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Samatosum Division

The Samatosum Tailings Water Cover: Six Years of Success

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The Samatosum Tailings Water Cover: Six Years of Success

Opening Comments:

- **The Samatosum Division tailing water cover has performed well since installed in 1995**
- **Tailings water covers are not totally maintenance-free**
- **For INMET however, the risk associated with this solution is better than AD treatment**

Presentation Outline

- **Samatosum Division Overview**
  - **Mine description and property chronology**
  - **Tailings description**
- Water Quality Review
  - Tailings pond
  - Seepage
- Future Considerations: On-site and Elsewhere
  - Characteristics affecting tailings water cover success

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Samatosum Division Overview

Samatosum Division: Pit, Waste Rock, Plant. Photo looking east

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Samatosum Division Overview

Samatosum Division: Plant, Surge, Sludge and Sed Ponds. Photo looking west.

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Samatosum Division Overview

Samatosum Division:

Air Photo of Sedimentation Pond, Old Mill Site, Tailings Pond and Access Road

~1.5 km x 1.0 km

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Samatosum Division Overview

- Ag-Pb-Zn-Cu Mine: 1989-1992
  - 350-500 tpd pit and underground mine, 566 Kt
  - 3-concentrate floatation (tetrahedrite, galena, sphalerite), 50-60% passing 200 mesh (coarse)
  - 3,014,000 m^3, or 8.14 Mt waste rock, layered
  - 422,462 m^3, or 542 Kt, sub-aqueous tailings
  - 90% recycle, high pH slurry, effluent treatment
  - 50-60% runoff, 850 mm annual precipitation

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Samatosum Division Overview

- Chronology:
  - 1989 May opened
  - 1992 September closed
  - 1992-1993 tailings re-distributed to < 1134 m
  - 1992-1993 in-situ ferric sulphate treatment: Mo, Sb
  - 1994 tributary diversion re-routed to impoundment
  - 1995 compliant tailings pond supernatent overflow
  - 1996 wasterock and pit drainage treatment plant
  - 1998 HDS treatment plant upgrade

Samatosum Division Overview

- Tailings:
  - 25 m H x 250 m L earthen dam, 1 L/s seepage
  - 10 ha pond, 20 ha catchment --> 260 ha catchment, 2 m water cover typical (1 m minimum design)
  - Potentially acid generating tailings at 1:1.6 AP/NP
  - 10% pyrite, 3.9% S, 0.8% Zn, 8.75 paste pH

Samatosum Division Overview

Samatosum Tailings: ABA Quarterly Composite Data						
Sample	Sulphur	Paste pH	AP	NP	NNP	AP/NP
Q2 1989	3.35	8.60	102.50	50.00	(52.50)	2.05
Q3 1989	3.07	8.20	93.90	40.70	(53.20)	2.31
Q3 1989	3.97	8.40	121.50	61.70	(59.80)	1.97
Q4 1989	3.58	8.90	109.50	81.80	(27.70)	1.34
Q1 1990	3.24	8.70	99.10	103.10	4.00	0.96
Q2 1990	3.39	8.00	103.70	100.00	(3.70)	1.04
Q3 1990	4.01	8.50	122.70	86.70	(36.00)	1.42
Q4 1990	4.07	8.60	124.50	110.00	(14.50)	1.13
Q1 1991	4.57	9.70	139.80	92.60	(47.20)	1.51
Q2 1991	4.78	9.30	146.30	76.40	(69.90)	1.91
Q3 1991	4.44	8.90	135.90	93.80	(42.10)	1.45
Q4 1991	4.56	9.20	139.50	122.30	(17.20)	1.14
Avg	**3.92**	**8.75**	**119.91**	**84.93**	**(34.98)**	**1.52**

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Water Quality Review

Water Quality - Tailings Pond: Overflow Spillway. Photo looking northeast.

