Closure of the Albino Lake Facility Eskay Creek Mine

18th ANNUAL BC/MEND ML/ARD WORKSHOP

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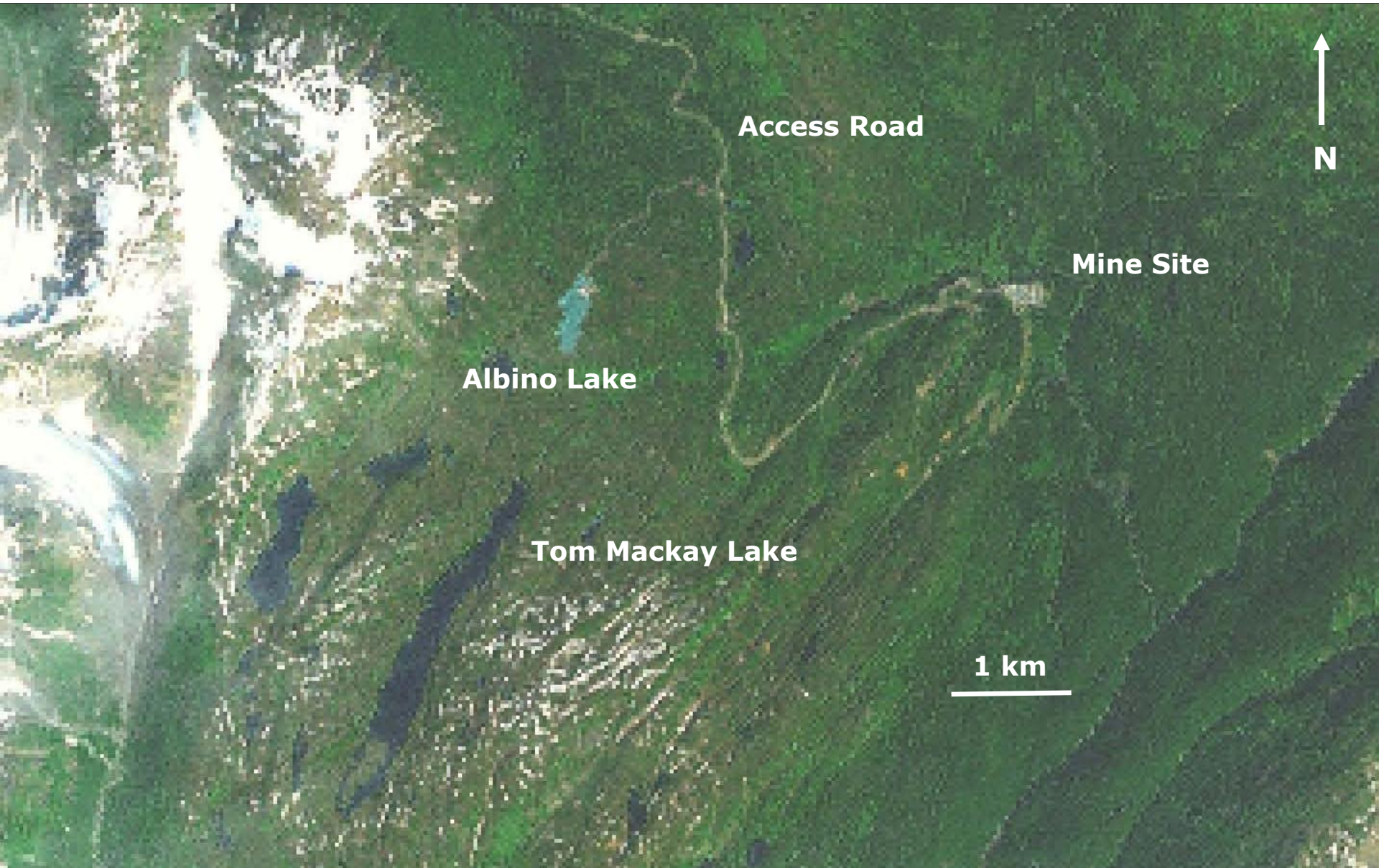
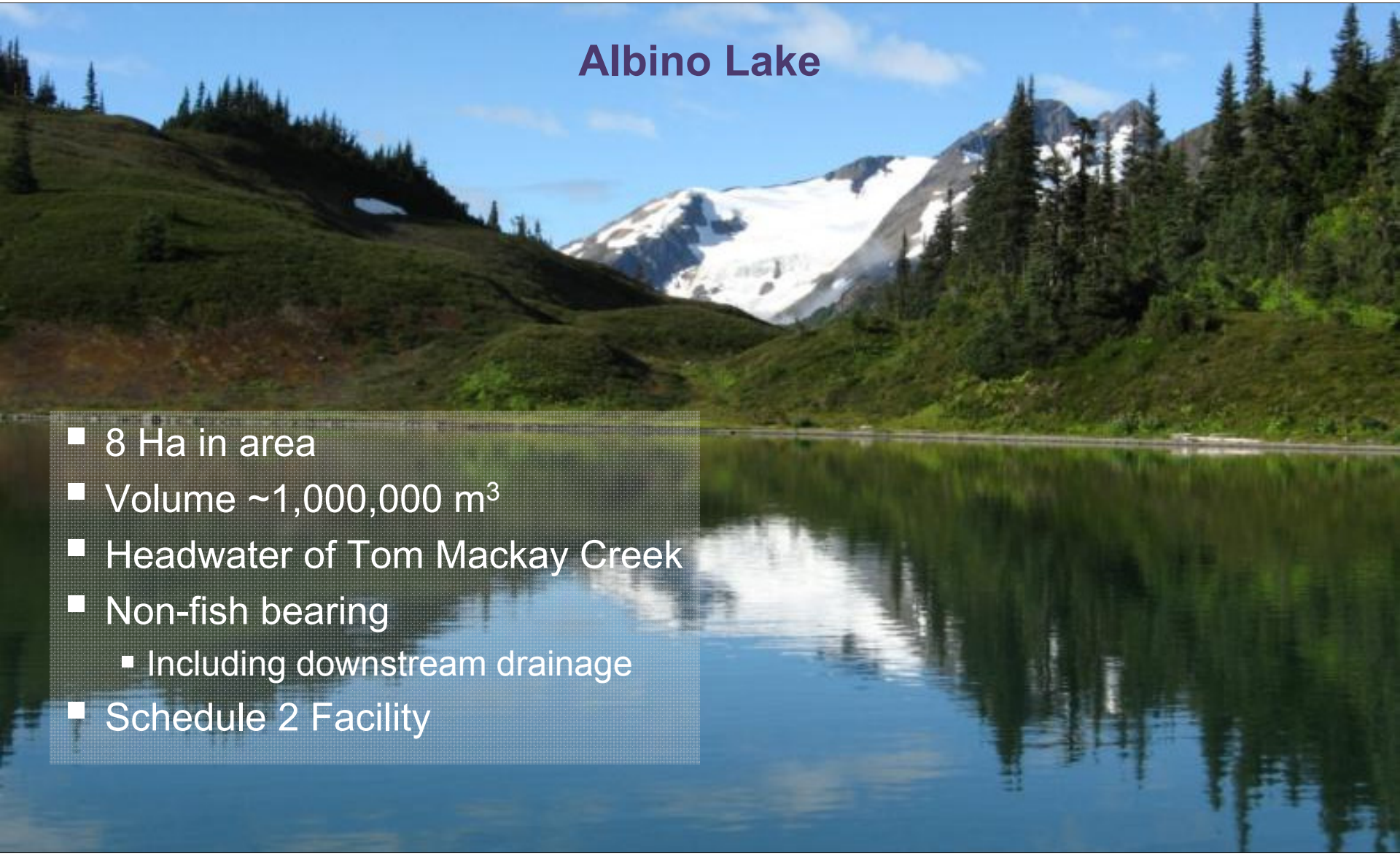
Eskay Creek Mine

