



Long-Term Monitoring Data from the Britannia Mine, BC

- Kelly Sexsmith, Danette Schwab and Stephen Day, SRK Consulting
- Rob McCandless, Environment Canada

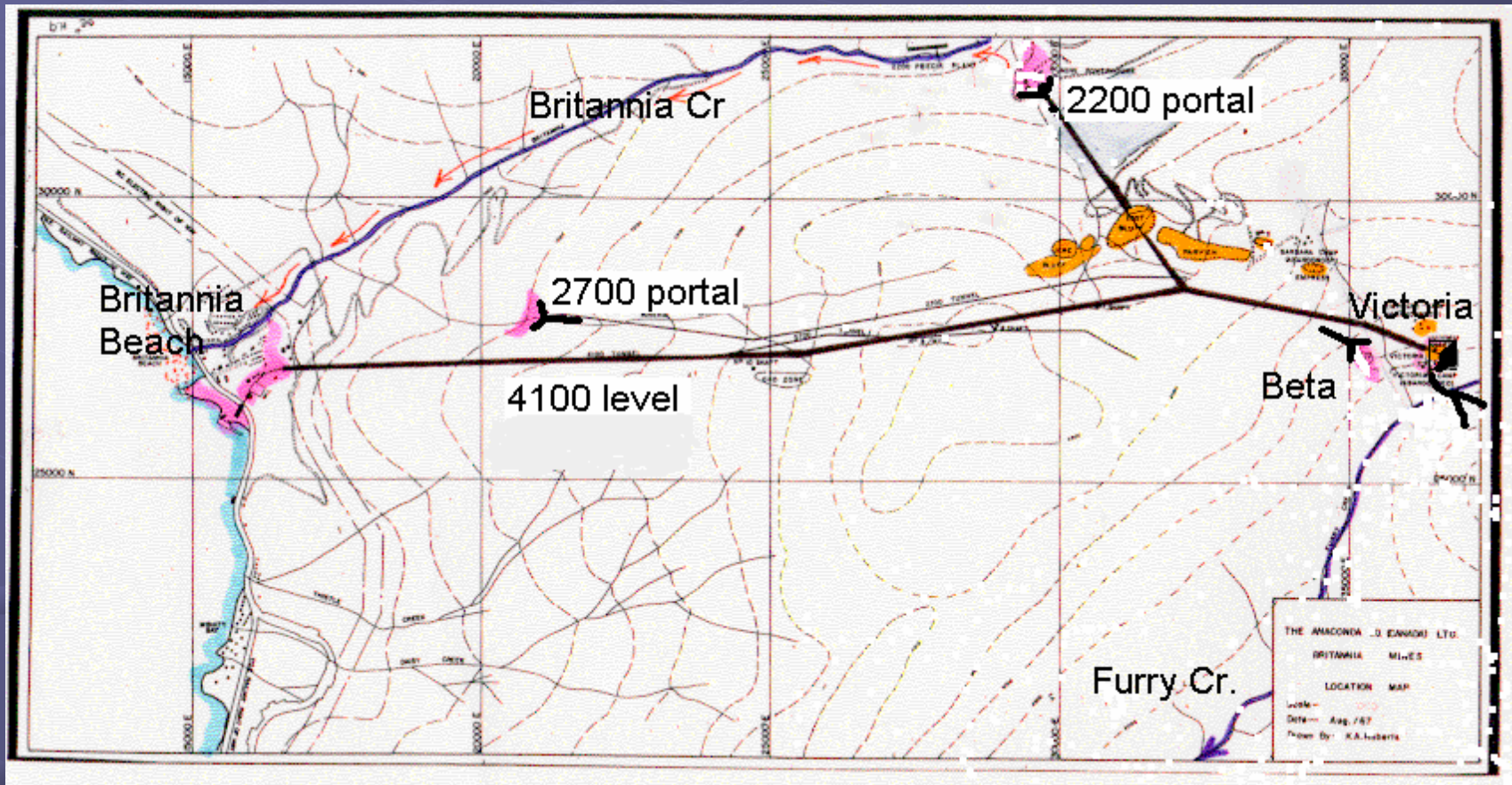
Acknowledgments

- BCWLAP
- Gerry O'Hara- Golder Associates
- Peter Healey – SRK Consulting
- Pat Bryan – Associate Consultant
- Terry Johnson - Mine Manager

Presentation Outline

- Geology
- Historical Water Quality
- Precipitates
- Comparisons with Similar Sites
- 2002 Plug Test
- Post Test Water Quality
- Conclusions

