

Teck



Red Dog Mine Annual Meeting

Waste Management Permit No. 0132-BA002

Reclamation Plan Approval F20099958

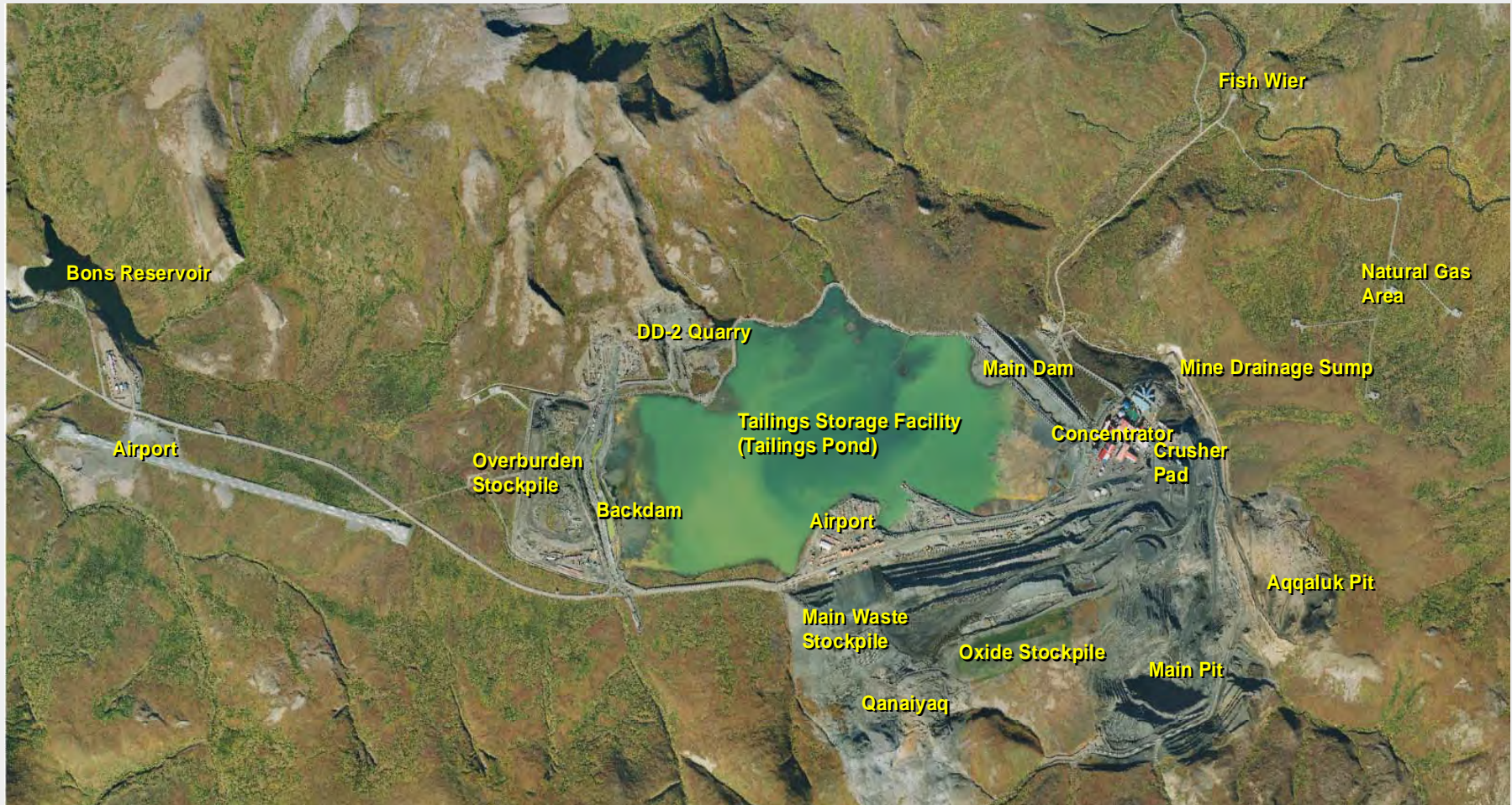
2013

Agenda



- **Site Overview**
- **Production**
- **Waste Rock Management**
- **Tailings and Water Management**
- **Permafrost Monitoring**
- **Biomonitoring**
- **Reclamation**
- **Water Treatment Pilots**
- **Mine Activities**

Site Overview



Aqqaluk and Main Pit 2013



Main Pit 2013



Aqqaluk Deposit 2012



Main Pit 2012



Production



2013 Production



Mine Production

- Ore Hauled 3,716,502 tonnes
- Waste Rock Hauled 7,945,848 tonnes
- Total 11,662,3500 tonnes
- Strip Ratio 2.1 : 1.0

Mill Production

- Ore Milled 3,852,807 tonnes
- Concentrate Production
 - Zinc 983,942 tonnes
 - Lead 175,228 tonnes

