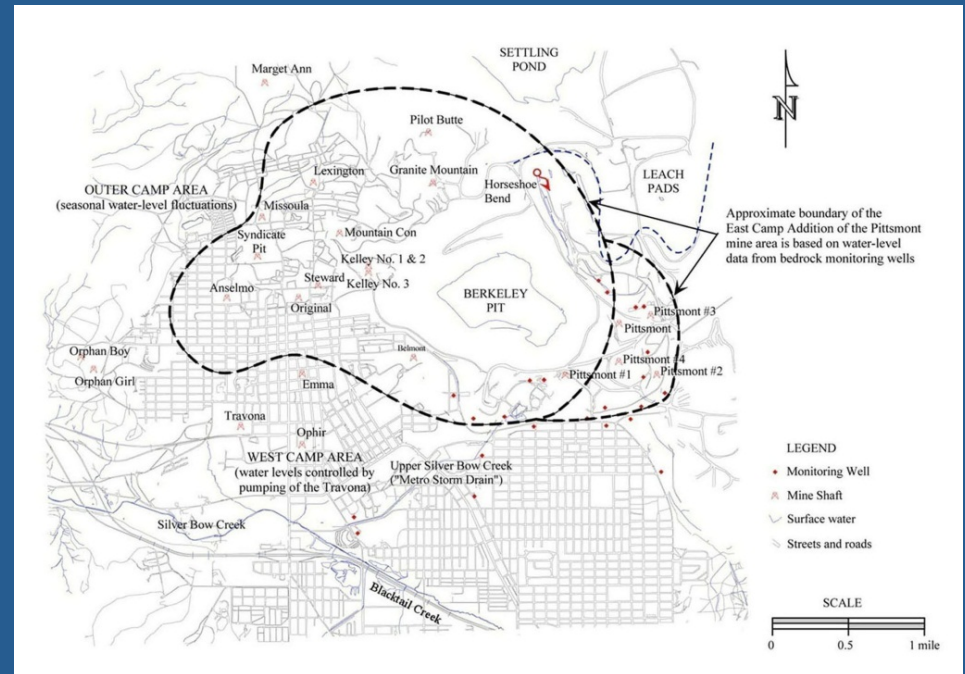
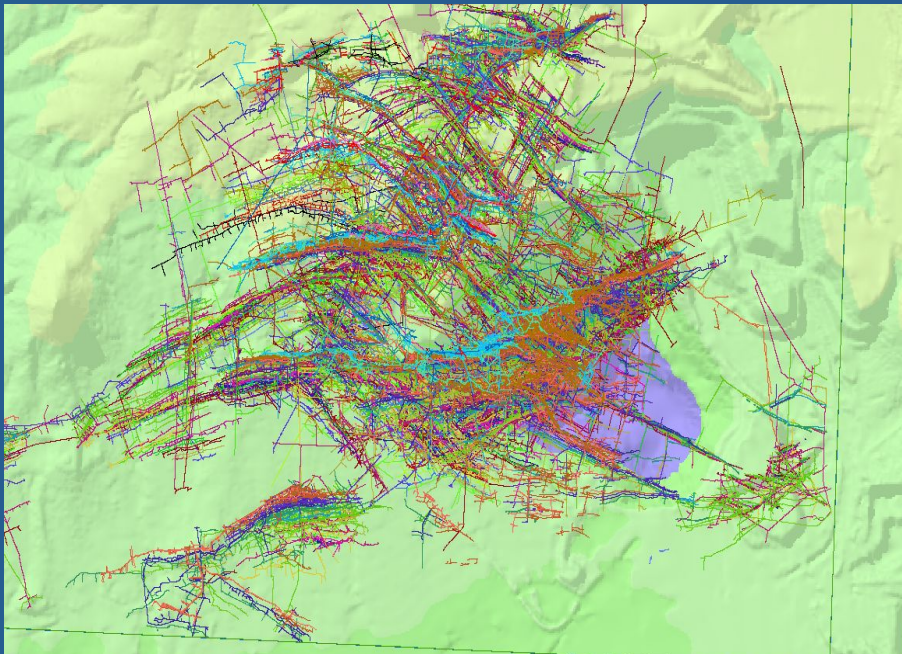


Montana Bureau of Mines and Geology

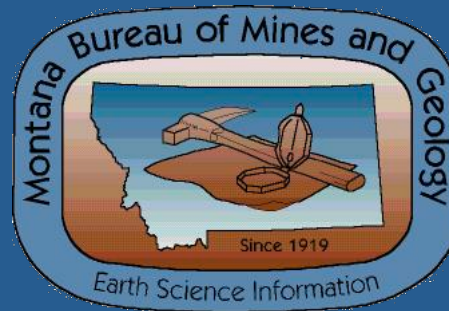
Butte Mine Flooding Monitoring

East Camp System



Nicholas J. Tucci
March 19, 2013

Montana Bureau of Mines and Geology “the Bureau”



Butte – MT Tech

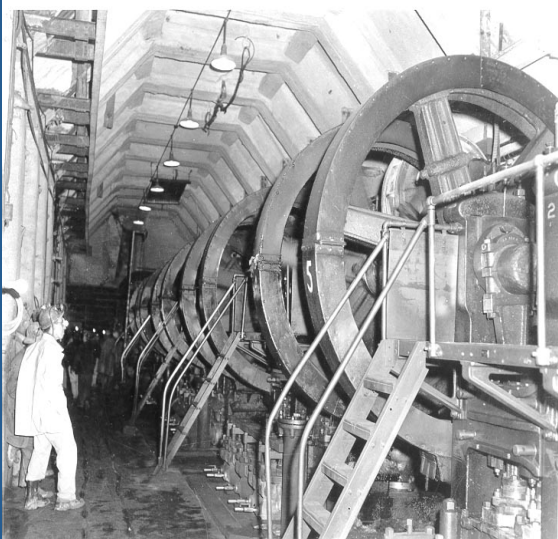


Billings – MT Tech
(on MSU-Billings campus)

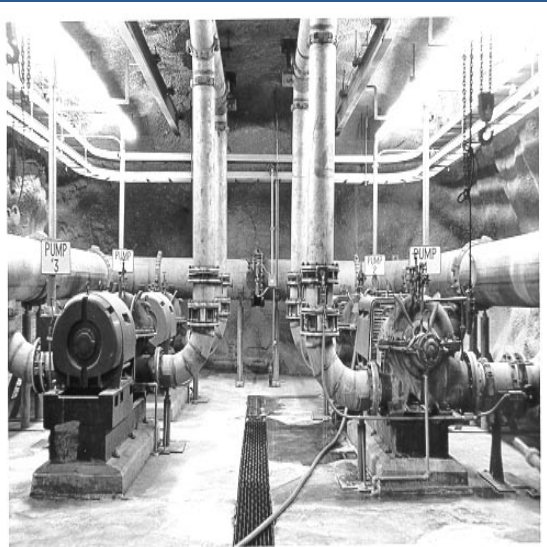
...~65 professionals & staff, ~20 students...