Britannia Mine Geology - 1



Britannia Mine Geology - 2

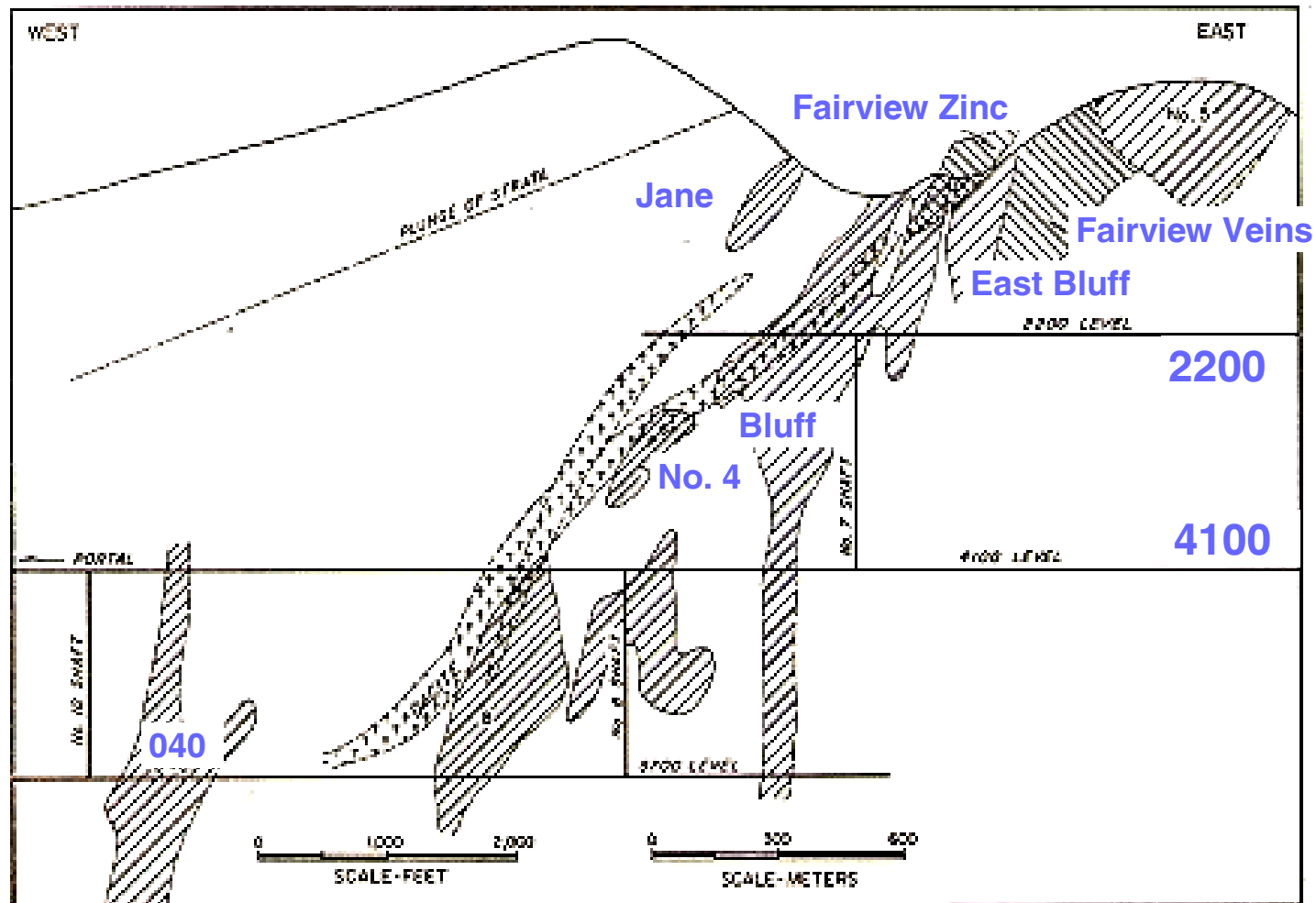


Fig. 3. Longitudinal Section Britannia Mine.