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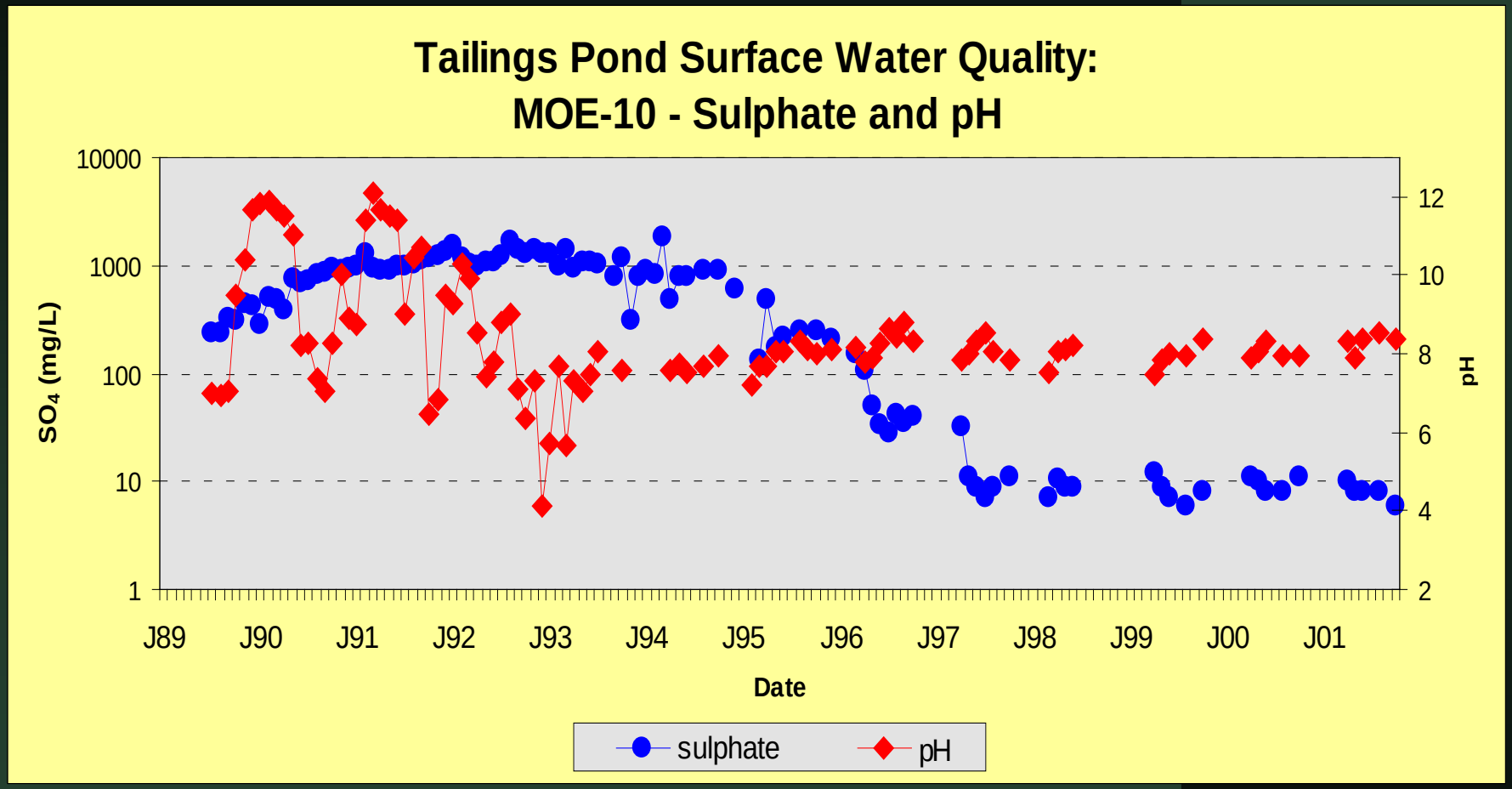
Water Quality Review



