SECTION 1

PRELIMINARY SITE CHARACTERIZATION INTRODUCTION TECHNICAL MEMORANDUM

MOLYCORP MINE RI/FS

REVISION 0

Prepared for
Molycorp, Inc.
Questa, New Mexico

April 4, 2005

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Project No. 22236242

SECTIONONE Introduction

1.1 INTRODUCTION

Molycorp, Inc. (Molycorp) entered into an Administrative Order on Consent (AOC) with the U.S. Environmental Protection Agency (EPA) to perform a Remedial Investigation/Feasibility Study (RI/FS) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) for the Molycorp Mine site in Taos County, New Mexico. Molycorp is the owner and operator of a molybdenum mine and milling facility located approximately 3.5 miles east of the village of Questa, New Mexico. In addition, Molycorp owns a tailings pipeline that runs along State Highway 38, and a tailings facility west of the village of Questa. Under the AOC, these holdings are considered part of the site, as well as all other areas where any hazardous substance, pollutant, or contaminant (hereinafter contaminant) from Molycorp's mining, milling, and tailings disposal operations has come to be located. Figure 1-1 shows the general location of the site, including both the mine site and tailings facility.

Attachment A, Statement of Work for the Remedial Investigation (RI) and Feasibility Study (FS) for the Molycorp, Site, Item 25 identifies the Preliminary Site Characterization Summary (PSCS) (3.7.2) as a deliverable of the RI/FS. Within 90 days of receipt of the last sample results from the initial field sampling and analysis, Molycorp is to prepare and submit for EPA review and approval a Preliminary Site Characterization Summary. Molycorp is to briefly review the results of initial field sampling and analysis and describe and display site data documenting the location and characteristics of surface and subsurface features as well as contamination at the site including the affected medium, location types, physical state concentration of contaminants, and quantity. In addition, documentation is provided in relation to location, dimensions, physical condition, and varying concentrations of each contaminant throughout each source and the extent of contaminant migration through each of the affected media. The Preliminary Site Characterization Summary provides EPA with sufficient information to give EPA a preliminary reference for (1) developing the risk assessments, (2) evaluating Molycorp's development and screening of remedial alternatives, and (3) evaluating Molycorp's refinement and identification of Applicable or Relevant and Appropriate Requirements (ARARs). If EPA or Molycorp identify remedial actions involving treatment as remedial alternatives for the site, Molycorp will, in the PSCS, provide EPA with the specific data requirements for treatability studies for those identified alternatives. A Candidate Technologies Report for Treatability Studies, dated March 26, 2002 was submitted to EPA as part of the RI/FS Work Plan. No treatability studies were recommended at that time. No specific data requirements for treatability studies are identified at this time and no studies are recommended.

1.2 BACKGROUND

The sampling and analysis conducted for the RI/FS was performed in accordance with the following work plans:

- *Draft Final Molycorp Remedial Investigation/Feasibility Study Work Plan*, Revision 1.0, Volumes 1 through 4, dated July 11, 2002

- *Volume 4, Final Molycorp RI/FS Quality Assurance Project Plan, Appendix A, Field Sampling Plan*, dated October 24, 2002
- *Final Molycorp RI/FS Quality Assurance Project Plan, Appendix A, Field Sampling Plan, Appendix A1, Sampling and Analysis Plan for Investigating Historic Tailings Spill Deposits* dated, April 30, 2004d
- *Draft Molycorp Tailings Facility Investigation Work Plan for the Nature and Extent of Groundwater Contamination Beyond the Seepage Interceptor System*, Revision 1.0, dated January 31, 2003b
- *Addendum One, Molycorp RI/FS Quality Assurance Project Plan, Appendix A, Field Sampling Plan, Automatic Samplers on the Red River – Field Sampling Plan*, dated March 14, 2003a
- Revision 1, *Work Plan, Wildlife Impact Study*, dated January 31, 2002
- Proposed Field Sampling Program for RI Data Gaps South of the Tailings Facility, USEPA Region 6 and CDM Federal Programs Corporation, letters dated June 2, 2003 and October 2, 2003c
- *Draft Work Plan Outline, Molycorp, Inc. Mine Site in Taos County, New Mexico, In Situ Evaluation of the Potential Exposure of Aquatic Receptors to Contaminated Groundwater Discharging to the Red River*, EPA Site #NMD002899094, USEPA Region 6 and EPA Environmental Response Team, undated
- *Proposed Draft Work Plan, Additional Groundwater/Surface Water Interaction Piezometer Sampling, Molycorp Mine, Questa, New Mexico*, USEPA/Region 6 and EPA Environmental Response Team, dated March 3, 2004c
- *Final U.S. Environmental Protection Agency, RI/FS Work Plan Addendum, Additional Data Collection to Determine Environmental Impacts of Groundwater Discharge to the Red River, Molycorp Mine, Questa, New Mexico*, dated September 2, 2004b

Deviations from the work plans and field changes were documented and approved by EPA on the Change of Procedure Forms. These forms and a summary of the field investigation including deviations from the Field Sampling Plan will be presented in the Remedial Investigation Report.

The AOC RI/FS Section IV Statement of Purpose Item No. 8, acknowledges that Molycorp holds other permits which require Molycorp to conduct certain investigations and studies within specified schedules ("outside study"). Molycorp requested and EPA agreed to include the following outside studies as part of the work required under this order. These studies include:

- Final Molycorp RI/FS Quality Assurance Project Plan, Appendix A, Field Sampling Plan, Appendix A1, Sampling and Analysis Plan for Investigating Historic Tailings Spill Deposits dated, April 30, 2004d
- Draft Molycorp Tailings Facility Investigation Work Plan for the Nature and Extent of Groundwater Contamination Beyond the Seepage Interceptor System, Revision 1.0, dated January 31, 2003b

- Revision 1, Work Plan, Wildlife Impact Study, dated January 31, 2002

Data collected under these plans are included in the RI/FS and discussed in the PSCS.

1.3 OVERVIEW OF SAMPLING APPROACH

The areas of investigation include the mine site, the tailings facility, the Red River, and reference areas. The general rationale for sampling design was media specific, however, each of the areas was divided into exposure areas to focus on exposure pathways and receptors. The mine site and tailings facility were divided into exposure areas for both the soil and groundwater. The mine site was divided into nine exposure areas for soil sampling. The tailings facility was divided into six soil exposure areas. Soil samples were collected from 0 to 6 inches and 0 to 24 inches. Sampling was conducted using a systematic random sampling approach intended to provide information on the mean concentration in an exposure area and biased sampling to evaluate specific point sources.

Biota sampling for chemical concentrations in biota, field measurements of effects, and bioassays were conducted at the mine site, tailings facility, along the Red River, and at reference areas. Vegetation and small terrestrial animal tissues were collected for chemical analysis from areas co-located with soil samples. Plant parts were divided into aboveground (leaves, fruit, seeds, and small stems/branches) and underground plant parts for metals analysis. Measurements were made of plant community structure and composition in the field and soil invertebrate communities, which are largely immobile and closely tied to the soil physical habitat. Rye grass was considered as representative for other plants that occur at the site and a rye grass soil bioassay was conducted. Earthworms were considered representative of other soil invertebrates that occur at the site and an earthworm bioassay was conducted. These direct measures of adverse effects (i.e., bioassays and community structure) were performed to supplement and aid interpretation of the results of the chemical or metal analyses in biotic and abiotic media. Biota sample locations for chemical analyses were co-located with the collection sites of analytical samples from physical media in order to maximize the interpretability of the data.

The mine site was divided into six exposure areas for groundwater and the tailings facility was divided into three exposure areas. Samples were collected from new and existing monitoring wells to evaluate the concentrations of metals and inorganics in groundwater. Samples from new wells installed for the RI/FS were collected monthly for a minimum of a year.

Surface water and sediment sampling locations were selected utilizing a biased sampling design in order to: (1) supplement historic data that is available (i.e., co-locate with historic sampling stations); and (2) to provide upstream and downstream bracketing of defined sources, such as springs and tributaries.

