
Hecla
GREENS CREEK

2010 Annual Tailings Report

Hecla
MINING COMPANY

Presentation Outline

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

2010 Northwest Expansion Area

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Table 2.1 Tailings Placement Data

	All Materials	All Materials Cumulative	All Materials	All Materials Cumulative	Rock from Site 23	All Other Materials	Tailings
	yd^3	yd^3	tons	tons	tons	tons	tons
	survey	survey	calculated	calculated	truck count	truck count	calculated
2009	227,817	3,078,657	412,736	5,577,603	16,117	90,584	306,035
2010	222,363	3,301,020	402,855	5,980,458	30,796	105,076	266,983

Tons calculated at 134.2 pounds per cubic foot for tailings
Remaining capacity: 3.6 million tons

Tailings Facility Stability Compaction

- High degree of achieving >90% compaction
- Average dry density: 141 pcf
- Average Standard Proctor dry density: 146 pcf
- Average optimum percent moisture: 11.8%
- HGCMC on-site lab 1-point Proctors
  - Average dry density: 144 pcf
  - Average percent moisture: 11.8%

Tailings Facility Stability - Inspections

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- Results of operator, engineering, environmental department, and regulatory inspections revealed no signs of instability
- Agency Inspections in 2010
  - USFS - 16
  - ADEC - 6

Tailings Facility Water Controls
(2003 EIS)

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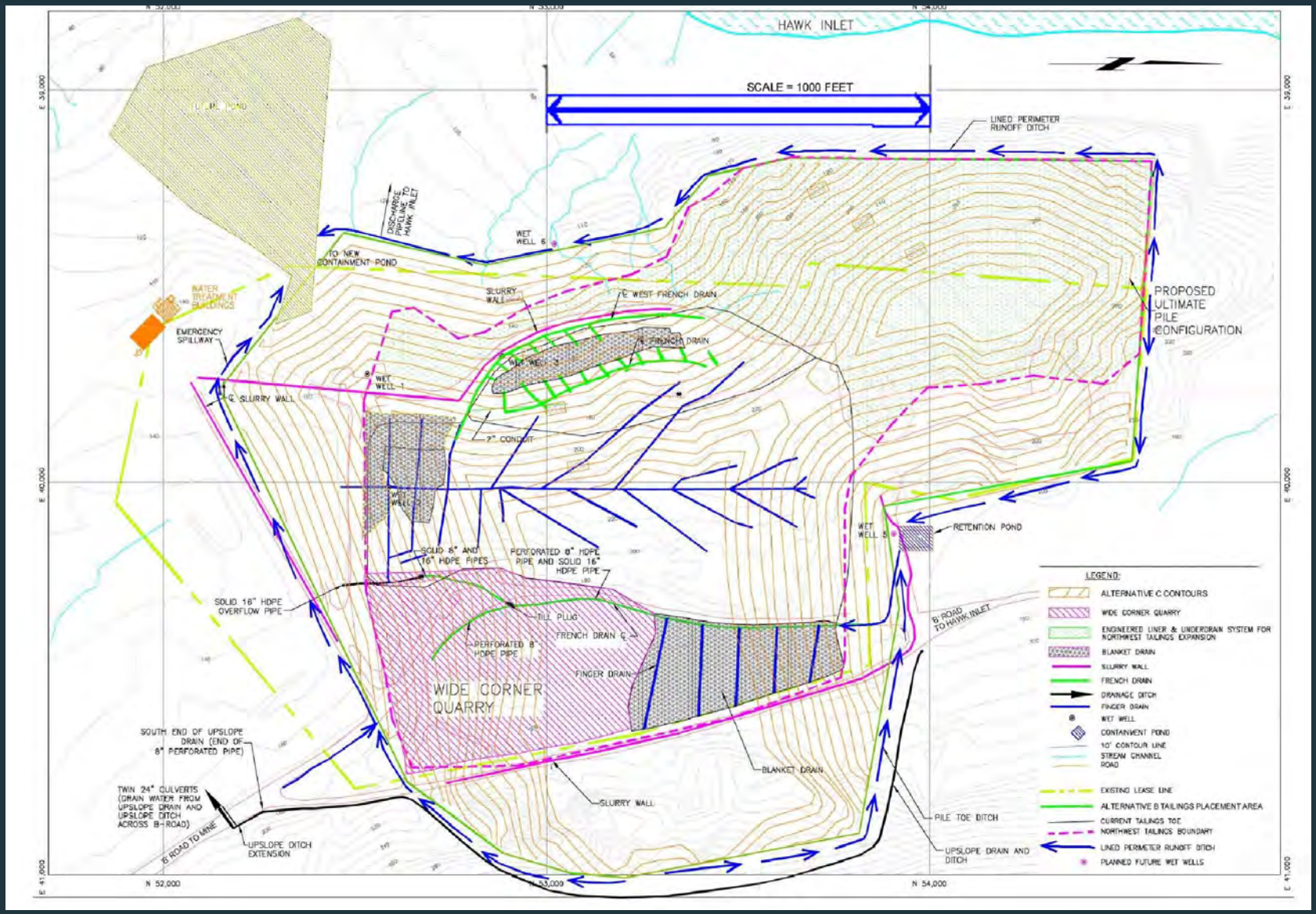


Tailings Facility Monitoring Well and Piezometer Water Level Data

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

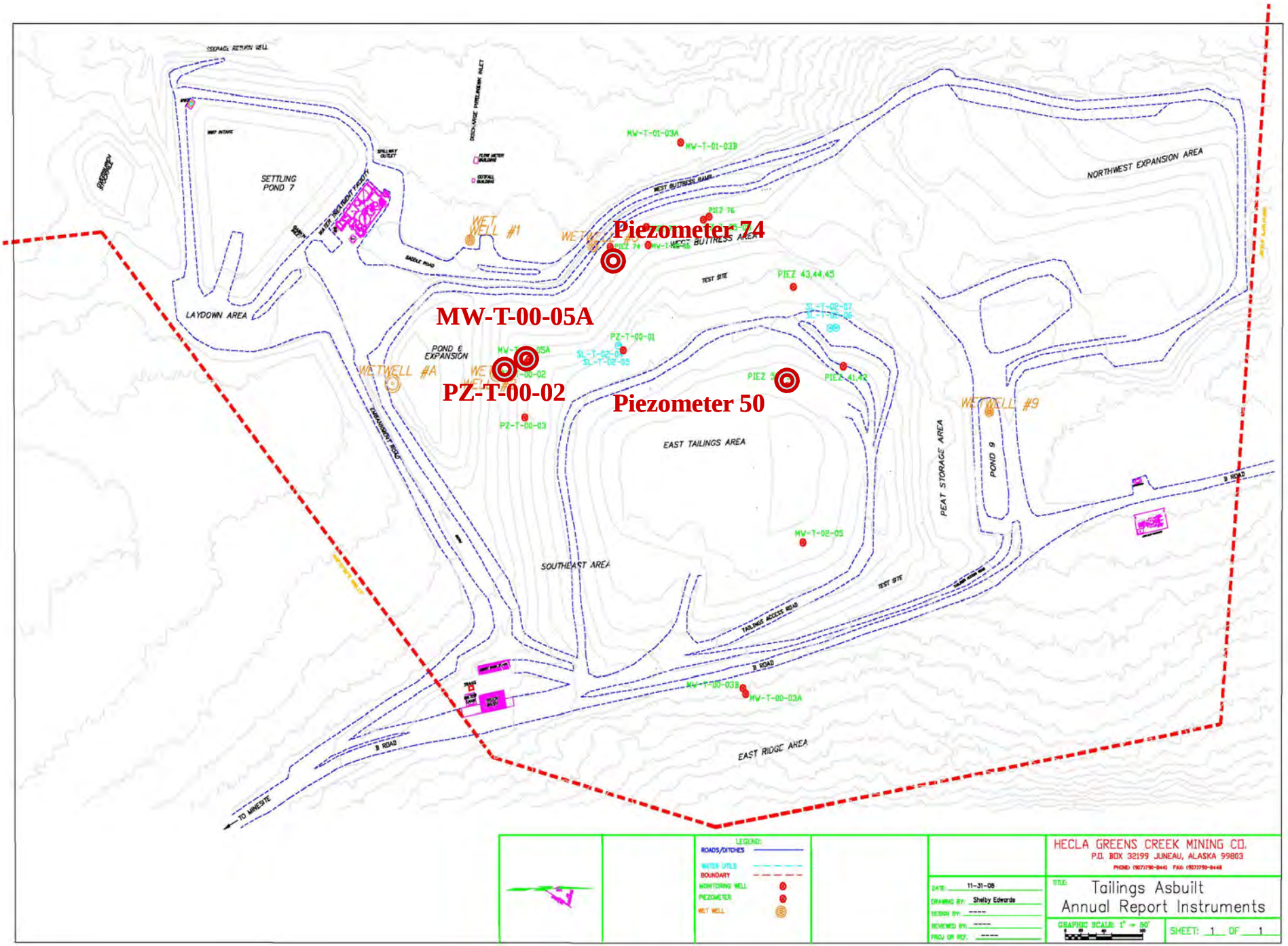
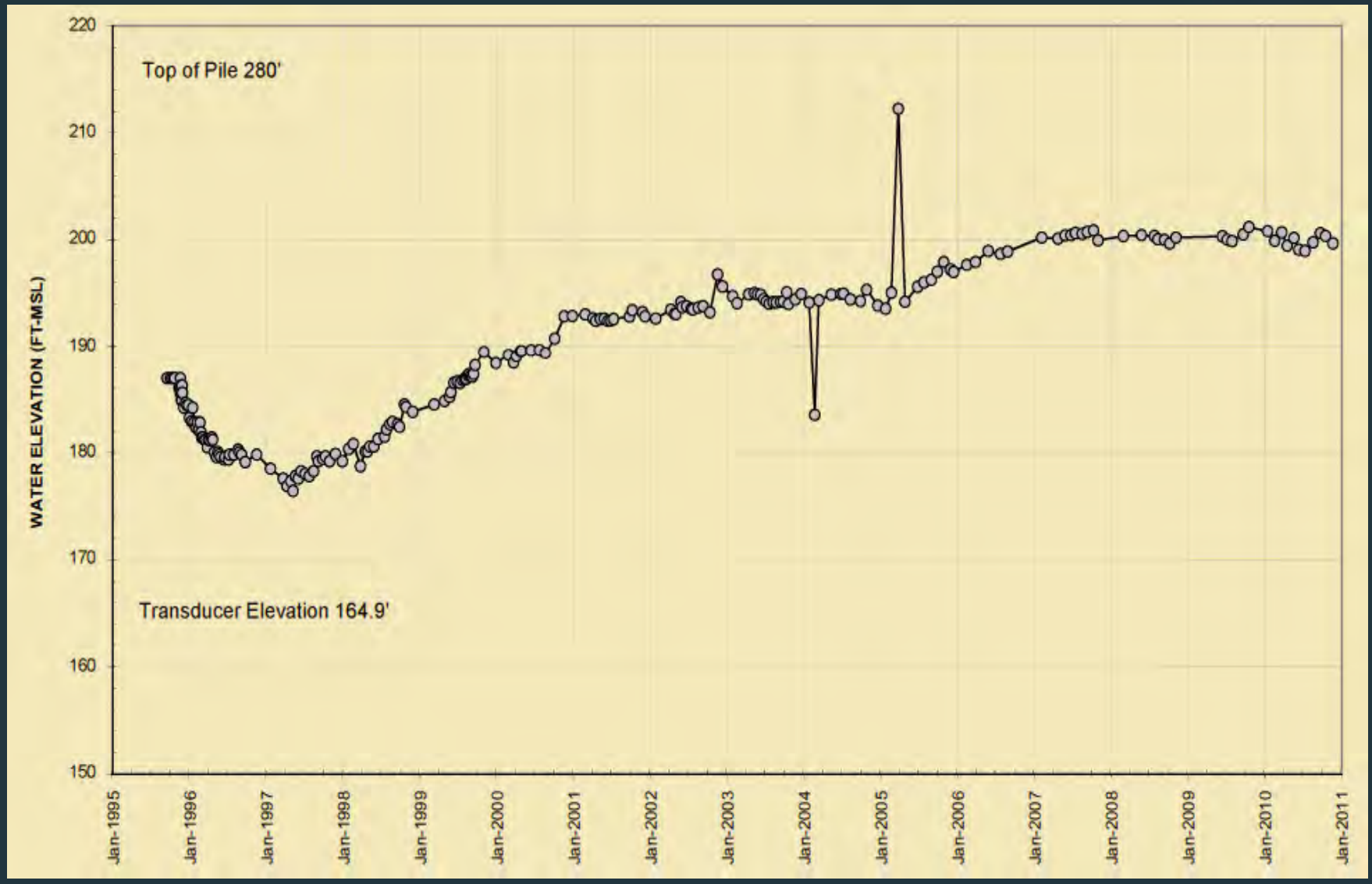

Piezometer 74
MW-T-00-05A
PZ-T-00-02
Piezometer 50
SETTLING POND 7
LAYDOWN AREA
POND 6 EXPANSION
WET WELL #1
WETWELL #A
WETWELL #9
WEST BUTTRESS AREA
NORTHWEST EXPANSION AREA
EAST TAILINGS AREA
SOUTHEAST AREA
EAST RIDGE AREA
PEAT STORAGE AREA
POND 9
TAILINGS ACCESS ROAD
B ROAD
TO MINESITE
HECLA GREENS CREEK MINING CO.
P.O. BOX 32199 JUNEAU, ALASKA 99803
Tailings Asbuilt
Annual Report Instruments
DATE: 11-31-08
DRAWING BY: Shelby Edwards
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

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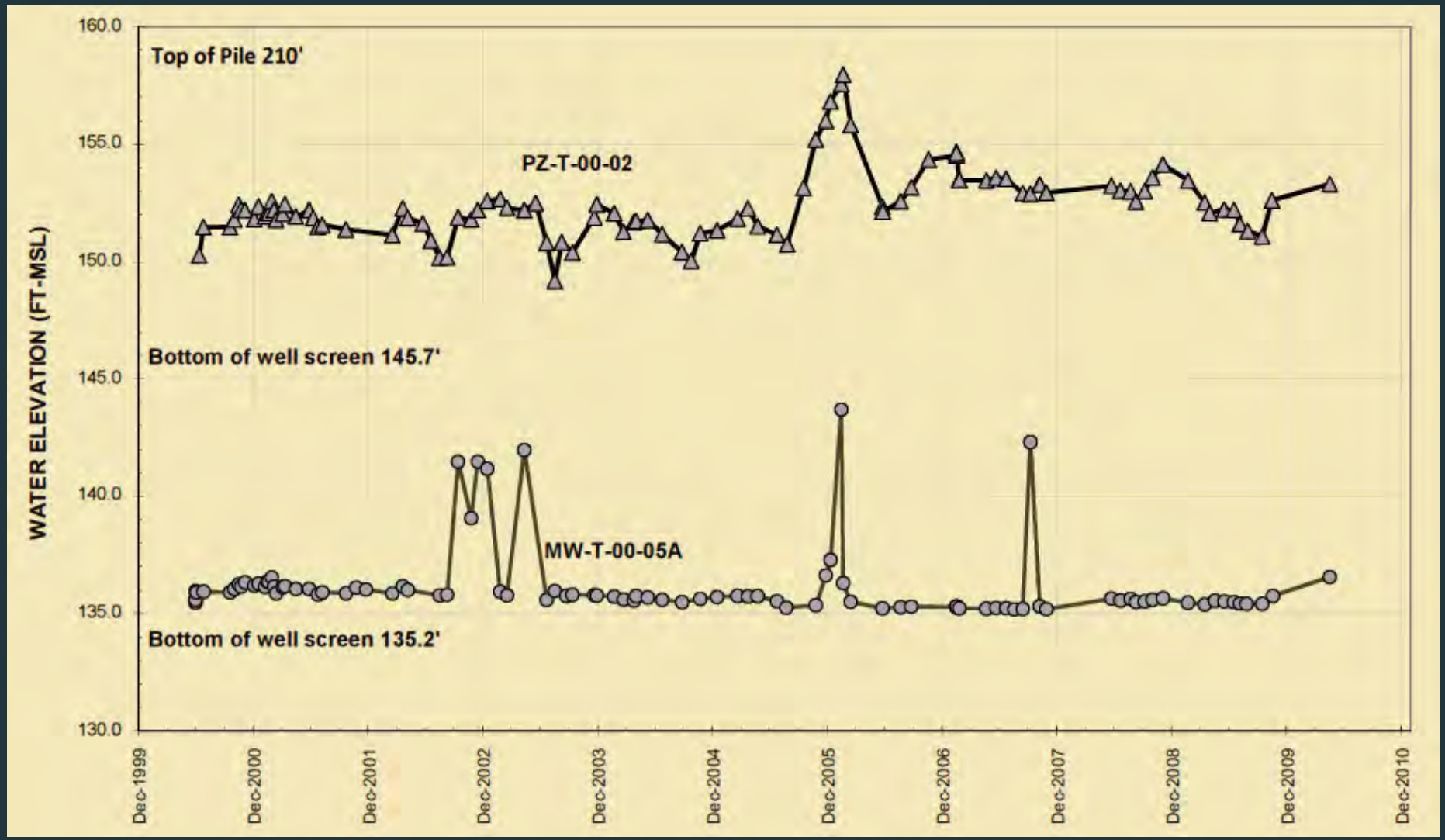

