

Exhibit G

953 1st Avenue
Salt Lake City, Utah 84103
August 17, 2007

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DEPT. OF JUSTICE - ENRD
ENVIRONMENTAL DIVISION

Subject: Comments, Final RD/RA Consent Decree
Kennecott Utah Copper Corporation
OU2 Groundwater Remedy

Dear Madams/Sirs:

The proposed Final Consent Decree for the Operable Unit No. 2 of Kennecott's 'South Zone' groundwater contamination, with the remedy that it represents and implements, fails in several measures to address critically important issues and concerns. To reduce those issues and concerns to their most concise, they are as follows:

1. **Contaminant Containment:** The Consent Decree fails to restrict contamination to the mining impact site and devote monies expended to the narrow remediation of contamination caused by KUCC, as was intended by the original judgment that was rendered by 3rd District Court Judge Thomas Greene, the judgment that has been made into a cascade of unintended consequences. For this cascade, I can hold myself partially to blame, as the activist arguably the longest involved in this issue (since 1989) and paradoxically a former Kennecott contract employee involved at least tangentially in the early reformulation of these issues. At the beginning, if I'd remained silent, it is likely that the settlement would have been finalized in a way that would have left the contamination in-place, though probably with some degree of pumping, treating and containment; and would have "replaced" lost water resources from alternative sources. Instead, the Great Salt Lake ("the Lake") ecosystem is now severely endangered.
2. **Groundwater Remediation Alternatives:** The Consent Decree fails to realize the full range of alternatives for contaminated groundwater remediation, even failing to realize the range of technologies considered by KUCC. There were and are other ways to accomplish appropriate objectives, as KUCC proved over the years of the 1990s when it began investigation of several, viable technologies, including biosulfide selective precipitation and several forms of evaporation and crystallization. Sequenced properly, these and others not yet considered should have afforded both clean water recovery and recovery of contaminants as commodities with value. Instead, KUCC management cut off further research, silenced the release of the results of these projects, and proclaimed reverse osmosis (RO) to be the technology of choice.
3. **Contaminant Mischaracterization:** The Consent Decree, as well as previous landmark legal documents in its development (ROD, ESDs and Joint Proposal), fails to comprehend the nature of these particular groundwater contaminants ("wastes" in the parlance of the CD, once run through RO), all of which are derived from one of the most chemically prolific, extensive and aggressive acid mine drainage occurrences in the planet's history. Some of these contaminants are peculiarly persistent in environments proposed for their disposal. They don't enter into reactions of precipitation, chelation, adsorption or physical separation easily. Acid is portrayed to be the problem, but it is not. Rather, it is little more than the *vehicle* for contaminant mobilization and transport. Some contaminants of greatest concern, especially selenate (Se⁺⁶ oxidation state), are 'indifferent' to pH and remain soluble even in great expanses of tailings *and in the Great Salt Lake* until/unless reduced through microbiological activity that is the mirror of the cause of selenate's liberation from mineral in the rock. Neither does the Consent Decree recognize cumulative or synergistic effects of selenate releases ongoing from the 'North' zone, where selenium is a byproduct

- of copper electrolytic purification and subsequent precious metals refining. Together, this is one of the world's largest flows into nature of selenate, made possible by the State of Utah's misguided and negligent maintenance of the sequence of discharge permits to the Great Salt Lake. The State has written off the Great Salt Lake as a sacrifice zone and industrial sink. The Consent Decree reinforces this choice while obfuscating having made it.
4. **Mischaracterization of Tailings Line 'Benefits':** The Consent Decree, like previous documents in the sequence leading to it, fails to recognize the nature of the tailings line and tailings impoundment and the limits to benefits of this choice of disposal. Chemically, some degree of acid neutralization is about all it can accomplish, with the resultant precipitation of some compounds from oxidation and pH rise (oxides, hydroxides and products of complex interactions); and filtering by adsorption and physical separation, as sand filters can effectively do for some suspended materials. Contaminants that remain in solution, however, pass through, given the design of this and nearly all other tailings impoundments in the mining industry as sieves, porous devices to retain solids but pass through liquids. On the proverbial bottom line, contaminant chemicals have not been destroyed or even significantly altered from their potential to cycle in nature. They remain contaminants at their new location.
 5. **Consent Decree's Effective Linking of Discharge Permits:** The Consent Decree fails to recognize its own consequent role in legitimizing the concatenation of water discharge permits, from Mine to Concentrator to Tailings Line to Tailings Impoundment to Great Salt Lake, thereby formalizing the possibly tragic ecological consequences of pumping soluble contaminants from the ground and sending them ultimately to the Great Salt Lake.
 6. **Precarious Nature of Tailings Impoundment:** The Consent Decree fails to recognize the Tailings Impoundment's precarious and temporary nature in an extremely dynamic and unpredictable basin, that of the Great Salt Lake, which may experience high water levels in hydrological cycles propelled beyond the 'historic range of variability' by forecasted climate changes as a result of global warming. Only a few feet of rise beyond the high levels of the mid-1980s and mid-1990s would jeopardize the Tailings Impoundment's integrity, offering the perverse opportunity for the Lake to liberate contaminants pumped from OU2 to the impoundment.
 7. **Contaminant Relocation into Harm's Way:** The Consent Decree fails to recognize that, if KUCC denies that contaminants will be transported into the Lake, then in effect, the mass of Kennecott's contaminants will have been lifted from an area in the southwest Jordan Valley, taken outside the mining impact area, and placed into an unstable area of roughly similar extent, creating a future Superfund-type contaminant occurrence. If it was so bad at the 'south' OU2 area, then why is it so good here? Acid neutralization? But the constituent chemicals making up the contamination, mobilized and carried by the acid water vehicle, will still be there, according to the Laws of Conservation of Matter and Energy. Surely, *some* of the contaminants will be altered, but many of critical concern will not — most notably, selenate.
 8. **Contaminated Land Proposed for Development:** The Consent Decree fails to recognize the importance of this previous observation in the land use plan drafted by Kennecott Land Company and now being considered by Salt Lake County. Known as the 'West Bench General Plan,' towns, residential developments and industries are proposed on the Tailings Impoundment, on seismically-unstable fine sands that will be permeated by the mass of contaminants from OU2. This constitutes irresponsible public endangerment on several bases, and carries with it ecological portent that future human self-interest will find a way to move contaminants farther downhill, meaning only into the Great Salt Lake. Please see the attached 'West Bench General Plan' map, downloaded from the Salt Lake County Planning Department website; please also see the currently posted map at <http://www.pwpds.slco.org/images/westbench/CalthopePlanMap.pdf>, which communicates even more graphically the residential nature of proposed land use on the surface of this *de facto* but insufficient repository for contaminated materials from OU2, as well as from the Mine's long history.
 9. **Surreptitious Contaminant Relocation History:** As we have learned the story over these recent years of non-disclosure and administrative opaqueness, KUCC has been pumping contamination from the acid/metals plume since 1996, directing flows into the Tailings Line and sometimes into the

- Great Salt Lake by virtue of linkages among the UPDES permits. Several years of this discharge occurred while I was employed as contract environmental planner and contracts manager for the very group that engineered the system by which this occurred (KUCC Environmental Engineering Projects Group) -- a fact concealed from me even on the "inside." These years of "early pumping" apparently account for the fairly dramatic reductions of quantity estimated in the acid/metals and sulfate plumes, aside from the perniciously consistent *de minimis* claims of KUCC toward environmental responsibilities for this, one of the world's most significant contamination occurrences. How much surreptitious dumping has already occurred? What is the magnitude of harm and risk already caused? Who is culpable for these potentially damaging decisions to look the other way, allowing KUCC to perpetrate this outrage, clearly against the intent of Judge Greene as he rendered the opinion that sent the groundwater resolution 'back to the drawing table' in the early 1990s. Is DOJ now prepared to preside over such a patently illegal, immoral and unjustifiable act?
10. **'Transport and Fate' Analysis Avoidance:** The Consent Decree, like all the documents and decisions preceding it in this unfortunate sequence, fails, therefore, to follow through the 'transport and fate' analysis that would have restricted the remedy to the mining impact site; favored technologies that recovered for human highest-and-best use not only water, but also the dissolved copper, aluminum, potential gypsum and other commodity constituents (instead of turning them into a frothy, undifferentiated 'glop' in the Tailings Line); and that recognized the extreme global and hemispheric importance of the Great Salt Lake's migratory bird populations; and then rendered choices that were protective of the environment while still recovering water and commodities. We request that our previous comments on the Joint Proposal be incorporated herein as elaboration of the ecological tragedy this Consent Decree will perpetrate.
11. **Risk, Liability and Indemnification:** The Consent Decree inadequately develops the mechanisms by which KUCC will indemnify the United States for future consequences of this remedy set. Instead, the public is left with essentially the entire risk. Salt Lake County, particularly, is faced with approving, under immense political pressure, a 'general plan' that exposes residents, businesses and municipalities to occupy these newly engineered/contaminated sites to unprecedented hazards. This will *happen on your watch, under your auspices, in your chapter of the region's environmental history*, if and only if you validate this Consent Decree. In the face of a likely Tailings Impoundment failure or a 'turning acid' event to remobilize the relocated contaminants (virtually inevitable, over a decades-to-centuries timeframe, far short of the "10,000 year" threshold we see in RCRA), it will be important to assure that remedies are maintained to hold responsible Kennecott, Rio Tinto and any other mining or land holding company that enters this chain of liability. At the considerable (and rapidly escalating) levels of cost for remediation, neither the local/regional/state "public" nor the federal "public" can or should be charged with this responsibility. It is nothing short of an outrage. In the short run, closely monitored variables in the Great Salt Lake and at the monitoring points around the Tailings Impoundment must be mirrored by rapid, effective response *solely at the expense of Kennecott and Rio Tinto*. In the longer term, the cost of an eventual, catastrophic response will dwarf the cost of appropriate, responsible groundwater containment and remediation at OU2, dwarfing even the cost of Kennecott's generally laudable soils source control cleanup actions of the 1990s (for which they were largely compensated by insurance companies). A bond -- a huge bond, measured in billions of dollars, almost as much as KUCC earned in 2006 from the Bingham Canyon Mine -- would be the appropriate mechanism to put into place for this level of risk, a bond of unprecedented magnitude. This fits, given that it is a risk of unprecedented magnitude, both to the future residents and users of newly contaminated lands and to the many millions of migratory shorebirds and waterfowl that depend on the Great Salt Lake each year, year after year, century after century.
12. **Migratory Bird Treaty Act, Ramsar and the Great Salt Lake:** The 1918 Migratory Bird Act protected many of the species among those (250+ species documented extensively in scientific literature) that frequent the Great Salt Lake. Some use the Lake and its shorelands in numbers exceeding populations found anywhere else on Earth; others are in huge numbers, though not of such unique proportions; some are quite rare; all will be devastated, we may safely assert, if the Lake's habitat functions are disrupted in any way by the introduction of KUCC's massive geochemical

"contribution." Without question, some significant portions of the groundwater plumes could be engineered to mirror Lake chemistry, and could be placed safely into the Great Salt Lake: sulfates of several variations, for example. Other contaminants, however, including selenium variants, aluminum, and all of the toxic metals (zinc, copper, cadmium, etc.) known to be present in the acid/metals plume, *must not be allowed into the Great Salt Lake any more than they already have*. Indeed, the damage may already have been done. The Lake is one of the Western Hemisphere's most critical migratory bird breeding, feeding and resting areas. As such, it is long overdue for Ramsar protection as an internationally recognized wetlands area. Neither Kennecott nor Rio Tinto behave as though they recognize or care about the ecological importance of this place. Perhaps our present natural resource valuation case law does not allow a value to be placed on matters such as this, but someday it will. When it does, the public will own some enormous mining properties around the world.

