

2008 Annual Reports

Tailings



June 2, 2009

Presentation Outline

- Placement data
- Stability
 - Compaction
 - Inspections
- Water level data
- Precipitation and flow data
- Water quality at internal monitoring sites
- Snow sample results
- Sulfate Reduction Monitoring Program (SRMP) update
- ABA data
- General site management and co-disposal

Tailings Facility Sept. 2007

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2008 Pit 5 Looking South

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Table 2.1 Tailings Placement Data



	All Materials Annual	All Materials Cumulative	All Materials Annual	All Materials Cumulative	Prod Rock from Site 23	Other Materials	Tailings
	yd ³	yd ³	Tons	Tons	Tons	Tons	Tons
	<i>Survey</i>	<i>Survey</i>	<i>Calculated</i>	<i>Calculated</i>	<i>Truck Count</i>	<i>Truck Count</i>	<i>Calculated</i>
Totals							
2007	215,575	2,648,842	390,557	4,798,255	39,425	16,285	334,847
Totals							
2008	201,658	2,850,140	365,344	5,163,598	25,679	62,395	277,270

Tons calculated at 134.2 pounds per cubic foot for tailings.

Remaining capacity approx 4.4M tons

Tailings Facility Stability Compaction

- High degree of achieving >90% compaction
- Average dry density: 138 pcf
- Average Standard Proctor dry density: 143 pcf
- Average optimum percent moisture: 12.5%
- HGCMC on-site lab 1-point Proctors
 - Average dry density: 147 pcf
 - Average percent moisture: 12.5%

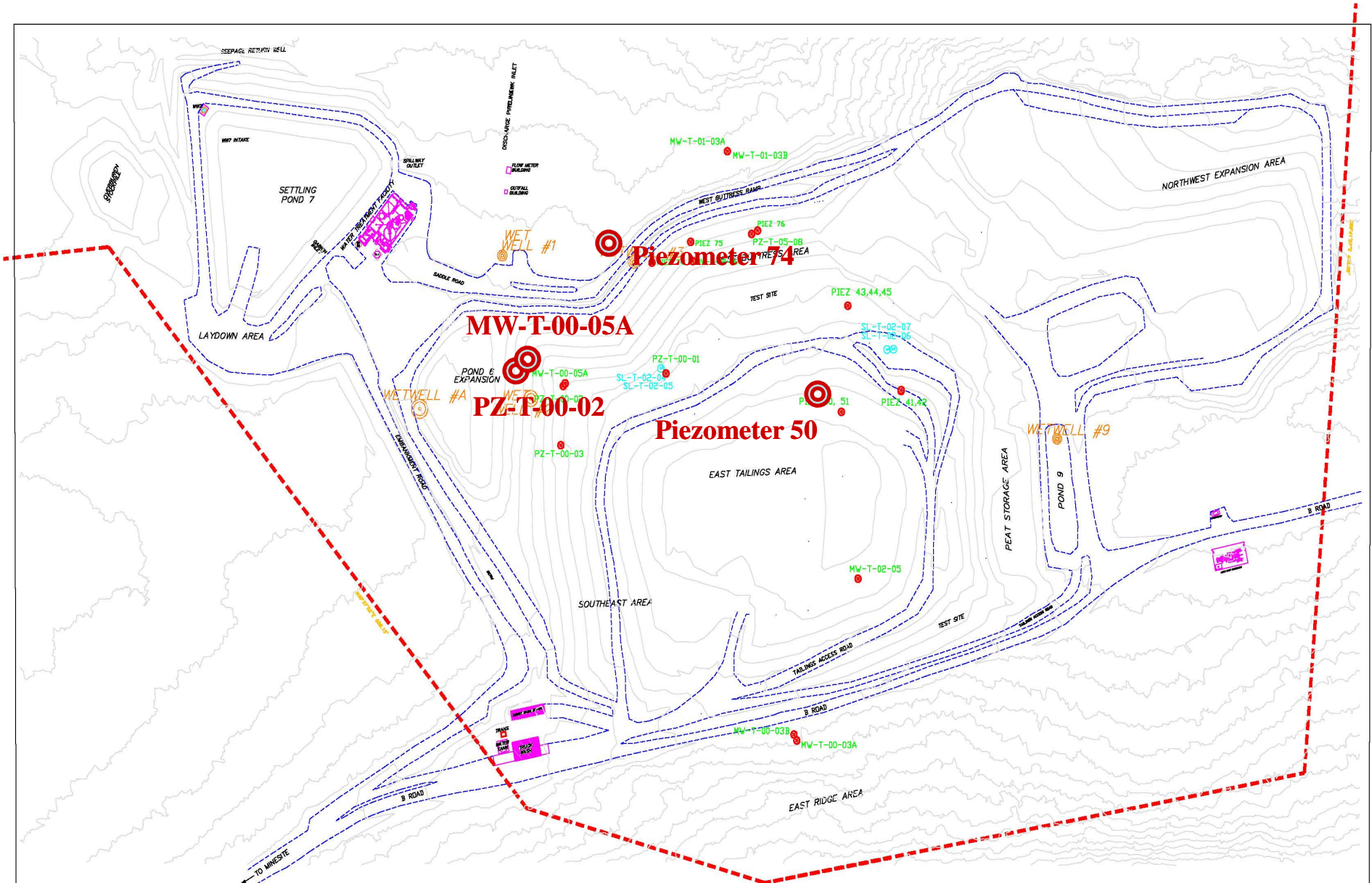
Tailings Facility Stability - Inspections

- Results of operator, engineering, environmental department and regulatory inspections revealed no signs of instability
- 2008 WMP Audit by SRK
- Agency Inspections
 - USFS - 21
 - ADEC - 4
 - DNR - 2

Tailings Facility Monitoring Well and Piezometer Water Level Data

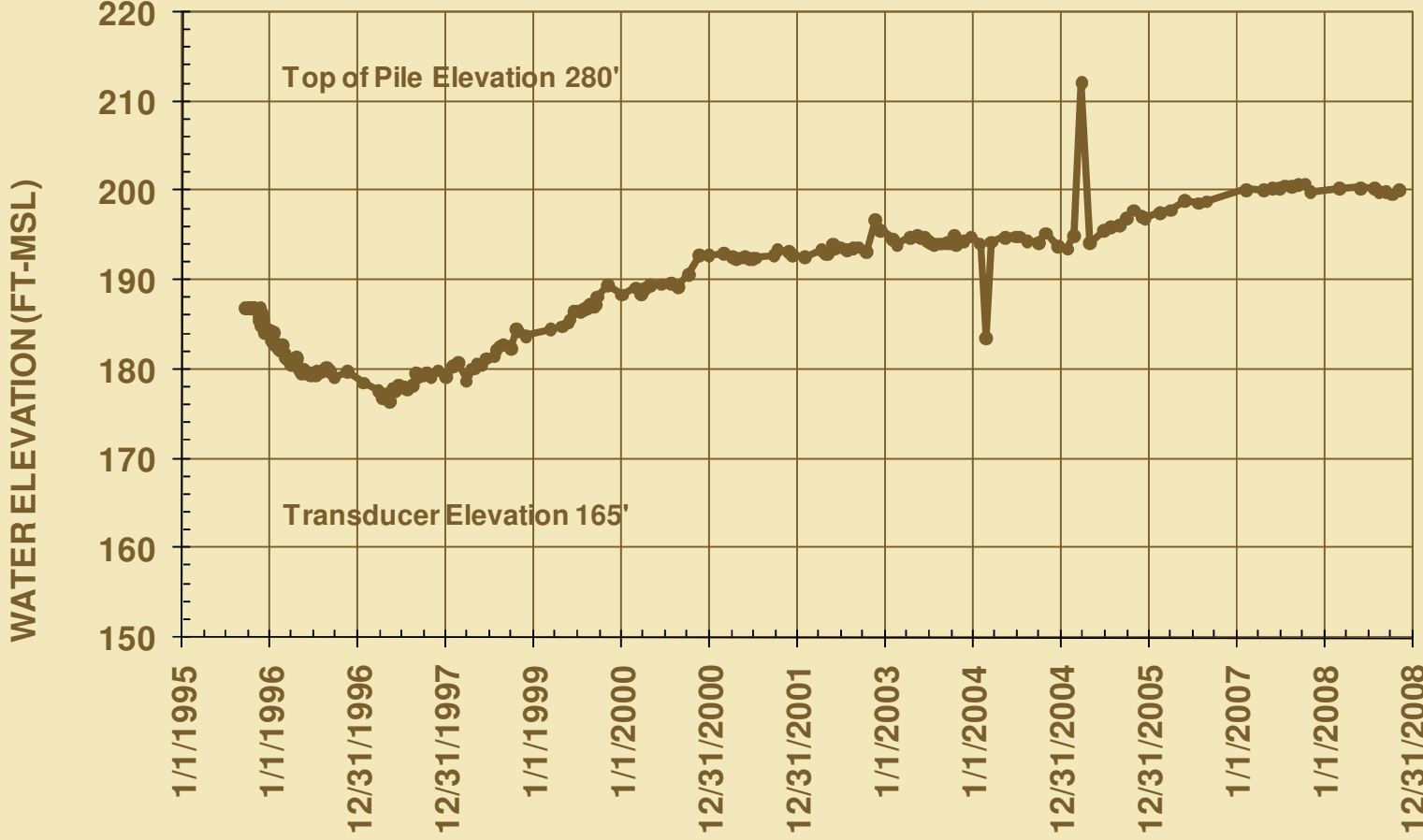


- Maximum saturated thickness 35 feet
- Toe foundations are well drained
- Water perches approximately 12 feet above the unsaturated underdrains



	LEGEND: ROADS/DITCHES: ——— WATER UTILS: - - - - BOUNDARY: - - - - MONITORING WELL: ● PIEZOMETER: ○ WET WELL: ⊙	DATE: 11-31-08 DRAWING BY: Shelby Edwards DESIGN BY: _____ REVIEWED BY: _____ PROJ OR REF: _____	HECLA GREENS CREEK MINING CO. P.O. BOX 32199 JUNEAU, ALASKA 99803 PHONE: (907)790-8441 FAX: (907)790-8448 TITLE: Tailings Asbuilt Annual Report Instruments GRAPHIC SCALE: 1" = 50'
	SHEET: 1 OF 1		