...a non-regulatory research agency within the MUS and the state geological survey

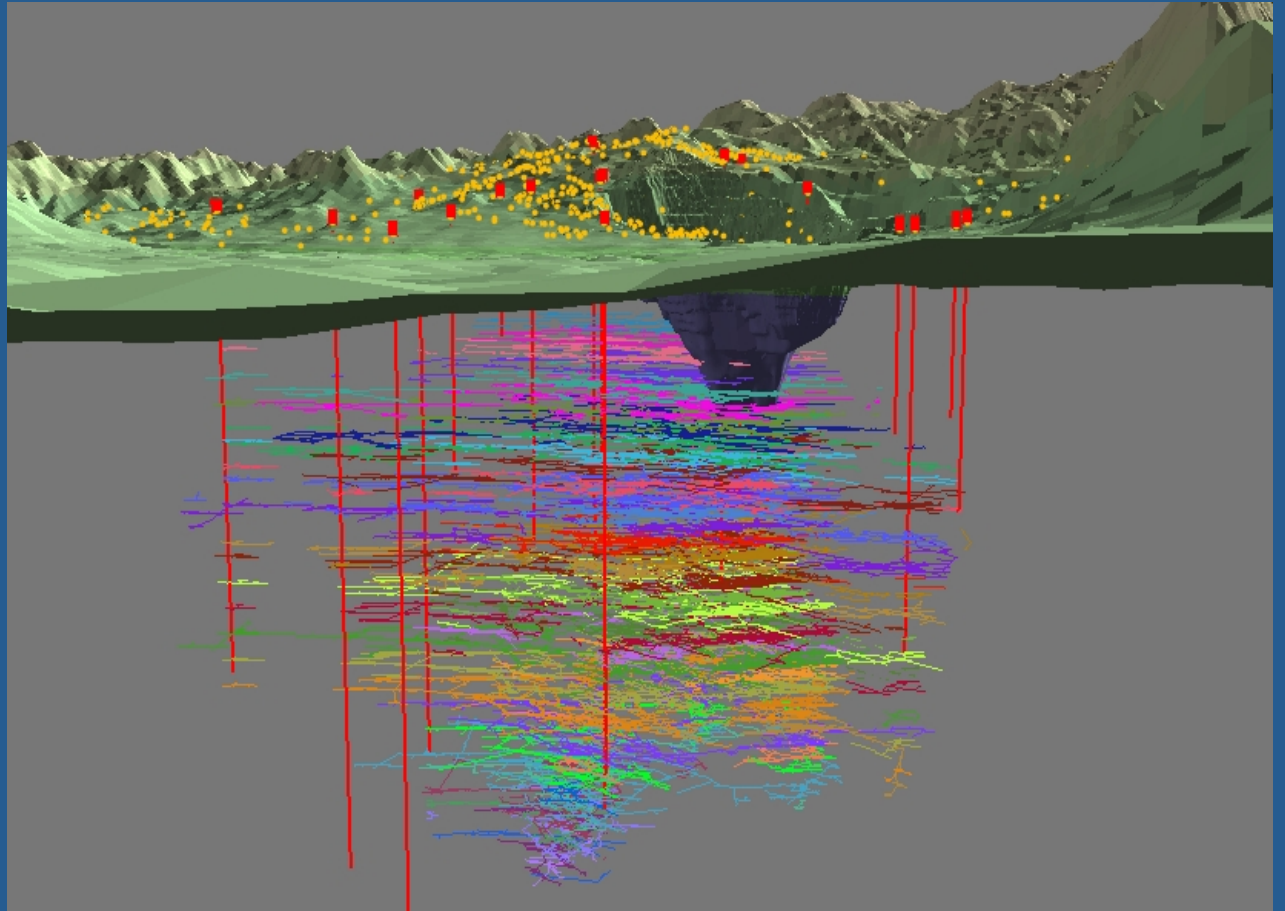
How Did We Get Here?



High Ore Pump Station 2800



Kelley Pump Station 3900



Monitoring Program

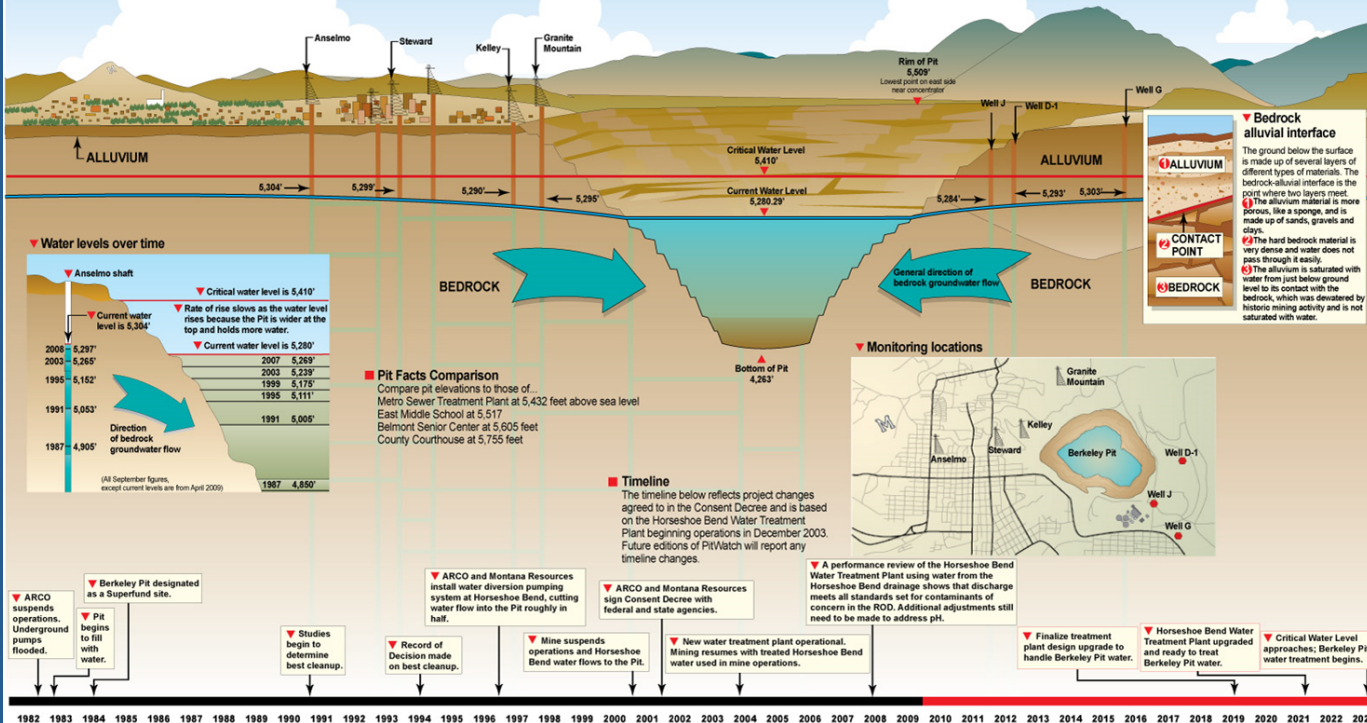
▼ Watching the water...

