McLaren Tailings Abandoned Mine Site Reclamation Project Delisting of Soda Butte Creek

Presented to:

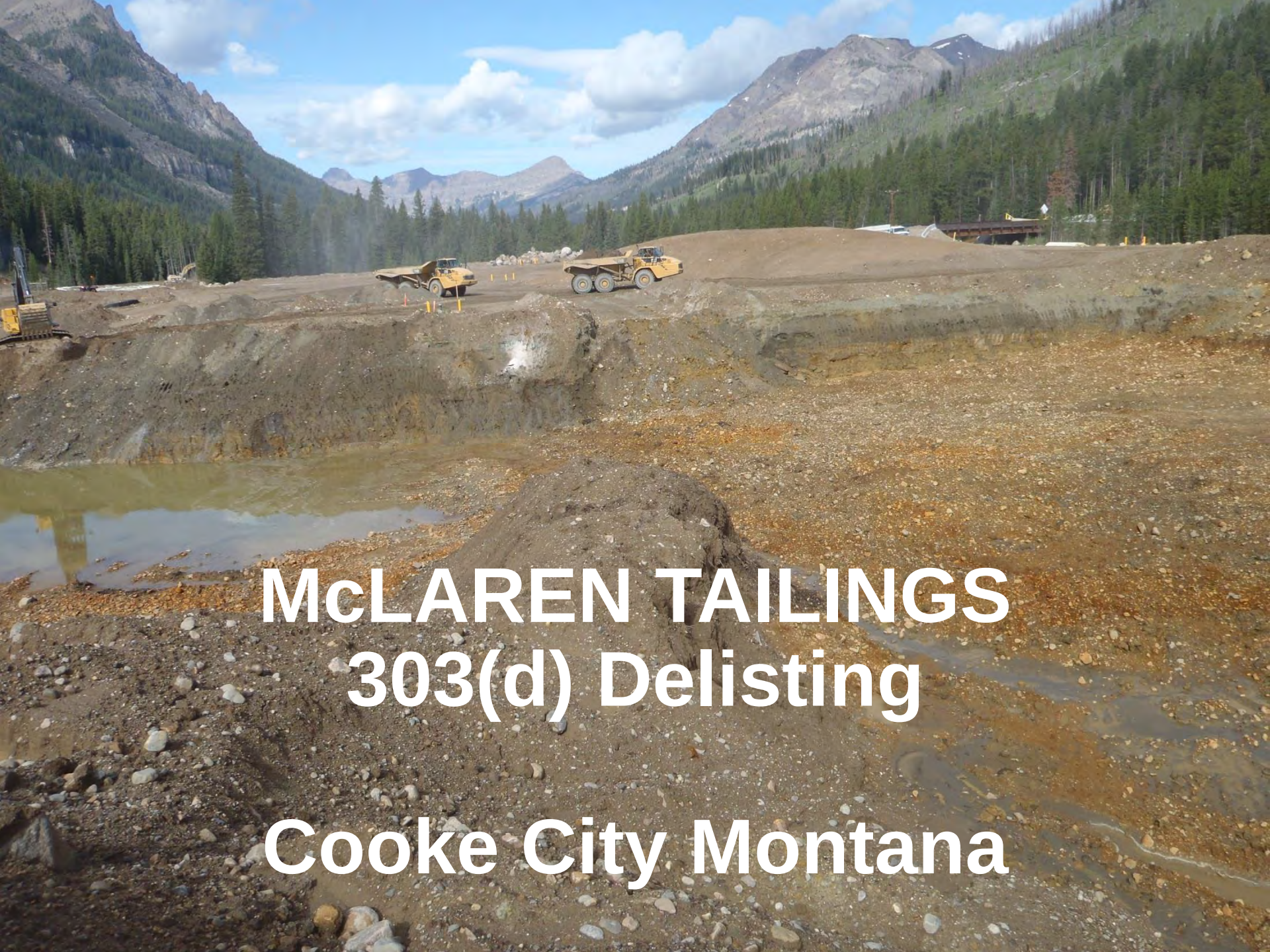
Mining and Metallurgical Society of America (MMSA)

5th Annual Summit, Montana Technological University

Presented by:

Pioneer Technical Services, Inc.

