McLaren Tailings Abandoned Mine Site Reclamation Project Restoring Previously Unusable Area Back to its Historical Landscape

Presented to:

2016 National Meeting of the American Society of Mining and Reclamation

Presented:

June 6, 2016

Presented by:

Pioneer Technical Services, Inc.

Presentation Outline

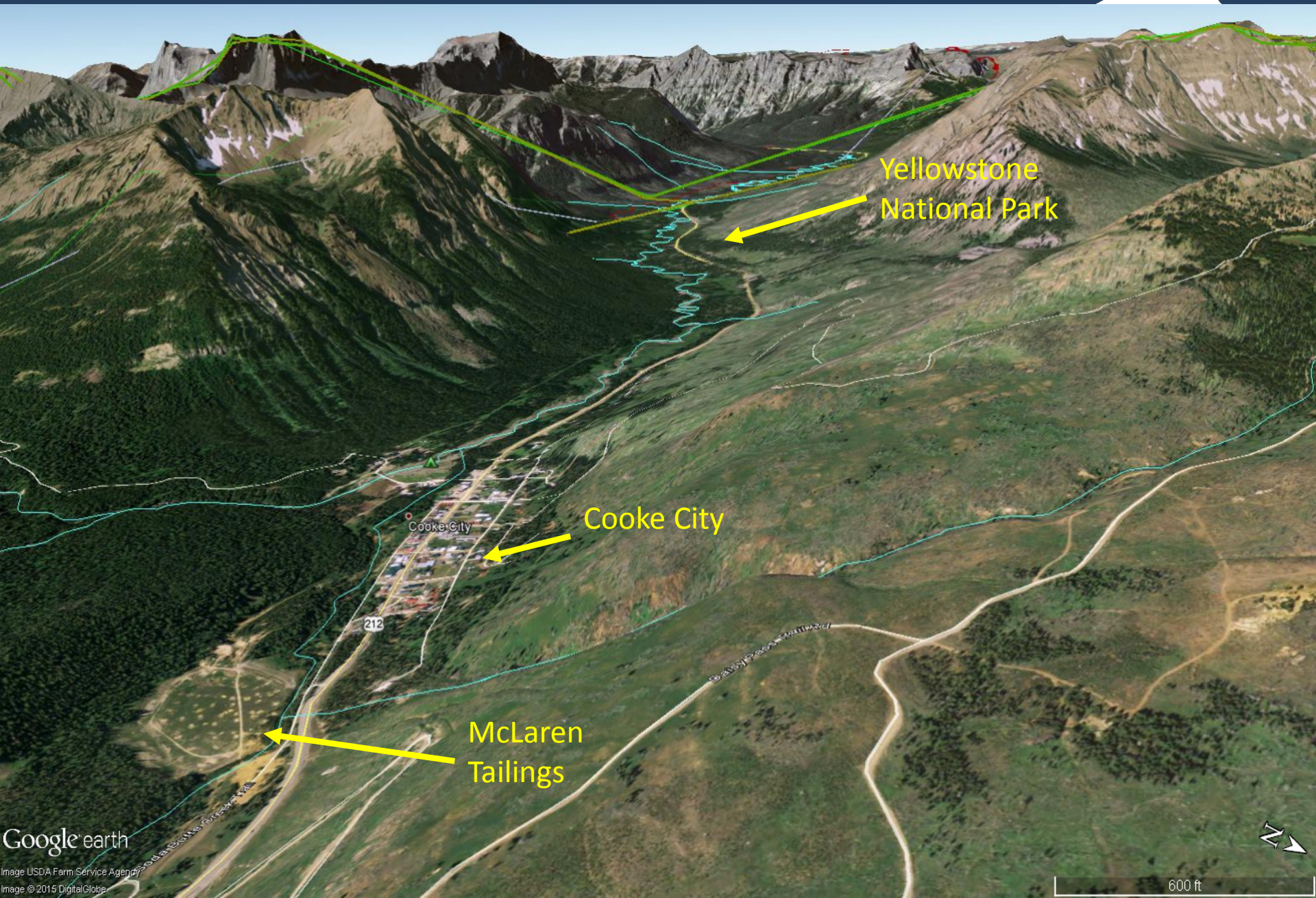
- Project Settings
- History
- Challenges
- Design Approach
- Construction
- Results