This illustration depicts bedrock groundwater levels in the Berkeley Pit and underground mine workings beneath Butte. It shows how the Pit is at the center of a large "cone of depression" which works like a big sink that draws water toward it. Water level measurements, shown as elevations (in feet) above sea level, help us understand the complex nature of the underground water system.

▼ What is the current water level of the Pit?

As of April 2009, the Berkeley Pit's water level was 5,280.23 feet above sea level. The water level climbed about 7.35 feet since the last issue of PitWatch in spring 2008. Since June 1996, when PitWatch was first published, the water has risen about 152 feet.

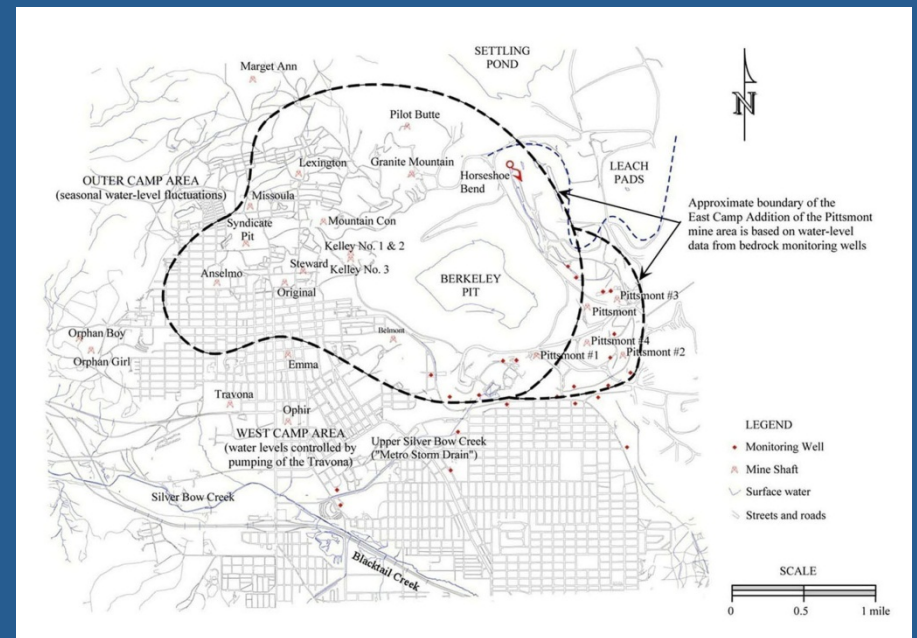
DATA SOURCES: EPA, Record of Decision (1994) and monthly monitoring reports from the Montana Bureau of Mines and Geology. All elevations based on U.S. Geological Survey data. Contact the PitWatch Committee for full data reports.



Graphic and photos available at: www.pitwatch.org

East Camp System

- Alluvial groundwater within the active mine site.
- Bedrock groundwater, including abandoned underground mines.
- Berkeley Pit, Horseshoe Bend, and Continental Pit (not monitored during active mining).



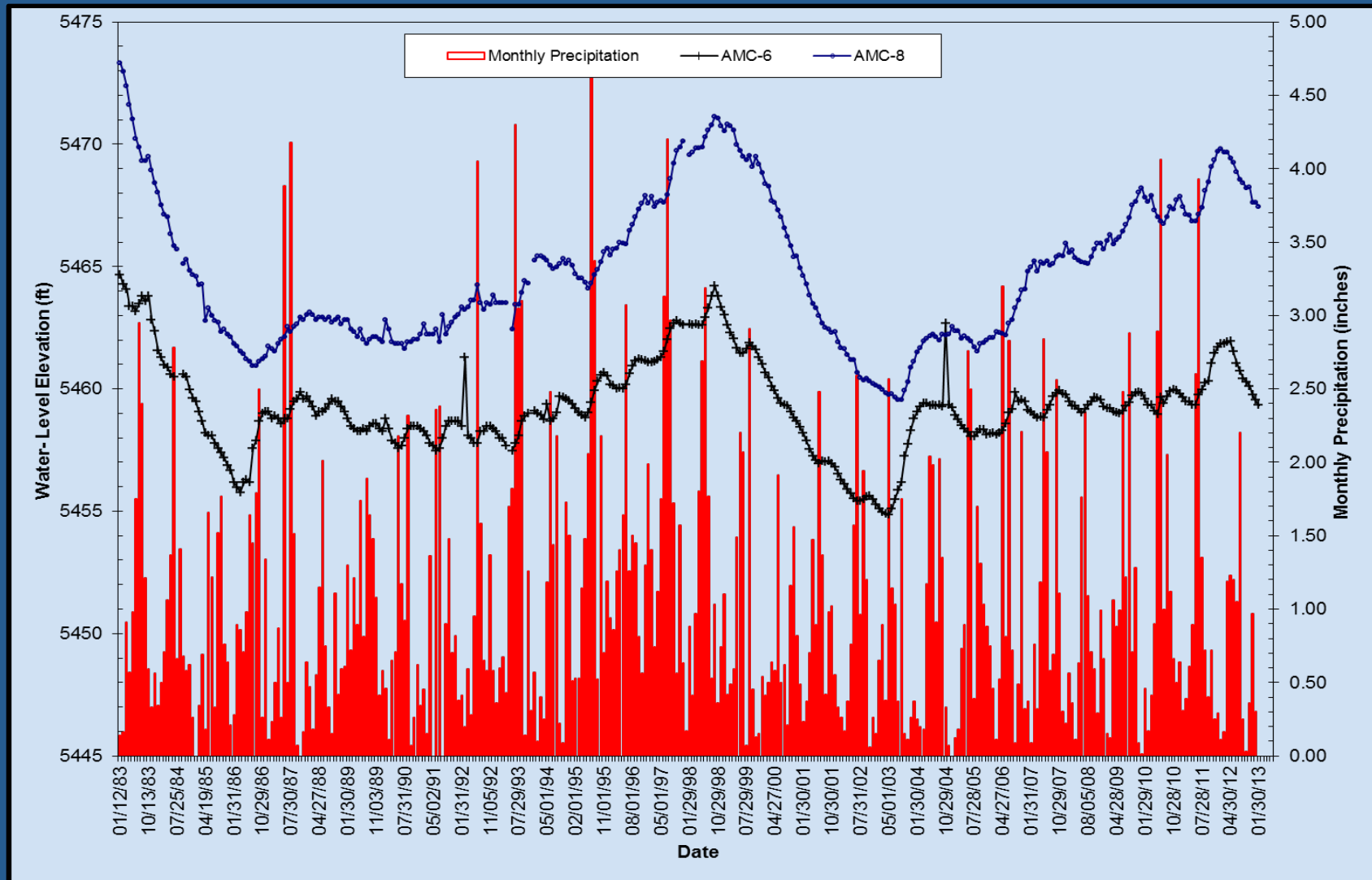
Alluvial Monitoring Network



Alluvial Network

- 22 wells within the active mine area
- 16 wells outside the active mine area
- 2 nested well pairs within mine area
- 3 nested well pairs outside mine area
- Hourly water-level monitoring in 21 wells