Sampling frequency for surface water and sediment was seasonally based. Samples were collected in fall 2002, spring 2003 (pre-snowmelt and snowmelt), summer 2003, and fall 2003. Storm event (high and moderate) and a post storm event sampling was conducted in summer 2003 to evaluate the potential influence on the nature and extent of contamination from the mine

and tailings facility, as a result of these less frequent, short-term pulsed exposure precipitation and subsequent flow events.

Aquatic biological sampling of fish, benthic macroinvertebrates, macrophytes, and periphyton was conducted at numerous locations along the Red River, Eagle Rock Lake, Red River State Fish Hatchery (fish only), tailings ponds, and other unique aquatic habitats. All aquatic sampling locations included surface water and sediment sampling so that the results of the aquatic analyses are correlated with the results of the chemical and physical analyses of the abiotic media. Three principal types of aquatic biological sampling were conducted: community/population analyses, tissue analyses, and bioassays.

Following is a brief description of the exposure areas for the mine site, tailings facility, Red River and reference areas, the medium sampled, and analytical groups.

1.3.1 Mine Site Soil

Surface soils on the mine site were sampled to provide data for the Human Health Risk Assessment and Ecological Risk Assessment (ERA). Two types of sampling were performed: systematic random sampling and biased sampling. Systematic random sampling was performed in areas of the mine site that represent surface soil to which a human or ecological receptor is most likely to be exposed and is intended to provide information on the mean concentration in an exposure area. Biased sampling was performed at specific sources.

Soil Area 1 – Mill Area

Soil Area 1 covers the mill site. The mill site includes the crushers, mill and concentrator building, grinding, drying, packaging, chemical storage, assay lab, fuel storage, former drum storage, thickeners, warehouse, decline shop, power plant, vehicle maintenance, boneyard, portal, and historic mine site tailings.

Biased soil samples were collected at locations where the maximum concentrations of chemicals associated with these sources are most likely present. All samples were analyzed for metals and inorganics. Samples collected near the fuel storage tanks and from areas of stained soil were analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) to evaluate the potential presence of hydrocarbons and related compounds. Soil samples collected near transformers or historic transformer locations were analyzed for polychlorinated biphenyls (PCBs). Samples collected near the power plant, laboratory, and former drum storage area were analyzed for VOCs and SVOCs to evaluate the potential presence of fuels and solvents.

Randomly located samples in soil exposure area 1 were also analyzed for VOCs, SVOCs, and PCBs to provide concentrations of these compounds over the area that represents the likely integrated human exposure. One sample from soil exposure area 1 was also analyzed for dioxins, furans, and pesticides to determine if these compounds are present.

Soil Area 2 – Administrative and Maintenance and Electrical Area

Soil Area 2 covers the administrative, and maintenance and electrical (M&E) area. Potential sources in this area include independent sources such as aboveground tanks, underground storage tanks, and maintenance and electrical area. The administrative and M&E area is adjacent to the shafts where the dry shop, machine shops, warehouse, maintenance, and engineering buildings and storage yard are located. The nearby administration buildings and carpenter shop are also included in this exposure area.

Biased soil samples were collected at locations where the maximum concentrations of chemicals associated with these sources are most likely present. Samples were analyzed for metals and inorganics. Samples collected near the fuel storage tanks, the maintenance shop, and from areas of stained soil were analyzed for VOCs and SVOCs to evaluate the potential presence of hydrocarbons and related compounds. Soil samples collected near the electrical shop and transformers were analyzed for VOCs and SVOCs to test for the potential presence of solvents and other compounds. Randomly located samples in soil exposure area 2 were analyzed for VOCs and SVOCs to provide concentrations of these compounds over the area that represents the likely integrated human exposure. One sample from soil exposure area 2 was analyzed for polychlorinated dibenzo dioxins and polychlorinated dibenzo furans (PCDDs/PCDFs), and pesticides to evaluate if these compounds are present.

Soil Area 3 – Mine Site Soils

Areas of the mine site other than rock piles and scar areas were sampled and analyzed for total metals. Randomly located soil samples in soil exposure area 3 were analyzed for metals and inorganics to provide concentrations of these constituents over the area that represents the likely human exposure. In addition, one soil/sediment sample was collected from the bottom of Capulin Canyon and Goathill Gulch near the lower end of each drainage to evaluate whether metals and inorganics are migrating toward the Red River in the mine site drainages. Soil samples were collected for Synthetic Precipitation Leaching Procedure (SPLP) testing to evaluate potential leaching of metals to groundwater from the mine site soils.

Biota sampling included collection of soils from locations that were co-located with soil sampling locations on site to investigate rye growth and survival and invertebrate (earthworm) survival. Plant community structure, invertebrate community structure, and chemical concentrations in biota media (terrestrial plants, terrestrial invertebrates grown in site soils in the laboratory, and small mammals) were investigated along transects in proximity to soil sampling locations.

Soil Area 4 – Rock Piles

Soil Area 4 Rock Piles was subdivided into three sub-areas for the purposes of this RI/FS which include: Soil Area 4A1 Capulin and Goathill rock piles; Soil Area 4A2 Sugar Shack West, Sugar Shack South, Middle, and Sulphur Gulch rock piles; and Soil Area 4A3 Blind Gulch and

Sulphur Gulch North rock piles (the basis for consolidation of the various rock piles was to include those that form a contiguous area as one exposure area).

Randomly located soil samples from each sub-area were collected and analyzed for metals and inorganics to provide concentrations of these constituents over the area that represents the likely human exposure. In addition to the random samples, biased soil samples were collected at the toes of the rock piles to evaluate potential migration of metals and inorganics from the rock piles to the surrounding soils. SPLP testing was performed on bulk rock pile samples from soil exposure area 4 to evaluate potential leaching of metals to groundwater from the rock piles.

Small mammals were collected from the base of Capulin Rock Pile to evaluate exposure of biota to low pH and expected high metals bioavailability. Liver and kidney tissues were analyzed for metals to assess potential risk to rodents. Carcass tissue was analyzed for metals and the results were combined with organ results and used to assess risk to rodent predators.

Soil Area 5 – Spring Gulch Rock Pile and Truck Shop Slice Area

The Spring Gulch Rock Pile is located along Spring Gulch approximately 2,000 feet northwest of the mill and overlays Tertiary aplite porphyry intrusions, andesite porphyry flows, and alluvial/colluvial material within the former Spring Gulch channel. The truck shop slice area is located on the south rim of the open pit and includes the old truck shop. The Spring Gulch and truck shop slice materials are designated to be the borrow source for the cover for the other rock piles under the closure plan for the mine.

Randomly located soil samples from soil exposure area 5 were analyzed for metals and inorganics to provide concentrations of these constituents in the aplitic material. In addition to the random samples, biased soil samples were collected at the toe of the Spring Gulch Rock Pile to evaluate potential migration of metals and inorganics from the rock pile to the surrounding soils.

Soil Area 6 – Open Pit

Soil Area 6 includes soils from the open pit, which contains exposed mineralized rock, including mixed volcanics, aplite, and granite.

Randomly located soil samples from two sub-areas within the pit that were accessible to humans were collected and analyzed for metals and inorganics to provide concentrations of these constituents over the areas that represent the likely human exposure.

Soil Area 7 – Mine Site Scars

Prior to mine operations, hydrothermal scars were present in the valleys where Sulphur Gulch North/Blind Gulch and Sugar Shack South rock piles are located. A portion of the Goathill Rock Pile overlies the Goathill Scar. A portion of Sulphur Gulch Scar still remains above the northwest wall of the open pit, but the majority of that scar was excavated during stripping of the open pit. The Middle Scar is located beneath the Sulphur Gulch South Rock Pile.

Randomly located soil samples from the scar areas were collected and analyzed for metals and inorganics to provide concentrations of these constituents over the areas that represent the likely human exposure.

Biota samples were co-located with soil samples. Toxicity of scars to plants and soil fauna were evaluated using bioassays.

Soil Area 8 –Independent Sources

Soil Area 8 includes other mine site independent sources that are not included in the mill or administration maintenance and electrical soil areas. Soil Area 8 was subdivided into six subareas for the RI/FS to assign an exposure area to independent sources. These include transformers, landfills, historic fueling area, historic and current explosive storage area, and the former truck shop.

