Mining the Pebble Deposit 404 Compliance and Unacceptable Impacts

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OVERVIEW

- Assess potential threats posed by mining the largest known ore body in the Bristol Bay watershed
- Assess applicability of CWA to reduce or eliminate potential threats
  - Compliance with CWA Section 404(b)(1)Guidelines
  - Potential CWA Section 404(c) restrictions on discharge

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Potential Threats

- Direct impacts on fish and wildlife resources from the placement of dredged or fill material;
- Direct and indirect toxicity impacts on aquatic resources from the discharge of dredged or fill material; and
- Indirect impacts due to hydrologic modification resulting from the discharge of dredged or fill material

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Direct Impacts

- Potentially 23 billion tons of fill/mine waste material from Pebble deposit alone
- At least 9,200 acres of fish and wildlife habitat losses under the Pebble Project 25-year scenario
- Over 30 miles of wild salmon spawning and rearing habitat buried under mine waste
- Unprecedented loss of fish and wildlife habitat
- Unprecedented loss of wild salmon habitat

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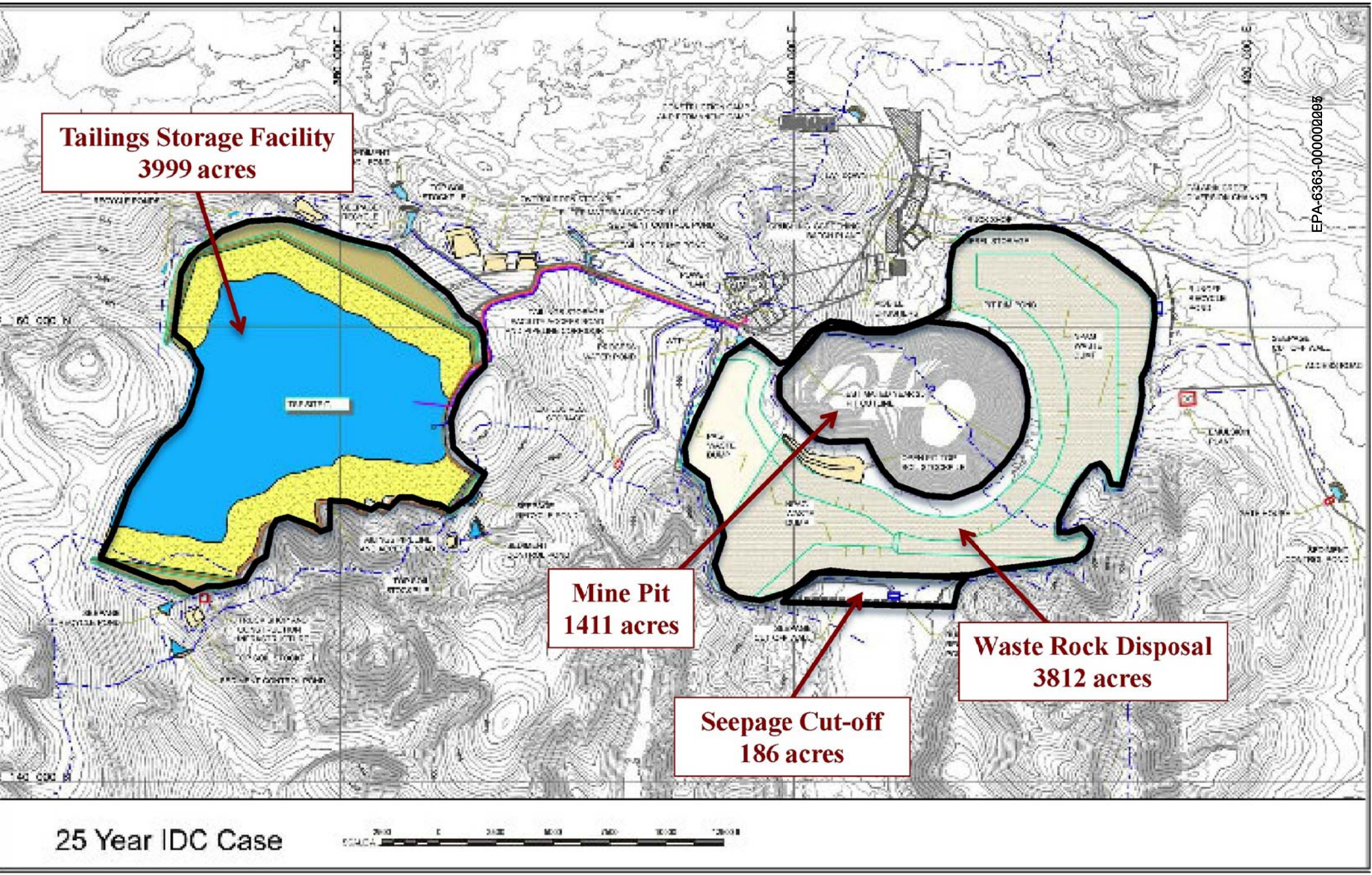

