



United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Dear Mr. Chapman:

We appreciate your efforts in assisting the State and Federal Natural Resource Trustees in resolving Natural Resource Damage issues at the Molycorp Molybdenum mine (Molycorp) site in Questa, New Mexico. As you are aware, each Trustee has particular resources that they are partially or wholly responsible for protecting. On behalf of the U.S. Department of the Interior (DOI), the U.S. Fish and Wildlife Service (Service) assumes partial responsibility for protecting and managing plant and animal species listed as threatened or endangered under the Endangered Species Act, most migratory birds, and the habitats needed to support these species. The intent of this correspondence is to aid in your efforts to resolve the Trustee's Natural Resource Damage issues at Molycorp, and to provide you with an overview of the Service's perspective on several issues.

Since 1996, the Service has been actively involved with various regulatory processes associated with the Molycorp Molybdenum mine in Questa, New Mexico. Most recently, we have provided extensive technical support to the U.S. Environmental Protection Agency's (EPA) Superfund Remedial Investigation (RI). As part of that investigation, and our knowledge of historical data, we have developed some "early impressions" of likely injuries to natural resources under the purview of the Service, particularly migratory birds and their supporting habitat. In cooperation with the State of New Mexico Office of the Natural Resources Trustee (ONRT), the U.S. Forest Service (FS), the U.S. Bureau of Land Management (BLM), and the Molycorp Molybdenum Corporation, we have been working towards a joint understanding of current and historical impacts of mine-related contaminants to our Trust Resources. Your consulting firm will be instrumental in reviewing information and assisting the Trustees in identifying and quantifying injuries to our natural resources. To assist you with this process, we have assembled this outline of issues, along with our thoughts on the potential for injury. Your firm's thorough review of all available data will flesh out these issues further. Much of this overview is based on the past 2-3 years of data collected as part of the EPA Superfund RI/Ecorisk investigation unless stated otherwise. This review

is by no means comprehensive, but is meant to provide you with a basic understanding of the major NRDAR issues of concern to the Service at this time.

Primary Contaminants of Concern (COCs)

- **Aluminum (Al):** Primarily a concern in surface water because of its impact on migratory bird supporting habitat, i.e., fish and invertebrate food items. *Mine site* soil concentrations are also highly elevated, but Al is not highly toxic in a terrestrial environment.
- **Chromium (Cr):** Concentrations in roughly 1/3 of soils on the mine site exceed an ecorisk-based NOAEL soil screening criteria (SSC) for small mammals (9 ppm) and invertebrates (10 ppm). These and the following SSCs were determined as part of ecological risk assessments at the Los Alamos National Laboratory and the Phelps Dodge Chino Mine (LANL/Chino). Until site-specific SSCs are developed, these values will be used for preliminary assessments.
- **Molybdenum (Mo):** Concentrations are highly elevated throughout the mine site and tailings areas. Toxicity of Mo to aquatic biota is unlikely, but effects to terrestrial biota are possible. *A thorough literature review of Mo toxicity to terrestrial wildlife is needed.* Soil concentrations far exceed LANL/Chino SSCs.
- **Lead (Pb):** In roughly 1/3 of the mine site, Pb concentrations are greater than 150 ppm, which is twice the LANL/Chino NOAEL SSCs of 35-76 ppm for small birds (note: 2003 EPA SSL = 16 ppm for birds).
- **Antimony (Sb):** In approximately 1/3 of the mine site, and 1/10 of the tailings area, Sb concentrations exceed the LANL/Chino NOAEL SSCs for small mammals (0.5 – 0.6 ppm) by an order of magnitude. Sb concentrations follow a similar pattern to Cr.
- **Vanadium (V):** Concentrations are naturally elevated throughout the area, and exceed the LANL/Chino NOAEL SSCs for small birds (2.8 ppm) and mammals (0.05 ppm). Background concentrations are ~25 ppm, an order of magnitude greater than the SSCs. This is not likely a site-specific COC, but rather a baseline issue.
- **Zinc (Zn):** Concentrations are elevated above the small bird LANL/Chino NOAEL SSCs (41 -230 ppm) in ~1/5 of the mine site area. Although Zn is elevated above background and SSCs, Cr and Pb are likely more widespread and more significant terrestrial contaminant issues. Areas with elevated Zn concentrations do not correspond with waste rock piles, but are in mining disturbed areas. This is a mine-site derived COC.

- **pH:** Soils in approximately 1/10th of the mine site have soil pH's less than 4.0. Approximately ¼ of the mine site has soil pH's between 4.0 and 5.0. In addition to the direct toxic effects of low pH soils to plants, acidic soils render metals more bioavailable and thus increase soil-plant bioaccumulation factors.