Figure 2.8 Water Level Data for Piezometer 74

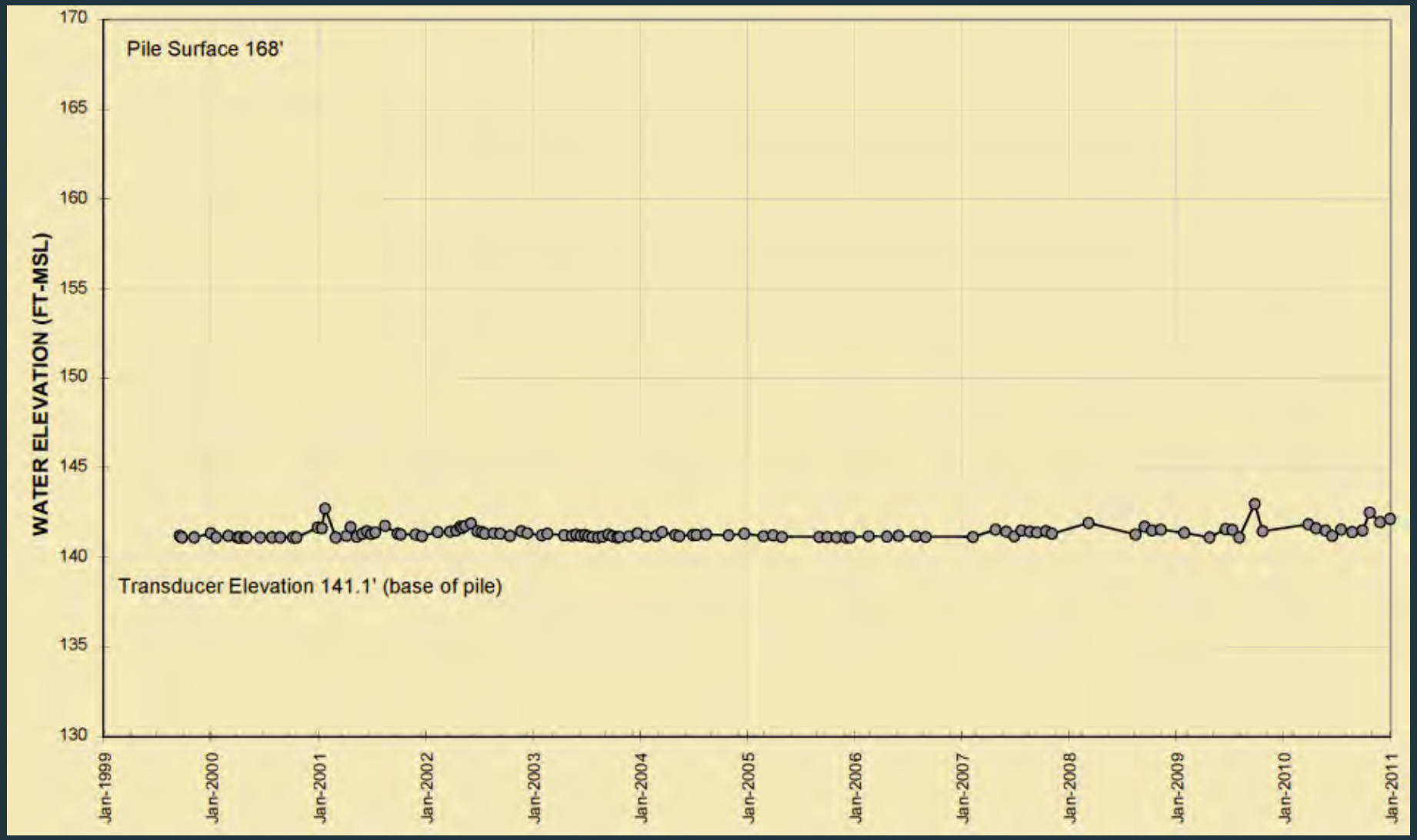

Table 2.4 Monthly Summary of Tailings Area Climate Data

Month	Avg Temp (°C)	Precipitation (in)
January	0.58	2.6
February	2.60	0.97
March	2.59	3.7
April	4.90	2.01
May	8.99	1.08
June	10.92	3.49
July	12.03	2.56
August	13.04	3.26
September	10.54	5.34
October	6.46	6.34
November	2.27	4.94
December	-2.18	0.06
2010	**6.06**	**36.35**

Tailings Facility Internal Monitoring Sites: Water Quality Data

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- Internal site waters captured, treated, and discharged per NPDES/APDES permit
- pH between 6.0 and 8.5
- Alkalinity between 150 and 500 mg/L
- Conductivity in wet wells and tailings completion wells between 2000 and 4100 uS/cm
- Conductivity in suction lysimeters between 1400 and 5000 uS/cm
- Sulfate and hardness correlate with conductivity

Tailings Facility Internal Monitoring Sites: Water Quality Data

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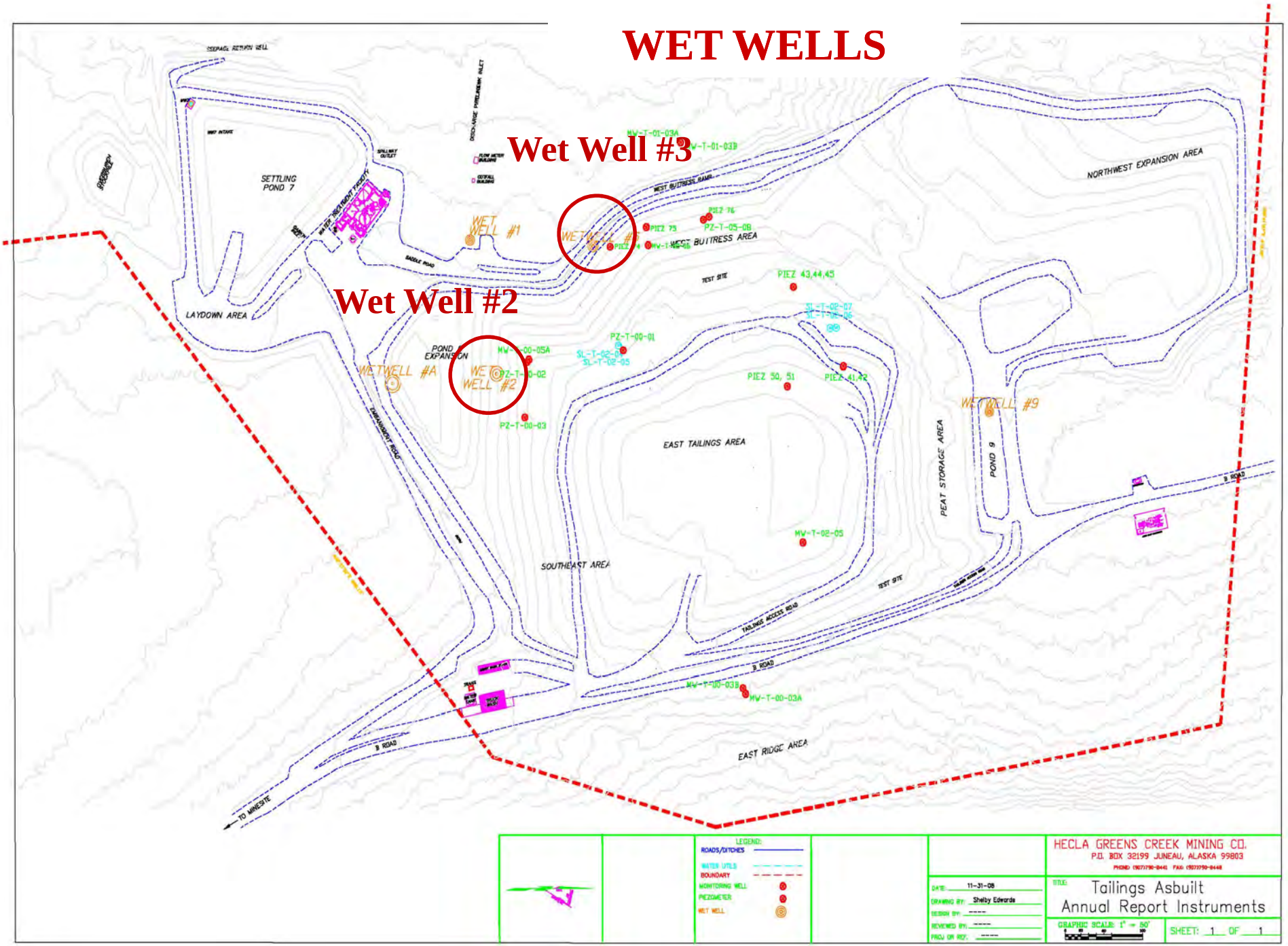
- Fluctuations in saturated zone thickness and associated redox conditions influence arsenic and iron concentrations
- Zinc is considerably more mobile than other metals
- Microbial sulfate reduction and base metal sulfide precipitation produces low metal concentrations in most saturated zone wells
- Shallow unsaturated zone and Wet Well 3 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


Wet Well #3
Wet Well #2
SETTLING POND 7
LAYDOWN AREA
WET WELL #1
WET WELL #3
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POND EXPANSION
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Tailings Area Internal Sites
pH - Figure 2.20a

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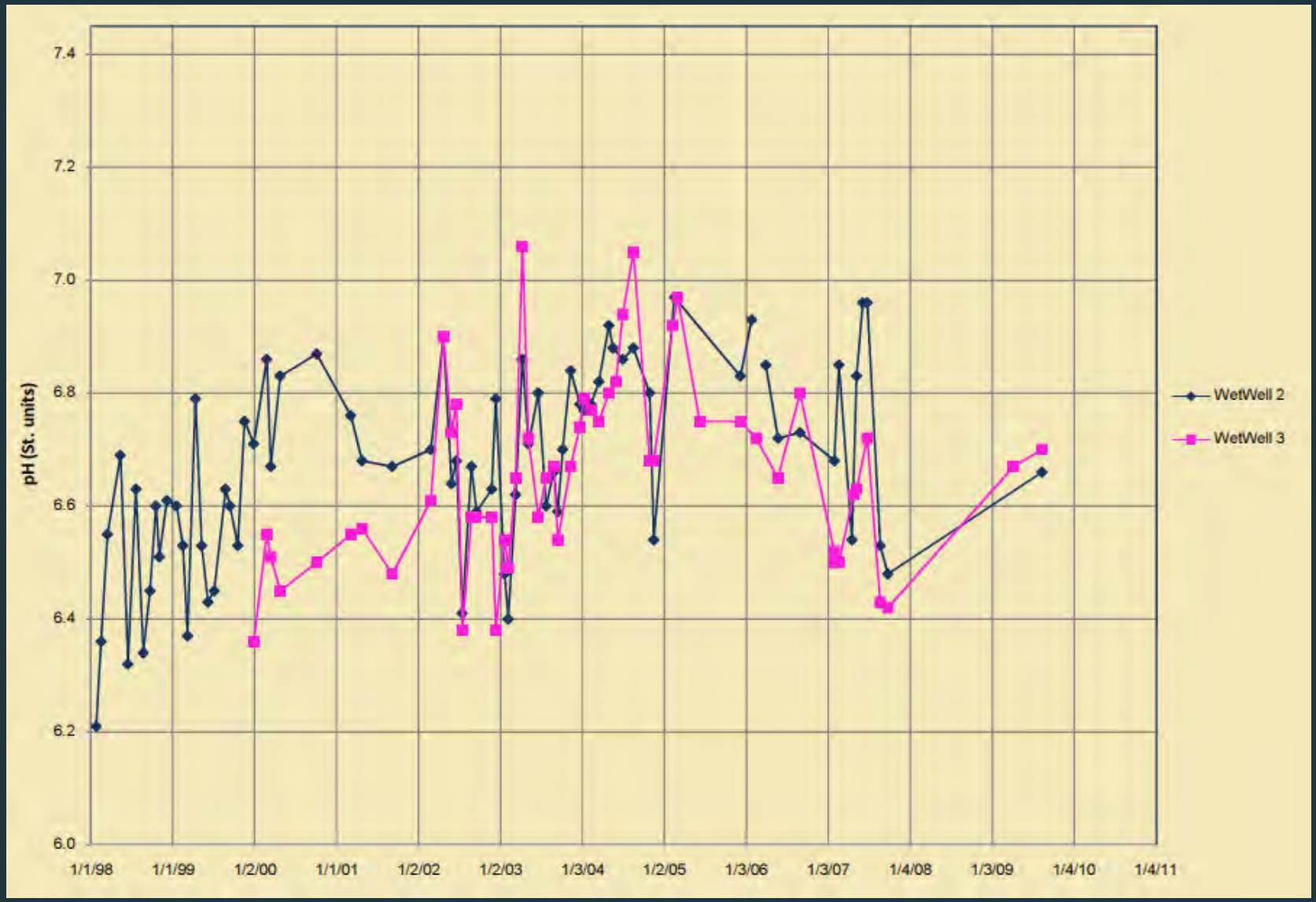
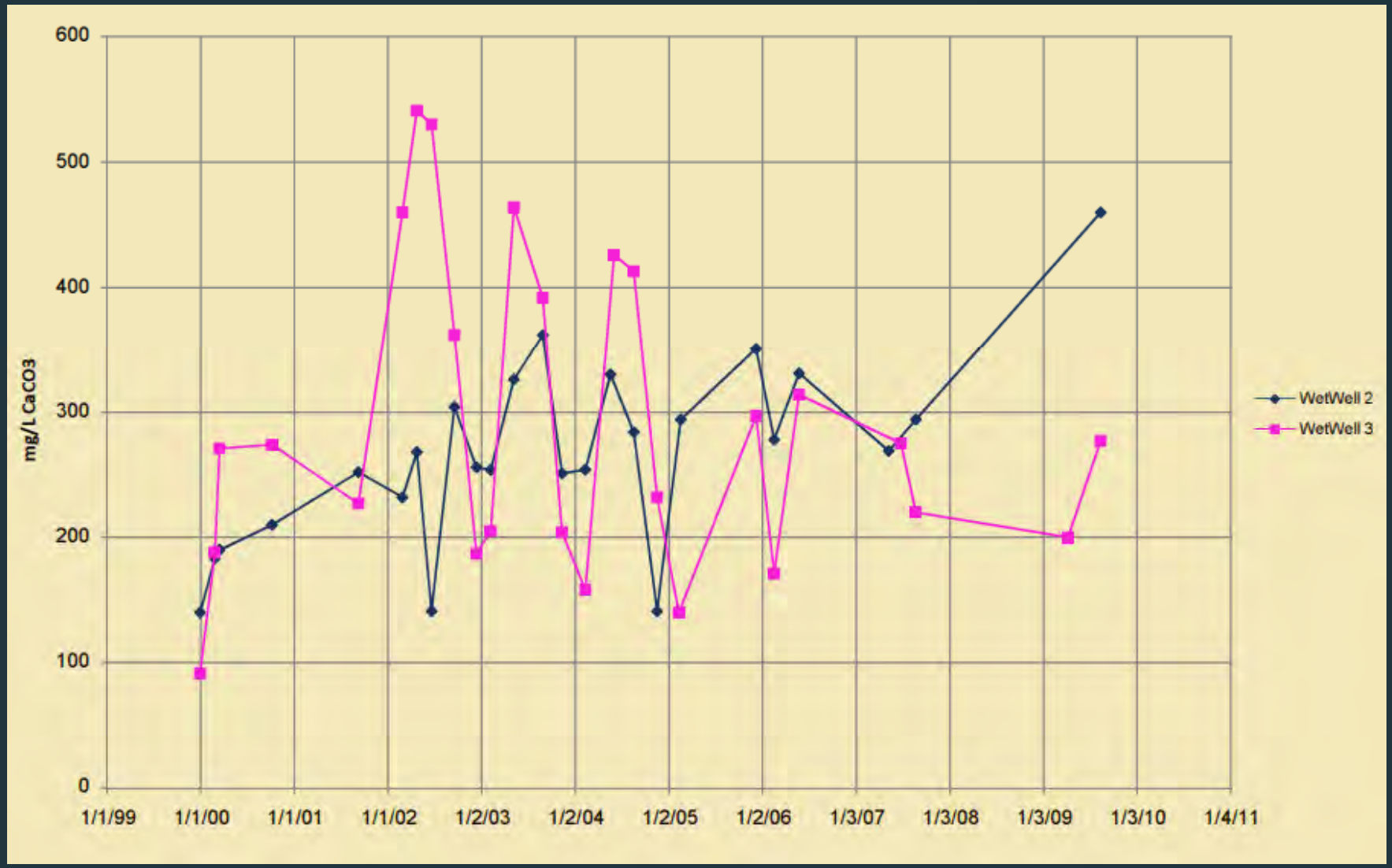


