Questa Baseline and Pre-Mining Ground-Water Quality Investigation. 3. Historical Ground-Water Quality for the Red River Valley, New Mexico

Water-Resources Investigations Report 03-4186

Prepared in Cooperation with the New Mexico Environment Department

U.S. Department of the Interior
U.S. Geological Survey

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By Sara H. LoVetere, D. Kirk Nordstrom, Ann S. Maest, and Cheryl A. Naus

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U.S. GEOLOGICAL SURVEY

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NEW MEXICO ENVIRONMENT DEPARTMENT

Boulder, Colorado
2004

U.S. DEPARTMENT OF THE INTERIOR
GALE A. NORTON, Secretary

U.S. GEOLOGICAL SURVEY
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Front cover photograph taken by Philip Verplank

Explanations and Abbreviations

--- (not analyzed or not measured)
AOC (Administrative order on consent)
AVIRIS (Airborne Visible/InfraRed Imaging Spectrometer)
AWWT (Advanced Waste Water Treatment facility)
BC (Bitter Creek)
C (Celsius)
CD (Compact disc)
C.I. (Charge imbalance)
COD (Chemical oxygen demand)
DB (Database)
DP-1055 (Discharge permit 1055)
EQP (EQ plot file)
GW (Ground water)
IAP (Ion activity product)
ICP (Inductively coupled plasma)
ID (Identification)
IDL (Instrument detection limit)
J (estimated concentration)
K_{sp} (Solubility product)
km (Kilometer)
L (Liter)
m (Meter)
MC (Molycorp, Inc.)
meq/L (milliequivalents per liter)
mg/L (milligrams per liter)
mM (millimoles per liter)
MMW (Mine monitoring well)
µS/cm (microsiemens per centimeter at 25 degrees Celsius)
µm (micrometers)
NAD (National American Datum)
ND (Non-detect)
NGVD (National Geodetic Vertical Datum)
NMED (New Mexico Environment Department)
NMHD (New Mexico Department of Health)
No. (Number)
OSE (Office of the State Engineer)
QA/QC (Quality Assurance/ Quality Control)
QSP (quartz, sericite, pyrite)
PWS (Public water supply)
RGC (Robertson GeoConsultants)
RL (Reporting limit)
SAP (Sampling and Analysis Plan)
SC (Straight Creek)
Spec Cond (Specific conductance)
SD (Standard deviation)
SI (Saturation index)
SMA (Souder Miller and Associates)
SOP (Standard Operating Procedure)
SPRI (South Pass Resources, Inc.)
SRK (Steffen Robertson and Kirsten)
STORET (U.S. Environmental Protection Agency Storage and Retrieval database)
TAL (Target analyte list)
Temp (Temperature)
TDS (Total dissolved solids)
TKN (Nitrogen kjedahl)
TSS (Total suspended solids)
U (not detected at the reporting limit)
USEPA (U.S. Environmental Protection Agency)
USFS (U.S. Forest Service)
USGS (U.S. Geological Survey)
V (volts)
WATEQ4F (Water equilibrium model)

CONVERSION FACTORS, ABBREVIATIONS, AND DATUM

Multiply	By	To obtain
cm (centimeter)	3.937×10^{-1}	in. (inch)
m (meter)	3.281×10^{0}	ft (foot)
m (meter)	1.094×10^{0}	yd (yard)
km (kilometer)	6.214×10^{-1}	mi (mile)
g (gram)	3.527×10^{-2}	oz (ounce)
km^2 (square kilometer)	3.861×10^{-1}	mi^2 (square mile)
L (liter)	2.642×10^{-1}	gal (gallon)
mg (milligram)	3.530×10^{-5}	oz (ounce)

Water and air temperature are given in degrees Celsius (˚C), which can be converted to degrees Fahrenheit (˚F) by use of the following equation: $˚F = {}^{9}/_{5}$ (˚C) + 32.