Waste Rock Management



Waste Rock Hauled 7,945,848 tonnes

Main Waste Stockpile
1,631,296 tonnes

Main Pit Dump
5,845,374 tonnes

In pit use / disposal
25,912 tonnes

Construction use
446,710 tonnes

Most Reactive Waste
1,154,742 tonnes
2.3% Zn
1.4% Pb
3.6% Fe

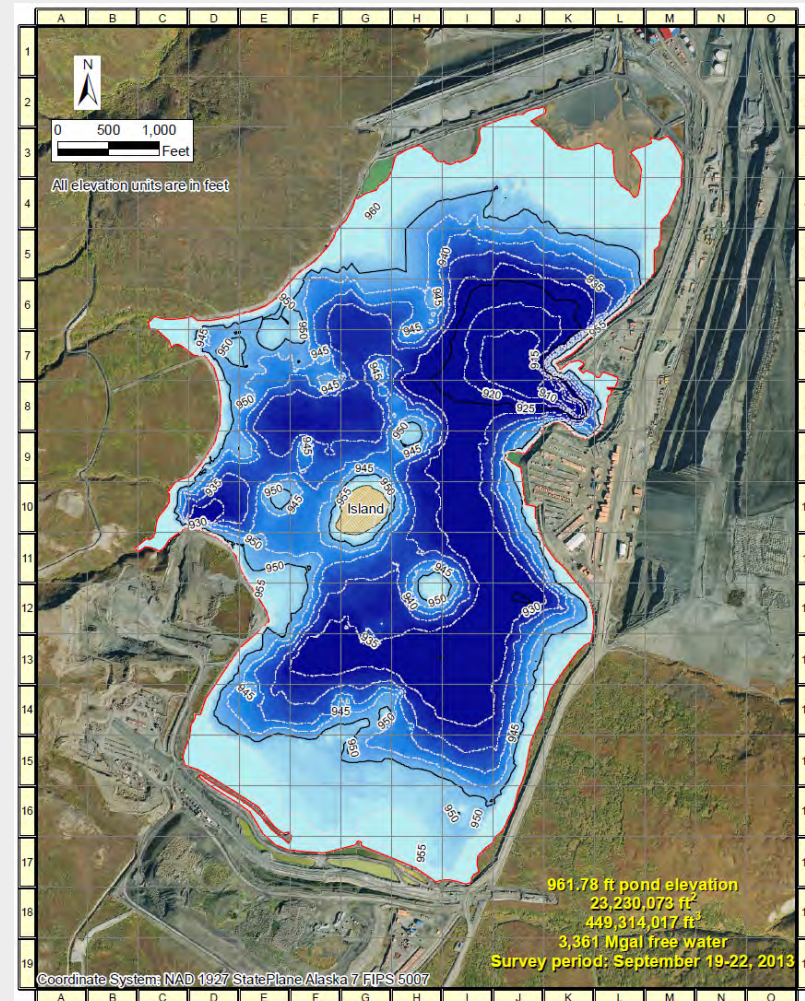


2013 Bathymetric Survey

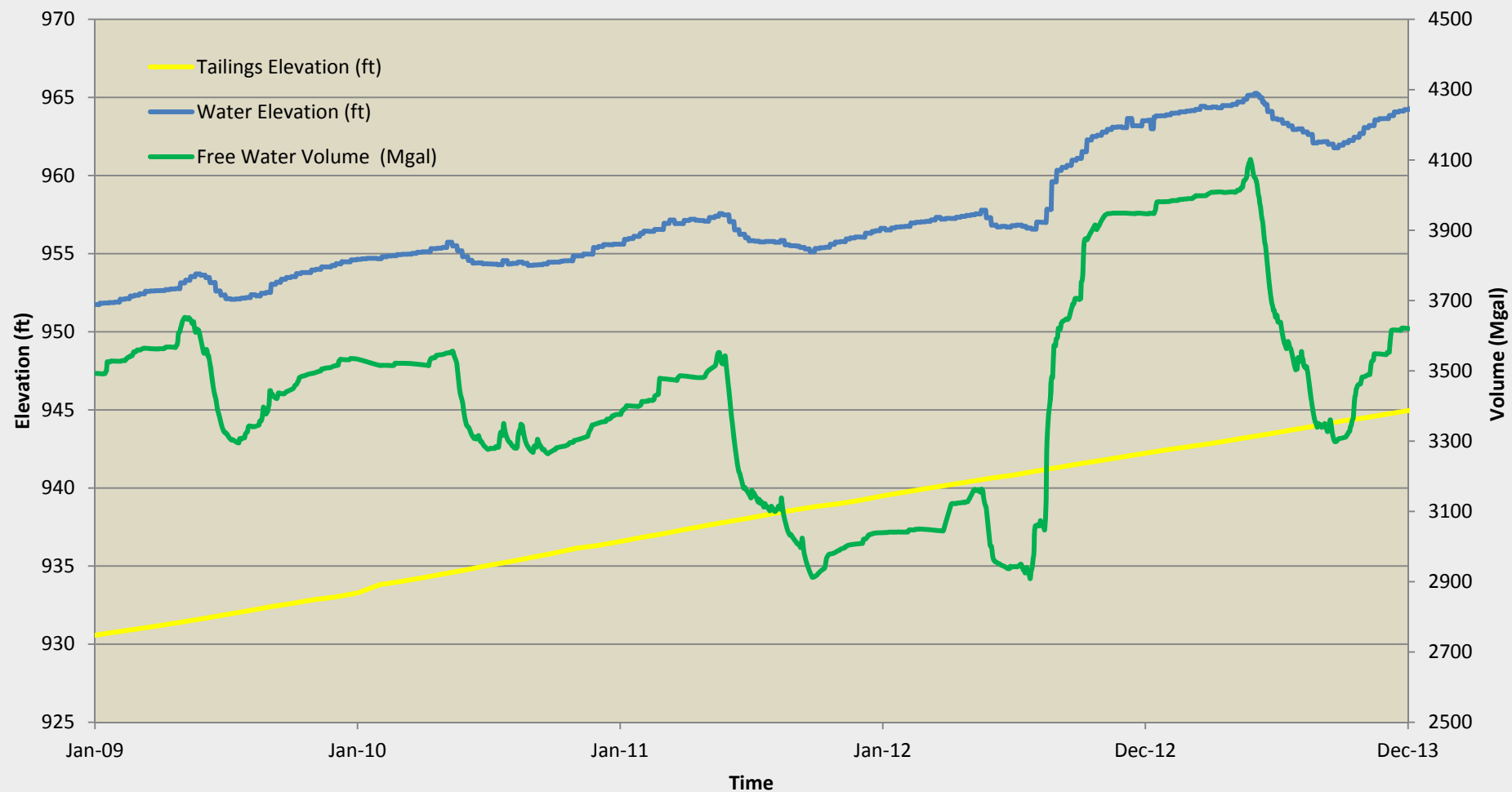


- **Surveyed Sept 19-22, 2013**
- **TSF water elevation 961.78 ft**
- **3,361 Mgal free water**

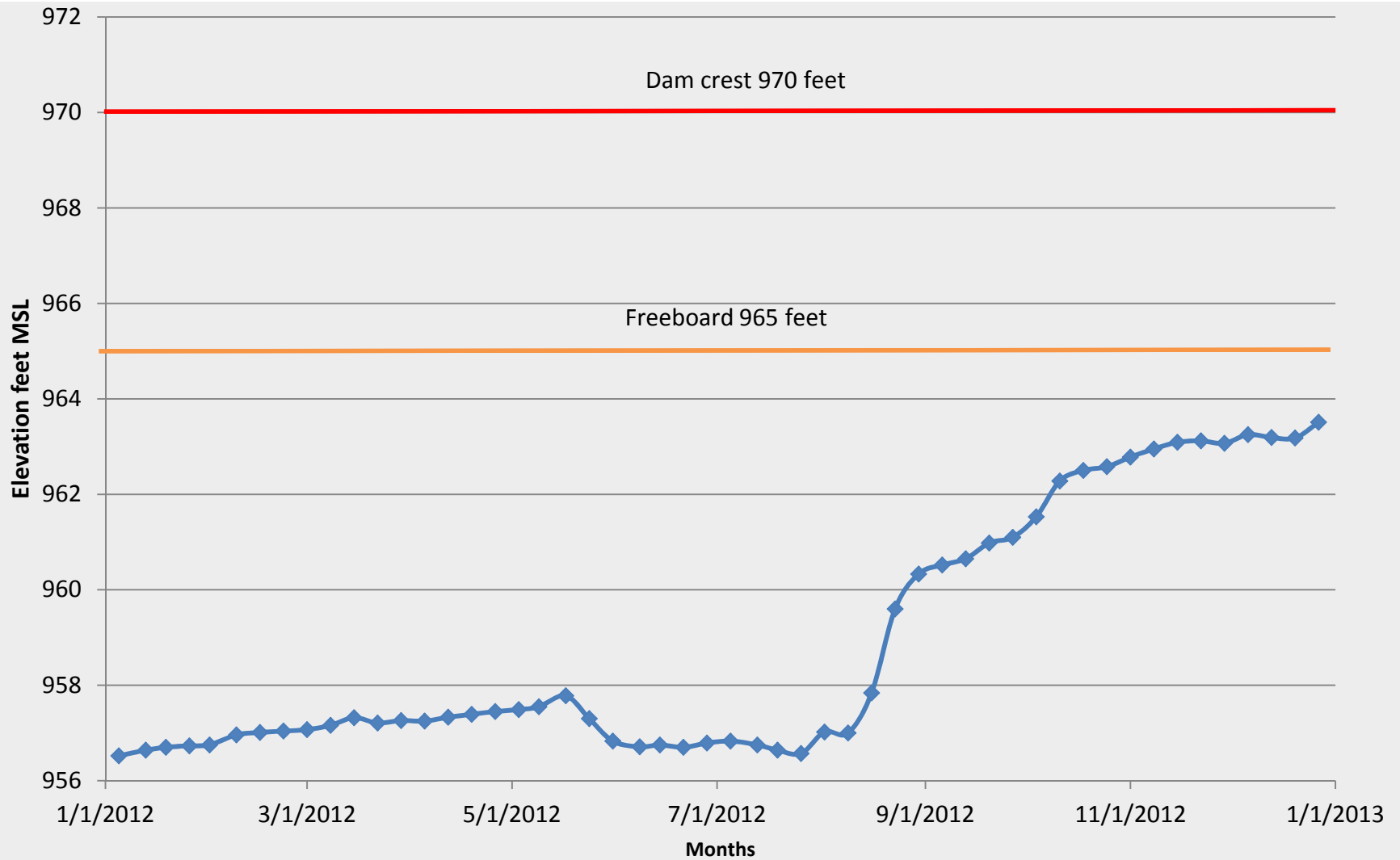
- **Model predicted**
 - 961.71 ft water elevation
 - 3,231 Mgal free water



