

Teck



Red Dog Mine Annual Meeting

Waste Management Permit No. 0132-BA002

Reclamation Plan Approval F20099958

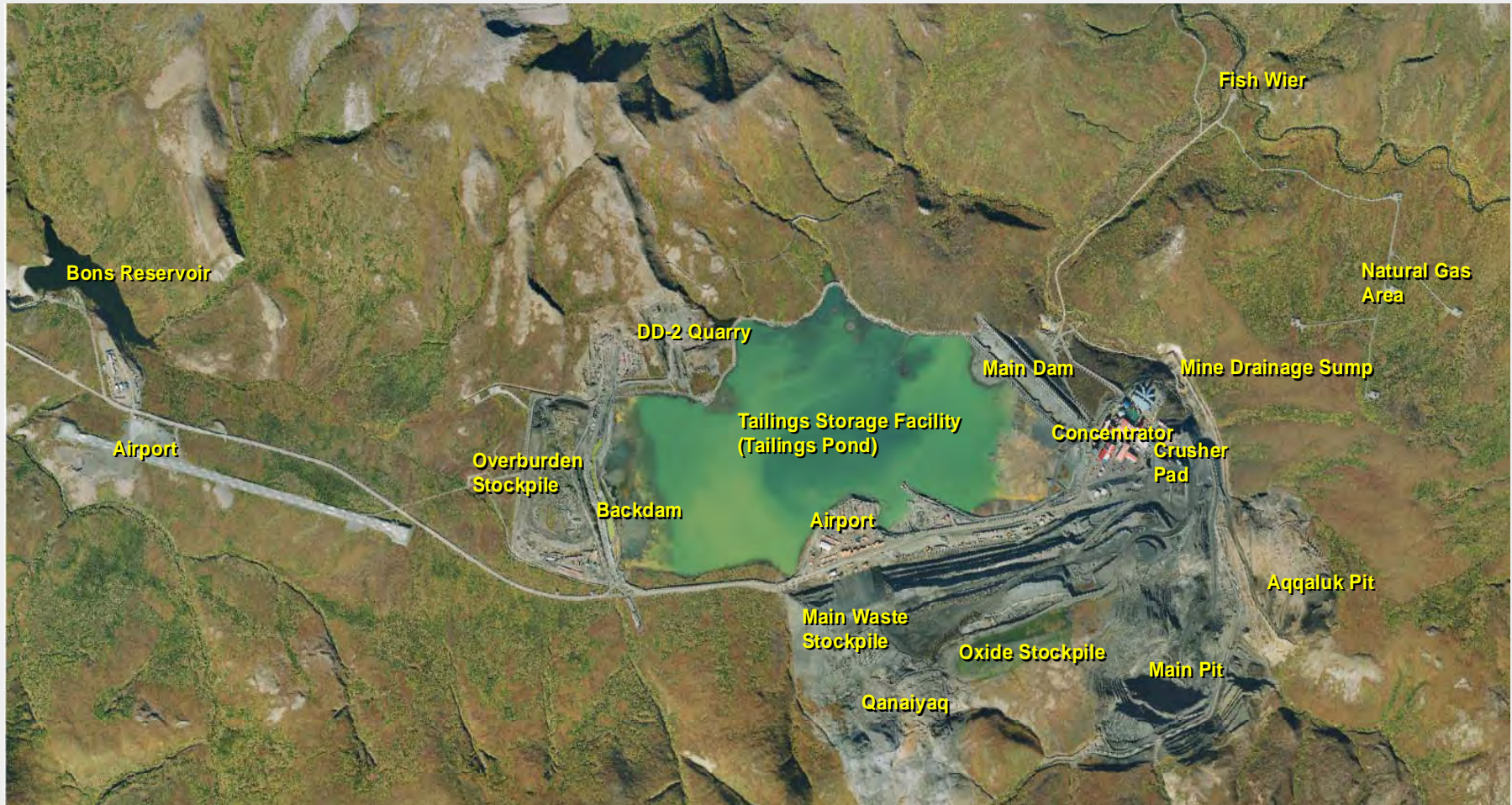
2011

Agenda



- **Opening Remarks Tom Crafford, DNR**
- **Site Overview**
- **Production**
- **Waste Rock Management**
- **Tailings Management**
- **Water Management**
- **Permafrost Monitoring**
- **Biomonitoring**
- **Disturbance and Reclamation**
- **Inert Solid Waste Landfills**
- **Dust Monitoring**
- **Construction Activities**

Site Overview



Aqqaluk Deposit 2010



Aqqaluk Deposit 2011



Production



2011 Production



Mine Production

- Ore Hauled 3,798,240 tonnes
- Waste Rock Hauled 9,790,180 tonnes
- Total 13,588,420 tonnes
- Strip Ratio 2.6 : 1.0

Mill Production

- Ore Milled 3,673,065 tonnes
- Concentrate Production
 - Zinc 1,027,297 tonnes
 - Lead 154,748 tonnes

