

PROJECT UPDATE

PARROT TAILINGS WASTE REMOVAL PROJECT

SITE CHARACTERIZATION

In the summer of 2009, the Montana Natural Resource Damage Program (NRDP) and the Montana Bureau of Mines and Geology (MBMG) conducted a drilling/groundwater analysis investigation to determine the nature and extent of the contamination in and around the old Parrot Smelter site. This study provided valuable information about the waste types (slag, tailings, original soil horizon, alluvium, and groundwater). These results were published in MBMG Open File Report No. 590.



2009 MBMG Parrot Investigation—core sample containing tailings

This MBMG investigation provided State scientists with enough information for them to conclude that the Parrot wastes would continue to contaminate groundwater for many hundreds of years if not removed or contained. Not only are these waste sources a significant and ongoing contaminant source to groundwater, but they also threaten to impact the long-term surface water and instream sediment quality of Silver Bow and Blacktail Creeks.

More data was needed to better define conditions at the Parrot site in order to develop a waste removal plan. The data collected, allowed the design team to develop the “Parrot Tailings Removal Construction Management Quality Assurance Project Plan” or “QAPP”, which is the roadmap for the waste removal decisions.

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These periodic updates are intended to provide information about activities at the Parrot Tailings Waste Removal Site.

WASTE TYPES

Overburden at the Parrot site is generally clean material that was placed on top of the Parrot Smelter wastes by the Anaconda Copper Mining Company in the late 1950's through the 1960's. This material was removed from East Butte in order to expose the Berkeley Pit ore body. This overburden is primarily Butte Quartz Monzonite and typically "passed" the removal criteria, was stockpiled, and then used as backfill in the bottom of the excavation.

Slag is a heavy black/brownish waste tapped and drained from the furnaces during the smelting process. Slag consists primarily of silica, iron, zinc, and other metals. Once slag has cooled, it becomes very hard, yet brittle and its fragments are sharp. Laboratory tests conducted on Parrot Smelter slag revealed that metals do leach from it, some samples contained over 1% copper. As such all Parrot slag was treated as a waste product and placed into two onsite repositories. The repositories are about 6 to 8 feet above the water table. At the end of Phase II these slag repositories will be capped with an evapo-transpiration cover.

Tailings are a waste by-product from crushing and grinding the ore. The Parrot Smelter facility had a small concentrator with a vanning room and a jig room. The tailings from this process were conveyed into large piles south and west of the smelter. Tailings are similar to sand, and the Parrot Tailings varied in color from white, to yellow and orange. Some tailings samples contained over 3% copper. All the tailings material was hauled to a stockpile or another location on the Montana Resources (MR) property.

Organic Clay is the original soil horizon at the Parrot Smelter site. The fine, black soil absorbed the metals that leached from the tailings and slag. Some clay samples contained over 4% copper, as well as high levels of zinc, lead and other metals. The entire clay layer was treated as waste and hauled to the stockpile or another location at MR.

Alluvium is the fine sandy material below the soil layer. During the two investigations, metal contaminant levels in the samples of the alluvium varied widely. During the Phase I waste removal, much of the alluvium "failed" and was treated as waste and hauled to the stockpile or another location at MR.

Groundwater was not sampled/analyzed during the removal action, but it served as the lower vertical limit of waste excavation. Groundwater exposed to the surface during excavation appeared blue or green (typically an indication of high concentrations of copper). Exposed groundwater was isolated by temporary coffer dams to keep work areas dry.

Black slag pile atop a layer of white/yellow tailings. Excavation of contaminated materials continued to groundwater.



WASTE REMOVAL CRITERIA

The criteria used during the Parrot Tailings Waste Removal Project is basically the same as those the State used during the clean-up of Silver Bow Creek. The table below was applied to determine if excavated material “passed” and could be used for backfill or “failed” and was disposed of as a waste.