Tailings Area Internal Sites Alkalinity - Figure 2.21a



Tailings Area Internal Sites Conductivity - Figure 2.22a

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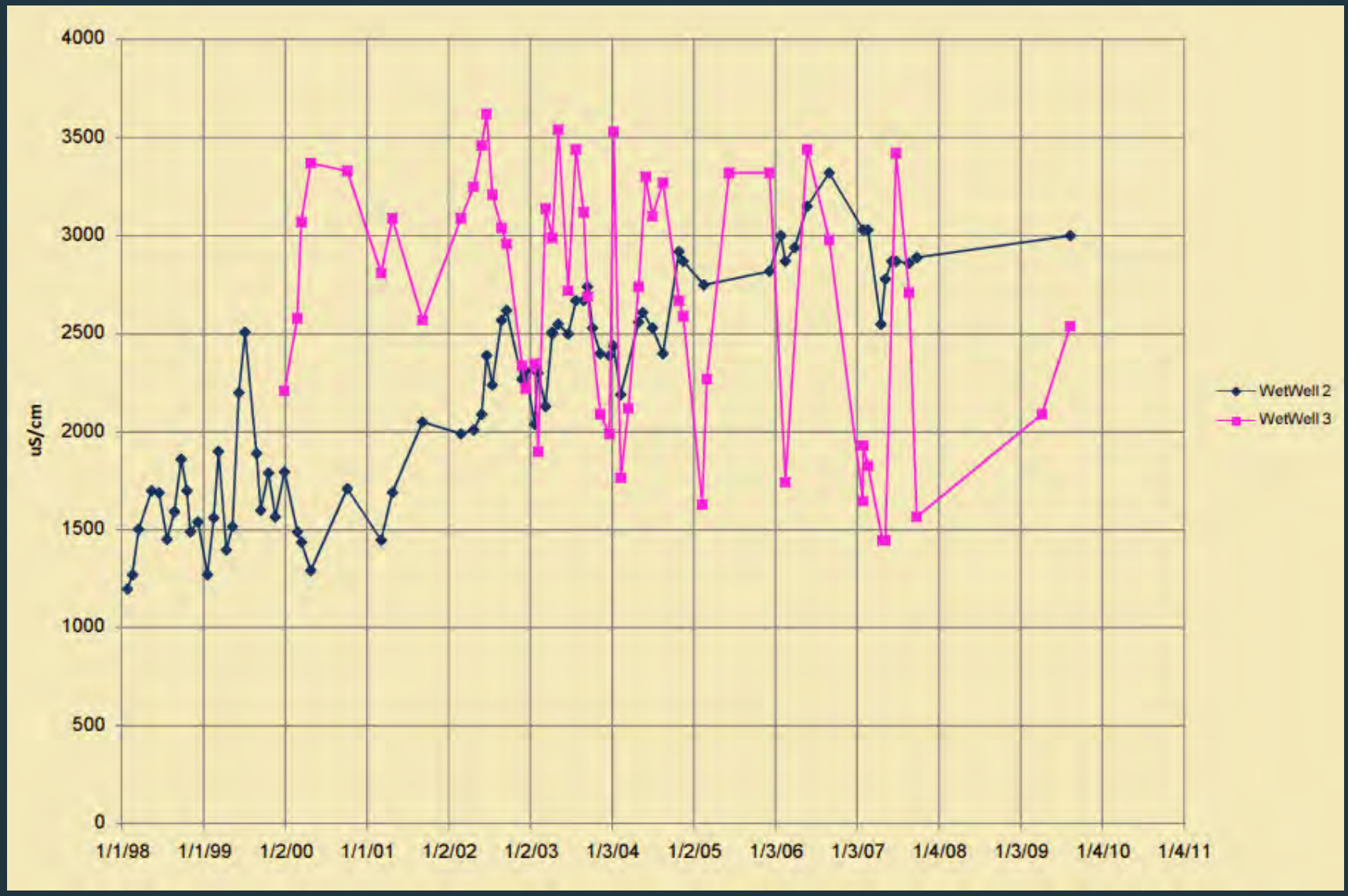

Tailings Area Internal Sites
Zinc - Figure 2.26a

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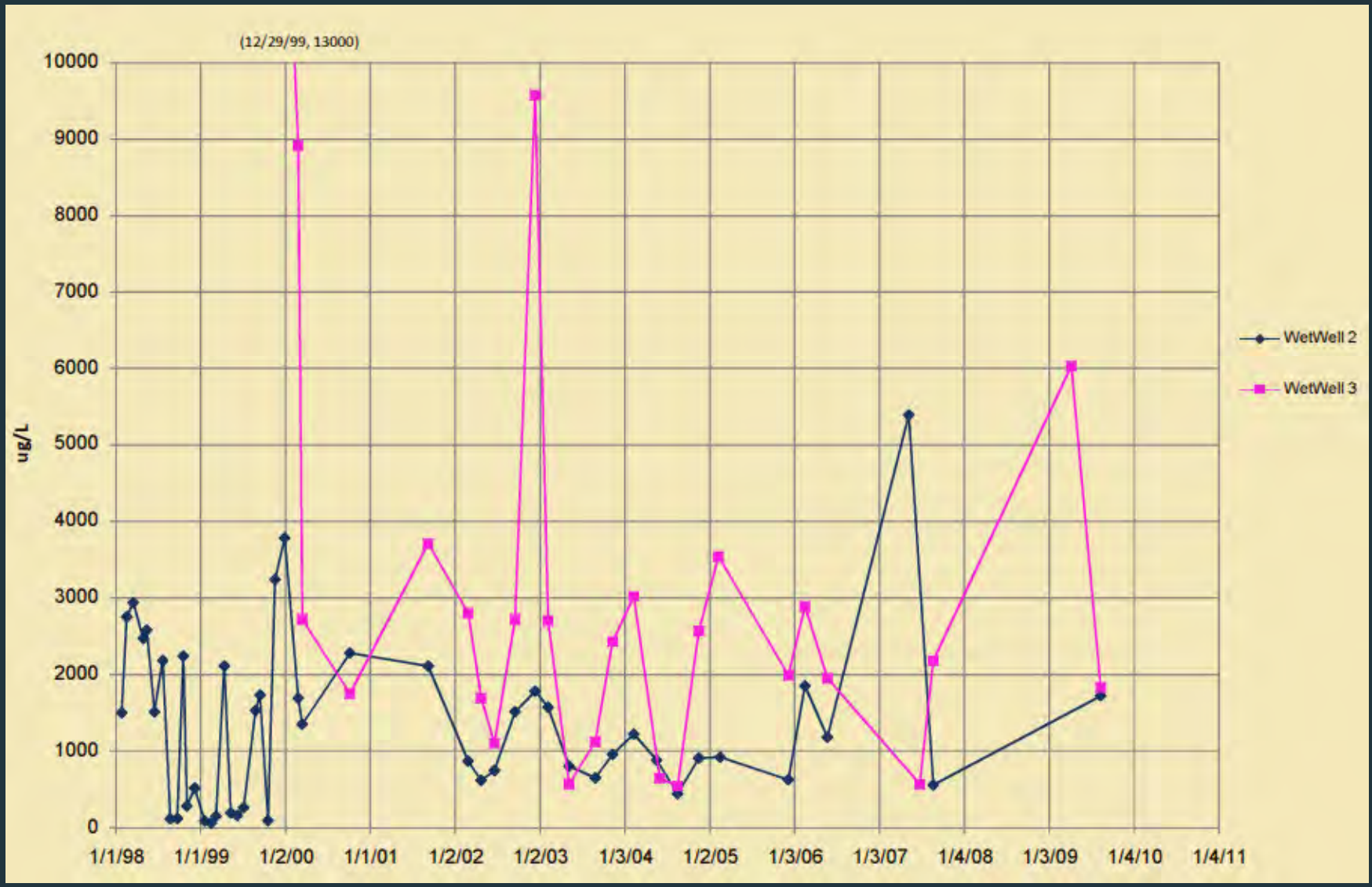
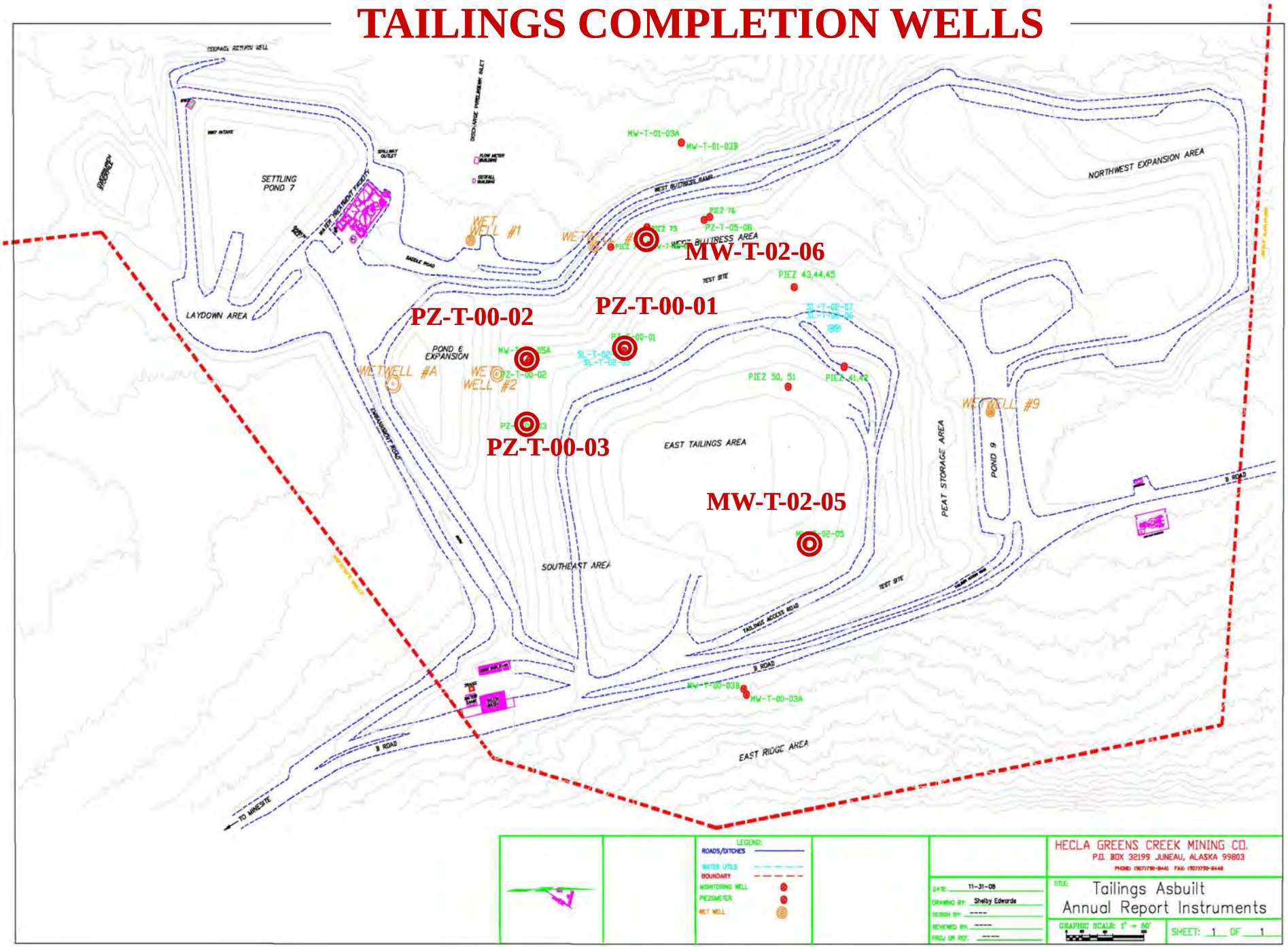