Waste Rock Management



Waste Rock Hauled
tonnes 9,790,000

Main Waste Stockpile
9,174,000 tonnes

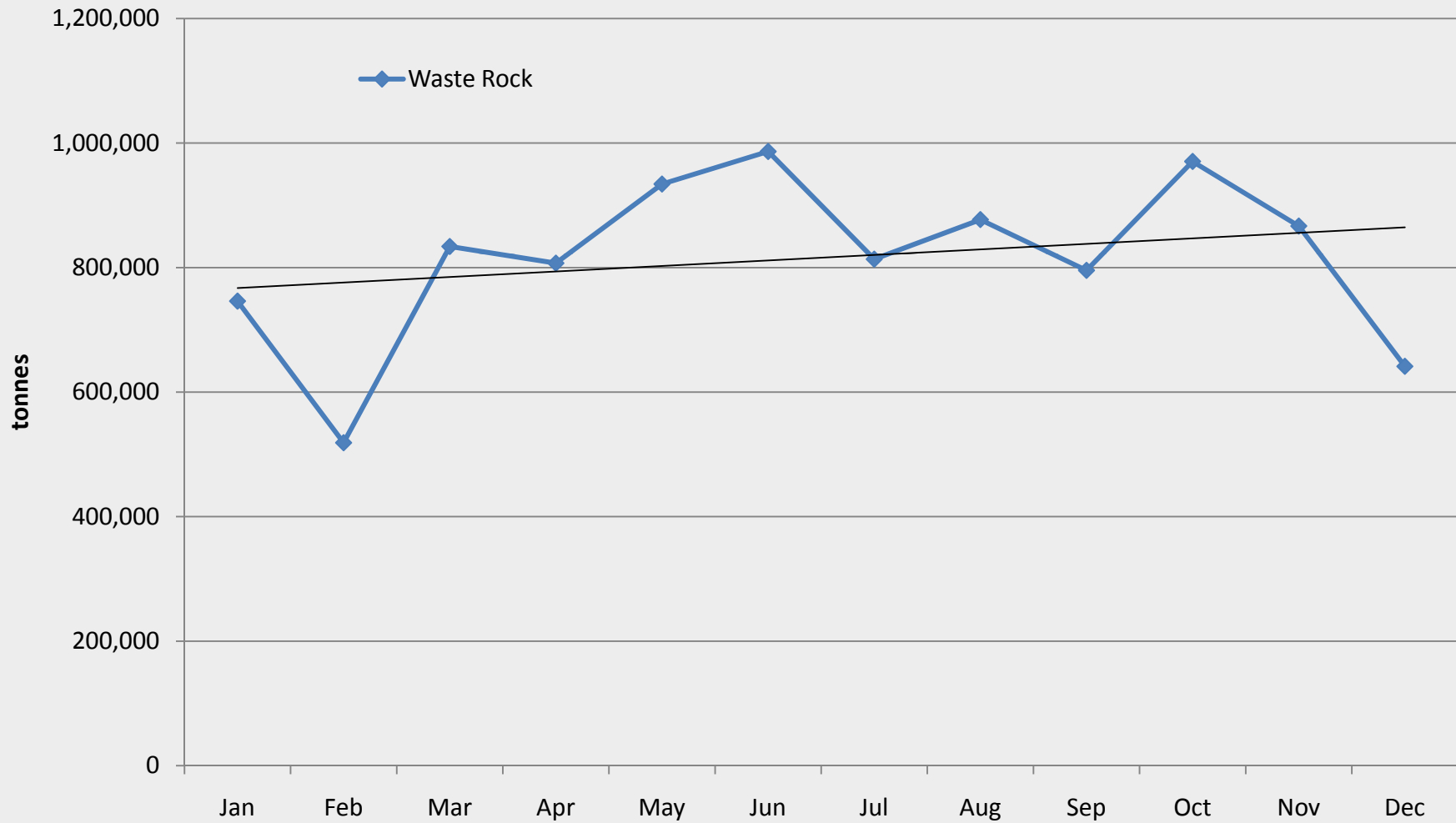
In pit use / disposal
508,000 tonnes

Construction use
108,00 tonnes

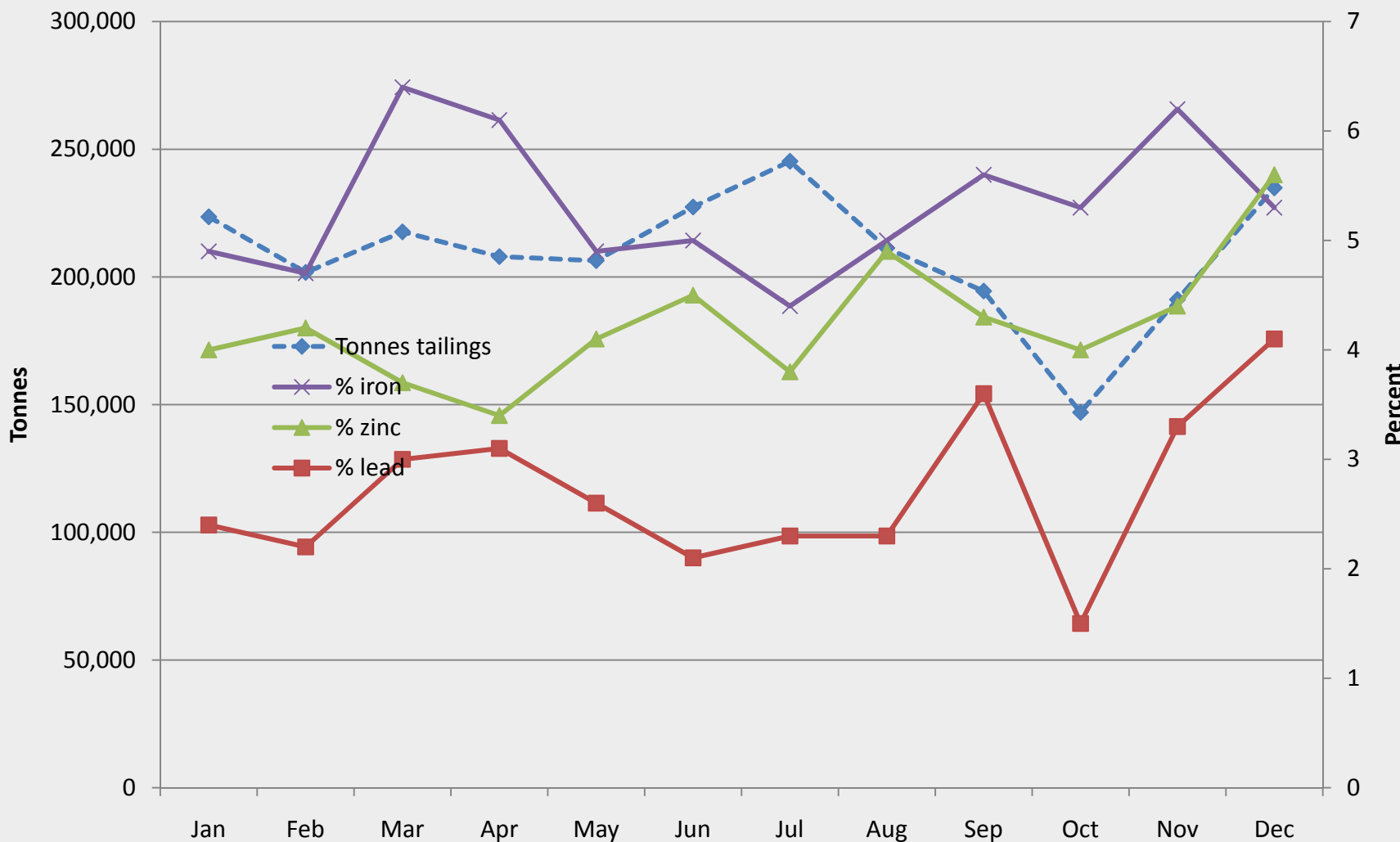
Most Reactive Waste
1,701,200 tonnes
2.6% Zn
3.0% Pb
4.3% Fe