The independent sources and exposure areas include: Soil Area 8A Explosives Storage Areas (current and former); Soil Area 8B Historic Fueling Areas; Soil Area 8C Landfills; Soil Area 8D Truck Shop; Soil Area 8E transformers; and Soil Area 8F Core Shack and Carpenter Shop. There are two historic construction and demolition debris landfills in the mine area. One is located east of the open pit in Spring Gulch; the other is located south of the subsidence zone in Goathill Gulch (which is no longer used). The current Spring Gulch Landfill is active and used for construction debris only.

Biased soil samples were collected at locations where the maximum concentrations of chemicals associated with these sources are most likely present. Biased samples were analyzed for metals and inorganics. Samples collected near transformer locations were analyzed for PCBs. Samples collected near the fueling area were analyzed for SVOCs to evaluate the potential presence of semivolatile hydrocarbons and related compounds. Volatile organic compound (VOC) analyses were not necessary since this fueling area did not use gasoline or other volatile fuels. Samples collected near the truck shop from areas of stained soil were analyzed for VOCs and SVOCs to evaluate the potential presence of hydrocarbons and related compounds. Soil samples collected from the former and current explosives storage areas were analyzed for SVOCs (from fuel oil associated with ammonium nitrate/fuel oil) and explosives. Soil samples collected from the former and current landfills were analyzed for VOCs and SVOCs to evaluate whether materials containing these compounds have been disposed of in these areas.

Soil Area 9 – Soils/Riparian Soils

Soil Area 9 includes the soil/riparian soil along the Red River reach that extends from the eastern mine site boundary above the mill area to the eastern boundary of the tailings facility. Riparian areas include forest, woodland, and scrub-shrub dominated by woody riparian species such as narrowleaf cottonwood, alder, and willow. Transitional areas dominated by conifers such as ponderosa pine, Douglas fir, and spruce are also included as riparian.

Biota sampling was conducted in systematic random design in order to characterize chemical concentrations for this exposure area. Rye grass and earthworm bioassays were conducted using

riparian soils, and community measurements were made. Systematic random sampling of riparian area soils along the mine area reach of the Red River was conducted in order to characterize soil chemical concentrations for this general area. Biased sampling was performed within areas such as campgrounds and cabin areas as part of the riparian soil evaluation. Samples were analyzed for metals and inorganics. Samples from two locations were analyzed for VOCs, SVOCs, pesticides, PCBs, and explosives.

Edible Riparian Plants – Mine Site

Samples of edible riparian plants were collected from potentially site affected riparian areas at the mine site (campgrounds, Eagle Rock Lake, Goathill) for evaluation of uptake by plants and/or the dietary ingestion pathway for human health. Riparian soil samples were collected from within each location at the time of plant sampling.

1.3.2 Mine Site Groundwater

Groundwater at the mine site occurs in three aquifers or water-bearing units. Alluvial groundwater is present along the Red River floodplain within transmissive alluvial sand and gravel sediments. Groundwater also occurs in colluvium sediments along the existing and pre-existing side drainages at the mine, and within the debris flow material where the side drainages enter Red River, e.g., Goathill Gulch. Bedrock groundwater occurs in secondary fractures and pore spaces, and underlies the alluvium and colluvium. For this investigation, the mine site was divided into six groundwater exposure areas, which are discussed below.

Groundwater Area GW-1 – Capulin Canyon

Groundwater Area GW-1 covers the area drained by Capulin Canyon and includes Springs 13, Lower Spring 13, 14M, 14 MA and 15M. Samples from groundwater exposure area 1 were analyzed for metals and inorganics. Samples from wells MMW-23A and MMW-23B and Springs 13 and 14M were analyzed for hexavalent chromium to evaluate the oxidation state of chromium in the colluvium in Capulin Canyon and in the alluvial springs at the base of Capulin Canyon.

Groundwater Area GW-2 – Capulin Rock Pile

Groundwater Area GW-2 covers the area that contains the Capulin Rock Pile. Samples from Capulin Spring Source in groundwater exposure area 2 were analyzed for metals and inorganics. The water at Capulin Spring Source represents groundwater seepage from the side of the Capulin Rock Pile.

Groundwater Area GW-3 – Central Mine Site

Groundwater Area GW-3 covers portions of Goathill Gulch and the open pit area. Surface water within this area is captured, either by the open pit or the subsidence zone in Goathill Gulch.

Alluvial and bedrock monitoring wells, underground mine water, and Goathill Gulch Spring located in GW-3 were sampled as part of the RI.

GW-3 contains a number of independent sources that may potentially impact groundwater beneath the area. These sources include the truck shop, a former explosives storage area, and former and current landfills. Therefore, groundwater samples collected from wells within groundwater exposure area 3 were analyzed for VOCs, SVOCs, and explosives in addition to Samples from Goathill Spring and MMW-34B and MMW-35B were analyzed for hexavalent chromium to evaluate the ratio of hexavalent chromium to total chromium in groundwater at GW-3.

Groundwater Area GW-4 – South Mine Site Rock Piles

Groundwater Area GW-4 covers the area along the Red River that drains the Sulphur Gulch, Middle, and Sugar Shack South rock piles. It includes mine site wells, the Columbine Campground well, Company Cabin well, private wells and the mine site groundwater withdrawal wells.

Groundwater samples collected from new and existing wells and springs within groundwater exposure area 4 were analyzed for explosives in addition to metals and inorganics to evaluate the potential presence of these compounds in the water. Select wells were sampled and analyzed for VOCs and SVOCs. Samples from wells were analyzed for hexavalent chromium to evaluate the valence state of chromium in the colluvium beneath the rock piles and from an alluvial spring.

Groundwater Area GW-5 – Administration and Maintenance and Electrical Area

Groundwater Area GW-5 covers the M&E area of the mine and the administration facilities, the Sugar Shack West Rock Pile, and the Columbine/Cottonwood Park area. An unnamed drainage channel flows through the mine site area. The drainage bifurcates into two channels above the mine site. One channel extends across the new underground mine to the base of the Goathill South Rock Pile, and the other leads to a buried drainage channel beneath the Sugar Shack West Rock Pile. Mine site wells, Goathill Gulch Spring, Shaft Springs, Spring 39, and Upper Spring 39 are included in GW-5.

GW-5 contains a number of independent sources that may potentially impact groundwater beneath the area. These sources include the electrical shop, fuel storage tanks, and former and current explosives storage areas. Therefore, groundwater samples collected from new and existing wells within groundwater exposure area 5 were analyzed for VOCs, SVOCs, and explosives in addition to metals and inorganics to evaluate the potential presence of these compounds in the water. Samples from several wells were analyzed for hexavalent chromium to evaluate the valence state of chromium in the Red River alluvium downgradient from the mill site. A sample from well MMW-44A was analyzed for hexavalent chromium to evaluate the valence state of chromium in the colluvium at the base of Goathill Gulch.

Groundwater Area GW-6 – Mill Site Area

Groundwater Area GW-6 the mill area, covers and contains a number of independent sources that may potentially impact groundwater beneath the area. These sources include the laboratory, fuel storage tanks, a former drum storage area, and transformers. Mine site wells, lab well and Potato Patch spring are included in GW-6. Groundwater samples were collected from existing wells within groundwater exposure area 6 and analyzed for VOCs, SVOCs and explosives in addition to metals and inorganics. A sample from well MMW-43A was analyzed for hexavalent chromium to evaluate the valence state of chromium in the Red River alluvium downgradient from the mill site.

1.3.3 Tailings Facility Soil and Tailings

Soils at the tailings facility include the interim soil cover over the tailings, soils on areas of mine-related disturbance, and natural soils that surround the facility. Soils around the tailings have been divided into five soil exposure areas.

Soil Area 11– Dry/Maintenance Area

This area is located east of tailings Dam No. 1B and includes several buildings, tanks, and an equipment maintenance area.

Sampling was conducted in areas of staining and likely areas of use, such as near buildings. Soil samples were analyzed for inorganics and metals to assess the nature and extent of constituents. Samples were also analyzed for VOCs and SVOCs to assess the effect of any fuel spills or other organic compounds. Soil samples were collected from 0 to 6 inches depth to assess exposure to human receptors, and one at 0 to 24 inches to assess exposure to ecological receptors.