As indicated before, *mea culpa* for some part I have played in the development of this regrettable remedy. We cannot accept blame, however, for KUCC's extreme historical indifference to ecosystems, wildlife and nature. The choice to allow leach water to leak from the Large Bingham Reservoir in the first place was just that --- a choice, made when the company elected not to line the reservoir in order to save roughly a million dollars, in 1964-65. In general, we are taught to face and pay for the consequences of our choices, especially when they are made willfully and with foreknowledge of the consequences. The Consent Decree, like the Joint Proposal, the ESDs, the ROD and the other decision documents in the sequence leading to this point, fails abjectly either to face the realities it will institutionalize into law or to seek to defend the public good or the ecosystems and wildlife that are the embodiment of the public good.

Sadly, if this Consent Decree is approved, we must now relinquish hope for the fate of the Great Salt Lake. Those communities of people who may innocently choose to live or work on or around KUCC's and KLC's land use adaptations of the Tailings Impoundment, with its new Superfund-level contaminant burden, seismic instability and susceptibility to future flooding, will eventually fare as badly as the Western Hemisphere's migratory shorebirds and waterfowl. Only by rejecting this Consent Decree and changing it substantially to address points raised here --- especially insistence on addressing contamination within the mining property, and doing so in a manner to restrict impacts within that property --- and previously can an enduring remedy be chosen on behalf of the public and regional ecosystems. This Consent Decree, in short, is an enormously harmful mistake, a mistake that was imminently avoidable, ultimately for the financial benefit of a foreign-owned corporation. As seems endemic to the mining industry, it is the community in all its senses that takes the risks and winds up suffering.

Sincerely,



Ivan Weber

Enclosures:

- Critique (for Sierra Club Utah Chapter) of Joint Proposal, 2003
- Addendum to Critique, 2003
- Map, West Bench General Plan, Kennecott Land Company and EDAW, October 2005



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October 19, 2003

Dr. Dianne Nielson, Trustee of the Natural Resource
Executive Director, Utah Department of Environmental Quality
168 North 1950 West
Salt Lake City, Utah 84114

Subject: Critique, Natural Resource Damage Claim Proposed Settlement
Kennecott Utah Copper Corporation Ground Water Contamination

Dear Dr. Nielson:

Please consider the following critique of the Kennecott Ground Water Natural Resource Damage Claim proposed settlement, submitted on behalf of the Utah Chapter of the Sierra Club's more than four thousand members. The mission and purpose of the Sierra Club encompasses the full spectrum of environmental phenomena, from urgent problems to compelling opportunities.

We see nearly the entirety of the Oquirrh Mountain range encompassed in Kennecott's environmental history, culminating in this settlement proposal among other aspects of facility 'closure' planning. Until now, the predominant environmental impacts of Kennecott and preceding activities in and around the Oquirrh Mountains have included the following:

- Air pollution from smelting and refining is a picture that has improved drastically in recent years, while leaving several miles at the north of the range acidified, denuded of topsoil and incapable of supporting most plant growth in approaching decades, if not centuries.
- Deforestation by a combination of over-harvesting in pre-Kennecott, early settlement and timber-hungry underground mining years.
- Overgrazing, which contributed to vegetation community alterations of extensive and permanent nature.
- Acid mine drainage from unknowing and careless waste rock dumping and inadequate leach water control, resulting in polluted surface water on the southern east flank of the Oquirrhs, as well as ground water contamination on a world-unprecedented scale, both geochemical and geographical in extent (i.e., concentrated and large).
- 'Cutoff' or interception of all surface water flows except from Butterfield Tunnel and the occasional south-end seep, making clean water available to wildlife extremely rare for at least ten miles of the mountain face.
- Land use changes, including the Bingham Pit and several billion tons of waste rock deposited on the surface; Barney's Canyon gold mine pits, cyanide leach pads and waste rock dumps, with their own acid mine drainage problems; and the Magna Tailings Impoundment with the recent expansion into the North Tailings Impoundment. Together, the surface disturbances make up at least 20,000 acres of the total of approximately 85,000 owned by Kennecott in Salt Lake County. Former surface-contaminated sites that have been *partially* cleaned (i.e., to agricultural land use standards) constitute about 3,000 or so acres of the total.
- Facilities and infrastructure making up both the present and many previous manifestations of the Kennecott industrial complex, one of the largest in the mining industry.
- Highway, railroad and industrial infrastructure severing ecological relationships with the Great Salt Lake shore as thoroughly as can be imagined.
- Vegetation community changes from, and compounded by, all the factors listed above, with the dominance of invasive plant species added (cheatgrass, wild mustard, whitetop, Phragmites, tamarisk, Russian olive, etc.) to



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form a vegetative landscape alien to native wildlife communities (burrowing owl, kit fox, raptors, etc.) and favoring disturbed-lands species (deer, elk, fox, etc.).

The human community has undeniably benefited economically for more than a century from the wealth derived from this huge mine and its predecessors. There have been, however, counterposed to economic benefits, the extensive environmental and public health problems created by Kennecott and its predecessors. We *do not* advocate opening a new mine somewhere else (e.g., Lisbon Valley, near Lasal, Utah) in order to obtain supplies of copper and other metals that our technological society demands. We regret to point out, however, that the Kennecott ground water settlement proposal before us creates a new, macro-scale item that must be added to this list of major Kennecott environmental impacts: Great Salt Lake and Jordan River metals contamination over short and long terms. For these vulnerable aquatic environments, already under siege from urban growth that promises to overwhelm their margins, from MagCorp/US Magnesium dioxins and other regional-scale stressors, this may be the straw that breaks the camel's back. If this settlement proposal is carried out as formulated, we will strenuously advocate reopening of National Priorities List ("Superfund") nomination for the Kennecott South and North Zones because of the breach of trust inherent in the scheme. It is *that bad* a concept, technically and ethically.

We thank you for extending the comment period by one month from the original deadline, but we must repeat the objections voiced in the first hearing to what is still an excessively short evaluation/comment period, and request additional time for our many interested and concerned members to further digest such a large body of technical documentation. Please extend the comment deadline at least to December 1, 2003, and preferably to January 1, 2004. This is much too complex a confluence of issues, involving multiple pathways of regulatory, scientific and community concern, to be crowded not only into the short timeframe originally proposed for comment, but --- for ordinary citizens with ordinary lives --- also compressed into the one month time extension. It is critical to note that the settlement's inseparability from at least two critical UPDES discharge permits, JWCD to the Jordan and KUCC to the Great Salt Lake, render holistic understanding of the settlement proposal dependent on these documents, as well as other, previous records of Technical Review Committee discussions, not to mention the December, 2000, Record of Decision. Sorting through these records is a daunting task, at best.

We are very concerned that this decision has been 'wired' for some time. There have been signals visible both from inside and outside the process that it was likely, but frankly, we did not believe that anyone would so abdicate ecological dimensions of the public trust that some elements of the proposal would be put forth with the finality we've witnessed. Governor Leavitt's citing of this settlement immediately after his August 11, 2003, nomination to EPA Administrator occurred several weeks *before* the September 2 public notice, alerting us that something 'was up.' As we've gone back through available documents, especially TRC meeting notes and materials presented at TRC meetings, it appears that a decision to abandon relatively thoroughgoing, corrective measures that fully engage the precautionary principle, in favor of risk-externalizing dilution and disposal strategies, have been shaping up for about six years, approximately since the Shepherd-Miller study of acid/metals water disposal in the tailings line, which we recall to have occurred around 1996-97. This is critically important, both because of the dealbreaking conceptual faults of that study, but also because of the lack of continuity in what amounted to sadly deficient citizen involvement prior to current representation by Friends of Great Salt Lake's Ms. Joy Emory, TRC member since about 2001. By the time Ms. Emory joined the TRC, it is now apparent that the decision had been made. Documentation since approximately 1997-98 has been very deficient in representing previous investigations, concerns and justifications (or lack thereof) of conclusions.



Utah Chapter Sierra Club Comments Abstract: Our comments present the following points:

1. **Wrong Questions Beget Wrong Answers:** The settlement proposal is conceptually flawed, reflecting process flaws in the Company's and Agencies' management of the Technical Review Committee, and lack of additional conduits for both public education and receiving public reflections, then adapting as the project went along.
2. **Time for review and comments:** Still more time is needed to educate the public and to afford review and comment opportunity that was not encouraged by the Technical Review Committee structure and schedule.
3. **Great Salt Lake and Jordan River ecosystem attributes and significance were suppressed;** biogeochemical meaning of terminal basin is ignored; cumulative impacts are dismissed without adequate study, understanding or care; and the Migratory Bird Act of 1918 is ignored.
4. **Avoidance of ecological concern and science is at the very base of the settlement proposal.**
5. **Zone A acid/metals plume metals removal at point of extraction has been suppressed without cause and ignored.**
6. **Metals removal technology alternatives have been suppressed and ignored, but are demonstrably feasible, especially used in combinations.**
7. **The tailings impoundments are inadequate as toxic metals repositories.**
8. **Air quality degradation from metals-toxified tailings impoundment dust appears inevitable, but has been inadequately considered and inaccurately characterized by ignoring metals 'fate' and physical behavior in the tailings line and impoundments.**
9. **Tailings impoundment vegetation cover is critical to air quality maintenance, but will be compromised or rendered impossible by metals deposits.**
10. **Environmental accounting and sustainable solutions:** The narrow financial analysis applied to alternatives evaluation has effectively precluded assemblage of sustainable solutions.