- Operated November 1994 to January 2008
- Very unique and very high grade deposit
- Production
  - Over 2 million tonnes of ore
  - Silver: ~180 million ounces
  - Gold: ~3.5 million ounces
- Direct shipping ore (DSO) 1994-1997
- Production increases in 1997 and 2001


Access Road
N
Mine Site
Albino Lake
Tom Mackay Lake
1 km

Albino Lake



- 8 Ha in area
- Volume ~1,000,000 m^3
- Headwater of Tom Mackay Creek
- Non-fish bearing
  - Including downstream drainage
- Schedule 2 Facility

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ESKAY CREEK

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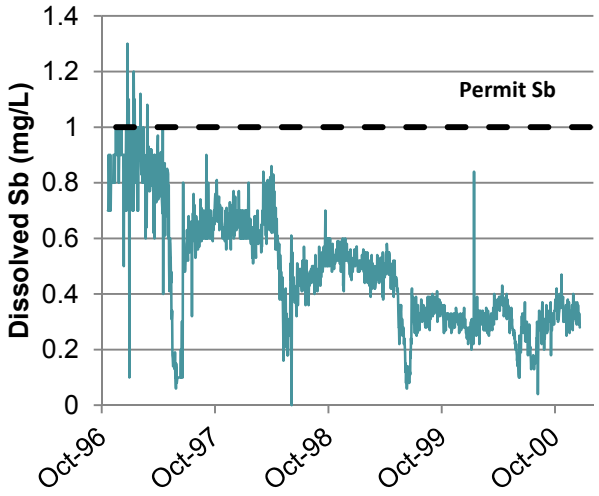
Site Conditions

- ~2000 mm/yr precipitation
- 2/3 as snow
- Snowpack up to 20m
- Lake ice-layer ~ 2m thick
- Short construction season (July-October)

Albino Lake 1994 - 2000

- Deposition of waste rock and mine fines
- Lime stabilized waste rock from exploration adit
- Recognition of antimony issue
  - Fines contained high concentration of stibnite (Sb_2S) – forms halo around ore
  - High pH of stabilized waste rock increased Sb mobility
- Mitigation of Sb began in 1995 with ferric sulphate addition to fines
- Early recognition of requirement for subaqueous deposition of waste rock, tailings and mine wastes