Soil Area 12 – IX Plant

The Ion Exchange (IX) Plant is located south of Dam No. 4 and includes the building and tanks that comprise the plant, as well as the surrounding pad on which the plant was built.

Sampling was conducted in areas of staining and likely areas of use, such as near buildings. Soil samples were analyzed for inorganics and metals to assess the nature and extent of constituents. Soil samples were collected from 0 to 6 inches depth to assess exposure to human receptors, and one at 0 to 24 inches to assess exposure to ecological receptors.

Soil Area 13 – Pope Lake

Pope Lake is located just south of Dam No. 4 and is designed as a holding pond for water treated by the IX Plant, prior to discharge to the Red River. It has not been needed as a holding pond for several years. Soil Area 13 extends only to the edge of the pond.

One location was sampled and two soil samples were collected. One was collected from 0 to 6 inches depth to assess exposure to human receptors, and one at 0 to 24 inches to assess exposure

to ecological receptors. Soil samples were analyzed for inorganics and metals to assess the nature and extent of these constituents. Soil sample locations were also sampled for biota. Constituent concentrations were measured in terrestrial plants, terrestrial invertebrates, and (if available) small mammals to assess exposure. Soil samples were collected to assess growth and survival effects on rye and invertebrate (earthworm) survival.

Soil Area 14 – Tailings

Soil Area 14 comprises the tailings facility itself. Tailings soil samples were located by systematic random selection using a grid. Two soil samples were collected at each location. One was collected from 0 to 6 inches depth to assess exposure to human receptors, and one at 0 to 24 inches to assess exposure to ecological receptors. Tailings soil samples were analyzed for inorganics and metals to assess the nature and extent of constituents. SPLP testing was conducted on four tailings soil samples to assess the leachable component. Tailings material below cover material was sampled and analyzed for metals and inorganics.

Biota sampling was conducted using a systematic random design, based on the soil sampling design. Plants were sampled as part of the RI/FS data collection efforts. Small mammals were sampled to assess exposure to herbivores that feed on roots.

Soil Area 15 – Soils Potentially Affected by Windblown Particulate Deposition

Soil Area 15 consists of soils adjacent to the tailings facility that could potentially have been impacted by deposition of windblown particulates.

The field program consisted sampling transects away from the tailings pile, with two samples at different depths (0 to 2 inches and 2 to 6 inches) collected at each location. This design allows an evaluation of whether surface soils are affected by windblown tailings as an exposure area for human health and biota.

Soil Area 16 – Riparian Soils Along the Red River

Soil Area 16 – soils/riparian soils from seasonal flooding of the Red River along tailings facility reach contains soil to which humans could be exposed during work or other activities.

Systematic random sampling of riparian area soils along the tailings facility reach of the Red River was conducted in order to characterize soil chemical concentrations for this general area. Samples were randomly selected in the tailings facility area. Biased sampling, in addition to the overall systematic random sampling, was also performed in campgrounds and cabin areas as part of the riparian soil evaluation. Biased sampling characterizes these areas where the potential exists for exposure to humans.

Metals and inorganics were analyzed in all riparian soils sampled to characterize the nature and extent of constituents. VOCs, SVOCs, and SPLP were analyzed at two locations only: above and below the dry maintenance area.

Biota sampling was conducted on a systematic random design in order to characterize analyte concentrations for this exposure area. Rye grass and earthworm bioassays were conducted using riparian soils. Vegetation cover and number of species at each site were measured.

Edible Riparian Plants – Tailings Facility

Opportunistic samples of edible riparian plants were collected from potentially site affected riparian areas at the tailings facility for evaluation of uptake by plants and/or the dietary ingestion pathway for human health. Two species (wintercress and chokecherry) and three locations were selected. Each species was collected from each sampling location.

Riparian soil samples were collected from within each location at the time of plant sampling.

1.3.4 Tailings Facility Groundwater

Groundwater at the tailings facility occurs within three primary aquifers. Groundwater occurs within an alluvial aquifer that is divided into an upper and basal section. The Upper Alluvial Aquifer is comprised of the first occurrence of the water table and may contain perched groundwater. The Basal Alluvial Aquifer is comprised of deeper groundwater within alluvial sediments, typically found at depths greater than 80 to 100 feet. Deep groundwater also occurs within consolidated basalt and andesite (volcanics) and referred to as the Basal Bedrock Aquifer. The Basal Bedrock Aquifer underlies the western portion of tailings facility and Guadalupe Mountain. For this investigation, the tailings facility was divided into the three groundwater exposure areas which are discussed below.

Groundwater Area GW-11 – Dry/Maintenance Area

GW-11 includes the Dry/Maintenance area and groundwater downgradient of this area. This area was selected as a groundwater exposure area because of the potential for spills from truck maintenance activities or dust stabilizer.

One existing well was sampled quarterly and one new well was sampled monthly for one year. Samples were analyzed for metals and inorganics in order to determine nature and extent. Samples were also analyzed for VOCs and SVOCs.

Groundwater Area GW-12 – IX Plant

GW-12 includes the IX Plant area and groundwater downgradient of this area. If soil sampling results indicated a potential for impacts to groundwater, a well was to be installed downgradient of the IX Plant. This well was not installed and groundwater was not sampled in this exposure area.

Groundwater Area GW-13 – Tailings Facility Area

GW-13 includes groundwater underlying the tailings facility and downgradient of Dams No. 1 and 4 to the Red River. This exposure area was selected to determine the extent of seepage from the tailings facility into groundwater.

Existing groundwater wells and new monitoring wells at the tailings facility were monitored. Water level piezometers were installed at seven locations along the southern perimeter of the tailings facility.

Existing wells were sampled quarterly. New wells were sampled monthly for one year. Several monitoring wells were monitored for field parameters on a monthly basis to assess geochemical changes that might occur.

Groundwater samples were analyzed for metals and inorganics to assess nature and extent. Several well and spring water samples were analyzed for hexavalent chromium. Water levels were measured monthly in all new piezometers.

Geophysical data was collected along two transects to determine the locations of faults. Water levels from the piezometers were compiled and hydraulic gradients in the upper and basal aquifers were identified and monitoring wells were installed.

1.3.5 Seeps/Springs

Several springs are located in the tailings facility area or just downstream. Springs 9 and 10 are located south of Dam No. 1 and discharge just north of the Red River. Five springs (Springs 12, 14, 15, 17, and 18) discharge on the north side of the Red River between the western boundary of the tailings facility and the fish hatchery. Seeps and springs are included in GW-13 of the tailings facility area.

Seep and spring surface water samples were collected and analyzed for metals and inorganics because seeps/springs could be exposure media for humans (during work or recreation).

One grab surface water was collected at each spring to assess water quality. Samples were collected quarterly to coincide with groundwater sampling. Spring water samples were analyzed for metals and inorganics to help define nature and extent of tailings seepage. One seep water sample was analyzed for VOCs and SVOCs.

1.3.6 Surface Water

Surface water and sediments in the mine site ephemeral drainages and surface water collection ponds were sampled to provide data necessary to evaluate exposure to these media by mine workers and ecological receptors. Samples were collected from the existing collection ponds beneath the Capulin Rock Pile. In addition, samples were collected from the lower reaches of the Capulin Canyon, Goathill Gulch, and the front rock piles, when water was found to flow or pond for 24 hours or more.

In order to provide comparability to the historic surface water data available for the Red River, a biased sampling program was implemented to co-locate historic stations with new stations to be sampled during the RI.

Locations were selected to characterize the surface water, sediment, and aquatic biota in the Red River. Most stations provide upstream and downstream bracketing of defined sources within the mine area, such as springs and tributaries. In general, these stations were sampled in fall 2002, spring 2003 (pre-snowmelt and snowmelt), summer 2003, and fall 2003. Additionally, during summer 2003, four storm events and one post storm event were sampled at selected locations to evaluate the potential surface water impacts as a result of such storm events. Sampling for storm water was conducted at several locations: RR-6 (upstream of the mine site and also the location for associated aquatic biological sampling), RR-8, RR-12, RR-15 (downstream of the mine site and downstream of Capulin Canyon), and LR-16 (downstream of the tailings facility, yet upstream of the fish hatchery).