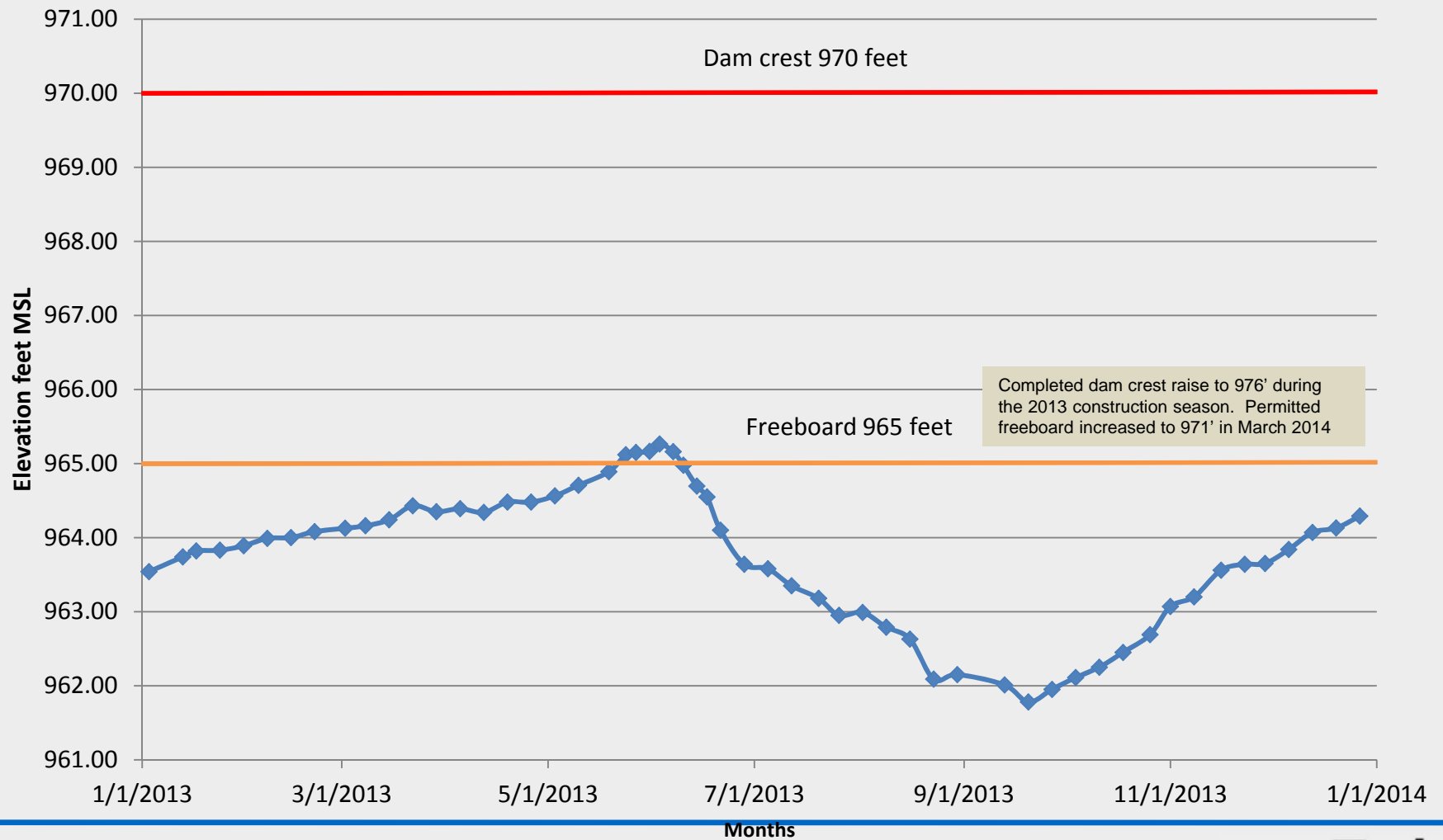
Tailings Pond Trends



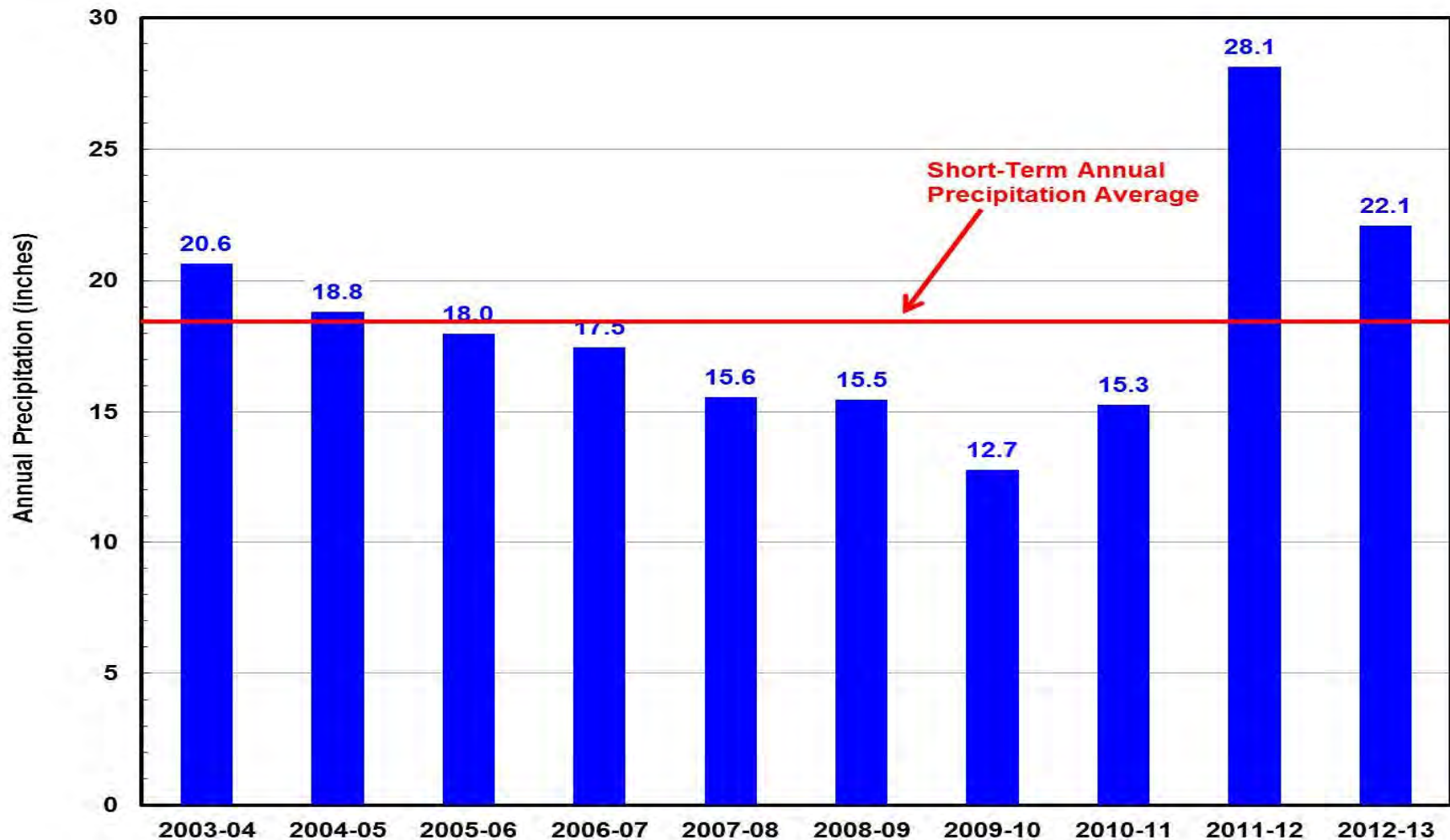
Tailings Pond Water Elevation 2012



Tailings Pond Water Elevation 2013



Red Dog Yearly Precipitation vs. 21 year average