Utah Chapter Sierra Club Expanded Comments:

1. **Wrong Questions Beget Wrong Answers:** The settlement is conceptually wrong in that it measures criteria only against human-needs water resource considerations (water and rights to M&I purveyor, 40-year sustainable supply, contamination plume stabilization, water supply cost stabilization). Additional, unavoidably appropriate criteria should have included: assurance of minimal or no ecological consequences, minimal or no human health consequences, no vulnerability to natural disaster, management error or malfeasance, or to corporate or ownership changes. Failure to adequately discuss these additional criteria in a truly public forum (which the TRC generally was not during critical years) through this concept's development render the *concept as a whole* unacceptable, unworkable, and reprehensible. Collectively, we can and must do better than this, both early problem formulation and public involvement and education to assure adaptive improvement of problem and solutions formulation along the way. Further, the settlement predicates Zone A "acid" plume "treatment" strictly on acid neutralization, a breach of scientific common sense first put forth by the Shepherd Miller study in 1997 on use of the tailings line for neutralization. "Neutralization," as we point out elsewhere, is a Trojan horse that distracts us from the mass transport of toxic metals into the North Tailings Impoundment, if not directly into the Great Salt Lake. Indeed, selenium, pound-for-pound arguably the most ecotoxic of metals in the Zone A 'acid/metals' plume (we insist on use of this technically correct and non-denial-laden terminology, instead of 'acid plume'), is not at all dependent on acidity in some of its most dangerous oxidation states (+2 selenite, especially). Neutralization is a deception. Metals are the reality. Until the settlement reflects this reality, it must be rejected.



2. **Time for Review and Comments: Still more time is needed** to understand the proposed settlement in the context of separate UPDES permits, to recognize reasonable alternatives abandoned along the way, and to compensate for the conceptual deficiencies of the settlement process and documents on ecological, public health and water resource/rights concerns.
- Together, the settlement and supporting permits form a **single system of contaminant disposal** from ground water to surface ecosystems --- a system that we believe was neither intended nor countenanced by the 1995 Natural Resource Damage disposition by Judge Thomas Green in the Third District Court.
 - **The 'public' component of the natural resource damage claim process has been woefully inadequate**, with meetings consistently held over the years in workday hours, times when the working public cannot get free. There has been no newsletter or public information summary sent out disclosing enough about the thought process to allow formulation of critical thought on alternatives. No 'technical assistance' group or grant was formed or sought. The 'technical review committee' included functionally no representation from the environmental community until very recently, especially AFTER decisions critical to this settlement had been made apparently in the 1996-1999 timeframe. Since the State and EPA --- not to mention the PRP, Kennecott --- have chosen not to educate forthrightly not only the public, but also our political leaders, about this subject, we guess that it falls to us and other public-interest activists to do it. That being the case, we need more time: at least another two months will be required to adequately perform the ecological and biogeochemical data accumulation that the State is disinclined to do. Others who are very concerned about water rights and resources implications may need more time than that. Extension beyond January 1, 2004, is the least amount of additional time that can reasonably be expected.
 - Not enough about alternatives has been disclosed.
 - As quoted under comment 5, below, "community acceptance" was designed to be undertaken *after* the settlement proposal was announced. The present process is the only opportunity for the larger community, beyond agency and immediate, invited neighbors (who are free on workdays) to participate.
3. **Great Salt Lake and Jordan River Ecosystem Significance:** The Great Salt Lake (GSL) and its watershed constitute the single most important ecological element of our region. As the Kennecott Visitors' Center video points out, the Bingham Canyon Mine is one of two man-made objects that can be seen from space. Although it is not man-made, the Great Salt Lake is even more 'visible from space,' especially to wildlife dependent on it for their lives (as opposed to transitory economic gain).
- The settlement proposal, together with the supporting, but separate, State (UPDES) discharge permits, **consign the Great Salt Lake ecosystem to an early death due to metals accumulation that would not occur otherwise**. Effectively, the settlement's Zone A acid/metals plume metals relocation would accelerate the mass transport of millions of years of natural processes into a few decades. The Great Salt Lake is a terminal basin. Whatever goes in that does not evaporate or get removed by humans or natural processes STAYS. The molecule stops here, except for water and whatever off-gases.
 - The settlement is, therefore, '**eco-ethically challenged**,' to put it charitably. *The Great Salt Lake is not a corporate sink, nor is the Jordan River.* The approximately ten million migratory shorebirds and waterfowl per year in populations of more than 250 species, typically, that are dependent on the GSL in their seasonal migrations are unique, living, treaty-protected international wildlife (Migratory Bird Act of 1918), warranting our utmost efforts on their behalf to conserve all elements of their complex ecosystem. Similarly, the riparian habitat values offered by the Jordan uniquely in the Lower Provo watershed are much too rare and important to diminish for the sake of accommodating an increment of water demand in a culture tragically --- almost pathologically --- reluctant to conserve water, much less to pay its true cost.



- **Landscapes teach**, and so do government policies toward landscapes. What would this settlement teach about Utah's official regard for Nature and for living beings in Nature? That Utah holds wild lives in contempt, that they are secondary and disposable to the will of business interests and corporate expediency, that they are not appreciated as intrinsic magnets for sustainable economic development, in and of themselves. When was the last time you heard of a Utah *State-initiated* eco-tourism task force? More money is spent on bird watching than on hunting, nationally; and have we got birds! Does this add up to a business development thrust in State government circles, as it has begun to be in Davis County? Not so far, not at all.
- **Birds Protected by the Migratory Bird Treaty Act of 1918:** "The Migratory Bird Treaty Act is the domestic law that affirms, or implements, the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protect selected species of birds that are common to both countries (i.e., they occur in both countries at some point during their annual life cycle)." (US Fish & Wildlife Service Division of Migratory Bird Management website, <http://migratorybirds.fws.gov/intrnltr/treatlaw.html>).
- **Great Salt Lake birds that are also on the Migratory Bird Act of 1918** list of protected bird species (based on a cursory, comparative scan, comparing list in E.V. Rawley, "Wildlife of the Great Salt Lake" in *Great Salt Lake: a Scientific, Historical and Economic Overview*, ed. by J. Wallace Gwynn, UGMS/UDNR Bulletin 116, June, 1980, pp. 298-299, with the list on the USFWS website at <http://migratorybirds.fws.gov/intrnltr/mbta/mbtandx.html#alpha>, where scientific names are listed; for more information go to <http://migratorybirds.fws.gov/intrnltr/mbta/mbtintro.html>) includes AT LEAST the following:

American Avocet
American Bittern
Red-winged Blackbird
Yellow-headed Blackbird
Bufflehead
Canvasback
American Coot
Double-crested
Cormorant
Common Crane
Sandhill Crane
Whooping Crane
Least Curlew
Long-billed Curlew
Long-billed Dowitcher
Ruddy Duck
Wood Duck
Bald Eagle
Golden Eagle
Snowy Egret
Perigrine Falcon
Prairie Falcon
Gadwall
Marbled Godwit
Common Goldeneye
American Golden Plover

Lesser Canada Goose
Great Basin Canada
Goose
Snow Goose
Eared Grebe
Western Grebe
Pied-billed Grebe
Bonaparte's Gull
California Gull
Franklin's Gull
Ring-billed Gull
Great Blue Heron
Black-crowned Night
Heron
White-faced Ibis
Killdeer
Common Loon
Mallard
Common Merganser
Oldsquaw
White Pelican
Brown Pelican
Wilson's Phalarope
Pintail (Northern)
Snowy Plover
Virginia Rail

Redhead
Sanderling
Western Sandpiper
Least Sandpiper
Pectoral Sandpiper
Baird's Sandpiper
Spotted Sandpiper
Solitary Sandpiper
Greater Scaup
Lesser Scaup
White-winged Scoter
Shoveller
Black-necked Stilt
Whistling (Tundra) Swan
Blue-winged Teal
Cinnamon Teal
Green-winged Teal
Forster's Tern
Caspian Tern
Black Tern
American Wigeon (?)
Willet
Greater Yellowlegs
Lesser Yellowlegs



- **The Great Salt Lake is a place to celebrate, not to kill. Some of these species exist in greater populations at the Great Salt Lake than at any other place on earth.**
 - **Baseline studies targeted at comprehensive understanding of the Great Salt Lake ecosystem and watershed still have not been done, after all these years. As urban growth encroaches and makes vulnerable more and more ecosystem variables, the lack of this baseline knowledge becomes, increasingly, a moral deficiency, as well as a scientific gap.**
 - **'Ramsar' designation to promote international recognition of this hemispherically critical wetlands complex should be a State priority, as it should have been for decades. (Ramsar is a 1979 international convention named for the town in Iran where a meeting to draft the rules for wetlands recognition were drafted. Strictly speaking, it has nothing to do with the United Nations, and results in only voluntary measures to protect designated wetlands. See <http://www.ramsar.org> for more information. Ramsar "Mission Statement: "The Convention's mission is the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world" (Ramsar COP8, 2002)."** Recognition of the Great Salt Lake's importance must start somewhere. If it won't start in Utah, then it will start wherever it starts.
4. **Avoidance of ecological concern and science is at the very base of the settlement proposal:** Throughout alternatives screening, studies of impacts and formulation of remediation 'designs,' ecological impacts to the Great Salt Lake and to the Jordan River have been ignored. Parallel processes in State government have repeatedly dismissed consideration of numerical water quality standards for the Lake based on biogeochemical and ecological constraints. Permits have been issued jeopardizing the ecosystem, effectively spelling its doom over the long term in a way that is entirely avoidable by metals removal and sustainable alternatives choices. Alternatives screening omitted Great Salt Lake and Jordan River ecological considerations almost completely, notwithstanding the 'risk assessment' analyses prepared by Kennecott and Kennecott consultants in the 1990s. The GSL, we remind the Trustee, is a terminal basin, which will retain and accumulate any and all toxic metals of concern. The Lake is demonstrably already at the critical threshold for selenium effects on birds. Mass transport of an enormous additional consignment from Kennecott's acid/metals and sulfate plumes can only lead to ecological disaster.
- **Sulfate plume treatment:** Concentrates discharge to the Jordan River is not ecologically acceptable or responsible, however appealing water reclamation may to water utility administrators seeking to match supply with demand at least cost. Selenium and TDS, as pointed out by USFWS, are immediate problems that will be irresponsibly exacerbated by the settlement proposal.
 - **Acid/metals plume disposal:** Metals relocation from the acid/metals ground water plume to the north tailings impoundment next to the Great Salt Lake is neither ecologically acceptable nor responsible. Metals do not go away magically; if they are put into the top end of the gravity-fed tailings pipeline, they will come out at the bottom, even if acid is partially or entirely neutralized. Hollow claims of metals "treatment" in the tailings line must be recognized as counter-intuitive and abjectly unscientific, and must be rejected.
 - **Baseline studies** of the Great Salt Lake ecosystem have still not been done, despite years of pressure on both State and Federal agencies. Both US Fish and Wildlife and the US Geological Survey have led recent, post-Kesterson Marsh exploration of selenium in the GSL's saline environment, but even they



have emphasized that much, much more needs to be done in order for understanding to approach the threshold of competent policy formulation. Add to selenium the alarming probability of MagCorp/US Magnesium dioxin emissions through air, water and solid media, and the potential for synergistic effects should compel agencies at all levels to formulate immediately a plan for rapid advance of scientific knowledge about the Great Salt Lake ecosystem. The present settlement proposal flies in the face of this need, indeed exploiting the absence of scientific data and interpretation to justify use of the Lake as a metals disposal sink.