July 25, 2023



McLAREN TAILINGS 303(d) Delisting

Cooke City Montana

McLaren – Cooke City, Montana

McLaren Tailings Site

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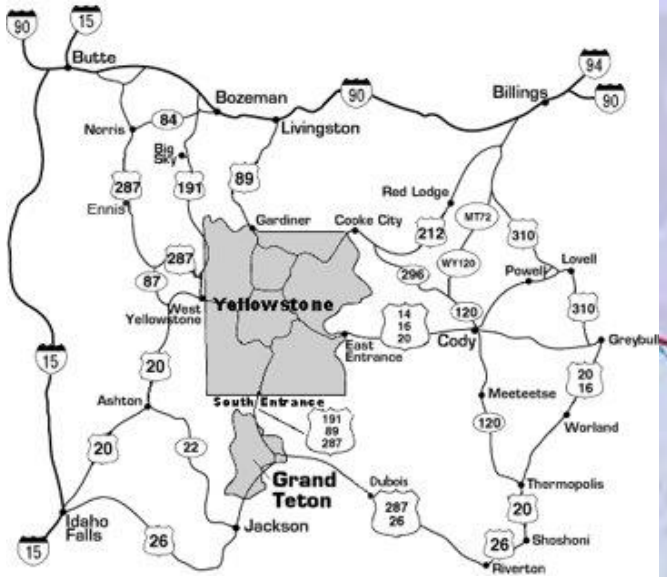
Project Location

- Cooke City, Montana



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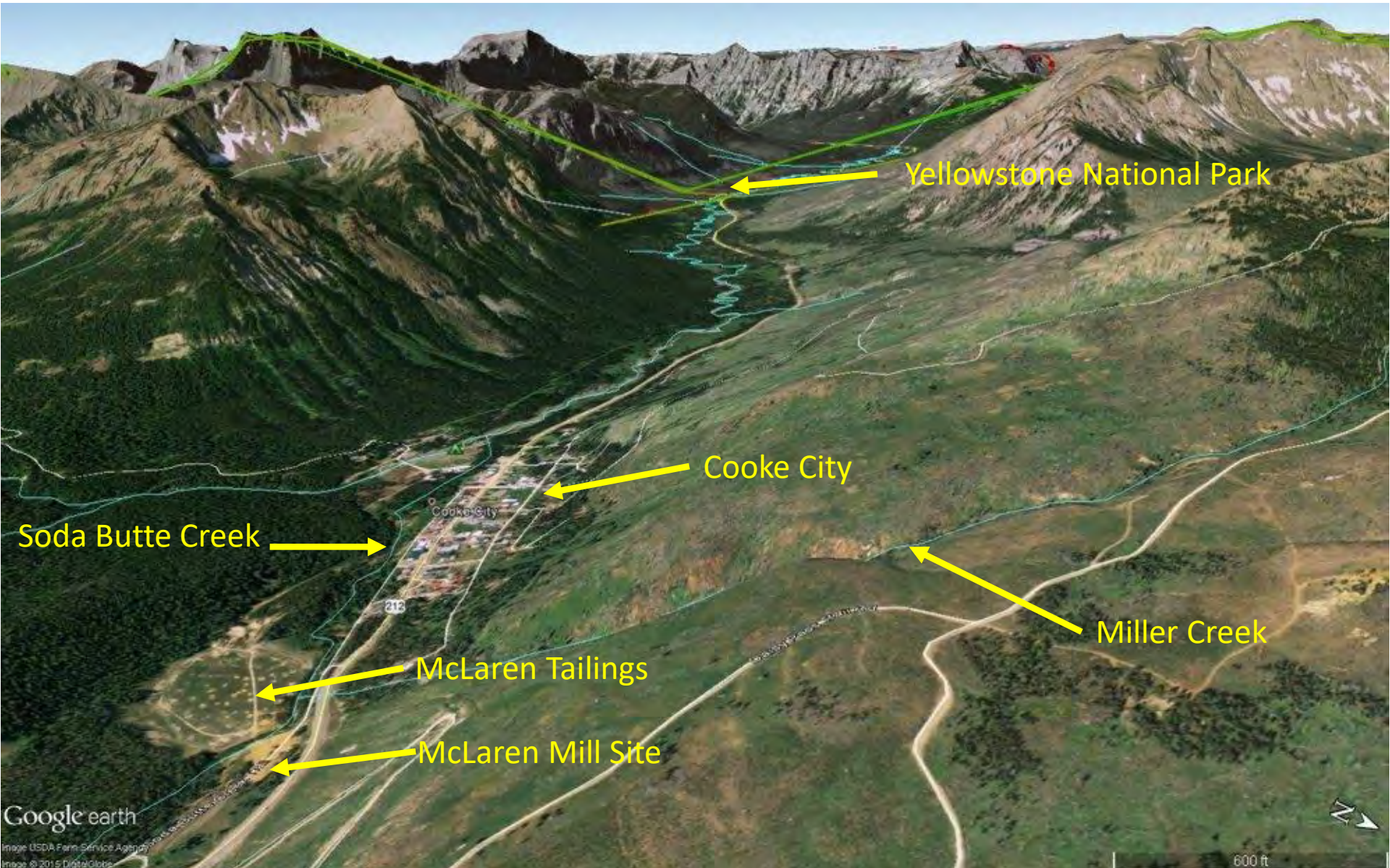
Project Area