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD29). The geodetic datum was derived from a general adjustment of the Sea Level Datum of 1929, which is now considered superseded as the national standard (*http://water.usgs.gov/usgs/publishing/Memos/memo2002_01.html*).

Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD 1927), which also is considered superseded as the national standard.

Factors for converting International System of Units to English Units are provided above to four significant figures. In this report, however, numerical results are shown to three or fewer figures because sample collection and analysis methodology were not consistently reported by the original sources where the data were obtained.

QUESTA BASELINE AND PRE-MINING GROUND-WATER QUALITY INVESTIGATION. 3. HISTORICAL GROUND-WATER QUALITY FOR THE RED RIVER VALLEY, NEW MEXICO

By Sara H. LoVetere, D. Kirk Nordstrom, Ann S. Maest, and Cheryl A. Naus

ABSTRACT

Historical ground-water quality data for 100 wells in the Red River Valley between the U.S. Geological Survey streamflow-gaging station (08265000), near Questa, and Placer Creek east of the town of Red River, New Mexico, were compiled and reviewed. The tabulation included 608 water-quality records from 23 sources entered into an electronic database. Ground-water quality data were first collected at the Red River wastewater-treatment facility in 1982. Most analyses, however, were obtained between 1994 and 2002, even though the first wells were developed in 1962.

The data were evaluated by considering (a) temporal consistency, (b) quality of sampling methods, (c) charge imbalance, and (d) replicate analyses. Analyses that qualified on the basis of these criteria were modeled to obtain saturation indices for gypsum, calcite, fluorite, gibbsite, manganite, and rhodocrosite. Plots created from the data illustrate that water chemistry in the Red River Valley is predominantly controlled by calcite dissolution, congruent gypsum dissolution, and pyrite oxidation.

INTRODUCTION

Mining activities in the Red River Valley, New Mexico, may have affected ground-water quality. New Mexico law states that part of a closeout plan for mining sites must include compliance with ground-water quality standards unless ground-water quality exceeds the standards prior to mining (S. McKitrick, New Mexico Environment Department, written commun., 2000). The Questa baseline and pre-mining ground-water quality investigation began with a Joint Powers Agreement between the U.S. Geological Survey (USGS) and the New Mexico Environment Department (NMED) on April 30, 2001. The main objective of the USGS component of the investigation is to infer the pre-mining ground-water quality at the Molycorp, Inc. Questa molybdenum mine site in the Red River Valley (Nordstrom, 2002). Many ground-water quality analyses had been obtained prior to the involvement of the USGS, but these had never been compiled or evaluated for quality assurance and quality control (QA/QC). The purpose of this report is to compile and evaluate these data for the Red River Valley between the Questa Ranger Station (USGS streamflow-gaging station 08265000) near Questa, New Mexico, and Placer Creek southeast of the town of Red River (fig. 1), to identify any spatial and temporal trends in the data, and to obtain preliminary information on water-rock interactions from speciation and saturation index calculations through geochemical modeling.