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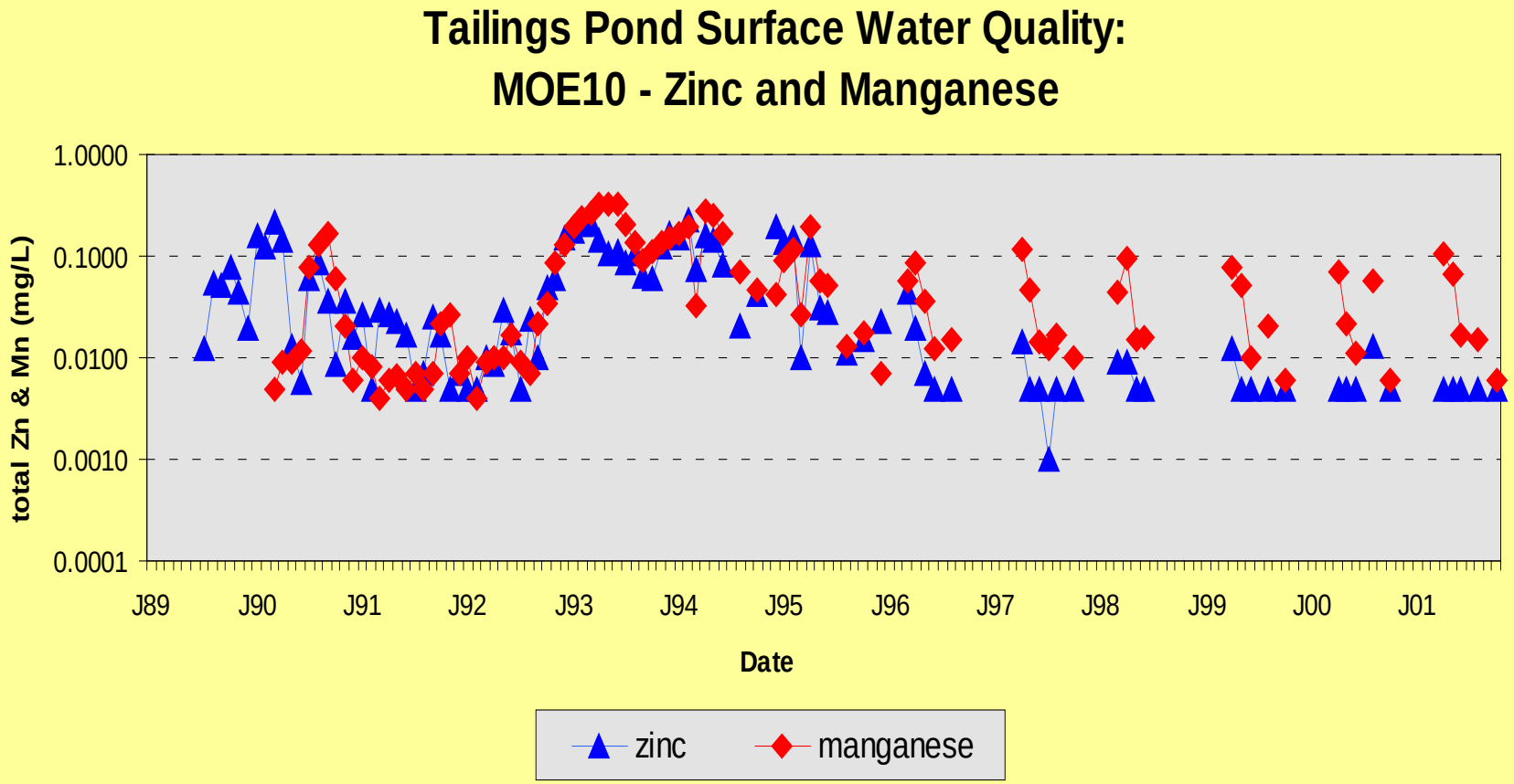
Water Quality Review



