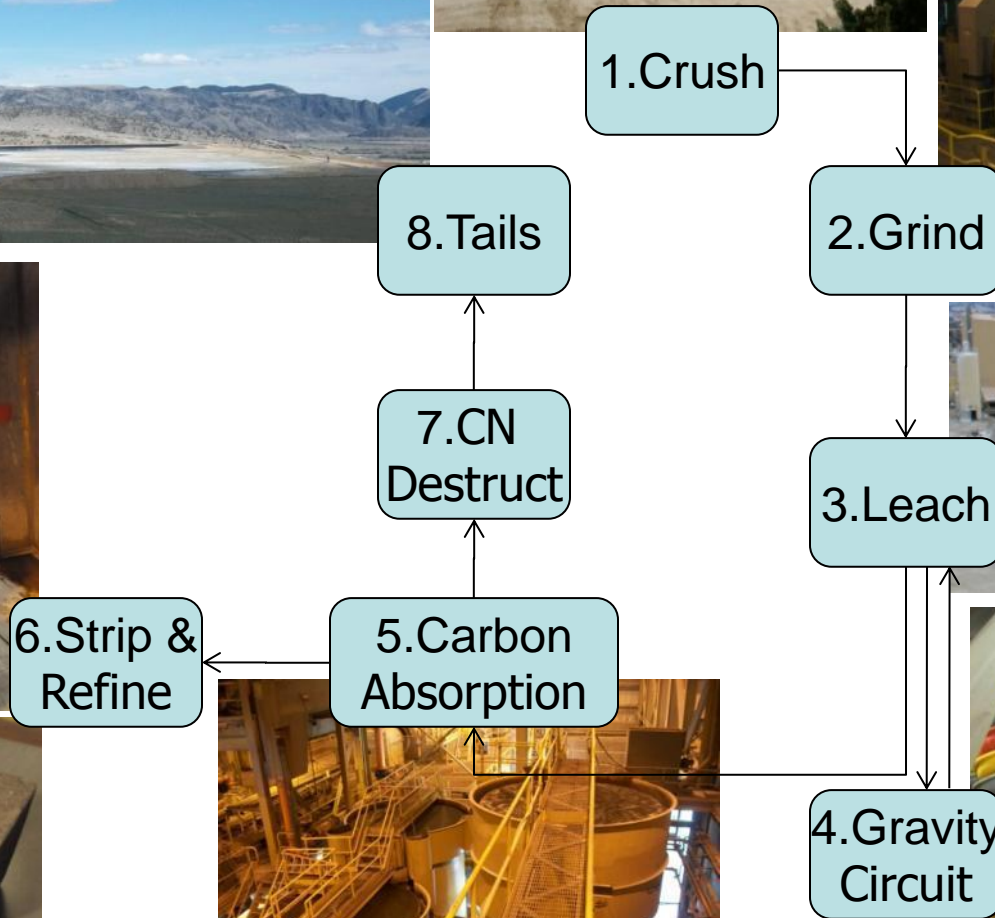
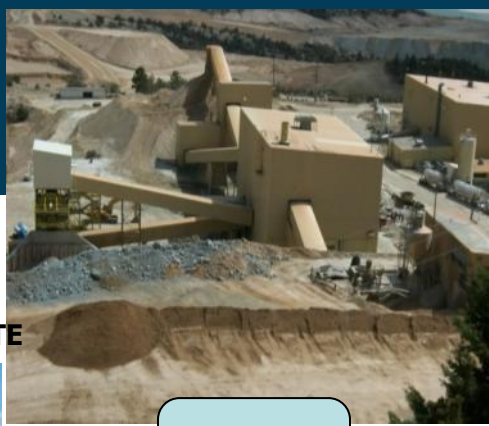
This % recovery will determine the recovered ounces that we will pay the customer on for that month.



Processing



INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE



Mill Operation



- 7600 tons/day mill through put
- Three stages of crushing
- Rod mill – ball mill - cyanide and lime added to slurry
- Vat leach (44-hour retention time)
- Cycloned (Wash circuit)
 - Sands (cyclone underflow) to sand tailing retreat (STR)
 - Spirals to separate pyrite
 - Regrind pyrite and leach
 - Slimes (cyclone overflow) to thickener
 - Thickener overflow to carbon columns
 - Thickener underflow to carbon in pulp (CIP)
- Gold stripped from carbon in pressure vessels
- Steel wool cathode electrowinning
- Refinery - Doré – 70% gold; 10% silver
- Mill tailings - Inco cyanide destruction

Refining



Toll Ore Program Totals 2011-Present



Year	Tons	Total paid out
2011	107,724.7	\$ 10,113,847.00
2012	237,446.1	\$ 17,577,764.00
2013*	31,826.4	\$ 3,775,978.83
sum	376,997.2	\$ 31,467,589.83
*YTD by March 31st, 2013		

- Golden sunlight accepts 18,000 Tons of Toll milling material every month, which translates to roughly thirty two-30 T trucks.
- The Toll Ore Program has paid out a total of \$31 million in the past three years that has gone back into the community.
- This program has also removed 377 thousand tons of legacy material from existing dump sites and relocated this material into GSM's modern tailings facility.

Summary



- Identification of Historic mine dumps
- Land use agreements, sampling, assay & lab work
- Process and ship to Golden Sunlight Mine
- Safe operations that leave a reclaimed landscape for safer use
- Positive environmental and economic impact for Montanan communities