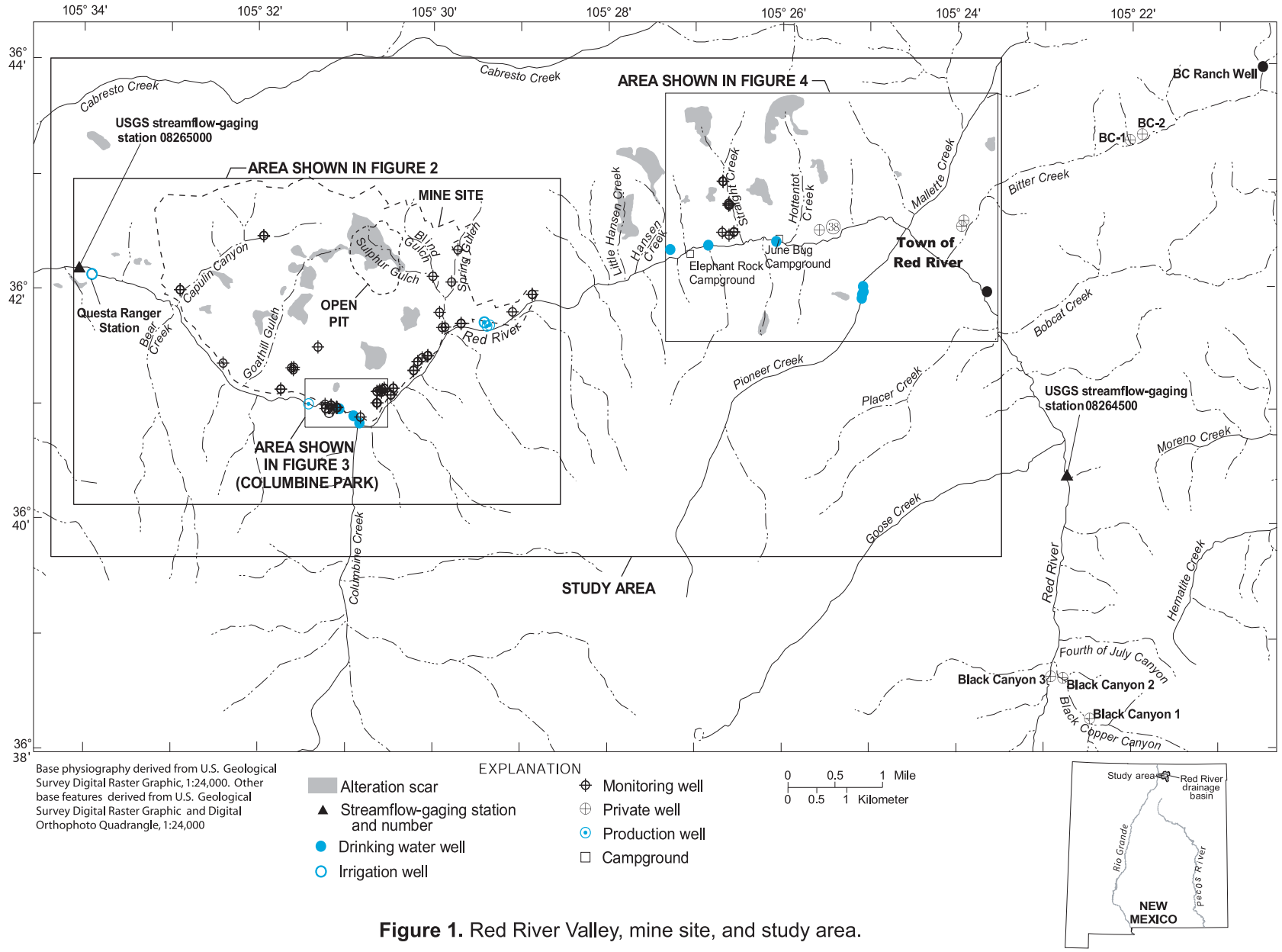

Figure 1. Red River Valley, mine site, and study area.

A considerable number of ground-water analyses are available, but the data are in numerous unpublished documents, including the mining company's archived documents, consultants' reports, students' theses, wastewater-treatment facility compliance letters, NMED files, and individual laboratory reports. Historical ground-water quality information is valuable because it presents the range of ground-water compositions found in the Red River Valley and allows for a preliminary evaluation of major mineral controls on ground-water chemistry. In this report, "historical" data are defined as all data existing from the earliest available record (November 1982) to August 2002. The collected data were divided into two databases and listed in two tables. One table (app. 1) contains all water-quality and related data that were compiled; it is referred to as the "complete database." The other table (table 6) is a subset of the complete database that contains selected analyses with documented accuracy information used for geochemical modeling and evaluation purposes. Both appendix 1 and table 6 are located on the compact disc (CD) in the back of this report.