McLaren – Cooke City Montana

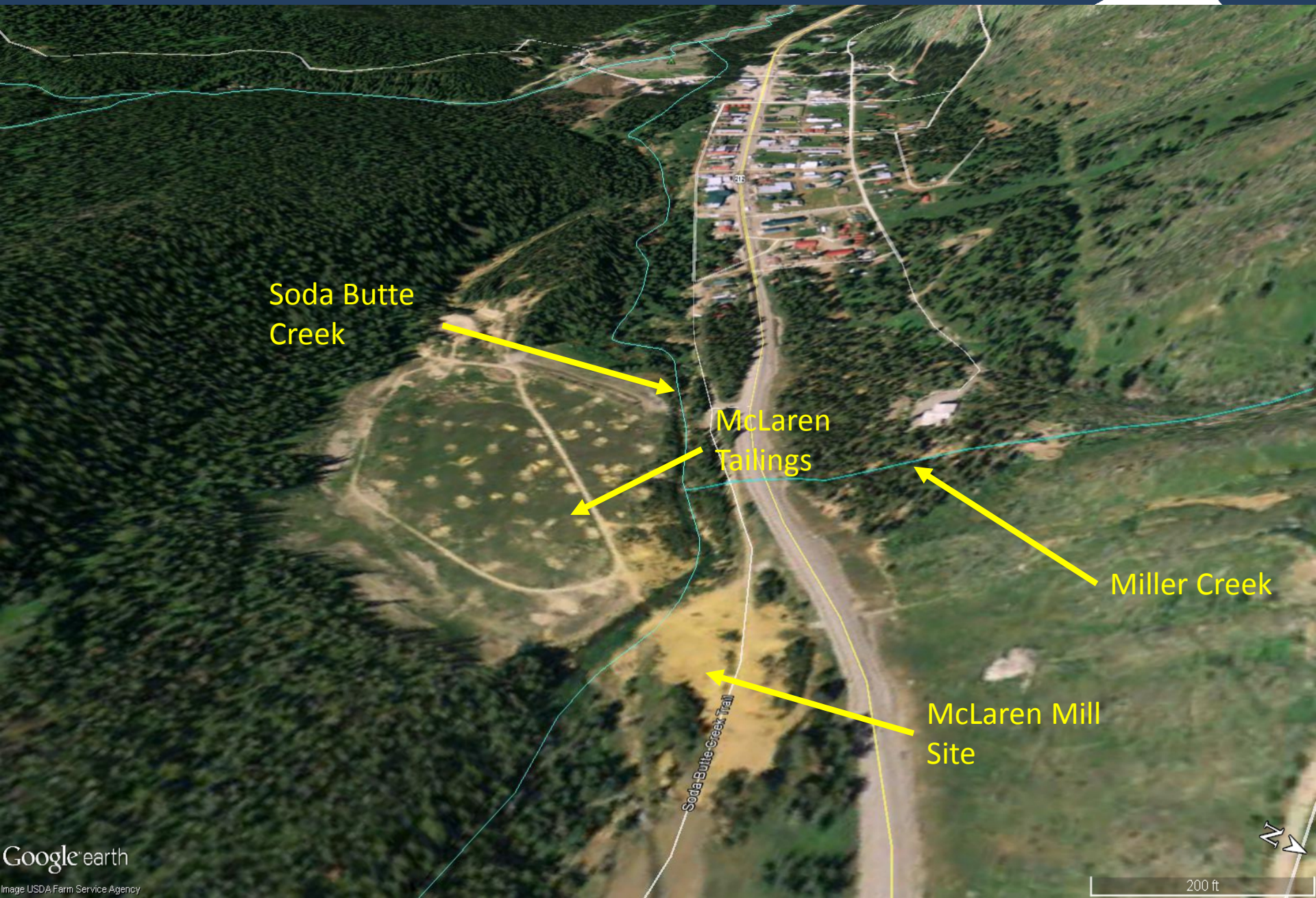
McLaren Tailings Site

PIONEER TECHNICAL SERVICES, INC.