Long-Term Trends in Alluvial Wells



East Camp Bedrock Network

- 11 bedrock wells within the active mine area
- 4 bedrock wells outside the active mine area
- 6 mine shafts
- Hourly water-level monitoring in 10 wells

Bedrock Monitoring Network



East Camp Bedrock Critical Water Level-Elevation 5410, USGS

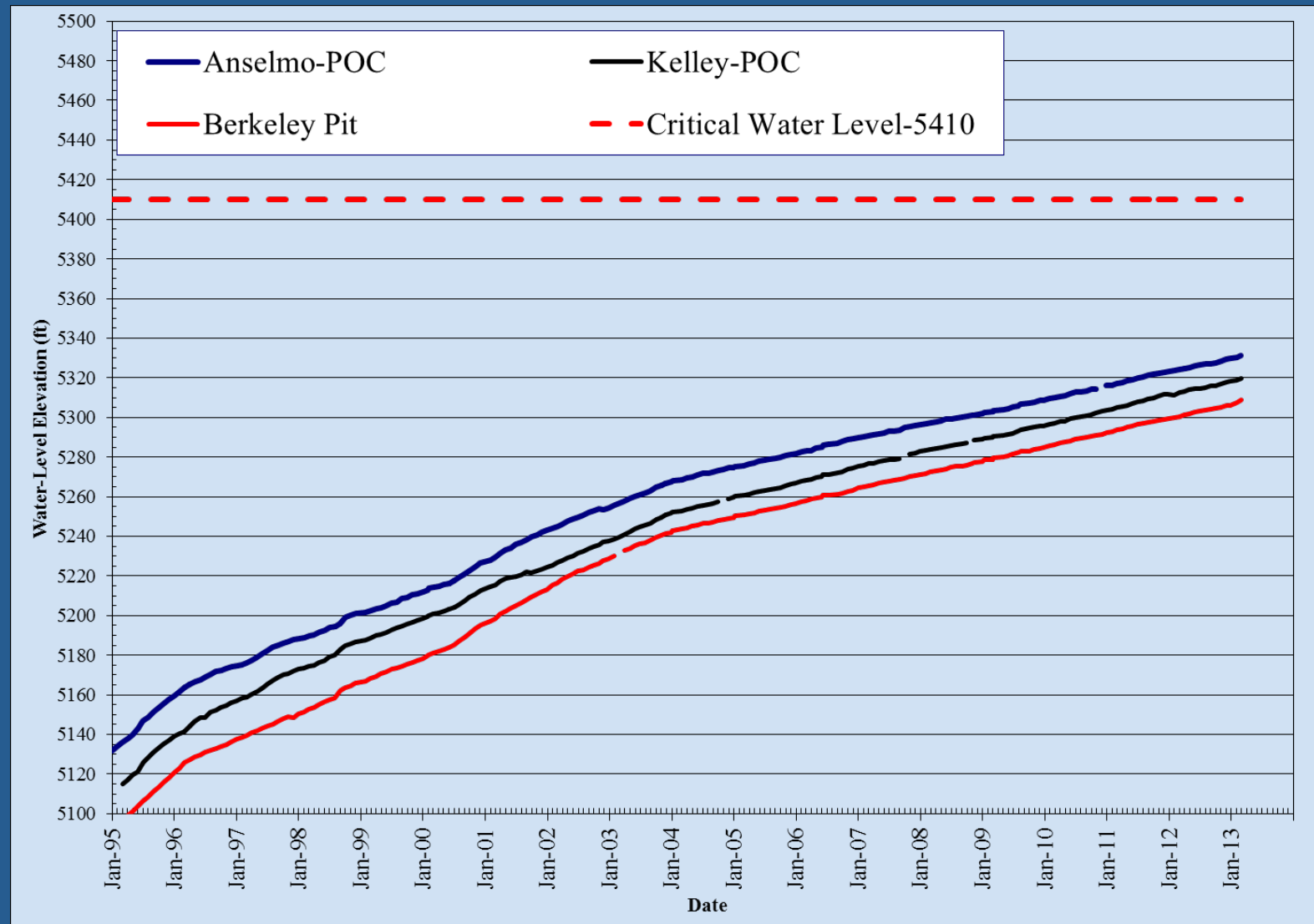
- Critical Water Level (CWL) is based on lowest point in the Butte Basin, location where Silver Bow Creek exists the basin, Ranchland Packing and where I-90 crosses creek.
- Established 9 Points of Compliance (POC)
- 4 mine shafts
- 5 bedrock wells
- Water-levels cannot exceed CWL at any of the POC's, therefore, pit always the lowest point.

Points of Compliance Sites

- Anselmo Mine
- Granite Mountain Mine
- Kelley Mine
- Pilot Butte Mine
- Belmont Well #2
- Bedrock Well A
- Bedrock Well C
- Bedrock Well G
- Sarsfield Well



Points of Compliance Vs. Berkeley Pit



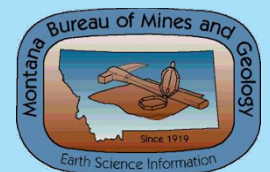
Comparison Elevations

- Elevation at 5 Mile Bar- 5562'
- Elevation at Butte Country Club- 5505'
- Elevation at Butte Plaza Mall- 5472'
- Civic Center- 5469'
- Courthouse- 5761'
- Elevation at Chamber of Commerce- 5459'
- Lowest point of Berkeley Pit rim- 5510'
- Alluvial Water-Level Elevation at Rim – 5450'
- Elevation of Pit water that would reverse gradient
- 5460'