- **Selenium ecotoxicology** has been effectively avoided by the State's utter lack of initiative in study and gathering of data on the Great Salt Lake ecosystem, despite years of discussion and exploration by Kennecott, including the company's hosting of a national-scale conference on selenium in aquatic environments. A true reflection appeared in the Salt Lake *Tribune* article printed Saturday, October 18, 2003, quoting Mr. Don Ostler, Executive Director of the Utah Division of Water Quality: "I don't see any scientific information that shows there's a problem in the wetlands," said Ostler. "There are perceptions but no presentation of data." Apparently, despite a storm of scientific study and very extensive data accumulation on the Great Salt Lake, sites elsewhere in Utah, and on sites all over the western states of the USA, it is incumbent on the public to force before the State of Utah's perception the existence of this literature. A partial bibliography is enclosed with these comments, and a more extensive literature search will produce a supplement to these comments for later submittal before the comment deadline.
- **After Kesterson:** Since California's Kesterson Marsh came to light in the 1980s, the biological sciences and public agencies throughout the world have focused attention on selenium that could be considered unprecedented, were it not for Rachel Carson's *Silent Spring* and the almost countless studies done since its publication on pesticides, dioxins and other persistent organochlorines. This presents an interesting Utah contrast with the typical public policy development process, however, in that the MagCorp/US Magnesium dioxins have been ignored, like nearly all other issues of Great Salt Lake biogeochemistry and ecology that may not be conducive to industrial use of the Lake as source and sink. By contrast, the 1999 Great Salt Lake Management Plan process bravely began with "A Starting Point for Issue Identification," including a list pertaining to "Lake Hydrology and Water Chemistry," which in turn included the following (among others):
 - "The potential for groundwater contamination of culinary water supplies from mining activities might be reduced by directly discharging wastewater concentrate containing acid and sulfates into the lake. Would this pose a risk to the Lake's ecosystem? How?"
 - Should the State begin to establish a scientifically defensible numeric water quality standards [sic] for GSL as a receiving water body? Why?"

By the time the Management Plan was issued, however, these questions had gone functionally dead, and no resolution of these issues was offered. The Great Salt Lake Draft Comprehensive Management Plan (Utah Department of Natural Resources Great Salt Lake Planning Team, Nov. 3, 1999, pp. 54-55) offers a useful summary of the way State water quality classifications affect administration of GSL water quality issues, after enumerating the five basic water quality classes:

"Class 5 GSL. Protected for primary and secondary contact recreation, aquatic wildlife and mineral extraction.

"Most of the main classes are divided into sub-classes which address specific pollutants and beneficial uses. GSL is in its own class (Class 5). Primary and secondary recreation, aquatic wildlife, and mineral extraction are the defined beneficial uses of the lake's waters. Numerical water quality standards have not been established



for GSL, but DWQ has established narrative standards for discharges to the lake and permits for waste water discharges are established on a case-by-case basis. Applications for waste water discharges are reviewed and regulated by the Water Quality Board to prevent the addition of pollutants which would be injurious to the defined uses. The general policy is that, to the extent feasible, no pollutants (discharges) should be delivered to the lake in amounts that result in concentrations greater than those already present in the lake.... Dischargers are regulated by state and federal effluent limitations for total suspended solids (TSS), biochemical oxygen demand, coliforms, pH and some metals. A public notice process is followed to allow comment on any concerns. Except for sewage treatment facilities, most facilities do not directly discharge into the lake and a mixing zone is allowed most cases."

- **Selenium ecosystem science is very recent, a fact that argues strongly for application of 'precautionary principle' to public policy.** Work thusfar on selenium aquatic ecosystem and wildlife impacts in the West has been restricted primarily to critical areas where response was needed, such as Stewart Lake, near Jensen in northeastern Utah, and in such major, obvious occurrences such as Kesterson Marsh, the Salton Sea and others in the USFWS Migratory Bird Refuge system where locations receive agricultural return flows for their sources of water. Although we have not yet gained access to recent relevant studies on the Great Salt Lake, we understand that cooperative work by the late Doyle Stephens, Kidd Waddell and others of US Geological Survey and US Fish and Wildlife Service has begun to address this deficiency of data for the Great Salt Lake. One thing is certain: Selenium is one of the environmental 'genies' which, when 'let out of the bottle,' are extremely damaging to wildlife, difficult to contain and remediate, and expensive to remedy. **An act as careless as the proposed Kennecott settlement, which conceptually proposes to relocate metals-contaminated acid ground water from one geological/geographic circumstance (alluvial fan at the toe of a Basin-and-Range montane copper mine) to one that is a basin-bottom, terminal basin, incapable of flushing itself, must not be allowed. There are better, feasible choices.**
- It is obvious that **selenium is necessary for nearly all life** at levels varying from not-more-than an almost undetectable trace for algae and other simple plant life (J. Vymazal, *Algae and Element Cycling in Wetlands*, section 5.13.2 "Selenium in Algal Nutrition," pp.356-7) to relatively significant benefits for selenium as an anti-oxidant in human diets. In between, it is increasingly clear that aquatic selenium is disastrous for birds and fish in excess of two parts per billion (ppb), and possibly less. The Clean Water Act limit of 5 ppb is not sufficiently protective of wildlife, most biologists now contend. The USFWS Salt Lake Field Office argues, in fact, for Jordan River selenium limits not in excess of that level (2 ppb) for total Se in the Jordan, and limits on each separate UPDES discharge permit to maintain that cap (see attached copy, USFWS 8-15-03 letter commenting on UPDES discharge permit UT0025551 by Jordan Valley Water Conservancy District to the Jordan River). Others have argued for limits as low as 0.5 ppb in aquatic environments. Certainly, the Kesterson Marsh experience of teratogenic (embryo deforming) effects of selenium in an irrigation return reservoir have so horrified the community of biologists, ornithologists, agricultural managers and those of the general public who possess basic compassion with wildlife that there is growing resolve to identify, for each waterbody/ecosystem nexus, the appropriate numerical limits for each selenium compound that may occur (see T. Harris, *Death in the Marsh*). The most recent, major works by Lemly and others (A. D. Lemly, *Selenium Assessment and Aquatic Ecosystems: A Guide for Hazard Evaluation and Water Quality Criteria*, Springer-Verlag, 2002) are not available to us, but we will endeavor to digest their implications for this complex set of selenium concerns. We can only assume that there is extensive discussion of these concerns in ecological and biological technical journals, but we can't justify holding up these comments pending a literature search.



None — literally none — of that work has made its way into public policy applied to the Great Salt Lake under the current administration, despite the coincidence of this administration with the advent of a preponderance of evidence that action is warranted. Only the Clean Water Act constraints of 5 ppb have been applied to the Jordan River. We seriously doubt that this constitutes responsible public policy, and sincerely beg resolute attention to this precise set of questions at the highest level of watershed science. It is one of the most urgent of several primary needs that *demand* numerical water quality designation for the Great Salt Lake, as quickly as can be done with scientific thoroughness, a collective act that simply must precede any decision to allow further discharge of selenium and most other metals into the Great Salt Lake. In fact, the North End discharge should be halted, as much for the reason that there are other reasonable, technologically feasible choices that can avoid this measure, with few downsides and affording greatly reduced ecological uncertainty, compared to this hyperbolically ill-advised settlement proposal.

Despite the recent nature of scientific inquiry, Selenium sources are no surprise, nor should the discovery that one of the worst is on our doorstep be in any way startling. Tom Harris, in *Death in the Marsh*, warned that Kennecott may be a major selenium source but could not investigate it because of high Great Salt Lake water levels in the mid-'80s when he was making his informal survey of sources in Western states. Sources have long been identified in scientific and industrial literature (e.g., Ilnat, *Occurrence and Distribution of Selenium*; Rosenfeld and Beath (U. of Wyoming), *Selenium*; Zingaro and Cooper, *Selenium*; Bay Institute of San Francisco Selenium Symposium Series; several Electric Power Research Institute (EPRI) studies) alerting us that the Great Salt Lake watershed may not be exempt from selenium effects from several potential sources:

- **Copper mining, smelting and refining** of pyrite-rich ores constitute a long-recognized major source of selenium, as a geological inevitability. Selenium occurs with sulfur in trace proportions of Se in proportion to S. Two major sources occur in copper 'beneficiation,' one at near the process end and the other at the beginning. After smelting, copper purification to >99% pure copper is done by an electrolytic process that drops out most impurities. The copper refinery electrolyte sludges, containing gold, silver, selenium, and often vanadium, tellurium and other trace metals, are refined to leave selenium as one of the last metals to be removed or disposed. At the beginning of the mining process, sulfuric acid leach water from pyrite oxidation and intentional sulfuric acid application to dissolve available waste rock metals into surface- and ground-water contaminated with a catalog of metals, as represented in the extreme in the 'Zone A' acid/metals plume. This can also be done by design, as is proposed at the Lisbon Valley mine south of Moab. In the Kennecott case, refining electrolytes is the primary source of selenium at the "North End" contaminated ground water zone, which is presently being pumped at massive rates directly into the Great Salt Lake. Kennecott is currently discharging an estimated 8,000-10,000 gpm of diluted water from the Garfield Wells, north of the Refinery, in order to eliminate a source of liability. This discharge is being pumped and diluted to approximately one part per million (ppm) selenium, not to exceed the permit limit of 54 ppm after the 'mixing zone,' directly into the Great Salt Lake, under a UPDES discharge permit, thus contributing from the North End to the growing total selenium load in the Great Salt Lake. It is worth noting, here, that the ecological limit established by the Clean Water Act is five parts per billion (5 ppb), ten thousand times less than is allowed to be discharged into the Great Salt Lake by the State DWQ permit (54 ppm).



The South End natural resource damage claim settlement deals overtly with the consequences of fugitive leach water from pyritic waste rock. Beginning in 1903 or so, Kennecott pulverized billions of tons of pyrite-bearing waste rock and allowed it to be exposed to air and moisture, creating conditions for pyrite to break down and form an extremely efficient metals solvent, sulfuric acid, in prodigious quantities. That the scale of ground water contamination from sulfuric acid is so huge should surprise no one who has seen the 2.5 mile-wide, 1,500 feet-deep pit. Neither should there be denial of the world-beating scale of this phenomenon, at the foot of the world's largest and oldest waste rock piles produced from pyrite-laden ores of copper, lead, zinc, silver, gold and molybdenum. You can't say that it is one of the largest metals producers without acknowledging that it is also one of the world's largest metals polluters. The roughly 15,000,000 tons of copper produced in Kennecott's century (Kennecott Visitors' Center video, "Kennecott Utah Copper's Bingham Canyon Mine") has also produced at least a quart of contaminated ground water for each pound of copper. This happened historically, mostly (but not entirely) between 1965 and about 1988 due to poorly managed leach water leakage from the Large Bingham Reservoir (one million gallons to seven million gallons per day of leakage of pH <3.0 waters saturated with metals and salts into ground water) prior to remediation and reservoir lining. This leakage produced the present 'Zone A' acid/metals plume, with some help from other drainages, such as Midas to the south. It is possible, however, that current waste rock dumping in Bingham Canyon and Dry Fork Canyon could become a future source of ground water contamination, with contributions from Barney's Canyon dumps into the Dry Fork Canyon area.