Water and sediment were collected for chemical analysis at three locations at Eagle Rock Lake – at littoral areas near the inlet, near the outlet, and near the middle. Biological samples were collected at one area near the middle of the lake. Macroinvertebrate community structures were measured to assess possible effects. Water and sediment samples from near the middle were collected for *Ceriodaphnia* sp., benthic amphipod, and midge bioassays. Metal concentrations in biota media (macrophytes, benthic macroinvertebrates, and fish) were collected to assess food web exposure of predators that ingest aquatic organisms. Similar sampling was conducted at the upper Fawn Lake reference area and at other ecologically unique aquatic habitats, noted during the site reconnaissance.

1.3.7 Aquatic Biota

Periphyton abundance, macrophyte tissues, macroinvertebrate tissues and community structure, and fish tissues and populations were measured in the Red River to assess potential effects from surface water and sediment. Native brown trout, stocked rainbow trout, and other trout and non-trout species were present in the Red River. Water and sediment samples were collected for *Ceriodaphnia* sp., benthic amphipod, and midge bioassays. Metals concentrations in biotic media (macrophytes, benthic macroinvertebrates, and fish) were measured to assess ecological exposure pathways. Surface water and sediment samples were collected at all aquatic biological sampling locations. Macrophytes, benthic macroinvertebrates, and fish tissues were analyzed for metals. Tissue analyses for metals were conducted only in fall 2002.

1.3.8 Tailing Ponds

Surface water samples were collected from the ponds in order to achieve the requisite power and confidence to assess the exposure to biota from ingestion and contact, and of dermal exposure of workers. Sampling locations were selected using a random sampling methodology based on the current pond configuration.

Samples were analyzed for metals and inorganics to identify nature and extent. One sample was selected and analyzed for hexavalent chromium.

The tailings pond sediment was also sampled using a random sampling methodology. Sediment samples were co-located with the pond water samples. Sediment samples were analyzed for metals and inorganics.

1.3.9 Ditch Irrigation Water

Irrigation water (surface water) was collected in the North Ditch, Central Ditch, South Ditch, LR-4 Return and at LR-4U. Additional samples were collected at the North Ditch terminus and Cabresto Ditch No. 4. Samples at each location were collected and analyzed for metals, inorganics, biological oxygen demand (BOD), and chemical oxygen demand (COD).

1.3.10 Garden Produce

Opportunistic samples of garden produce in areas potentially affected by the tailings facility were collected for evaluation of uptake by plants and/or the dietary ingestion pathway for human health. Soil and irrigation water samples were also collected. Garden produce was sampled from three gardens near the tailings facility. Three plant types (e.g., beans, lettuce, and zucchini) were sampled and analyzed for metals. Two reference gardens were sampled. Organic produce from Raley's Market in Taos, New Mexico, was purchased as reference garden produce.

1.3.11 Air Quality Data

Air quality monitoring was conducted at the tailings facility and data were collected outside the RI/FS. Two monitoring programs were conducted in 2003 for the purpose of evaluating the air quality at the tailings facility. The first was a continuous particulate matter of 10 microns or less (PM_{10}) monitor network with three stations placed across the length of the site. Its purpose was to collect data continuously for PM_{10} during normal operations over all seasons. The second program was a short-term sampling campaign in May 2003 to collect aerosol samples for metals analysis. This campaign was conducted at the same sites as the continuous PM_{10} monitors.

1.3.12 Reference Area

Reference areas were established in order to characterize the range of physical and chemical conditions that exist in the area exclusive of mine-induced changes (i.e., natural background conditions). Reference areas for biota were co-located with reference areas for soils and surface water in order to maximize data usability and reduce uncertainty.

Mine Site Reference Areas

Reference soil samples were collected from undisturbed areas with similar geologic and geomorphic conditions as the mine site to allow for the estimation of natural background conditions. The reference surface soil exposure area consisted of samples collected from two areas. The first area is above the mine site and encompasses Hansen, Straight, and Hottentot creeks. The second area is within the Cabresto Creek Watershed, north of the mine site.

The groundwater reference monitoring wells include wells installed by the U.S. Geological Survey (USGS) along the Red River on the upgradient side of the mine site and well MMW-17A. Surface water and sediment were collected at reference stations in the Red River and in upper Cabresto Creek. Aquatic biota (macrophytes, benthic macroinvertebrates, and fish) were sampled at three of these surface water and sediment reference stations in the Red River. The biotic component of reference sampling/analysis included population/community analysis, tissue analysis, and bioassay (toxicity) tests. Surface water, sediment, macrophyte, benthic macroinvertebrate, and fish samples collected at upper Fawn Lake serve as references for samples collected at Eagle Rock Lake. Reference riparian soil samples were collected from two areas: (1) along the Red River above the mine site; and (2) along the upper Cabresto Creek drainage, north of the mine site.

Two upland exposure areas for biota exist on the mine site, based on soil/geologic substrate type and overlying vegetation: mine site soils (including the subsidence area) and natural scars. Two reference areas selected for comparison with these sites were in the Cabresto Creek drainage, west and north of the mine site in the Sangre de Cristo Mountains, and in the Red River drainage above (east) the mine.

Tailings Facility Reference Area

Reference soil samples were collected as part of the field sampling for potential windblown particulates around the tailings facility. Subsurface (2 inches to 6 inches) soil samples were collected along transects radiating to the north, east, northeast, and northwest from the tailings facility. Reference soil samples and terrestrial biota (vegetation and small animals) were also collected from Cater Ranch. Cater Ranch is located north of the tailings facility and was used as a reference area as the geology and geomorphology are the same. Three reference groundwater wells (MW-20, MW-21 and MW-22) were installed upgradient of the tailings facility. Reference data for the tailings facility, Red River surface water, sediment, and riparian soils were collected in the lower Cabresto Creek.

1.3.13 Groundwater/Surface Water Interaction Study

Three Groundwater/Surface Water Interaction (GSI) studies were conducted: GSI #1 in October 2003, GSI #2 in April 2004, and GSI #3 in September 2004. Sample locations, sampling methods, and field and laboratory test methods were developed through discussions and Technical Meetings between EPA, Molycorp, and contractors. EPA and members from EPA's Environmental Response Team performed the GSI studies, with assistance from Molycorp. The studies characterized the potential for exposure of aquatic organisms in Red River to groundwater discharges; evaluated exposure, effects, chemistry, and system dynamics in areas up- and down-stream of the mine and tailings; and evaluated exposure point concentrations in groundwater discharge zones. A triad of mini-piezometers were installed at locations at depths of 20 to 30, and greater than 40 centimeters in the streambed. Mini-piezometer pressures were measured for upwelling or downwelling conditions, and sampled. Exposure chambers against and/or within the streambed, and suspended in the water column with *Drunella* (indigenous

mayfly) and *Hyalella azteca* (standard test organism) in the chambers were used to evaluate acute toxicity. A set of chambers was situated in the center of the piezometer triad. Surface water and sediment samples were collected at each location.

1.3.14 Special Sampling

During spring 2004, additional sampling of wells and springs at the mine site and off-site reference area was performed that was not originally contained in the Work Plan. At the request of EPA, select wells were sampled and analyzed for lead and sulfur isotopes, and lanthanides. At that same time, select wells were also analyzed for the stable isotopes of oxygen and hydrogen, and tritium and helium to estimate the age and source of the water.

1.3.15 Wildlife Impact Study

The Wildlife Impact Study was a study of plant uptake of metals required by the State of New Mexico under Condition 43 of New Mexico Environmental Department (NMED) Discharge Permit 933, and Condition 29 of Mining and Minerals Division (MMD) Permit Revision 96-1 to Permit No. TA001RE, Section 7. Its goal was "to investigate the toxicity and bioaccumulation potential of molybdenum and other metals to plants and animals (small and large) that come into contact with tailings or consume vegetation growing on covered tailings." This was to be accomplished by analyzing the current metal concentrations in vegetation and root-zone soils at the tailings facility and a nearby reference area. The data from the Wildlife Impact Study have been included in the RI/FS and Site Characterization Report following discussions with EPA. Details of the study are provided in the Wildlife Impact Study Report dated November 22, 2004.