TAILINGS COMPLETION WELLS



Tailings Area Internal Sites
pH - Figure 2.20b

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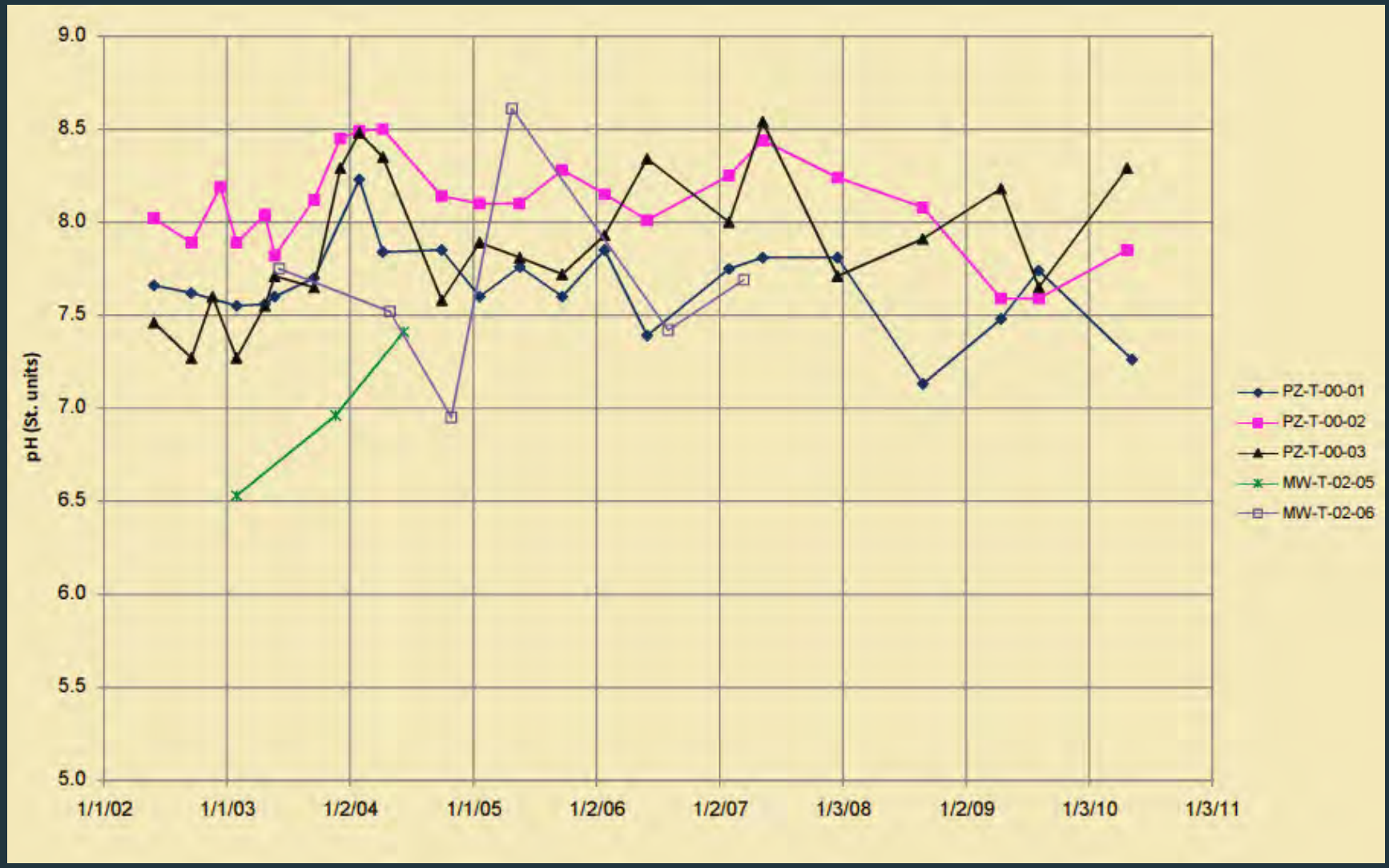
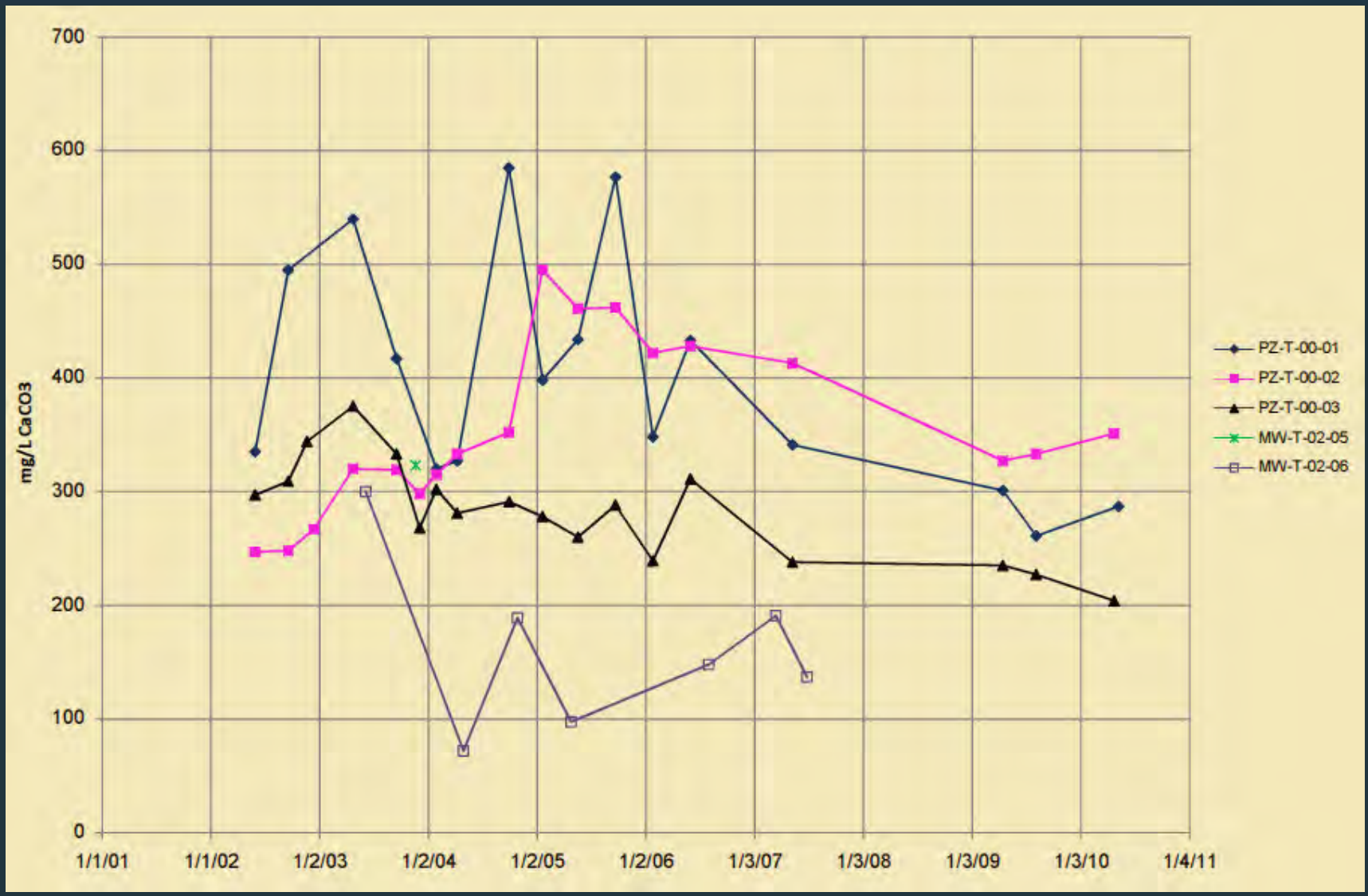
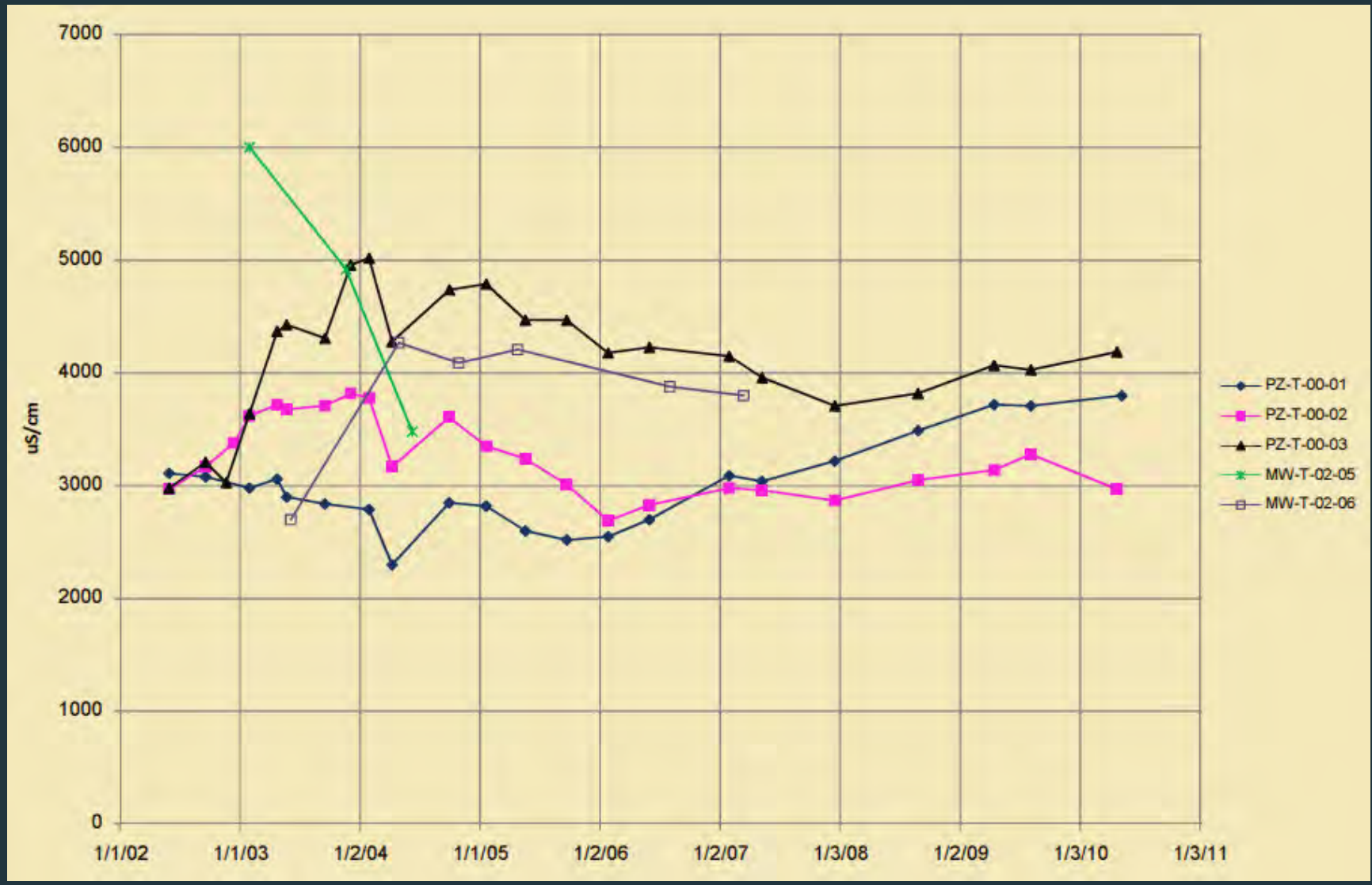


Tailings Area Internal Sites Alkalinity - Figure 2.21b



Tailings Area Internal Sites Conductivity - Figure 2.22b



Tailings Area Internal Sites
Zinc - Figure 2.26b

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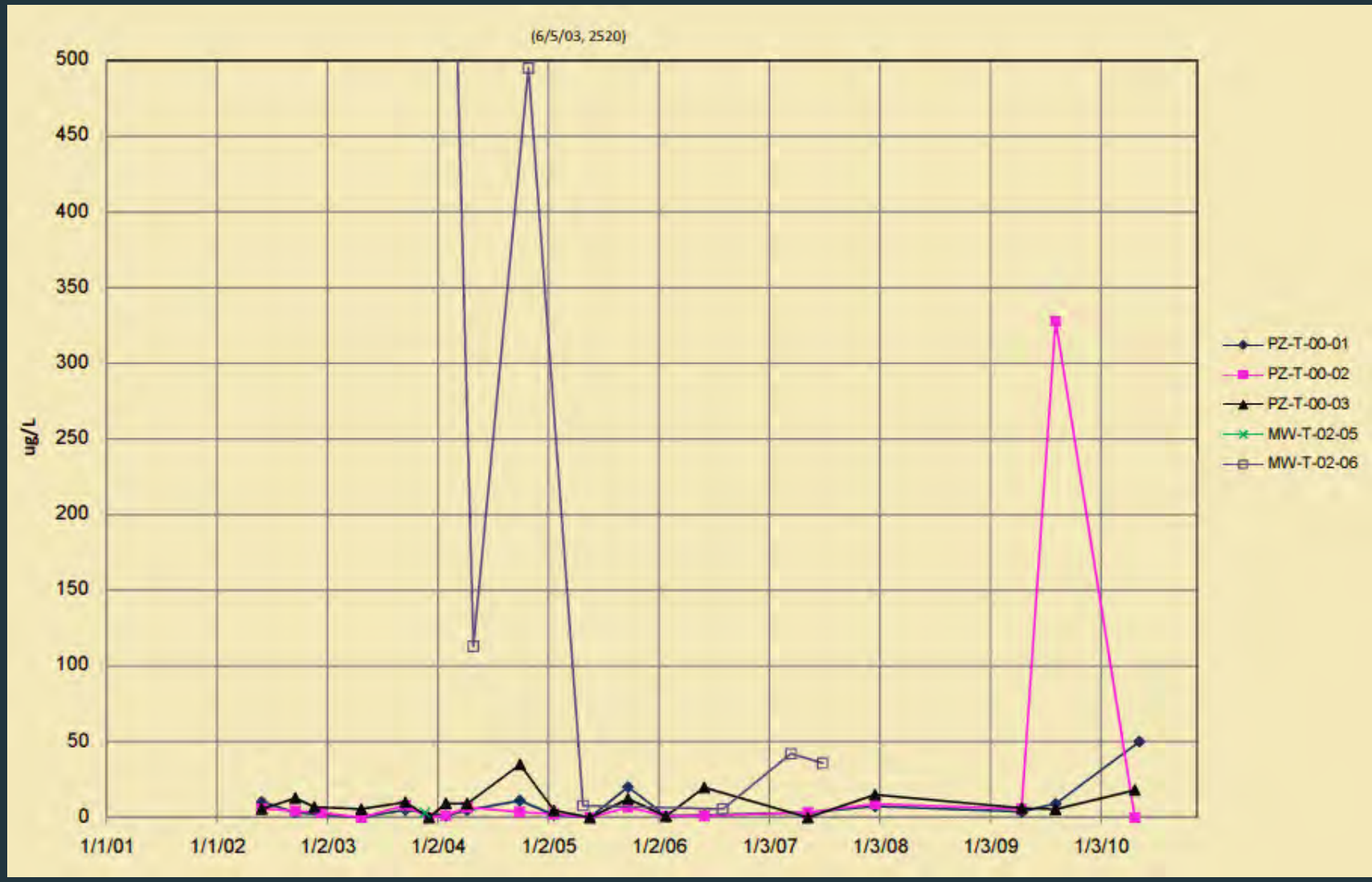
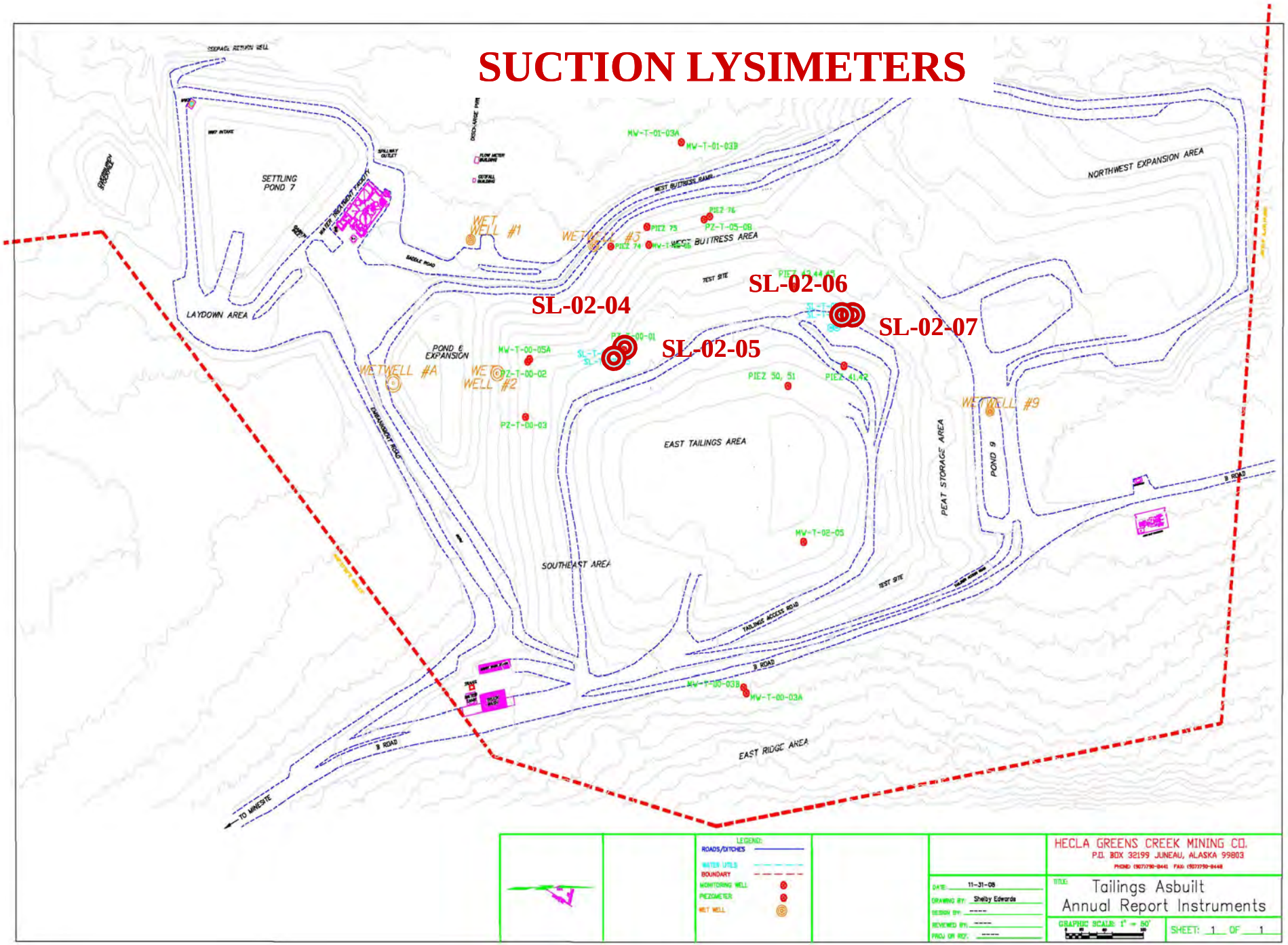
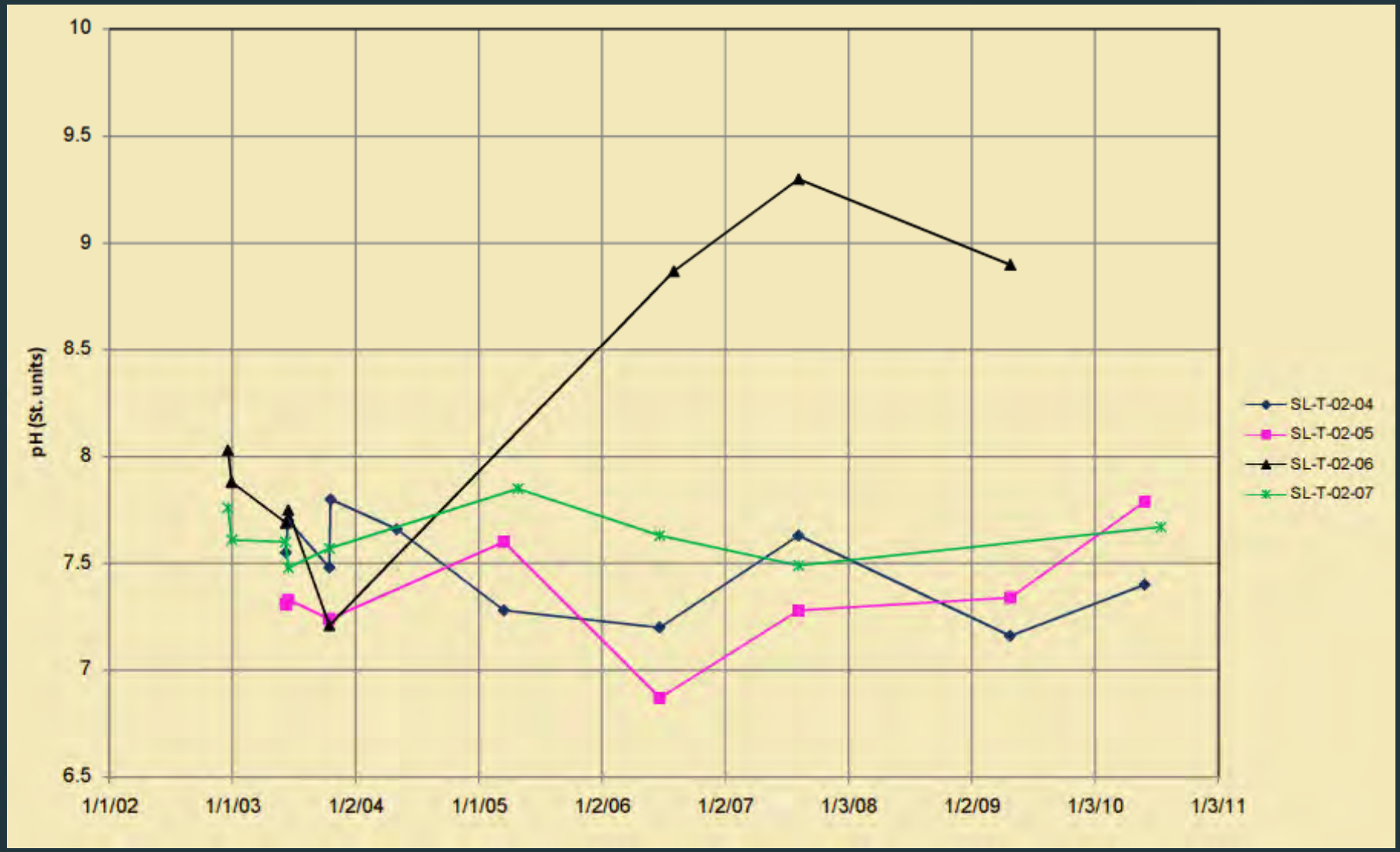