The Town of Red River Advanced Waste Water Treatment (AWWT) facility began onsite annual monitoring of ground-water quality at the facility in 1982, which increased to biannual monitoring for compliance with the NMED in 1985. The mining company collected water-quality data from mill wells, private wells, and monitoring wells starting in 1992, 1993, and 1994, respectively. The U.S. Forest Service (USFS) performed preliminary assessments/site inspections for the Bitter Creek, Placer Creek, and Pioneer Creek watersheds in 2001. The USFS water-quality results were added to the database described in this report because the wells represent the most upstream data available even though the wells lie outside the study area.

Aquifer-property and water-quality data for campground, mine monitoring, private, production, and public-supply wells located within the study area were identified geographically by subbasin, waste-rock pile, or creek. Named geographic locations include Capulin Canyon, Columbine Park, the Mill area, Goathill Gulch, Sulphur Gulch, Spring Gulch, and Blind Gulch. Additional monitoring wells are located within or below rock piles at Sugar Shack West, Middle Dump, and Sugar Shack South (fig. 2). Private and supply wells are located along Hansen, Pioneer, Straight, Hottentot, and Bitter Creeks.

Figure 1 is a map of the Red River Valley and study area identifying the creeks, gulches, alteration scars, well types, and six wells upstream from the study area. Figure 2 is a detailed map of wells in the mine site. Figure 3 is a detailed map of Columbine Park near the mine site. Figure 4 illustrates wells near the town of Red River.

Several challenges were encountered during compilation including: (1) non-uniform collection, reporting, and interpretation of water analyses; (2) missing identification of employed analytical laboratories and analytical results; (3) incomplete or missing analytical values in reports; (4) discrepancies in reported aquifer, field, and analytical data; (5) absent sample collection or analysis methods and QA/QC information; and (6) nearly illegible analytical data due to small font size and poorly reproduced copies. After all the available data were obtained and organized, 100 wells with a total of 608 records of water-quality and aquifer information from 23 sources were catalogued in an Microsoft Access database. Water-quality data were obtained for 94 wells, and 6 additional wells were installed as dry wells. Only 19 of the available sources reported original data; the remaining 4 cited analytical results from other sources.