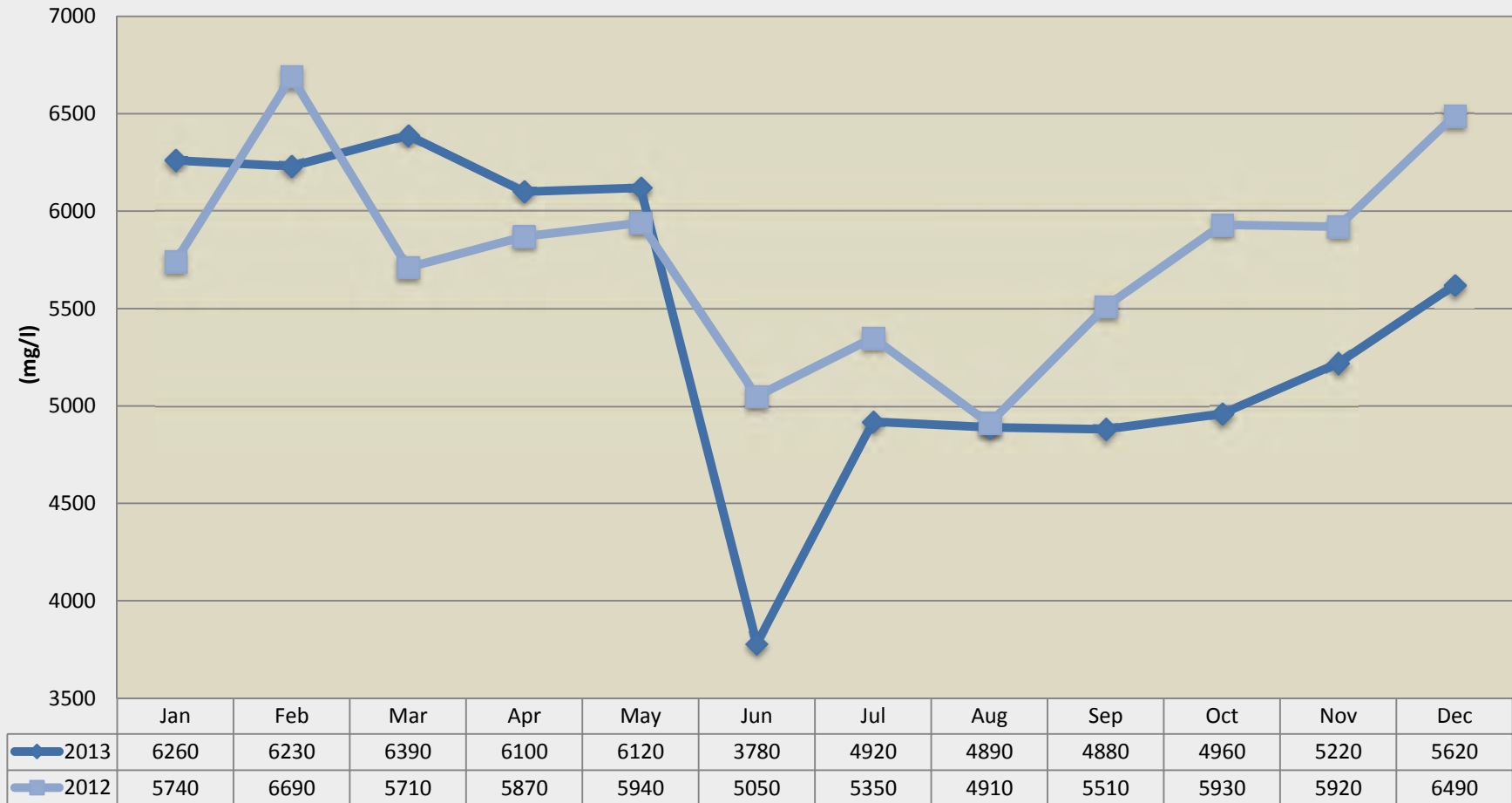
Mine Water Quality



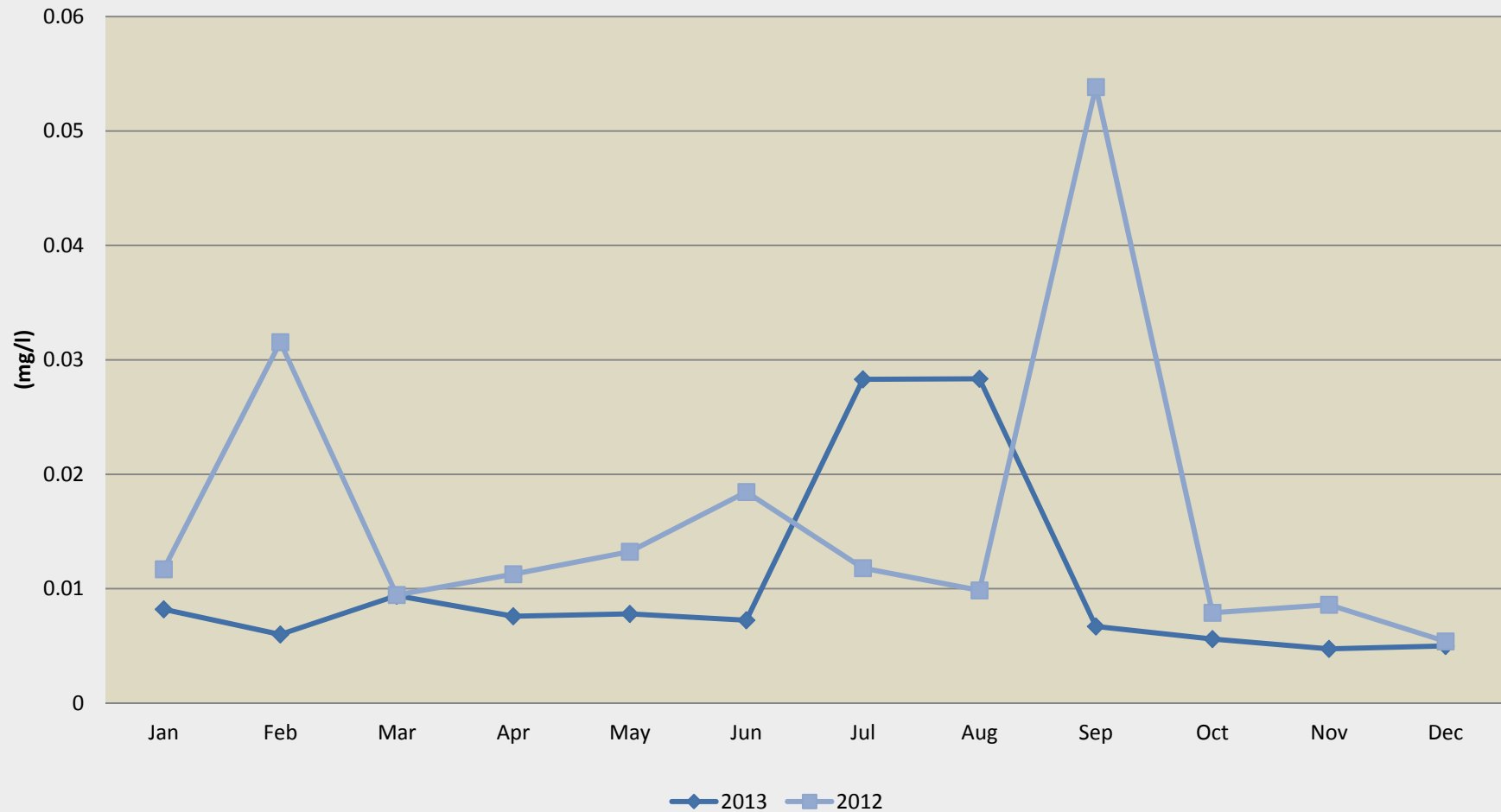
Water Treatment



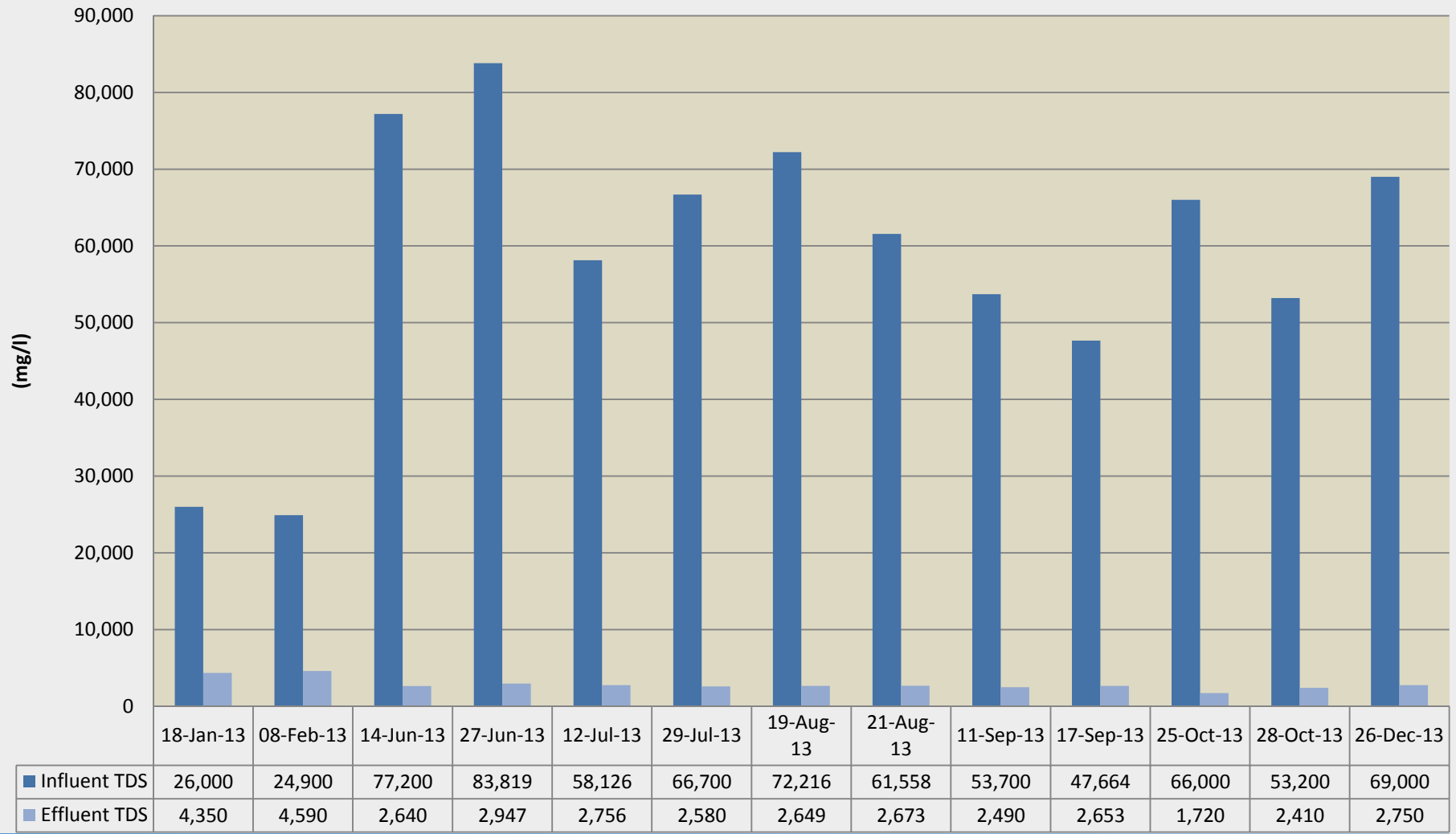
TDS Concentration in Tailings Pond (2012 and 2013)