Media Metal Concentrations

- **Soils:** Elevated metal concentrations in *mine site* area soils may have injured migratory birds and their supporting habitat. However, when quantifying this impact, local scar areas must also be considered since they may have also caused some baseline injury. With the exception of riparian areas with Mo-rich tailings deposits, *riparian soils* are likely not a source of injury to birds. In the *tailings area*, the primary metal of concern is Mo, and its potential to bioaccumulate and injure small seed-eating and insectivorous birds. Based on the bioaccumulation patterns of most metals, it is unlikely that larger birds feeding higher up the food chain (i.e., raptors) are injured by these soil Mo concentrations, and therefore Mo bioaccumulation in small mammal food items is probably not an issue for the Service. *A thorough literature review of Mo toxicity to terrestrial wildlife is needed.*
- **Sediments:** Historically, Red River sediments contained higher concentrations of metals than they do today, and probably were devoid of invertebrates for large stretches below the mine. As with surface water, injury to Service resources near the Red River is likely limited to a loss of small fish and invertebrates that were a food source for birds. The one exception is the Eagle Rock Lake area, where metal concentrations in sediments are still high enough that they may cause direct injury to birds consuming food taken from the lake. It seems likely that Eagle Rock Lake will need to be dredged to remove Molycorp derived contamination. Restoration actions may be possible following the remedial dredging.
- **Surface Water:** Based on various factors, I suspect that elevated metal concentrations between the Town of Red River and sample site RR-8 are due primarily to natural hydrothermal scar inputs. Below this point, hydrothermal scars continue to influence the river somewhat, but mine inputs are now probably the predominant contaminant source. River water quality has clearly improved over the years, following the installation of groundwater seepage interception systems and a new tailings pipeline, but injury to fish and invertebrates is still possible. Historically water quality was much worse, and injury was more likely. *To better track changes in water quality over time, I suggest installation of Hydrolab water quality monitors at several locations in the Red River.* Overall, injuries to Service resources are most likely tied to the loss of small/young-of-year fish and invertebrates in the Red River that were food for migratory birds. However, wildlife may also be injured by drinking directly from seeps and interception system ponds, and tailings water with elevated Mo concentrations.

- **Groundwater Springs:** Because groundwater emanating from these springs is of unusually poor quality, birds and other wildlife drinking from these areas could be directly injured. Where these waters enter the Red River, localized decimation of fish and invertebrate populations will eliminate a bird food source, and thus indirectly injure those birds.

Biota Metal Concentrations

- **Plants:** Plants were not sampled on *mine site* rockpiles during the EPA RI, so accumulation must be modeled based on soil metal concentrations and literature derived soil-plant bioaccumulation factors. Metal concentrations were determined in plants from other parts of mine site. Bioaccumulation of metals into plant seeds is a potential source of injury to birds if seeds are consumed. At the *tailings area*, plants accumulate significant amounts of Mo. Birds, and other wildlife, consuming this vegetation may be injured. Injury is most likely in small, ground feeding birds with small feeding ranges.
- **Terrestrial Invertebrates:** At the *mine site*, invertebrate metal concentrations were based on accumulation in earthworms exposed to site soils during toxicity bioassays. Unfortunately, these tests are not applicable for earthworms in acidic soils because soil pH was adjusted from acidic to neutral as part of the test procedure (acidic soils render metals more bioavailable and thus increase soil-invertebrate bioaccumulation). Therefore, if tests are not repeated at in-situ, mine-site pH, then bioaccumulation should be modeled for soils with pH less than 5.0, using literature derived soil-earthworm bioaccumulation factors. Insects accumulating metals from the mine site may injure birds if consumed. At the *tailings area*, elevated Mo concentrations in insects (represented by the earthworm) could result in direct injury to insectivorous birds consuming them. Injury is most likely in small, ground feeding birds with small feeding ranges.
- **Aquatic Invertebrates:** Insects in the *Red River*, and particularly in *Eagle Rock Lake*, have and still do accumulate metals to concentrations that could injure migratory birds consuming them. Insects in the *tailings area* ponds that accumulate significant quantities of Mo, could cause direct injury to birds consuming them. Injuries are likely greatest in kingfishers, dabbling ducks, and other small waterfowl feeding at Eagle Rock Lake, but injuries are possible to other insectivorous birds feeding near waters with metal-rich sediments.
- **Fish:** Small fish in the *Red River* and *Eagle Rock Lake* are a food source for several birds, especially the kingfisher, some waterfowl, dippers, and certain other large passerines. Larger raptors (e.g., eagles, osprey) have not been observed feeding in contaminated portions of the Red River watershed. No fish were found in the *tailings ponds*. Injury to birds is possible due to consumption of contaminated fish, and indirectly, by loss of fish as forage.