McLaren History

- The McLaren Mine is Located 3 miles North of the mill site.
- Mill Started in 1933, ran consistently until about 1942.
- After WWII mine and mill ran intermittently until 1953.
- At which time it was closed.
- There have been environmental problems with the site since the beginning.
- In 1969, the site was rehabilitated.

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More McLaren History

- 1988 to 1991 EPA had Kennecott complete an Emergency Response Action to stabilize the dam.
- 1993 –Pioneer performs site investigation for Montana DEQ, details numerous environmental and engineering concerns.
- 2000 2001 – Pioneer completes an EE/CA for the site.
- 2008 – Montana DEQ, EPA and Department of Justice reach an agreement that released Montana from liability allowing the acquisition of the tailings and repository area.
- There have been 100's of documents written about this site by different federal and state agencies.

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McLaren 2008

Soda Butte Creek Below the Tailings 2009

- 1960s – Soda Butte Creek is documented by Yellowstone Park officials as being the most polluted stream entering the Park.

- Tailings Discharges (USGS):
- Fe 418 mg/L
- Al 122 mg/L
- Cu 6 mg/L
- Pb 0.6 mg/L
- Cd 0.06 mg/L

- Approximate Annual Loads:
- 40,000 lb Fe
- 12,000 lb Al
- 590 lb Cu
- 58 lb Pb
- 6 lb Cd