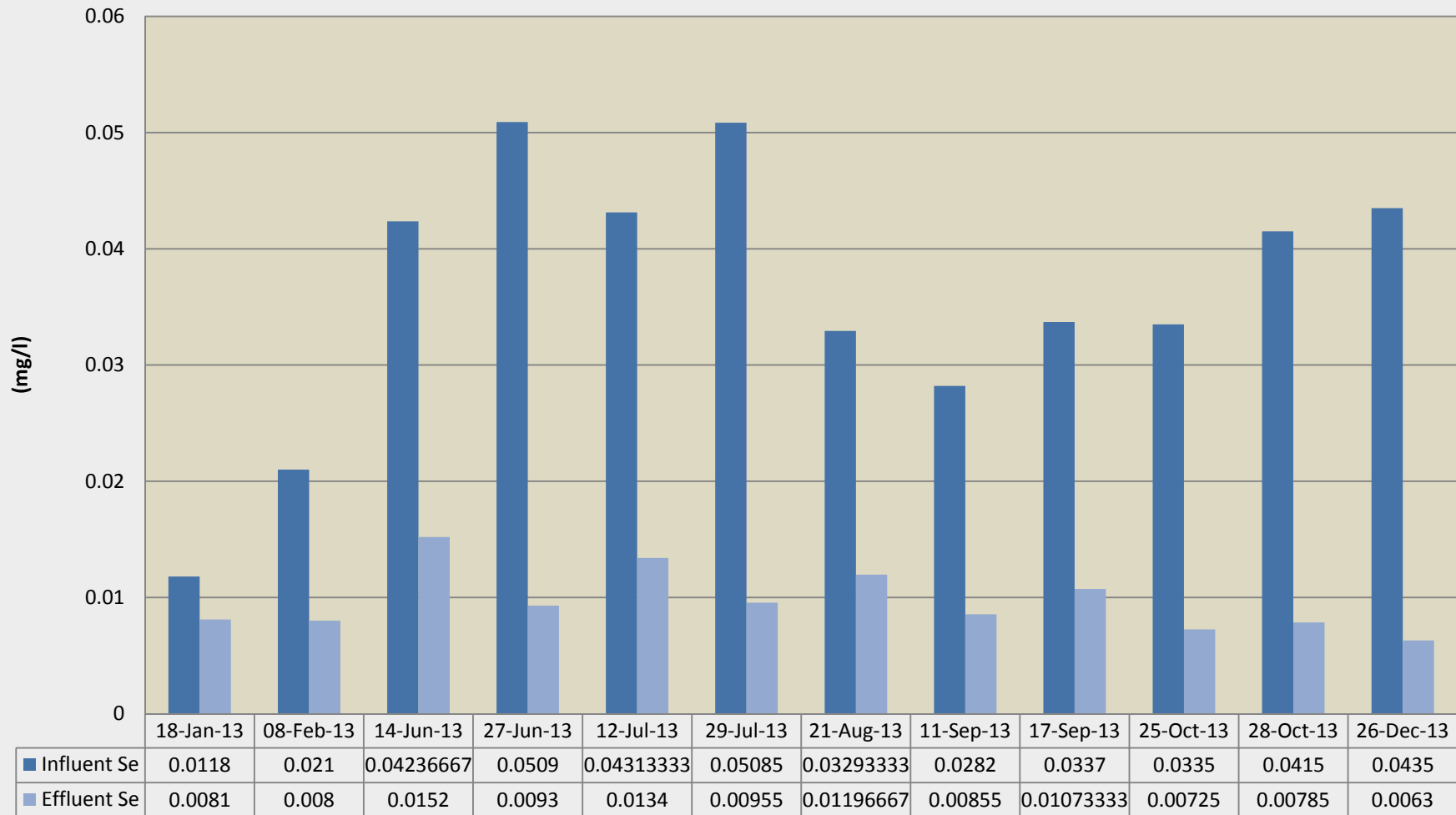
Se in the Tailings Pond (2012 and 2013)



High Density Sludge Treatment of ARD Water (TDS)



High Density Sludge Treatment of ARD Water (Se)