- To say that 'we now know better' than to inflict this pollution on the environment is to suppose that we will choose to do so. **The present settlement presents evidence to the contrary.** True, we now collectively know how to use available technologies to prevent most of mining's pollution to water. Recent melding of technology, engineering, economics and political will COULD conspire to mine an ore body sustainably, in theory. For this to happen, the mining company must *want* to integrate technology, engineering, economics and political will --- inspired by ecological ethics --- into preventive, corrective and restorative action, or nothing will be done. The settlement goes only a small portion of the way there, the easy, obvious part, leaving the crux of sustainability to future generations.
- Considering the magnitude of this ground water pollution act by Kennecott, and the perilous nature of potential impacts on the Great Salt Lake and its watershed, it is both fitting and just that higher expectations be enforced on behalf of the surrounding environment, instead of this compounding of the problem represented by the settlement proposal.
- From memory, we list the following approximations of chemical constituents and properties of the acid/metals plume water:
 - Aluminum > 2,000 ppm
 - Iron > 600 ppm
 - Copper > 100 ppm
 - Manganese ~ 300 – 400 ppm
 - Zinc > 120 ppm
 - Magnesium > 4,000 ppm
 - Cadmium – approaching 1 ppm
 - Lead – also approaching 1 ppm
 - Selenium > 10 ppm
 - Sulfate > 30,000 ppm
 - pH ~ 3.4 to 3.6
 - Mineral acidity more than 90% made up of dissolved aluminum, dwarfing pH as primary acidity



(These numbers are at some variance with those presented in the settlement documents, but they can probably be verified by review of TRC meeting note, presentations and discussions.)

Should the South End metals be allowed to be discharged to the Great Salt Lake, either directly (via the same 'outfall' as that from North End selenium ground water contamination) or indirectly (through the tailings impoundments and their eventual leakage or catastrophic degradation), **the cumulative effects of these conjoined discharges are not even remotely addressed in such a way that it would justify further metals and selenium releases from South End sources of such enormous magnitude, especially when technological choices exist to avoid it all in the first place.**

Other selenium sources may be regionally significant but less direct in their effects on the GSL:

- Irrigation return flows from Jurassic and Cretaceous soils that are sometimes rich in selenium. This was the genesis of the Kesterson Marsh catastrophe, resulting in deformed and dead bird embryos, discovered in the 1980s (Tom Harris, *Death in the Marsh*, 1991), as well as the northeastern Utah occurrence at Stewart Lake, where Harris reported the highest selenium measurements known in living tissue at the time, in catfish.
 - Phosphate refining for fertilizer, as is done from Phosphoria Formation rock throughout the West (e.g., Uinta Basin). The Phosphoria Formation, often hundreds or thousands of feet thick, is also a natural selenium source into surface and ground waters, as is suspected in Spanish Fork Canyon in the Lower Provo River, where the formation outcrops.
 - Coal mining and coal combustion, especially in power plants and major industrial facilities. For many years, EPRI has addressed this problem on behalf of member utilities in cooling water circulation systems and in power plant releases to rivers and lakes, without resolution. Airborne releases of selenium on a wide geographic scale are substantially unevaluated, despite awareness of immense total quantities of particulate selenium released by this mechanism. Ecological consequences to forests, crops and aquatic systems and ecosystems are similarly unknown.
 - Oil extraction, gas extraction, coal bed methane extraction (esp. surface water discharges), and oil refining are, with near certainty, major selenium sources, since there is a range of consistent association between sulfur and its surrogate, selenium. Tar sands and oil shale, were they to be developed, would pose extreme problems of isolating water-borne selenium discharges from surrounding water bodies for this essential reason.
 - Pulp and paper production, generally not an activity in our region, is an ongoing selenium source in the American southeast and northwest, as well as in Canada and elsewhere in the world.
- Selenium is very reactive, cycling readily from oxidized to reduced or to elemental form, or oxidizing from reduced to 'higher' oxidation states. The dynamics of the Great Salt Lake may be the worst-case scenario for supposed 'safe' discharge of selenium. No adequate study has been done of the fate and consequences of this aspect of the proposed settlement. This, alone, constitutes a 'deal-breaker.'
 - Selenium may cause 'synergistic' impacts with other elements and compounds. Vanadium, particularly, appears in scientific literature as an element possibly causing such synergistic effects. "Sentinels" are telling us, according to current USFWS work on the Great Salt Lake, that the ecosystem is vulnerable to further cumulative effects (see USFWS 8-15-03 comment letter on the JWCD UPDES permit UT0025551 to the Jordan River). Unless the Trustee is completely certain that cumulative *and* synergistic effects are categorically impossible, this settlement proposal must be



rejected on the face of the matter. The Great Salt Lake ecosystem, including the Jordan River, are far too unique and ecologically important to jeopardize for corporate expediency.

5. **Zone A acid/metals plume metals removal at point of extraction has been suppressed without cause and ignored.** The Record of Decision (Dec. 2000) *required* metals removal from acid/metals plume extraction flows by nanofiltration, but the settlement proposal brushes this aside, apparently based on the fraudulent claim of metals “removal” in the tailings line. Here is a direct transcription of the line item from the ROD/Settlement comparison and notes of differences obtained from DEQ files (from p.2, entire document attached to these comments, 4pp long; origin or exact date is unknown, but it appears to have been an appendix to the settlement proposal submittal to the Trustee):

“Remedy in Record of Decision	Remedy in Design Phase	Differences, if any
Pretreatment of acid water using nanofiltration	Acid water sent directly to tailings line without pretreatment. Neutralization and metals removal takes place in the tailings line. Neutralization by tailing can be augmented with lime if needed.	Nanofiltration step eliminated in final design”

There is no way to dignify this facile claim that “...metals removal takes place in the tailings line.” We must call it what it is: Fraudulent, ‘junk’ science, deceiving and possibly dishonest. This isn’t a magic-show ‘black box’ with applicable spells from Hogwarts. **Metals don’t just ‘get removed’** without scientifically described process intervention of credible natural phenomena. Nothing of the sort happens in this large but simple gravity pipeline. What is sometimes called the “law of conservation of matter” reminds us that if we put metals into the top end of a closed pipe (the tailings line is gravity fed), then the metals will come out at the bottom relatively unchanged. They may be transformed into different metals compounds as a result of reactions that take place in the pipe — precipitation resulting from partial neutralization, which is being claimed --- and they will be very thoroughly ‘hammered’ by the extreme violence of falling about 1,200 feet in a 50,000 gpm flow of >30% tailings solids, but they *will* come out at the bottom, nonetheless, with the only exception being those that bind to ‘scale’ on the insides of the pipe or other parts of the closed vessel along the way.

The true difference between the ROD’s recommended nanofiltration ‘pretreatment’ to remove toxic metals, on the one hand, and mass dumping of the acid/metals-laden water “directly to tailings line without pretreatment,” on the other, is the metals. They would be removed by nanofiltration and not be put into the pipe (as long as concentrates aren’t put into the pipe!); without nanofiltration, they go into the pipe and into the environment at the bottom end. We are willing to recognize that some degree of neutralization will occur, but ‘neutralization’ is not the core issue at stake here. *The long-term metals impacts on disposal-area ecosystems and public health are the collective, critical point.* Metals could be removed by any of, or a combination of, several technologies (see next Sierra Club comment item “6. Metals removal technology alternatives...”).

This provision of the settlement proposal, to ‘remove metals by putting them into a pipe,’ is no better than smoke and mirrors. We must not allow ourselves to be deceived into thinking that there are no other issues than



'neutralization' nor choices other than simple discharge. If treated by nanofiltration or other membrane filtration technology, permeate (the purified fraction of water flow) could be reclaimed, affording even more culinary water than the settlement proposes. Concentrate (all the contaminants loaded into a slurry) disposal is a burden, to be sure, *but it is so because of past management choices and mistakes* that allowed extremely acidic/metals-saturated leach water to escape over more than half a century, and is therefore an obligation that cannot merely be discharged into handy ecosystems for corporate expediency.

Not on our watch.

It is possible, moreover, for truly 'sustainable solutions' (see Sierra Club comment 10, below) to be applied in order to dramatically reduce ecological and other environmental impacts, and to dramatically compensate for treatment costs by accrual of revenues from sale of byproducts commodities. These commodities may be substances recovered from concentrates and from selective precipitates from other, non-membrane purification processes, and even materials made from the tailings, themselves, IF they are not made excessively toxic by metals transport.

Omission and/or avoidance of ecological values: We do not have available all the TRC meeting notes over the years, but one, in 1998, is very telling. In these notes from the January 21, 1998, TRC meeting, the major agenda item was the review and screening of 'general response actions,' including remedial technologies, as they appeared at the time. The 'general response action' alternatives included:

- "No Further Action (except source control and monitoring)
- Institutional Controls
- Point-of-Use Management
- Containment
- In-situ Treatment
- Collection/Treatment/Delivery"

The 'screening' process imposed criteria, as follows (quoting from TRC notes):

- "Threshold Criteria:
 - ✓ Overall protection of human health and the environment
 - ✓ Compliance with potential ARARs [applicable, relevant and appropriate requirements]
- Balancing Criteria:
 - ✓ Long-term effectiveness and permanence
 - ✓ Reduction in toxicity, mobility or volume through treatment
 - ✓ Short-term effectiveness
 - ✓ Implementability
 - ✓ Cost
- Modifying Criteria:
 - ✓ State acceptance
 - ✓ Community acceptance"



Notes on the 'modifying criteria' indicate that:

- ✓ "The UDEQ has been and currently is involved in each step of the RI/FS process for this site.
- ✓ ***Although this criterion will be addressed after the Proposed Plan is released***, the TRC has provided community input throughout the development of the RI report and FS discussion document."

Italicized/bold emphasis added by Sierra Club to call attention to the apparent intent of Trustee, EPA and Kennecott to defer 'community acceptance' process until period after announcement of settlement proposal.