Albino Lake 2001-2008

- Waste rock, including some cemented rockfill
- Tailings directed to Tom Mackay Lake
- Minor volumes of tailings, fines and water treatment sludges
- Production increases made it increasingly challenging to place waste rock at depth in lake
- Practical difficulties associated with cost-effectively and safely placing waste rock underwater
- Resulted in the growth of a subaerial waste rock pad


Summer 2003

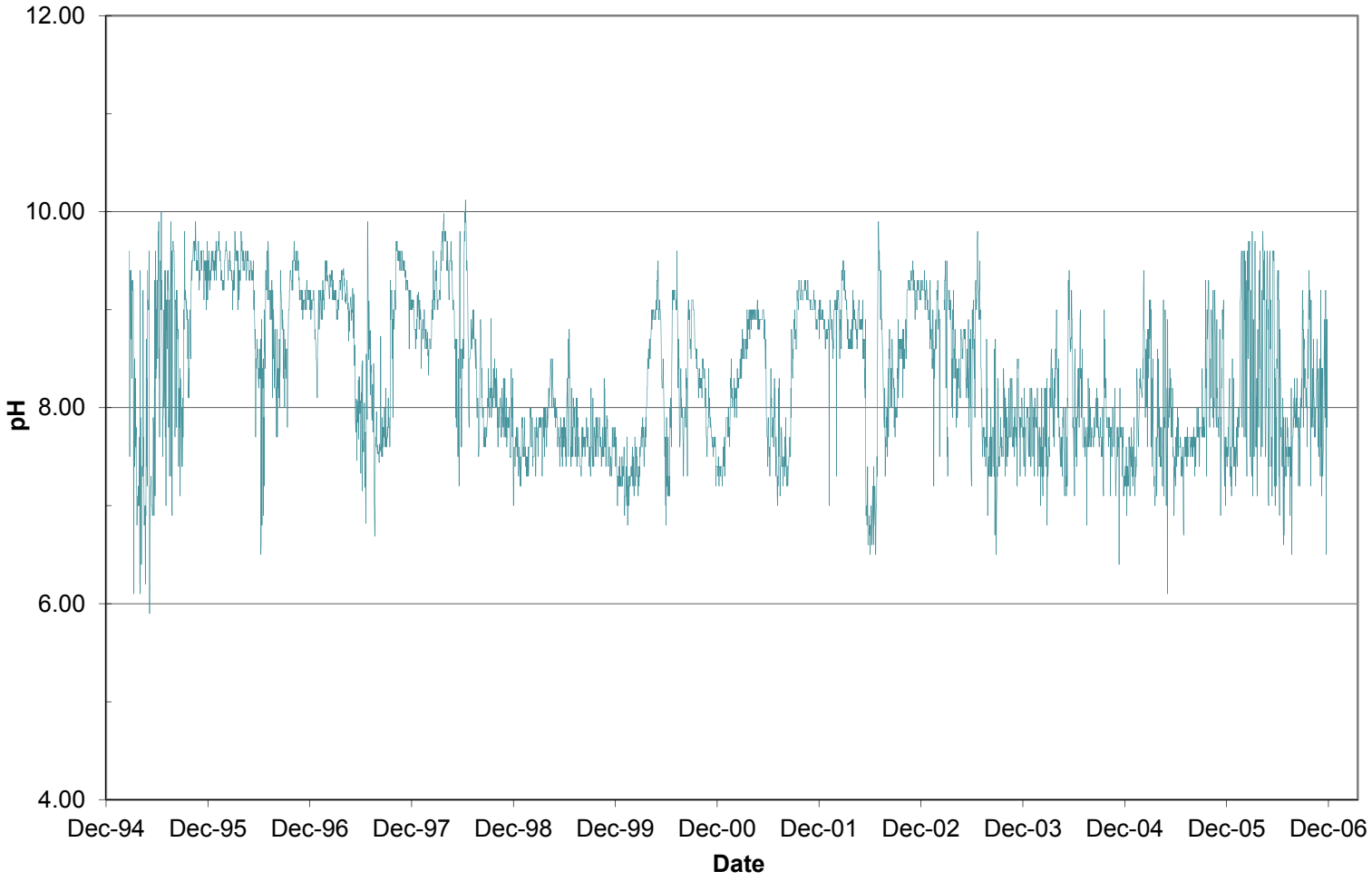

August 2005

Water Quality Issues Operations and Closure