Figure 2.6 Water Level Data for Piezometer 50



PZ-T-00-02 and MW-T-00-05A Data Figures 2.12 and 2.14

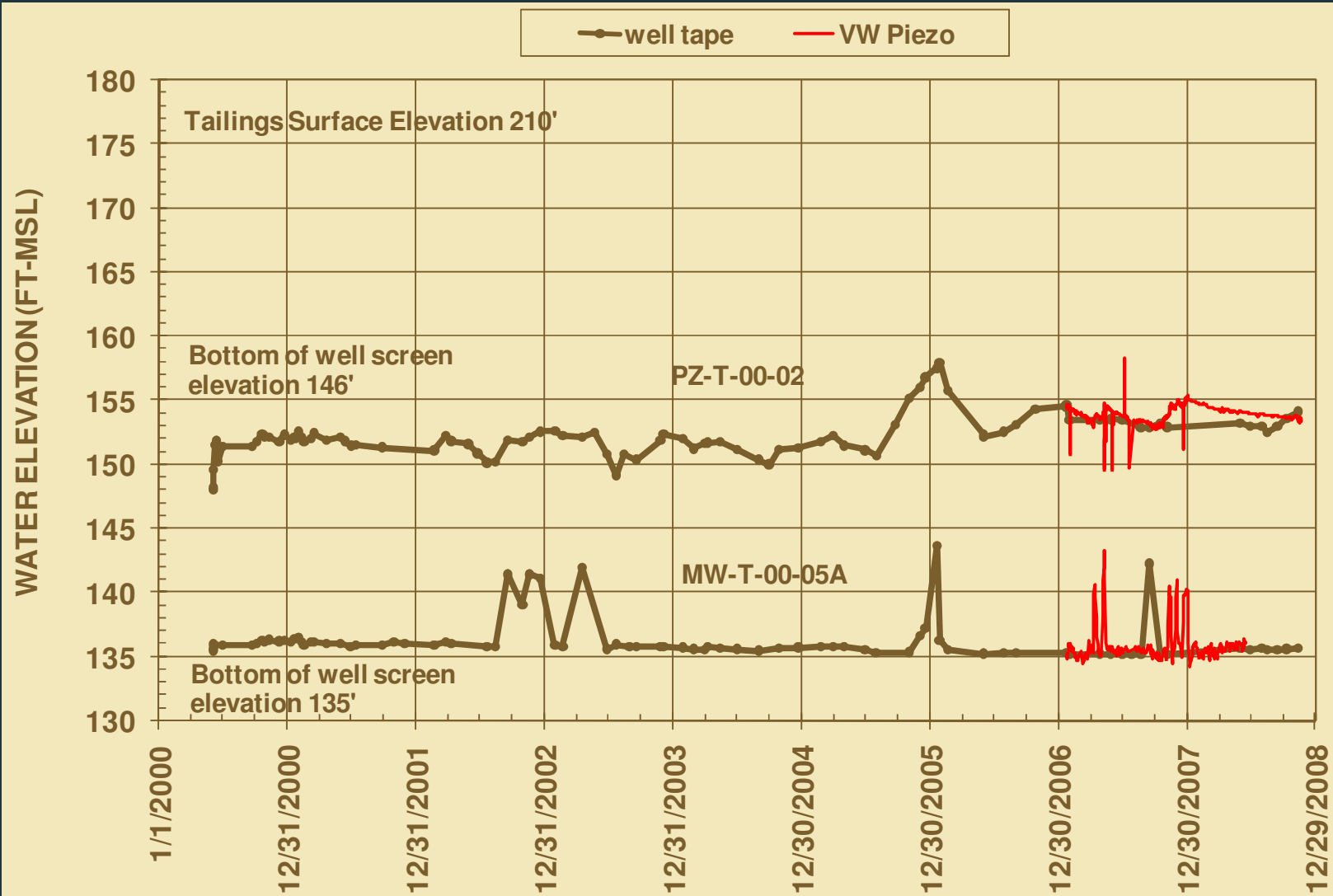


Figure 2.8 Water Level Data for Piezometer 74

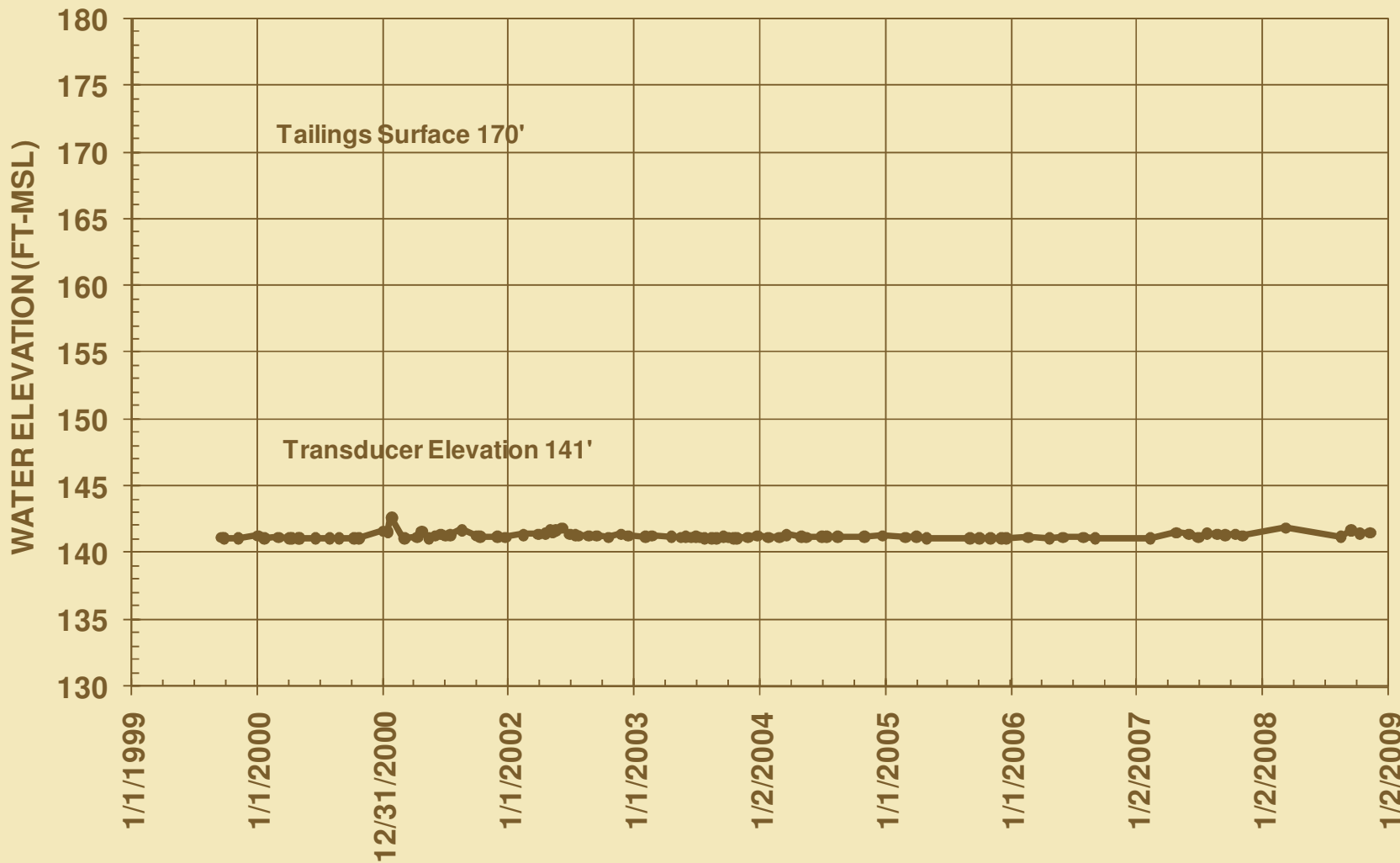


Table 2.4 Monthly Summary of Tailings Area Climate Data

Month	Avg Temp (°C)	Precipitation (in)
January	-2.6	4.7
February	-2.3	4.9
March	1.7	3.9
April	3.3	4.6
May	7.9	3.2
June	9.7	2.8
July	11.6	5.9
August	12.0	3.8
September	9.8	8.2
October	5.1	9.9
November	2.5	5.0
December	-3.3	3.6
2008	4.6	60.5

Tailings Facility Internal Monitoring Sites: Water Quality Data



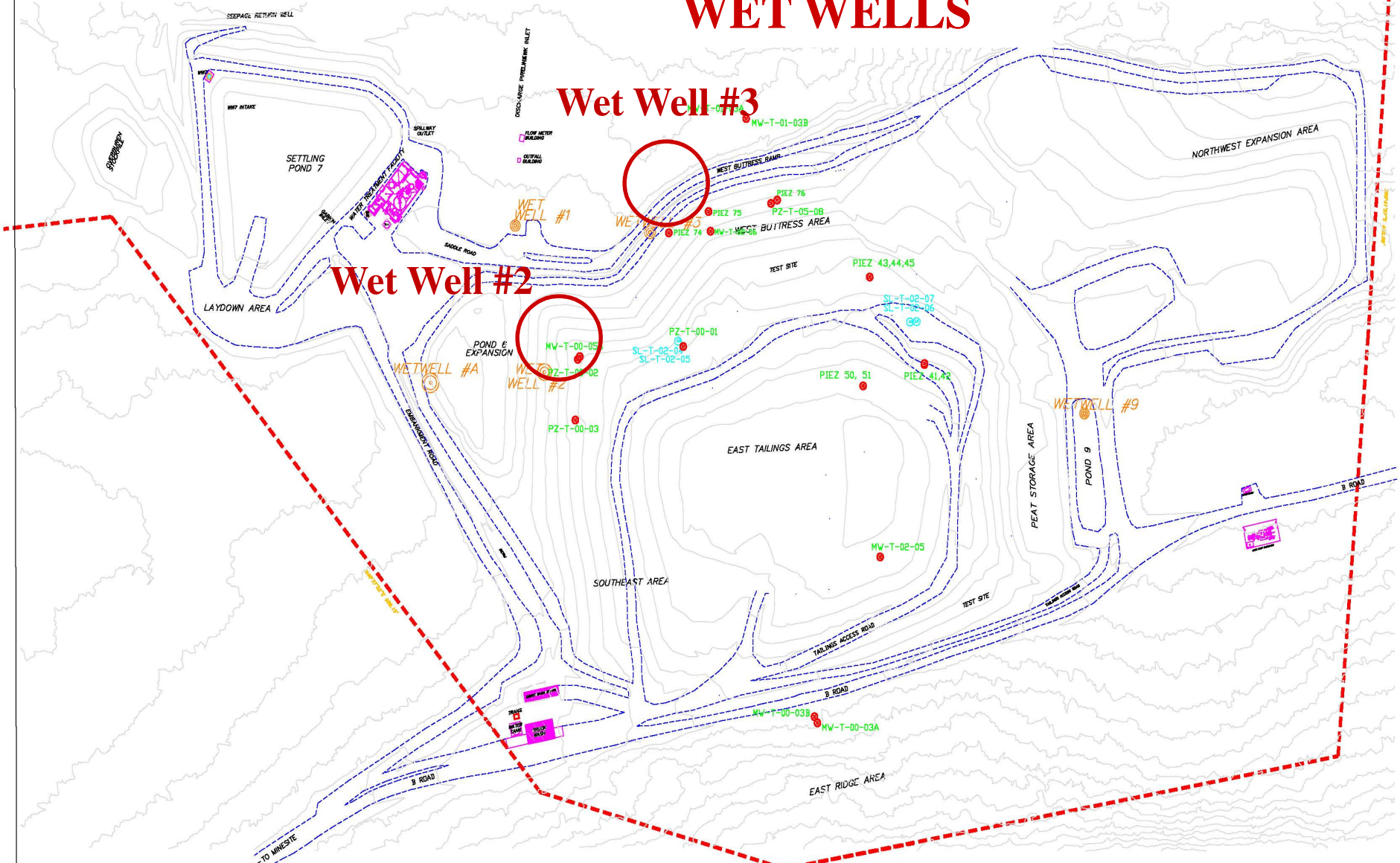
- Internal site waters captured, treated and discharged per NPDES permit
- pH between 6.0 and 8.5: Alkalinity 250 to 600 mg/L
- Conductivity in wet wells and tailings completion wells ranged from 1400 to 3700 umho/cm
- Conductivity in suction lysimeters ranged from 1400 to 6600 umho/cm
- Sulfate and hardness correlate with conductivity

Tailings Facility Internal Monitoring

Sites: Water Quality Data

- Fluctuations in saturated zone thickness and associated redox conditions influence arsenic and iron concentrations
- Zinc is considerably more mobile than other metals
- Microbial sulfate reduction and base metal sulfide precipitation produces low metal concentrations in most saturated zone wells
- Shallow unsaturated zone and WW3 have higher metal concentrations
- Iron and manganese concentrations are elevated in wet wells, groundwater, and most of the suction lysimeters due to oxidation/reduction and buffering reactions