Six 'remedial technologies' were screened against these criteria:

- I. "No Further Action
- II. Institutional Controls
- III. Point-of-Use Management
- IV. Hydrologic Containment, RO Treatment, Delayed Acid Plume Extraction and Delivery [with permeate to one of four 'delivery options', one of which is 'Directly to the Great Salt Lake']
- V. Hydraulic Containment, RO Treatment, Active Extraction of Acid Plume and Delivery [with same four 'delivery options']
- VI. Hydraulic Containment, RO Treatment, Active Pumping of the Acid Plume and Lime Treatment" [with lime addition taking place such that, "Sludge generated from lime treatment would be placed in a newly created, lined repository, and Permeate from the lime treatment plant could potentially be sent to RO plant for polishing and ultimate municipal use"]

The last page of the Powerpoint-generated notes is transliterated to MS Word exactly, as follows:

"Comparison of Alternatives

Relative Comparisons of Advantages and Disadvantages of the Options

- In general, protectiveness of human health and the environment increases from Alternative I to VI.
- In general, ARAR compliance increases with increased remedial action (Alternatives I through III do not comply).
- Of the six options, Alternative I does not provide long-term effectiveness and permanence.
- Alternatives IV through VI provide better long-term effectiveness and permanence by reliable controls
- Alternatives I through III provide little or no reduction in TMV. [toxicity, mobility or volume]
- Alternatives V and VI provide the greatest reduction in TMV, but VI generates large amounts of sludge.
- Alternatives IV through VI permanently reduce TMV by extraction of contaminant mass.
- Costs increase as a function of the degree of action taken at the site (generally increasing from Alternative I through VI)."

This sequence of quotations from the January, 1998 TRC meeting presentation is useful here to show the state of the implied settlement proposal at that time. Whether nanofiltration was 'in' or 'out' of the proposal, the primary



alternative was metals removal *before* any plume disposal in the tailings pipeline, creating the problem of great amounts of sludge (from lime treatment, in this case, but it could be nanofiltration concentrate sludges, as well). There was, therefore, intent to remove metals near the point of origin, though there was mention of possible filtration concentrates disposal directly into the Great Salt Lake. 'Community acceptance,' as noted above, was anticipated to happen after the settlement proposal was announced --- i.e., it hasn't happened yet, as of January, 1998, and the TRC isn't to be understood as representing that public process. Costs were predicated in the TRC presentation to increase linearly through the six alternatives, with no consideration of modifying factors, such as potential revenue from resource recovery byproducts (we discuss these under our last point, "10. Environmental Accounting and Sustainable Solutions," below).

In only one instance in the entire TRC meeting is there mention of the word, 'ecology' or a derivative of that term, that one instance being in reference to the Jordan River. At no time is there reference to any concerns about the ecology of the Great Salt Lake, which happens to be by far the most significant ecological phenomenon in our region. We submit this to be an effect of lack of numerical water quality standards, compounded by a societal and governmental lack of biological ethics.

The settlement snatches defeat from the jaws of victory, in ecological terms. A job that was in the process of being relatively well done, tempered by an ongoing lack of ecological consciousness, as late as 1996-97, was turned into a tragedy of the largest proportions imaginable for the region's dominant ecological feature and one of the region's most conspicuous public trusts (with air quality and drinking water). This has to be placed in a position of dubious honor alongside MagCorp/US Magnesium's dioxin production (with which there may be synergies in the Great Salt Lake) for sheer environmental destructiveness.

- 6. Metals removal technology alternatives have been suppressed and ignored in the settlement, but are feasible, especially used in strategic combinations.** Kennecott knows intimately, and has developed at least to large pilot applications, treatment technology alternatives that are not only technically effective, but are also economically feasible by virtue of *selective precipitation* or *selective recovery* of metals plume chemical constituents. The acid/metals plume can be viewed as a liquid mine. As reported in years of TRC meetings and in reports to EPA Region VIII and to the Trustee, Kennecott has done extensive work in evaluating **biosulfide and filtration** (ultra-, nano- and reverse osmosis filtration) as **selective precipitation** technologies. At some historical point we have been able to reach only by deconstruction, Kennecott abandoned nanofiltration and biosulfide treatment technologies hastily and without adequate cause (ref. summary of differences between the Dec. 2000 ROD and the Settlement, obtained from UDEQ files). If the obligations and responsibilities imposed by Kennecott mal-management as the contamination's source are to be honored by a supposed corporate 'good citizen,' then metals removal for highest-and-best use should be a paramount consideration. The December, 2000 Record of Decision (see Sierra Club comment 5, above) stipulated that nanofiltration would be used to remove metals and excess salts, a measure that we would probably find acceptable, depending on verification and monitoring to accompany this technology, and eventual disposition of the removed concentrates (i.e., NOT into the Great Salt Lake or the tailings impoundments, thence eventually into the GSL). Pilot work at Kennecott proved the efficiency of nanofiltration in this particular application, specifically to acid/metals ground water flows. That's how nanofiltration came to be the technology of choice at the point of the ROD's announcement. It is dismaying in the extreme to see that organizational politics and a frankly disreputable drive to improve the bottom line at the expense of the Great Salt Lake and the public trust has been exercised here, with apparent support from UDEQ and EPA.



7. **The tailings impoundments are inadequate as toxic metals repositories, especially considering pass-through hydrology, Lake level changes, and potential for geological hazards occurrences.** The tailings impoundments are not RCRA-qualified repositories in any sense. But the metals proposed to be relocated there warrant the application of RCRA repository criteria for permanent isolation from the environment. Neither the old, Magna Tailings Impoundment nor the North Tailings Impoundment are lined. In fact, they operate by promoting water to pass through the fine sand materials that make up the dikes (made entirely of tailings), to be collected in a similarly-unlined, perimeter canal (C7 Ditch) for collection and recirculation into the Copperton Concentrator process line, or for discharge to the Great Salt Lake.
- **GSL Hydrological Unpredictability:** Counting on the North Tailings Impoundment for reliable, long-term isolation of toxic metals contaminants from the Great Salt Lake is unnecessarily risky, in the face of regional hydrological unpredictability, especially to extreme Lake level fluctuations. As stated by Atwood and Mabey ('Flooding Hazards Associated with Great Salt Lake,' Genevieve Atwood and Don R. Mabey, in *Environmental and Engineering Geology of the Wasatch Front Region*, Utah Geological Association Publication 24, 1995, W.R. Lund, ed.; page 483), "Twice in historical time Great Salt Lake has risen to an elevation of 4,212 feet above sea level. The second rise occurred in the 1980s and cost industry and government over \$300 million. Rises to even higher levels should be considered in the design of structures on the lake bed. Wind setup and wave runup associated with sustained high-velocity winds cause flooding up to several feet above the static lake level. This super-elevation of the flooding level varies by several feet around the lake shore. The magnitude of the setup and runup is determined by wind velocity, fetch, lake depth, shoreline exposure, lake bed slope, and the configuration of the beach or constructed shoreline feature such as a dike or causeway." It is flatly irresponsible to ignore the long term potential of iterative physical attacks on the tailings impoundments, as well as the potential inherent in these episodes for metals mixing with Great Salt Lake waters and sediments.
 - **Low-water hydrology** also appears to be off the 'radar screen' in the settlement, not considered at all. The settlement's assumptions seem to be based on studies of the tailings impoundment vicinity done during the sustained mid-1980s-early 1990s high-water episode, in the course of application for the tailings expansion that became the North Tailings Impoundment (~3.5 square miles of the total 12.5 sq.mi. impoundment area). With the Great Salt Lake's level low and falling due to several years of drought, hydraulic 'head' must necessarily have altered the hydrological gradient. Lake margin soils consist of a complex interlayering of sands, gravels and clays, with few of these layers capable of resisting hydraulic flow even slightly, much less to meet the impermeability expectations we'd have of a 'liner' system. Indeed, these soils present preferred pathways to horizontal migration in more cases than not. Given the porosity of the North Tailings Impoundment dike and canal, there is literally nothing in the way of migration of metals from the impoundments into the Great Salt Lake at low Lake water levels, even without exacerbation of the problem by geological disaster. *Hydrological models of the tailings impoundment vicinity were done during GSL high-water years*, finding to no one's retrospective surprise that hydraulic gradients were generally upward (artesian), and only insignificantly vectored toward the Lake. Now that the GSL level is quite low and falling, **we do not know that this is still true**, nor that it will be true in future, "geological timeframe" low-water episodes. It is common-sense engineering wisdom that hydraulic 'head' has changed by as much as ten or twelve feet since the Tailings Expansion Project EIS was done, a change probably conducive to communication of contaminants from the unlined tailings impoundments and the unlined collection ditch system (C7 Ditch) to the Great Salt Lake. What if the Lake drops ten or fifteen more feet? 'Snapshot' environmental decision making doesn't work around the shores of our extremely dynamic terminal basin.



These analyses need, first, to *understand* how the Lake and its ecosystem work over both short and long terms; second, to *respect* ecosystem functions and values; and third, to *engineer within ecosystem constraints*. 'Snapshot' engineering isn't good enough when the Great Salt Lake's miraculous ecosystem is at stake. The long term here means centuries, certainly, and millennia, appropriately.

- **Seismic instability has not been considered, but evidence suggests should be emphasized in this evaluation.** We are overdue for an earthquake in the Richter 7.0 to 7.2 range, which UGS and USGS literature says can produce great instability in Lake sediments, as well as significant 'seiche' tidal wave events due to Lake shallowness and significant tectonic ground displacement. Liquefaction, structural displacement, resonant amplification effects like those observed in Mexico City's similar circumstances, and "seiches" (earthquake-generated lake waves) all offer opportunity, over geological timeframes, to degrade or destroy impoundment dike structures and to mix whatever is put into the tailings impoundments into the Great Salt Lake.
8. **Air quality degradation from metals-toxified tailings impoundment dust** appears inevitable, but has been inadequately considered and inaccurately characterized by ignoring metals 'fate' and physical behavior in the tailings line and impoundments. Air quality implications of metals precipitates and consequent evaporates at surface are not considered. Kennecott's "Little Gobi" creates sufficiently severe, intermittent dust storms now; we hardly need toxic metals added to the cloud when these storms occur.
- **Metals salts** discharged into the tailings impoundment may behave differently from the rosy scenarios presented in settlement documents, which assume homogeneous diffusion, as though the tailings were a liquid. Tailings are extremely fine, relatively uniformly-sized sand. Tailings may will surely act more like a sand filter than a liquid, segregating and classifying some compounds, such as colloidal aluminum hydroxides and hydroxy-sulfates, possibly bound up with arsenic, selenium, copper, cadmium, chromium and other constituents of the acid/metals plume; while passing through some compounds that 'want' to remain dissolved regardless of pH (acidity, chemical neutrality or alkalinity). Some elements and compounds may, in fact, be dissolved and mobilized by high alkalinity.
 - **Evaporates** from Kennecott's leach water, even in slight dilutions similar to the acid/metals ground water plume, are observed to form on the ground surface in the course of accumulation and drying of some metals compounds. Some of these evaporates may be susceptible to dust formation and air transport into populated areas and neighboring ecosystems. The burden of proof that this will not happen is on the PRP (potentially responsible party, Kennecott) and the Trustee. It is a sufficient concern among those who have seen the properties of leach water evaporates that it deserves full consideration, rather than the absence of consideration that it has received in the settlement.
9. **Tailings impoundment vegetation cover is critical to regional air quality maintenance, but will be compromised or rendered impossible by metals deposits.** Since abandonment of the Magna Tailings Impoundment, less water has been placed into this nine square-mile area immediately north-northwest of Magna, Kearns and West Valley City, and west of Salt Lake City. High wind episodes, usually preceding storm fronts, have picked up and distributed many tons of tailings as dust clouds throughout the Salt Lake Valley, resulting in stringent efforts by Kennecott to establish vegetation on the impoundment surface. Temporary dust suppression measures have been necessary, especially in areas that have resisted plant growth.
- Dust prevention plans for the abandoned Magna tailings impoundment depend on creating vegetative growth, as will be the case when the North Tailings Impoundment is abandoned in upcoming decades, theoretically



when the Bingham Pit closes. Vegetation establishment appears not to have been very effective, casting suspicion on the neutralization-capacity theory of the tailings impoundment.