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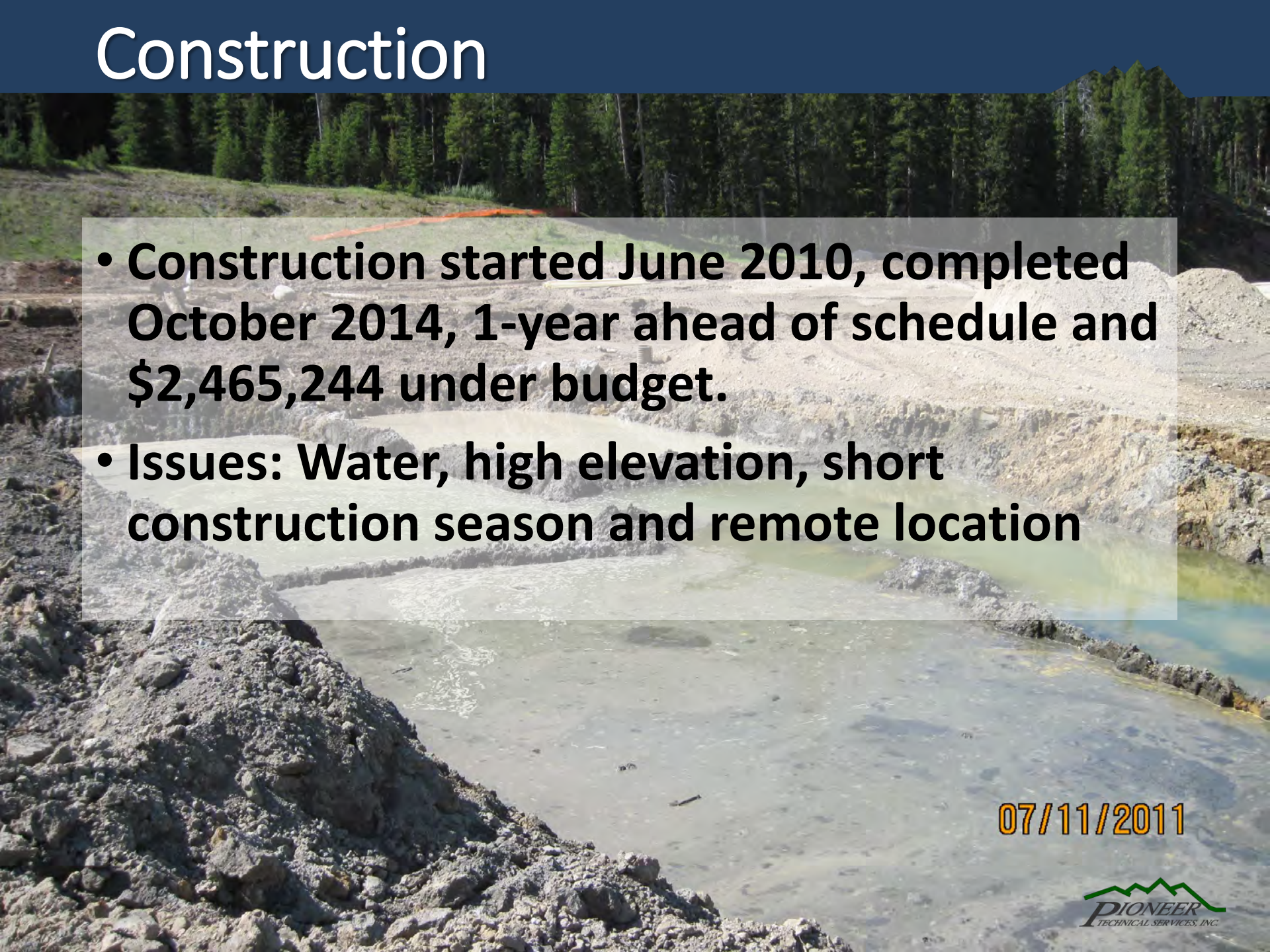
Construction



- **Construction started June 2010, completed October 2014, 1-year ahead of schedule and $2,465,244 under budget.**
- **Issues: Water, high elevation, short construction season and remote location**