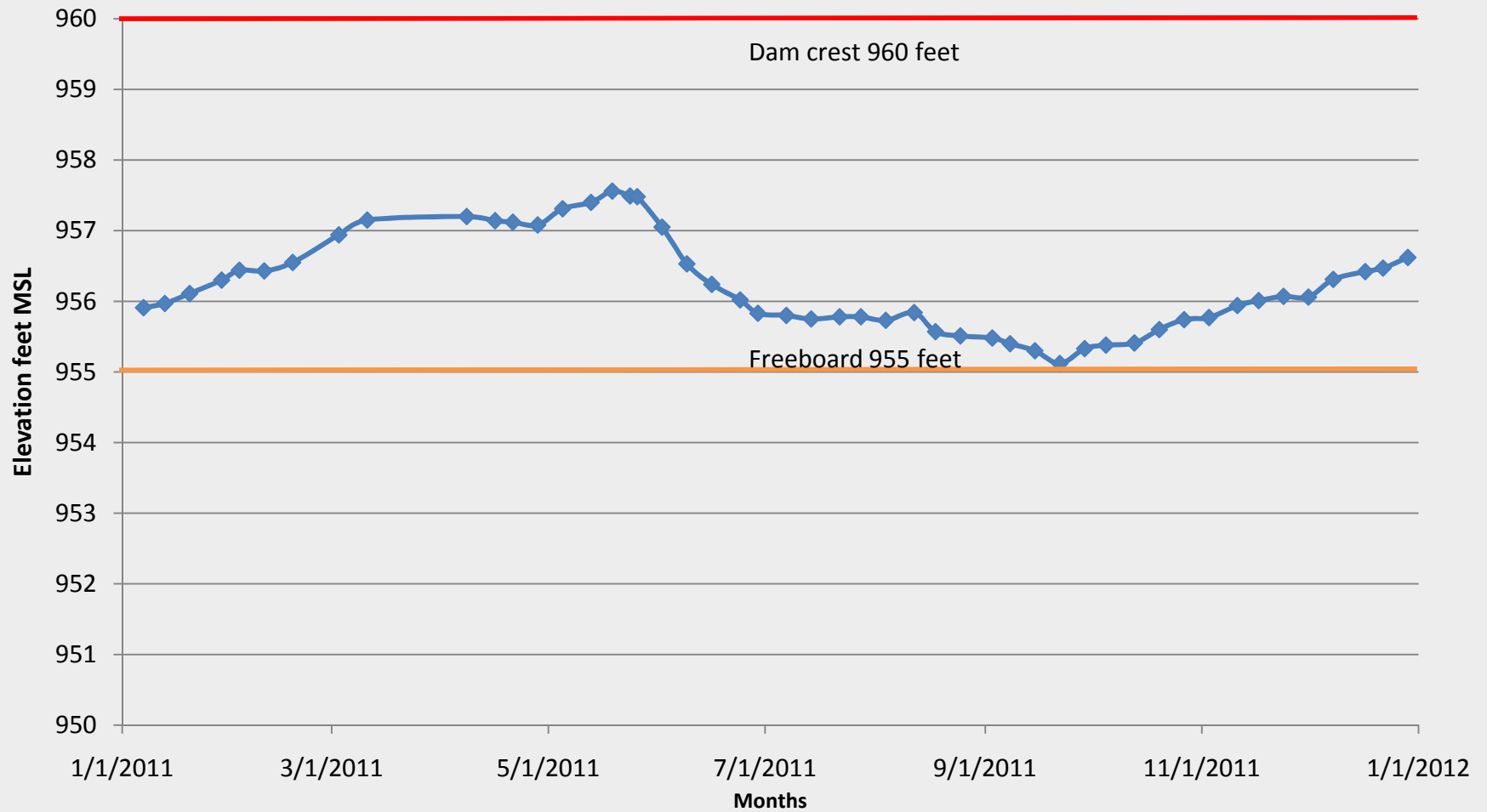
2011 Waste Rock Hauled



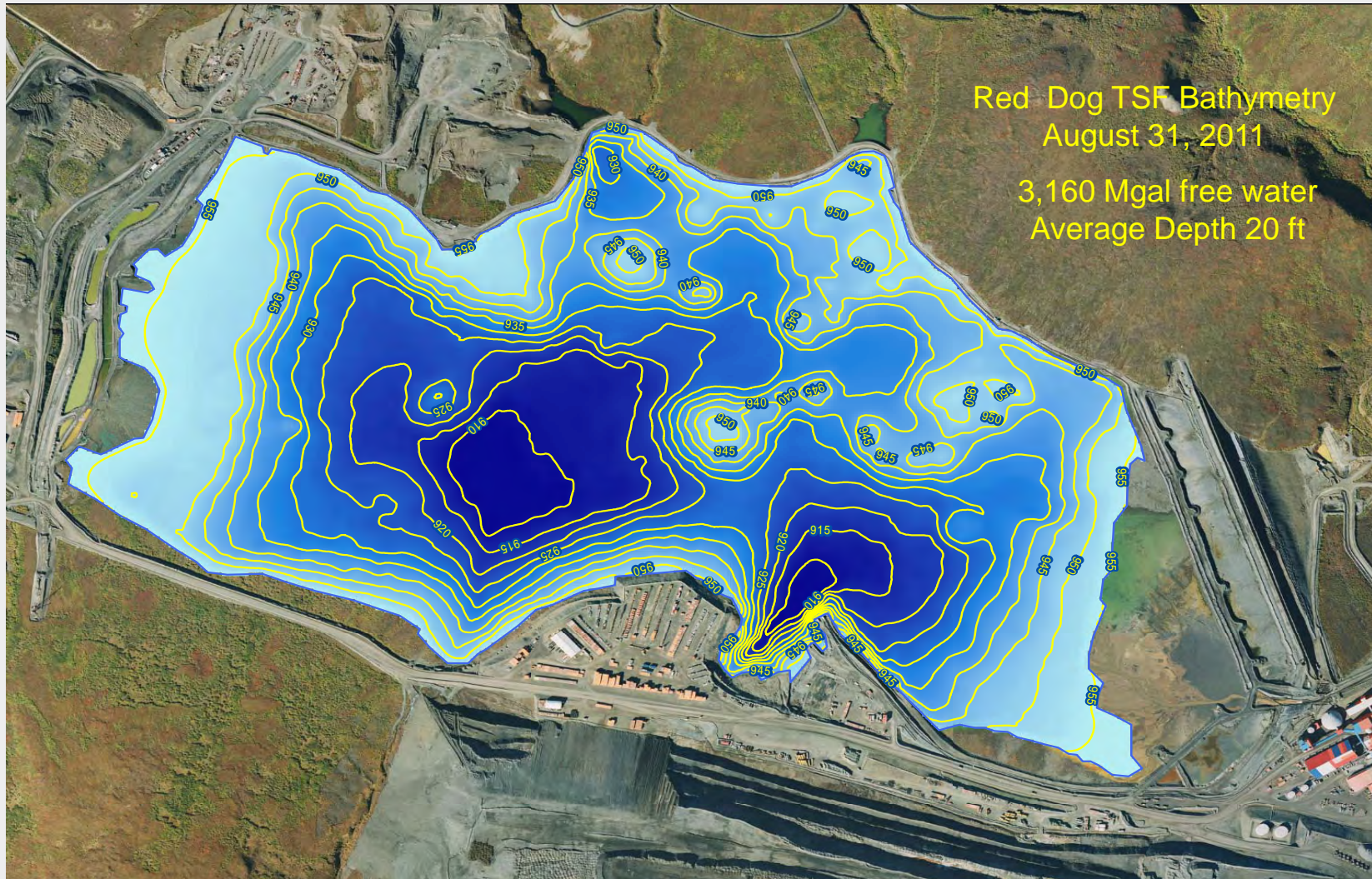
Tailings Management



Tailings Pond Water Elevation



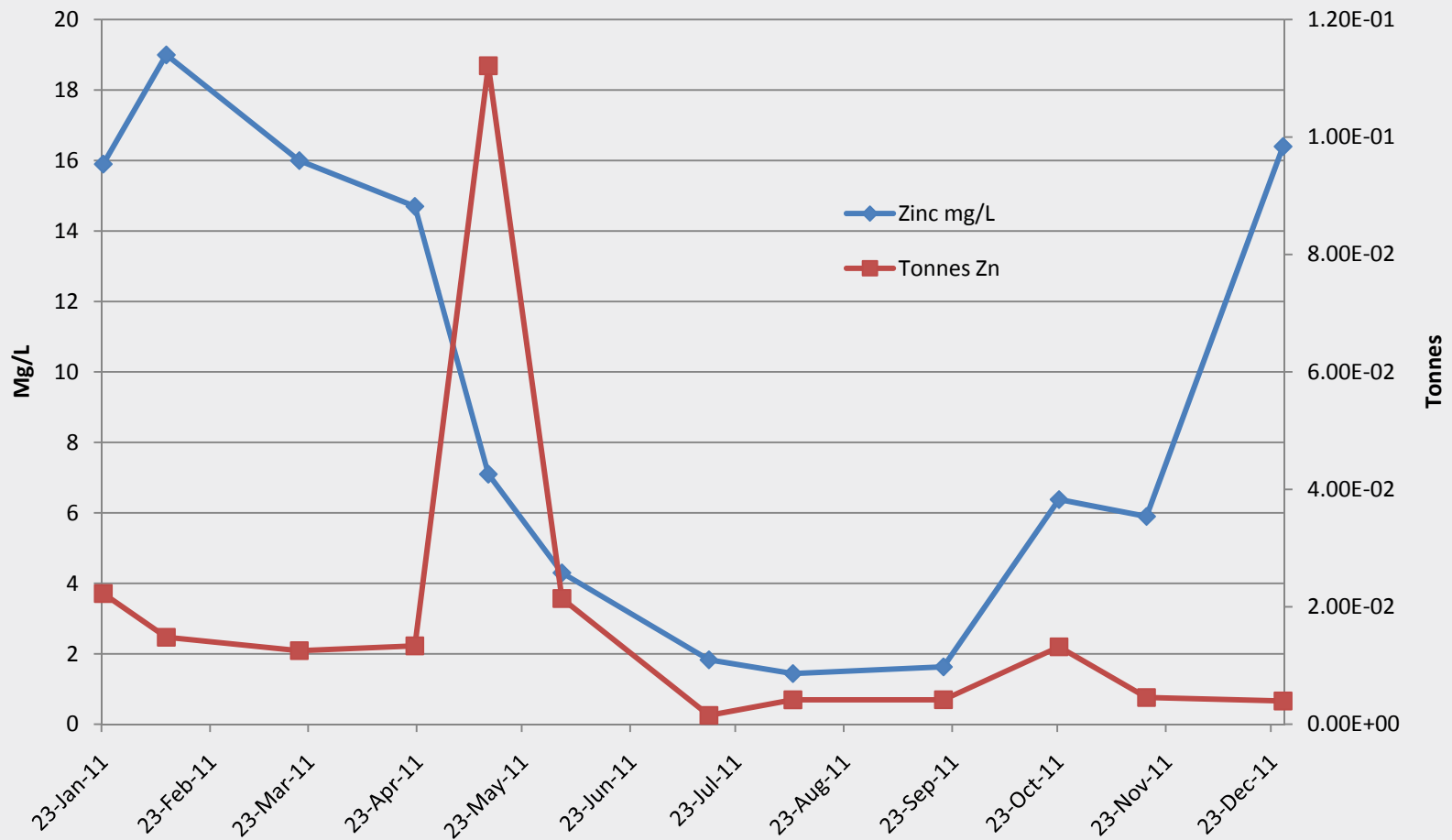
Tailings Pond Bathymetry



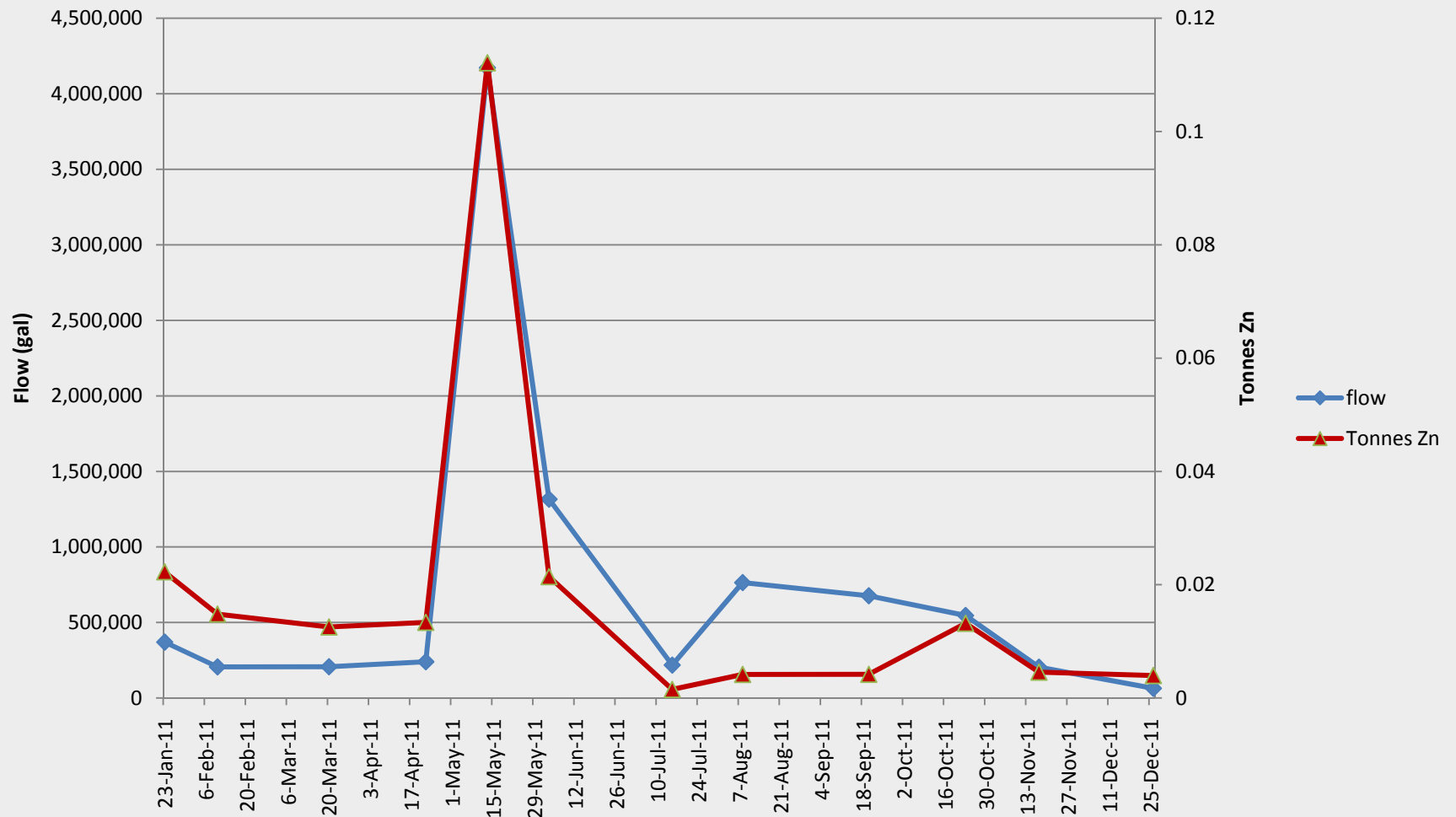
Mine Water Quality



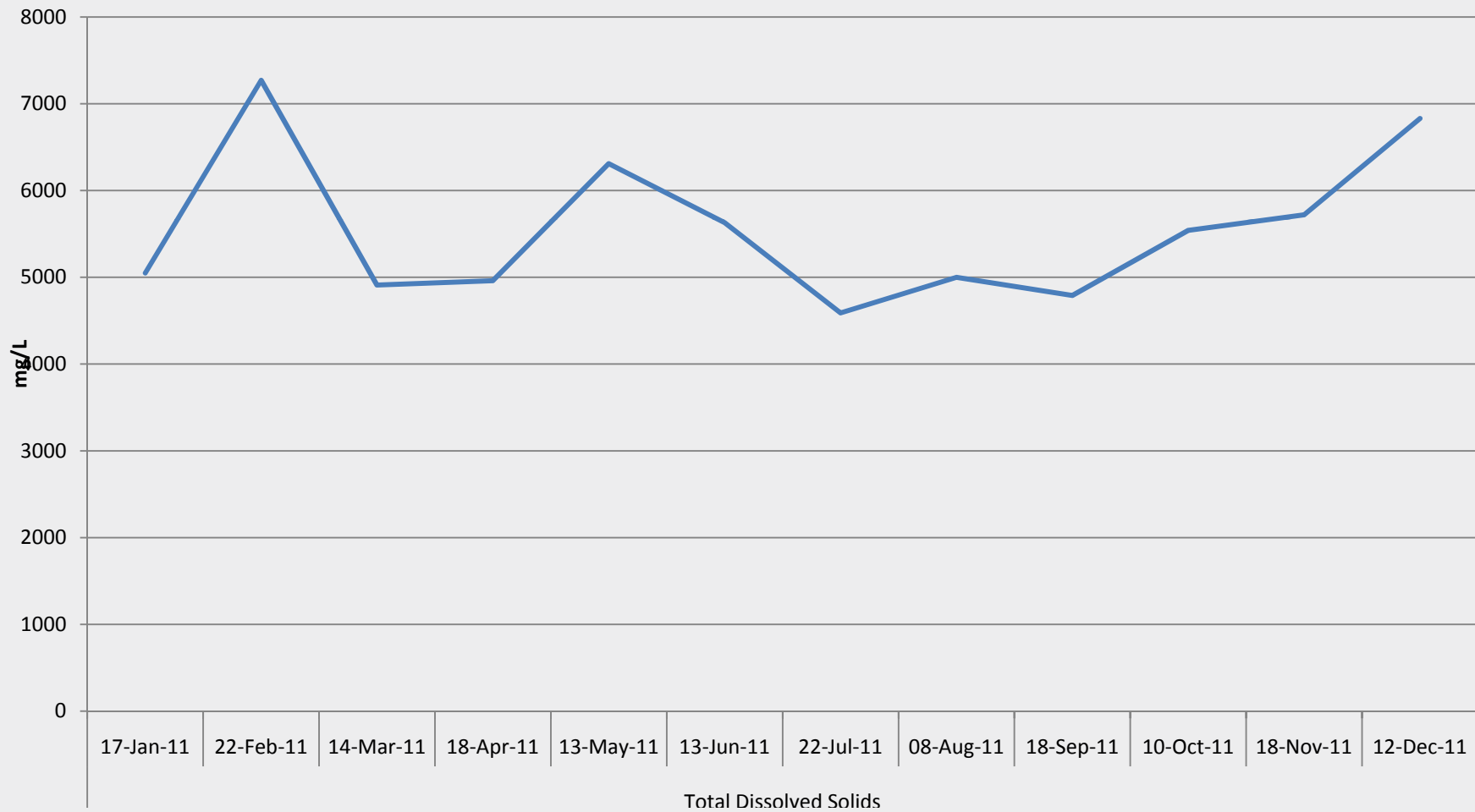
East Sump Zn Concentration & Load



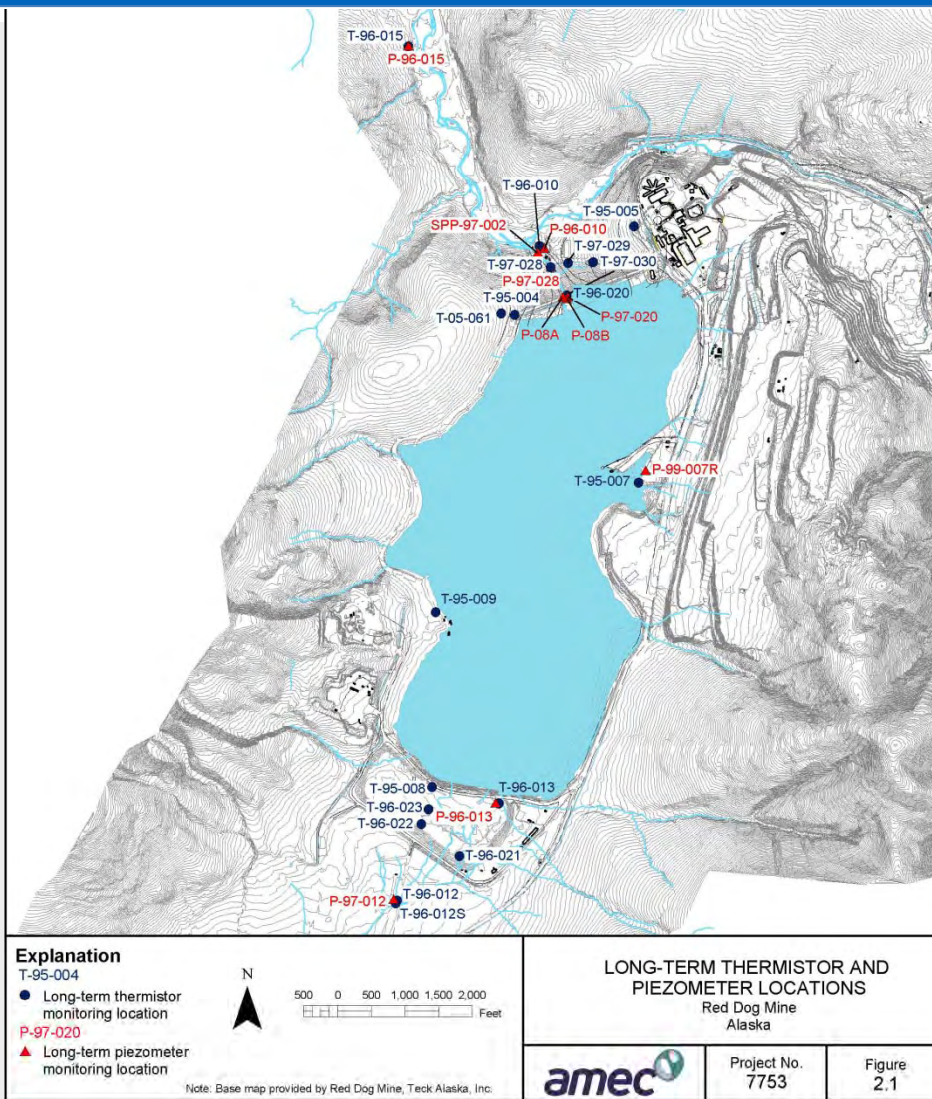
East Sump Water Flow & Zn Load