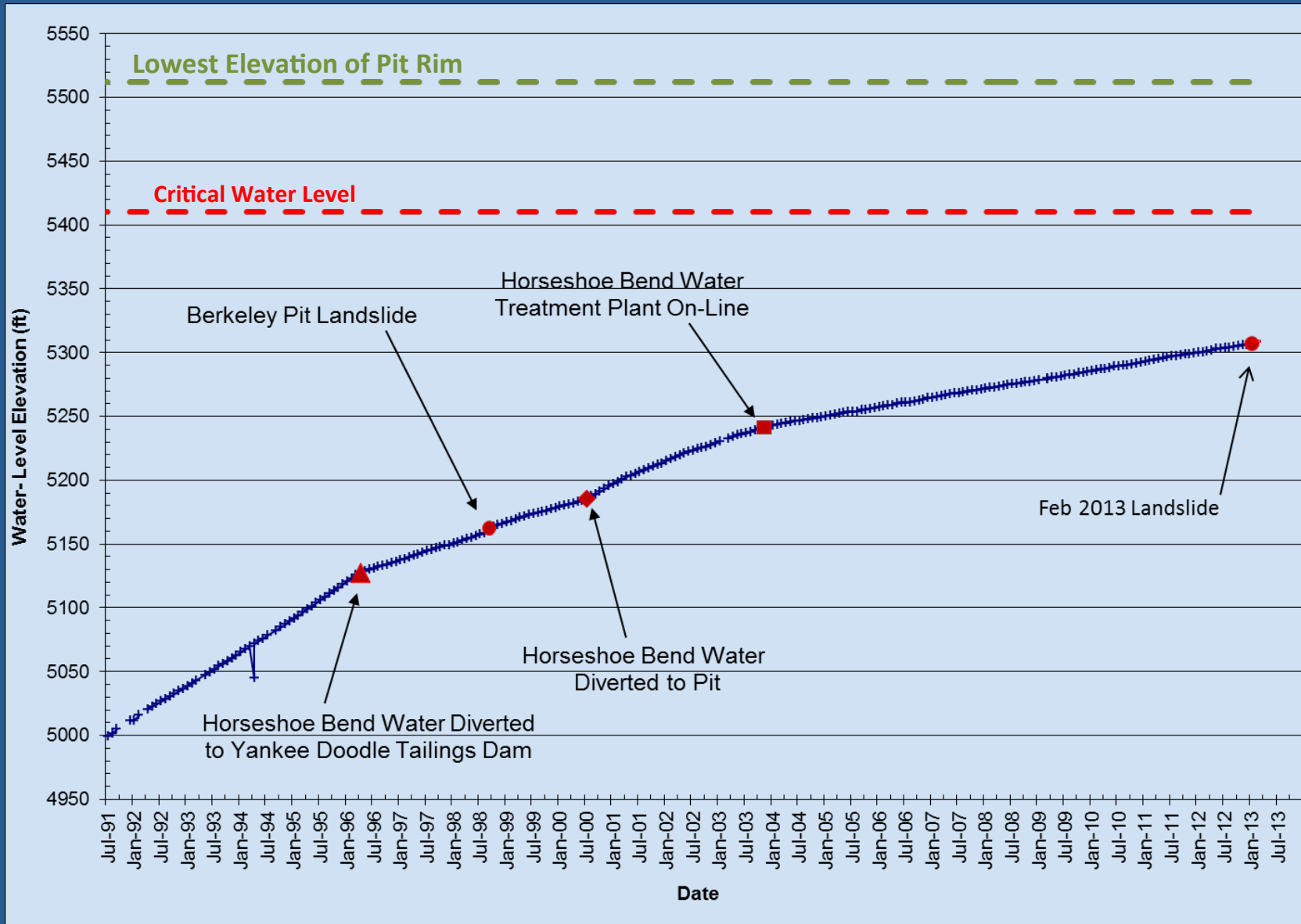


**The Berkeley Pit will never
overflow**

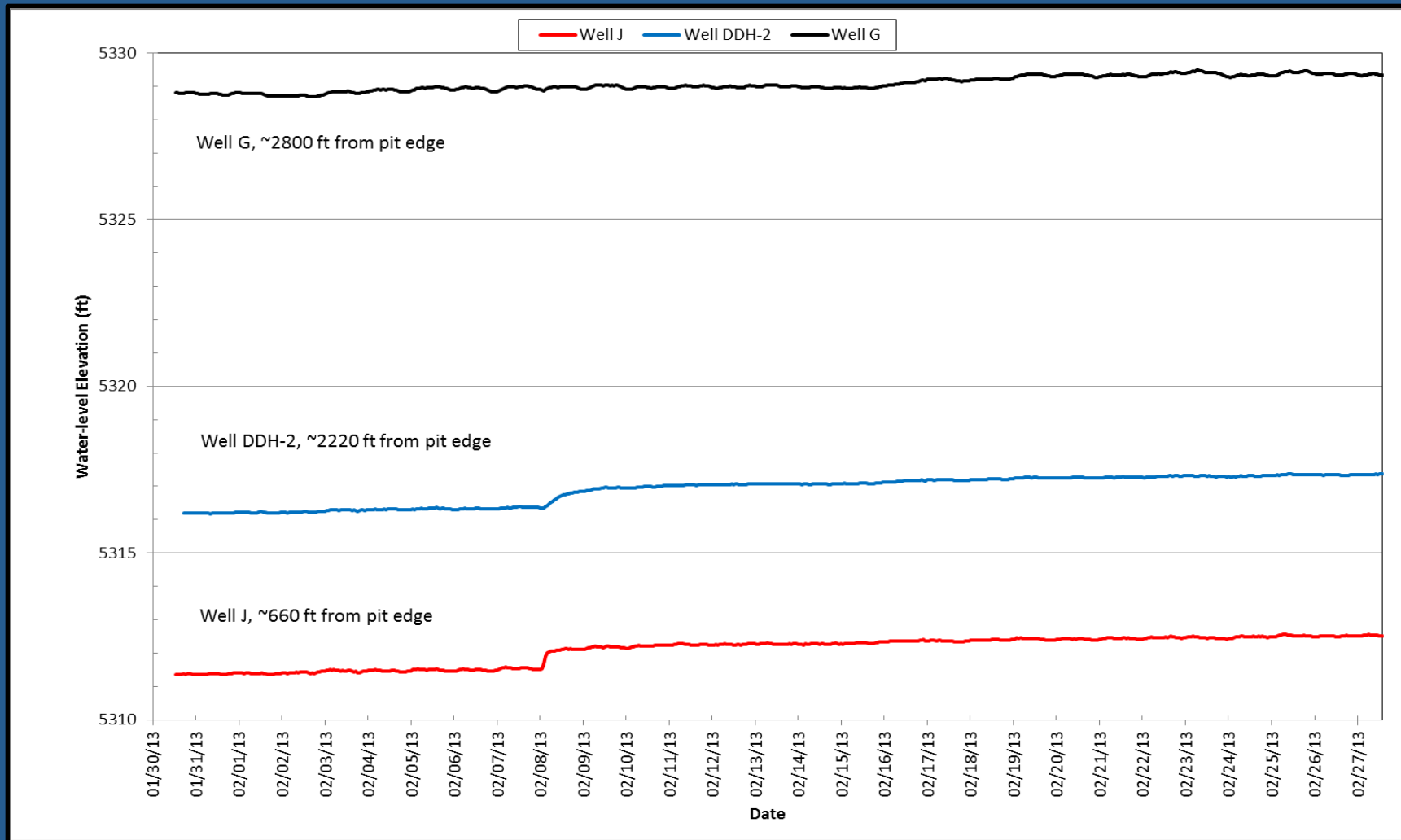
Approx. 5410' level
Dec 2012 water level
5306'