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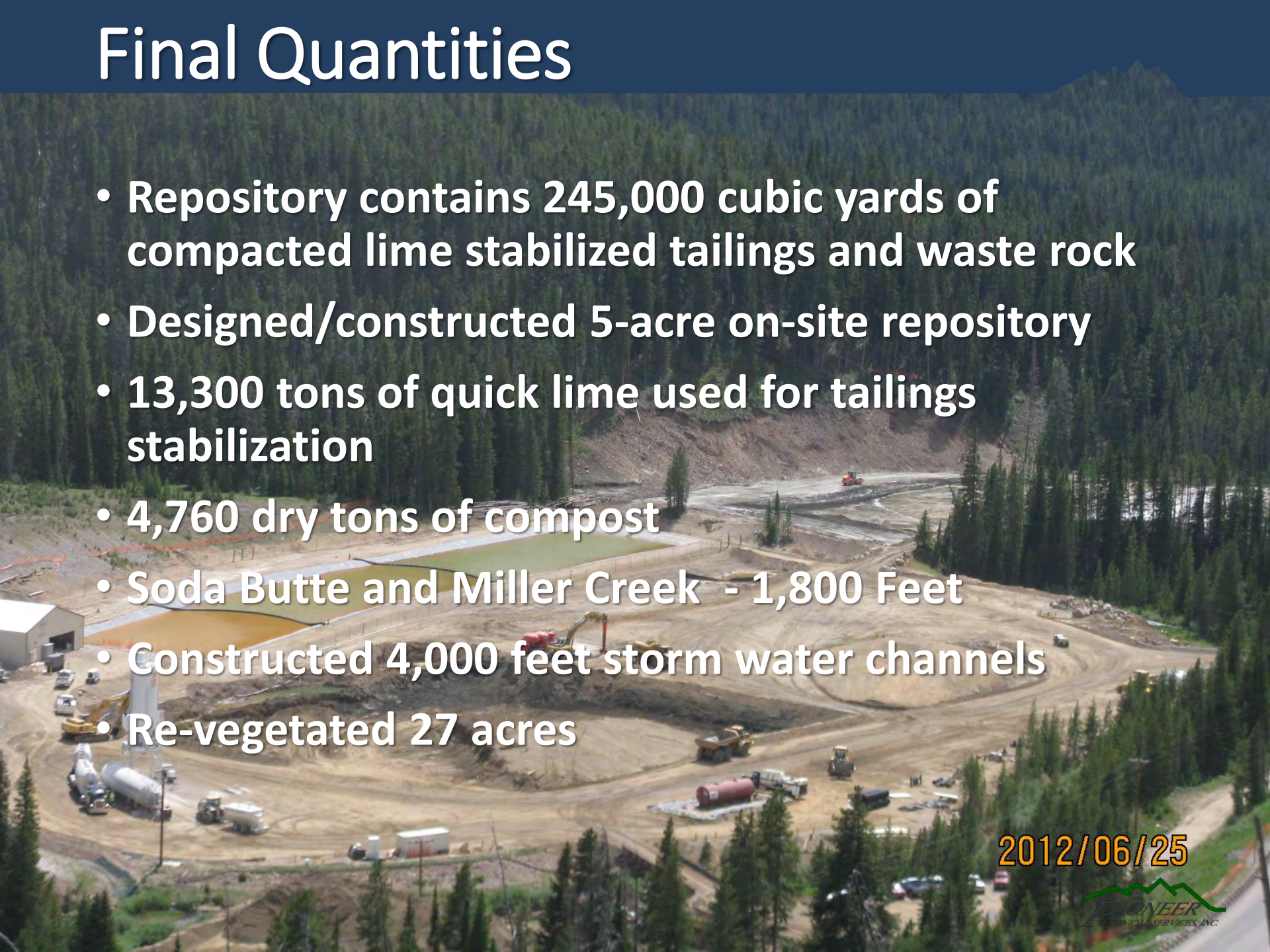
Tailings Excavation to Dam

Final Quantities



- Repository contains 245,000 cubic yards of compacted lime stabilized tailings and waste rock
- Designed/constructed 5-acre on-site repository
- 13,300 tons of quick lime used for tailings stabilization
- 4,760 dry tons of compost
- Soda Butte and Miller Creek - 1,800 Feet
- Constructed 4,000 feet storm water channels
- Re-vegetated 27 acres

Soda Butte Creek

Construction Stakeholders

- Montana DEQ/Mine Waste Cleanup Bureau
  - John Koerth
  - Autumn Coleman
  - Tom Henderson
- Cooke City Residents
- Beartooth Alliance
- Gallatin National Forest
- Yellowstone National Park