TDS in the Tailings Pond



Thermistor & Piezometer Locations



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.

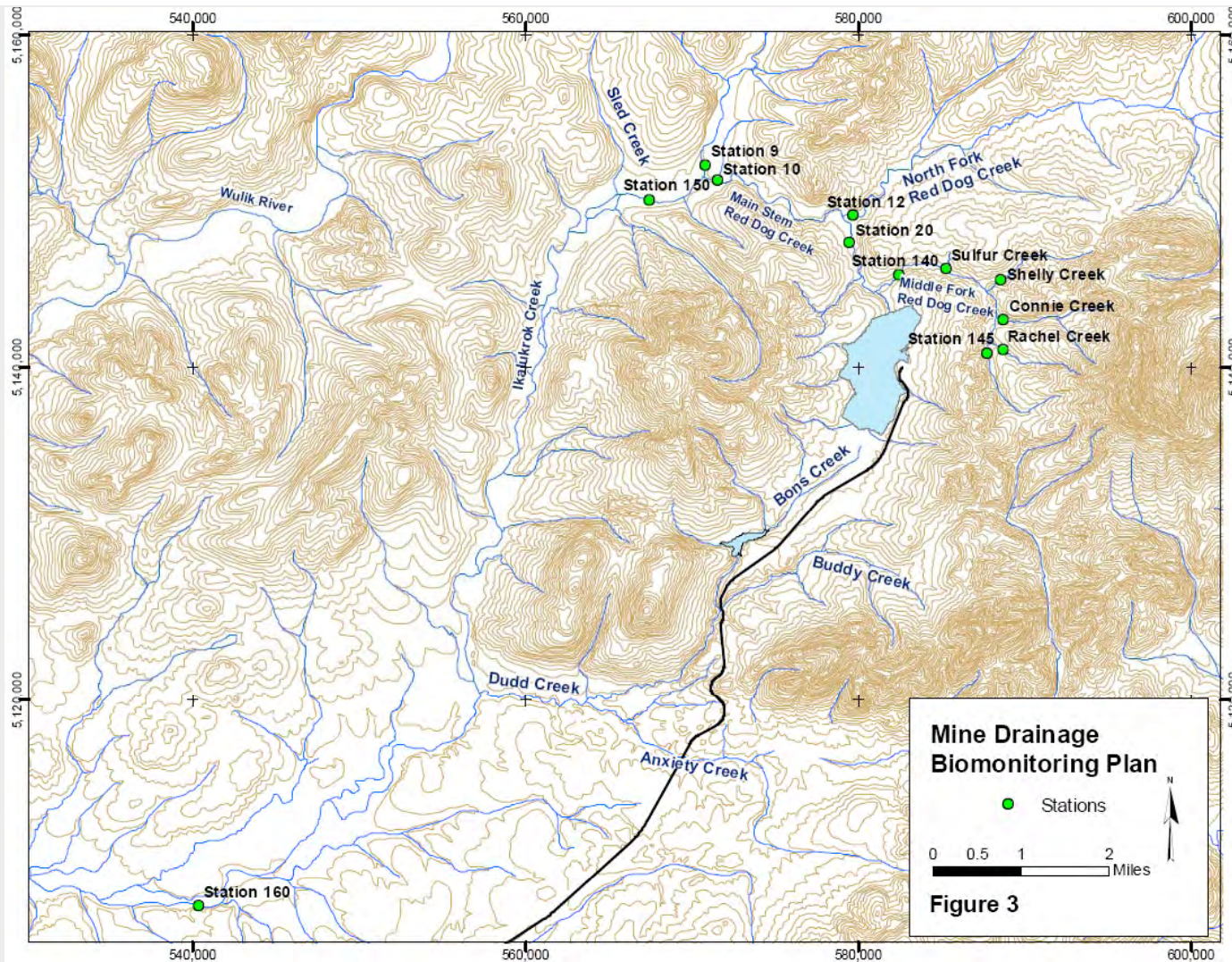
2011 Conclusions:

- Subpermafrost groundwater conditions beneath the dam are the same as those noted for background conditions in 1997.
- No vertical flow is occurring from the impoundment into deep groundwater, even though there is a zone where permafrost is absent beneath the impoundment.