Permafrost Monitoring



Monitoring Program

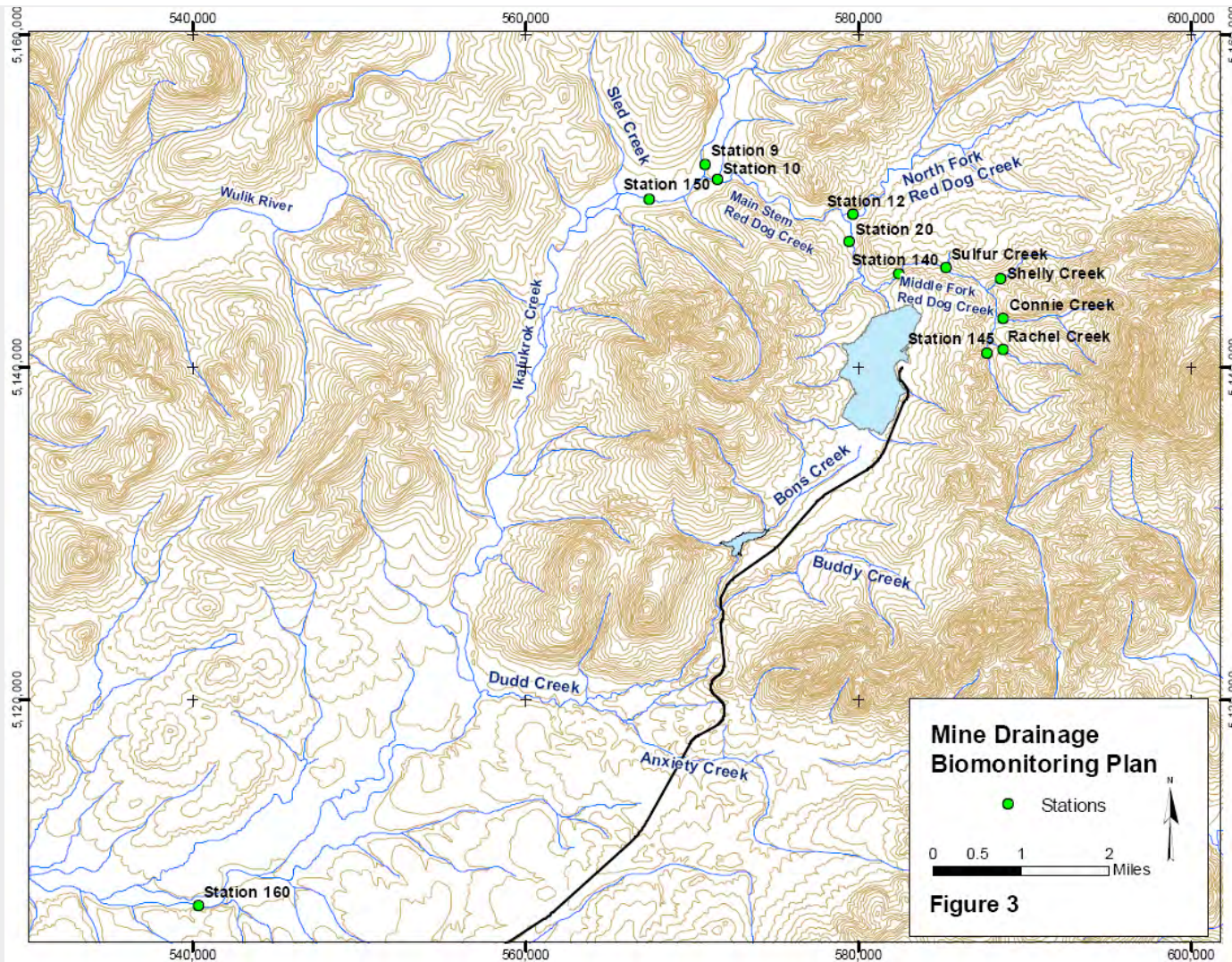
- Quarterly monitoring of 15 key background and dam area thermistors was conducted to assess currently observed trends in temperature changes in the permafrost;
- Quarterly monitoring of 8 key background and dam area piezometers was conducted to assess currently observed water levels and gradients.
- Annually produce an annual data monitoring report.
- Every five years review and analyze data to determine if changes in permafrost or sub-permafrost groundwater have occurred or can be expected to occur. Next review is in 2017.

Biomonitoring

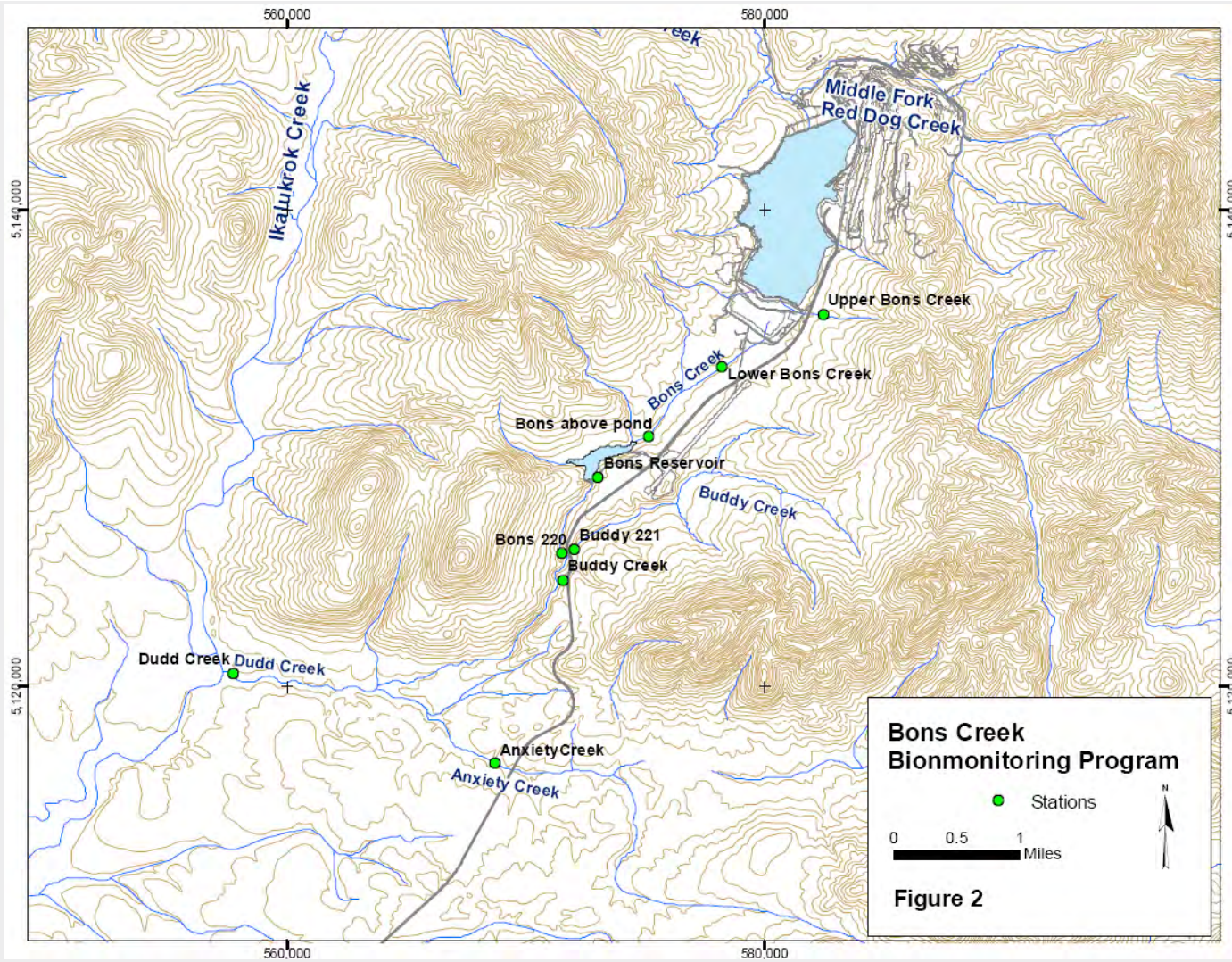


Figure 46. North Fork Red Dog Creek fyke net site in early June (left photo 2012, right photo 2013).