Collaborative Science Supports Recovery of Yellowstone's Soda Butte Creek

- ***Partnerships to the Recovery of Soda Butte Creek***
- **Reclamation**
  - MT DEQ, MT DNRC, NPS WRD, YELL, USFS, Beartooth Alliance, & Pioneer Technical Services, Inc.
- **Water Quality Response and Delisting**
  - NPS GRYN, MT DEQ AML and WQM&A, YELL, NPS WRD, USGS, & MSU
- **Restoration of Native Fishery**
  - NPS, USFS, MT FWP, WGFD, & Beartooth Alliance

Road to 303(d) Delisting

- Post Reclamation WQ Study of Soda Butte Creek 2015 & 2016
- 4.9 mi section (AU MT43B002_031) of Soda Butte Cr (McLaren Tailings to the MT border outside YNP boundary) listed on MT DEQ's 2014 List of Impaired Waters as **not fully supporting aquatic life**
- Causes of impairment: **Cu, Fe, Pb**, and **Mn**
  Probably source is listed as **acid mine drainage; mine tailing**
- This section is in water quality reporting category 4A (all TMDLs needed to rectify all identified threats or impairments have been completed and approved)

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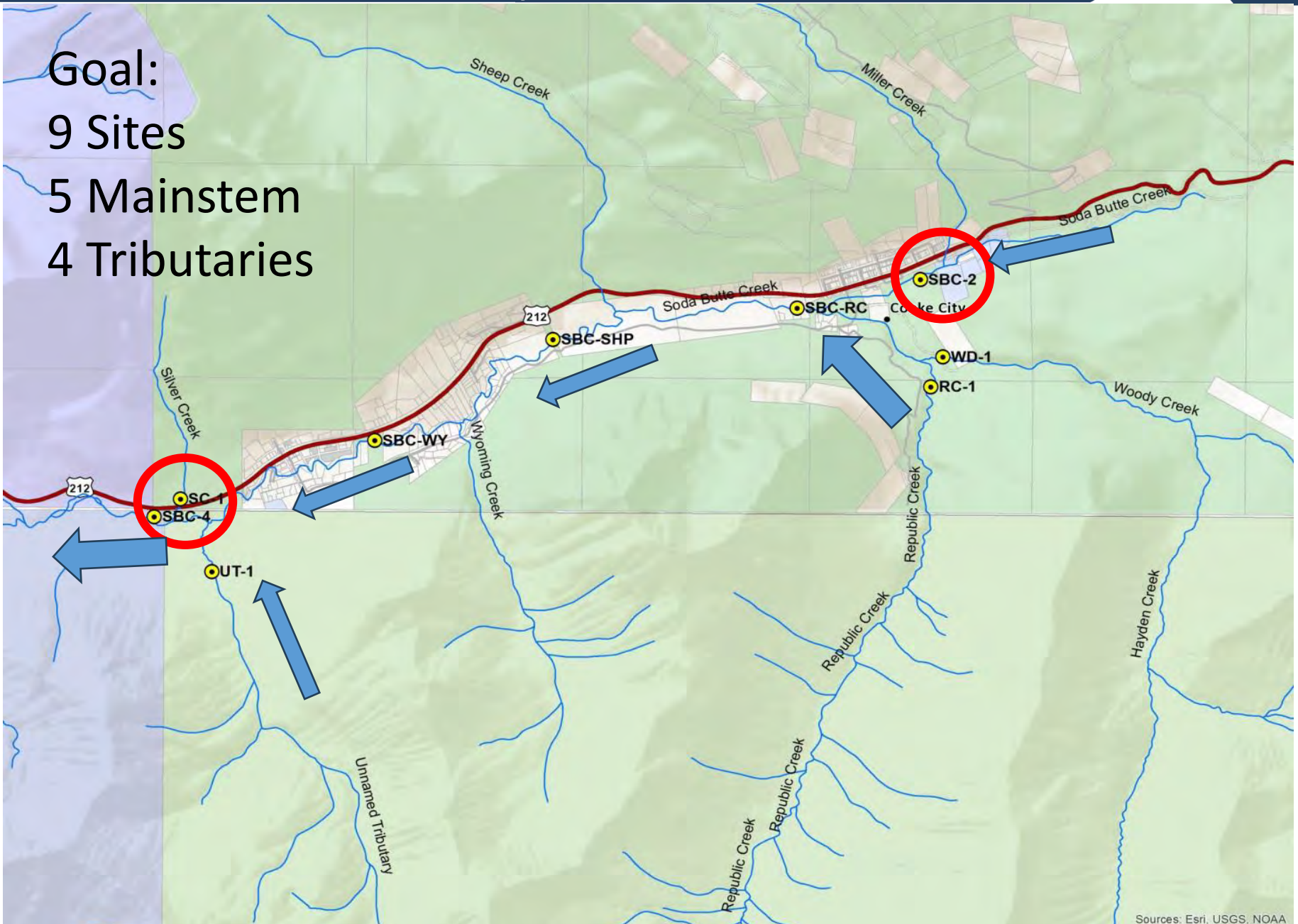
SBC WQ Study 2015 & 2016