Approximate acreages of project features for the 25-year Pebble Project. Underlying figure from Wardrop (2011).

Water Quality

- Wastewater discharges potentially 3 times larger than Anchorage STP
- Low hardness = low metals Water Quality Criteria (*e.g.*, copper at 2.7 ug/l)
- No mixing zones available due to preponderance of anadromous fish spawning and rearing habitat
- Long-term risk of acid mine drainage and metals leaching
- Highly permeable soils and fractured bedrock in a geologically active area

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NPDES Discharge Parameters

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MINE	Target minerals	Ore processing rate (tons per day)	Tailings Facilities (acres)	Allowable discharge rate (millions of gallons per day)	Copper MDL/AML[1] (parts per billion)	Mixing zone?
Greens Creek	Ag, Pb, Zn, Au	2400	123	1.1	300/150	yes
Red Dog	Zn, Pb	9000	585	6.6	25.2/12.6	yes
Ft. Knox	Au	49,000 [2]	1,150	N/A	N/A	N/A[3]
Pogo	Au	3500	108	0.86	4.4/2.2	yes[4]
Kensington	Au	2000	55	N/A	3.7/1.9	yes[5]
Pebble 25-year (2 Billion Tons)	Cu, Au, Mo	218,000	4,000	26.3	2.8/1.4[6]	no
Pebble 45-yr (3.8 Billion Tons)	Cu, Au, Mo	229,000	7,600	50	2.8/1.4	no
Pebble 78-yr (6.5 Billion Tons)	Cu, Au, Mo	229,000	13,000	85.5	2.8/1.4	no
Pebble Full production (11.9 Billion Tons)	Cu, Au, Mo	229,000	23,800 (37.2 square miles)	156.5	2.8/1.4	no

Toxicity Impacts

- Pre-tertiary waste rock is potentially acid generating and leaches copper
- Kinetic tests show tailings leach copper
- Some tailings streams potentially acid generating
- Site "G" Tailings Storage Facility "leaky"
- Non-conservative approach for segregating NAG vs. PAG waste rock