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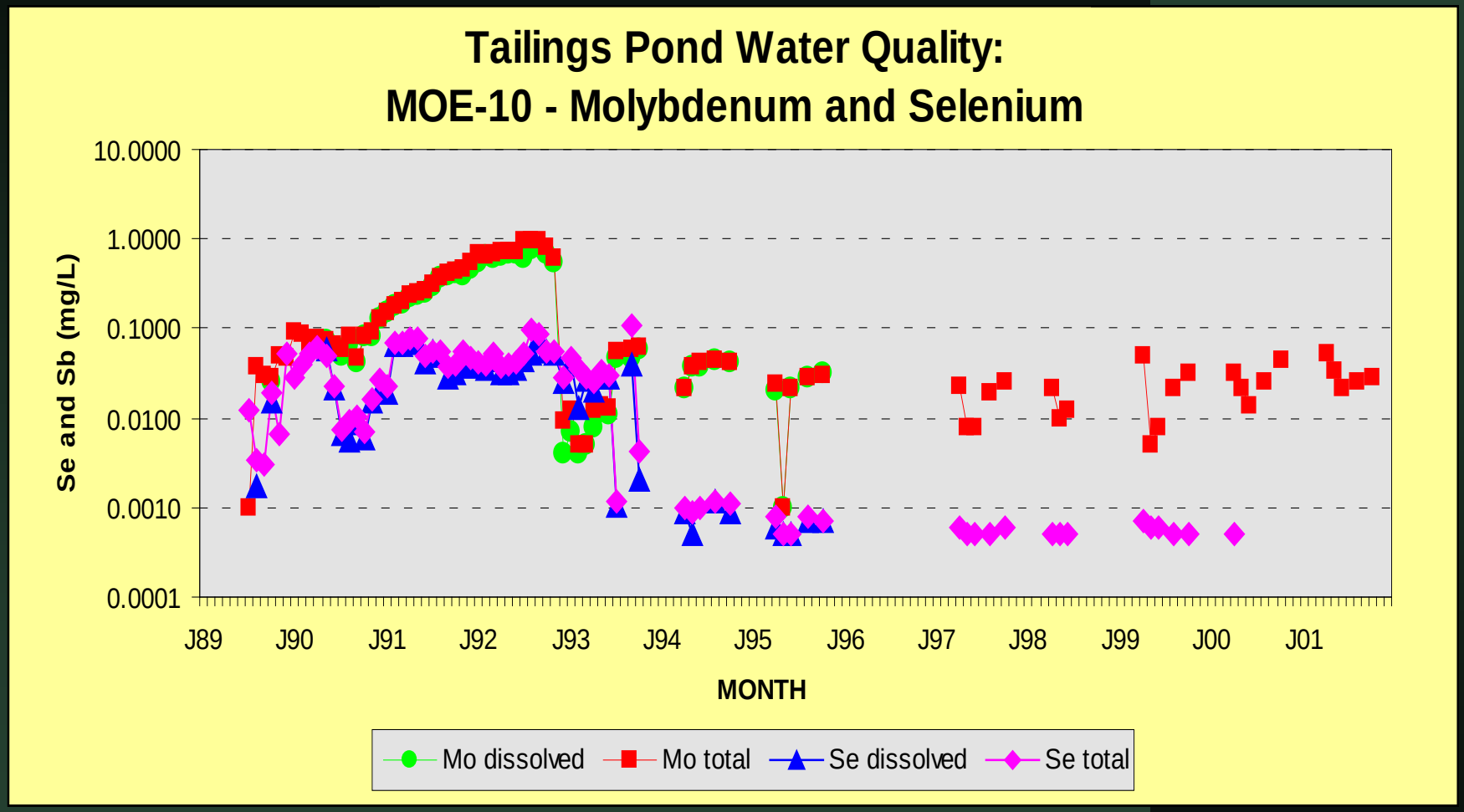
Water Quality Review



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Water Quality Review

Water Quality - Seepage Pond: Photo looking northwest.

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Water Quality Review

Water Quality - Tailings Seepage Pond: Overflow. Photo looking east.

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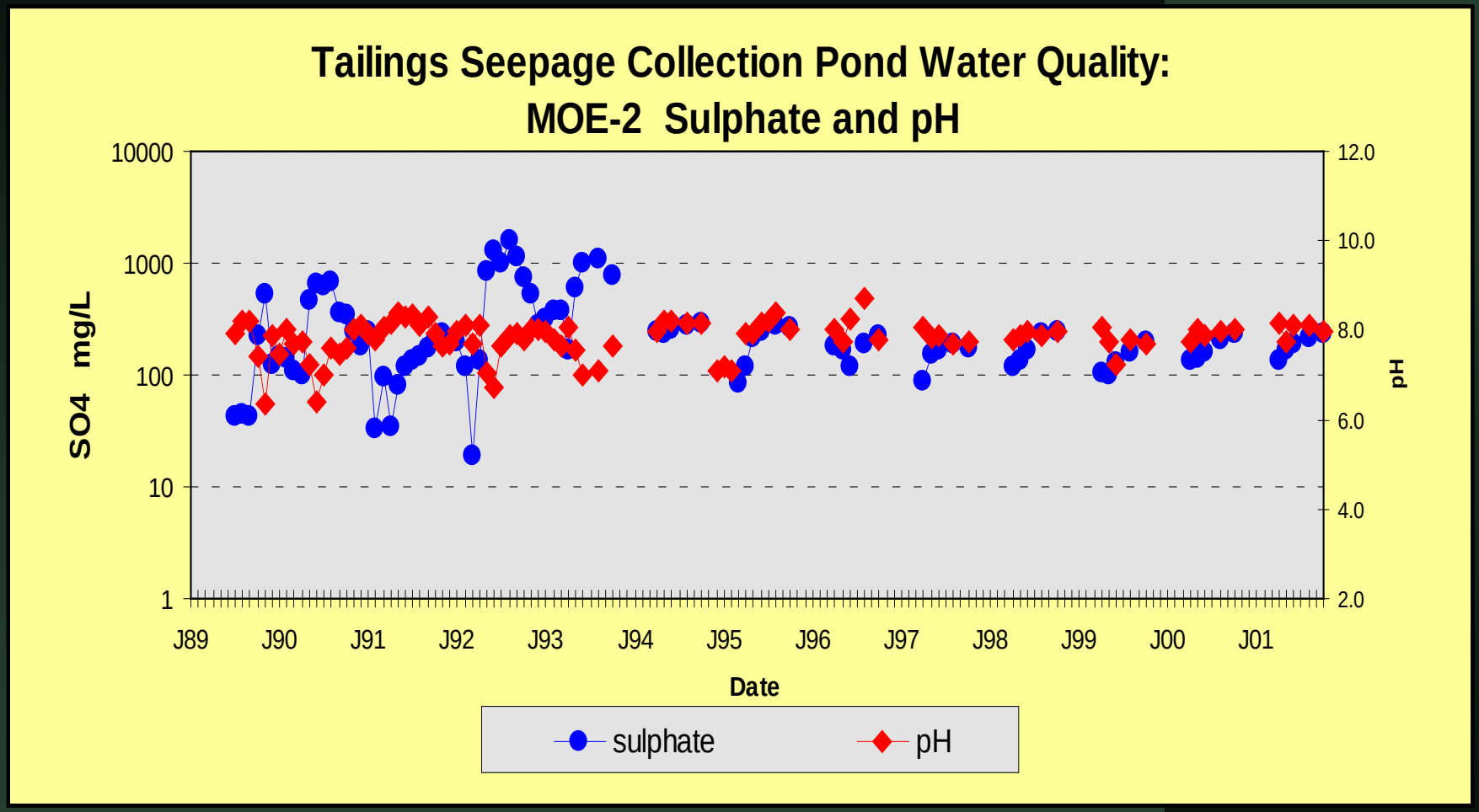
Water Quality Review