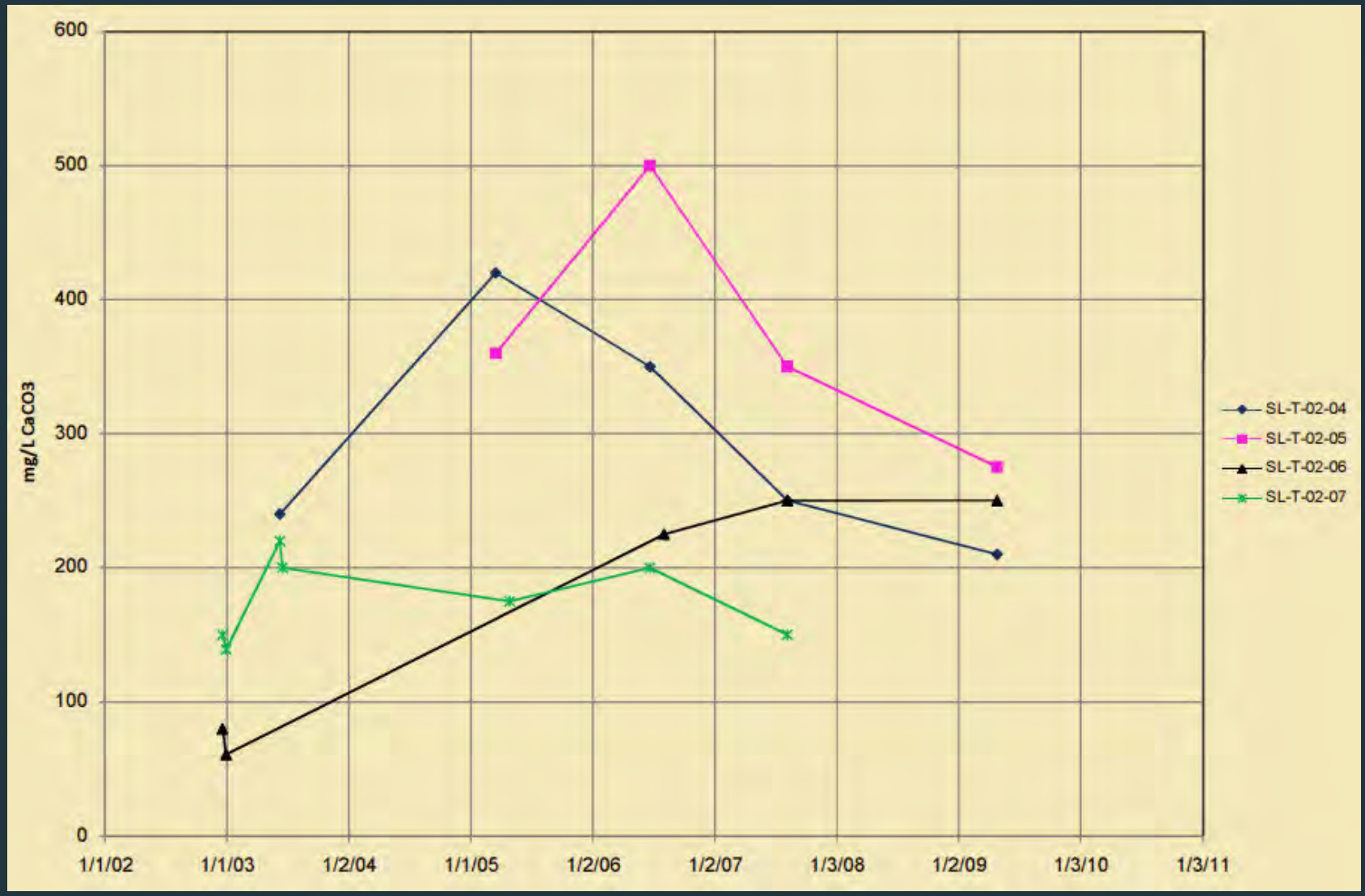
SUCTION LYSIMETERS



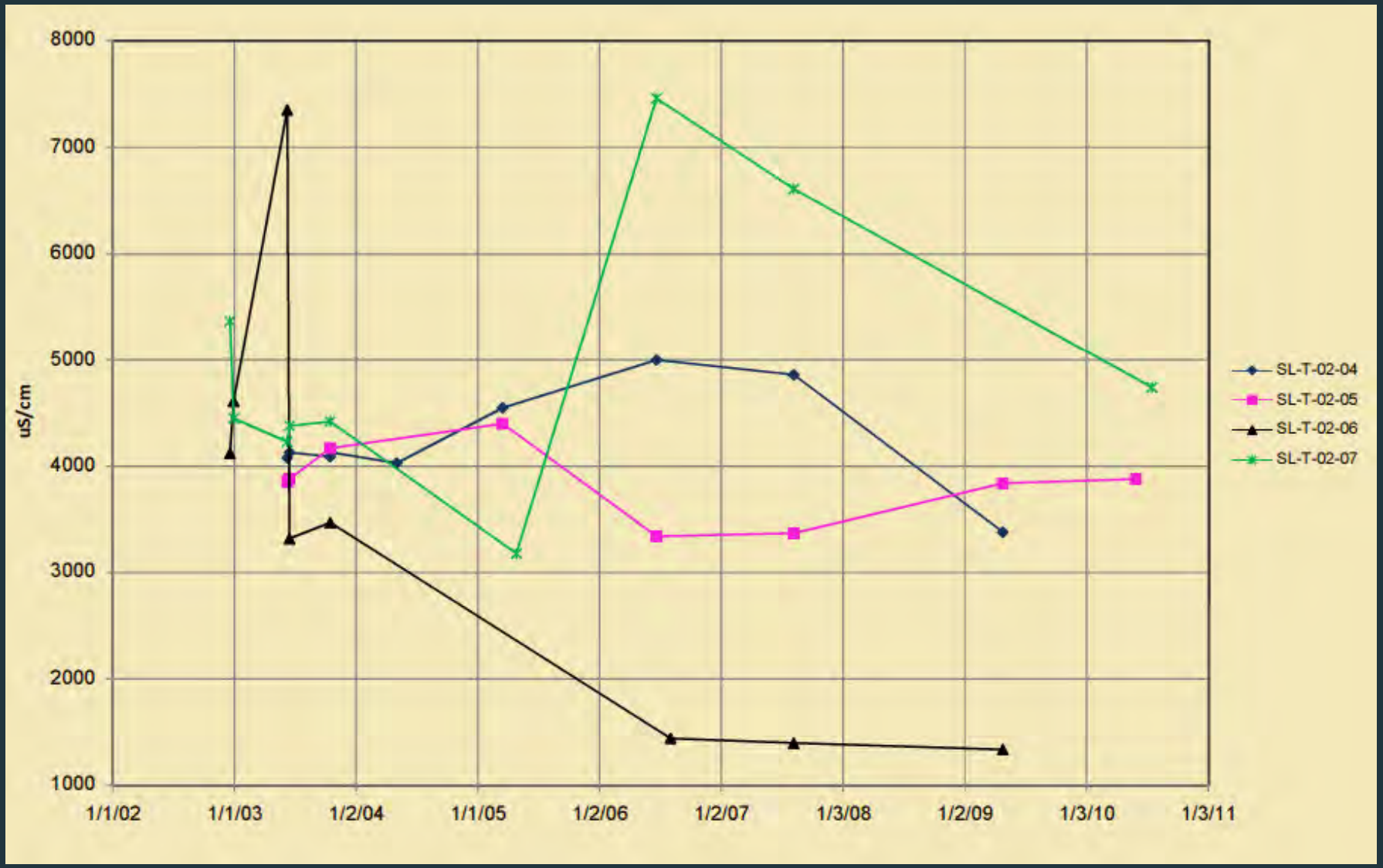
Tailings Area Internal Sites
pH - Figure 2.20c



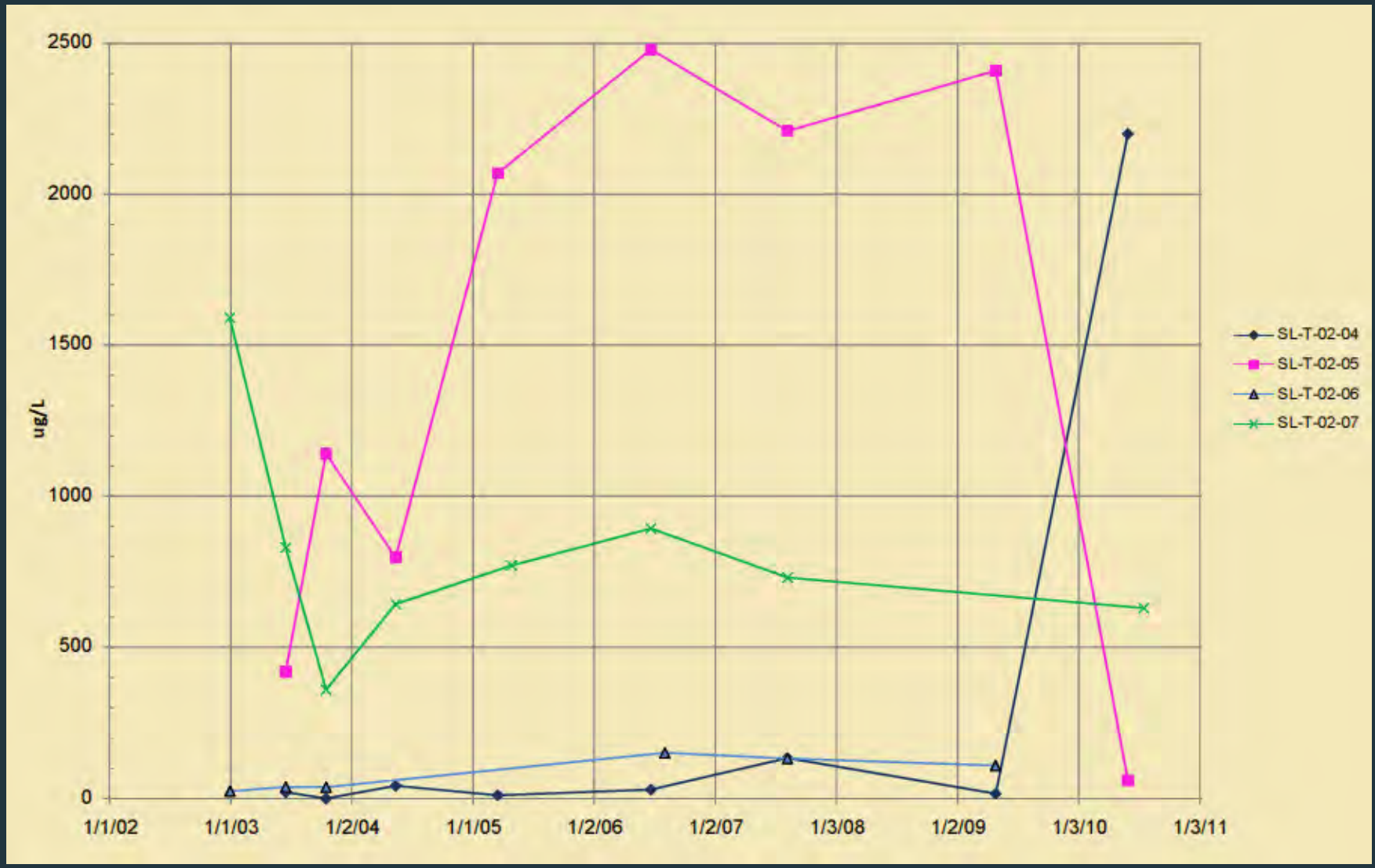
Tailings Area Internal Sites Alkalinity - Figure 2.21c