Mine Drainage Monitoring Stations



Bons Creek Monitoring Sites



Aquatic Invertebrates

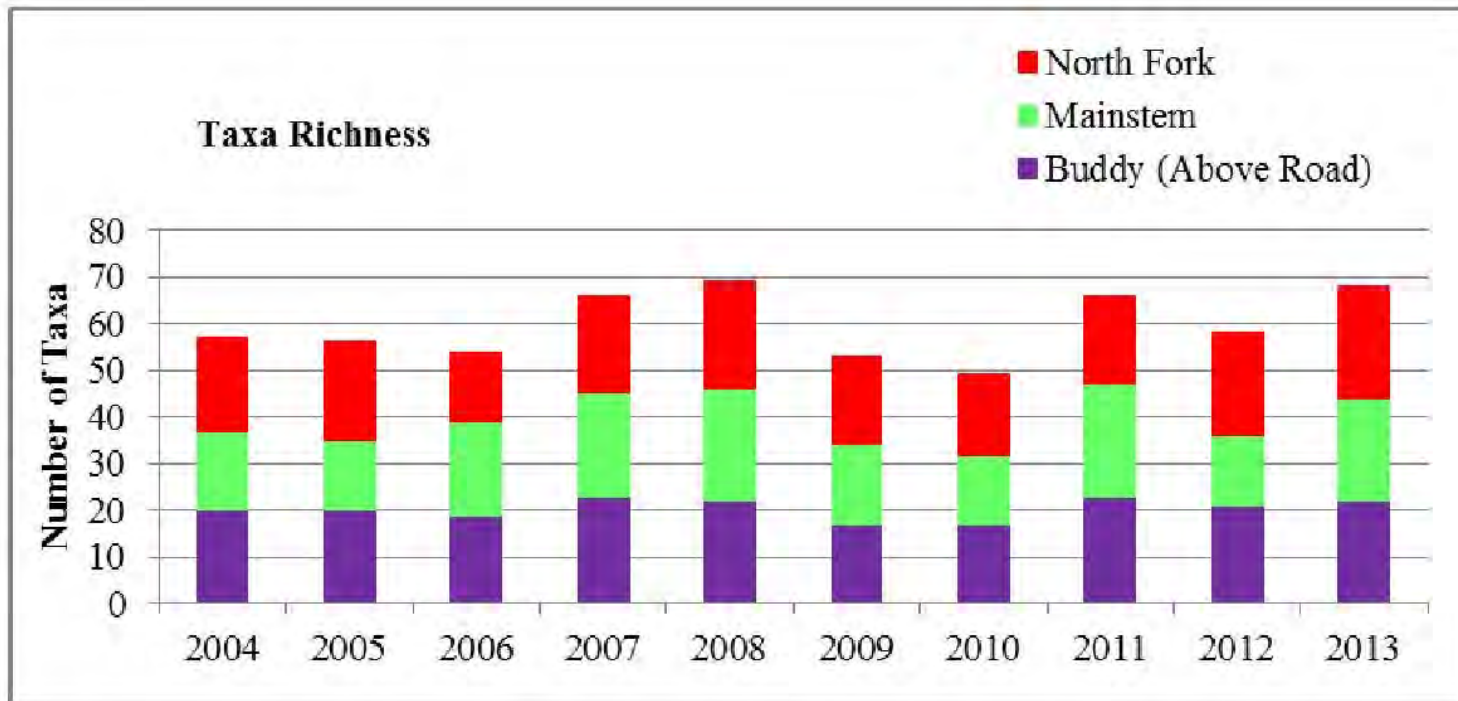


Figure 31. Aquatic invertebrate taxa richness in North Fork Red Dog, Mainstem Red Dog, and Buddy creeks.

From [Aquatic Biomonitoring at Red Dog Mine, 2013](#) by Alvin G. Ott and William A. Morris

Lead Concentrations in Creeks near Red Dog Mine

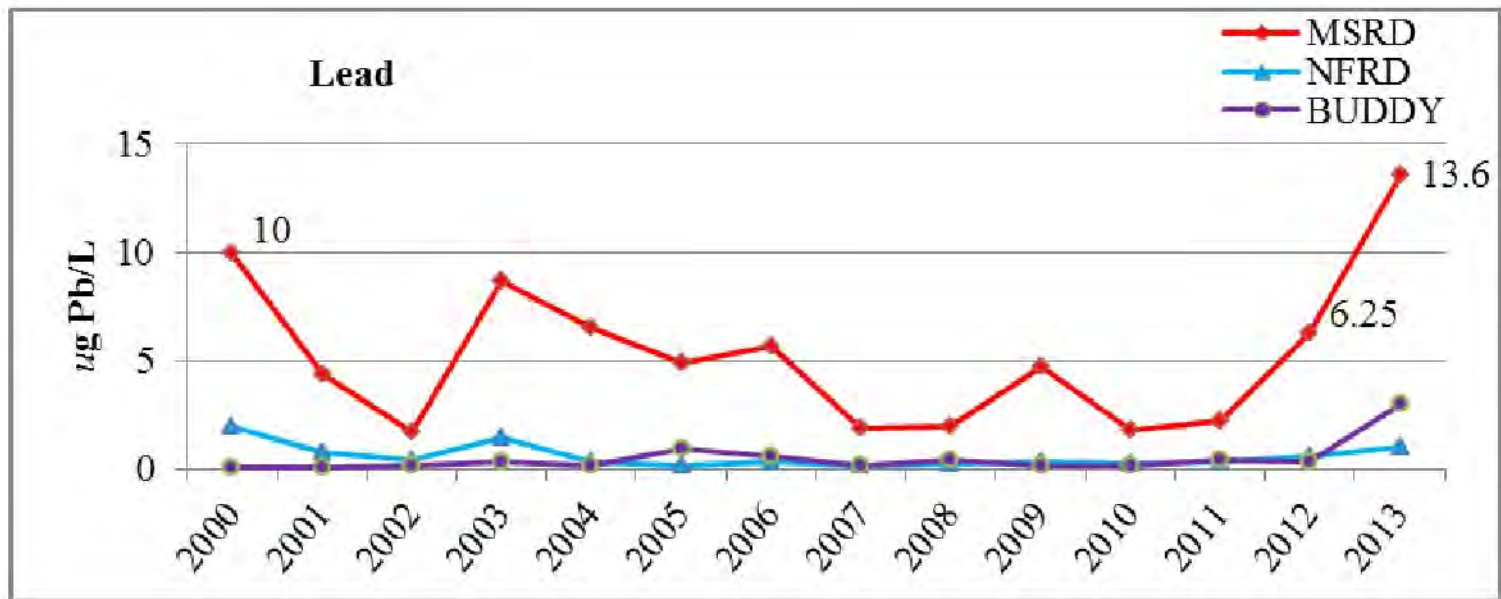


Figure 15. Median Pb concentrations in Mainstem Red Dog, North Fork Red Dog, and Buddy Creeks (2000 to 2013).

From [Aquatic Biomonitoring at Red Dog Mine, 2012](#) by Alvin G. Ott and William A. Morris

Zinc Concentrations in Creeks near Red Dog Mine



Figure 16. Median Zn concentrations in Mainstem Red Dog, North Fork Red Dog, and Buddy Creeks (2000 to 2013).

From [Aquatic Biomonitoring at Red Dog Mine, 2012](#) by Alvin G. Ott and William A. Morris