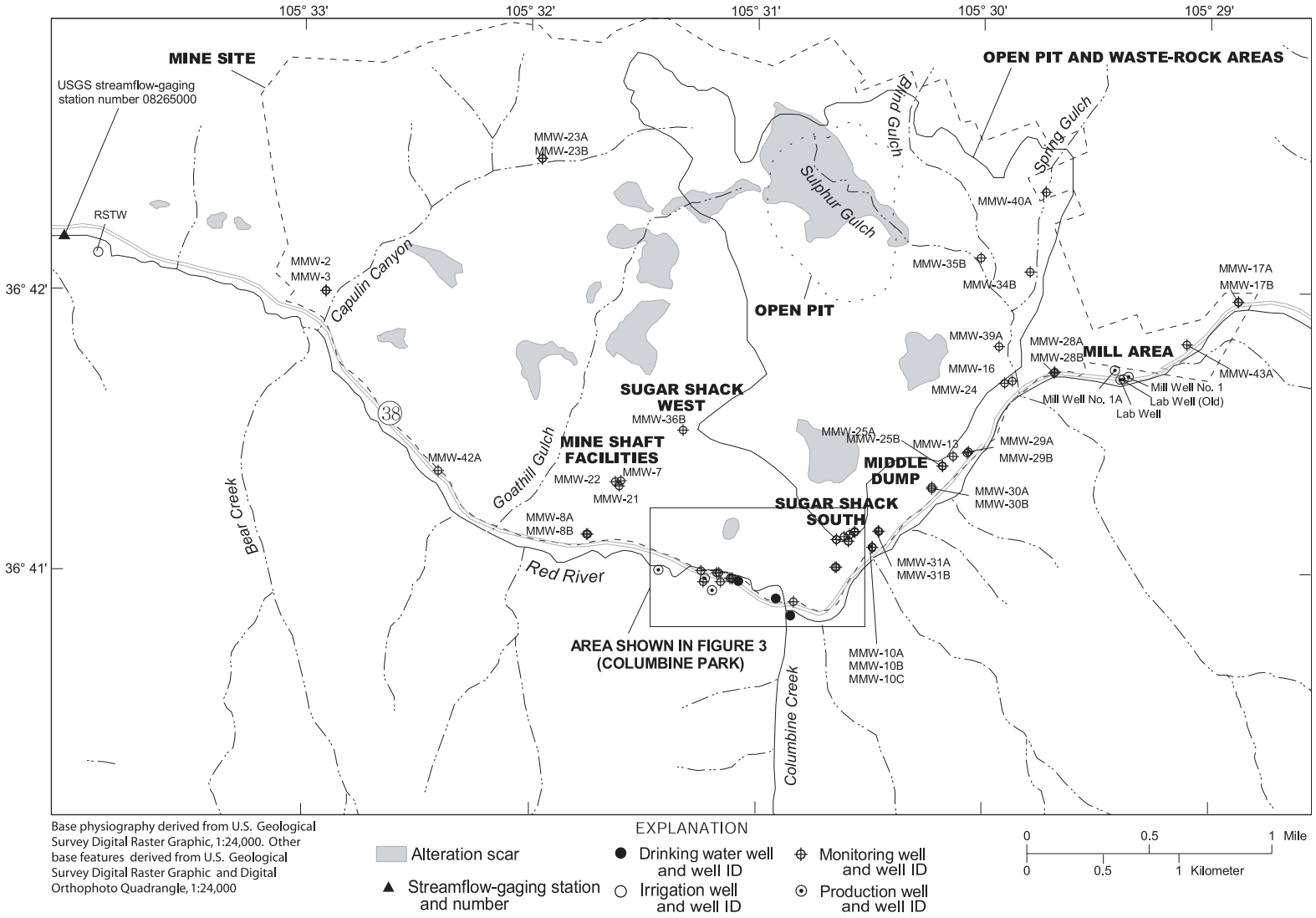

Figure 2. Drinking water, irrigation, monitoring, and production wells between the Questa Ranger Station and Mill area.