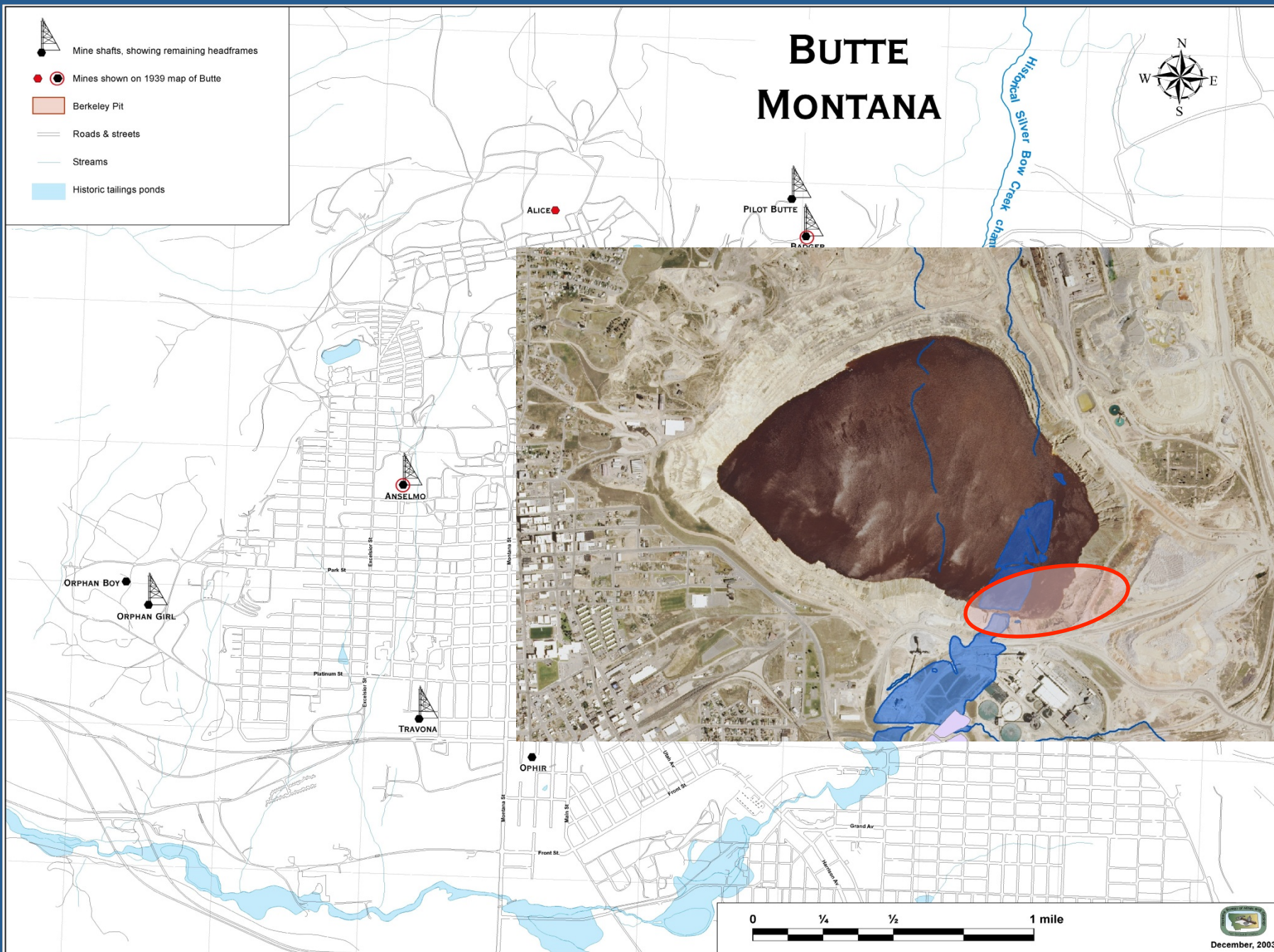


Berkeley Pit Long-Term Trend



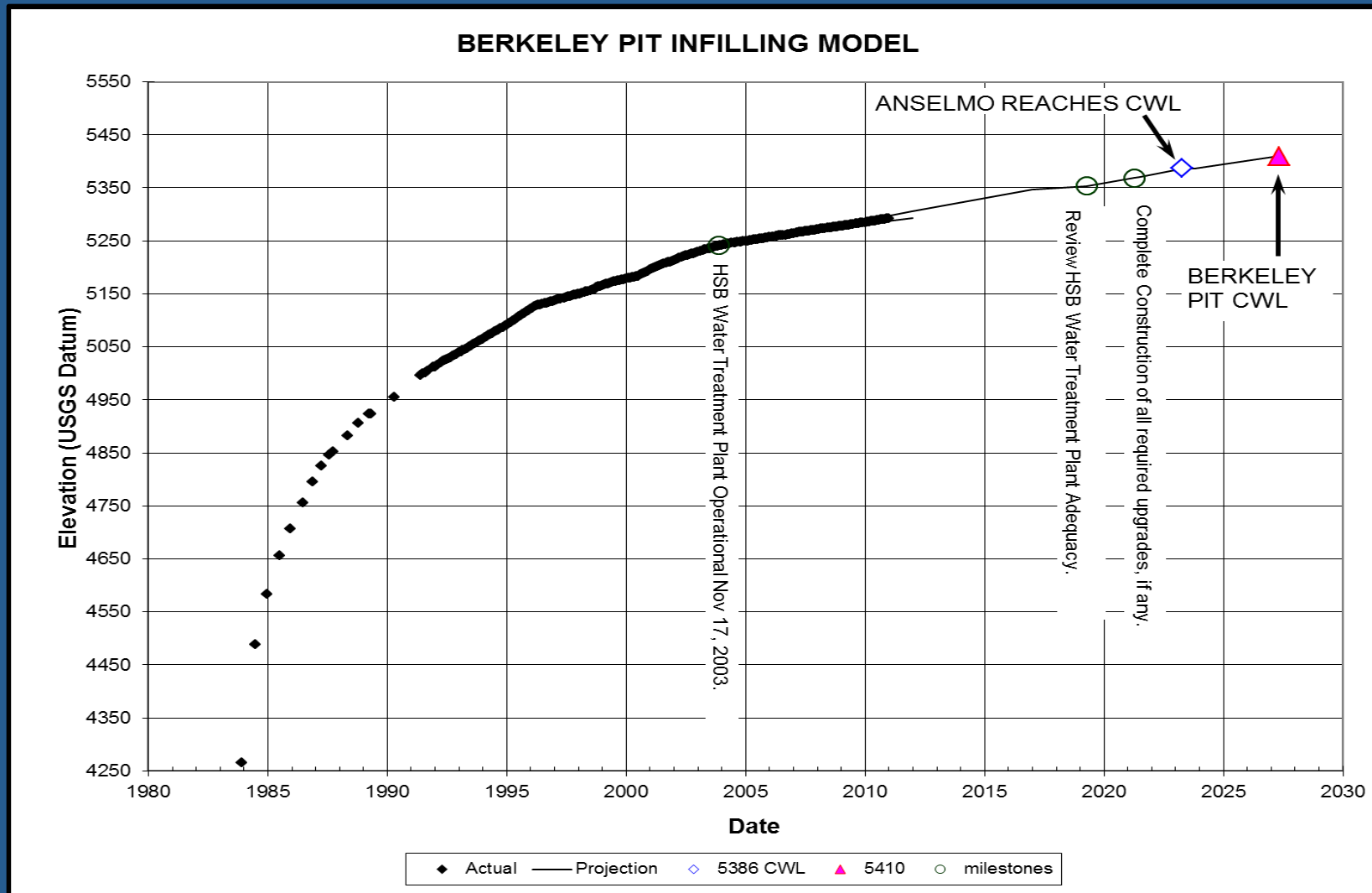
Recent Berkeley Pit Landslide Transducer Data-February 2013