Selenium Concentrations in Creeks near Red Dog Mine

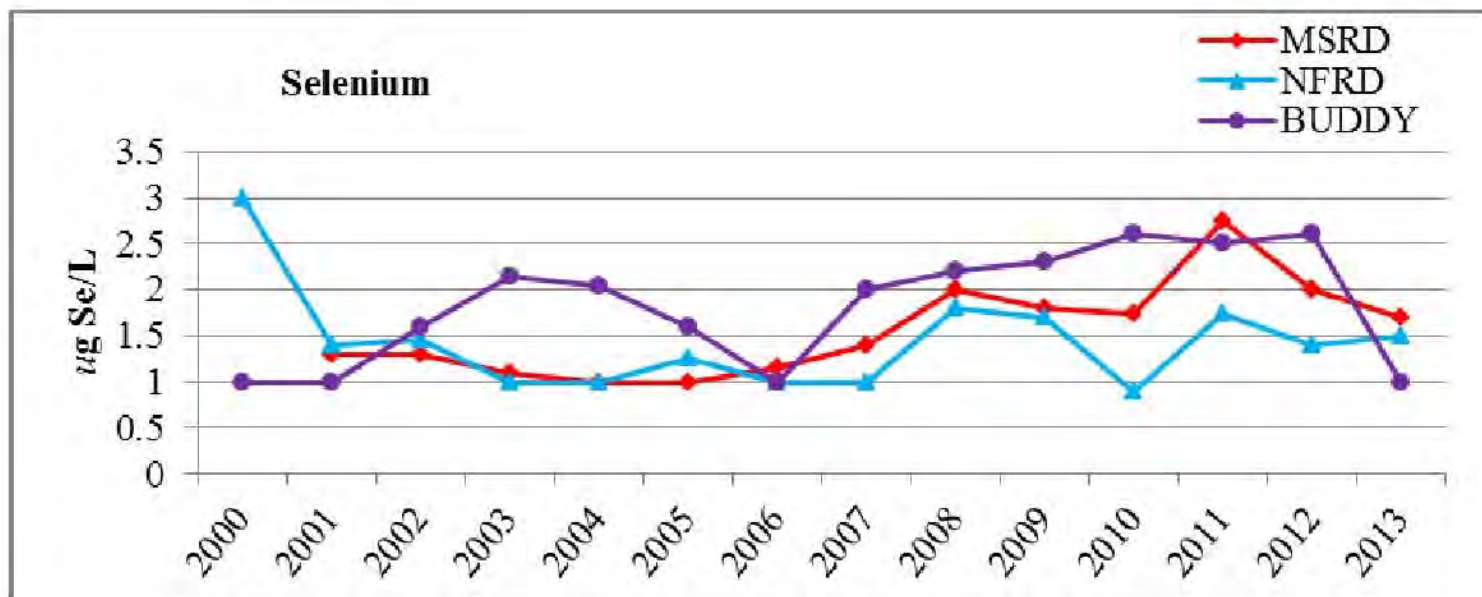


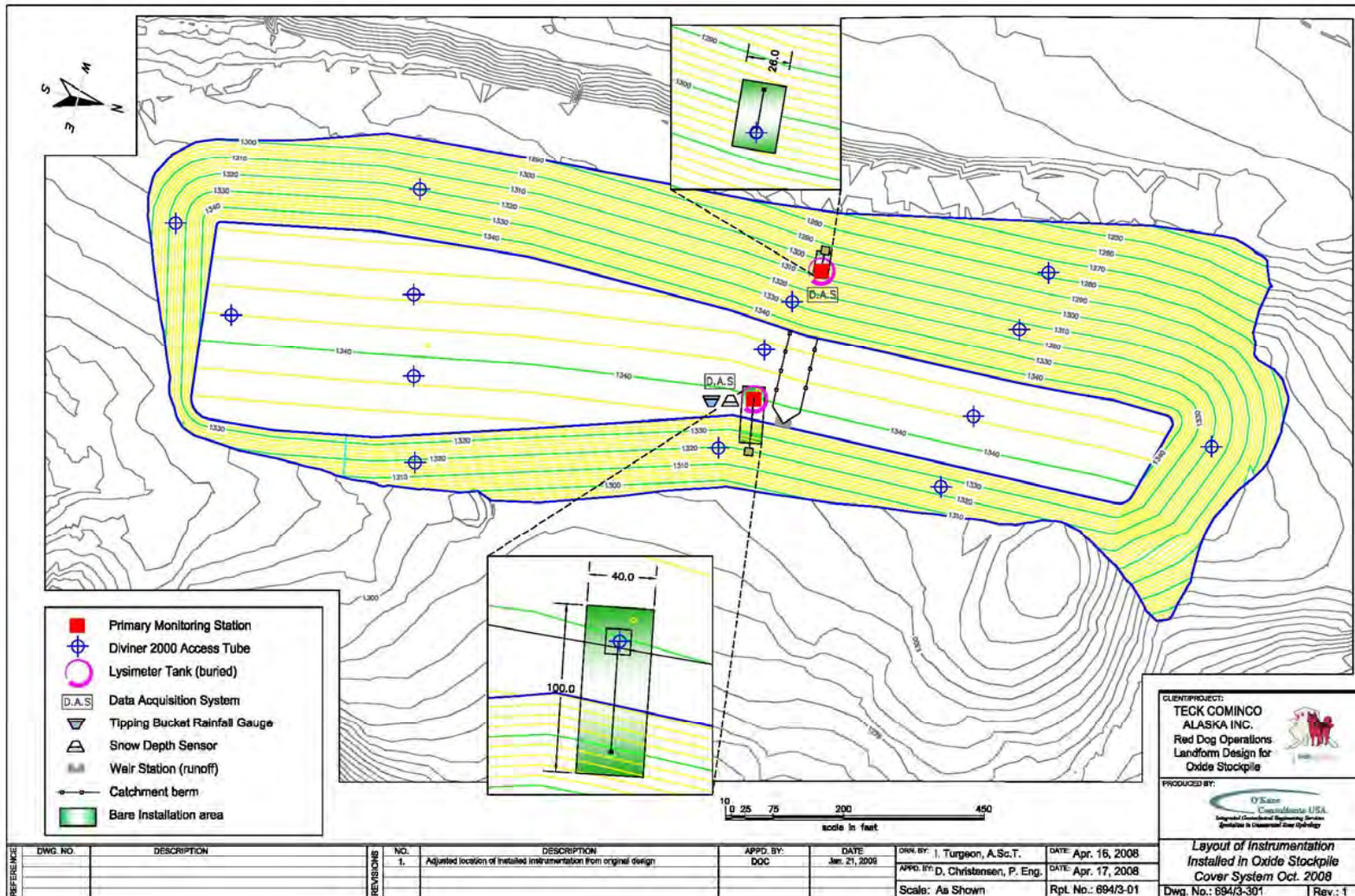
Figure 17. Median Se concentrations in Mainstem Red Dog, North Fork Red Dog, and Buddy Creeks (2000 to 2013).

From [Aquatic Biomonitoring at Red Dog Mine, 2012](#) by Alvin G. Ott and William A. Morris

Oxide Pile Cover



Oxide Pile Cover Study



Five Year Results Oxide Pile Cover Study



Table 3.2
Net percolation summary.

Station	Airport Precipitation as Net Percolation					Station Precipitation as Net Percolation
	Year 1 2008-09	Year 2 2009-10	Year 3 2010-11	Year 4 2011-12	Year 5 2012-13	2012-13
Plateau	16%	11%	16%	36%	41%	42%
West	17%	10%	24%	38%	73%	30%

2013 ARD Collection & Treatment – TDS Reduction



- Upgrades to Capture System – Instrumentation, Heat Trace
- 2013 Treatment
 - 59.6 Mgal treated
 - 12,967 tonnes TDS removed
 - 22.6 Mgal diverted to MPL
 - 5,800 tonnes TDS diverted
- Reclaim TDS 700 mg/L lower now than in January 2013 (~5800 mg/l)



Year	2007	2008	2009	2010	2011	2012	2013
mgal ARD (treated & diverted)	31.6	19.8	20.9	13.6	24.1	74.1	82.2
Annual Percent Capture	24.2%	15.7%	15.7%	11.4%	19.4%	27.8%	35.6%

Selenium Piloting – Bio-Reactors



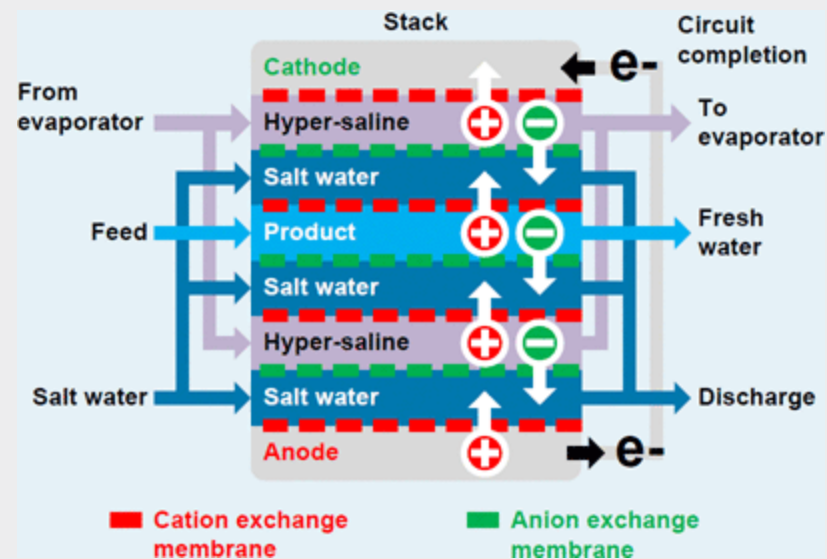
- GE: Advanced Biological Metals Removal Process (ABMet)
- Currently commissioned and set to run until June 2014



Selenium Piloting – Saltworks ElectroChem



- Saltworks ElectroChem process – ion exchange membrane with electrical currents to attract ions
- Pilot Plant onsite – “MicroPilot” 50-500 L/d



Selenium Piloting – Reverse Osmosis Membrane Filtration



- 25 gpm pilot plant onsite
- Piloting scheduled for to fall 2014 through 1st Qtr. 2015. Commissioning in September-October.



Activities



Continuing

- Improved ARD collection at the base of the Main Waste Stockpile.
- Year-Round Treatment of ARD from Main Waste Stockpile
- Selenium geochemistry studies

2014 Activities

- Replacing and moving several thermistors
- Planning for Qanaiyaq deposit mining
- Reevaluate cover design for waste rock



Thank You