1.3.16 Historic Tailings Spill

The Historic Tailings Spill Investigation is a comprehensive study of the historic tailings spills at the Molycorp Mine was required by the NMED via a modification to Discharge Permit 933 (Permit Condition 42, in accordance with 20 NMAC 6.2 Subpart IV). The work involved a stepped investigation that included a review of documentation relating to the spills, field reconnaissance to locate and map the spills, sampling and analysis of the tailings spills, and reporting of results. Data were collected to assess impacts of historical tailings spills from the Molycorp tailings pipeline on soil, groundwater, sediment, and surface water.

After discussions with EPA, the investigation of historic spills was incorporated into the RI/FS. On January 12, 2004, the EPA expanded the study to include an investigation of Hunt's Pond, three private residences, and selected ditch samples (EPA 2004). Hunt's Pond is a small pond located south of the town of Questa. Soils and groundwater at nearby private residences and sediments from the irrigation ditch that runs behind these private residences were also sampled at the request of EPA. Results of the investigation of the historic tailings spills, including the additional studies, were presented in the *Draft Final Report on Historical Tailings Spills Molycorp Mine, Questa, NM* (URS 2004a).

1.4 SUMMARY OF SAMPLING EVENTS

The investigation phase of the RI/FS was conducted over a two-year period. Sampling activities began in September 2002. Soil, groundwater, vegetation (terrestrial plants), small animals, surface water, sediment, aquatic plants, and fish were collected during September through November 2002. Soil, vegetation, and small animal sampling at the Tailings Facility was postponed until June and September 2003. Monthly groundwater and surface water sampling began in December 2002 and continued through December 2003. Surface water, sediment, and benthic macroinvertebrate tissue sampling was conducted in March 2003. Snowmelt sampling of surface water was conducted in April 2003. Quarterly surface water and sediment sampling and storm event surface water sampling was conducted in July 2003. Vegetation, garden produce, and edible riparian plants were sampled in June, August, and September 2003. A second storm event was sampled for surface water in August 2003. Surface water storm events 3, 4, and 5 sampling was conducted in September 2003. Surface water, sediment, and aquatic biota were also sampled in September 2003.

The GSI Study sampling was performed in October 2003 and a second GSI sampling event was conducted in March 2004. Soil sampling south of the Tailings Facility was conducted in November and December 2003. Special sampling for stable isotopes of water, age dating with tritium and helium, lead isotopes, sulfur isotopes, and lanthanides analysis was performed in February 2004. Colloidal boroscope testing was completed in March 2004. The Wildlife Impact Study sampling was conducted in June 2003 and September 2003. Historic tailings spill investigation sampling activities were conducted in May 2004. Supplemental samplings of groundwater, soil, and biota were conducted in May 2004. In September 2004, the Springs 13 and 39 supplemental sampling, a third Supplemental GSI study, and the radon tracer study were completed. Table 1-1 provides additional information regarding the monthly sampling activities, the laboratories used, the matrices sampled, and the analysis type.

1.5 LABORATORY ANALYSES AND ASSESSMENTS

All samples collected were analyzed in accordance with the methodologies specified in the RI/FS Quality Assurance Project Plan (QAPP). All laboratories utilized are governed by a quality assurance plan specific to each organization. The types of analyses performed included chemical analyses, bioassay analyses, and population and community structure assessments. Summaries of the analyses performed by the laboratory are provided below.

1.5.1 Chemical Analyses

Two commercial fixed-base laboratories were used to conduct the chemical analyses. The primary laboratory used for chemical analysis was Severn Trent Laboratories (STL) facility in Barrington, Vermont (STL-B). STL-B analyzed groundwater, surface water, soil, sediment, and biota (plant, fish, and benthic macroinvertebrate tissues) samples for the organic and inorganic analysis parameters specified in the QAPP and Field Sampling Plan (FSP) for the various media. STL-B subcontracted the dioxins and furans analysis to their Knoxville, Tennessee, facility. The secondary laboratory used for chemical analyses was EnChem, Inc. in Madison, Wisconsin. A

minimal number of samples were contracted to STL-Canton, Ohio, STL-Austin, Texas, STL-St. Louis, Missouri and STL-Seattle, Washington when the primary laboratory was overloaded in order to meet holding time requirements or instrument malfunction occurred. EnChem analyzed the small mammal tissue samples for metals.

Some analyses were also conducted onsite. STL provided an on-site analyst for part of the investigation and STL-Denver to analyze selected groundwater and surface water samples for hexavalent chromium during the first sampling event. In addition, during the first GSI #1, URS Corporation (URS) conducted on-site analyses for ammonia using an ion-selective electrode (ISE) method and for alkalinity using titrimetric field test kit.

For the February Specialty Sampling event, three additional laboratories were used for chemical analyses based on their ability to analyze for non-routine parameters. The commercial laboratory Frontier Geosciences, Inc. in Seattle, Washington, analyzed selected groundwater samples for total lead, lead isotopes, and lanthanides. The University of Arizona's Department of Geoscience's Laboratory of Isotope Geochemistry (Tucson, Arizona) analyzed selected groundwater samples for stable isotopes of water, total sulfur, and sulfur isotopes. The University of Miami's Rosenstiel School of Marine and Atmospheric Science's Noble Gas Isotope Laboratory (Miami, Florida) analyzed selected groundwater samples for helium and tritium.

1.5.2 Bioassay Analyses

Bioassay analyses were conducted on surface water, sediment, and soil media. Two commercial entities conducted bioassay analyses: Chadwick and Associates, Inc. (C&A) and EnviroSystems, Inc.

C&A in Littleton, Colorado, conducted acute and chronic bioassay tests on surface water and sediment samples collected from the Red River during the fall surface water and sediment sampling events. In addition, sediment bioassay tests were conducted in conjunction with the GSI #1 Sampling Event and a fish bioassay was conducted in conjunction with the Serial Dilution Test, which was a component of the Spring 13 and Spring 39 Supplemental Sampling Event.

Envirosystems, Inc. in Hampton, New Hampshire, conducted the earthworm and rye grass bioassay tests on selected soil samples. Upon completion of the earthworm bioassay, surviving earthworm tissue was harvested and submitted to STL-B for chemical analysis.

In addition, EPA personnel conducted an in-situ bioassay during two of the three Groundwater/ Surface Water Interaction Studies. During the GSI#1 and GSI#3 Sampling Events, EPA personnel deployed test organisms into chambers and removed them at the end of the test period, recording the survival statistics of the test organisms.

1.5.3 Population and Community Structure Assessments

In addition to chemical analyses and bioassay analyses, population and community structure assessments were conducted. Chadwick Ecological Consultants (Chadwick) conducted the

population and community structure assessments for aquatic biota and terrestrial invertebrates. The aquatic biota included fish, periphyton, macrophytes, and benthic macroinvertebrate media. URS conducted population and community structure assessments for terrestrial plants and terrestrial vertebrates.

1.6 DATABASE

1.6.1 RI/FS Data

Data collected under the RI/FS field investigation, special sampling, and outside studies are contained in an Access database. Tables containing the validated analytical results for all media collected during the RI/FS are found in Appendix A.

1.6.2 Compliance Reporting Data

Molycorp has collected samples on a quarterly basis under ground water discharge permits 1055 (Discharge Permit Molycorp Quest Mine, DP-1055; November 15, 2000) and 933 (Discharge Plan 933 for a Tailings Disposal Facility for Molycorp; February 26, 1997) issued by the New Mexico Environmental Department. Media sampled include:

- Groundwater
- Water in the underground workings
- Stormwater catchment ponds
- Seeps and springs
- Red River surface water
- Infiltration test plot leachate
- Tailings impoundment water

All samples are analyzed for the metal and inorganic constituents specified in the respective permit. Analytical data from samples collected under the discharge permits have been entered into the database. During the time frame in which the RI/FS data were being collected (third quarter 2002 through second quarter 2004) samples were collected from these locations to meet both the RI/FS and the permit requirements. Compliance data collected prior to the RI/FS and sampling subsequent to the RI/FS have not been included in this Site Characterization Summary Report. The data subsequent to the RI/FS time frame are not contained in the RI/FS database but are available should need for these data arise.