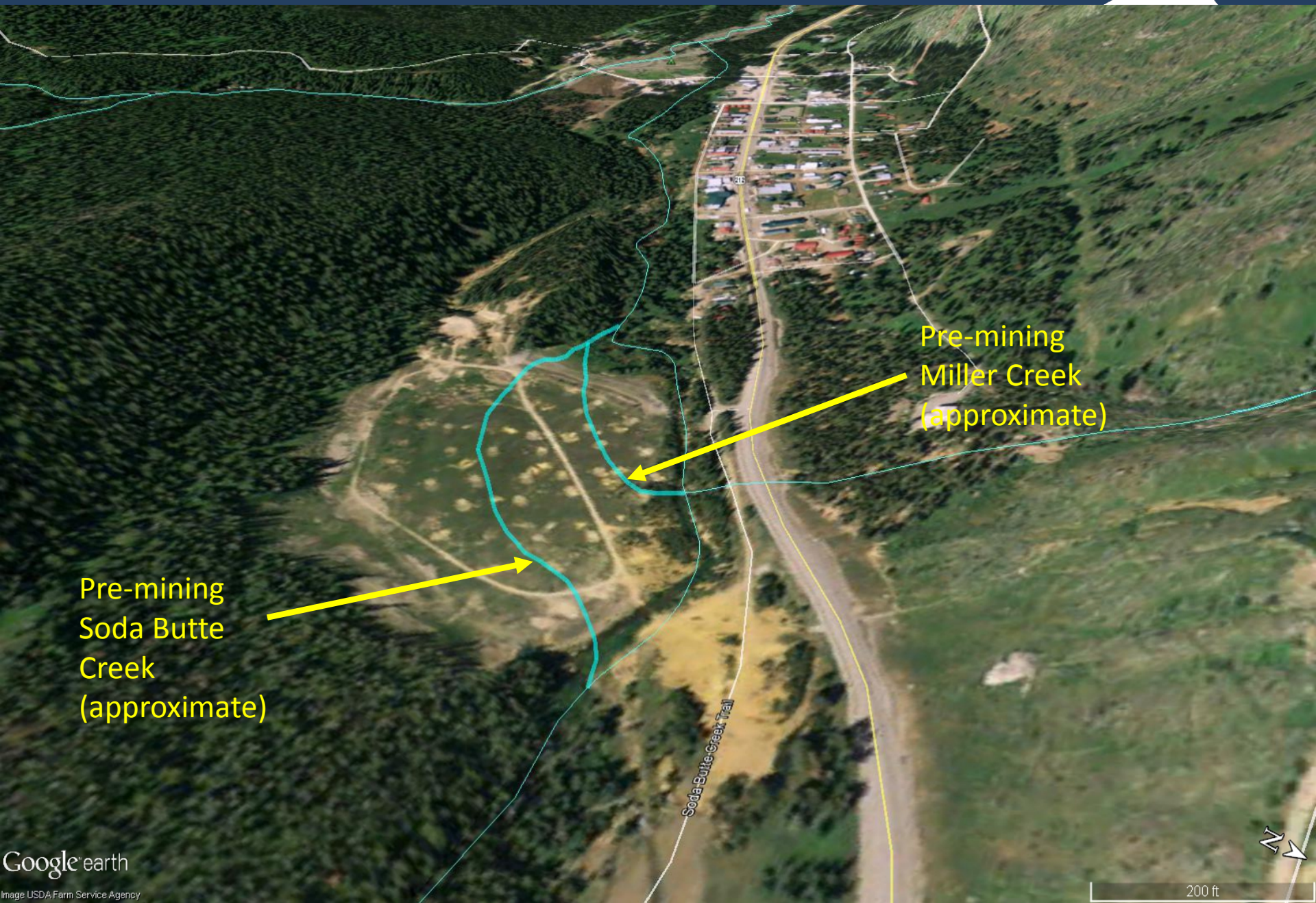
Project Setting



McLaren Mill and Tailings



Approximate Pre-Mining Creek Locations



HISTORY

New World Mining District

- Near Cooke City and Northwest Entrance to Yellowstone National Park
- Site of Crown Butte $65M Buyout in 1997 and USFS $30M Cleanup

McLaren Mill

- Processed Au and Cu ore from 1933 – 1953
- Produces 60,000 troy oz of gold, 2,000 short tons of copper
- Tailings Impoundment grew over Soda Butte Creek and Miller Creek
- 1950 tailings release mapped to the Lamar River

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 a EE/CA for the site.
- 2008 – MDEQ, 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.