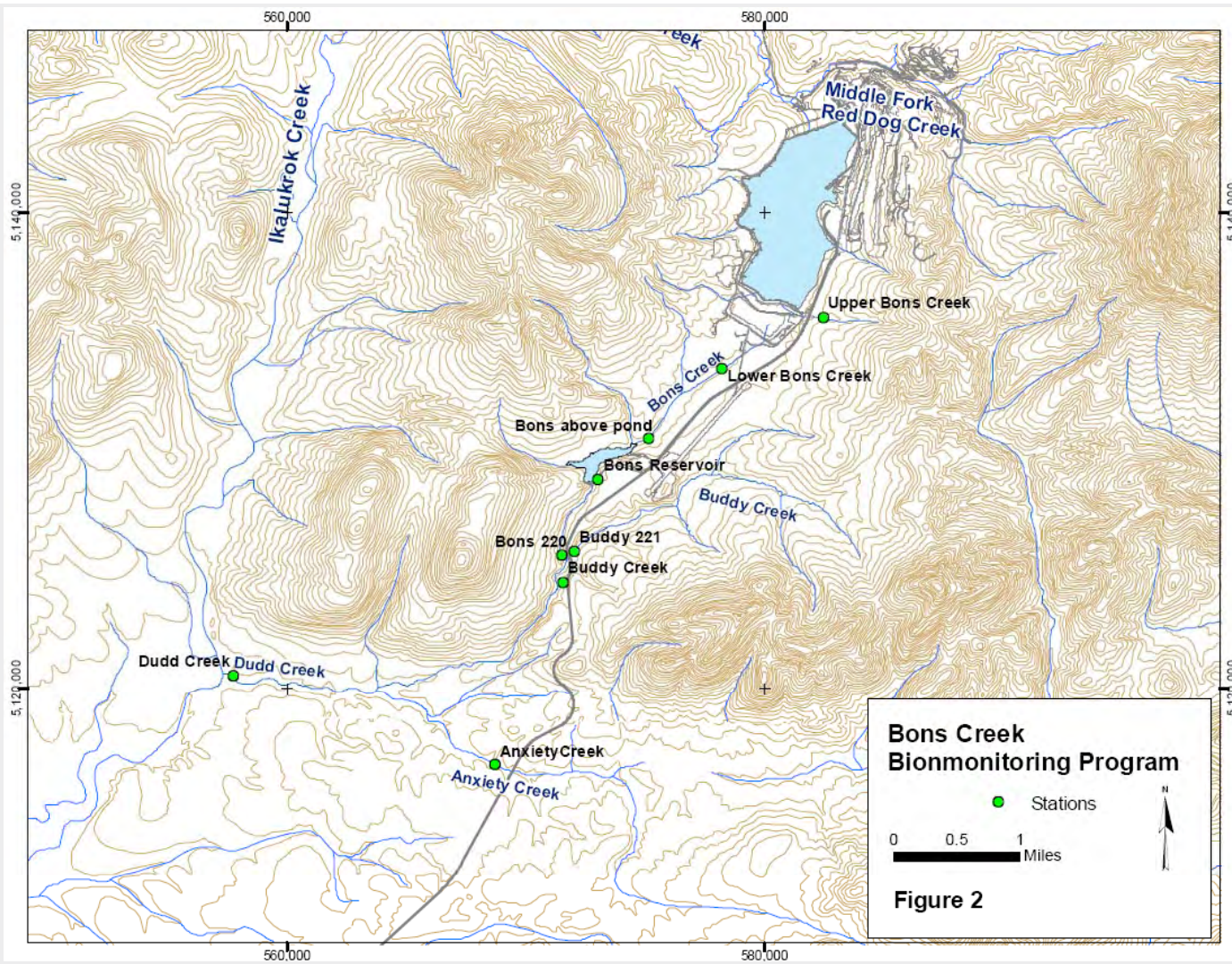
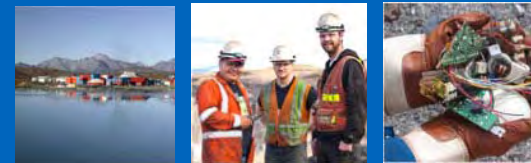
Biomonitoring



Mine Drainage Monitoring Stations



Bons Creek Monitoring Sites



Aquatic Invertebrates

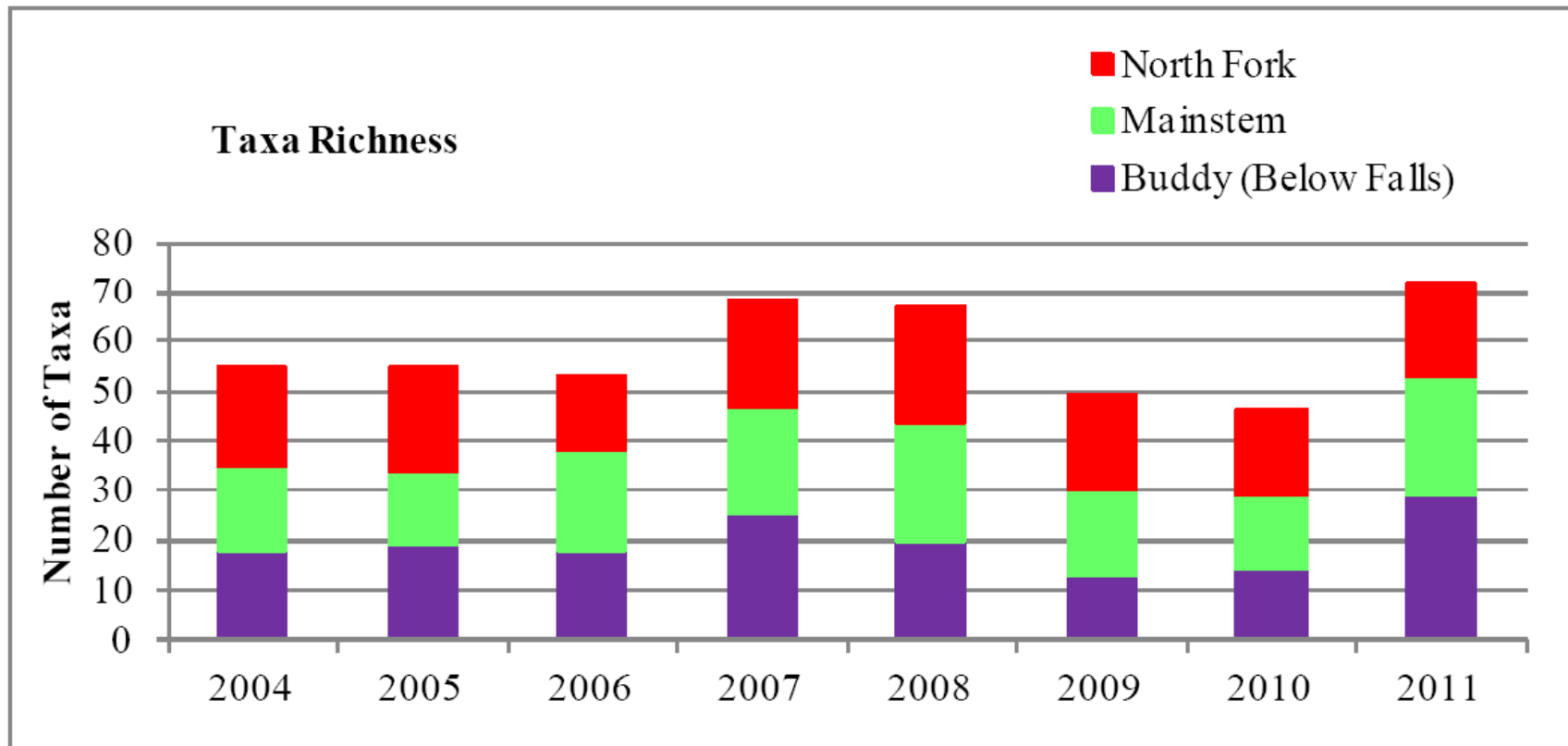


Figure 32. Aquatic invertebrate taxa richness in North Fork Red Dog, Mainstem Red Dog, and Buddy creeks. *From [Aquatic Biomonitoring at Red Dog Mine, 2011](#) by Alvin G. Ott and William A. Morris*

Arctic Grayling in Red Dog Creek

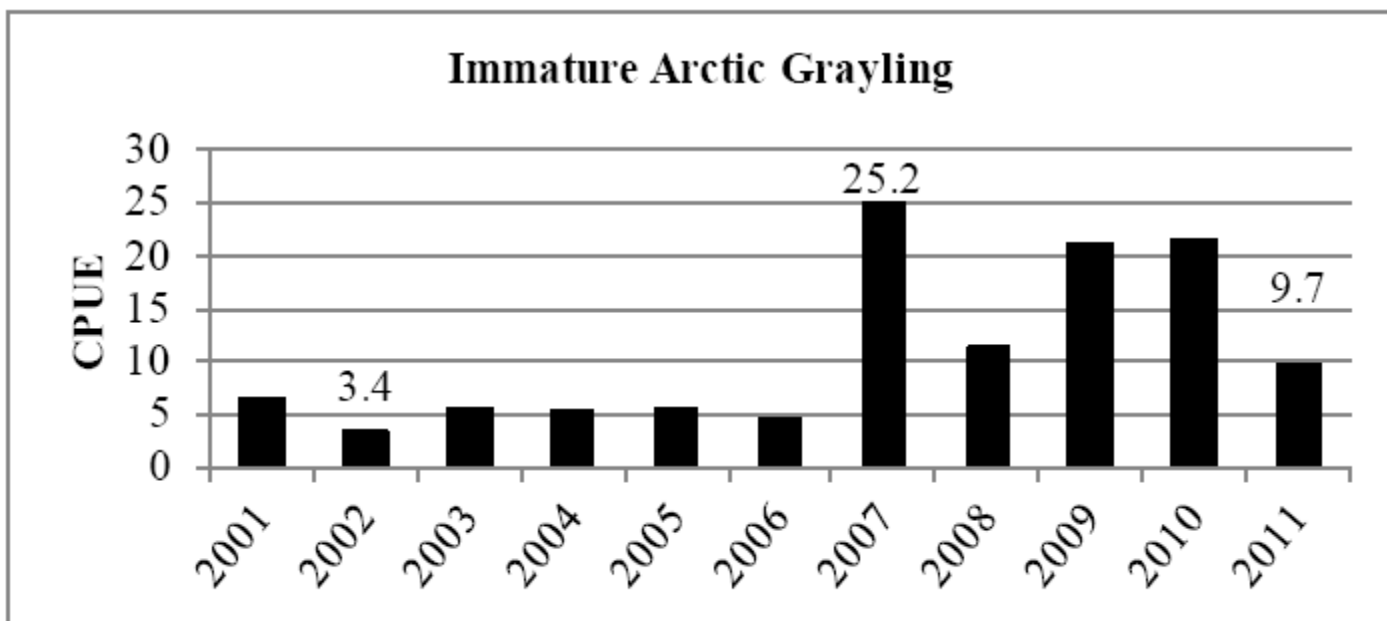


Figure 70. Catch per unit of effort (fish per day) of immature Arctic grayling in North Fork Red Dog Creek in spring 2001 to 2011.