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Acid-Base Accounting

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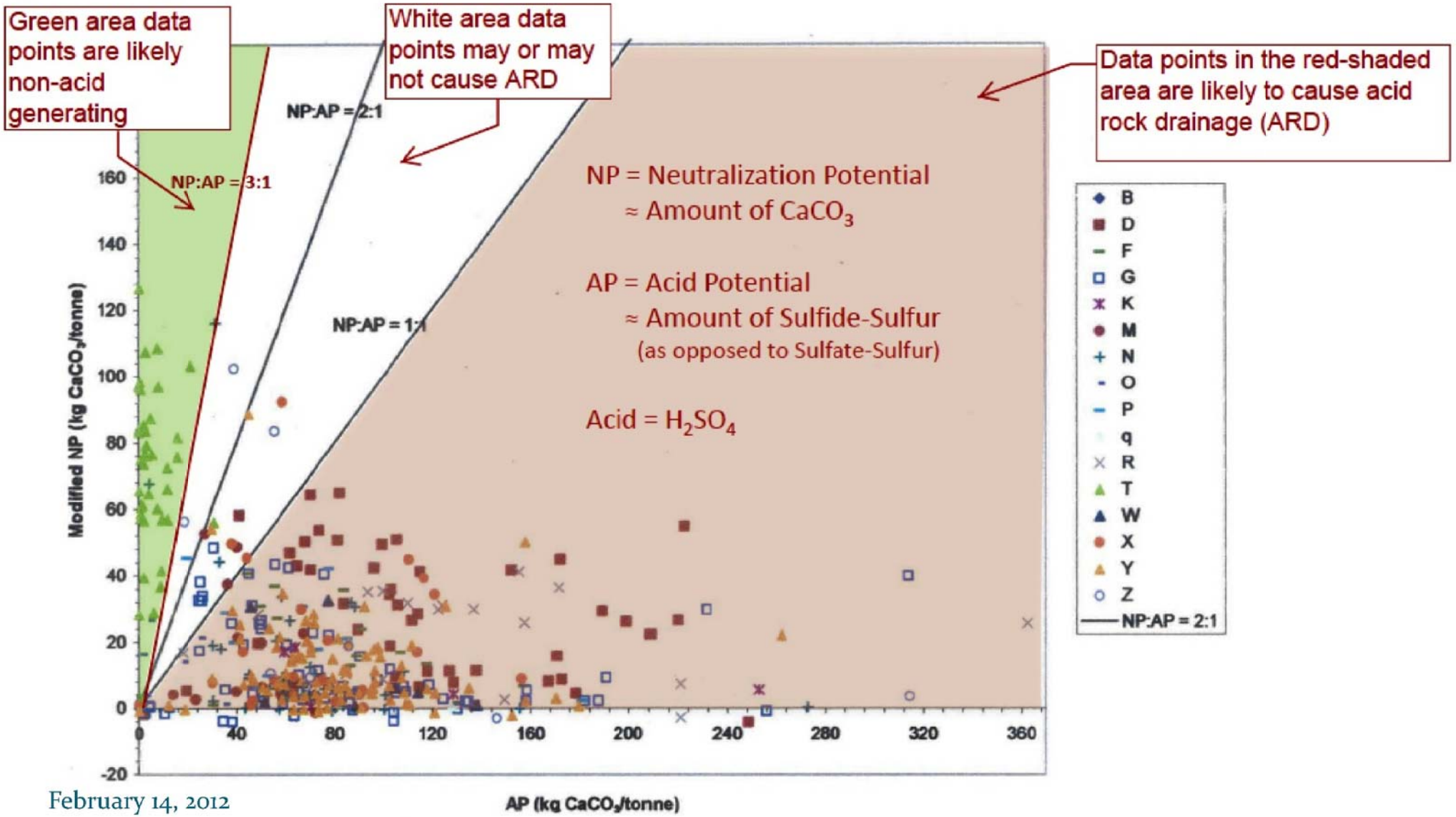

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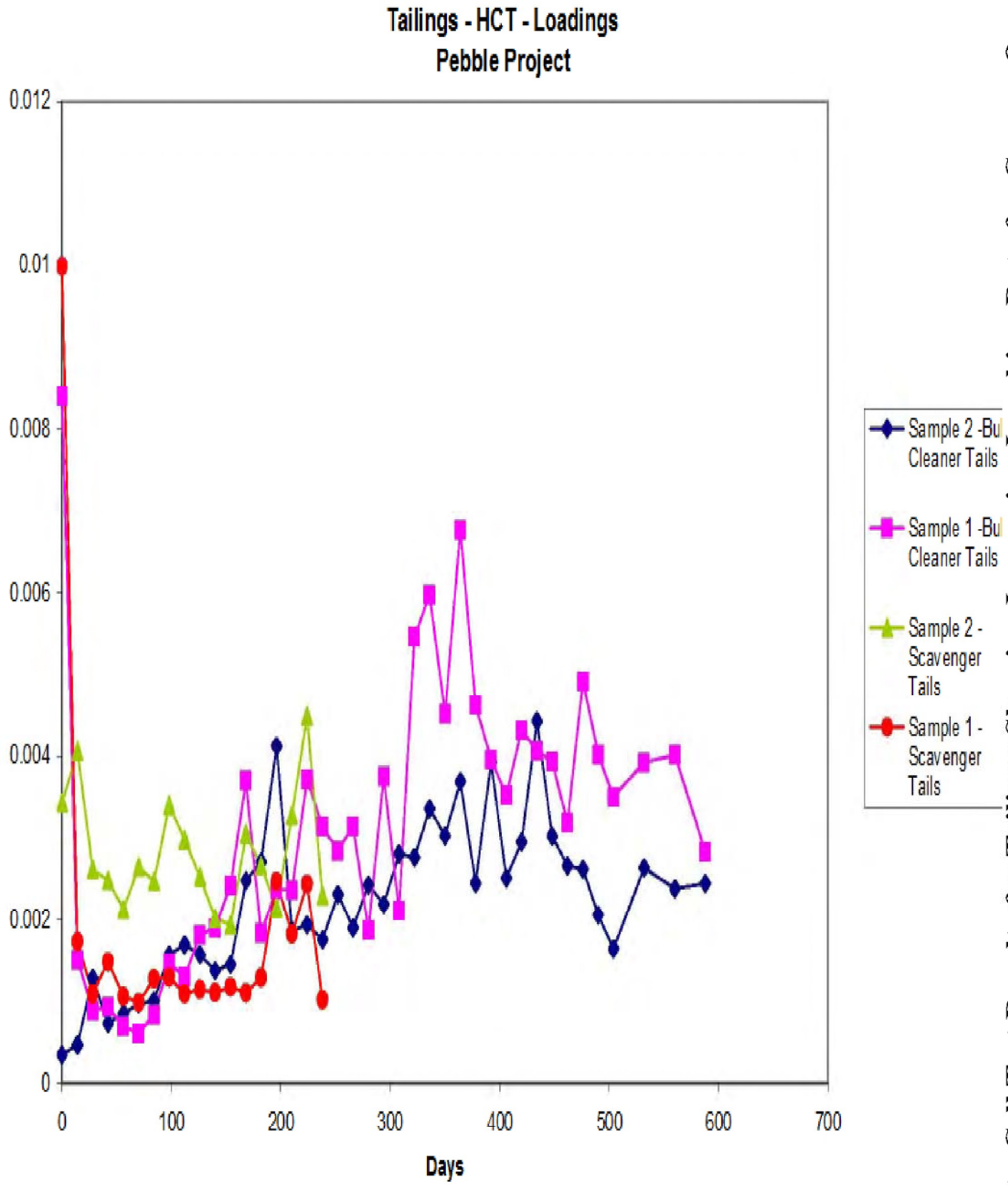