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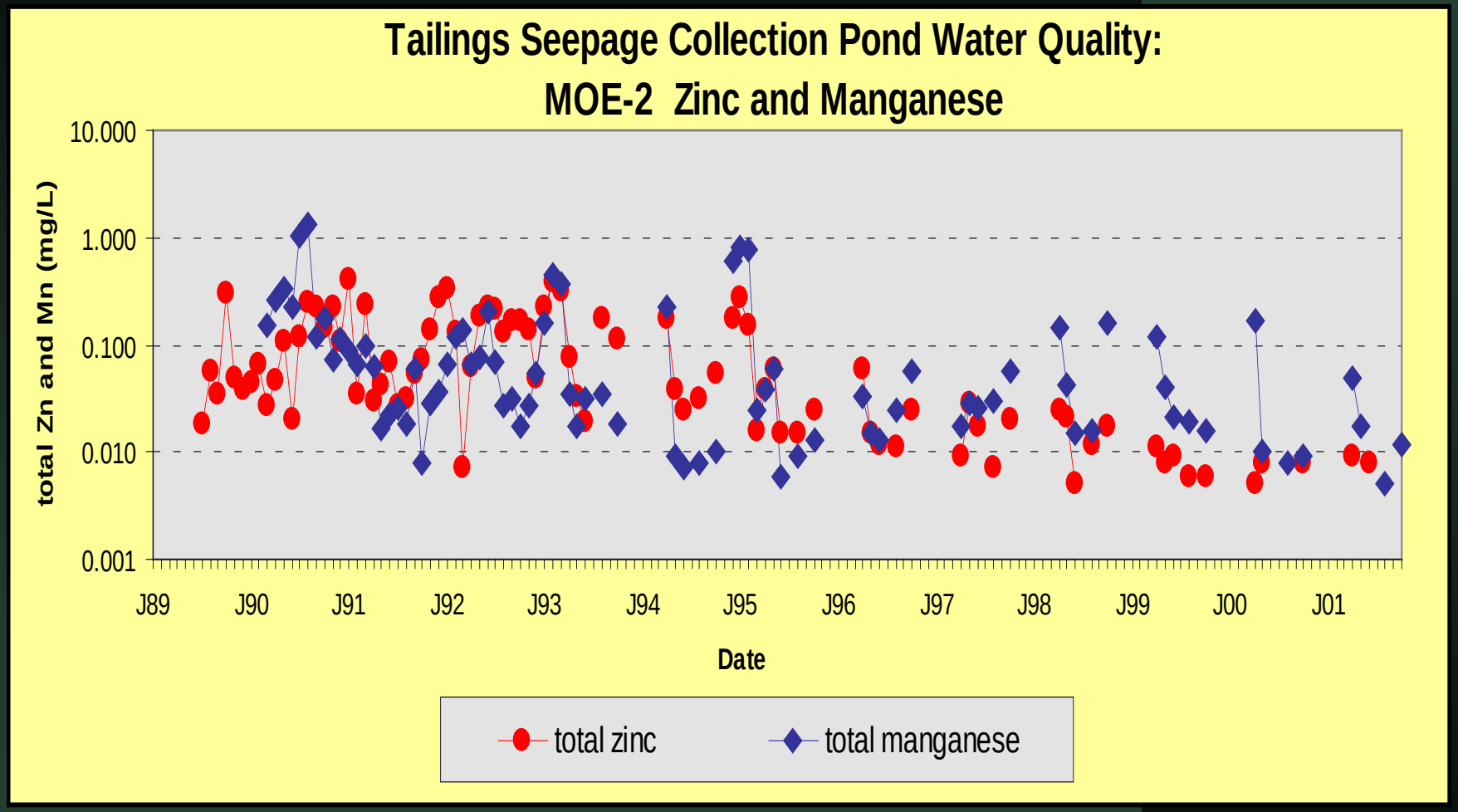