Seep from Toe of Dam

Soda Butte Creek Below Tailings

No Color Enhancement

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

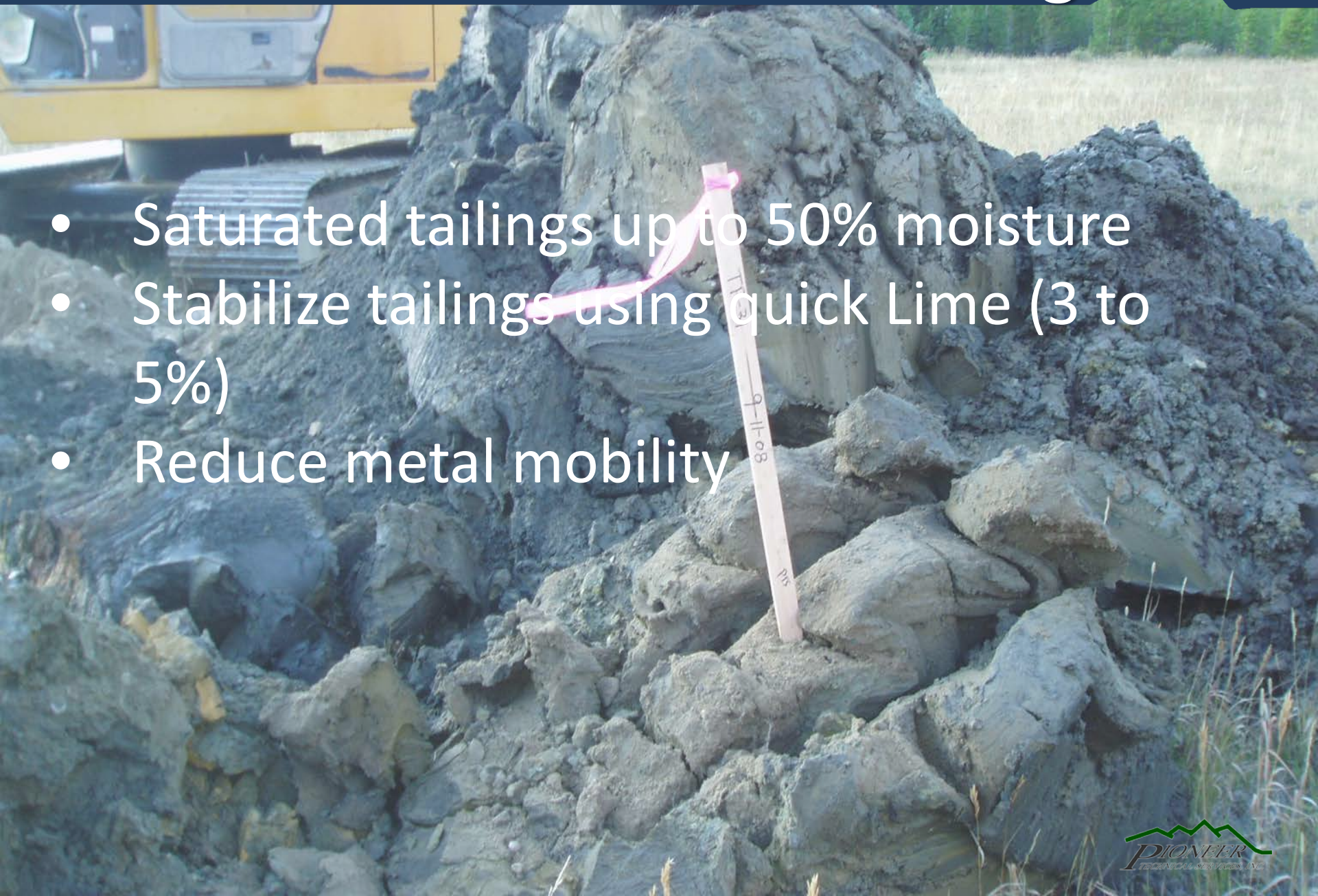
Soda Butte Creek Below Tailings

No Color Enhancement

McLaren Reclamation Challenges

- Dewater the tailings by pumping the underlying aquifer
  - Intercept clean water
  - Treat contaminated water to DEQ water quality standards

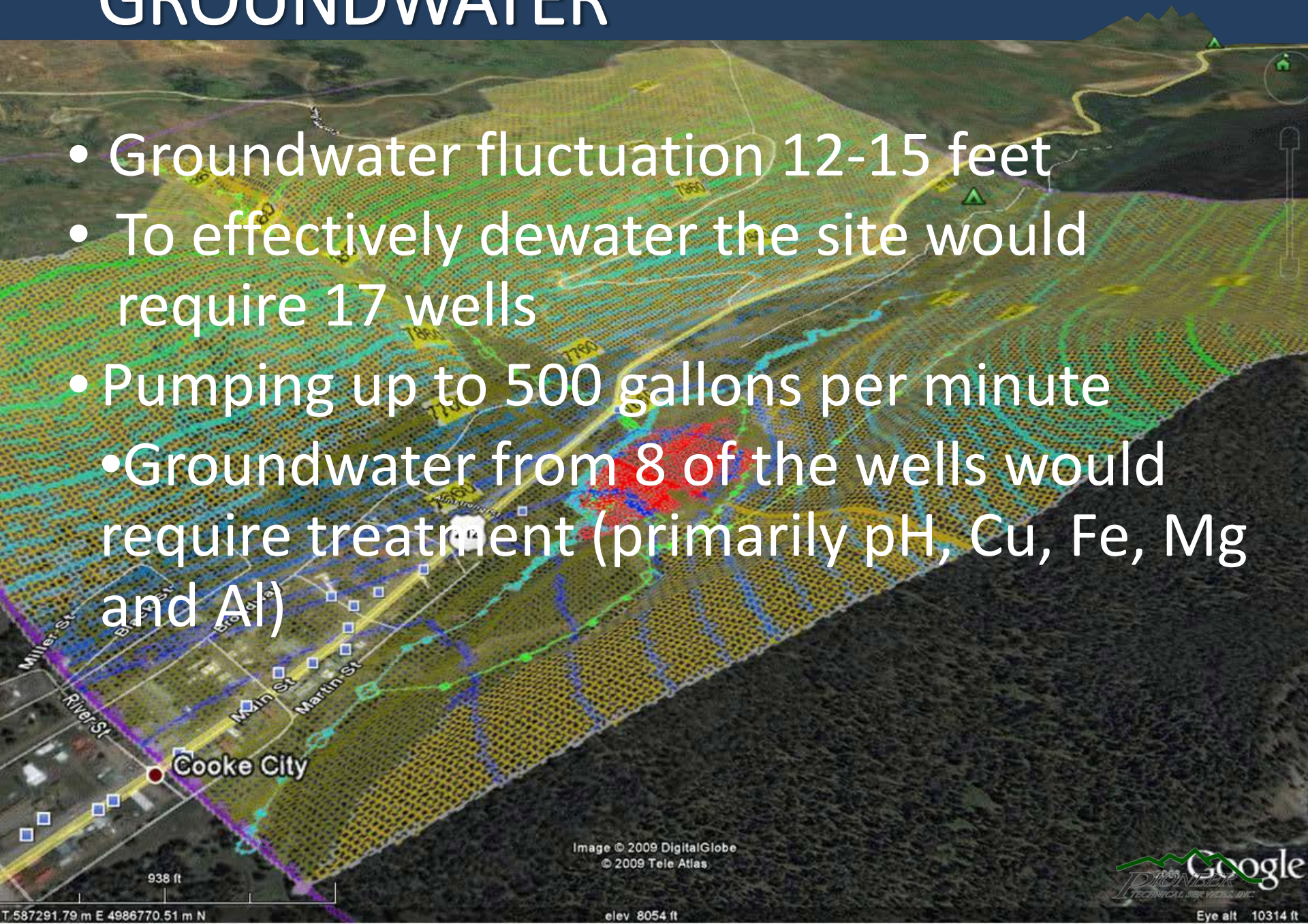
McLaren Reclamation Challenges



- Saturated tailings up to 50% moisture
- Stabilize tailings using quick Lime (3 to 5%)
- Reduce metal mobility