WET WELLS

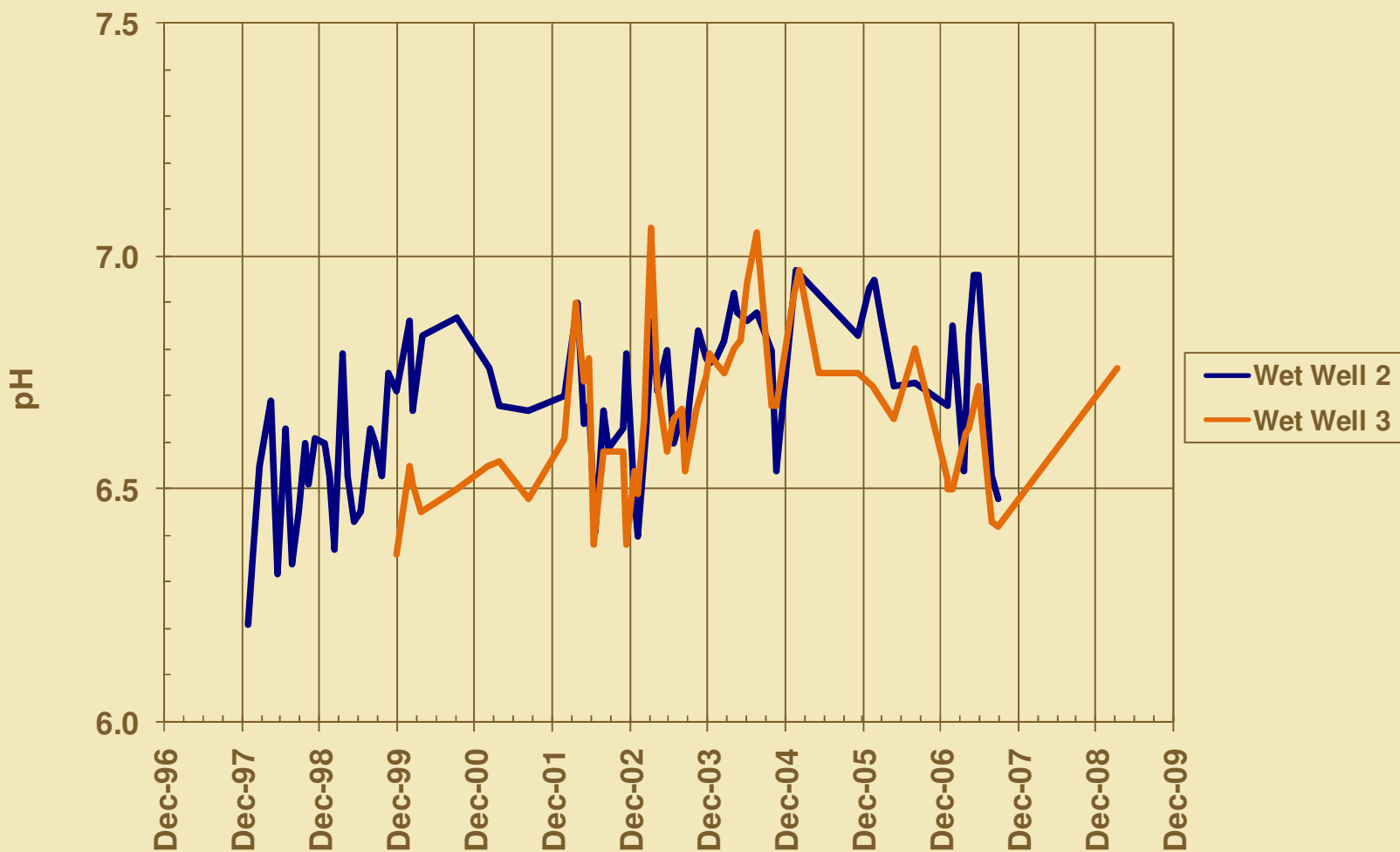


LEGEND:	
ROADS/DITCHES	—
WATER UTILS	---
BOUNDARY	- - - -
MONITORING WELL	○
PIEZOMETER	●
WET WELL	⊙

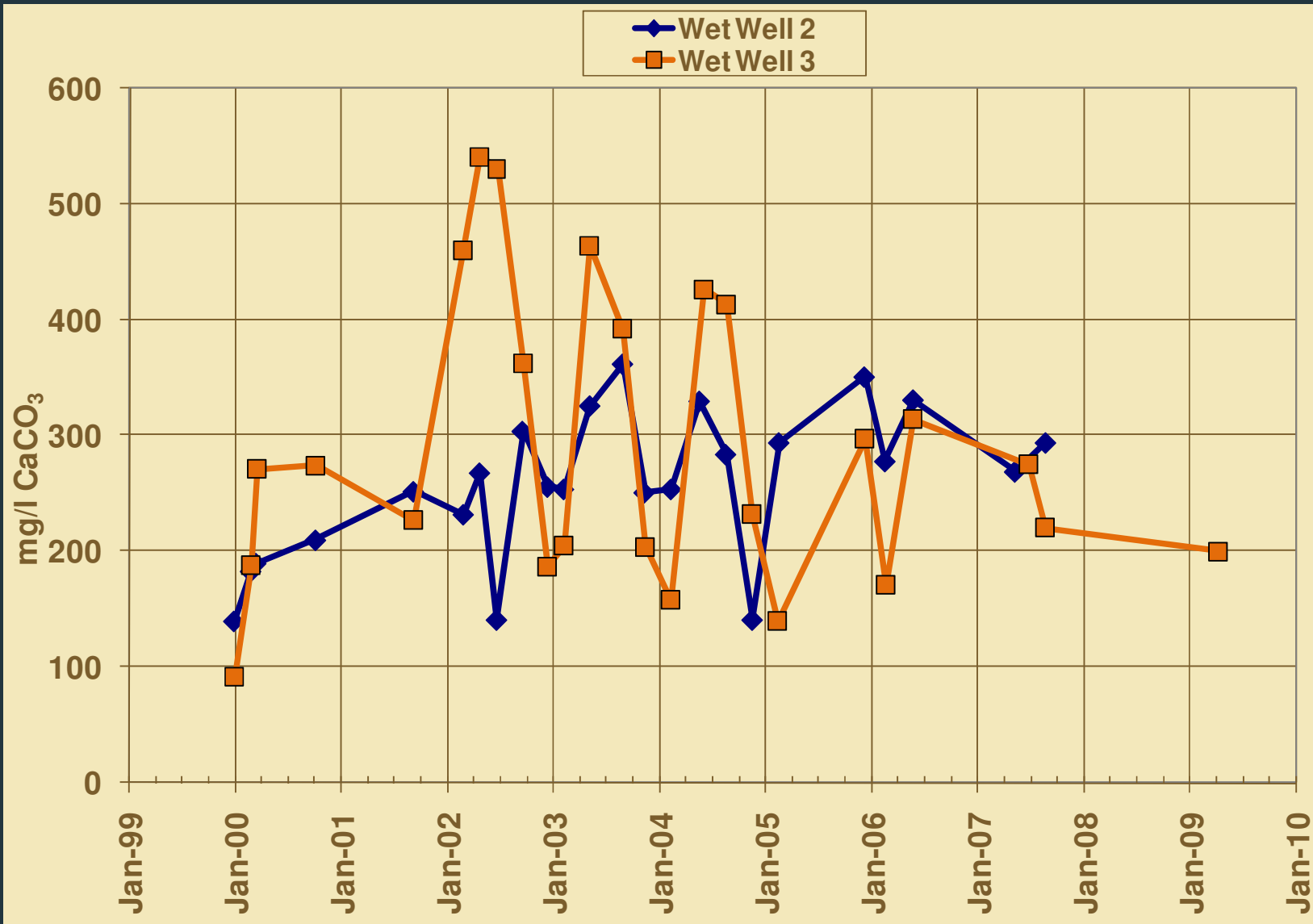
DATE:	11-31-08
DRAWING BY:	Shelby Edwards
DESIGN BY:	---
REVIEWED BY:	---
PROJ OR REF:	---

HECLA GREENS CREEK MINING CO. P.O. BOX 32199 JUNEAU, ALASKA 99803 PHONE: (907)790-8441 FAX: (907)790-8448	
TITLE: Tailings Asbuilt Annual Report Instruments	
GRAPHIC SCALE: 1" = 50'	SHEET: 1 OF 1

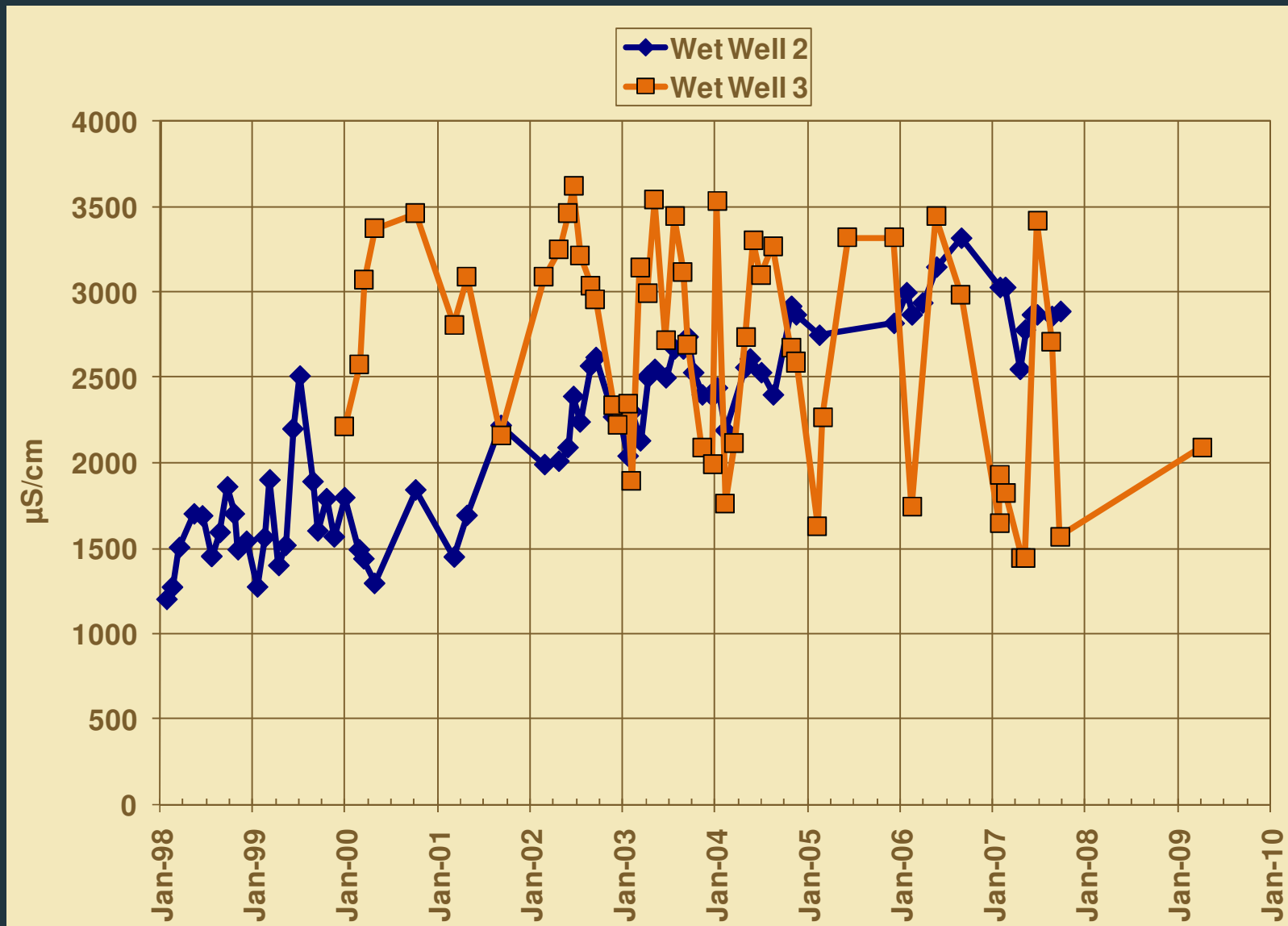
Tailings Area Internal Sites pH - Figure 2.20a



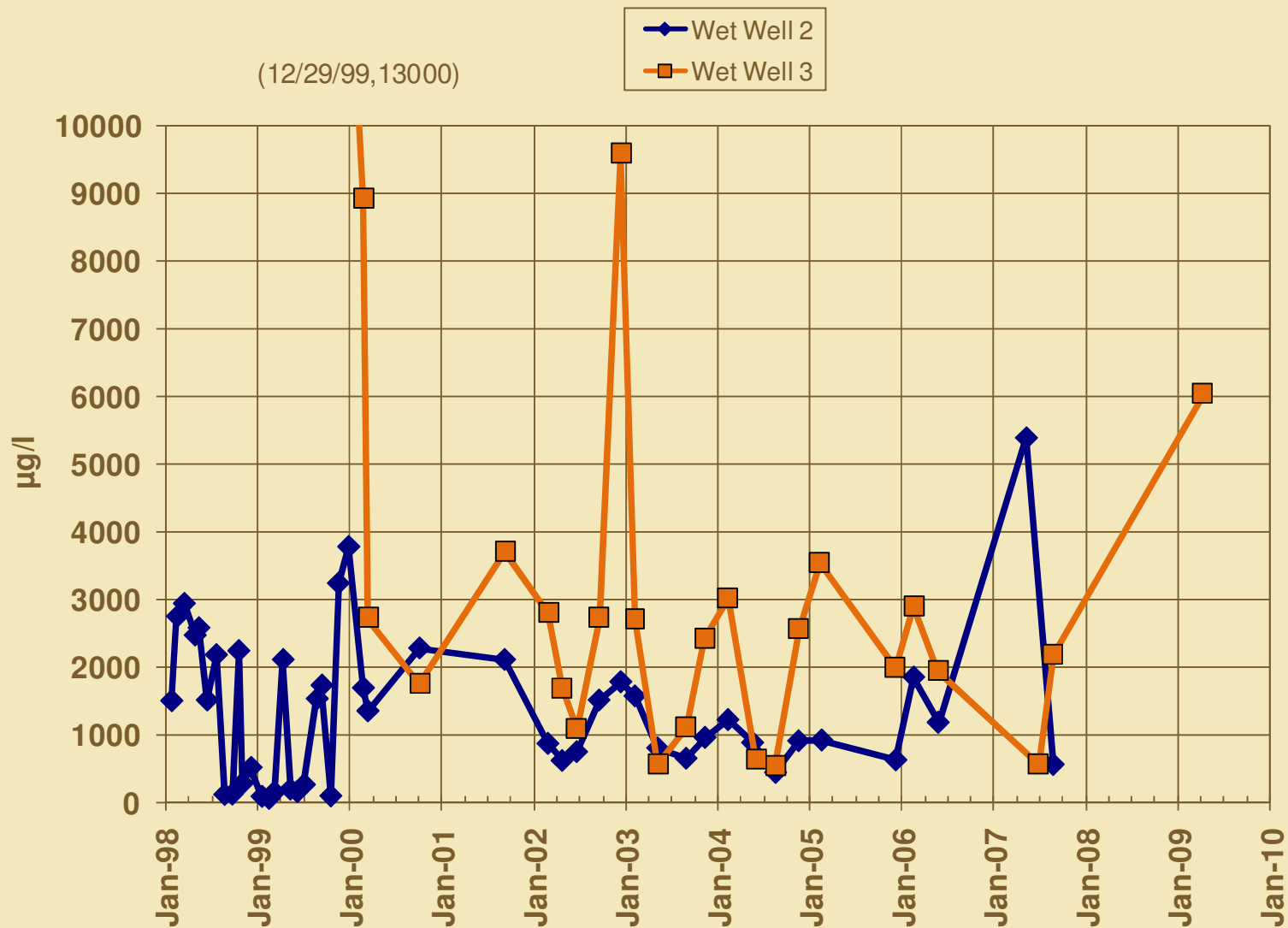
Tailings Area Internal Sites Alkalinity - Figure 2.21a