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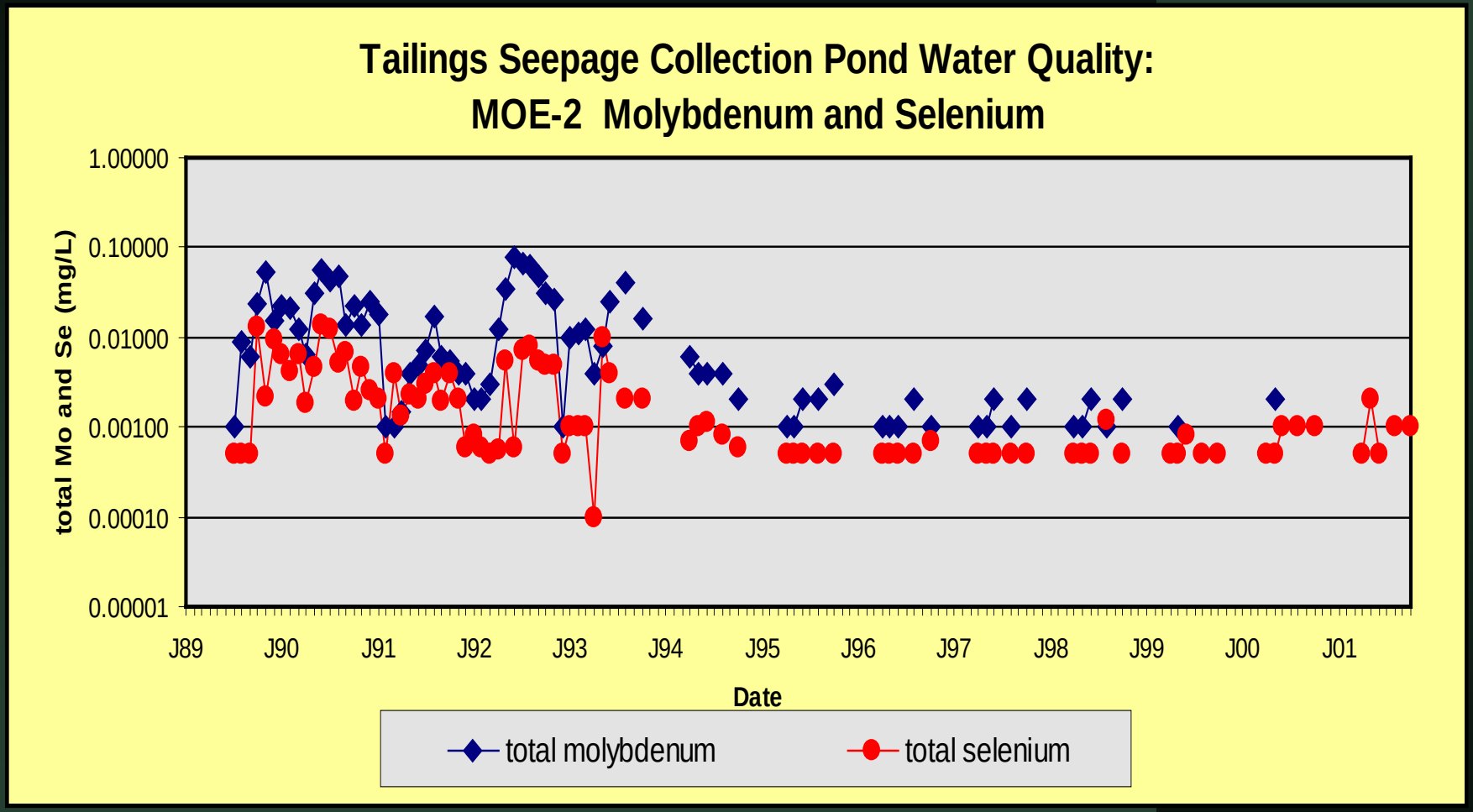