December, 2003

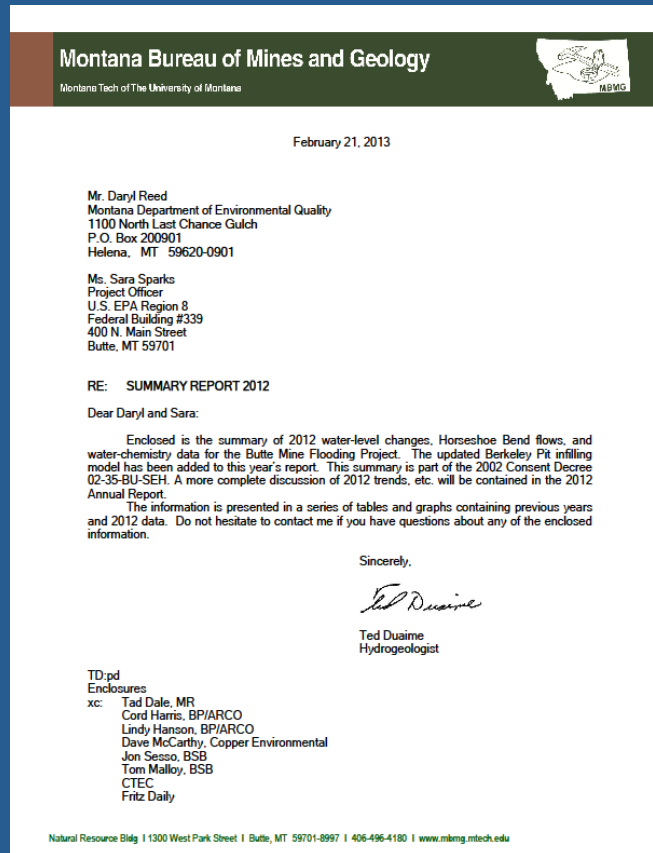
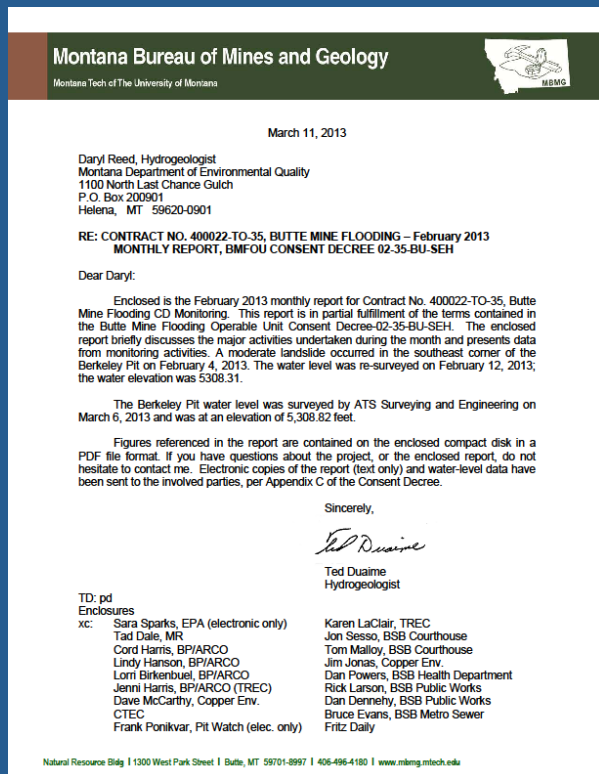
Berkeley Pit CWL Projections, Based on Anselmo Mine Water-Levels (July 2023)