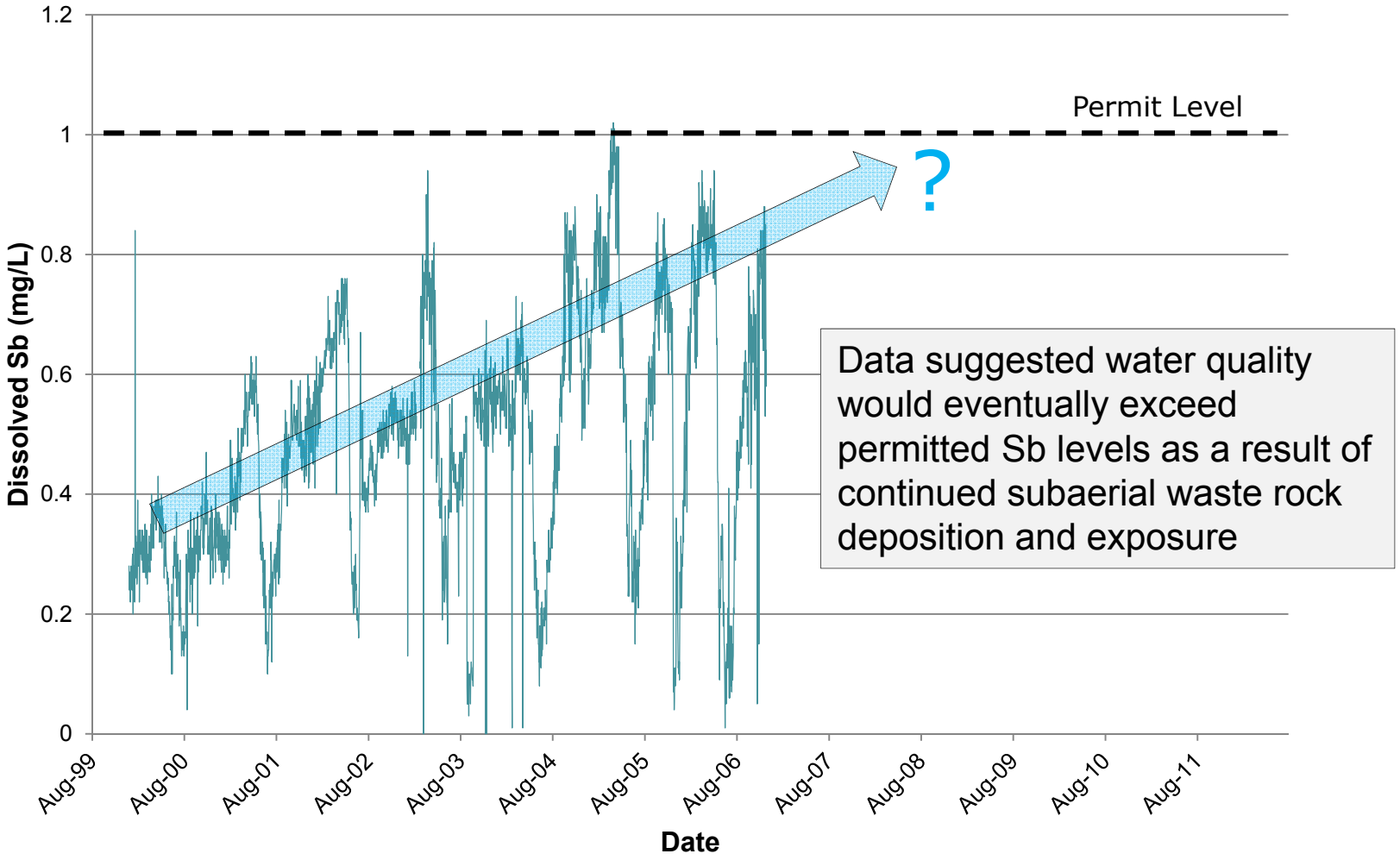
- High pH (occasionally >9.5) and elevated Sb concentrations in discharge from the flushing of exposed waste rock
- Eventual acid generation from subaerially exposed waste rock
- Concerns regarding potential for alkalinity and Sb release from submerged wastes

CO_2 bubbler system, Albino Lake discharge

pH of Albino Lake Discharge 1995-2006 (daily measurements)



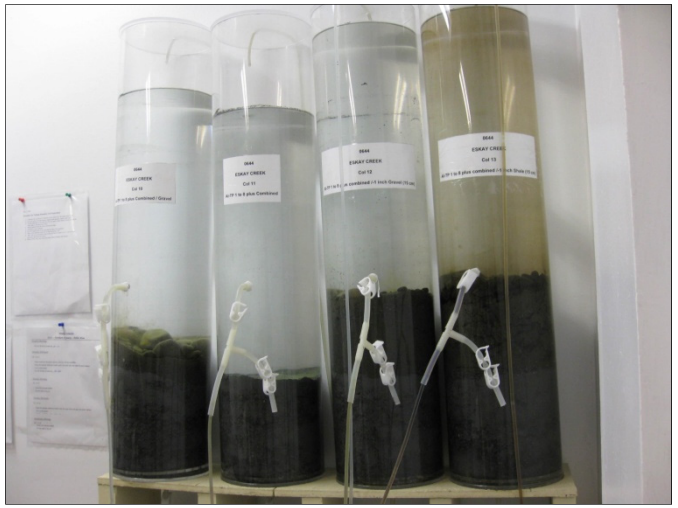
Antimony in Albino Lake Discharge 2000-2006