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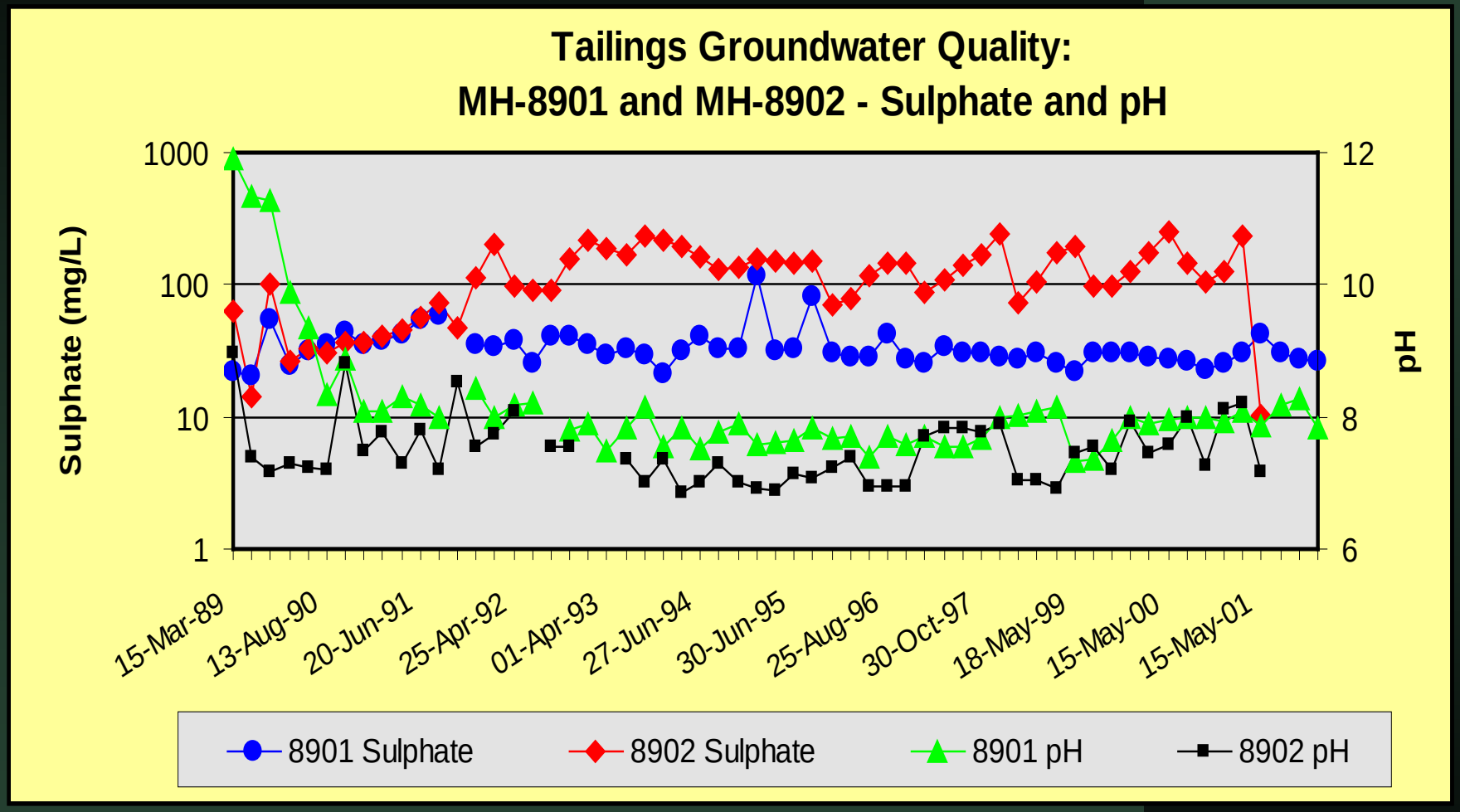