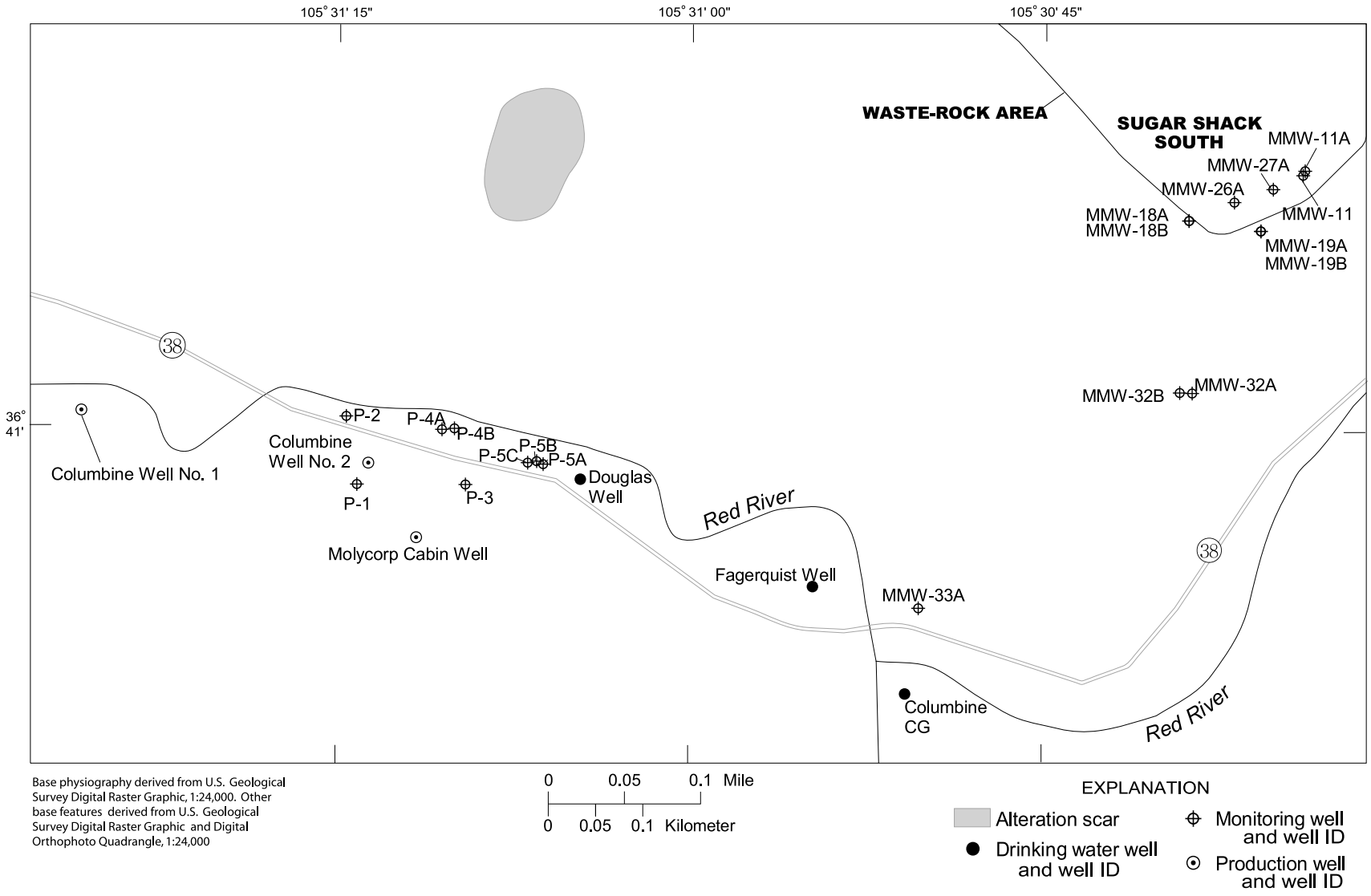

Figure 3. Drinking water, monitoring, and production wells in Columbine Park and at the toe of Sugar Shack South waste-rock pile.