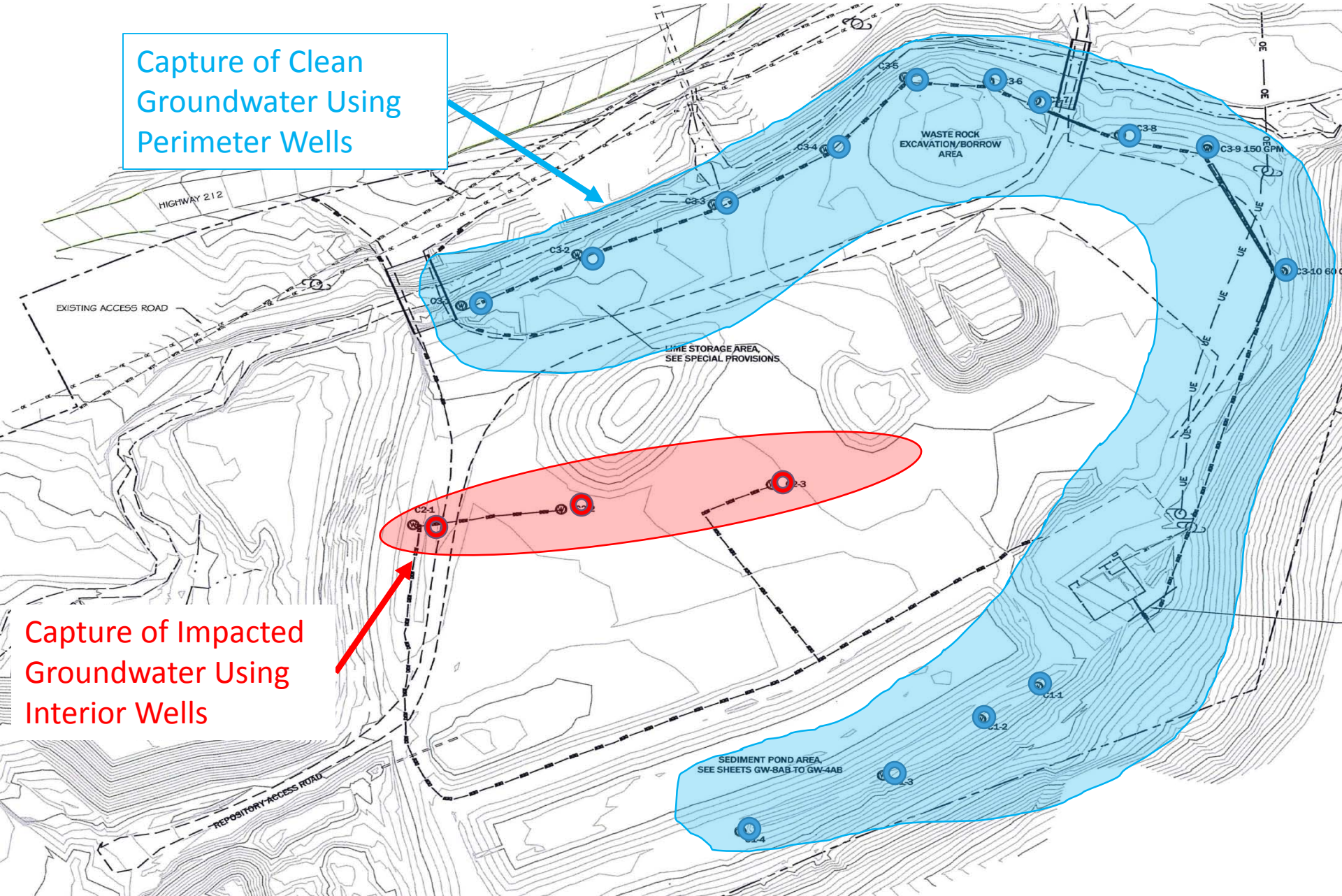
Sometimes Just Getting There

GROUNDWATER



- Groundwater fluctuation 12-15 feet
- To effectively dewater the site would require 17 wells
- Pumping up to 500 gallons per minute
  - Groundwater from 8 of the wells would require treatment (primarily pH, Cu, Fe, Mg and Al)

Final Pumping Well Design Locations



Start of Construction 2010

- Knife River – Yellowstone Division, Billings, Montana Mobilized to the Site June 2, 2010
  - Install BMPs
  - Install west and east bridges
  - Construct Water Treatment Building (WTB)
  - Clear, Grub and partial excavation of repository area
  - Stabilization of 8,400 cubic meters of tailings