Britannia Mine Geology – 3



Jane Basin, looking SW

Volcanic-associated massive sulphide deposit

- dacites > andesites
- clastics and tuffs

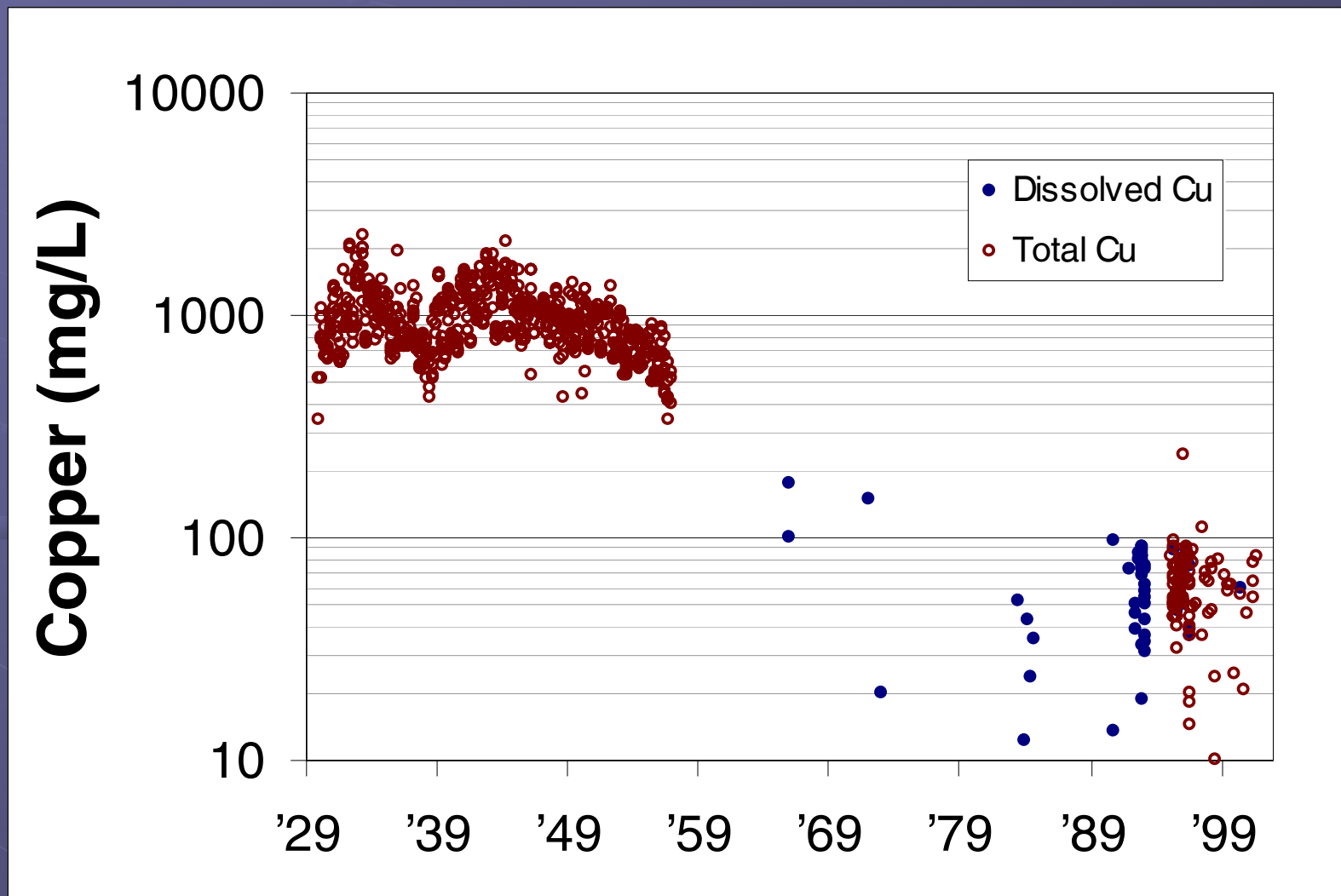
Ore minerals

- pyrite >> chalcopyrite > sphalerite >> galena,
- *no pyrrhotite.*

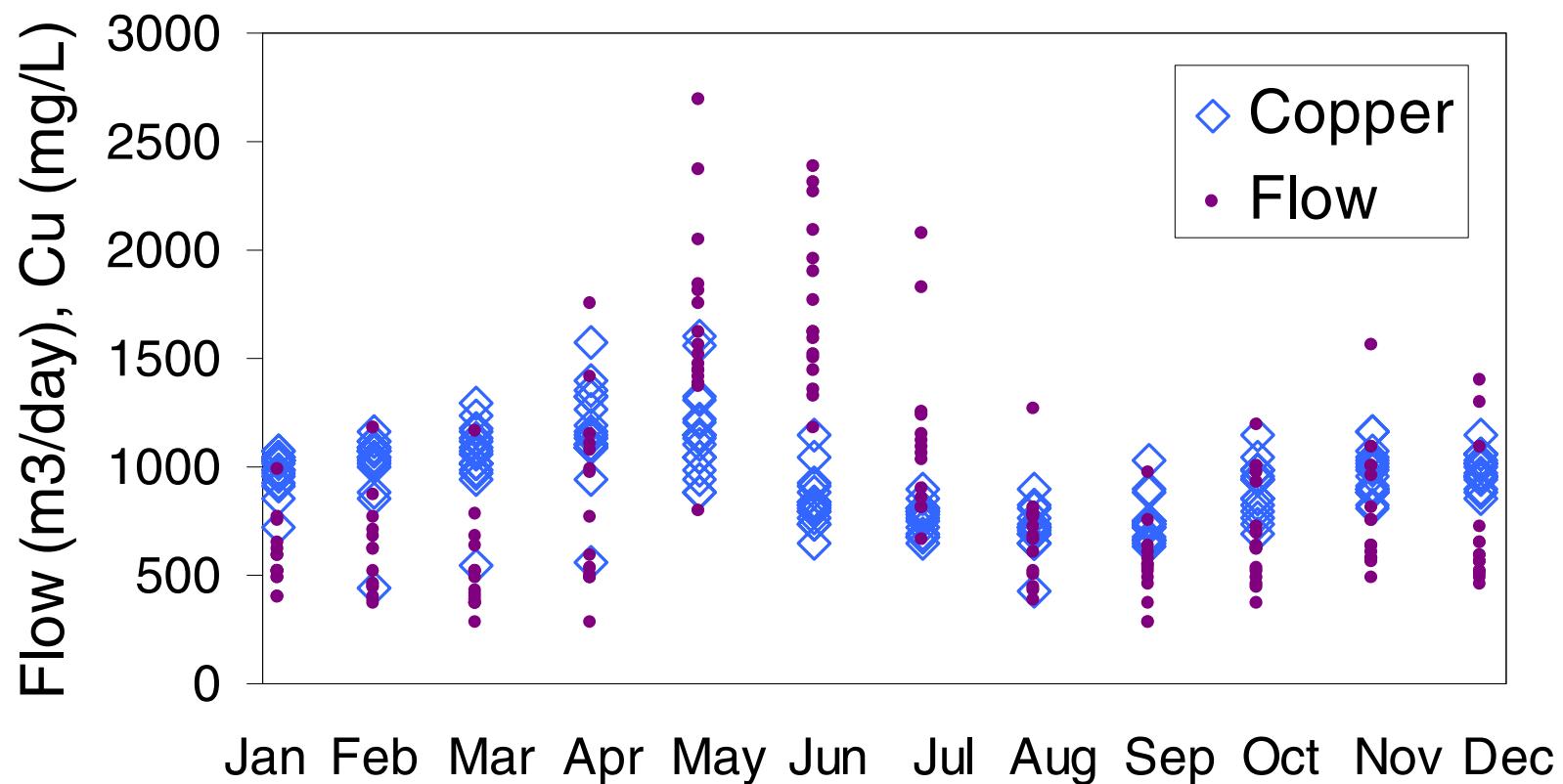
Gangue minerals

- quartz, chlorite/biotite, anhydrite, siderite, barite

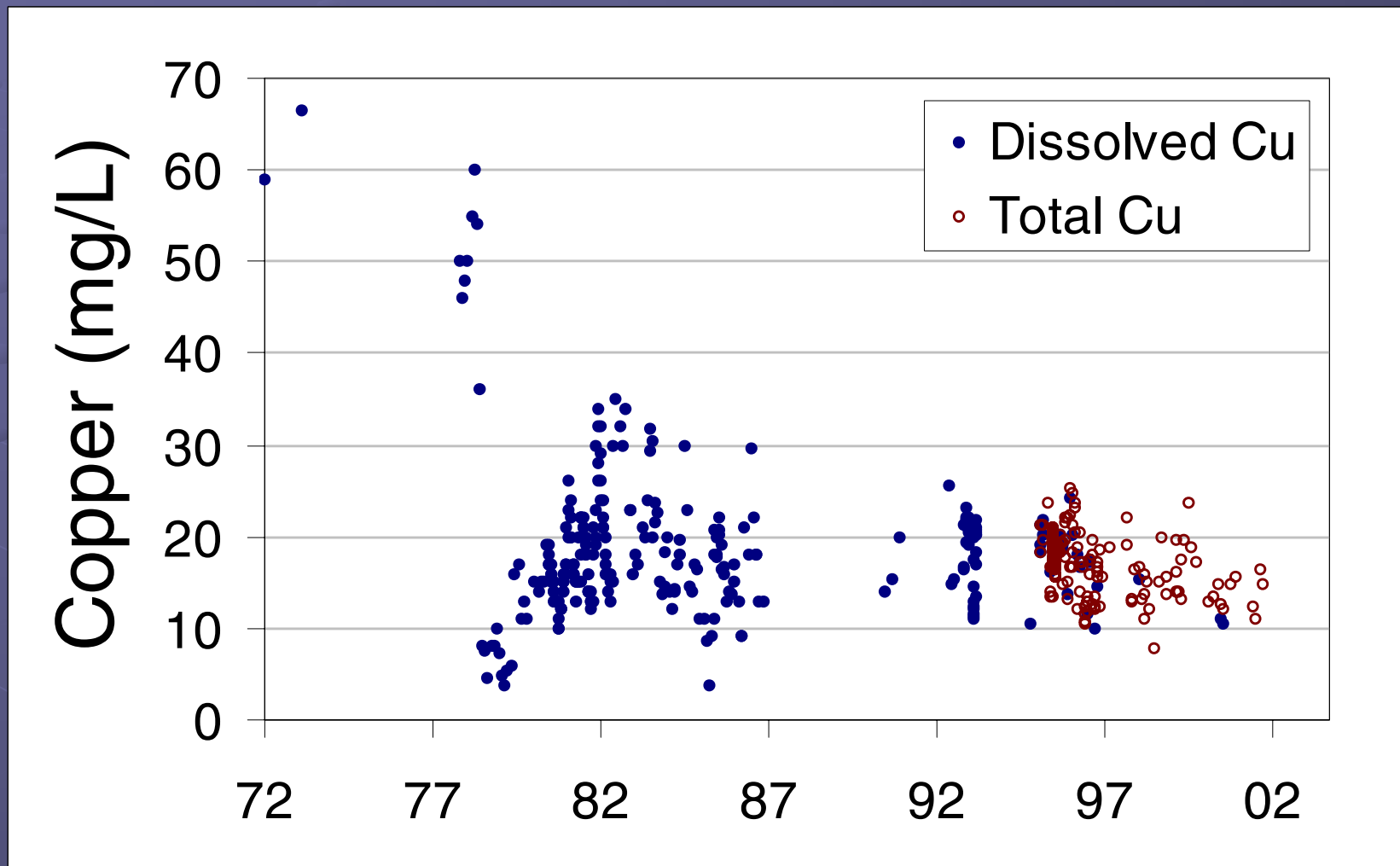
Historical Copper Data – 2200 Level



2200 - Seasonal Flows and Copper Concentrations (1945 to 1952)