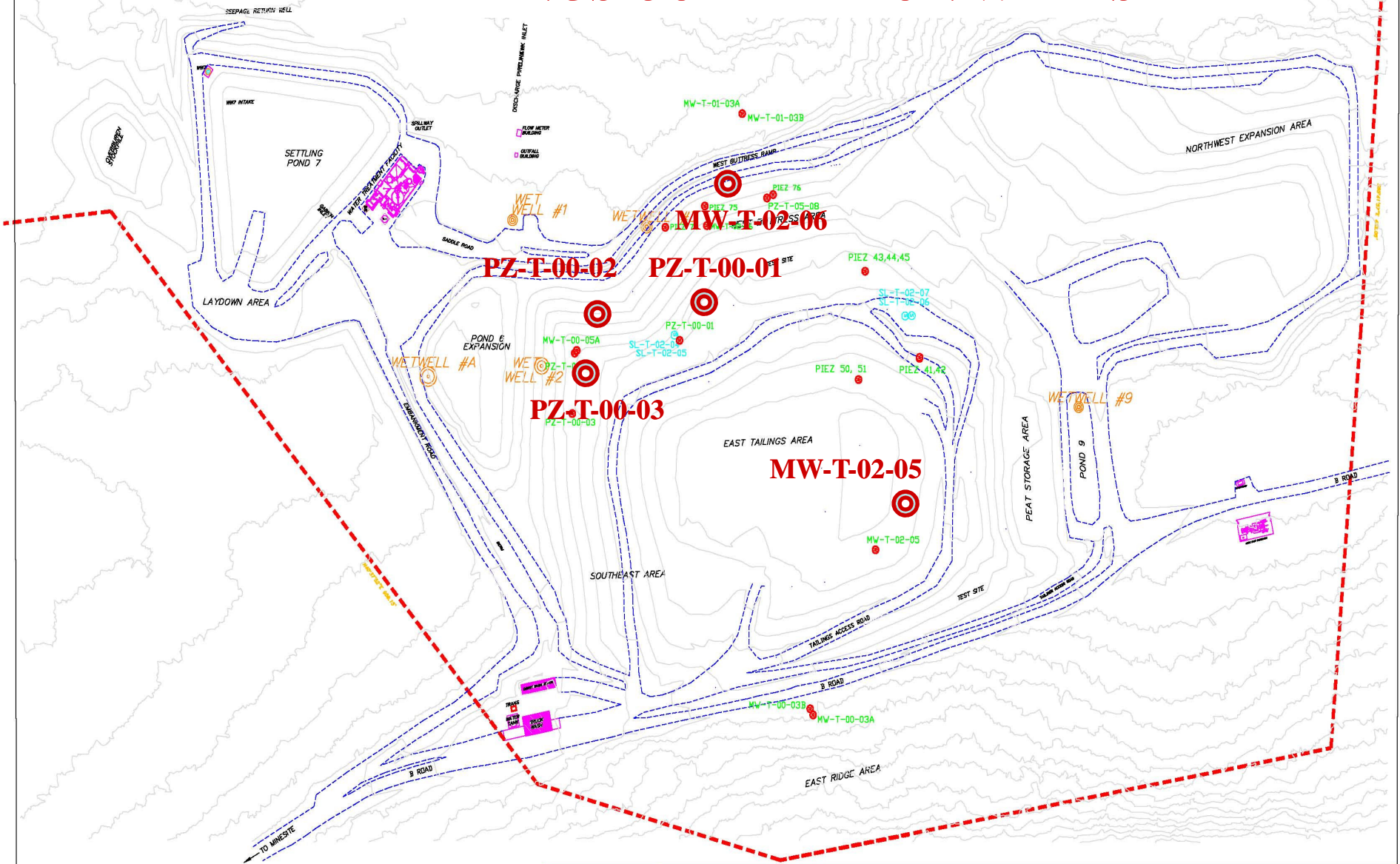
Tailings Area Internal Sites Conductivity - Figure 2.22a



Tailings Area Internal Sites Zinc - Figure 2.26a

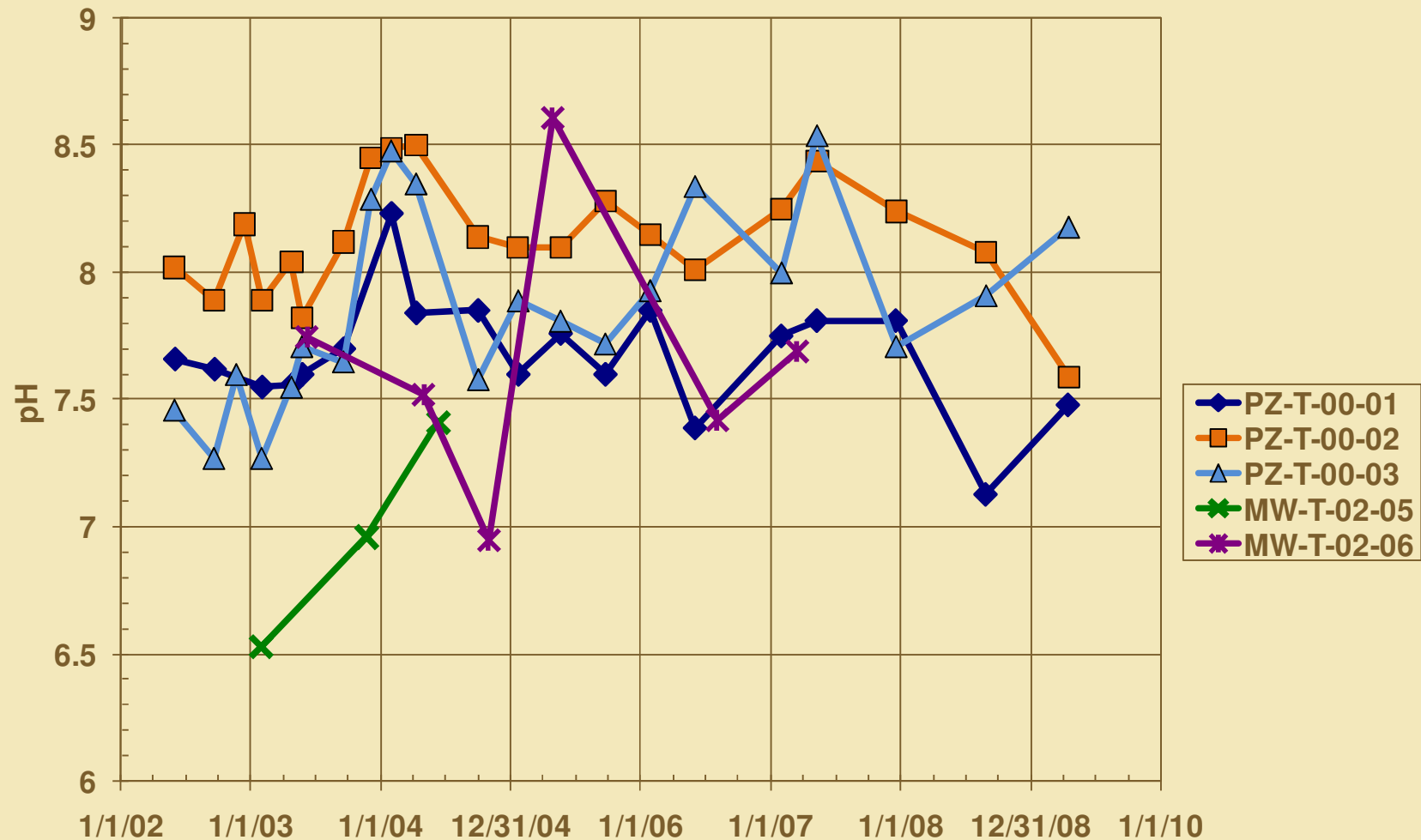


TAILINGS COMPLETION WELLS

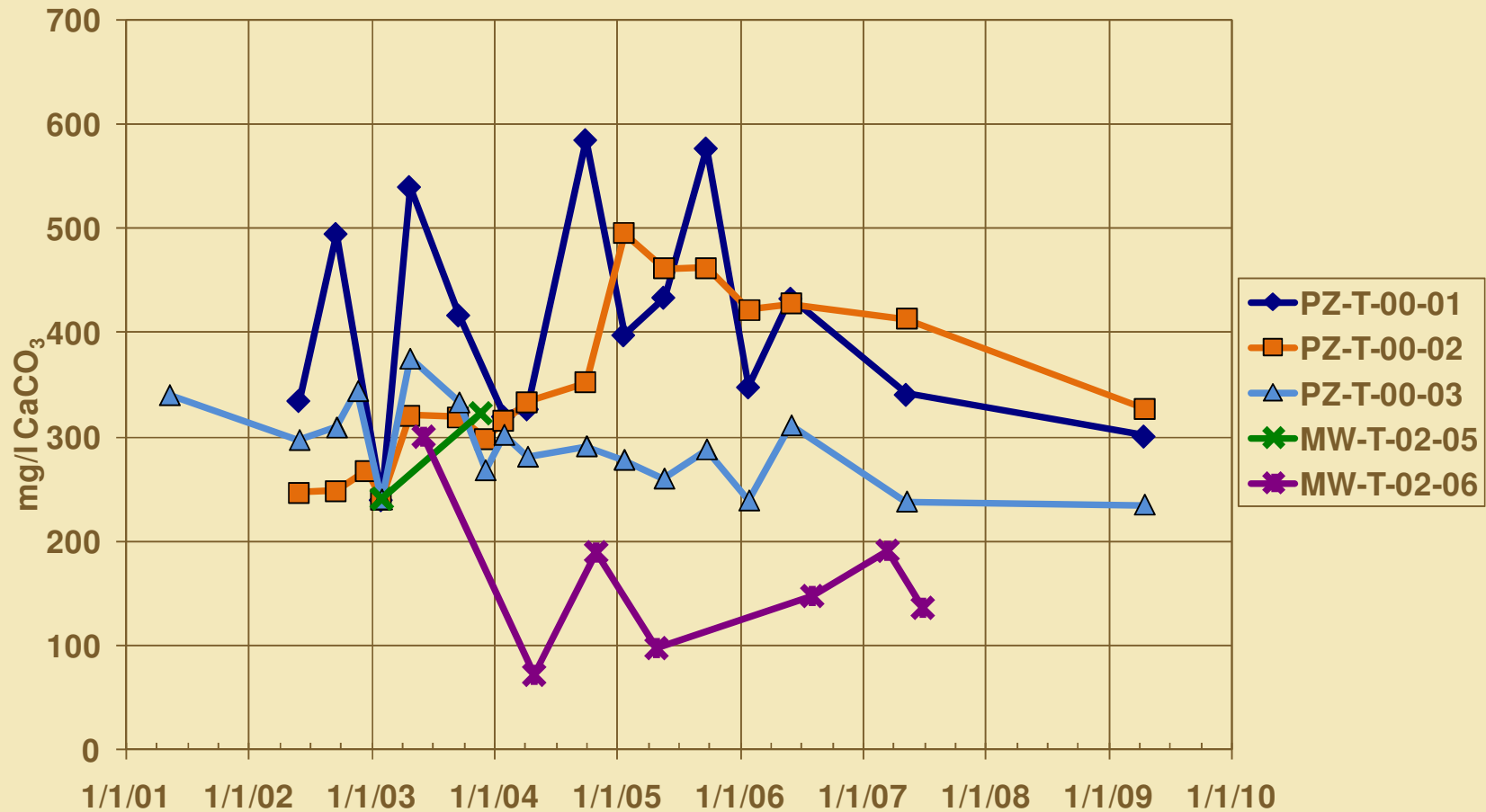


	LEGEND: ROADS/DITCHES: ——— WATER UTILS: - - - - - BOUNDARY: - - - - - MONITORING WELL: ● PIEZOMETER: ○ WET WELL: ⊙	DATE: 11-31-08 DRAWING BY: Shelby Edwards DESIGN BY: _____ REVIEWED BY: _____ PROJ OR REF: _____	HECLA GREENS CREEK MINING CO. P.O. BOX 32199 JUNEAU, ALASKA 99803 PHONE: (907)790-8441 FAX: (907)790-8448 TITLE: Tailings Asbuilt Annual Report Instruments GRAPHIC SCALE: 1" = 50' SHEET: 1 OF 1
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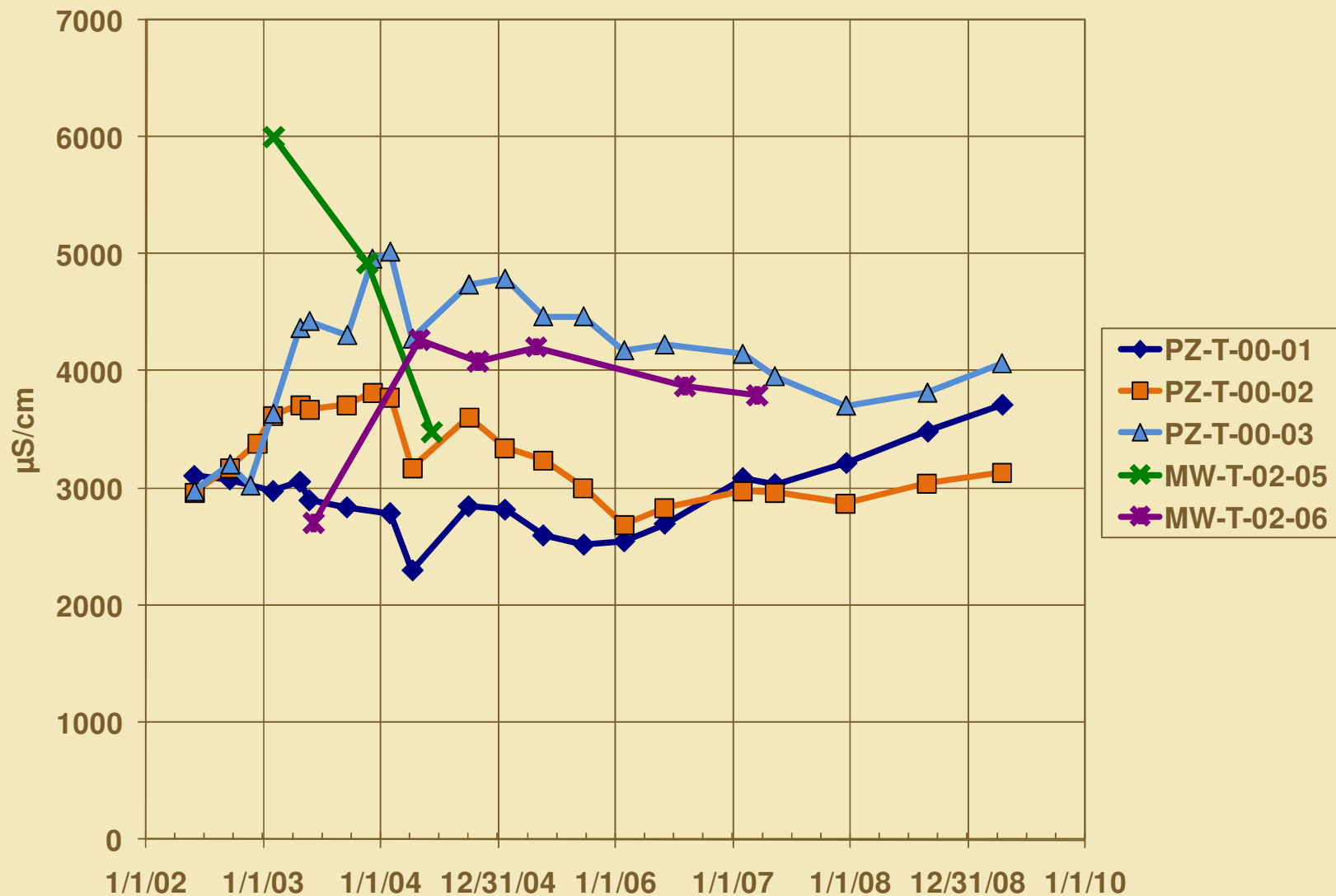
Tailings Area Internal Sites pH Figure 2.20b