1.6.3 USGS Background Data

As part of the Questa baseline and pre-mining ground-water quality investigation performed by the USGS, water analyses were conducted on ground water samples collected from the Straight Creek drainage upgradient of the mine. Analytical results for samples taken from Straight Creek

wells from March 2002 through June 2003 were provided electronically by the USGS and have been uploaded into the database. These data have not been included in this Site Characterization Summary Report, but are available in the database.

1.6.4 Historical Data

Available historical data from publications, reports, spreadsheets, and other documents in the files were reviewed for potentially useful data to be loaded to the database. A document number was assigned to each document and a record consisting of the following information was kept of all documents reviewed:

- Document Number
- Document Title
- Author
- Sampling Date
- Identification of Data Type - Physical, Chemical, Biological, Ecological, or Geotechnical
- Identification of Medium, Number of Samples, Parameters
- Information potentially indicative of quality of data
  - Samples collected under a Field Sampling Plan and SOPs?
  - Samples collected and analyzed following a Quality Assurance Project Plan?
  - Samples collected and shipped under chain of custody procedures?
- Laboratory
- Potential Data Use
- Whether the document contained data entered into database and if not, why not.

All data entered into the database from these sources is cross indexed to the historical data table by putting the Document Number from this table into the "SDG" field of the "Chemistry_Samples" table in the database. The end user should evaluate whether the data are of sufficient quality for a given end use before relying on those data for that end use.

1.7 PRELIMINARY SITE CHARACTERIZATION SUMMARY ORGANIZATION

The Preliminary Site Characterization Summary is organized into the following sections and appendices:

- Section 1 provides an introduction to the document.
- Section 2 presents a summary of the surface water data for the Red River, Cabresto Creek, lakes and ponds, snowmelt and storm events, tailings ponds, mine site catchments, drainages upstream of the mine, springs, and irrigation water.

- Section 3 presents sediment data for the Red River, Cabresto Creek, lakes and ponds, tailings, Hansen Creek, and irrigation ditches.
- Section 4 presents the aquatic biota data for the Red River, Cabresto Creek, Eagle Rock Lake, unique habitat areas, and tailings facility. This section includes population and tissue data for fish, benthic invertebrates, and periphyton/bryophytes. Bioassays for surface water and sediment in the Red River and Cabresto Creek are included as well as a habitat evaluation.
- Section 5 presents the data for the EPA GSI studies and focused sampling.
- Section 6 presents the groundwater data for the reference areas, mine site, and tailings facility.
- Section 7 presents the soil data for the reference areas, mine site, tailings facility, riparian areas, tailings material, and soils south of the tailings facility.
- Section 8 presents the data collected as part of the Historic Tailings Spill Outside Study.
- Section 9 presents the terrestrial vegetation data for the mine site, tailings facility, reference areas, riparian areas, mine site scars, and south of the tailings area.
- Section 10 presents the data collected as part of the Outside Study – Wildlife Impact Study.
- Section 11 presents the terrestrial biota – small animals data for the mine site, tailings facility, reference areas, and riparian areas.
- Section 12 presents the edible riparian vegetation data for mine site and tailings facility riparian areas and reference riparian areas.
- Section 13 presents the garden produce data for gardens and reference gardens. This includes soil, irrigation water, and vegetation data.
- Section 14 presents and summarizes analytical results for air quality monitoring conducted at the tailings facility as part of an outside study. Continuous PM_{10} data and metal analytical results from aerosol samples are presented.
- Section 15 provides a quality assurance summary that discusses the overall data quality. Data validation procedures, significant matrix effects, validation results, field and laboratory contaminants, and an overall assessment of data quality are discussed in the section.
- Section 16 provides a list of references used in preparation of the document.
- Appendix A and B provide tables of data and an assessment of air quality for the tailings facility. These appendices are presented consistent with the numbering of the report text sections based on media for ease of use.

Each section presents a description of the sampling, a summary of the data, and provides summary tables and graphs. The summary tables contain the analyte, total number of samples,

percent detects, the applicable screening level criteria (SLC), percent above the SLC, minimum and maximum reporting limits for the non-detects, the minimum and maximum value, and a mean value and a median value. Figures in each section present sampling locations.

SECTION 1

INTRODUCTION

TABLES

Table 1-1
EVENT SUMMARY

Sampling Activities	Time Frame	Laboratories	Matrices	Analysis Types
Fall 2002 Soil and Sediment Sampling, Part A	September 2002 through November 2002	STL	Soil Sediment	Chemical
		EnviroSystems, Inc C&A	Sediment	Bioassay
Fall 2002 Terrestrial Plant Sampling		STL	Biota	Chemical
Fall 2002 Aquatic Plants, Fish, and Terrestrial Invertebrate Sampling		CEC		Population Community Structure
Fall 2002 Small Mammal Sampling		EnChem		Chemical
Fall 2002 Groundwater and Surface Water Sampling		STL	Groundwater Surface Water	Chemical
		C&A	Surface Water	Bioassay
December 2002 Monthly Groundwater and Surface Water Sampling	December 2002	STL	Groundwater Surface Water	Chemical
January 2003 Quarterly Groundwater and Surface Water Sampling	January 2003	STL	Groundwater Surface Water	Chemical
Fall 2002 Soil Sampling, Part B		STL	Soil	Chemical
		EnviroSystems, Inc		Bioassay
February 2003 Monthly Ground-water and Surface Water Sampling	February 2003	STL	Groundwater Surface Water	Chemical
Spring 2003 Sediment Sampling	March 2003	STL	Sediment	Chemical
Spring 2003 Benthic Macro-invertebrate Tissue (BMI) Sampling and Pre-Snowmelt Assessment		STL	Biota	Chemical
		CEC		Community Structure
Spring 2003 Surface Water Sampling		STL	Surface Water	Chemical
March 2003 Monthly Groundwater and Surface Water Sampling		STL	Groundwater Surface Water	Chemical
April 2003 Quarterly Groundwater and Surface Water Sampling	April 2003	STL	Groundwater Surface Water	Chemical
Snowmelt Sampling		STL	Surface Water	Chemical
		C&A		Bioassay
May 2003 Monthly Groundwater and Surface Water Sampling	May 2003	STL-B	Groundwater Surface Water	Chemical

Table 1-1
EVENT SUMMARY

Sampling Activities	Time Frame	Laboratories	Matrices	Analysis Types
June 2003 Monthly Groundwater and Surface Water Sampling	June 2003	STL	Groundwater Surface Water	Chemical
RI/FS Soil Sampling (June and September 2003)		STL	Soil	Chemical
		EnviroSystems, Inc		Bioassay
RI/FS Plant Sampling-Cool Season (June, August, and September 2003)		STL	Biota	Chemical
June 2003 Small Mammal Sampling (make-up samples)		EnChem	Biota	Chemical
June 2003 Earthworms (harvested from soil bioassay)		STL	Biota	Chemical
Wildlife Impact Study Plants (June and September 2003)		STL	Biota	Chemical
Wildlife Impact Study Soils (June and September 2003)		STL	Soil	Chemical
Summer 2003 Sediment Sampling	July 2003	STL	Sediment	Chemical
Summer 2003 Surface Water Sampling		STL	Surface Water	Chemical
July 2003 Quarterly Groundwater and Surface Water Sampling		STL	Groundwater Surface Water	Chemical
Storm Event #1 Surface Water Sampling		STL	Surface Water	Chemical
		C&A		Bioassay
RI/FS Plant Sampling-Vegetable Garden and Edible Riparian Plants, including Choke Cherries (June, August, and September 2003)	August 2003	STL-B	Biota Soil Irrigation Water	Chemical
August 2003 Monthly Groundwater and Surface Water Sampling		STL	Groundwater Surface Water	Chemical
Storm Event #2 Surface Water Sampling		STL	Surface Water	Chemical
		C&A		Bioassay
September 2003 Monthly Groundwater and Surface Water	September 2003	STL	Groundwater Surface Water	Chemical
Fall 2003 Sediment Sampling		STL	Sediment	Chemical
		C&A		Bioassay
Fall 2003 Surface Water Sampling		STL	Surface Water	Chemical
		C&A		Bioassay
Fall 2003 Aquatic Biota (Fish, BMI, Periphyton, Macrophytes)		STL	Biota	Chemical