- Aluminum, the dominant acid-generating element in the acid/metals contamination plume, is phyto-toxic, moreover: it retards or kills plant growth. Mass transfer of metals to the north tailings impoundment may prevent vegetation from being established on that surface, as a consequence of aluminum, alone. Arsenic, copper and probably other metals and salts constituents of the acid/metals plume and leach waters cannot help to meet this vegetation cover imperative. In any case, the model of sustainable native vegetation in GSL lakeshore environments is of scattered, 'clumpy' vegetation, including forbs and small shrubs, not a landscape one would recognize as sufficiently preventive of dust-forming capacity in high winds to inspire confidence that the vision is adequate. Given some degree of phyto-toxicity (plant poisons) present, vegetation may be relegated to extreme sparseness, possibly even demanding very expensive, very extensive alternative measures to prevent dust *in perpetuity, for all practical purposes*. For this reason alone, the mass relocation of metals into the tailings impoundments is ill-advised, and surely in violation of air quality permit conditions for reclamation.

10. Environmental accounting and sustainable solutions: The narrow financial analysis applied to alternatives evaluation has effectively precluded assemblage of sustainable solutions. It appears that all decision making has occurred according to 'net present value' calculations, or some other calculus that 1) depreciates the future and 2) externalizes wildlife and Jordan River and Great Salt Lake ecosystems.

- The basic principle of "extended producer responsibility" must apply here. Kennecott **manufactured** the ground water contamination in the course of making copper, silver, gold, molybdenum, selenium and other related products. Considering the sulfate and the acid/metals plumes together, Kennecott has manufactured at least a quart of contaminated water for each of the approximately 30 billion pounds of copper it made in the Twentieth Century. Kennecott, therefore, **bears full responsibility** to remedy the damaging contamination byproducts in such a way that the public trust is not violated. If the settlement is carried forth as proposed, then an additional environmental cost for energy and global warming impacts will accrue per pound of copper.
- The settlement allows damage to the public trust to occur on a massive scale in the form of metals discharges to the Jordan River and, both directly and indirectly, to the Great Salt Lake.
- Technological remedies that would afford metals removal prior to disposal of possibly-acceptable salts into the Great Salt Lake (though not the Jordan River) have been dismissed by the device of separate evaluation of each technology by NPV investment evaluations that also place value on ecosystems, habitats, wild lives and the public trust that protects them. Combined technology applications integrating comprehensive environmental accounting presents the only sustainable approach:
 - For example, **biosulfide** pre-treatment, by engineered application of controlled microorganism cultures that biologically mediate selected chemical reactions, can selectively precipitate copper and aluminum. The biosulfide process can produce copper concentrate at higher copper content than the Concentrator's floatation process, and produce high-commercial value 'alumina' (aluminum oxide in various forms);
 - **nanofiltration** can remove most remaining salts to near-drinking water standards; reverse osmosis can 'polish' to culinary standards;
 - **drying by distilling** can reduce concentrate volumes for repository disposal, if necessary, further capturing culinary water, facilitating further resource extraction. The cost-benefit balance sheet for this holistic approach to remediation looks very different from the rigid, one-technology-at-a-time methodology applied to the settlement's analysis of alternatives.



- If energy is integrated into these equations --- which it surely must be, in this age of seemingly inevitable global climate change from fossil fuel use excesses, and in light of the recent report on regional water resource implications of global climate change --- then we are compelled to draw on abundant solar, wind and possibly other renewable energy forms in order to render energy use for contaminated water remediation not only less drastic than it would otherwise be, but make of water treatment a probable sustainable economic development tool for the region. We should recall that Kennecott and a few other Great Salt Lake shore industries are uniquely sited to employ 'salt gradient solar ponds (SGSP),' a type of low-tech, anti-convective pond capable of generating both heat and electricity by use of saturated salts in pond bottom layers that capture and hold solar heat, trapped by the density of salt layers above. Heat, in turn, can be extracted by circulating liquids through tubes in the bottom layer for direct use (greenhouses, 'district' or industrial/commercial heat), or for conversion to electrical power. The technology is proven, with plants in operation at many locations around the world (e.g., Univ. of Texas - El Paso, has had a small working plant for more than twelve years; see <http://www.cerm.utep.edu/solarpond/2epsp.html>). Salts from water treatment concentrates (minus toxic metals) may be usable as SGSP density-gradient salts, moreover, reducing disposal costs and making use of what would otherwise be wasted.
- These are only a few of several possible beneficially synergistic technology integration that can reduce overall cost more than enough to justify even to corporate accountants the undertaking of integrated-thinking sustainability projects, instead of simplistic, habitual approaches that 'pump-and-dump' into out-of-sight, out-of-mind waterbodies. **It just happens that these particular waterbodies are anything but out of mind, however out of sight we may imagine them to be.**
- The tailings, themselves, in the hands of enlightened company management, could become the source of one of the best 'green' building materials known: autoclaved aerated concrete (AAC). AAC samples exist made directly from Kennecott tailings from the Magna Tailings Impoundment, produced by the Pennsylvania State University Materials Laboratory (Dr. Michael Grutzeck). These samples show all the positive properties that have made AAC the dominant building material of Europe for more than 80 years: light weight, great thermal insulation value, strong performance in seismic events, rapid construction, easy workability with common hand tools, extreme fire resistance, good resistance to moisture and mildew. One US/Canadian company, E-Crete, is manufacturing AAC in Arizona using copper floatation process tailings, like Kennecott's, as the primary mineral filler. Early AAC samples made by an E-Crete predecessor (Airstone) from Kennecott tailings passed leachability tests. Whether these tailings will pass leachability tests (TCLP) after the mass transport of the contents of the acid/metals plume's contamination into the tailings impoundment, or not, is a question that is important to anyone who hopes to see this sustainable alternative to forest products and common masonry products come into existence. AAC, as it happens, is a heat-intensive manufacturing process, so it could be an on-site user of heat from salt gradient solar ponds and other solar-thermal technologies.
- Solar photovoltaic power is also worth considering. The nine square mile area of the abandoned Magna Tailings Impoundment could produce as much as 700 megawatts of solar (PV) 'green' electricity, which can be sold at 'peak' price rates, if covered with panels proposed by one solar farm developer, essentially at little or no cost to Kennecott. This power source can be accounted, also, as a 'sustainable' contribution to the positive side of the ledger by which Kennecott's societal and environmental obligations could be resolved.

What does the Sierra Club need to see in the Kennecott ground water natural resource damage claim settlement? At least the following:



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- **Ecological functions and values of the Great Salt Lake and its watershed must be adequately understood and considered in the full light of scientific scrutiny.**
- **Ecologically, environmentally and economically sustainable solutions to the problem must be formulated.**
- **Zone A metals from the acid plume must not be transported to the tailings impoundments or to the Great Salt Lake.**
- **Selenium must not be discharged into the terminal basin of the Great Salt Lake where it will accumulate, nor into the Jordan River, where 'assimilative capacity' may already have been exceeded.**
- **Jordan River water quality of any other critical parameter must not be degraded by concentrate discharge.**
- **Kennecott should change contaminants to resources by resource recovery, and create positives from negatives, wherever possible.**
- **Ecological and environmental restoration should prevail as the overarching objective, instead of sneaking through some rate of attrition that the community will tolerate.**

Hope is the most fundamental ingredient of sustainability, closely followed by compassion, restraint, selflessness, and community-centeredness. In order for us to trust the Trustee, not to mention the Company and the assembled regulators, there must be a gulf filled with hope, compassion, restraint, selflessness and community-centeredness. The Great Salt Lake lies before us as a beacon, reminding us that 'community' consists not just of the human community, but also of our wild neighbors in such miraculous profusion.

Please carefully consider these comments, submitted on behalf of Sierra Club's Utah members. We request that we be kept informed of all future events, publications and alterations of the settlement process as they may be scheduled.

Sincerely,

Ivan Weber
For the Utah Chapter

Encl: US FWS letter of comment 8-15-03 on UPDES Permit UT0025551 (4 pp) [hard-copy only]
"Explanation of Significant Differences..." document, date unknown (4 pp) [hard-copy only, though we will endeavor to scan the document and make it available on request]

CC: Agencies:

EPA Region VIII, Eva Hoffman
Kennecott Utah Copper Corp., Bill Williams, Louis Cononelos, Marcelle Shoop
USFWS Utah Field Office, H.R. Maddux Utah Field Supervisor
USGS - Utah Office
Utah Geological Survey
Utah Div. of Oil, Gas and Mining

Organizations, Institutions and Interested Individuals:

United Steelworkers of America, Mike Wright, Diane Heminway, Wayne Holland, Kelly Hansen
Friends of Great Salt Lake, President Lynn DeFreitas, TRC Rep. Joy Emory
Great Salt Lake Audubon Society, Jeff Salt



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National Audubon Society, Wayne Martinson
The Nature Conservancy, Utah Office, Dave Livermore, Joel Peterson
Utah Waters, Exec. Dir. Darrell Mensel
Utah Rivers Council
Mineral Policy Center
HEAL Utah, Exec. Dir. Jason Groenewold
Wasatch Clean Air Coalition, Kathy Van Dame
Dr. Ty Harrison, Westminster College Dept. of Biology
Dr. Genevieve Atwood and Dr. Don Mabey
Tom Belchak
Dr. John Veranth, Chairman, Utah Air Quality Board
Ms. Ann Wechsler, Utah Water Quality Board



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October 29, 2003

Dr. Dianne Nielson, Trustee of the Natural Resource
Executive Director, Utah Department of Environmental Quality
168 North 1950 West
Salt Lake City, Utah 84114

Subject: Addendum to Critique, Natural Resource Damage Claim Proposed Settlement
Kennecott Utah Copper Corporation Ground Water Contamination

Dear Dr. Nielson:

Please incorporate the following additional points and requests into the Utah Chapter Sierra Club's comments on the proposed settlement (continuing the item numbering from our previous submittal):

11. Some significant portion of the aquifer is ruined. Even if the near-neutral Sulfate plume portion can be purged, over time, the Zone A acid/metals aquifer is surely ruined for effective use as an aquifer, not only for the foreseeable future, but probably permanently. Many of the metals compounds present will have adsorbed, bound to alluvial soil particles in great quantities. In previous comments, we called attention to the discrepancy between our memory of previous statements about acid/metals plume pH, on the one hand (3.4-3.7), compared to the pH claimed in settlement presentation documents (~4.3). This latter number is approximately the threshold of aluminum precipitation. Has this event happened in the aquifer, or is it about to happen in the tailings line, producing a startlingly high-volume, low-mass precipitate that may behave in ways the Company and the Trustee do not anticipate? Which is it? Wouldn't it be a good idea 1) to be sure of this phenomenon, and 2) to disclose the true chemical condition of the acid well waters to the public? Aluminum is toxic to plant life and may have physical and biochemical effects we do not fully understand, particularly in the water column of such a unique and dynamic saline waterbody as the Great Salt Lake. Unless and until the Trustee is absolutely certain of the harmlessness of metals in the GSL ecosystem, these metals must not be placed into harm's way in the North Tailings Impoundment, much less directly into the GSL through Kennecott's unfortunately permitted Outfall 008.