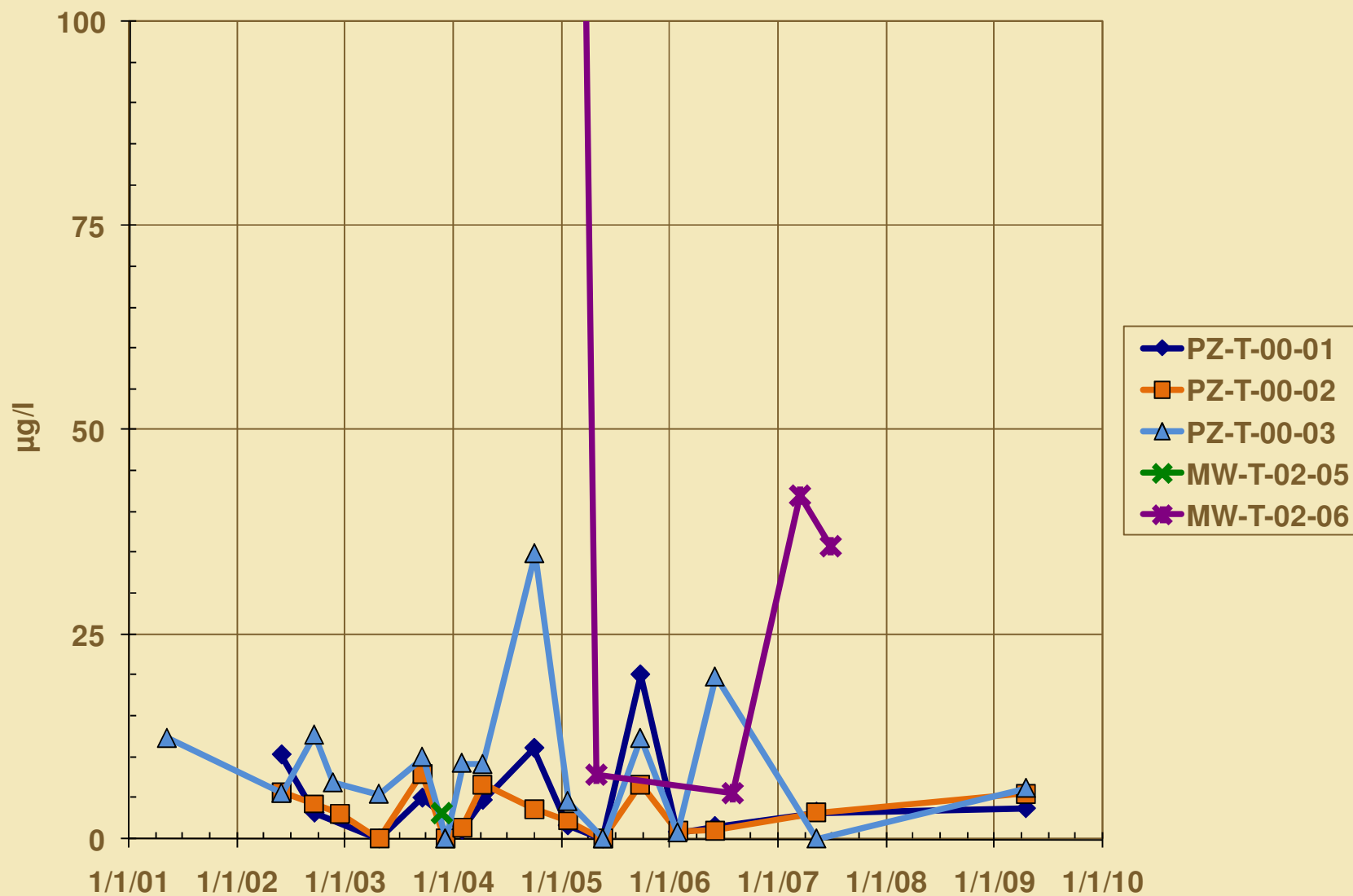
Tailings Area Internal Sites Alkalinity - Figure 2.21b



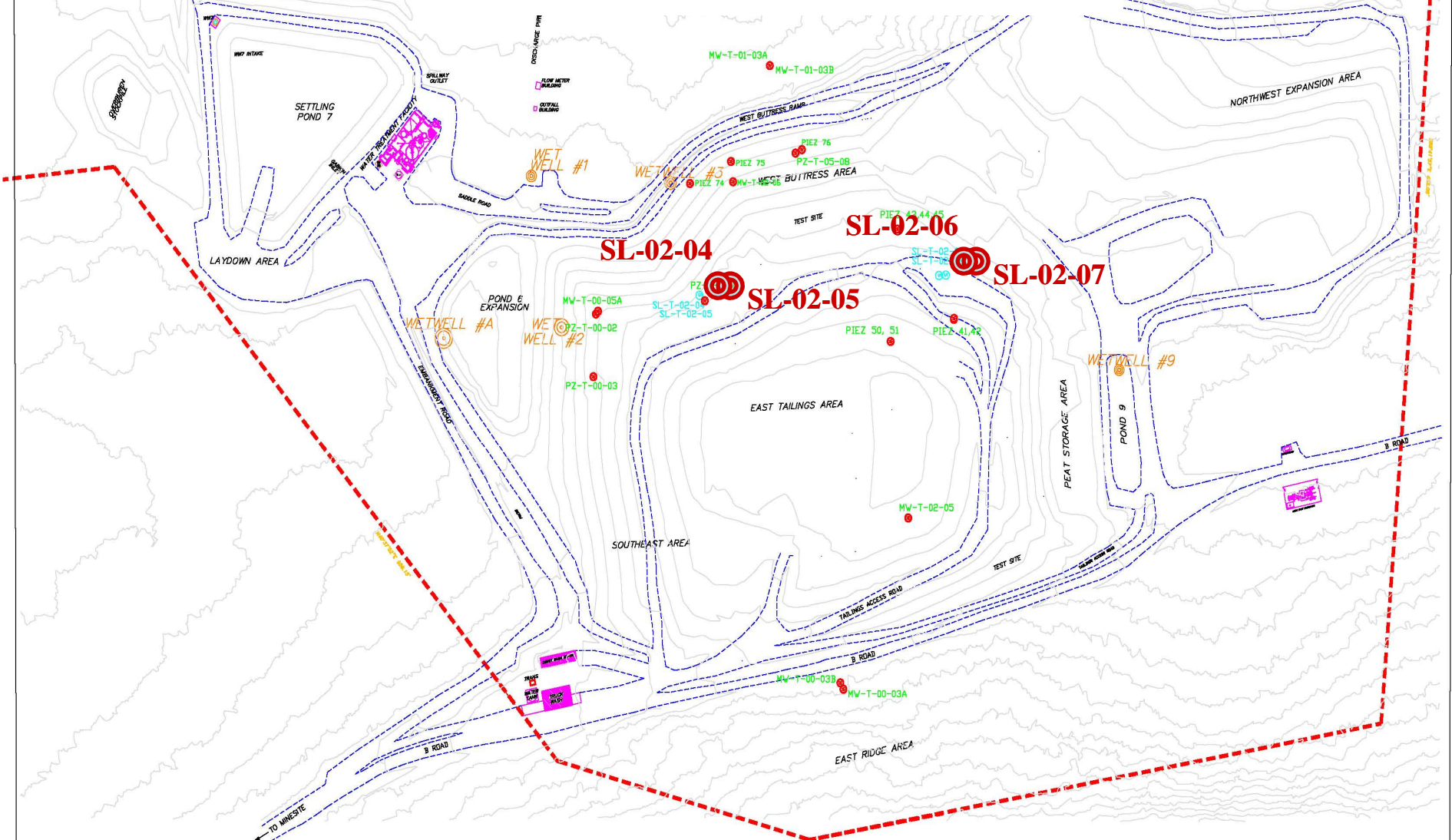
Tailings Area Internal Sites Conductivity - Figure 2.22b