SBC-4: Water Quality vs. DEQ-7 Standards

USFS 2000 – 2010 (As part of the New World Mining Permit)

31 Sampling Events

- 20 Iron exceedances
- 8 Copper exceedances
- 1 Lead exceedance

DEQ/NPS 2015 – 2016

11 Sampling Events

- 2 Iron exceedances (Unnamed Tributary and Woody Creek Tributaries)
- 0 Copper exceedance
- 0 Lead exceedance
- SBC-2 is located downstream of the McLaren Tailings project
- McLaren Tailings reclamation project began June 2010 - Completed October 2014

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SBC WQ Study 2015 Load Summary – Iron

Iron Loads in lbs/day				
Date	SBC2	WD1+ RC1	UT1+ SC1	SBC4
Jun-15	3.28		70.94	300.95
Jul-15	2.16	24.82	20.31	82.90
Aug-15	3.98	21.36	32.23	134.30
Sep-15	0.54	6.49	7.12	11.39
Oct-15	0.84	76.00	32.37	90.65

Percentage of Load at SBC4			
SBC2 (% SBC4)	WD1+SC1 (% SBC4)	UT1+SC1 (% SBC4)	Cumulative Percentage
1.09%		23.57%	
2.60%	29.93%	24.50%	57.04%
2.96%	15.90%	24.00%	42.87%
4.73%	57.01%	62.55%	124.29%
0.93%	83.84%	35.70%	120.47%

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SBC WQ Study2015 – Benthic Sediment Chemistry

- Collected benthic sediments (150 cm^3) from 3 locations along x-section
- Samples dried to constant mass and powdered to 10 µm
- Samples run individually through Powder X-Ray Fluorescence analyzer

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SBC WQ Study 2015 – Benthic Sediment Chemistry

- Fe , Cu, and Pb in benthic sediments varied among sites
- Sediments below former tailings site (SBC-2) had lowest levels of Fe, but highest levels of Cu and Pb
- Woody Cr and the Unnamed Tributary sediments among highest levels of Fe; Unnamed Tributary among lowest levels of Cu

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Soda Butte Creek WQ Stakeholders

- **Tom Henderson (late) Project Officer DEQ**
- **Andrew Ray Ecologist National Park Service**
- **Pete Penoyer Hydrologist, National Park Service**
- **Ann Rodman Physical Scientist National Park Service**
- **Mary Levandowski Hydrologic Technician National Park Service**
- **Alysa Yoder Hydrologist**
- **Shane Matolyak Environmental Scientist Tetra Tech**
- **Mary Beth Marks Geologist U.S. Forest Service**
- **Autumn Coleman Program Manager DEQ**


Questions