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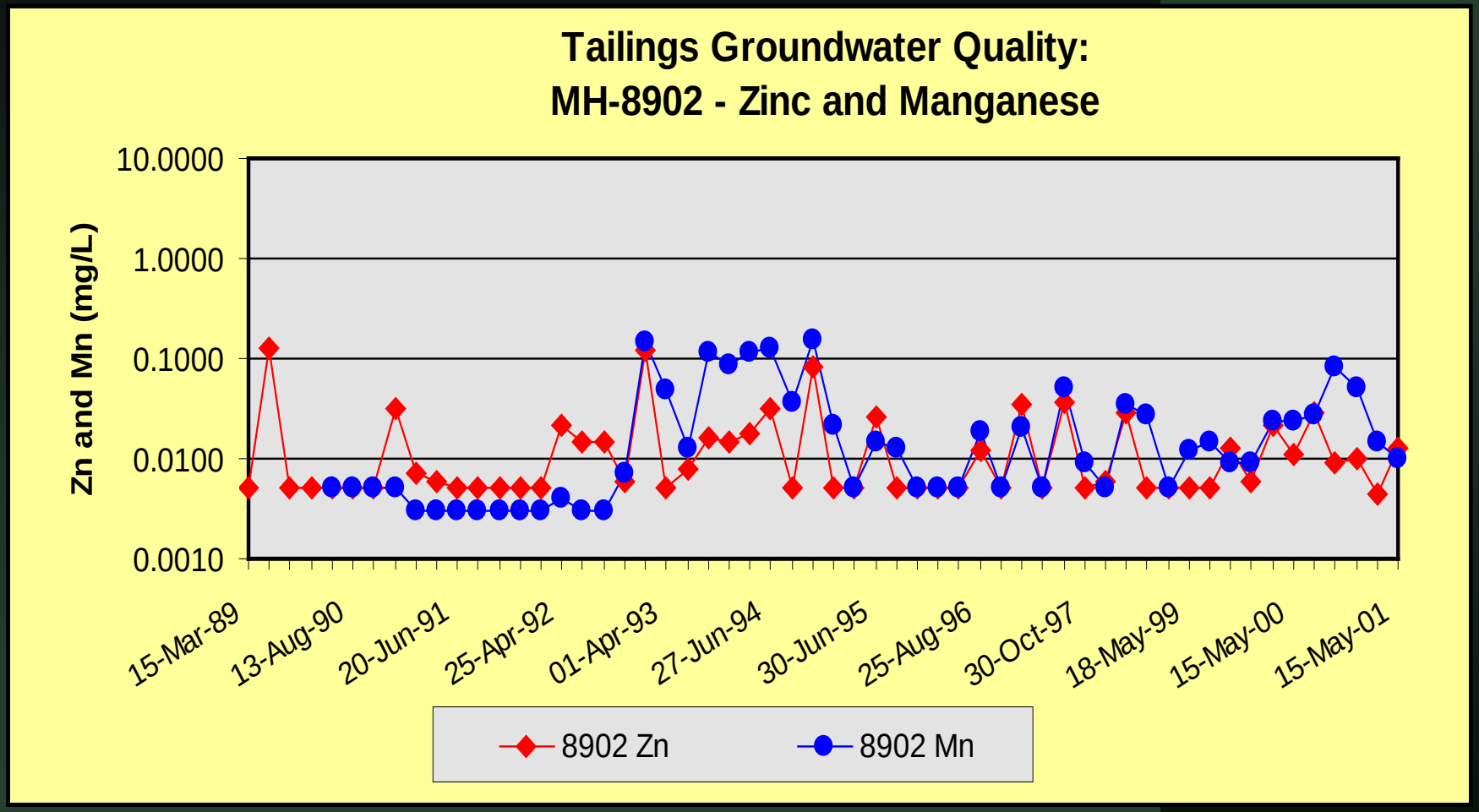
Water Quality Review



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Considerations for Success

Site characteristics that affect the performance of a tailings water cover can be either elements of:

- Design, or
- Operations, or
- Mitigation and Rehabilitation.

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Considerations for Success

- Impoundment characteristics
  - area, topography, climate (seasonal variation, wind)
  - watershed and flow-through
- Tailings characteristics
  - grain size, degree of oxidation
  - mineral content, pore water (process) chemistry
- Water cover characteristics
  - inflow chemistry, substrate (organic, carbonate, sediments), ecological systems

Collaborative Investigations ?

- Characterize successes and failures of tailings water covers relative to:
  - inflow chemistry, hydraulics and contaminant flux
  - substrate composition and thickness
  - substrate disruption (wave action, burrowers, plants)
  - substrate and pond ecosystem (algae, plants, invertebrates, fish and waterfowl) benefits and challenges

Closing Comments:

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