Tailings Area Internal Sites Zinc - Figure 2.26b

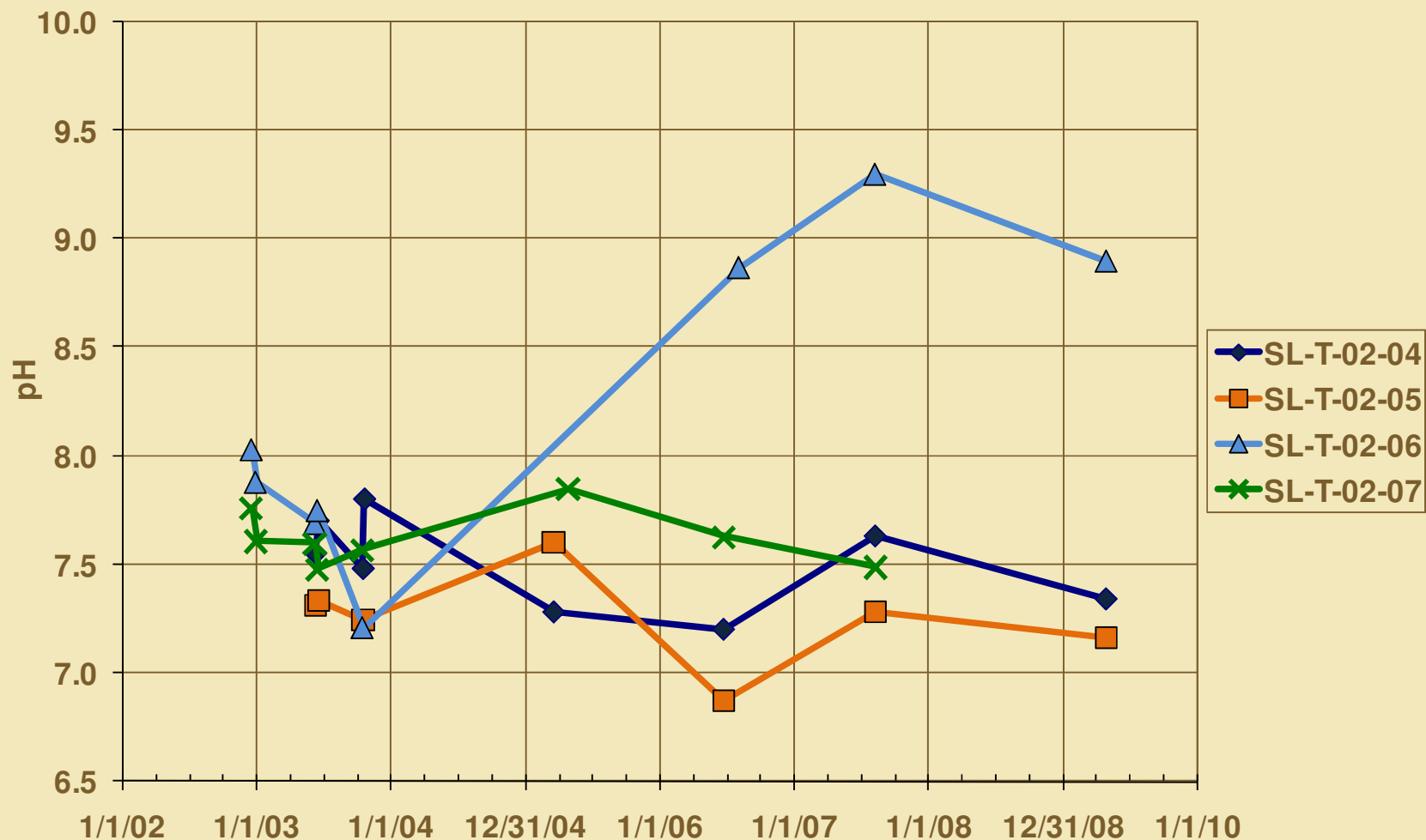


SUCTION LYSIMETERS

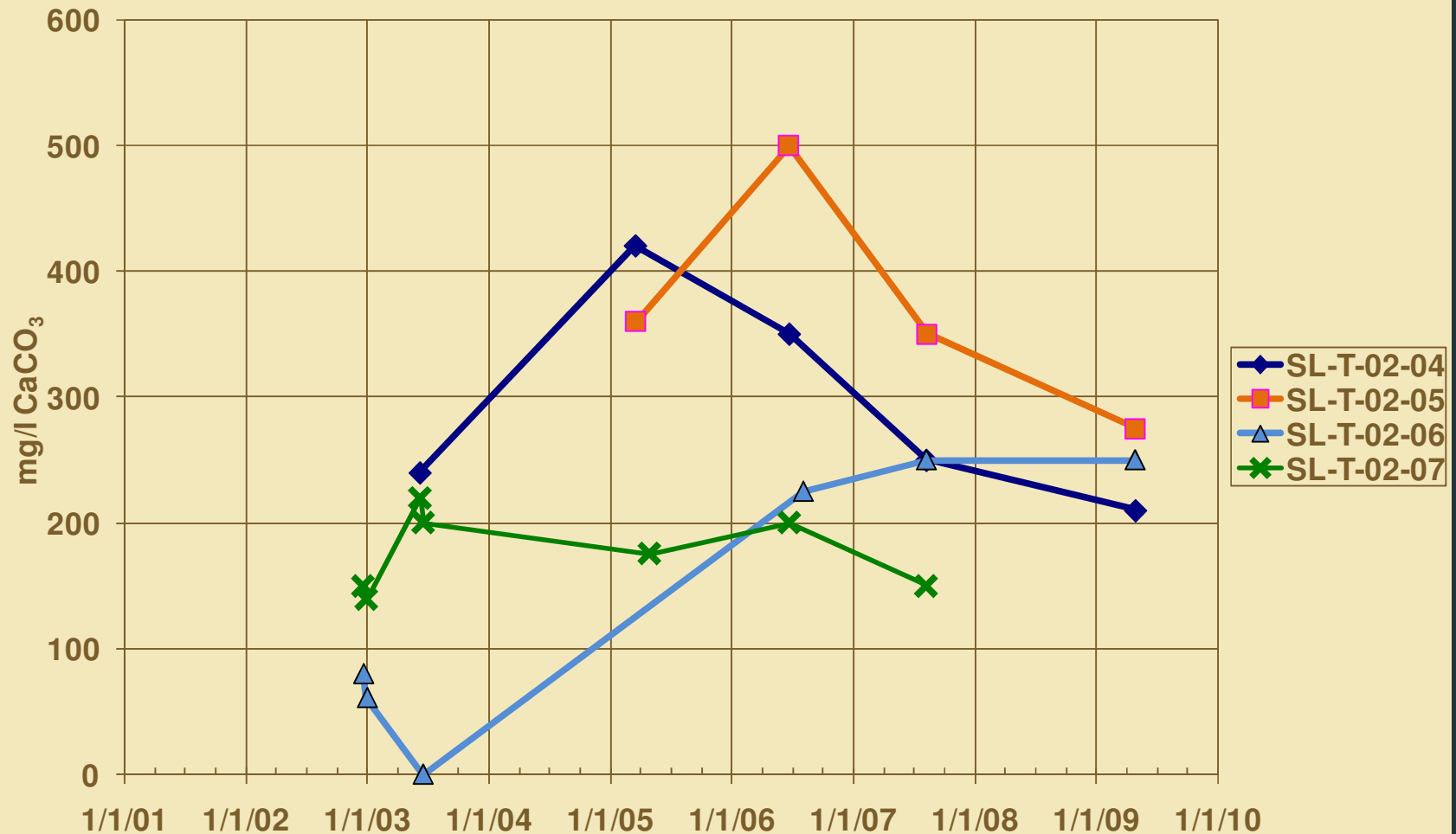


	LEGEND: ROADS/DITCHES: ——— WATER UTILS: - - - - - BOUNDARY: - - - - - MONITORING WELL: ● PIEZOMETER: ○ WET WELL: ⊙	HECLA GREENS CREEK MINING CO. P.O. BOX 32199 JUNEAU, ALASKA 99803 PHONE: (907)790-8441 FAX: (907)790-8448
	DATE: 11-31-08 DRAWING BY: Shelby Edwards DESIGN BY: _____ REVIEWED BY: _____ PROJ OR REF: _____	TITLE: Tailings Asbuilt Annual Report Instruments GRAPHIC SCALE: 1" = 50' SHEET: 1 OF 1

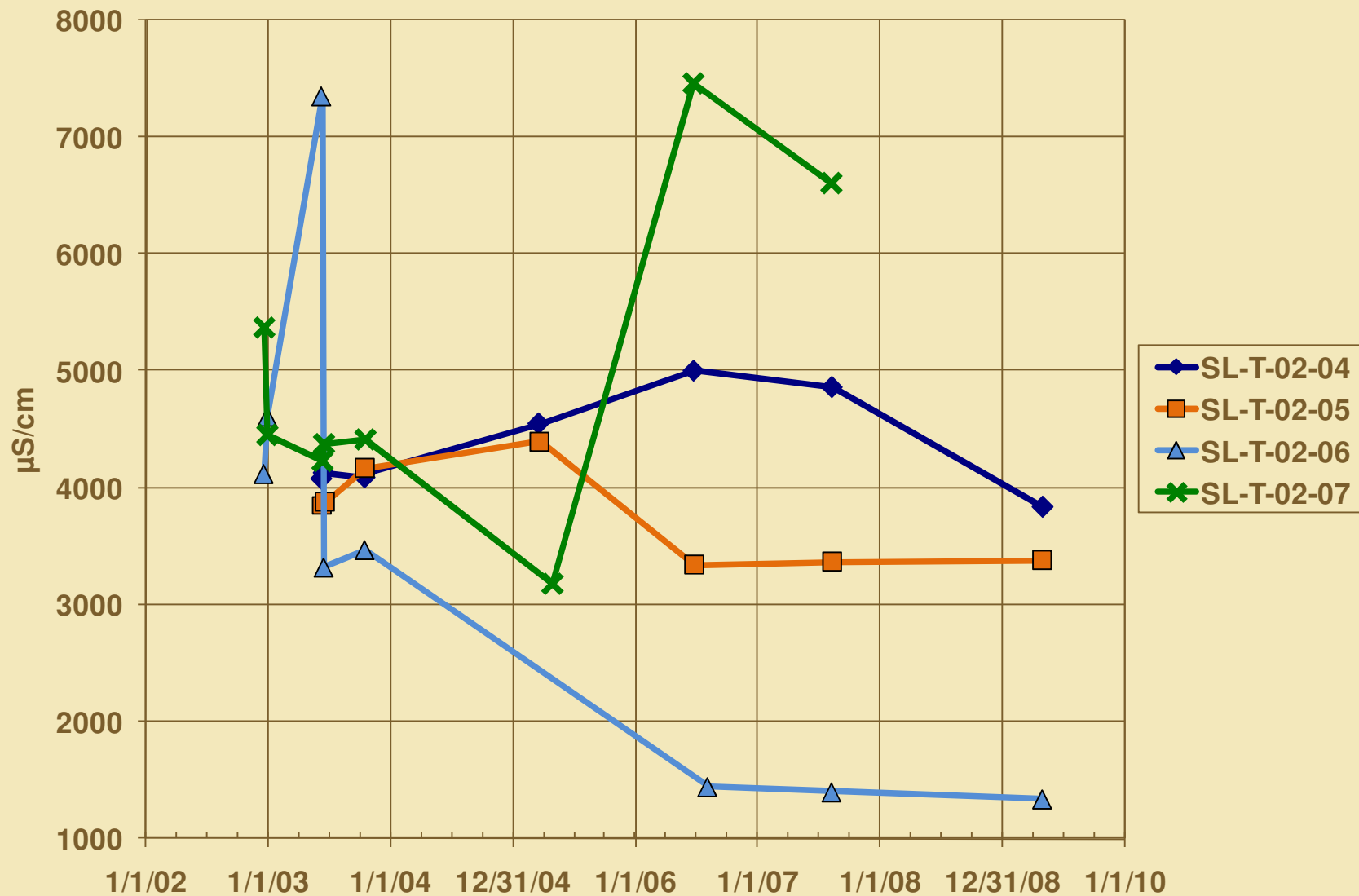
Tailings Area Internal Sites pH - Figure 2.20c



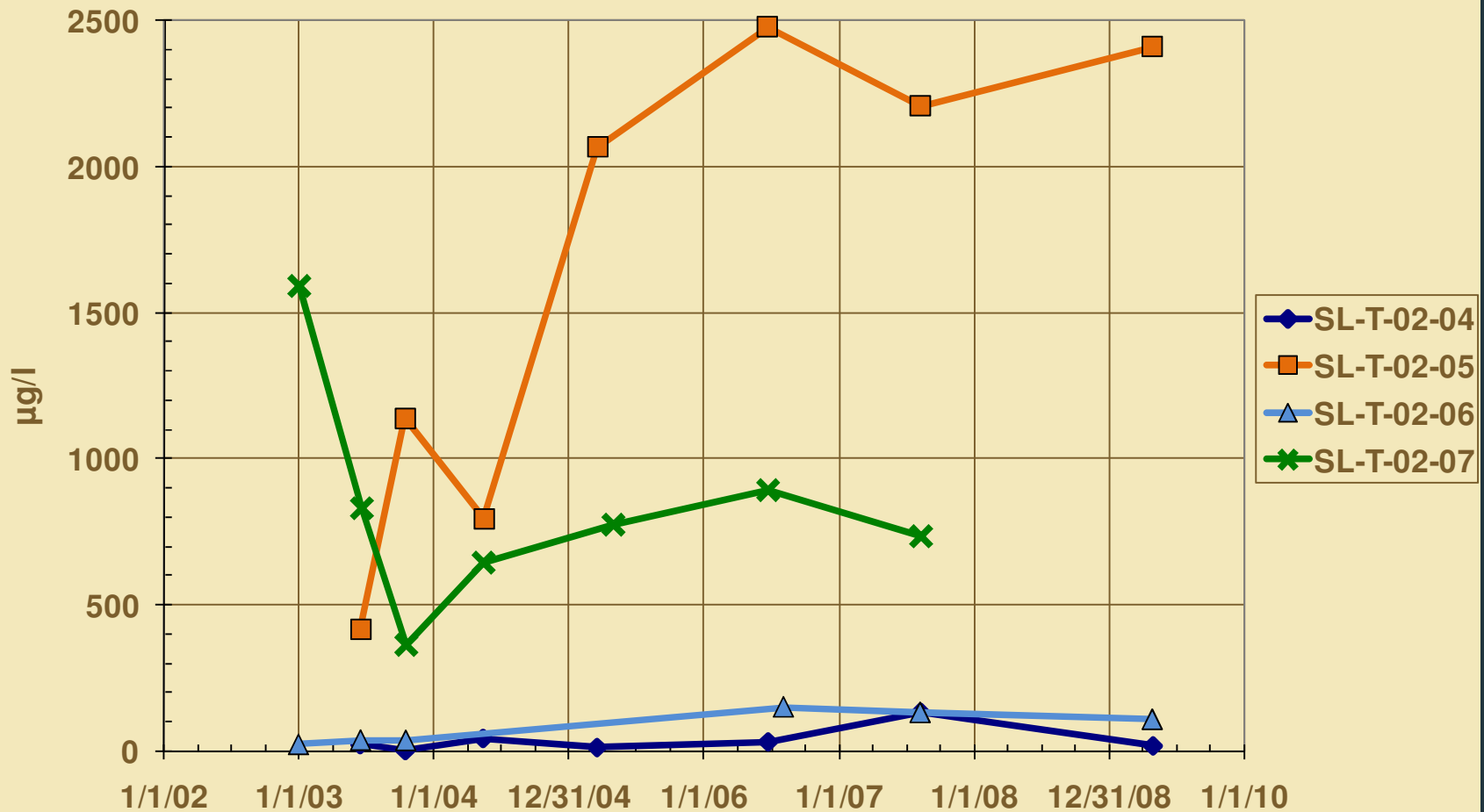
Tailings Area Internal Sites Alkalinity - Figure 2.21c



Tailings Area Internal Sites Conductivity - Figure 2.22c



Tailings Area Internal Sites Zinc - Figure 2.26c



Tailings Facility Additional Monitoring

- Perimeter wells exhibit chemistry comparable to background waters
- Pyritic rock used locally for access roads produced acidic drainage in two areas (The pyritic rock was removed from both locations)
 - Water quality shows improvement in response to remediation efforts
- Residual sulfate and metal concentrations are very low relative to contact waters but higher than background levels in localized areas
- Continued monitoring will determine the effects of other efforts to minimize loading (e.g. lined bedrock areas, improved truck wash, covering exposed slopes with rock and ditch sediments)