Historical Copper Data - 4100 Level



Britannia Mine Water Quality

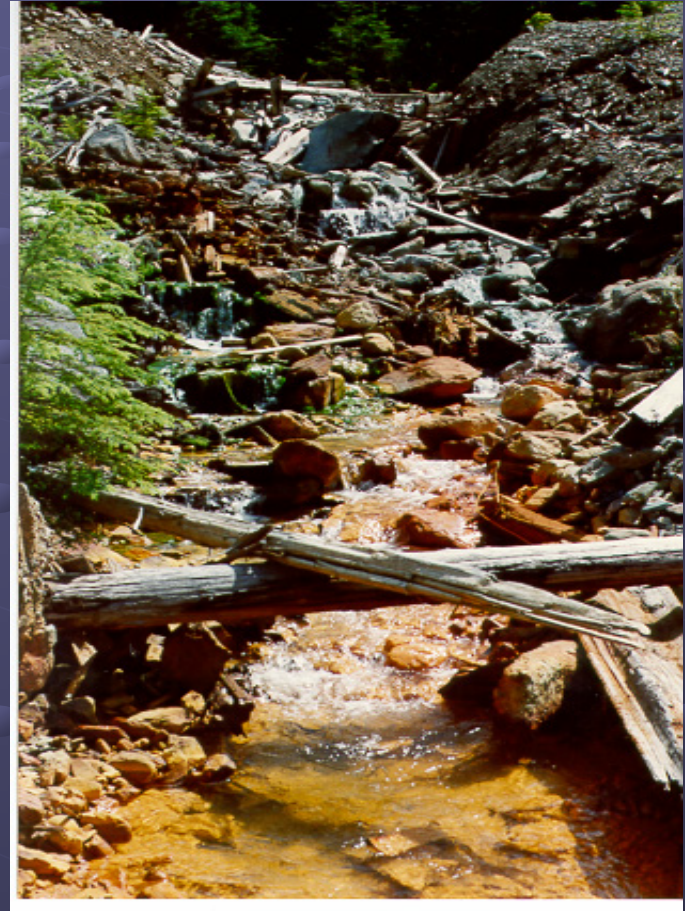
Stn.	Averages, pre-2001 chemistry								Dist. from mine, km	Av. flow m ³ /day
	pH	SO ₄	Al	Cd	Cu	Fe	Mn	Zn		
2200	3.1	1088	42	0.19	59	31	3.6	29	1.5	2783
4100	3.8	1528	26	0.09	18	4.5	4.2	21	5	9704

* Concentrations are in mg/L

Data compilation courtesy BC MWLAP and SRK

Britannia Mine Geochemistry

- Differences between 4100 and 2200 due to dilution of some unknown mine water.
- pH > 3 (at least since 1972)
 - Fe and Al precipitation may act as buffer.
 - ?Lack of pyrrhotite
- During mining, with fresh air and fresh mineral surfaces, 2200 Cu was 1500+ mg/l.



Jane Creek before Dec '01

Geochemistry of the 4150 Sludges

Whole rock:

- 57 % Fe_2O_3
- 2 % Al_2O_3
- 38 % loss on ignition

ICP metals (ppm, dry wt)

- Cu – 4382,
- Zn – 360
- Cd – <0.8,
- Pb – 181
- Fe – 107,000



Iron hydroxide sludge, 4150 level

Britannia compared to others



Anyox adit drainage

Tulsequah Chief:

pH - 3.0 Cu - 33.5
Fe - 34 Al - 22
Zn - 63 SO₄ - 997
(after SRK Consulting, 1992)

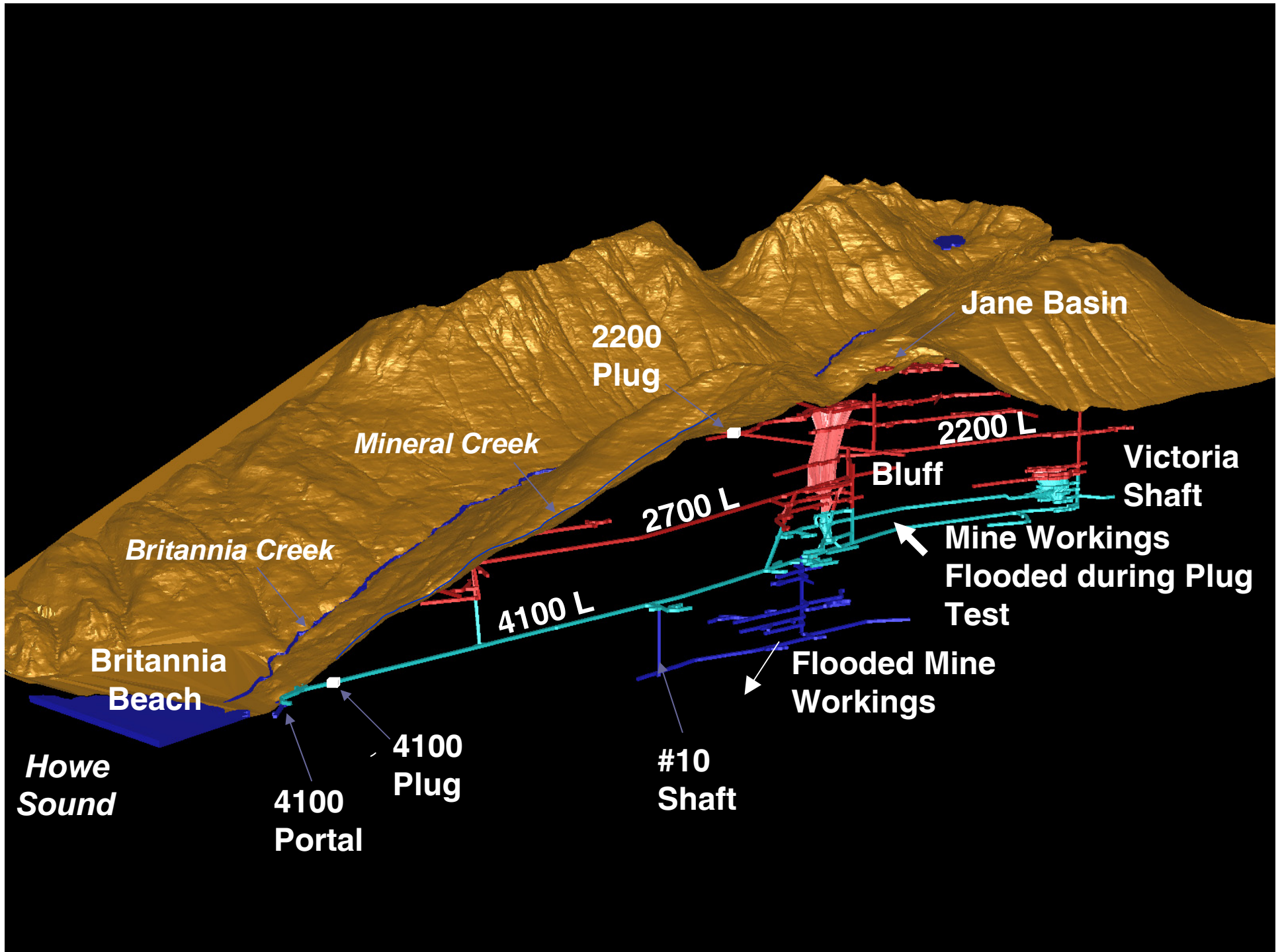
Anyox:

pH - 2.8 Cu - 2.3
Fe - 275 Al - 48
Zn - 5 SO₄ - 3500
(Environment Canada data to 2000)

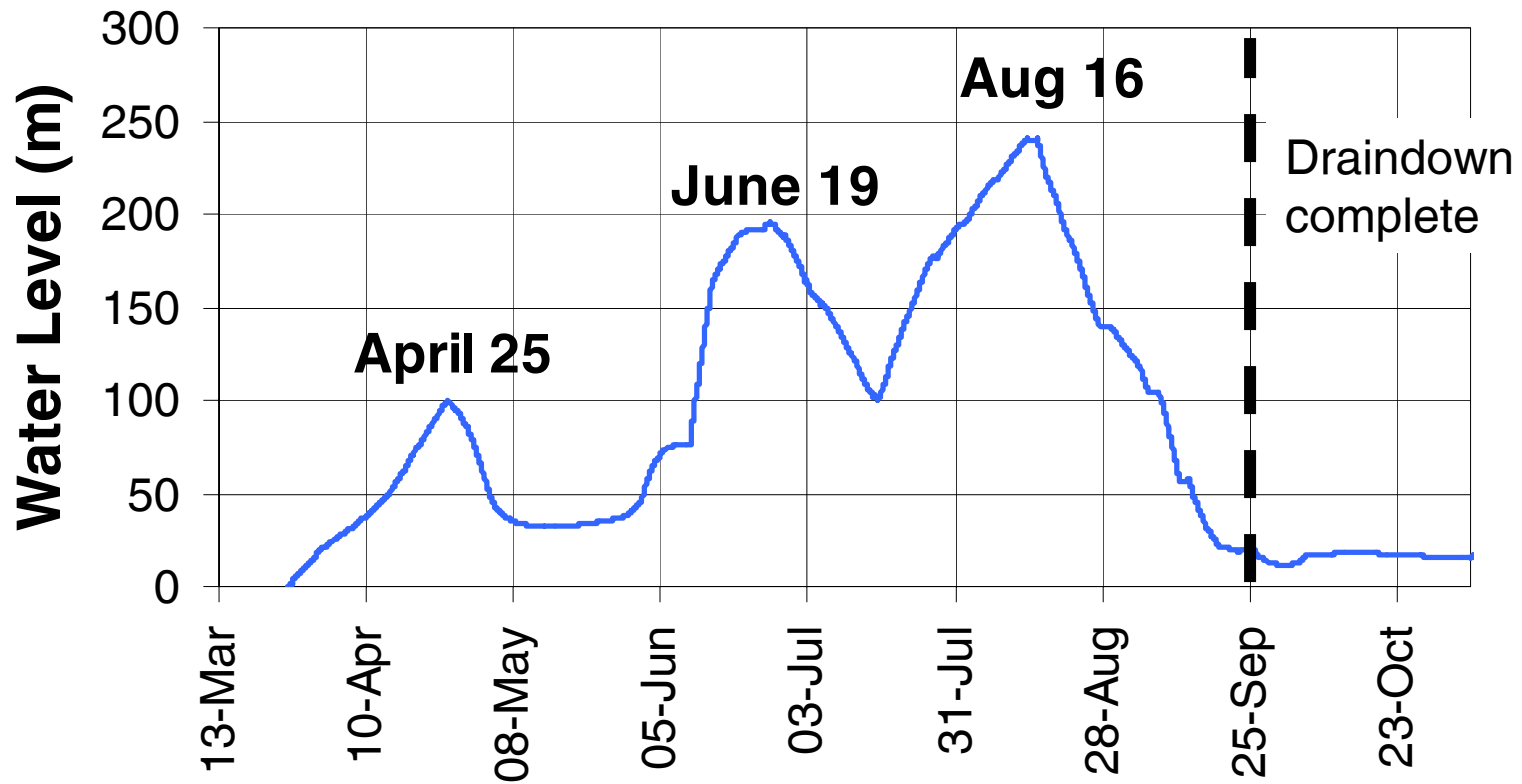
* Concentrations in mg/L