Table 2. Soil Screening Pass/Fail Criteria for Waste Removal			
Constituent	¹ Failure Criteria (mg/Kg)	XRF Failure Criteria (mg/Kg)	XRF Ceiling Criteria (mg/Kg)
Arsenic	200	≥ 241	Any single analyte above 5,000 mg/kg
Cadmium	20	As Zinc ≥ 3020	
Copper	1,000	≥ 1,240	
Lead	1,000	≥ 1,090	
Zinc	1,000	≥ 1,330	
¹ Butte Area One site investigations from Field Screen Criteria and Procedures Phase 7 and 8 Remedial Action, SSTOU Subarea 4, Reaches R and S (Pioneer 2011) mg/kg = milligrams per kilogram			

EXCAVATION CONTROL

The analytical requirements in the QAPP called for sampling and analyzing materials from:

- ♦ The interface between overburden and subsurface wastes (slag or tailings),
- ♦ The lower boundary of slag or tailings where it meets the original soil horizon (black clay), and
- ♦ The lower boundary between the black clay and unsaturated alluvium.

Clean materials could be segregated and used as backfill.

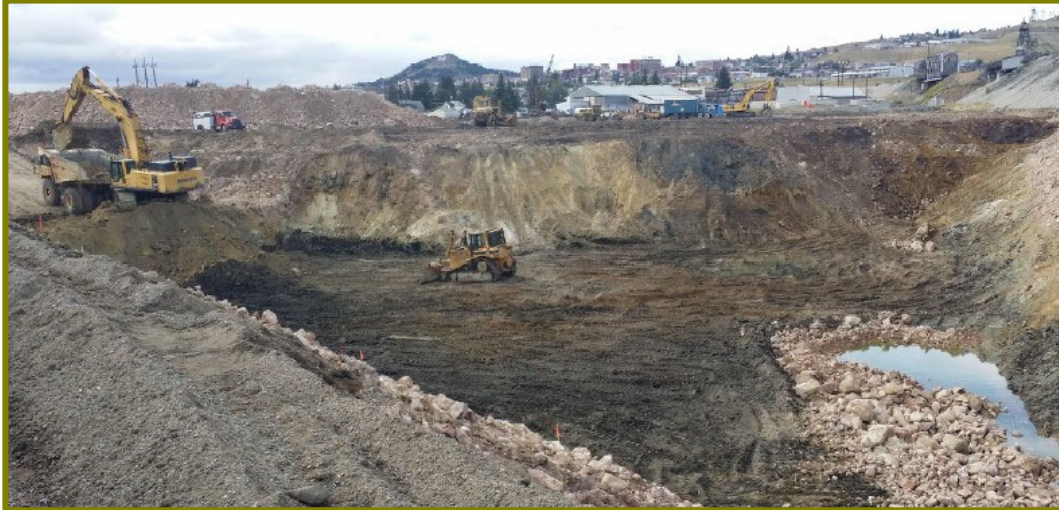
The vertical limit of the excavation proceeded until the entire clay layer was removed and clean alluvium was encountered or until the water table was encountered. Typically, the water table was below the clay layer, but in some areas, it was necessary to de-water in order to keep the work areas dry enough to excavate the entire clay layer. In all instances the clay layer was removed.

The quality control team collected 8-point composite samples from 304 locations during the Phase I removal action and prepared and analyzed them in the field using an X-Ray Fluorescence (XRF) instrument. For every 20 field samples, one split sample was sent to an offsite laboratory for analysis. Another 800 “point-and-shoot” XRF readings were taken in order to get real time characterization of materials during excavation.



Technician analyzing sample with XRF

Dozer pushing black organic clay toward excavator during Phase I removal action; clean overburden stockpiled behind red truck; yellow tailings in high wall behind dozer.



Phase I Excavation Volumes

The table below summarizes the estimated volumes of the various waste types to actual volumes excavated during the Phase I removal action. The difference in estimated versus actual waste volumes was the result of the alluvium being more contaminated than originally characterized by the drilling investigations. All volumes estimates are in bank cubic yards.

Volume Calc	Overburden	Waste	Slag	Total
Estimated	167,000	76,000	117,000	360,000
Actual	112,421	170,281	99,390	382,092
Difference	-54,579	94,281	-17,610	22,092



*Waste Sequence: Slag on top; white/
yellow tailings middle; black clay below*

Upcoming Work:

- Phase I Parrot Tailings Waste Removal—completed December 2018
- Parrot Performance Monitoring Plan—ongoing
- Butte-Silver Bow Shop Complex to be relocated 2019—2020
- Phase II Parrot Tailings Waste Removal to commence after shop relocation is completed