Tailings Area Internal Sites Conductivity - Figure 2.22c



Tailings Area Internal Sites
Zinc - Figure 2.26c



Tailings Facility Additional Monitoring

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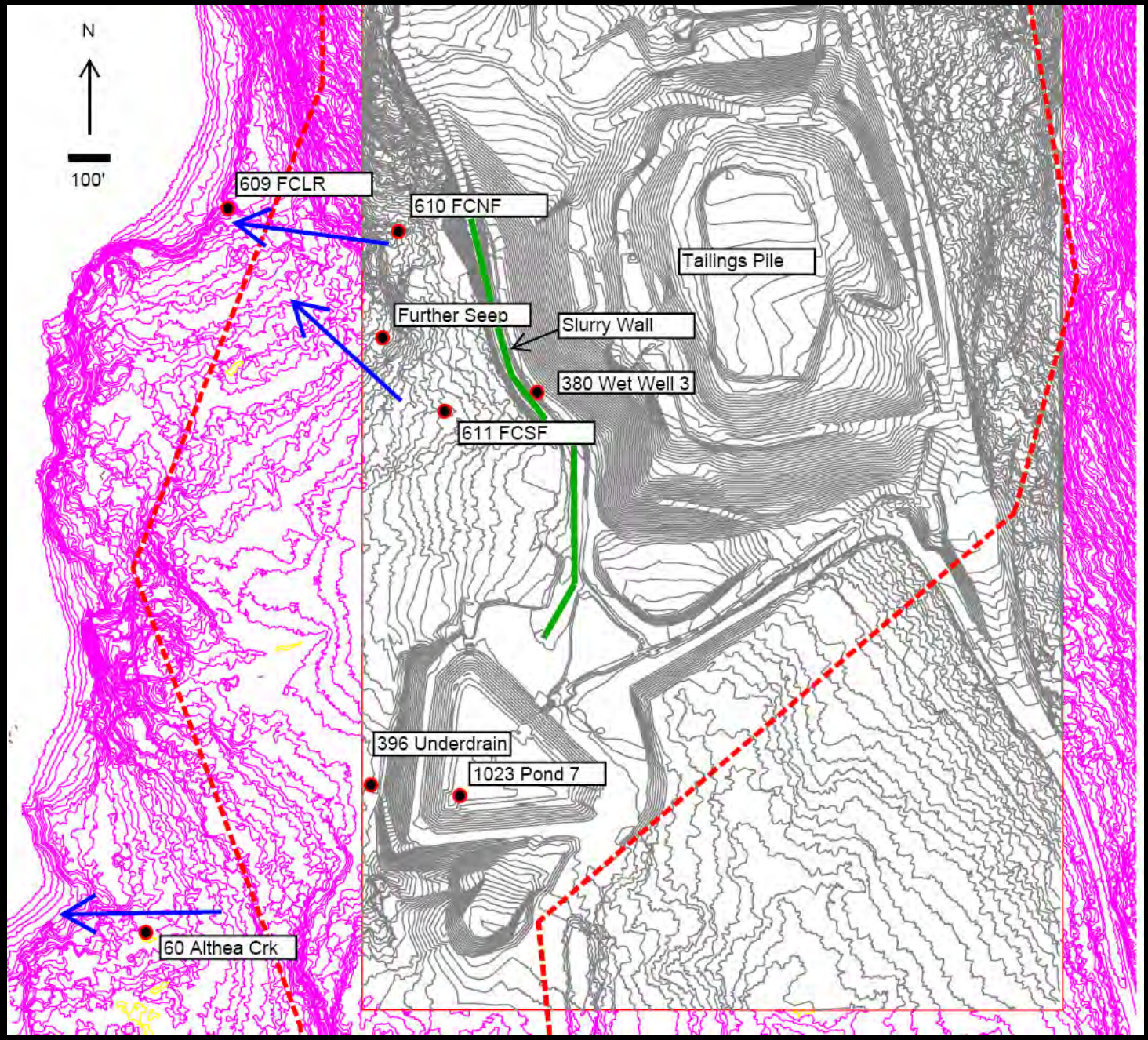
- Most perimeter wells exhibit chemistry comparable to background waters
- Pyritic rock used locally for access roads produced acidic drainage in two areas (the pyritic rock was removed from both locations)
  - Water quality shows improvement in response to remediation efforts
- Residual sulfate and metal concentrations are very low relative to contact waters but higher than background levels in localized areas
- West Tailings Facility Monitoring Action Plan submitted to regulatory agencies 12-15-2009


N
100'
609 FCLR
610 FCNF
Tailings Pile
Further Seep
Slurry Wall
380 Wet Well 3
611 FCSF
396 Underdrain
1023 Pond 7
60 Althea Crk

Tailings Facility Additional Monitoring

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- A complex history of disturbance poses challenges to identifying potential leakage from the facility
- Zinc in the drainage is an order of magnitude or more lower than contact water, suggesting that effects from seepage, if any, from the tailings pile are minimal
- Zinc at site 610 increased with construction and tailings placement activity
- Zinc at site 611 increased from 2004 to 2009 but decreased in 2010. The absence of manganese suggests the source of the increase is not tailings leachate
- Further Creek drainage is expected to improve. Some element concentrations may temporarily increase as the drainage returns to its naturally acidic, dilute condition

Tailings Facility Additional Monitoring

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- Quarrying and construction of Pond 7 influenced Althea Creek chemistry and collection of foundation drainage caused a return toward pre-construction conditions
- Comparison of zinc concentrations above and below the liner suggests that the liner is intact and functioning as designed. The lack of an increase in metals from Pond 7 suggests that the small increase in zinc and lead in 2010 at Site 60 is not from Pond 7.
- Background conditions typical of muskeg drainages preclude compliance with AWQS for pH, alkalinity, aluminum, and iron at sites 60 and 609
- Pb, Zn, Cd, Hg, Mn are expected to exceed background levels and may not meet AWQS as pH and hardness decrease to background levels. The magnitude of the exceedance is expected to be small and temporary