2010/06/02

Construction 2010

Construction 2010

- **ALLU Stabilization System**

Construction 2010

Construction 2010

Construction 2011

- KR started summer construction June 13, 2011
- Completed DCB (electrical, plumbing, wiring of wells)
- Complete excavation of Repository 18,350 cu m
- Salvaged 10,000 cu m of cover soil
- DEWATER DEWATER and DEWATER
- Stabilized and placed 42,800 cu m of tailings
- Constructed sediment detention pond

Construction 2011

Construction 2011

Construction 2011

Construction 2011

Construction 2011

Construction 2011

RCTS

Construction 2011

- Summer construction shut down October 20, 2011
- Winter operations of DCB

Construction 2012

- Summer Construction started on May 17, 2012
- Stabilized 129,200 cu m tailings
- Excavated, stockpiled 35,700 cu m cover soils
- Installed 21,300 sq m of temporary liner over compacted tailings in the repository
- Used 7,975 metric tons of quick lime
- Used 5 drums of anionic flocculant

Construction 2012

Construction 2012

Construction 2012

Construction 2012

Construction 2012

Construction 2012

Construction 2012

Construction 2013 Highlights

- Stabilized 22,250 cu m of tailings
- Excavated and stockpiled 9,175 cu m of cover soil
- Removed 17 pumping wells
- Removed the DWB
- Constructed 401 meters of Soda Butte Creek
- Constructed 142 meters of Miller Creek
- Installed 21,400 sq m of geocushion and HDPE liner at repository

Construction 2013

Construction 2013

Construction 2013

Construction 2013

Construction 2013

Construction 2013

Construction 2013

Construction 2013

Construction 2013

Construction 2013

- **October 2nd**

Construction 2013

- **October 3rd ~8” of snow**

Construction 2013

- **October 13th**

Construction 2014 Highlights

- Started June 5th
- Mixed 3,894 dry metric tons of compost with cover soil for a target of 3% organic matter (volume basis)
- Backfilled 27,065 cu m of amended cover soil
- Installed 19,900 sq m of geonet on repository
- Placed 21,560 cu m of amended soil on repository
- Constructed 610 meters of runoff/run-on channels
- Fertilized and seeded 11 hectares
- Planted 820 tubelings (Douglas fir, Aspen and Thimbleberry)