Data suggested water quality would eventually exceed permitted Sb levels as a result of continued subaerial waste rock deposition and exposure

Closure Concepts and Studies 2005-2007

- Several closure options considered:
  - Subaqueous placement
  - Flooding (raise lake level)
  - Cap in place
  - Relocate to mine or Tom Mackay Lake
- Trade off studies conducted
  - Geochemistry / water quality
  - Volume assessments
  - Waste management and handling



Closure Concepts and Studies 2005-2007

- Closure studies indicated the best option was subaqueous placement
  - Eliminate surface loadings to lake
  - No loadings from submerged wastes
  - Minimize long term management
  - Practical and feasible

- Methodology selected was to drawdown the lake and regrade the wastes below the natural lake level

Albino Lake Control Structure

- As a result of a toxicity test failure in early 2007, a control structure was constructed on Albino Lake in the event that the discharge quality became unacceptable
- Structure could also be used to raise the lake level if required
- Drawdown of the lake was begun in late August 2007
- Control structure was completed in October 2007

Subaqueous Placement

- Pumping of lake to 3m below natural level
- Placement of the wastes below the lake-ice depth of 2m
- Bulldozers and backhoes were used to push and place the waste rock out into the lowered lake
- Site conditions limited the operational period
  - Drawdown took 4-6 weeks starting after the freshet in early July,
  - Safe working conditions until mid October

2007 – Year with no Summer

Initial drawdown of lake for
Control Structure construction


August 2008
Campaigns to drawdown the lake and regrade the wastes were carried out in 2008 and 2009


Summer 2008


Summer 2008

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August 2008

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October 2008

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ESKAY CREEK

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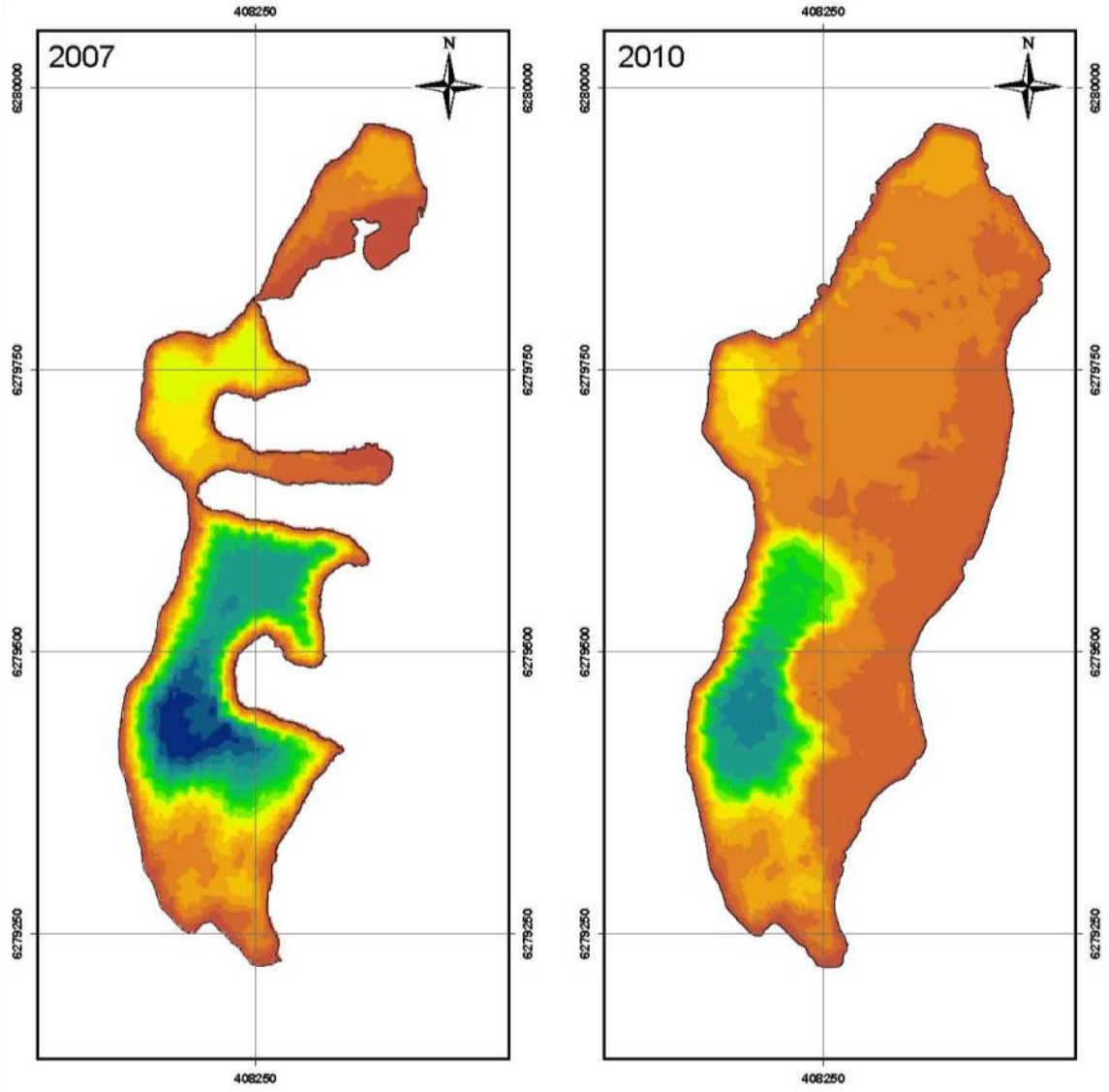
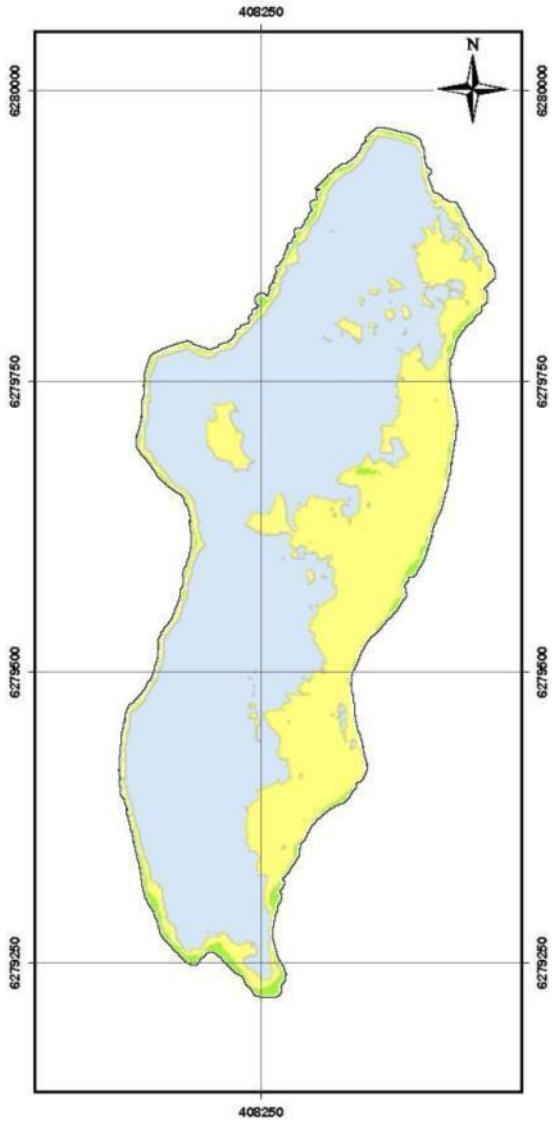