Table 1-1

EVENT SUMMARY

Sampling Activities	Time Frame	Laboratories	Matrices	Analysis Types
		CEC		Population Community Structure
RI/FS Plant Sampling-Warm Season (June, August, and September 2003)		STL	Biota	Chemical
RI/FS Soil Sampling (June and September 2003)		STL	Soil	Chemical
WIS Plant Sampling (June and September 2003)		STL	Biota	Chemical
WIS Soil Sampling (June and September 2003)		STL	Soil	Chemical
Storm Events 3, 4, and 5 Surface Water Sampling		STL	Surface Water	Chemical
		C&A		Bioassay
October 2003 Quarterly Groundwater and Surface Water Sampling	October 2003	STL	Groundwater Surface Water	Chemical
Groundwater/ Surface Water Interaction Study (GSI #1)		STL URS (on-site analyses)	Surface Water Groundwater Sediment	Chemical
		EPA	Biota	Bioassay
		C&A	Sediment	Bioassay
November 2003 Monthly Groundwater and Surface Water Sampling	November 2003	STL	Groundwater Surface Water	Chemical
South of Tailings Area Supplemental Sampling	Late-November 2003 to early-December 2003	STL	Soil Tailing Material Sediment	Chemical
December 2003 Monthly Groundwater and Surface Water Sampling	December 2003	STL	Groundwater Surface Water	Chemical
January 2004 Quarterly Groundwater and Surface Water Sampling	January 2004	STL	Groundwater Surface Water	Chemical
February 2004 Specialty Sampling	February 2004	STL U of Arizona U of Miami FGS	Groundwater Soil	Chemical
Groundwater/Surface Water Interaction Study (GIS #2)	March 2004	STL	Groundwater Surface Water	Chemical
MMW-50A Installation Sampling		STL	Groundwater	Chemical
		ACZ	Soil	

Table 1-1

EVENT SUMMARY

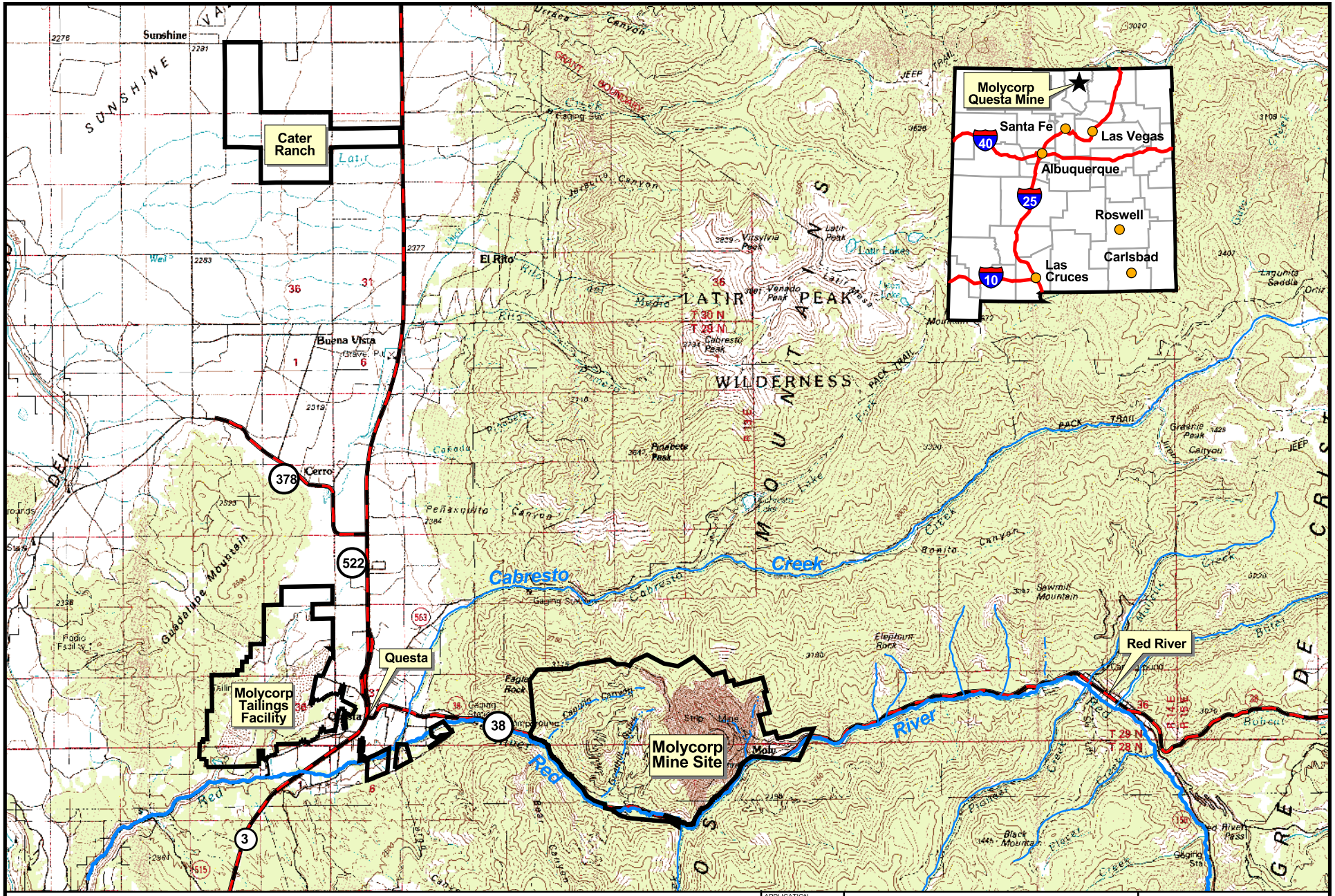
Sampling Activities	Time Frame	Laboratories	Matrices	Analysis Types
April 2004 Quarterly Groundwater and Surface Water Sampling	April 2004	STL	Groundwater Surface Water	Chemical
Historic Tailings Spill Investigation & Hunts Pond Investigation (including selected groundwater locations)	May 2004	STL	Soil Sediment Groundwater Surface Water	Chemical
Supplemental Sampling South of the Tailings Area		STL	Groundwater Soil Biota	Chemical
Spring 13 and Spring 39 Supplemental Sampling – Serial Dilution Study	September 2004	STL	Surface Water Groundwater Mixing Water	Chemical
		C&A		Bioassay
Spring 13 and Spring 39 Supplemental Sampling – Benthic Survey Study		STL	Surface Water Sediment	Chemical
Spring 13 and Spring 39 Supplemental Sampling – Groundwater Surface Water Interaction Study (GSI # 3)		STL	Surface Water Groundwater Sediment	Chemical
		EPA	Biota	Bioassay
Spring 13 and Spring 39 Supplemental Sampling – Radon Tracer Study		STL	Surface Water	Chemical
		USGS		Chemical

Notes:
STL = Severn Trent Laboratories
ACZ = ACZ Laboratories, Inc.
C&A = Chadwick and Associates
CEC = Chadwick Ecological Consultants
EPA = U.S. Environmental Protection Agency
FGS = Frontier Geosciences
USGS = U.S. Geological Survey
U of Arizona = University of Arizona
U of Miami = University of Miami (Florida)

SECTION 1

INTRODUCTION

FIGURES



URS

URS Center
8181 East Tufts Avenue
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(303) 694-2770

APPLICATION	ArcView GIS
FILE NAME	sec1_techmemo.apr
DRAWN BY	GIS - Denver
DATE	3/18/2005

MOLYCORP - QUESTA MINE

SITE LOCATION MAP

PROJECT 22236244

Figure 1-1

Preliminary Site Characterization Report

APPENDIX A-1

SECTION I
INTRODUCTI0N

PLACEHOLDER