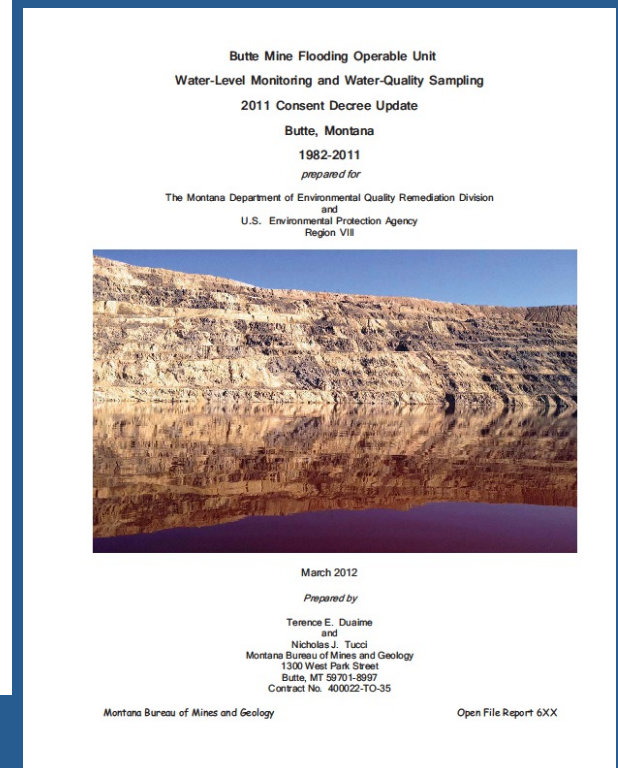
Data Reporting Requirements

Annual

Monthly



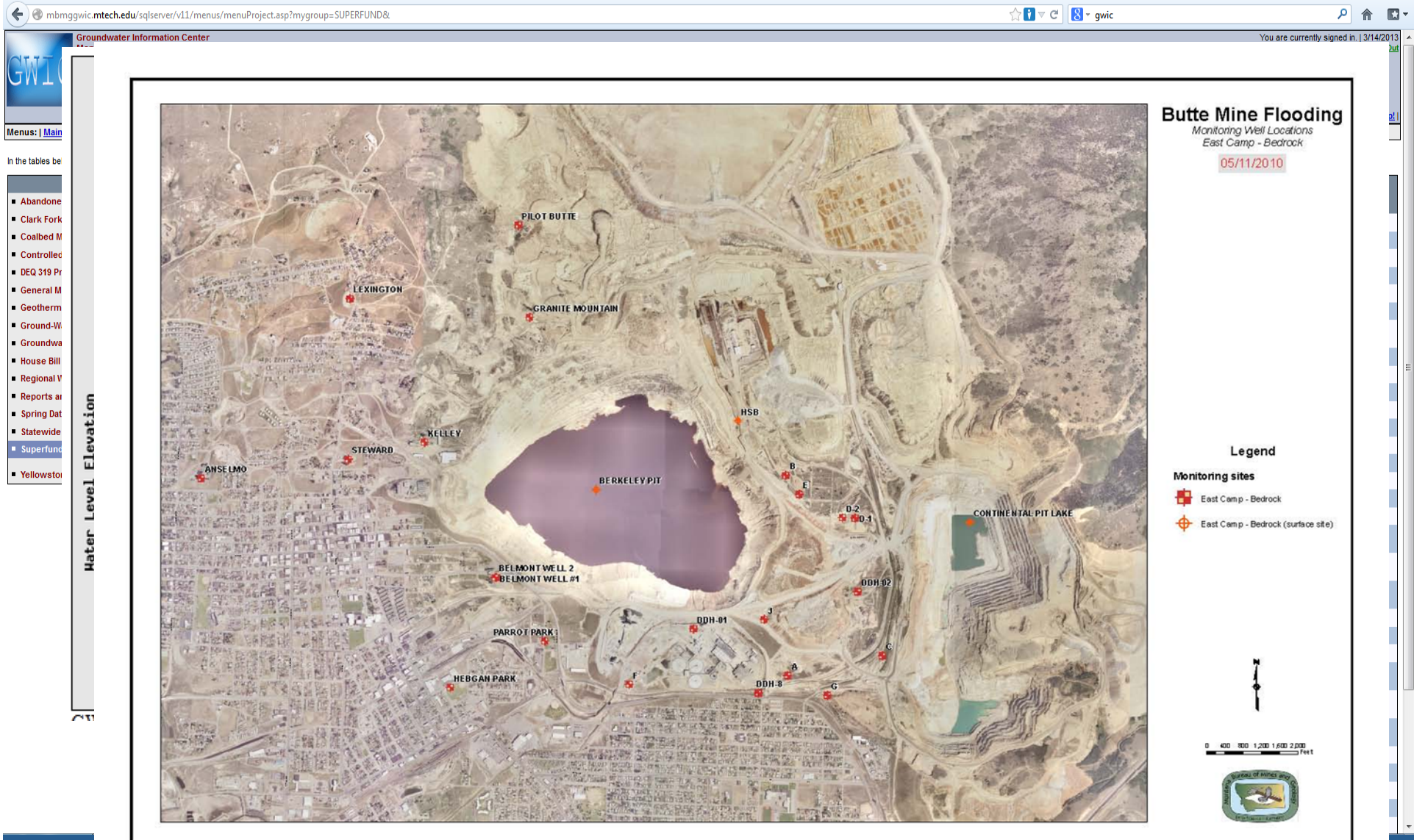
Open-File Reports



Open-File Reports Available online at:

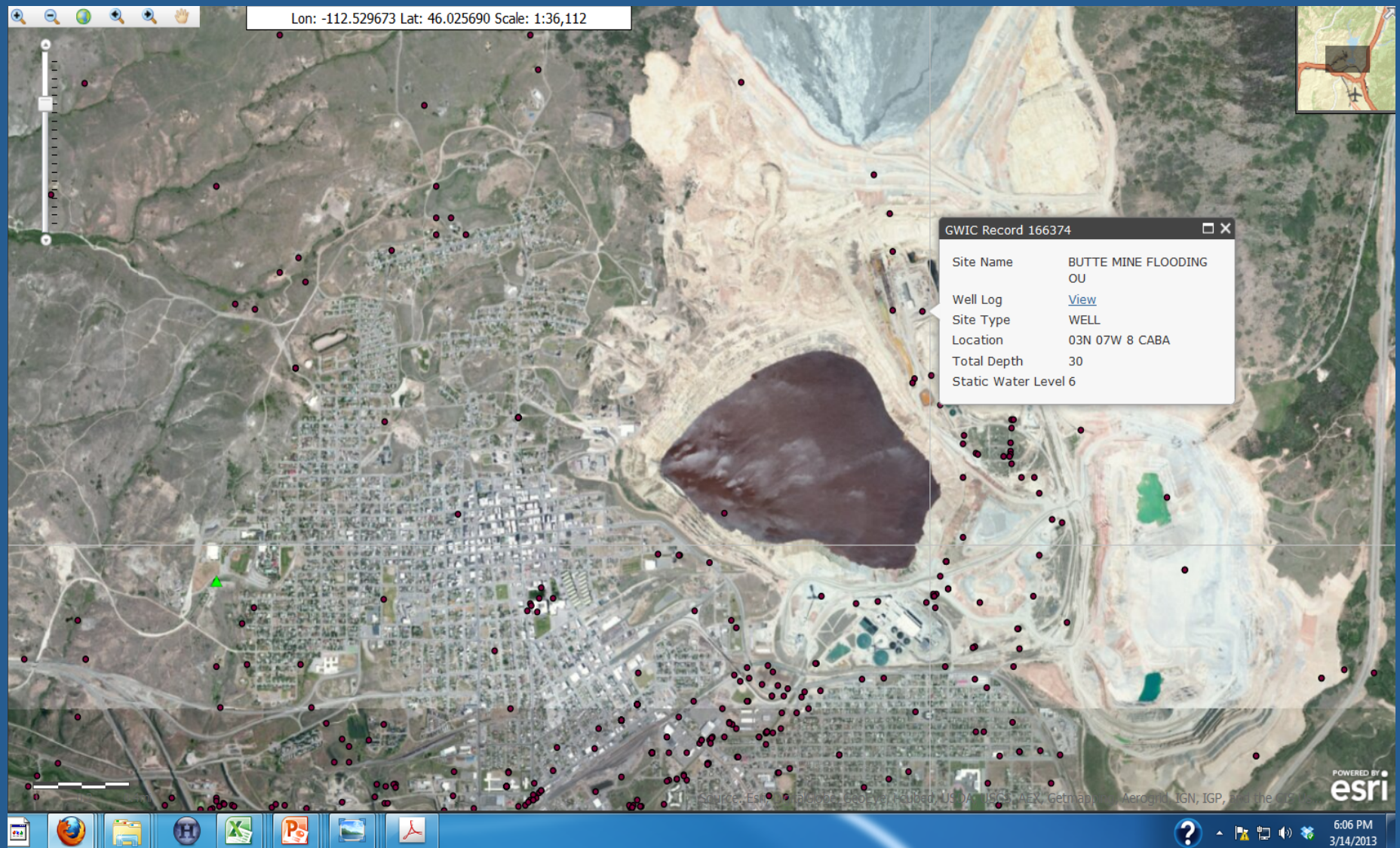
www.mbmgt.mtech.edu

All Data Available on GWIC



All BMFOU data available online at: mbmggwic.mtech.edu

GWIC Mapper



Questions????