Figure 2.40 Site 609 Zinc

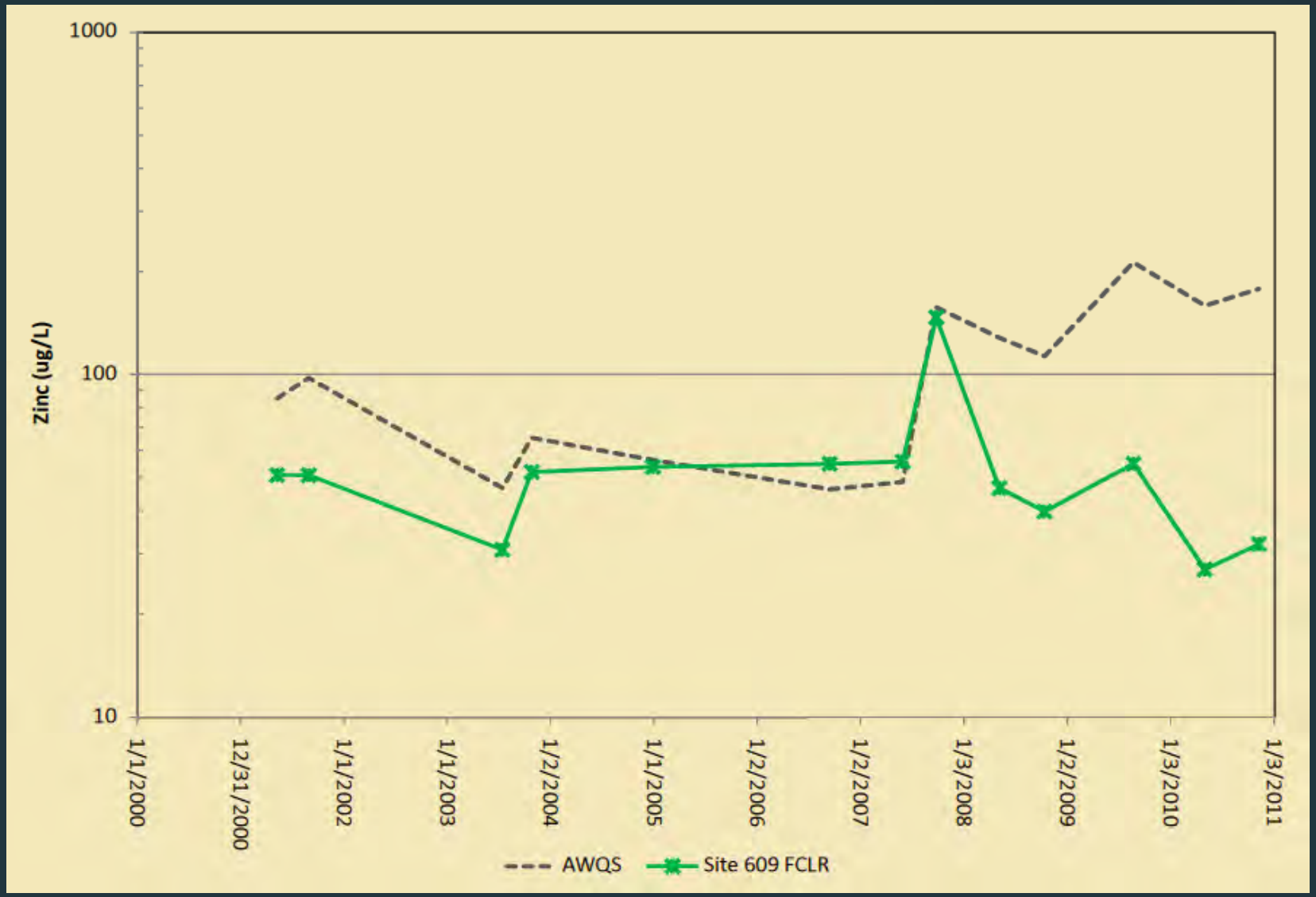


Figure 2.41 Site 609 Lead

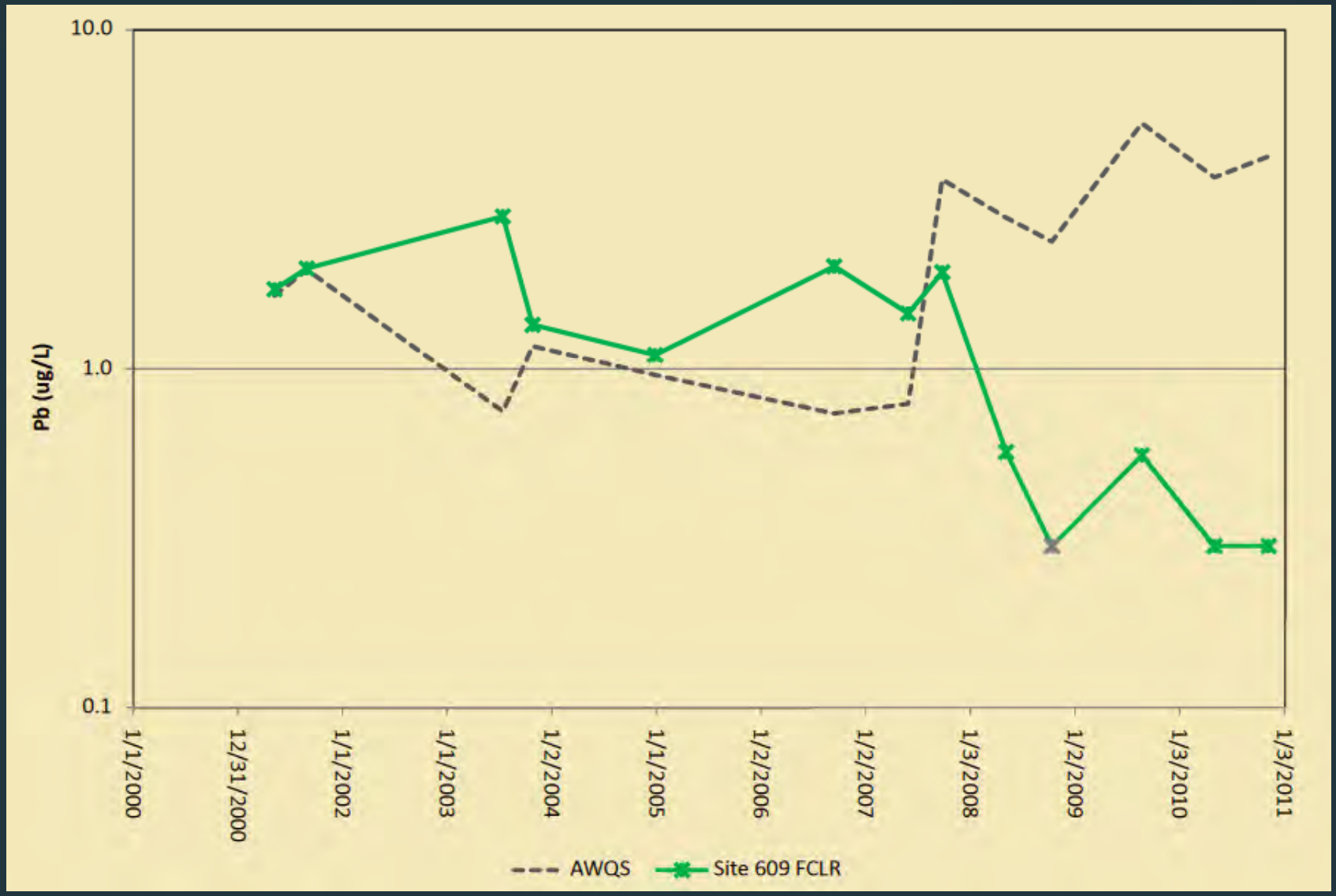


Figure 2.42 Site 60 Zinc

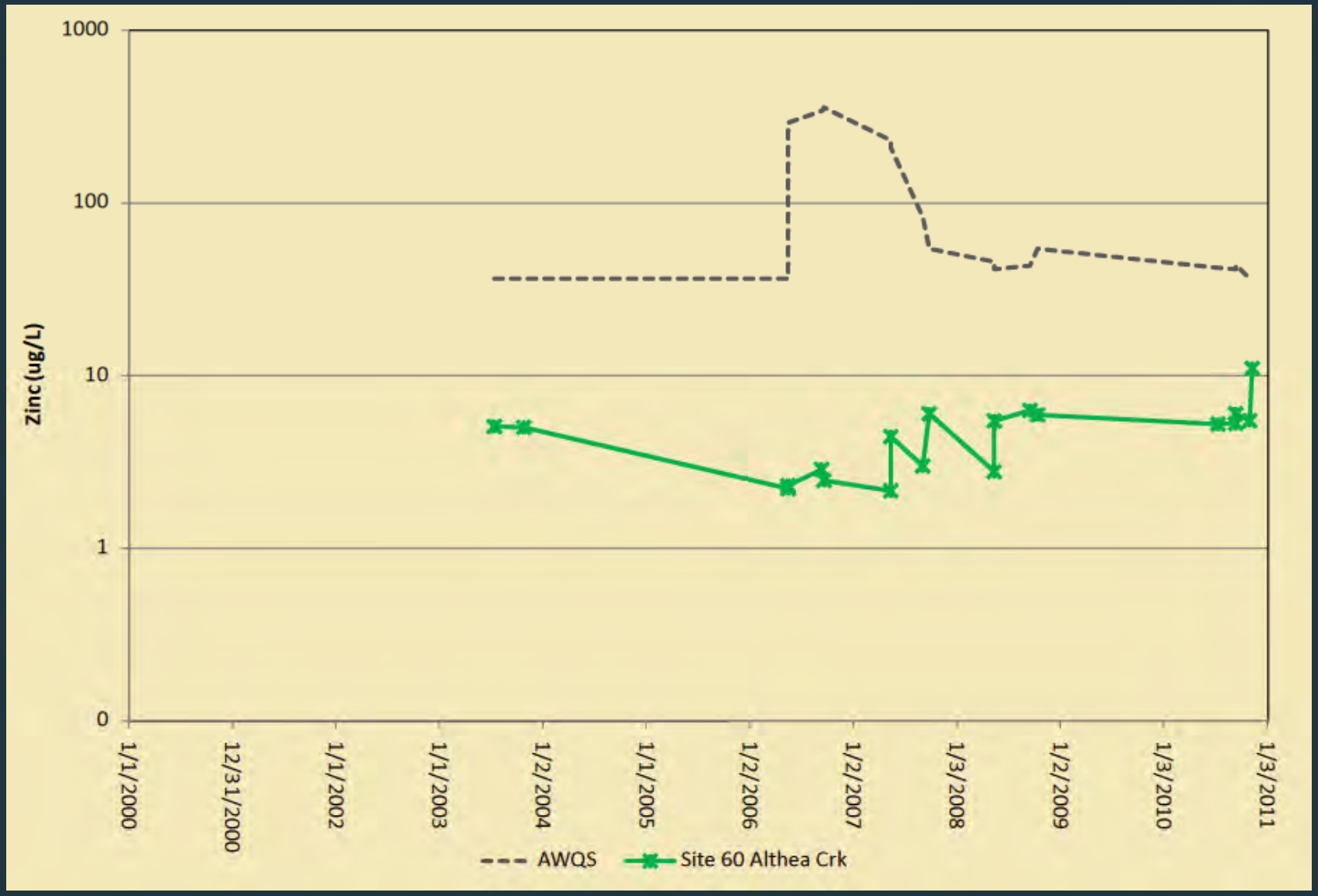
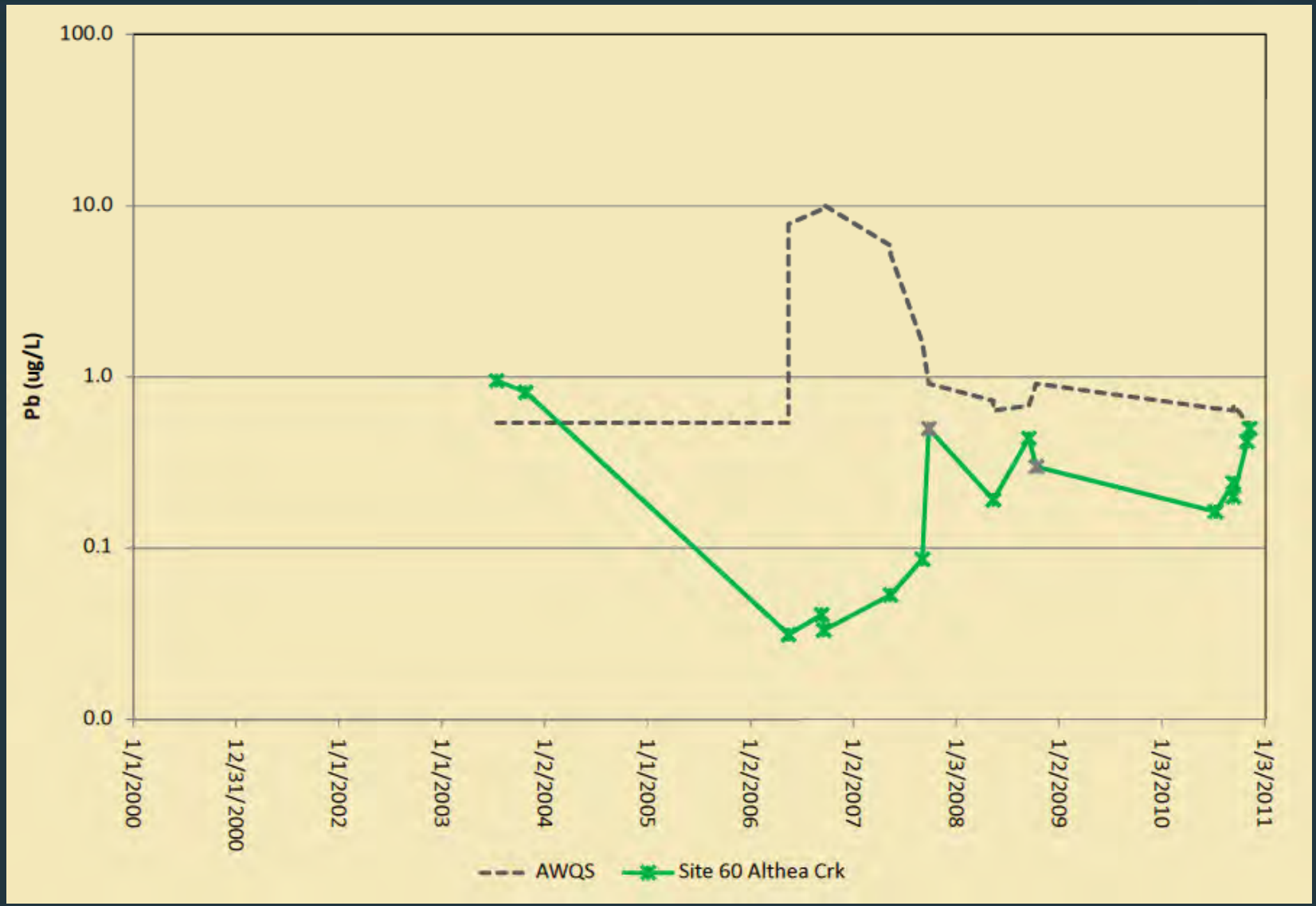


Figure 2.43 Site 60 Lead



Tails Snow Dust Sampling

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 relative to 2006. Variability due to location of active placement areas

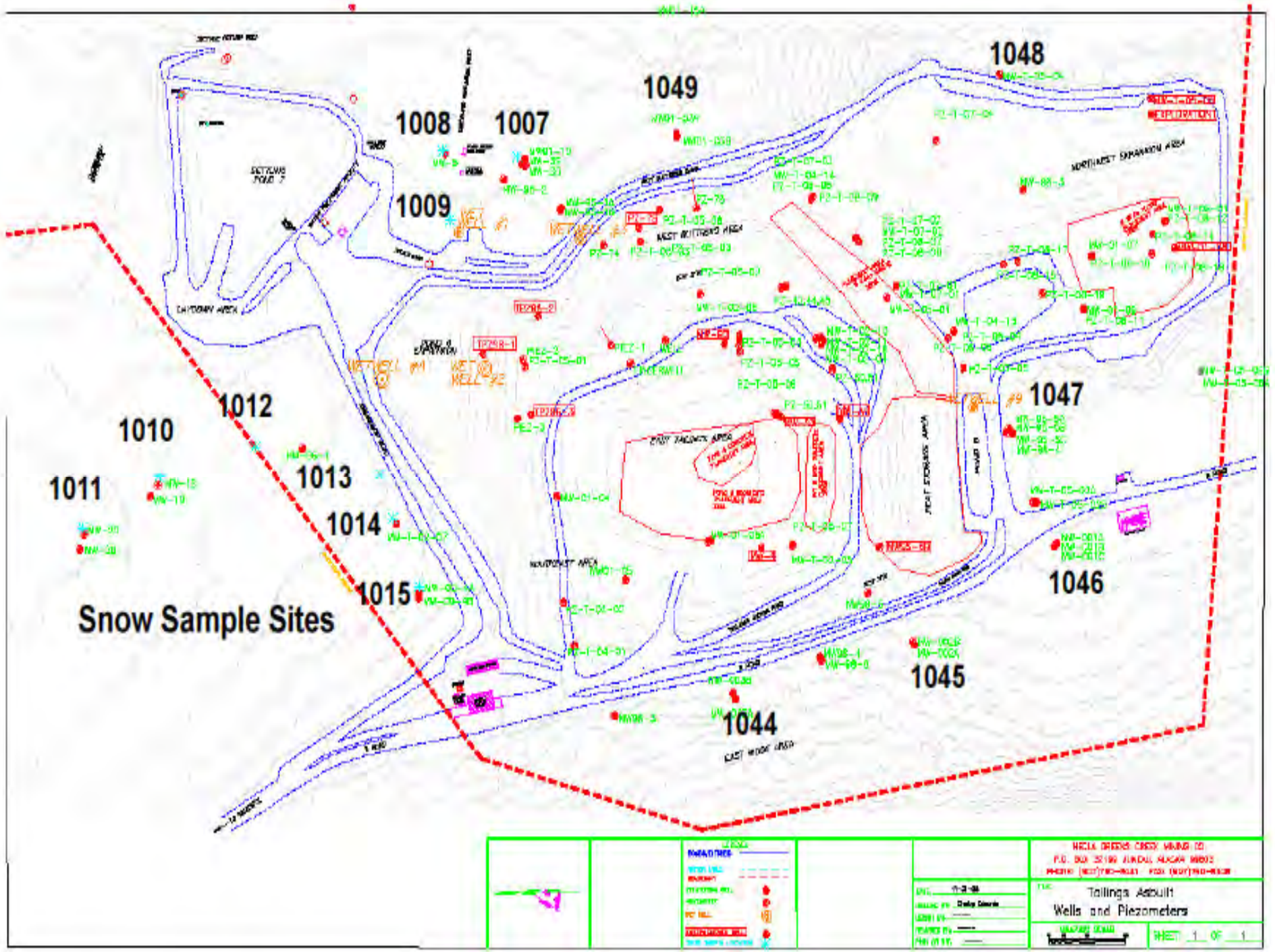

1048
1049
1008
1007
1009
1012
1010
1011
1013
1014
1015
1047
1046
1045
1044
Snow Sample Sites
Tailings Asbuilt
Wells and Piezometers