From [Aquatic Biomonitoring at Red Dog Mine, 2011](#) by Alvin G. Ott and William A. Morris

Dolly Varden

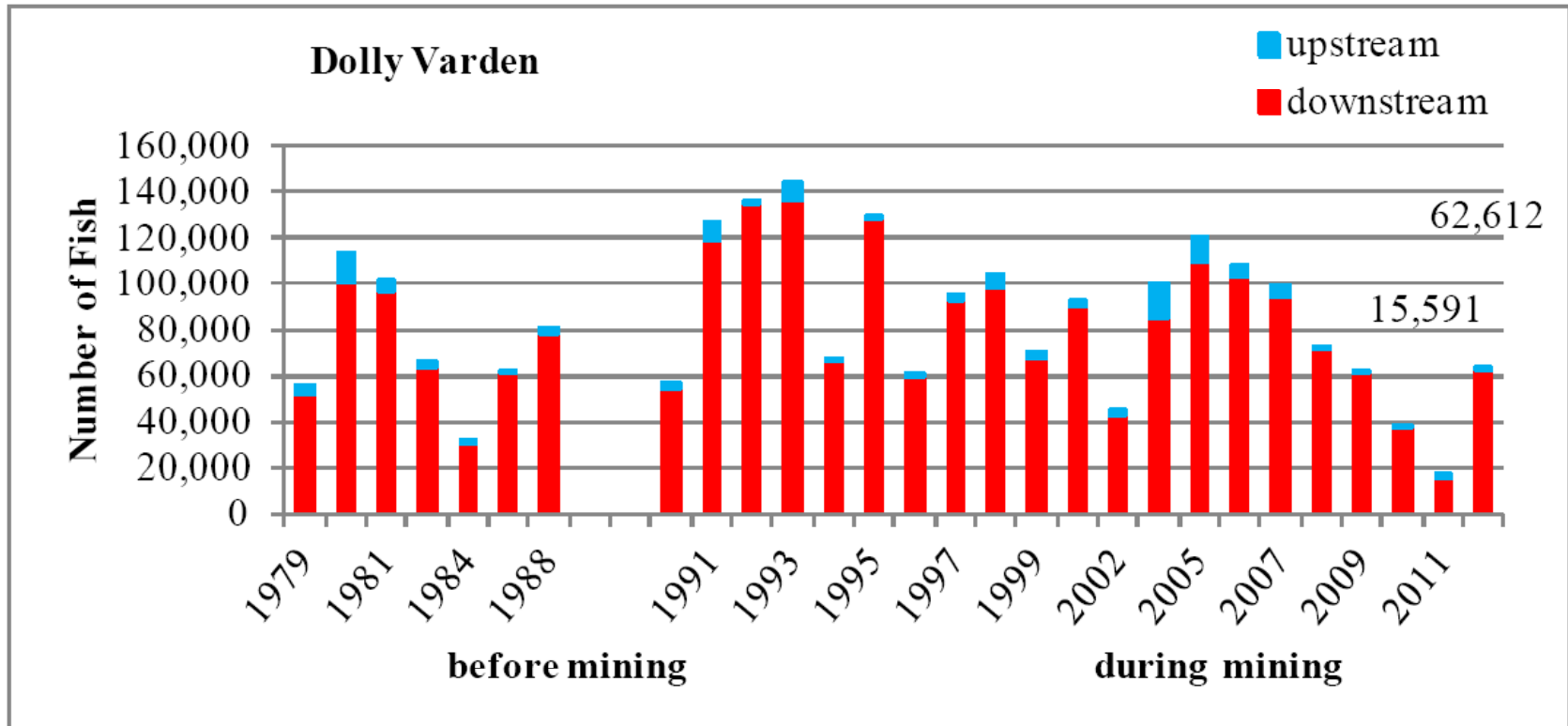
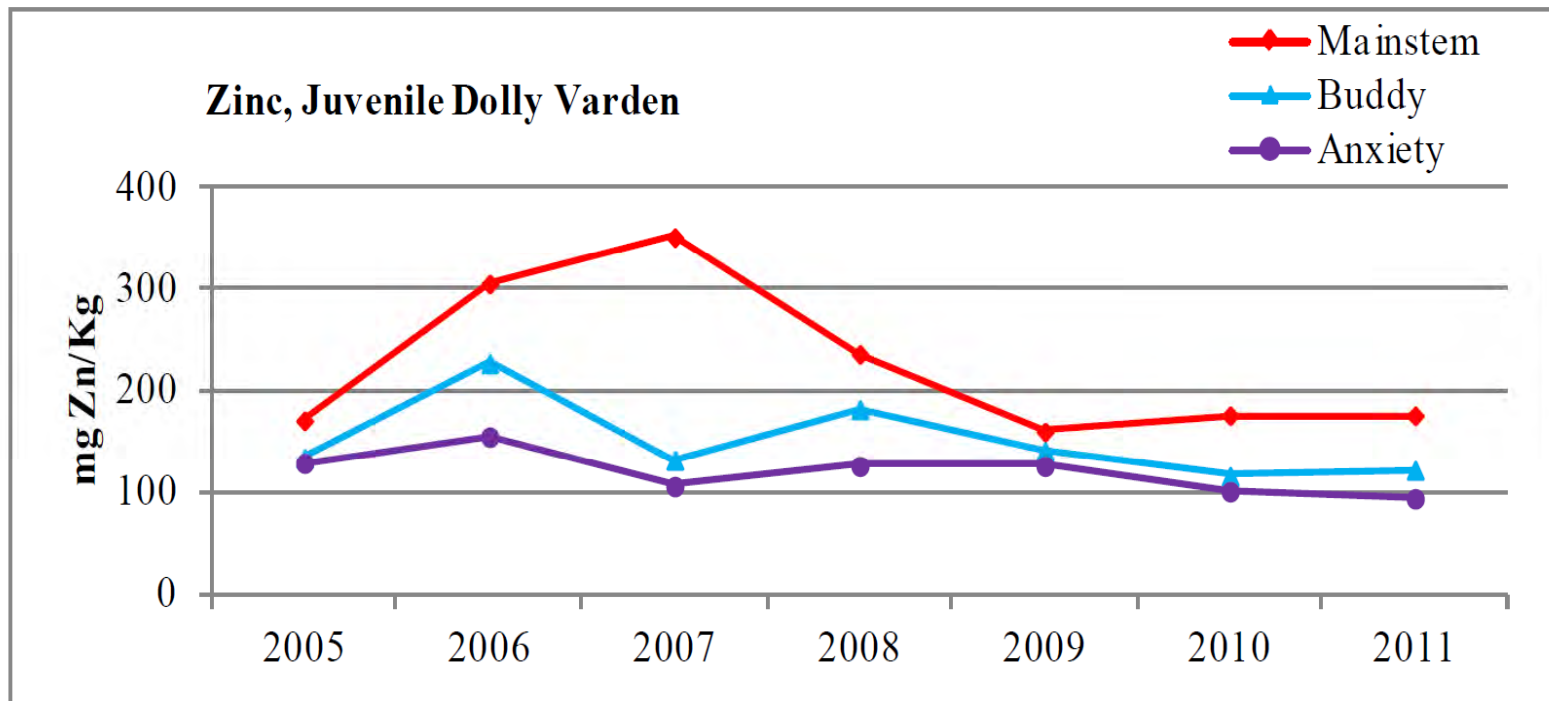


Figure 55. Estimated Dolly Varden in the Wulik River just prior to freezeup.

From [Aquatic Biomonitoring at Red Dog Mine, 2011](#) by Alvin G. Ott and William A. Morris

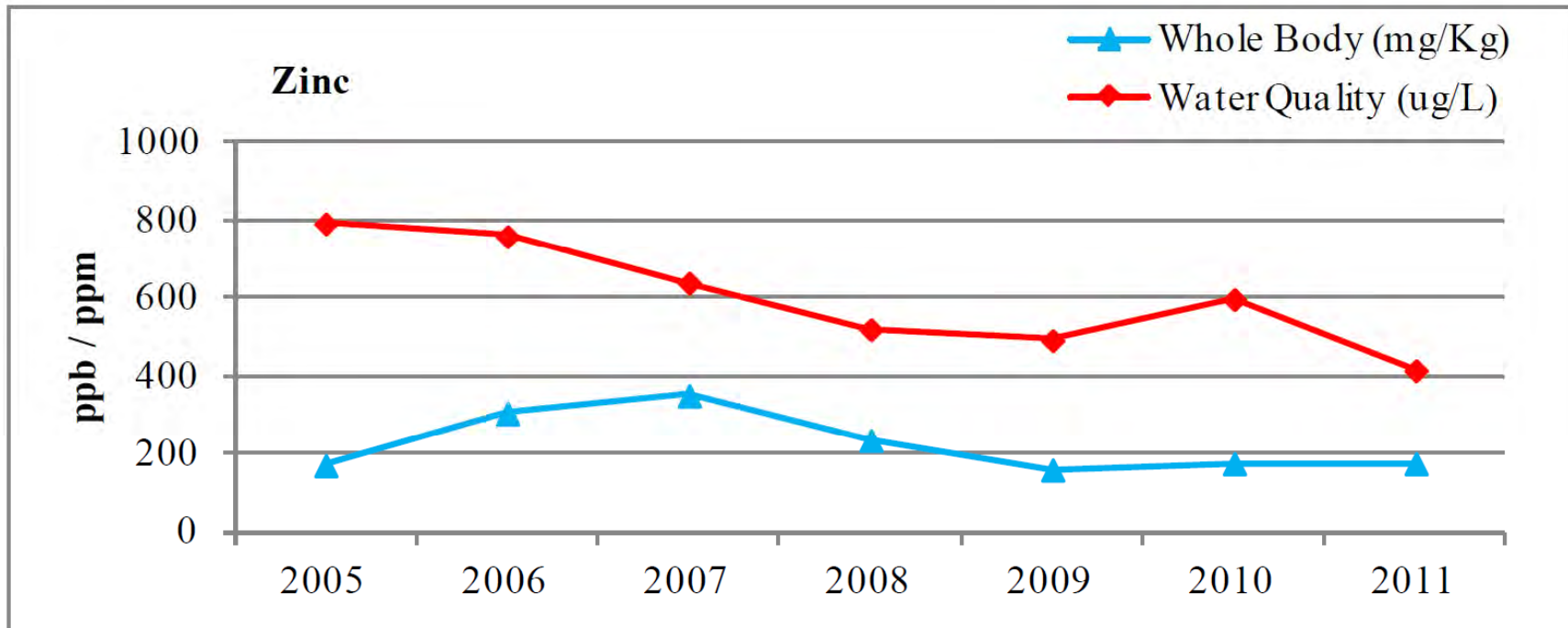
Dolly Varden Zinc Concentrations



From [Aquatic Biomonitoring at Red Dog Mine, 2011](#) by Alvin G. Ott and William A. Morris

Juvenile Dolly Varden Zinc Concentrations in Buddy and Anxiety Creeks and the Mainstem of Red Dog Creek