2007 and 2010 Bathymetry

Legend

Depth (m)		
0 - 1	5 - 6	11 - 12
1 - 2	6 - 7	12 - 13
2 - 3	7 - 8	13 - 14
3 - 4	8 - 9	14 - 15
4 - 5	9 - 10	
	10 - 11	



Depth of Water Cover 2010

Depth (m)

0 - 1

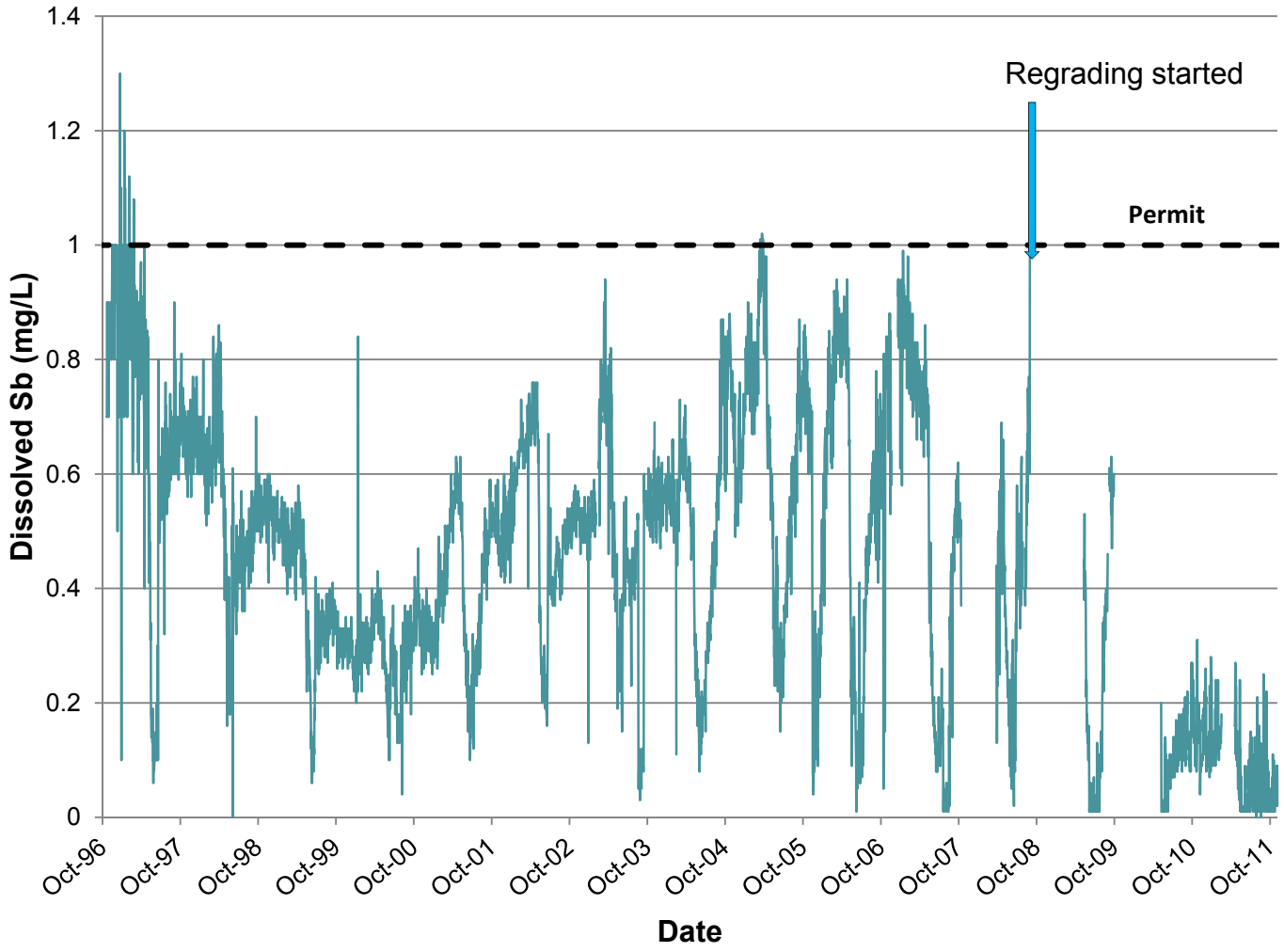
1 - 2

>2

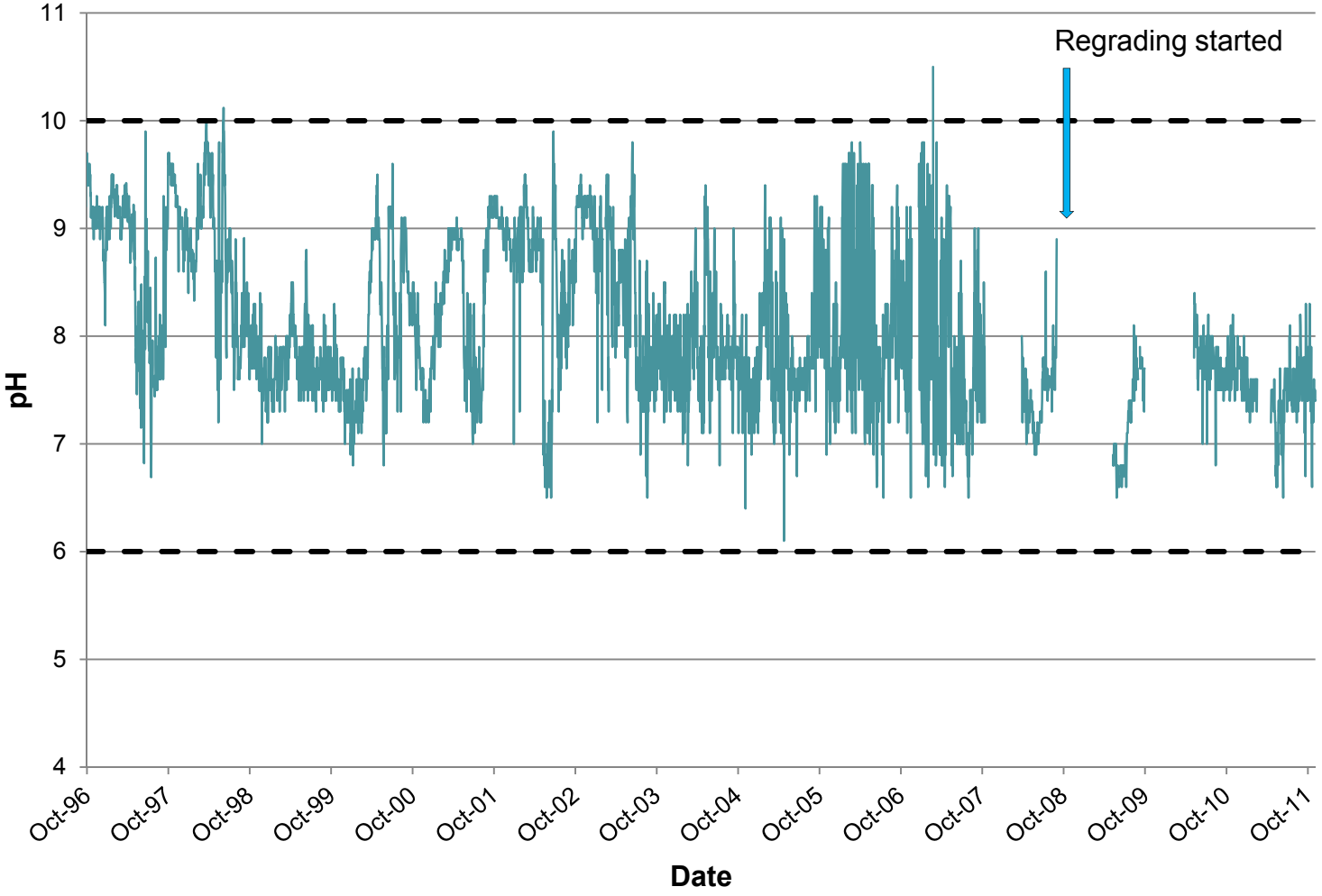

Summer 2010

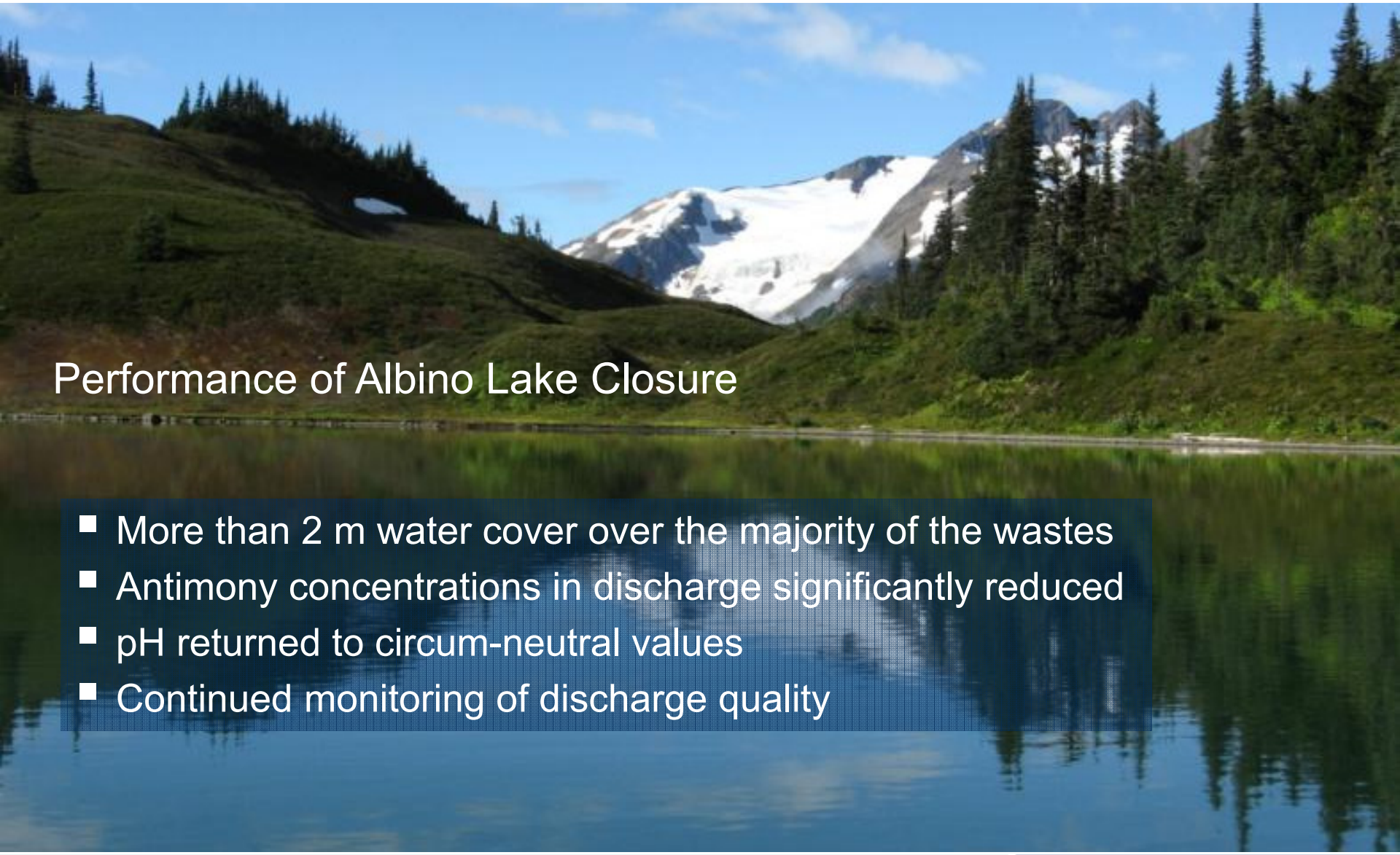

Summer 2010

Antimony in Albino Lake Discharge 1995-2011



pH in Albino Lake Discharge 1995-2011





Performance of Albino Lake Closure

- More than 2 m water cover over the majority of the wastes
- Antimony concentrations in discharge significantly reduced
- pH returned to circum-neutral values
- Continued monitoring of discharge quality