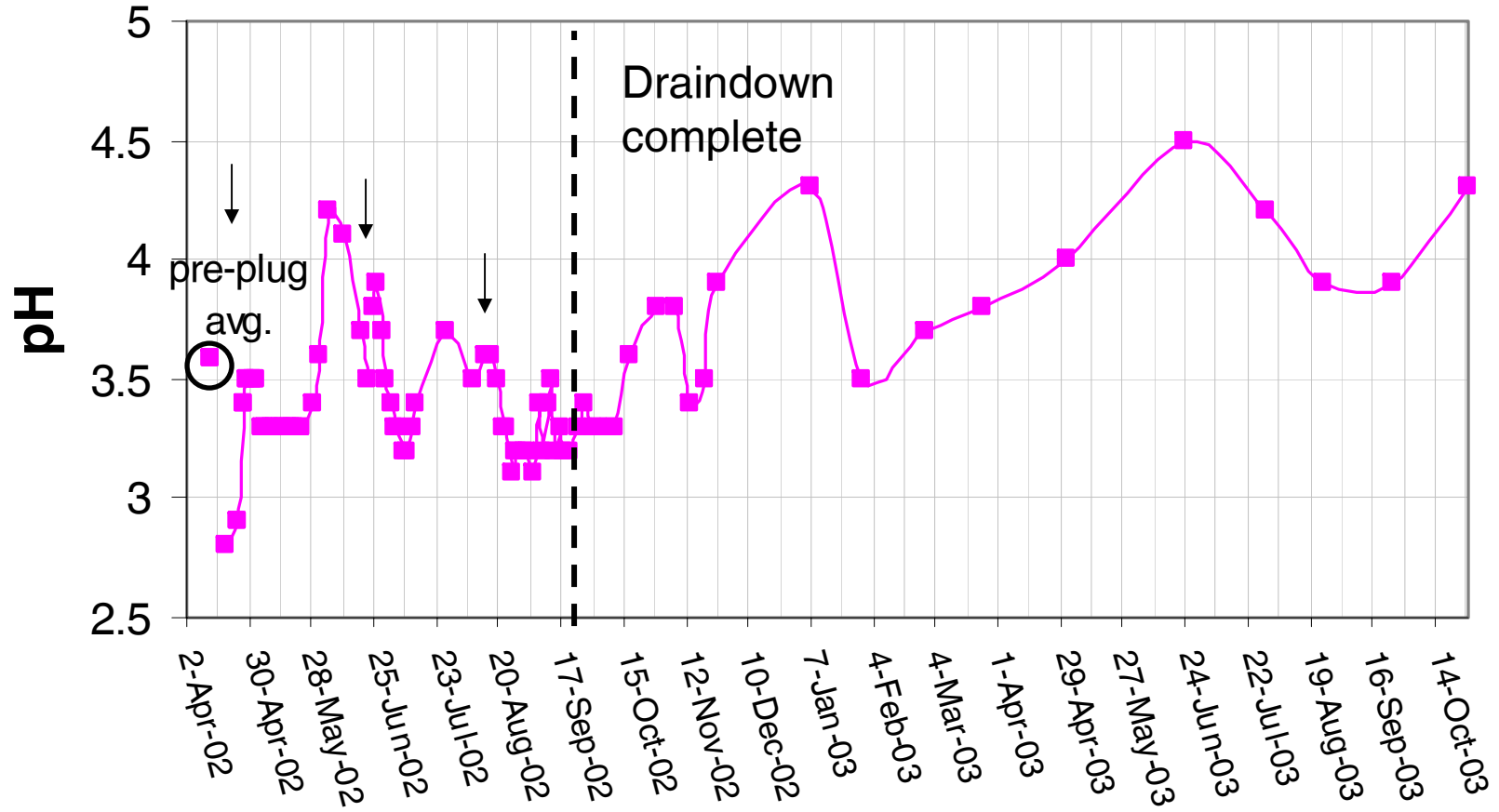
Release of Water During 2002 Plug Test



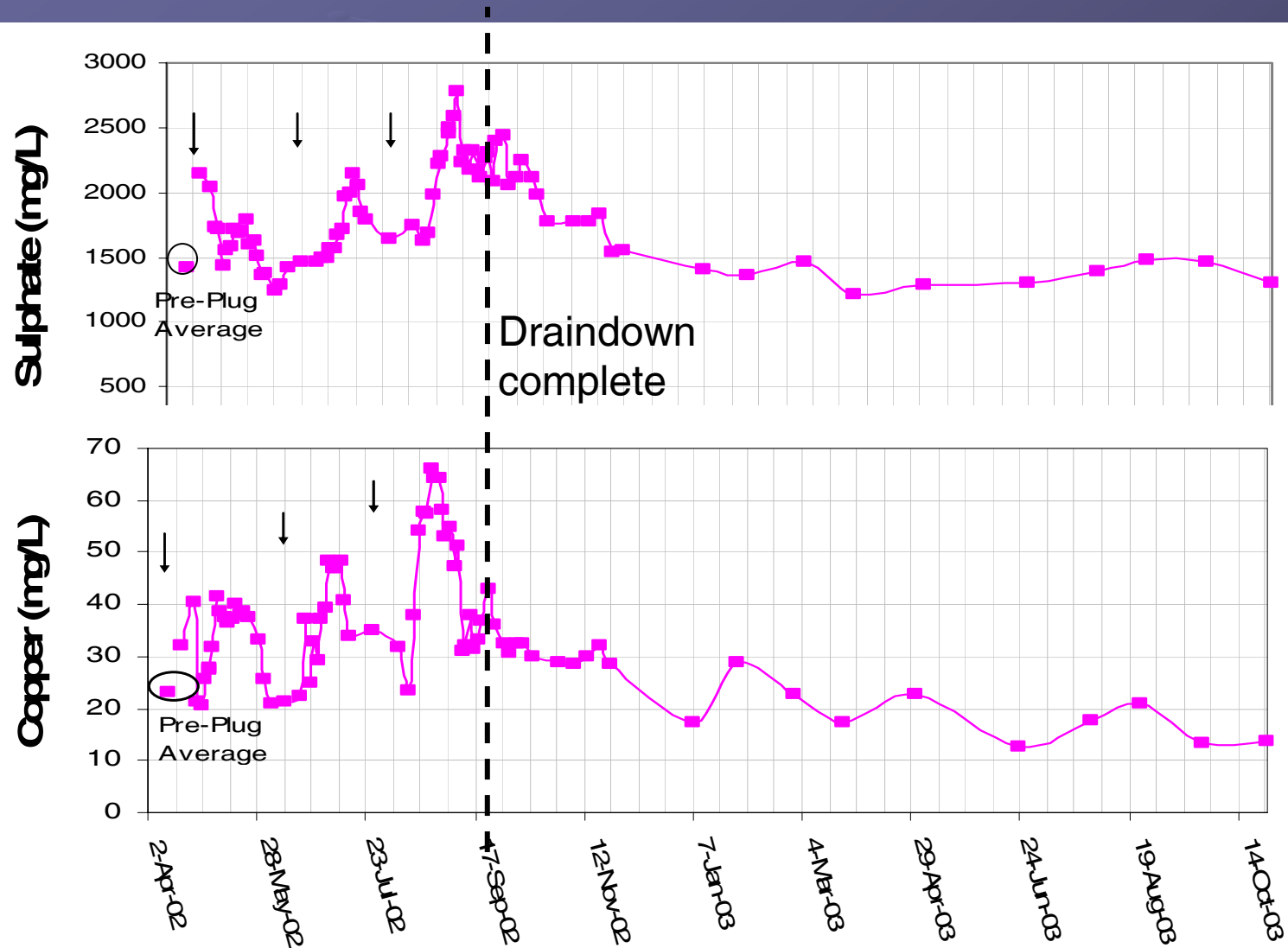
Plug Tests



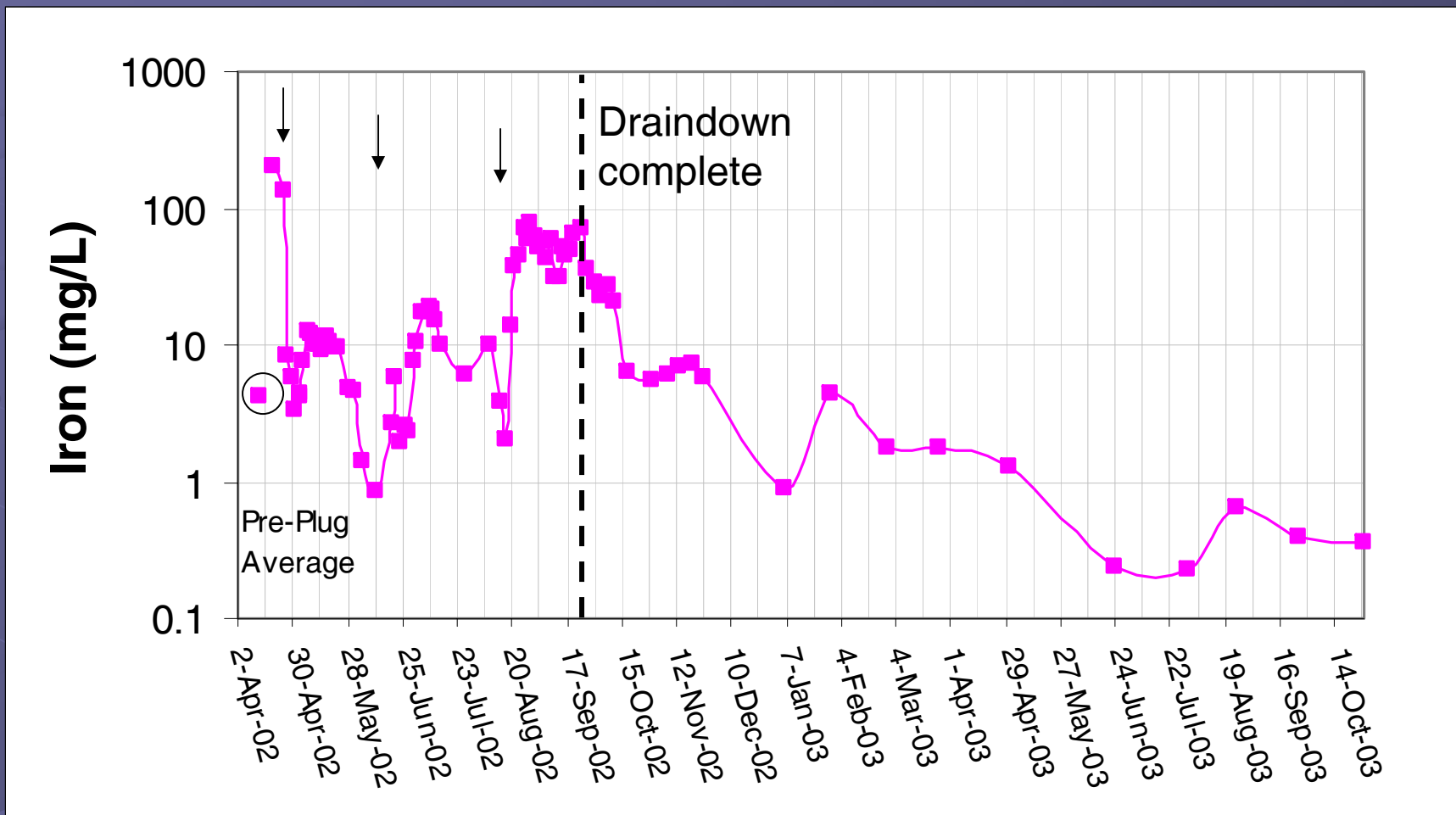
pH