Dolly Varden Zinc Concentrations



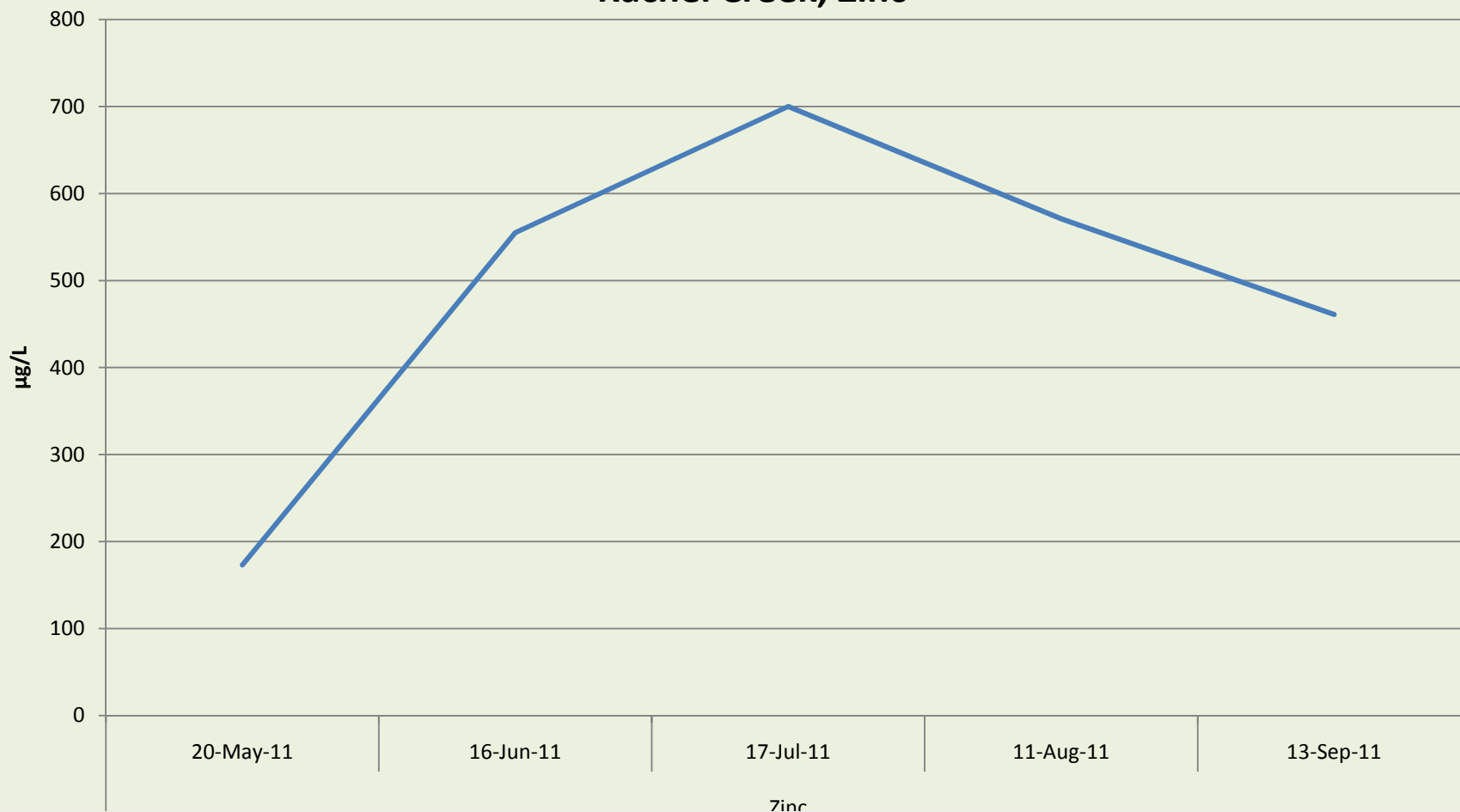
From [Aquatic Biomonitoring at Red Dog Mine, 2011](#) by Alvin G. Ott and William A. Morris