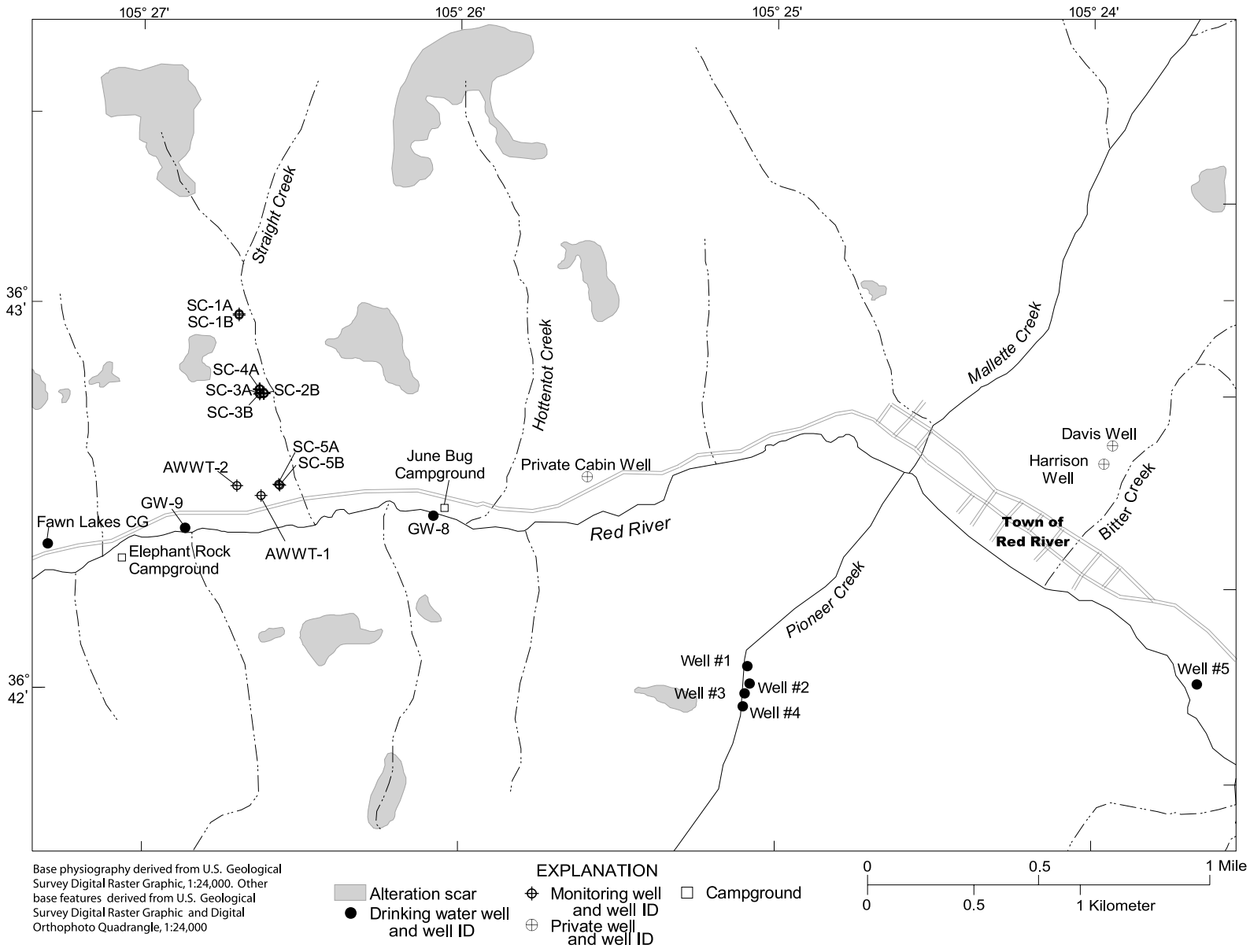

Figure 4. Drinking water, monitoring, and private wells east of Straight Creek or west of the town of Red River.

Physical Setting

The study area is located in Taos County in north-central New Mexico on the western slope of the Taos Range of the Sangre de Cristo Mountains within Carson National Forest. The mountainous area is rugged with steep slopes and V-shaped valleys, and bedrock has been locally altered by hydrothermal processes. The study reach is in the Red River Valley between the Questa Ranger Station (elevation 2,280 m) and the town of Red River (elevation 2,646 m). The Molycorp, Inc. Questa molybdenum mine, referred to as the "mine site," is located on the north side of State Highway 38 and the Red River, 13 km east of the Ranger Station. The mine site is approximately 18 km^2 and encompasses three tributary valleys to the Red River: Capulin Canyon, Goathill Gulch, and Sulphur Gulch, from west to east, respectively (fig. 1).

Mining activities produced extensive underground workings and an open pit of approximately 7.8 km^2 near or in Sulphur Gulch. Waste-rock piles cover steep slopes on the north side of the Red River between Capulin Canyon and Spring Gulch (a tributary valley of Sulphur Gulch). Hydrothermally altered bedrock is found in Capulin, Goathill, Sulphur, Hansen, Straight, and Hottentot drainages (fig. 1). Weathering of extensively altered rock has resulted in steep, highly erosive, sparsely vegetated "alteration scars" that are visible from the ground and in aerial photographs.

Climate and Vegetation

The Red River Valley is located in a semiarid desert that receives precipitation throughout the year and sustains moderate biodiversity. Between 1915 and 2002, the annual average temperature was 4 ^{o}C; annual average precipitation and snowfall were 52 cm and 370 cm, respectively. Daily temperatures generally fluctuated by 18 ^{o}C throughout the year (table 1) (Western Regional Climate Center, 2003).