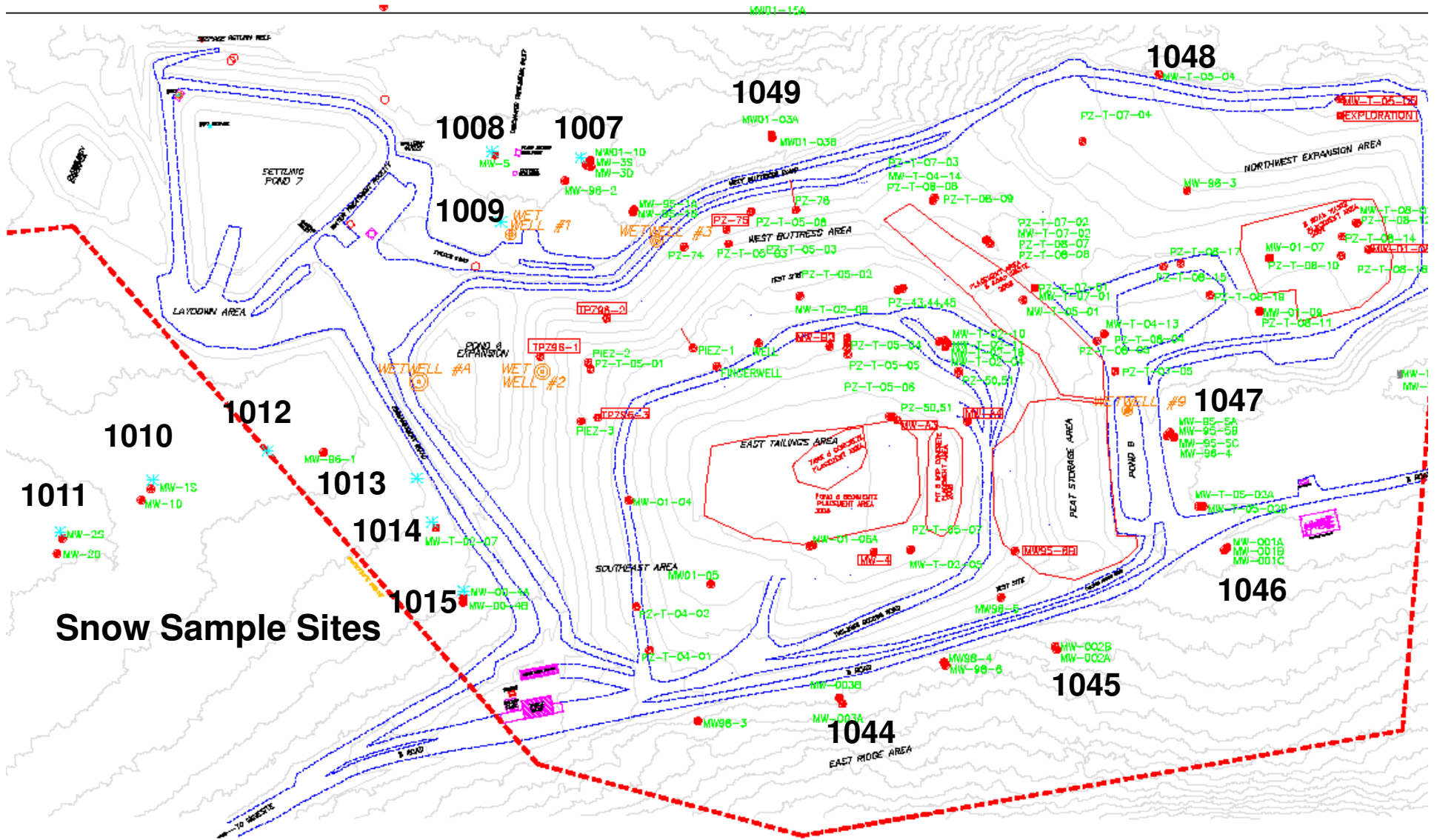
Tails Snow Dust Sampling

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Tails Snow Dust Sampling

- Mitigation
 - Snow Fences
 - Eco Blocks
 - Snow removal only in active placement area
- Lead levels in water do not directly correlate to lead loading values
- Observable up to approximately 1700 feet away
- Significant decrease in lead load over the past three years



Snow Sample Sites

LEGEND:	
	ROAD/DITCH
	WATER UTILITY
	BOUNDARY
	WATERING WELL
	PIEZOMETER
	WET WELL
	EXPLORATION AREA
	SNOW SAMPLE LOCATION

DATE:	11-21-08
DRAWING BY:	Chadly Edwards
DESIGN BY:	
REVIEWED BY:	
PRINT OR REF:	

HECLA GREENS CREEK MINING CO. P.O. BOX 32190 JUNEAU, ALASKA 99803 PHONE: (907)790-8441 FAX: (907)790-8441	
TTC Tailings Asbuilt Wells and Piezometers	
GRAPHIC SCALE	SHEET: 1 OF

Figure 2.35 Snow Survey Analysis

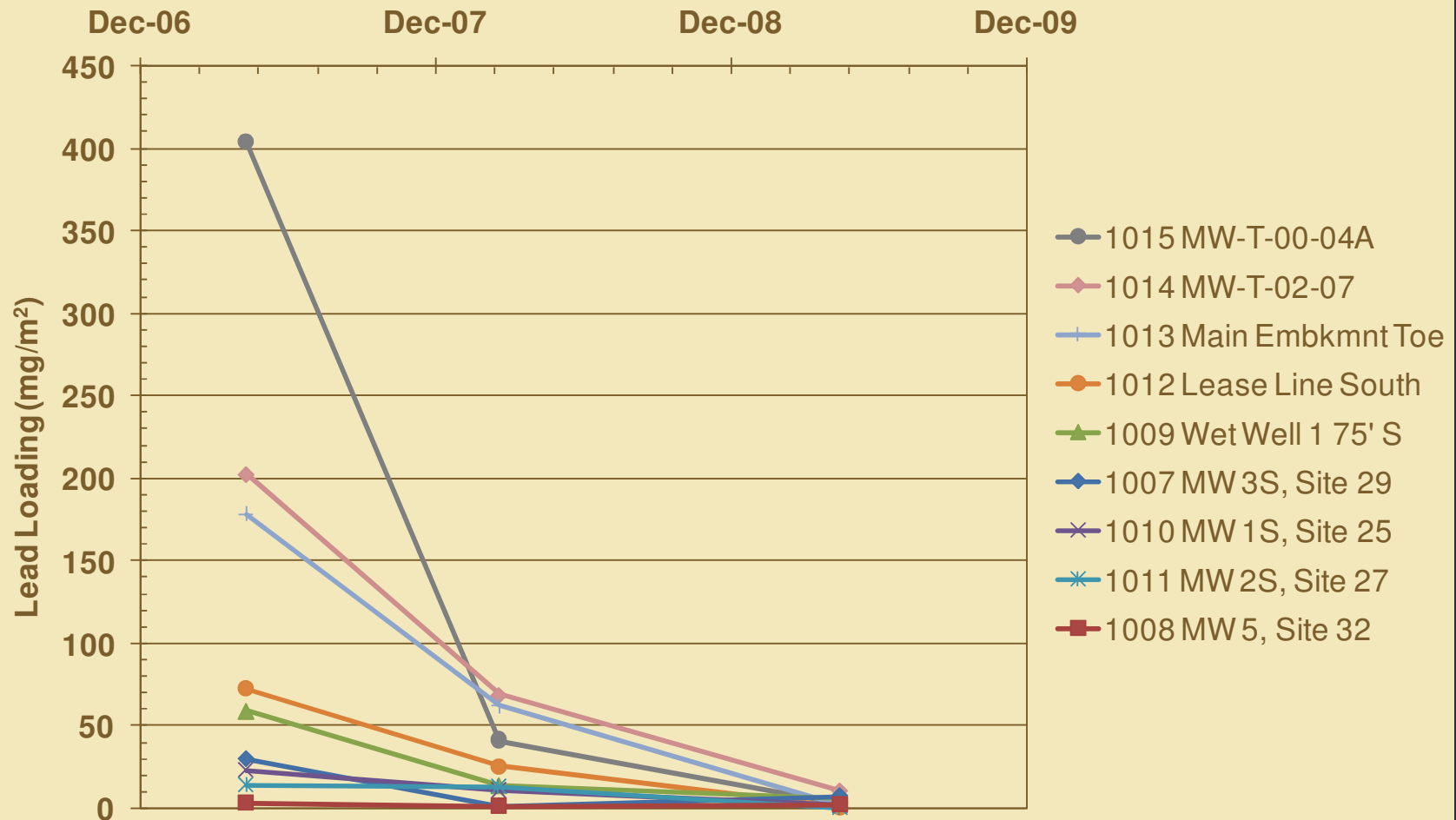


Figure 2.35 Snow Survey Analysis

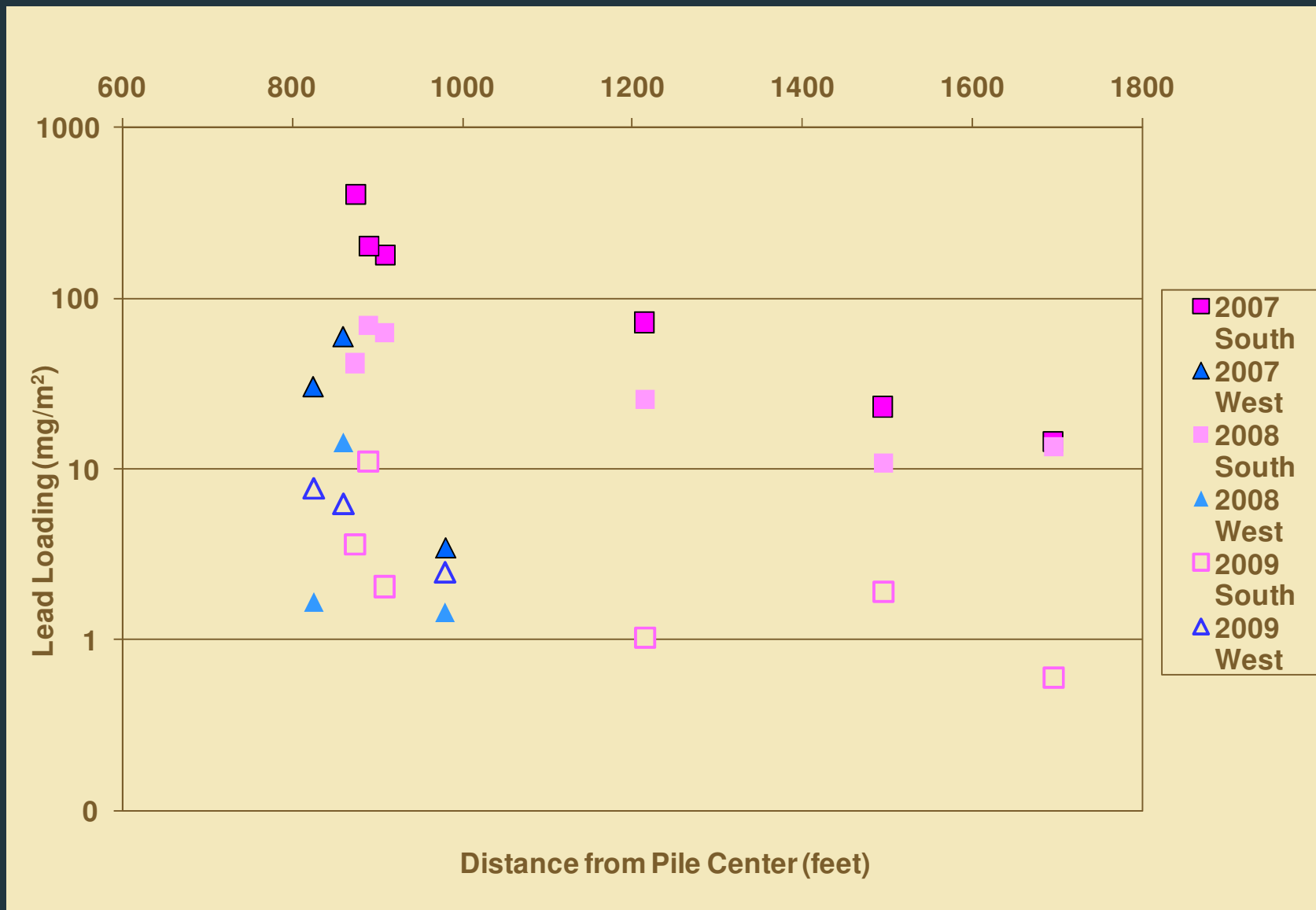
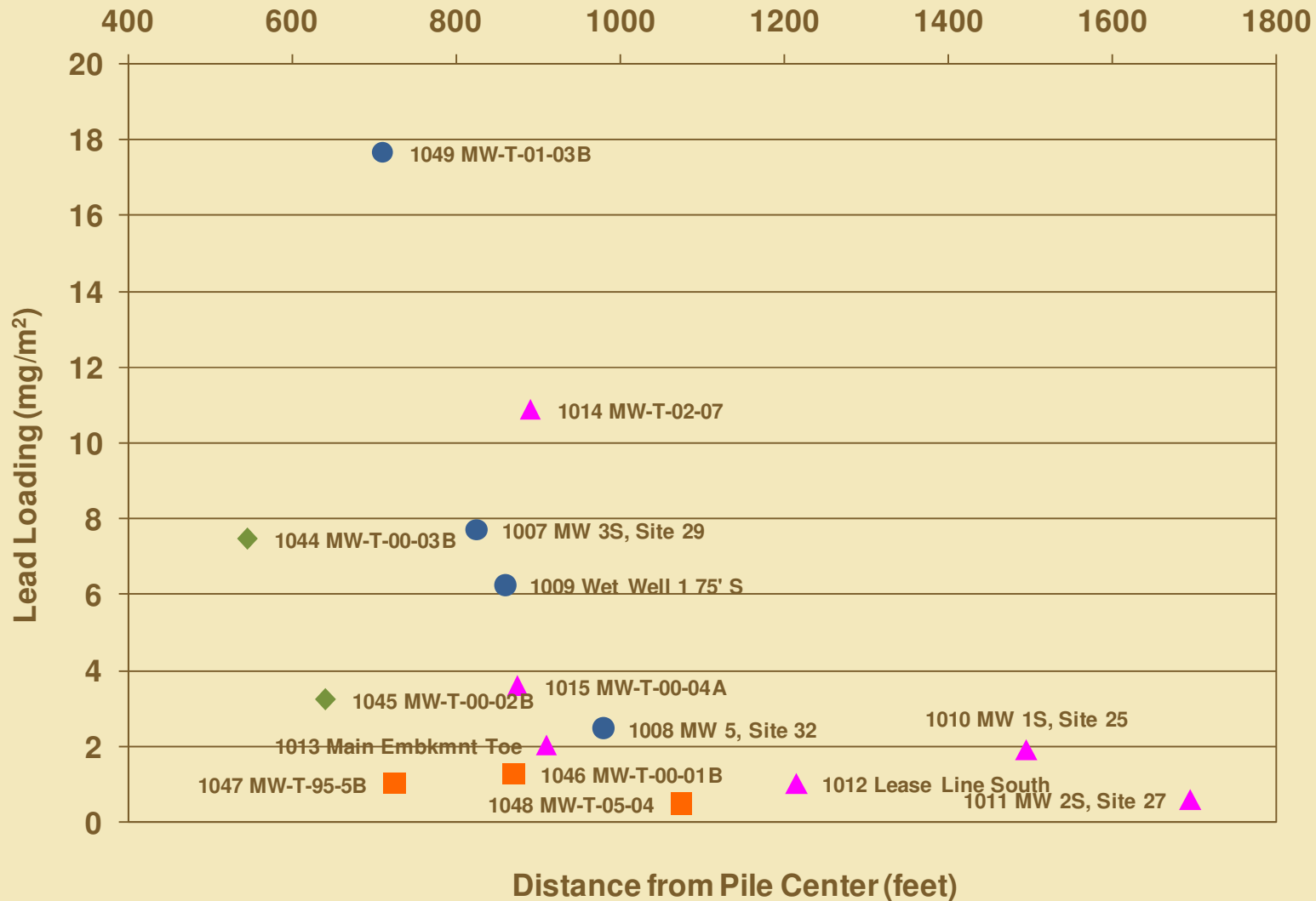