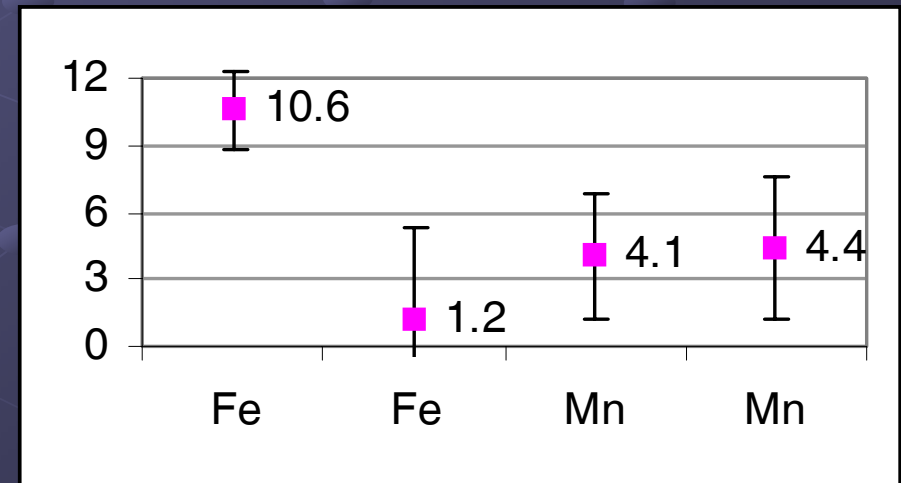
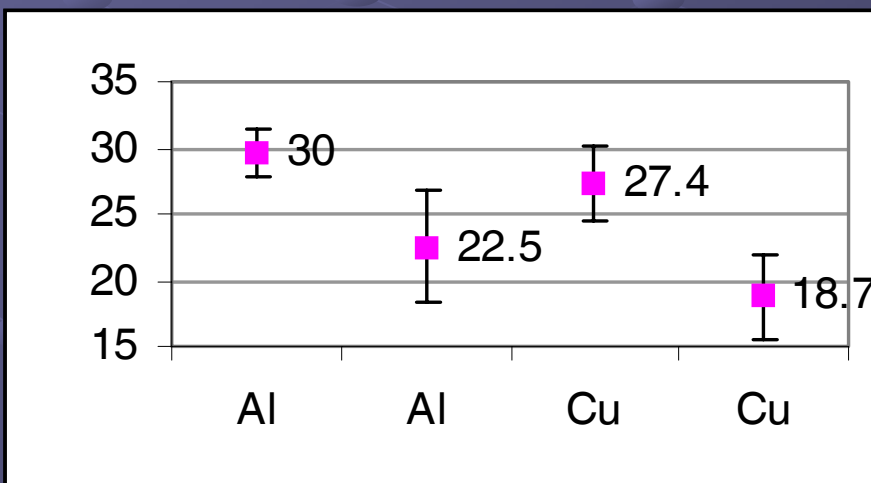
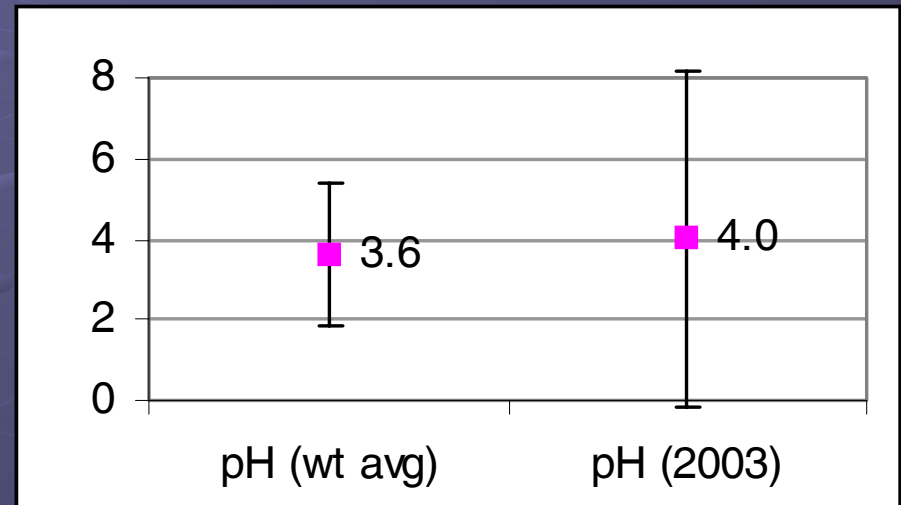
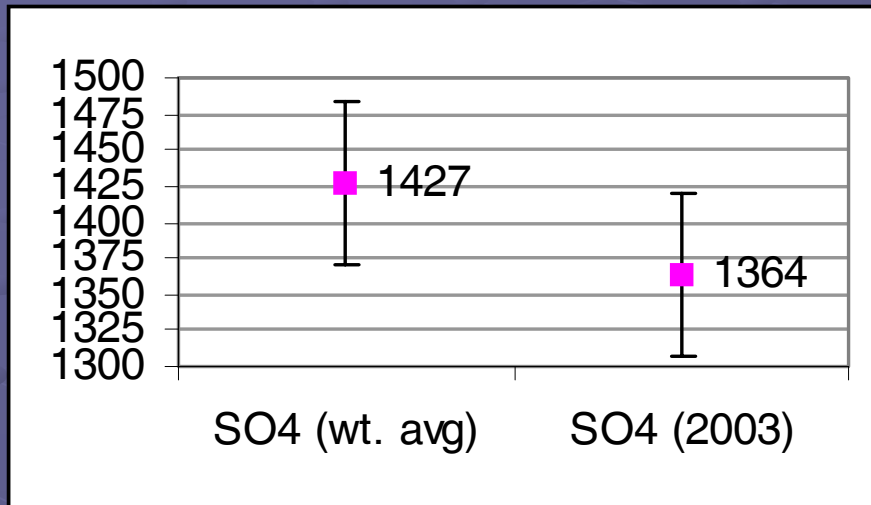
Sulphate and Copper