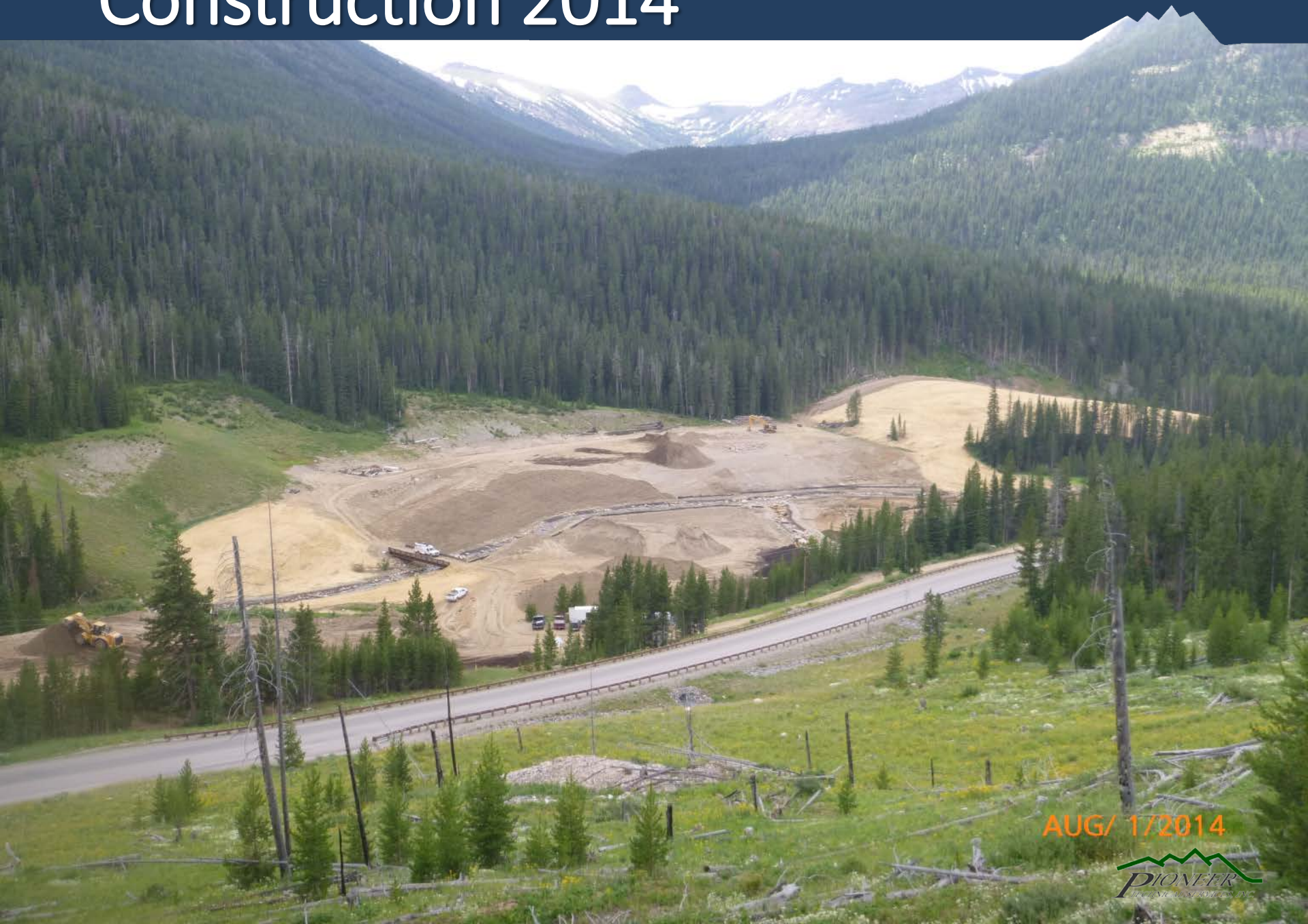
Construction 2014

Construction 2014

Construction 2014

- **Summer Erosion Control**

Construction 2014



Construction 2014

Construction 2014

Construction 2014

- **September 18th**

Construction 2014

- **September 19th**

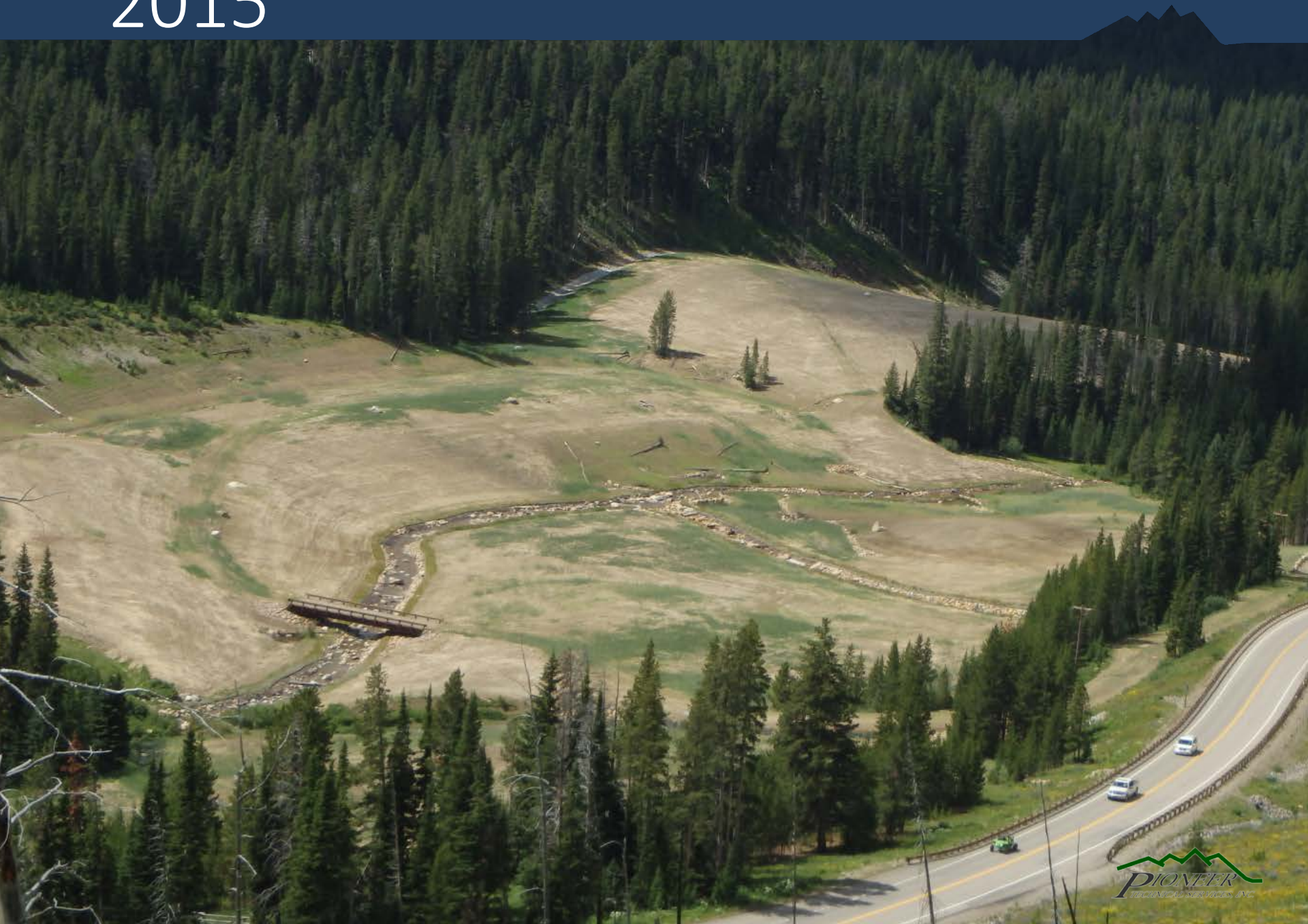
Final Project Quantities

- Repository contains 187,315 cubic meters of compacted lime stabilized tailings and waste rock
- 12,065 metric tons of quick lime used for tailings stabilization
- 4,318 dry metric tons of compost
- Soda Butte and Miller Creek - 548 meters
- Constructed 1,220 meters storm water channels
- Re-Vegetated 11 hectares