- **Reptiles and Amphibians:** No amphibians have been located in the area, possibly due to the generally cool weather, or possibly due to metals toxicity. Reptiles are present at the tailings facility, and while not collected and analyzed, may be a significant pathway of Mo to some birds feeding on them.
- **Small Mammals:** Few rodents were found on the *mine site*, due largely to a lack of suitable habitat, but possibly also due to metals toxicity. Mine site metal bioaccumulation should be modeled based on literature derived soil-plant-rodent bioaccumulation factors. Consumption of rodents by raptors (e.g., owls, hawks) at the mine site may cause injury, but the lack of large numbers of rodents to feed on suggests that this injury type will be minimal. In fact, the loss of rodents as a food source may be a more significant injury to raptors than direct toxicity due to metals intake. At the *tailings area*, pocket gophers accumulated significant concentrations of Mo in their tissues, but because there are numerous areas for raptors to forage, consumption of the occasional gopher from the tailings site is not likely an injury to these birds.
- **Birds:** An attempt was made to capture and analyze metal concentrations in ducklings at the *tailings area*, but no nests or ducklings were found. Accumulation of Mo by adult waterfowl and other birds using the tailings facility is possible, and may represent an exposure pathway for bird eating raptors (e.g., peregrine falcon [known to nest nearby]). Likewise, accumulation of metals by birds using and nesting at Eagle Rock Lake may also represent an exposure pathway for peregrine falcons and possibly owls (Mexican Spotted owls nest in the area) consuming those contaminated birds. Nonetheless, we suspect that this injury type is minimal.

Bioassays

- **Plants:** Tests conducted as part of the EPA RI are not applicable for acidic *mine site* soils since soil pH was adjusted from acidic to neutral as part of the test procedure. If tests are not repeated at in-situ pH, then it should be assumed that soils with pH less than 5.0 are toxic. Loss of plants (bird habitat) due to hazardous substances in the mine site area is an injury to birds. For the *tailings area*, community composition does not appear to be significantly impacted, thus injury to bird supporting habitat is unlikely.
- **Earthworms:** Tests conducted as part of the EPA RI are not applicable for acidic *mine site* soils since soil pH was adjusted from acidic to neutral. If tests are not repeated at in-situ pH, it should be assumed that soils with pH less than 5.0 are toxic. Loss of insects and other invertebrates (represented by earthworms) at the mine site is an injury to bird supporting habitat. For the *tailings area*, community composition does not appear to be significantly impacted, thus injury to bird

supporting habitat is unlikely, despite fact that bioassays demonstrated a significant reduction in earthworm reproduction.

- **Invertebrates** (Red River Surface Water and Sediments): Tests conducted with various invertebrates in the Red River surface water and sediments indicate toxicity, but the results are ambiguous. High toxicity at the Zwergle reference site confounds these results. In general, these tests confirm that some sites are toxic at some times under certain conditions (upwelling contaminated groundwater, storm events). These tests should be added to a weight of evidence for impacts to fish and invertebrate populations, but should not be used alone to make any major decisions.
- **Birds**: At this time, there are no plans to perform any Mo or other metal toxicity studies with birds. Therefore, a reasonable surrogate to testing seems to be a well-crafted ecological risk assessment, considering factors such as nesting and feeding ranges and alternative feeding areas. Endpoints should be based on CERCLA-defined injures such as reduced growth or reproductive impairment. Calculated metals consumption greater than an injury-based Lowest Observed Adverse Effect Level (LOAEL) would then be considered as the threshold for actual injury. The Service does not consider bird diversity surveys alone to be an adequate means to determine and quantify injury.

Overall, at this time, it appears that the most significant injuries to Service resources are, in order of perceived magnitude:

- 1) Current and historically, direct injury to small birds consuming Mo-rich seeds and insects at the tailings facility;
- 2) Current and historically, direct injury to small birds and waterfowl consuming metal-rich plants and invertebrates around Eagle Rock Lake;
- 3) Current and historically, direct injury to small, ground feeding birds consuming metal-rich insects and seeds from vegetated portions of the mine site;
- 4) Primarily historically, direct injury to small birds consuming metal-rich invertebrates and plants from the Red River;
- 5) Primarily historically, indirect injury to birds due to a lack of food resources within the Red River, Eagle Rock Lake, and mine site areas;
- 6) And lastly, current and historically, indirect injury to birds due to a lack of nesting and concealment habitat on the mine site waste rock piles.

While these points may not comprehensively address all possible injuries to natural resources of concern to the Service, they should provide you with a general overview. Our expectation is that this information, combined with input from the BLM, FS, ONRT, and Molycorp can be used to identify and quantify injuries, and quickly move towards restoration of nearby resources. If you have comments or questions, please contact Russ MacRae at (505) 761-4724.

Sincerely,

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Field Supervisor

Cc:

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