The greatest significance of this difference may lie in the amount of the metals compounds precipitated by dilution, in-situ neutralization due to aquifer alkalinity, and other factors, either in the aquifer or prospectively in the North Tailings Impoundment. Please keep in mind that the pH of water leaked from the Large Bingham Reservoir was generally <3.0 and as low as 2.6 or so, leaking (according to previous Kennecott studies and contractor studies in the public record) at a rate in the range of one million gallons to seven million gallons per day. This took place for about 30 years, yielding a total leakage between eleven billion and seventy-seven billion gallons of *de facto* leach water (i.e., highly acidic and metals-laden, as a result of waste rock leaching that yielded 'acid mine drainage'). Other, less well-defined sources must be added to this quantity, moreover, particularly from the drainages between Bingham Creek and Midas to the south, prior to cutoff wall and leach collection system commissioning.



Regardless whether the pH is actually lower than claimed, thereby retaining a great deal of the aluminum in solution, or the pH actually is at the aluminum precipitation threshold, there will be enough aluminum hydroxide precipitated by dilution and/or neutralization to surprise even those who have observed this phenomena in bench tests. A considerable proportion of the total metals content in the aquifer will be left in place, rendering the aquifer unusable, probably forever, requiring institutional controls forever.

12. Aquifer recharge has been contaminated and blocked (precluded) as a result of collection system commissioning, residual contamination and institutional controls imposed. Although it has been engineered, this deprives the public of the benefit of the aquifer, a public trust, forever. The Consent Decree takes this into account, but we ask that the Trustee not lose sight of this damage in weighing obligations of the PRP, Kennecott.
13. There are profound water resource and water rights implications of this severance of recharge, contamination of ground water, and ruining of the aquifer. A specific study of these implications by the State Engineer is in order, and should be requested on behalf of well owners and water rights owners in the affected area, as well as on behalf of water users in the entire region, who will be forced to seek other water resources as a result of Kennecott's mismanagement of its process waters, resulting in the subject ground water contamination.
14. The Utah Chapter Sierra Club requests that our comments be answered in writing.
15. The Utah Chapter Sierra Club requests that the Trustee publish in commonly accessible print media or mail to those who submit comments the list of all those who comment. This will constitute a significant step toward remedying the deficiencies of the 'citizen review' shortcomings of the TRC.
16. Only a much more significant extension of the review period can acceptably allow the public to digest and respond to the settlement proposal. Others are suggesting that a moratorium of at least one year be imposed to allow the public sufficient opportunity to respond. The Utah Chapter Sierra Club concurs with this suggestion, and hereby requests that the Trustee's decision on the settlement be deferred until November, 2004.

Thank you for incorporating these additional comments into our previously submitted critique.

Sincerely yours,

Ivan Weber
for the Utah Chapter

CC: Agencies:
EPA Region VIII, Eva Hoffman
Kennecott Utah Copper Corp., Bill Williams, Louis Cononelos, Marcelle Shoop
USFWS Utah Field Office, H.R. Maddux Utah Field Supervisor
USGS - Utah Office
Utah Geological Survey



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Western Resource Advocates (LAW Fund), Joro Walker, Atty.

Great Salt Lake Audubon Society, Jeff Salt

National Audubon Society, Wayne Martinson

The Nature Conservancy, Utah Office, Dave Livermore, Joel Peterson

Utah Waters, Exec. Dir. Darrell Mensel

Utah Rivers Council

Mineral Policy Center

HEAL Utah, Exec. Dir. Jason Groenewold

Wasatch Clean Air Coalition, Kathy Van Dame

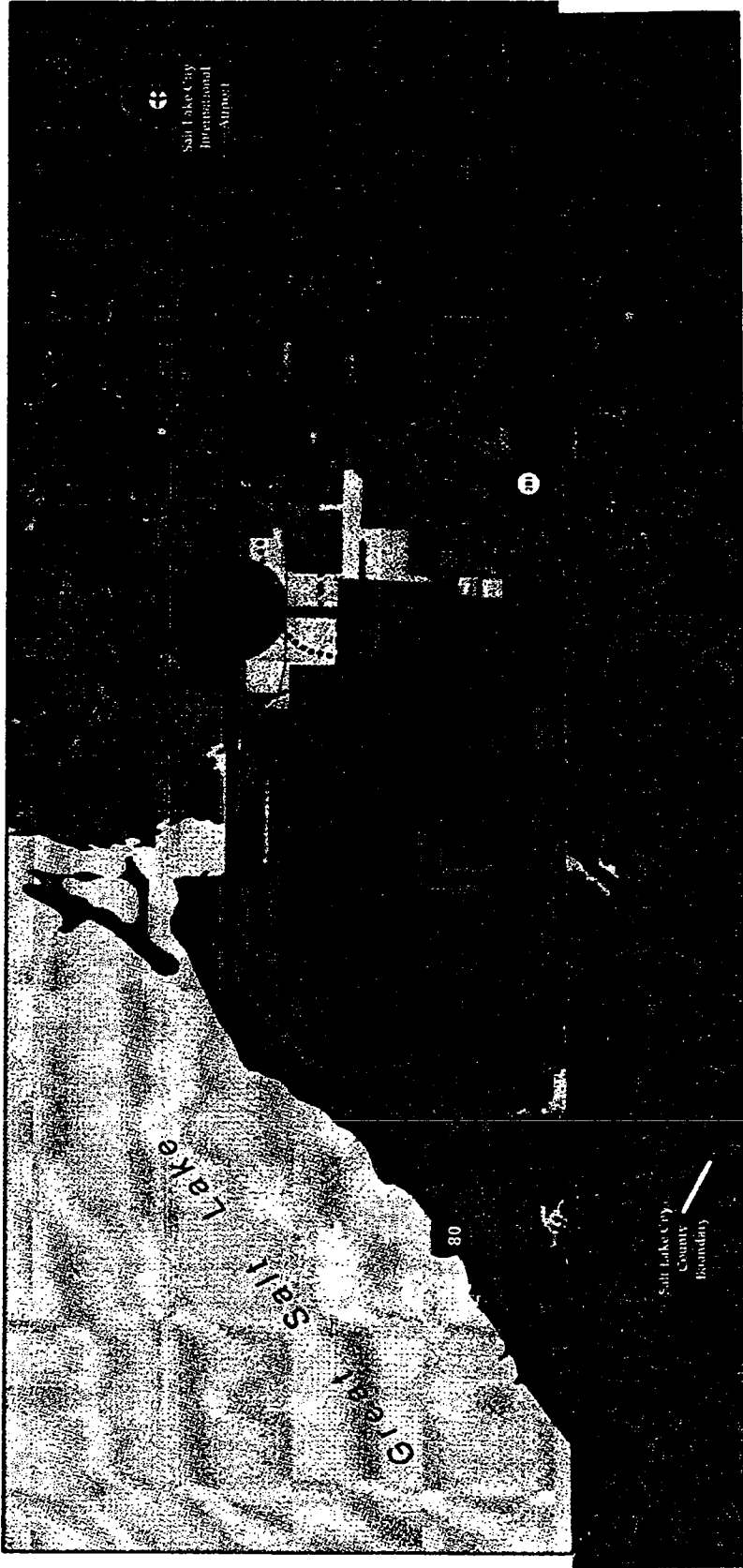
Dr. Ty Harrison, Westminster College Dept. of Biology

Dr. Genevieve Atwood and Dr. Don Mabey

Tom Belchak

Dr. John Veranth, Chairman, Utah Air Quality Board

Ms. Ann Wechsler, Utah Water Quality Board



DRAFT

Mixed Use Centers	Proposed Features	Existing Features	Land Use
● Urban Center	➤ Transit Boulevard	⚡ Highway	■ Hillside Cluster Residential
● Town Center	➤ Avenues & Arterials	⚡ Cross Streets	■ Neighborhoods & Neighborhood Centers
● Village Center	➤ Road Improvements		■ Employment District
	➤ Regional Transit		■ College/University
			■ High School Campus

■ Greenways	➤ Land use in city limits displayed with white opaque overlay and pink border	➤ Proposed WBGP Trails	➤ Proposed Regional Trails
■ Regional Parks			
⚡ Stream/River - Perennial	⚡ Stream/River - Intermittent	⚡ Canal Ditch/Aqueduct	⚡ County boundaries
			⚡ West Bench Planning Area

0 1 2 3 Miles

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FIGURE X.XX - LAND USE MAP

This map portrays the general land uses for the West Bench, but specific locations are likely to vary as specific development is proposed.

EDAW



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EPA Method	7/30/97	8/21/97	8/22/97	8/25/97	9/9/97	9/12/97	AVG	std. dev.	rel
SW-846	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)			%
EPA 7020	2,432	2,049	2,303	2,228		2,366	2,276	147.48	6.5%
EPA 7140	487	459	476	471		483	475	11.13	2.3%
EPA 7130	0.83					0.91			
EPA 7200	19.8					16.4			
EPA 7190	0.71					0.54			
EPA 7210	158	148	150	149	142	142	149	5.68	3.8%
EPA 7380	785	686	727	719		682	720	41.35	5.7%
EPA 7610	10.7	11.0	11.4	11.4		13.0	11	0.87	7.5%
EPA 7450	4,480	4,400	4,574	4,479		4,303	4,447	101.47	2.3%
EPA 7460	367	383	400	401		400	390	14.94	3.8%
EPA 7770	45.4	48.7	51.8	53.5		55.2	51	3.90	7.7%
EPA 7420	0.61					0.83			
EPA 7950	141	132	139	138		135	137	3.74	2.7%
chloride	14.2								
sulfate	33,759	33,327	32,632	32,105		32,360	33,020	639.65	1.9%

Sampler	7/30/97	8/21/97	8/22/97	8/25/97	9/9/97	9/12/97
pH		3.4	3.4	3.4	3.4	3.7
Ec		21,800	21,300	21,300	21,300	21,900
Eh		Lucy	Files	Files	Files	287 Files

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