The McLaren Reclamation project was completed 1 year ahead of schedule and $2.5 million under budget

Soda Butte Creek

2015



2015

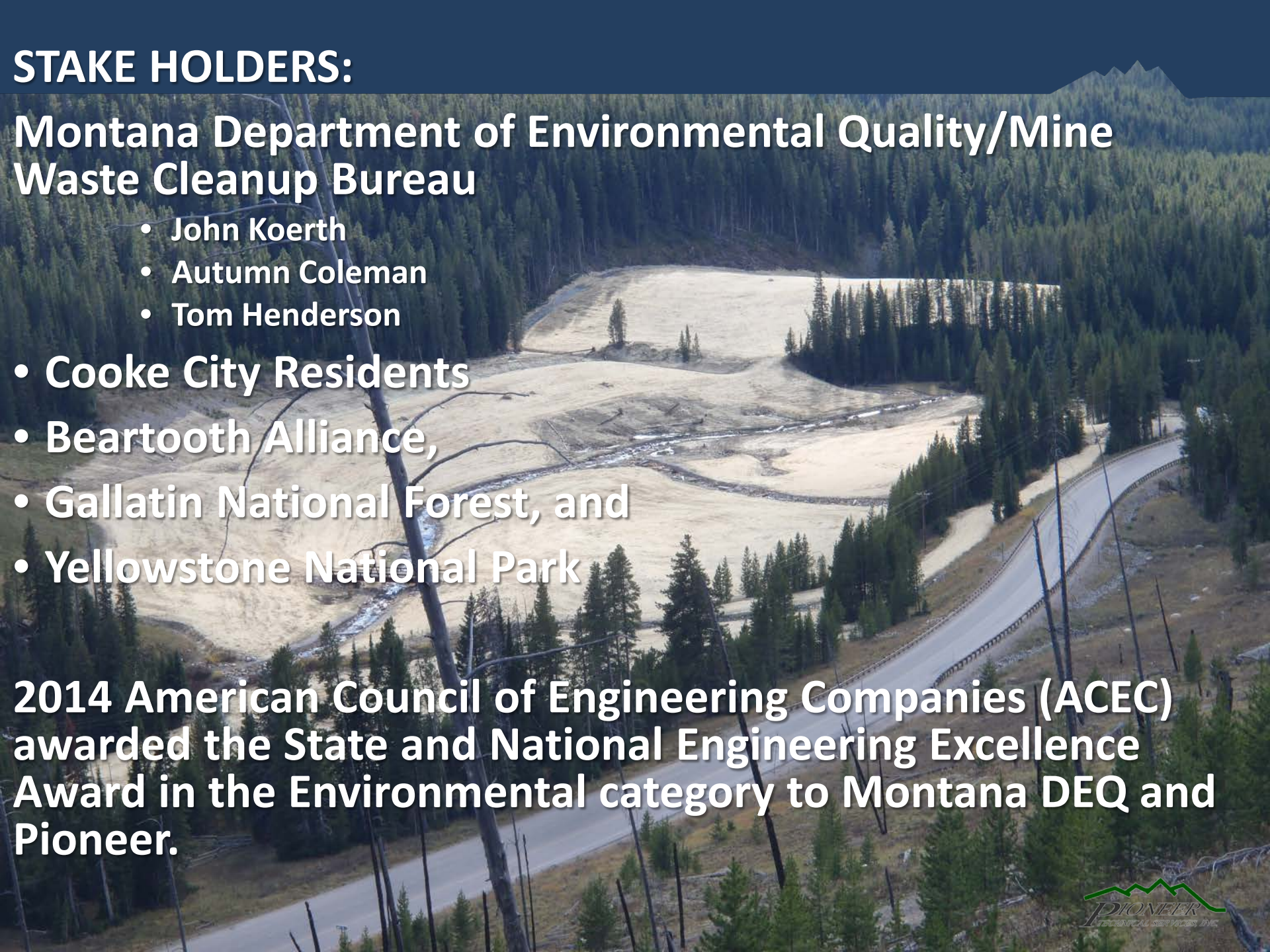
STAKE HOLDERS:

Montana Department of Environmental Quality/Mine Waste Cleanup Bureau

- John Koerth
- Autumn Coleman
- Tom Henderson

- Cooke City Residents
- Beartooth Alliance,
- Gallatin National Forest, and
- Yellowstone National Park

2014 American Council of Engineering Companies (ACEC) awarded the State and National Engineering Excellence Award in the Environmental category to Montana DEQ and Pioneer.



Costs Funding

COSTS

- Total Construction Cost $21,897,248.55
- Total Engineering Costs $2,027,851.85

FUNDING

- U.S. Department of Interior Office of Surface Mining (OSM) $23,000,000
- Department of Natural Resources Conservation $300,000

Questions