Figure 2.35 Snow Survey Analysis



Sulfate Reduction Monitoring Program (SRMP) Update



- Tailings Expansion EIS ROD required a study to determine if long term sulfate reduction is achievable and will meet closure needs; evaluate existing and additional carbon sources and application methods
- SRMP objectives and action plan developed and implemented: Project team includes GCMC, University of Waterloo, Environmental Design Engineering, Whitlock and Associates
- Seven field test plots (5 carbon amendments; 2 controls) constructed, instrumented (suction lysimeters, tensiometers, moisture access probes) and sampled

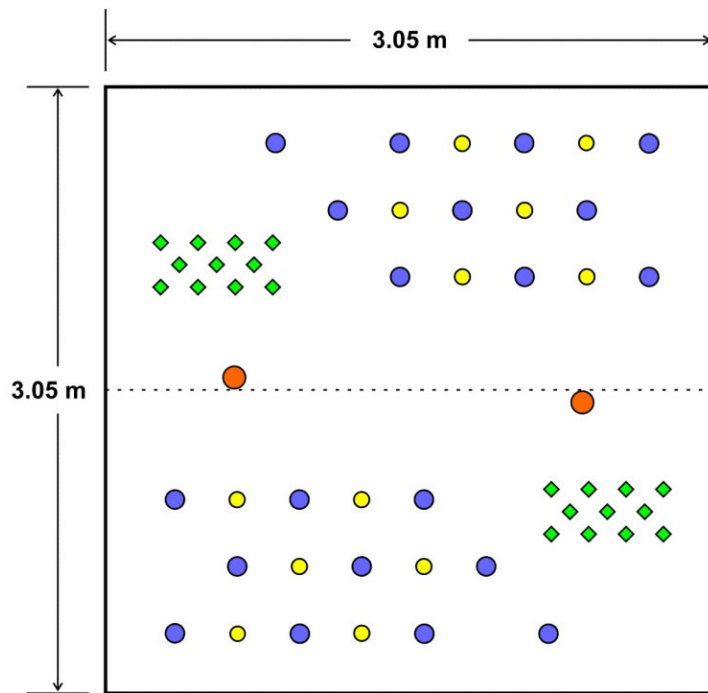
Sulfate Reduction Monitoring Program



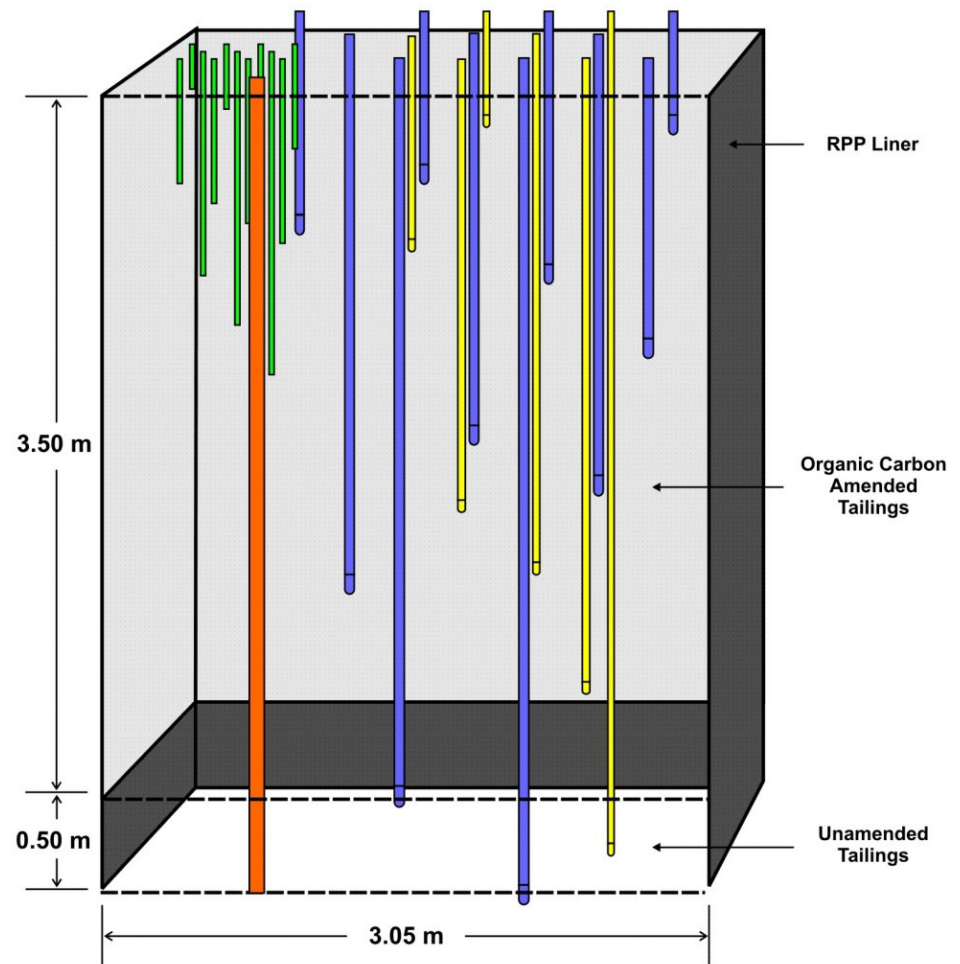
Field Test Cell Amendment Mixtures

	Tailings	Peat	Brewery	Bio-	
			Grain	Solids	
	(vol %)	(vol %)	(vol %)	(vol %)	
Cell 1	100	0	0	0	Unexcavated
Cell 2	100	0	0	0	Excavated
Cell 3	95	5	0	0	Amended
Cell 4	95	2.5	2.5	0	Amended
Cell 5	95	2.5	0	2.5	Amended
Cell 6	95	2.5	1.25	1.25	Amended
Cell 7	90	5	2.5	2.5	Amended

Sulfate Reduction Monitoring Program



- Lysimeter
- Tensiometer
- Moisture Probe Access
- ◆ Pore Gas Tube



Sulfate Reduction Monitoring Program (SRMP) Update

- Performance as of spring 2009
 - Microbially mediated sulfate reduction in cells 4-7
 - Lower sulfate: higher alkalinity, depletion of ^{13}C in dissolved inorganic carbon, and enrichment of ^{34}S in pore water sulfate
 - No evidence of significant sulfate reduction in control cells or peat-amended cell
 - Precipitation of metal sulfides contributes to a decrease in sulfate and metal concentrations
 - Increase in iron reducers, elevated dissolved Fe and As
 - Sulfate reduction and calcite/metal-sulfide precipitation control compositions in Cells 4-7
 - Sulfide oxidation, carbonate dissolution and sulfate precipitation control compositions in Cells 1-3
 - Organic carbon from biosolids is rapidly consumed. Cells containing spent brewing grain show best performance
 - Laboratory batch and column test results support field results

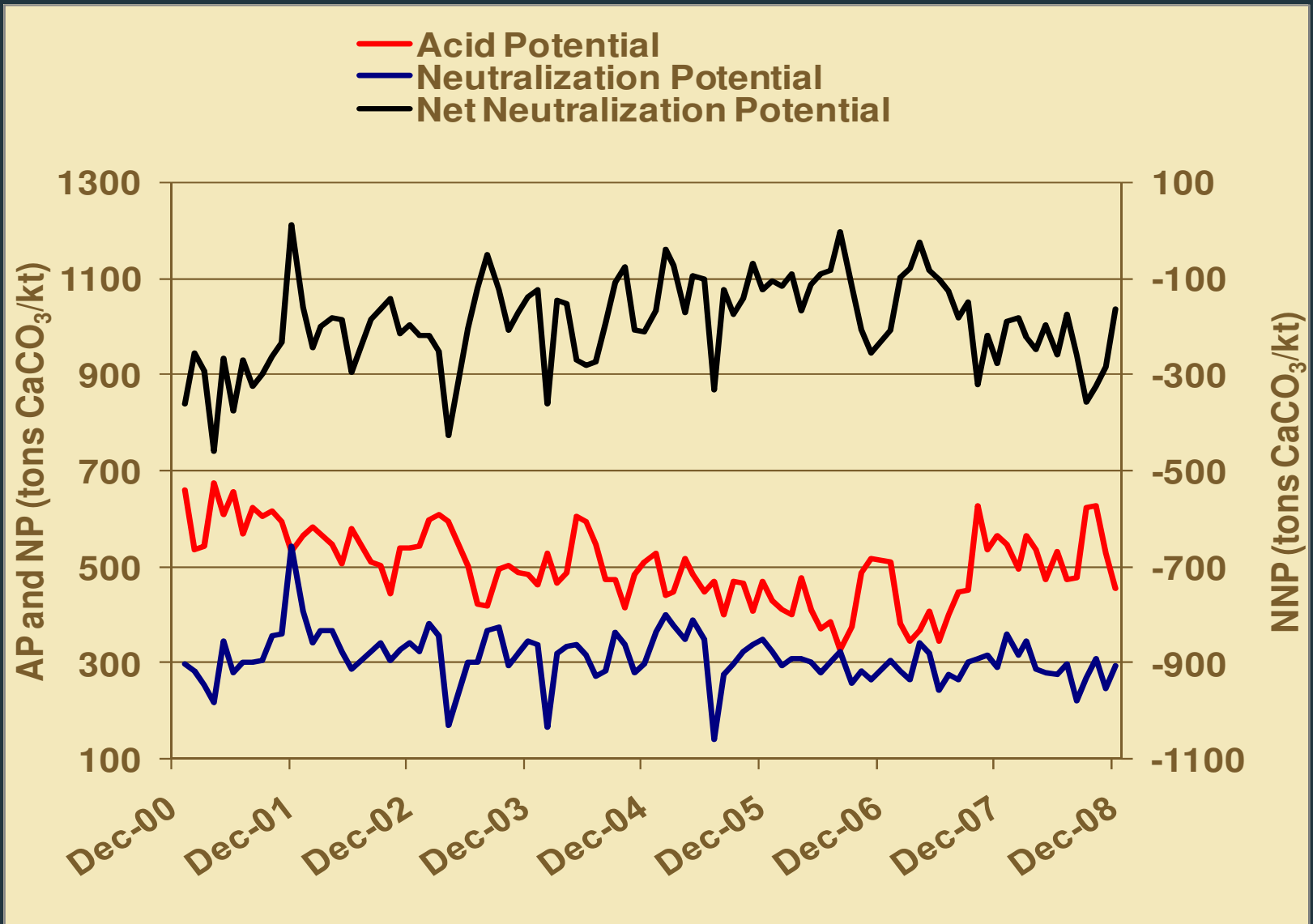
Sulfate Reduction Monitoring Program (SRMP) Update

- Future work planned
 - Ongoing performance sampling
 - Final report from University of Waterloo
 - Geotechnical evaluation
 - Logistical considerations
 - Program completion and final report

Tailings Facility Acid Base Accounting Analyses

- Tailings have the potential to generate acidic drainage if the buffering capacity of the tailings is consumed
- High carbonate content supports a long lag time for depletion of buffering capacity
- Long lag time (decades) allows time for construction and closure of the facility, including construction of an oxygen-inhibiting composite soil cover

Figure 2.32 Monthly Tailings Acid Base Accounting Data



Tailings Facility General Site Management



- Operations per GPO Appendix 3 and Waste Disposal Permit
- Most placement occurred in northwest expansion area
- Tailings facility activities in 2008
 - Completion of Pit 5 area
 - Relocation of Pond 6 sediments
 - Installation of Wet Well A
 - Placement of B Road pipeline excavation material

Tailings Facility General Site Management



- 2009 Planned Tailings Activities
 - Instrumentation at Pond 6 and Pit 5 area
 - Construction of degrit basin
 - Continued work at Pond 6
 - Begin test pits on East Ridge
 - Commence Site E removal and co-disposal

Co-Disposal Testing

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Tailings Facility General Site Management

- Tailings and production rock co-disposal geotechnical and geochemical studies complete
 - A 3:2 (production rock:tailings) ratio is recommended
 - Site E Drainage will improve following relocation
 - Lower acid generation potential (higher NNP) than tailings alone, improved stability, decreased permeability
 - Decreased oxidation and improved pore water compositions
 - Lower metal content than tailings

Co-Disposal Testing