Adult Dolly Varden Zinc Concentrations in the Main Stem of Red Dog Creek

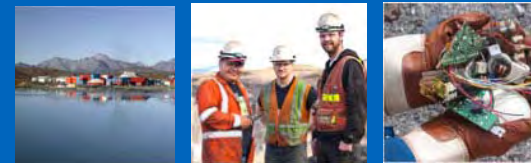
Biomonitoring Water Quality



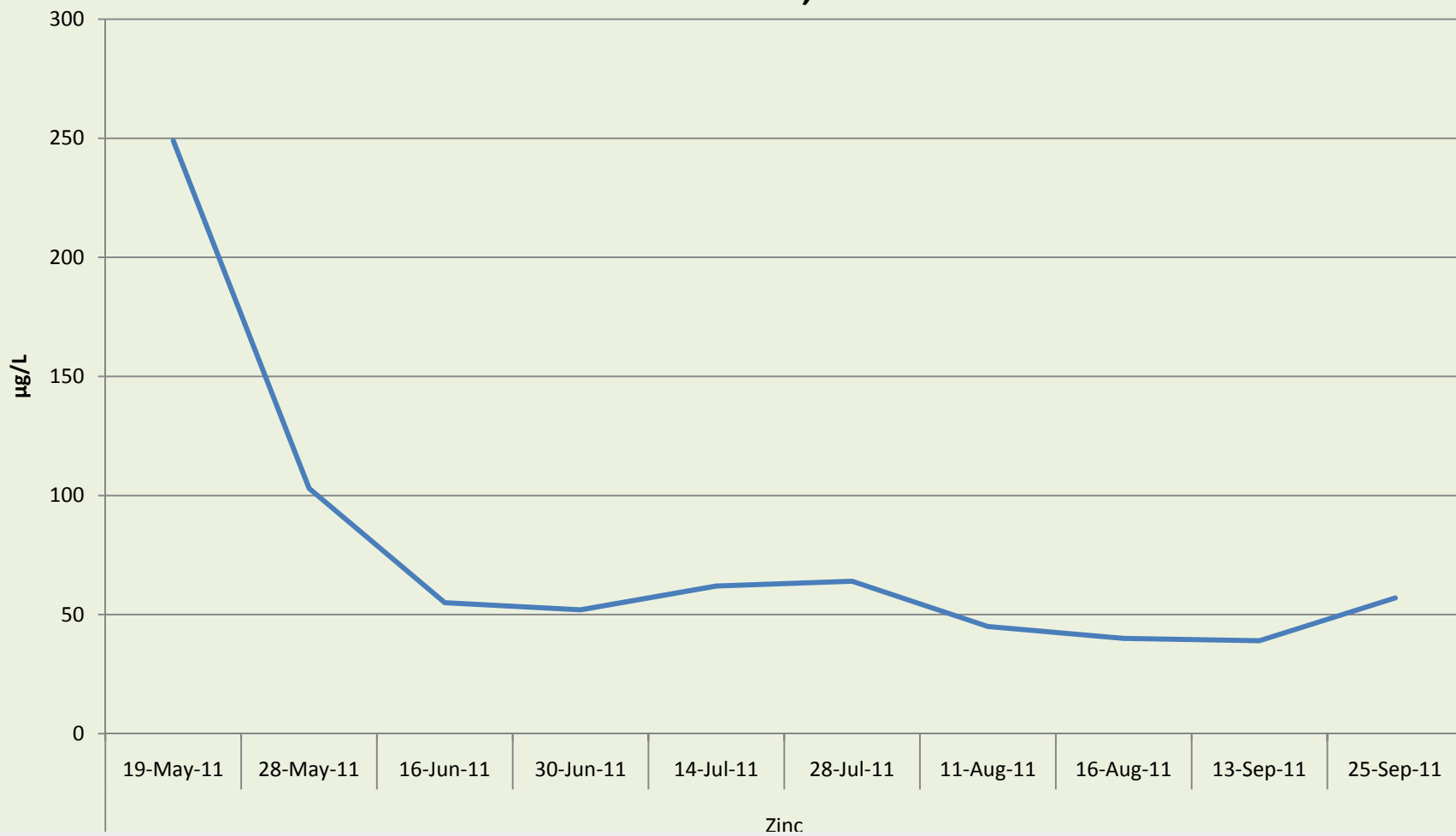
Rachel Creek, Zinc



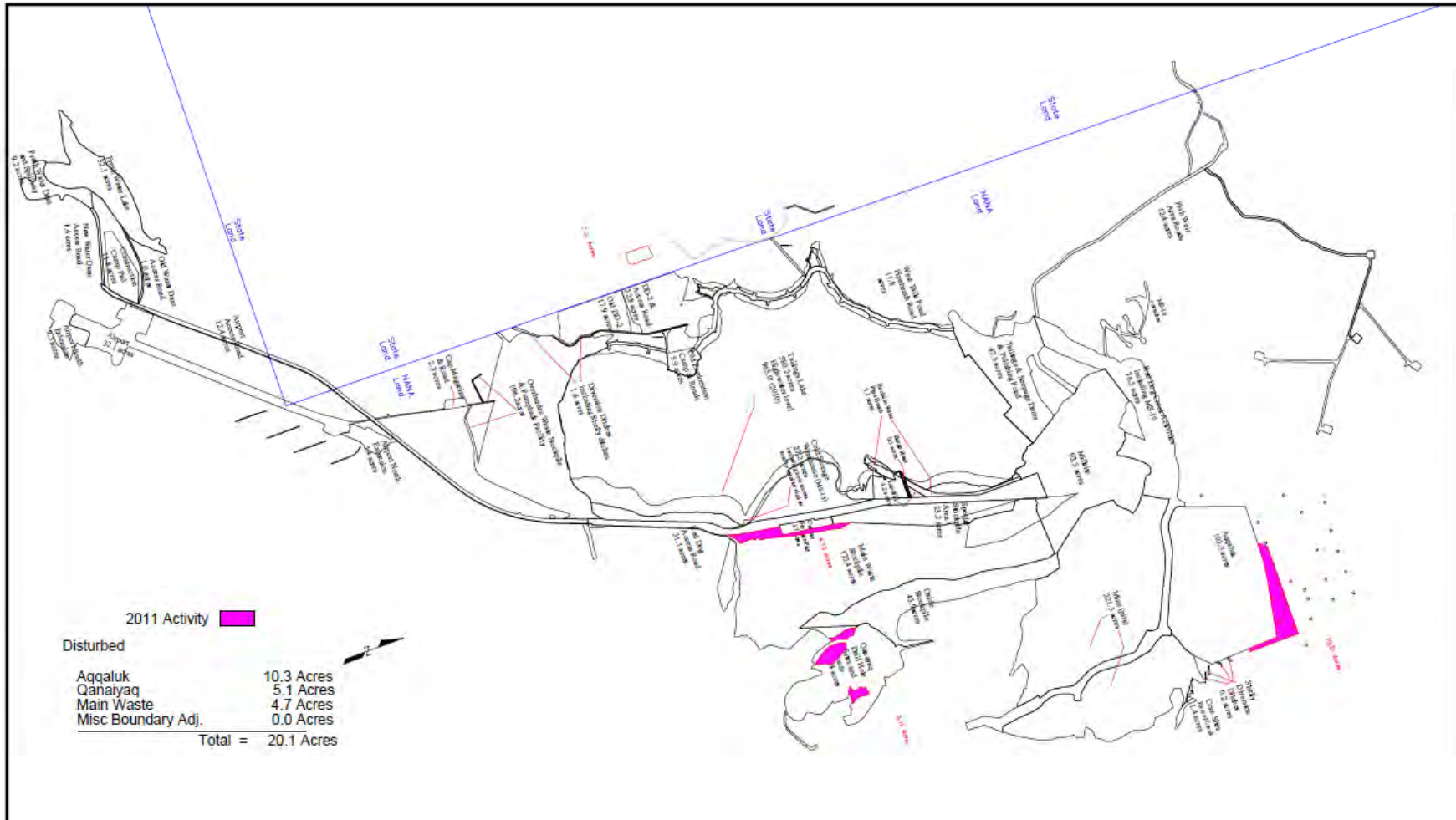
Biomonitoring Water Quality



Lower Bons, Zinc



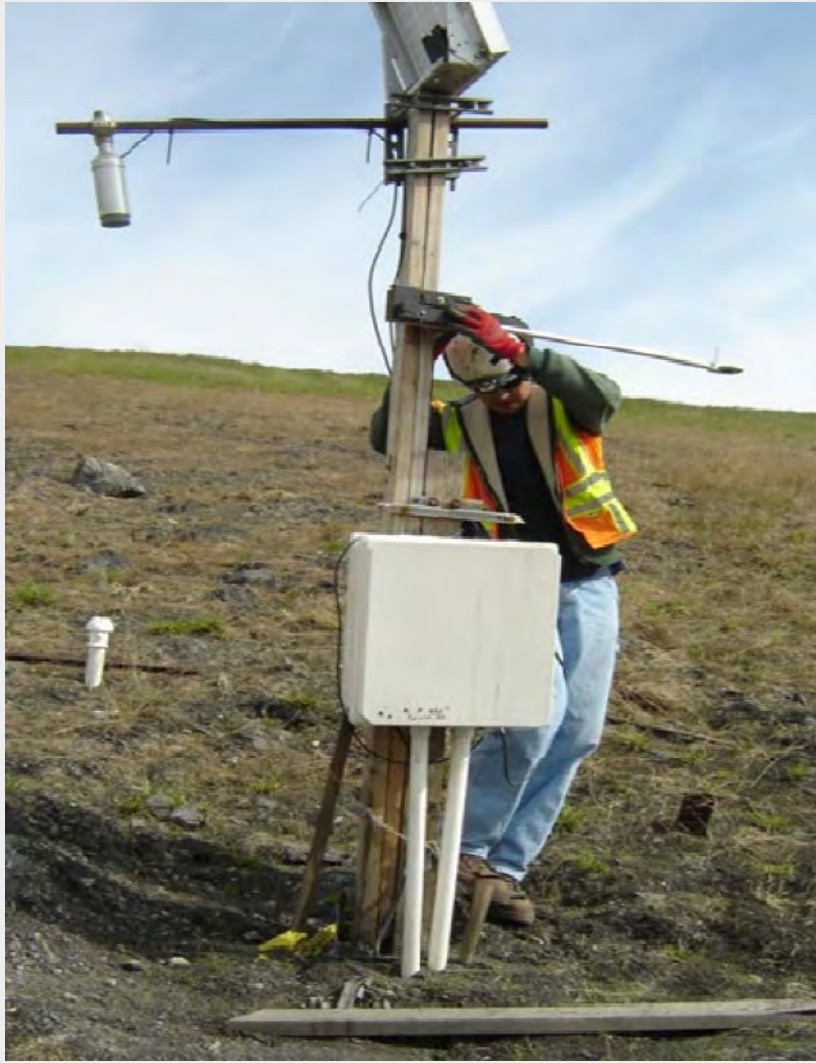
2011 Disturbance and Reclamation



Main Waste Stockpile Resloping



Oxide Pile Cover Study



Three Year Results



Table 3.3
Net percolation summary.

Station	Airport Precipitation			Station Precipitation
	Year 1 2008-2009	Year 2 2009-2010	Year 3 2010-2011	2010-2011
Plateau	16%	11%	16%	27%
West	17%	10%	24%	16%

Inert Solid Waste Landfills



Wildlife



Moose and Boundary Sign



Water Treatment



Water Use and Treatment



Location	Total 2011 Flow Gallons
Bon's Creek Total Flow	143,989,000
Reclaim Flow to Mill	3,100,000,000
WTP #1 Influent from Reclaim	499,160,000
WTP #1 Influent from MWD	0
WTP #1 Clarifier Underflow Sludge To Tails	4,201,000
WTP #1 Effluent to Sandfilter/Discharge	499,286,000
WTP #2 Influent from Reclaim	1,415,830,000
WTP #2 Sludge Discharge To Tails	67,063,639
SandFilter Effluent Discharged to Red Dog Ck	848,197,000
WTP #3 Influent from MWD	25,550,000
WTP #3 Influent from Mine Water Collection	42,800,000
WTP #3 Total Effluent	68,347,000
Total Treated Water Discharged to Red Dog Creek	1,293,800,000

Fugitive Dust



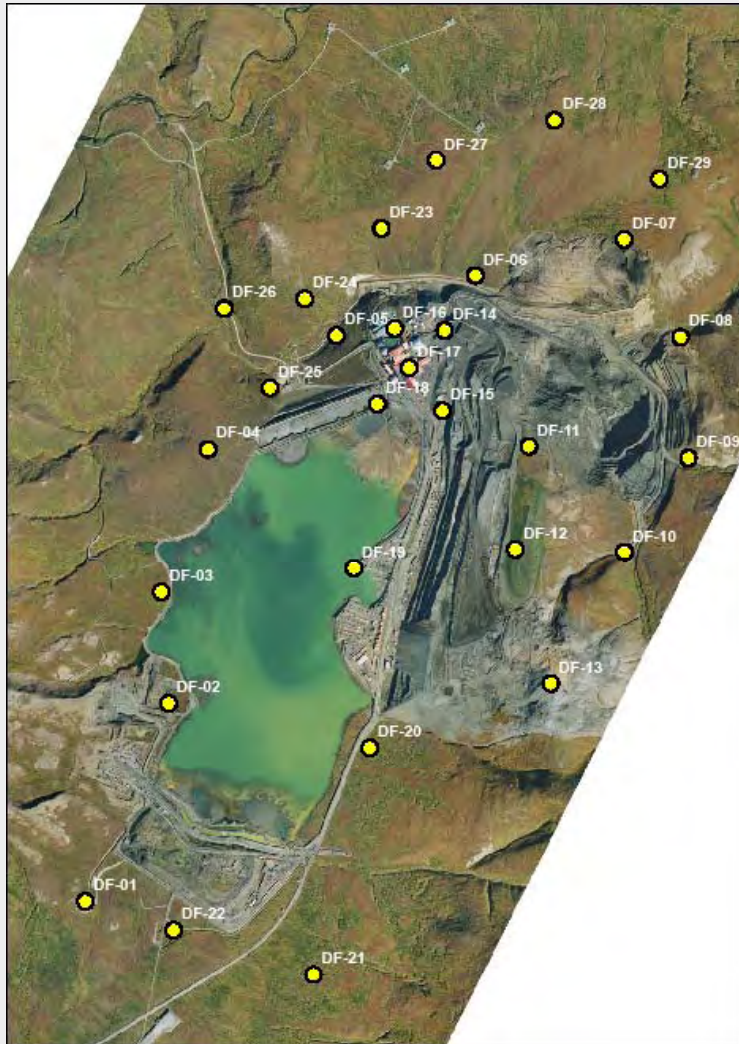
Dust Monitoring



Several monitoring programs are in place to monitor dust levels and deposition

- TEOMs* – real-time dust concentration measurements at PAC and Tailings Dam
- * Tapered Element Oscillating Microbalance; determines concentration in air by weight and airflow measurements
- Vegetation monitoring – effects of dust deposition on plant communities over time
- Moss studies – quantities of dust deposition over time
- Dustfall jars – rates and quantities of dust deposition over time
- Road surface sampling – deposition and tracking on roadways

Dust Monitoring



- Results of dust monitoring are analyzed to assist with mine air quality evaluations.
- This map shows dustfall jar locations for 2011.

Dust Monitoring



	2005	2006	2007	2008	2009	2010	2011
Days with TSP > 150	37	20	19	4	18	24	23
Average TSP	64	45	47	38	50	54	41
Average MAX TSP	260	179	180	117	180	218	332
Average Min TSP	8	8	7	6	10	8	4
Average Std Dev	57	43	39	29	43	46	58
Days Sampled	335	278	354	289	294	349	334

- Air monitoring programs allow for tracking and analysis of dust concentrations and effectiveness of dust control measures; and
- Provide information to help with decisions on where dust control improvement efforts should be focused

Construction Activities



Construction completed in 2011

- Main Dam lift to 970 feet in elevation
- IsaMill building and two new IsaMills
- Wing Dam to 970 feet in elevation
- Development drilling at Aqqaluk deposit

Continuing Construction

- Resloping of Main Waste Stockpile
- Improved ARD collection at the base of the Main Waste Stockpile.
- Development drilling at Qanaiyaq deposit

2012 Construction

- Conversion of floatation cells to microcell technology.
- Sulfur Creek stormwater diversion
- Re-skin the Mine Concentrate Storage Building

Main Dam Raise to 970 feet Completed in 2011



Isa Mills Completed in 2011



Wing Dam Construction



Wing Dam completed to a elevation of 970 feet in 2011.



Main Waste Stockpile ARD Collection system



Aqqaluk / Qanaiyaq Development Drilling



Sulfur Creek Stormwater Diversion





Thank You