Figure 2.35 Snow Survey Analysis

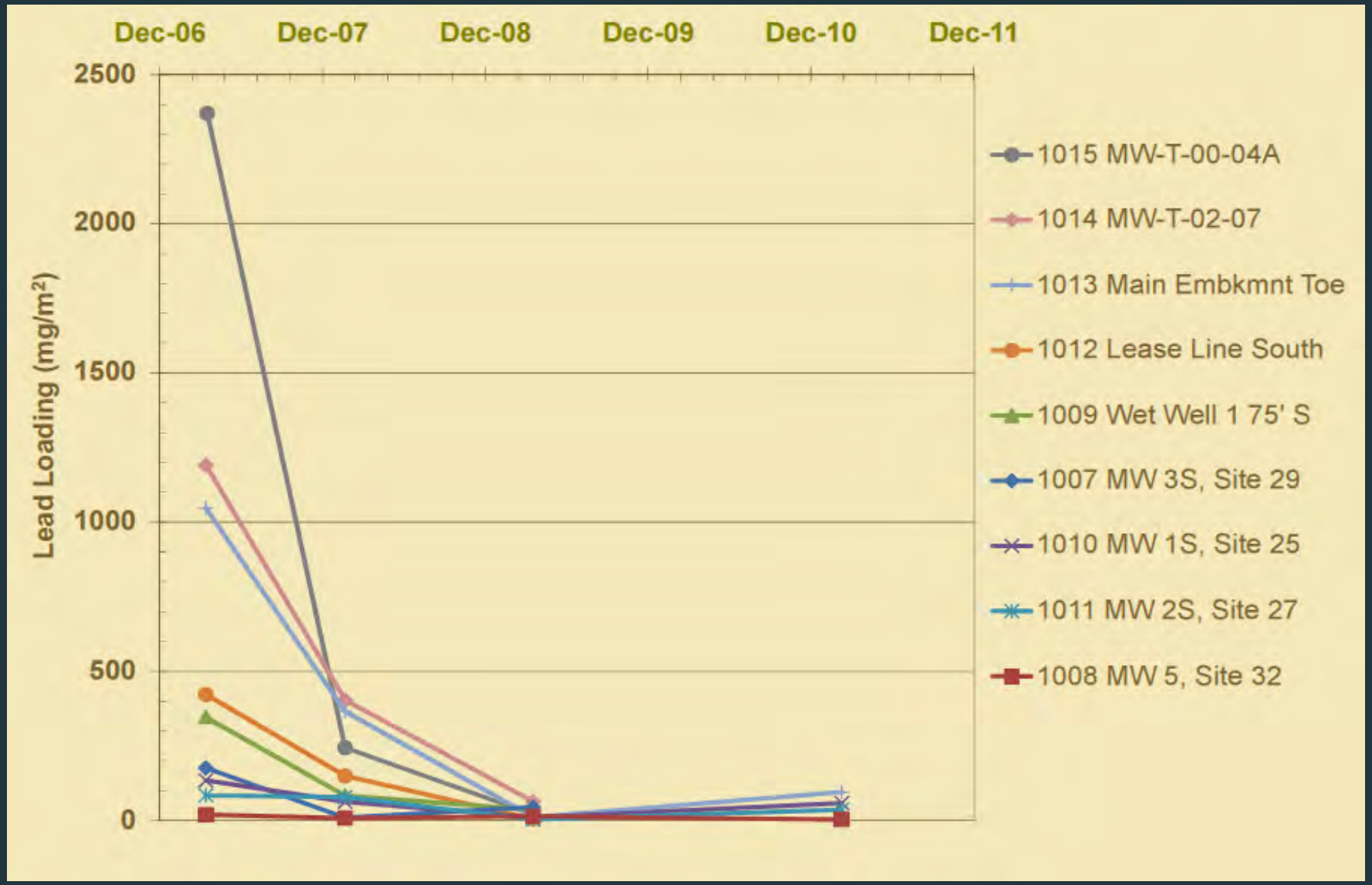


Figure 2.35 Snow Survey Analysis

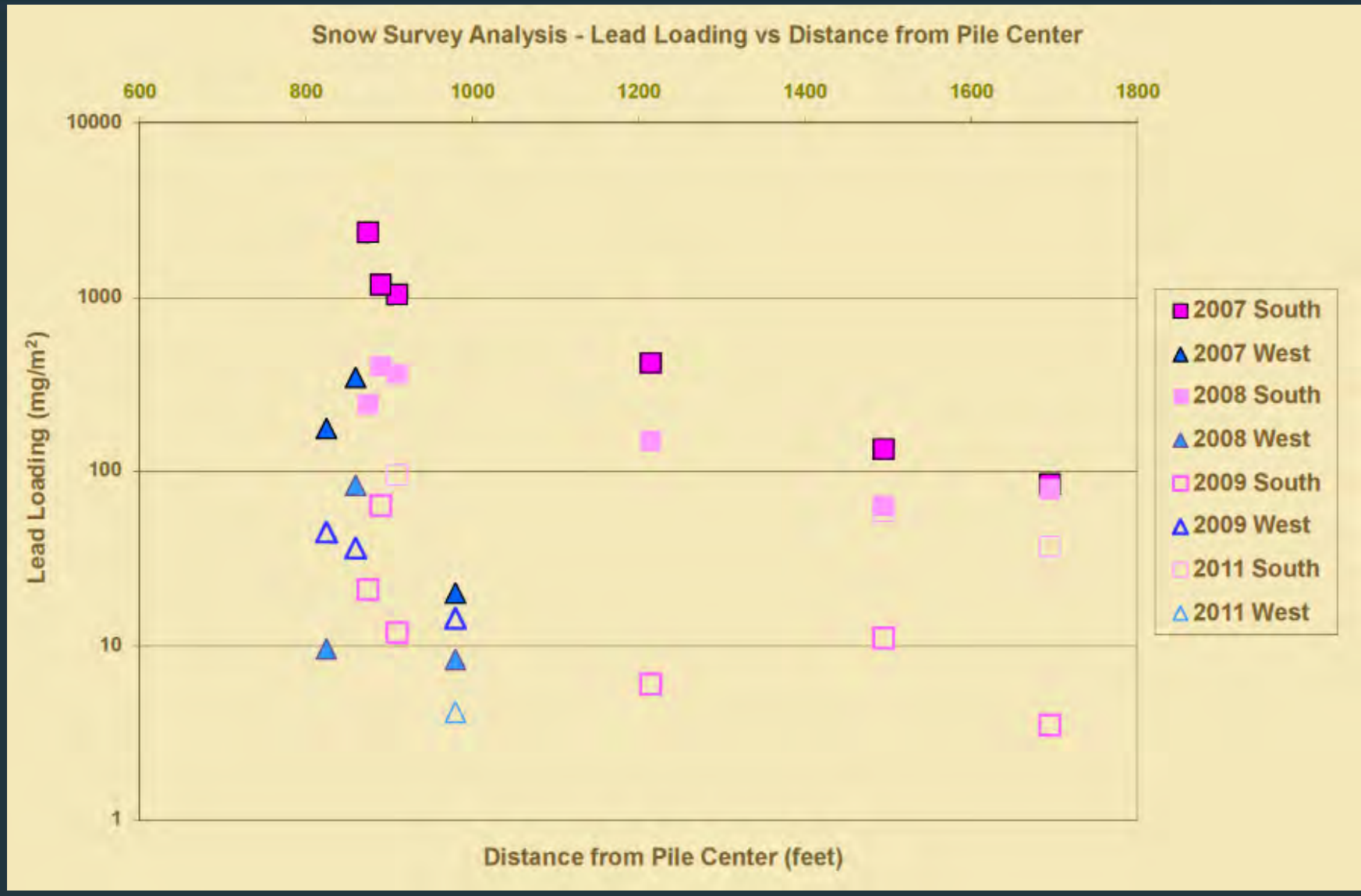
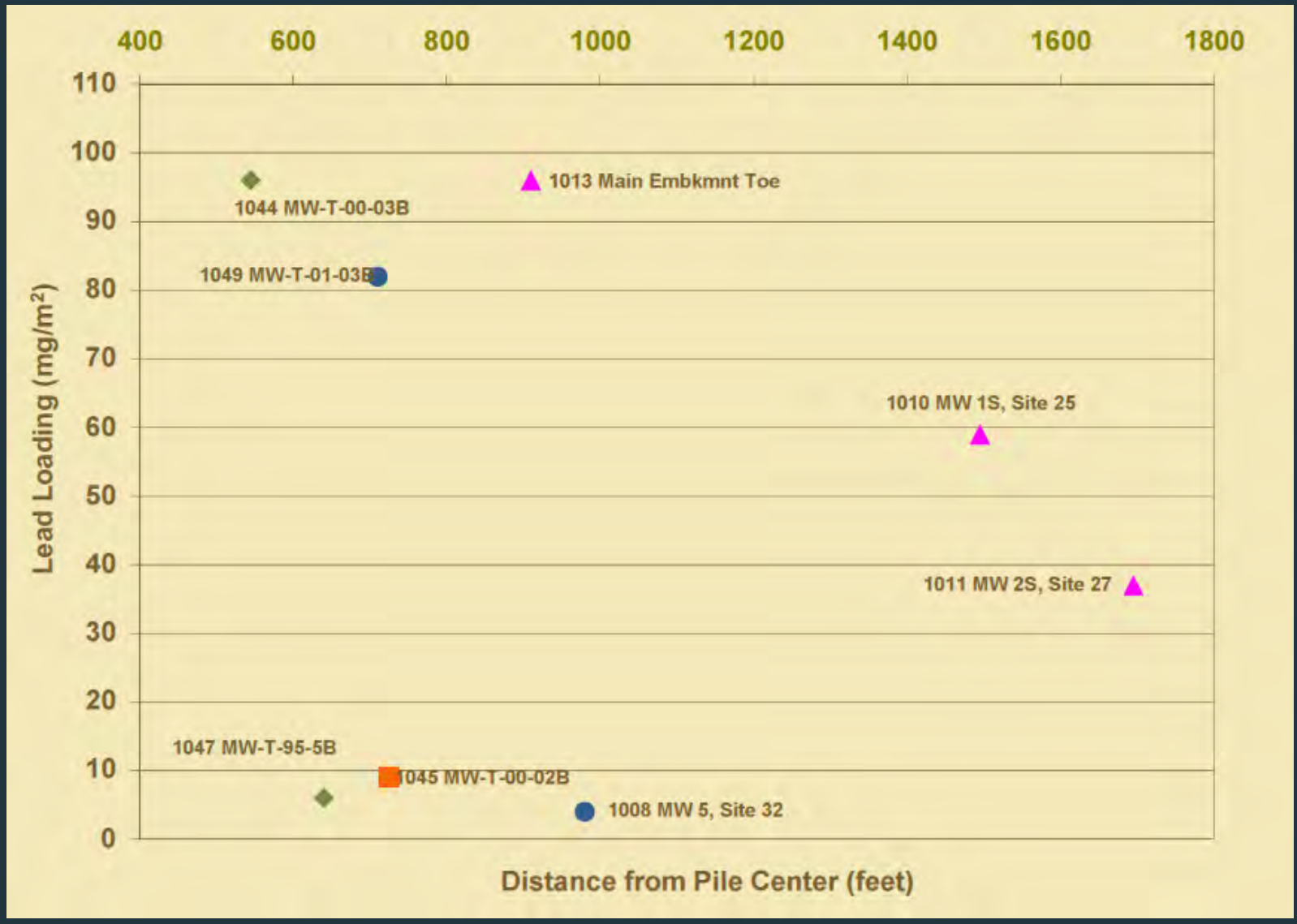


Figure 2.35 Snow Survey Analysis



Sulfate Reduction Monitoring Program (SRMP) Update

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- 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
- Seven field test plots (5 carbon amendments; 2 controls) were constructed, instrumented (suction lysimeters, tensiometers, moisture access probes), and sampled
- Laboratory batch and column test were performed to support field tests and constrain reaction rates
- Analyses of enzymes related to cellulose degradation were performed in support of field and laboratory testing

Sulfate Reduction Monitoring Program (SRMP) Update

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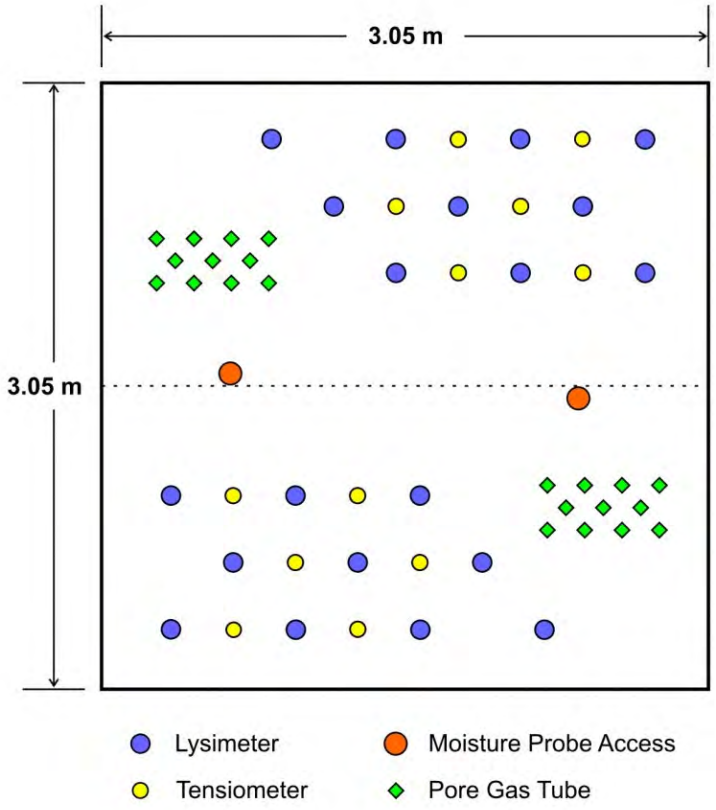
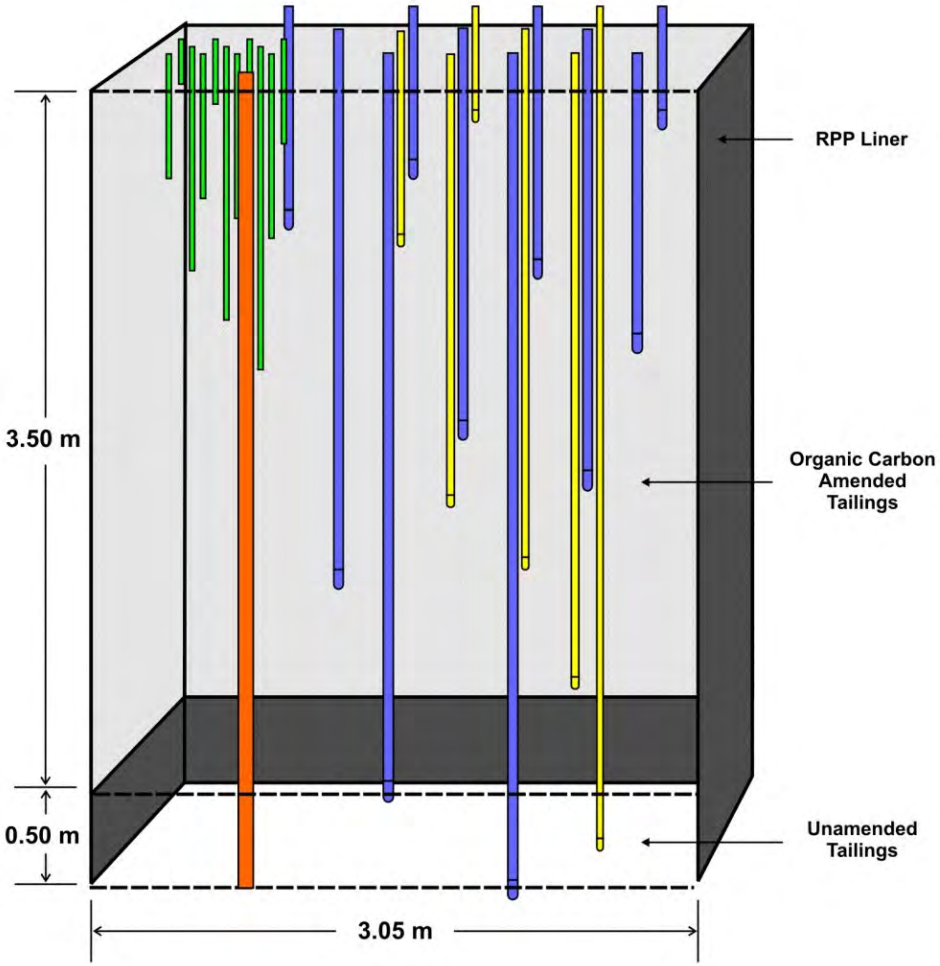
Field Test Cell Amendment Mixtures

	Tailings (vol %)	Peat (vol %)	Brewery Grain (vol %)	Bio-Solids (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 (SRMP) Update





Sulfate Reduction Monitoring Program (SRMP) Update

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- Key findings 2004-2010
  - Microbially mediated sulfate reduction in cells 4-7
  - No significant sulfate reduction in control cells or peat-amended cell
  - Precipitation of metal sulfides contributes to a decrease in sulfate and metal concentrations. Thiosulfate reduction/disproportionation is also significant.
  - Increase in iron reducers, elevated dissolved Fe and As
  - Organic carbon from biosolids is rapidly consumed
  - Cells containing spent brewing grain show best performance
  - Laboratory batch and column test results support field results
  - Carbon amendment to oxidized tailings is not recommended
  - High concentrations of DOC should be avoided to minimize iron reduction and arsenic mobility
  - Laboratory analysis of enzymes related to cellulose degradation supports water chemistry and microbiology results

Sulfate Reduction Monitoring Program (SRMP) Update

- Future work planned
  - Ongoing performance sampling
  - Geotechnical evaluation
  - Logistical considerations

Tailings Facility Acid Base Accounting (ABA) Analyses

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- 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 (ABA) Data

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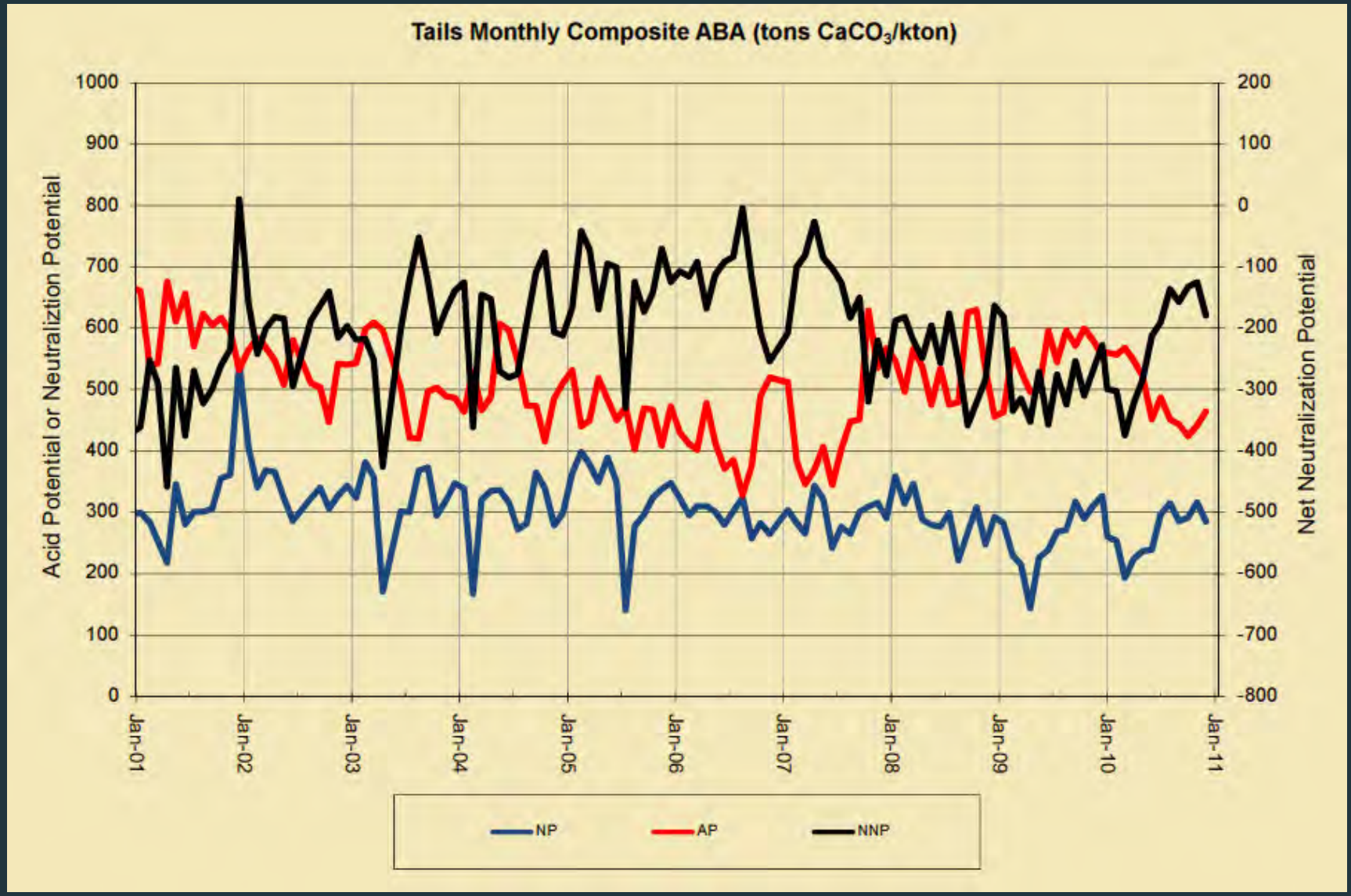

Tailings Facility General Site Management

- Operations per GPO Appendix 3 and Waste Management Permit
- Most placement occurred in northwest expansion area
- Tailings facility activities in 2010
  - Cleaned sediment from the lined degrit basins that were installed in 2009
  - Continued co-disposal of Site E rock and tailings
  - Replaced the geomembrane at the inlet to Pond 7 with concrete to create a permanent inlet channel
  - Expanded the sandpit in support of the planned East Ridge tailings expansion
  - Performed geotechnical investigation in the East Ridge area

Tailings Facility General Site Management

2011 Planned Tailings and Closure Planning Activities

- Geotechnical and environmental drilling program
- Continue Site E removal and co-disposal
- SRMP field program continues
- Stage III tailings preparation
- Cover monitoring continues
- Underground hydrology study continues