Humidity Cell Test Results for Tailings Showing Increasing Leaching Rate for Copper Over Time in Cleaner Tailings (reproduced from SRK Consulting Inc. 2006, page 183)

Hydrologic Modifications

- Assuming zero discharge, Ecology and Environment Ecological Risk Assessment (2010) predicted:
  - 21% flow reduction in NFK
  - 68% flow reduction in SFK
  - 80% reduction in UTC 2.5 miles from mine site
- Water balance shows discharges unavoidable
- Flow reductions could largely be replaced with treated mine wastewater
- Potentially effluent-dominated streams

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CWA Section 404(c)

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- Authorizes EPA to prohibit, deny or restrict the discharge of dredge or fill material where such discharge would have unacceptable adverse effects on:
  - municipal water supplies
  - shellfish beds
  - fisheries (including spawning and breeding areas)
  - wildlife
  - recreational areas
- "Unacceptable" assessed via 404(b)(1) compliance

CWA Section 404(b)(1) Guidelines

- Least Environmentally Damaging Practicable Alternatives (LEDPA)
- Water Quality and Endangered Species
- Significant Degradation
- Minimizing and compensating for losses

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LEDPA

- Project proponents/claim owners also have rights/claims to other copper ore bodies in Alaska, Canada, Arizona, Chile, and Peru
- Mining these other ore bodies would likely be less environmentally damaging than destroying miles of wild salmon spawning and rearing habitat
- Former mine sites are being proposed for re-mining given high metals prices, and these also represent possible LEDPA's.

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Significant Degradation

- Direct impacts from discharge of fill material
- Direct and indirect impacts from toxicity of fill material
- Indirect impacts from hydrologic modifications due to discharges of fill material

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Criteria met for utilization of CWA 404 (c)

- Potential impacts in Bristol Bay are far greater than other sites previously selected for 404(c) action
- Unacceptable impacts to fisheries, wildlife, recreation, subsistence
- Proactive action responds to tribal requests and addresses US trust obligations
- Proactive approach provides certainty to industry for project planning and expenditures

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Recommended CWA 404(c) Restrictions on Discharges of Fill

1. Prohibit the discharge of dredged or fill material into wild salmon spawning and rearing habitat
2. Prohibit the discharge of dredged or fill material that does not meet testing requirements demonstrating that such material is not toxic to aquatic life (per 40 CFR 230.61)
3. Prohibit the discharge of dredged or fill material runoff or seepage from which would require treatment in perpetuity

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