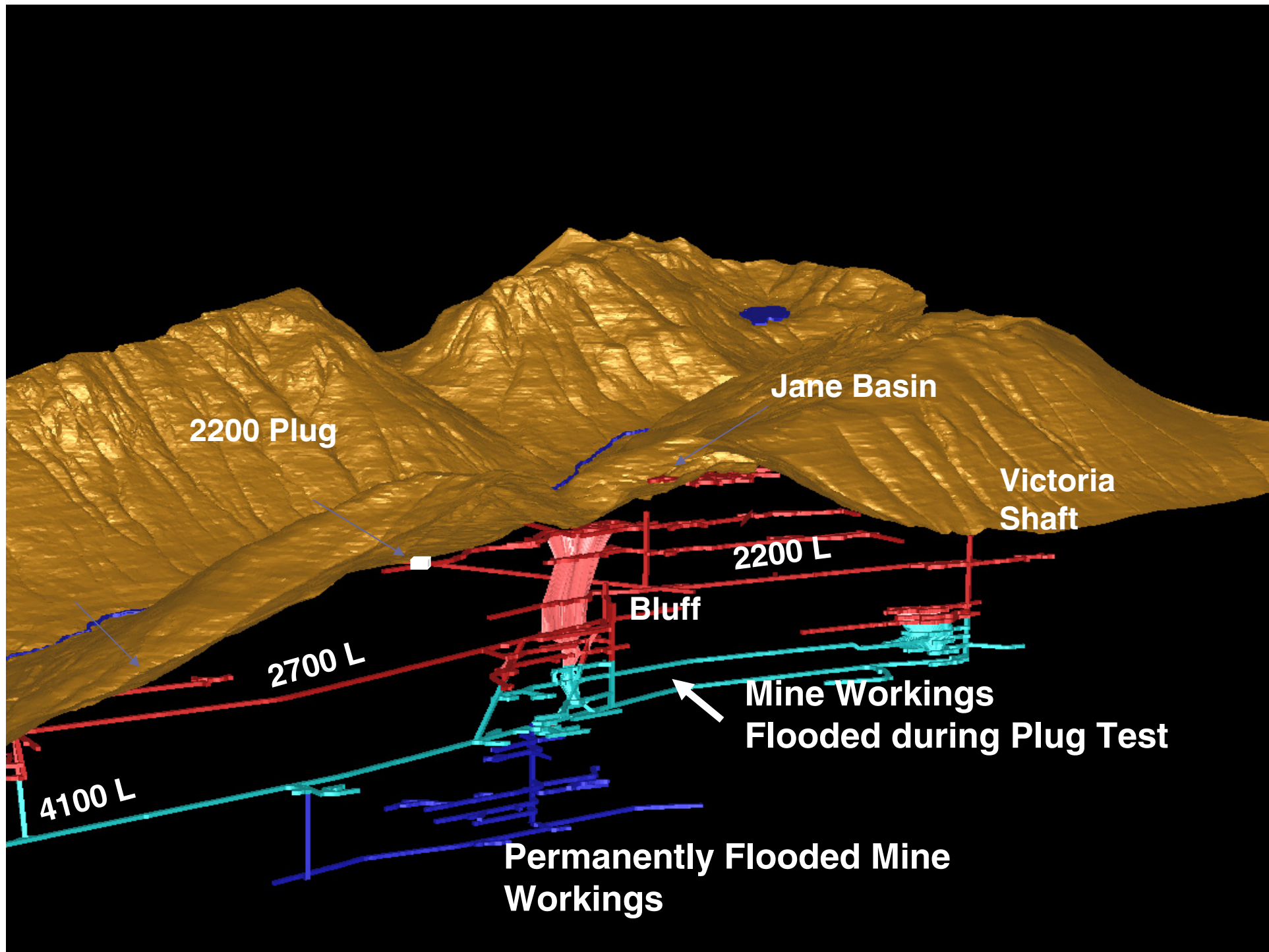


Iron



Comparison of Pre-Plug and Post-Plug Test Concentrations





Conclusions

- Flooded mine water had lower pH and higher than average sulfate and metal concentrations compared to pre-plug test values, consistent with the leaching of stored acidic salts
- Higher than average sulphate and metal concentrations persisted for 2 to 3 months following the test
- Concentrations of sulphate, aluminum, copper and iron were below average 4 to 10 months after the test, indicating effects of flooding were relatively short duration