Table 1. Red River monthly climate summary from January 1915 to December 2002

[C, degrees Celsius; cm, centimeters; Max., maximum; Min., minimum]

Month	Average Max. Temperature (C)	Average Min. Temperature (C)	Average Total Precipitation (cm)	Average Total Snow Fall (cm)	Average Snow Depth (cm)
January	2.5	-15.4	2.7	50.8	22.9
February	4	-13.3	3	54.1	22.9
March	6.7	-9.7	4.5	74.4	17.8
April	12	-5.6	4.4	55.4	5.1
May	16.9	-1.8	4.4	18.5	0
June	22.6	1.8	3.2	0.3	0
July	24.4	4.9	7.4	0	0
August	23.2	4.6	8	0	0
September	20.4	0.9	4.2	1.3	0
October	14.8	-3.8	3.8	21.1	0
November	7.2	-9.9	3.4	47	5.1
December	3.1	-14.4	2.9	48.3	15.2
Annual	**13.2**	**-5.2**	**52**	**371**	**7.6**

Data obtained from the Western Regional Climate Center, 2003.

Climate and vegetation vary greatly within short distances because of differences in topography, weather, and sediment composition. The altitude in the study area ranges from 2,280 m at the Ranger Station to 3,277 m at the crest of the Taos Range. Orographic effects of mountainous topography lead to precipitation on the windward slopes and localized storms within tributary valleys. Major precipitation events include summer thunderstorms and winter-spring snowstorms. Thunderstorms are responsible for mass wasting in hydrothermally altered areas, producing debris flows that potentially affect vegetation, alluvial aquifers, and the Red River. Winter snowpack contributes to ground-water recharge through snowmelt infiltration and runoff.

Hillslope composition varies among hydrothermally altered sediments, waste-rock overburden, and moderate soil development. Some scar areas and hillslopes with soil horizons support primarily Ponderosa pines (*Pinus ponderosa*), Limber pines (*Pinus flexius*), and Douglas fir (*Pseudotsuga taxifolia*). Willows (*Salix* spp.), cottonwoods (*Populus* spp.), primary vegetation, and flowering vegetation grow along the riverbank.

Geology

Ground water passes through and may geochemically interact with the various types of earth materials discussed in this section. These include fractured bedrock, soil and alluvium, and waste rock. They are discussed separately because they have differing origins, geochemical and hydraulic properties, and locations in the landscape. This section summarizes the work of Schilling (1956), Rehrig (1969), Lipman (1981), and Meyer and Leonardson (1997), in addition to observations made by the USGS scientists currently working at the site.

The Taos Range of the Sangre de Cristo Mountains is composed of Precambrian metamorphic assemblages and granitic intrusives overlain by Tertiary volcanics. Late Oligocene to early Miocene granitic plutons and associated hydrothermal alteration were the source of molybdenite and other sulfide mineralization.

The primary mineralogy of most of these units has been modified by hydrothermal solutions, producing a variety of secondary mineral phases. The types of minerals formed are a function of the initial mineralogy and the degree of alteration. The three principal alteration zones include highly altered quartz-sericite-pyrite (QSP), less altered argillic (dominantly kaolinite) zones, and mildly altered propylitic zones (containing calcite mineralization). Calcite, goethite, and sericite are widely distributed in the Red River Valley as revealed by the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) study (Livo and Clark, 2002). Calcite is an important mineral in the Red River Valley because its dissolution effectively neutralizes acid inflows so that pH values in the Red River tend to be alkaline (pH 7-8). Gypsum is commonly found throughout the Red River Valley as a secondary product of acid-sulfate weathering from pyrite oxidation reacting with calcite.

The Red River Valley is located along the southern edge of the Questa volcanic caldera and contains complex structural features and extensive hydrothermal alteration. In the Red River Valley, most of the visible rocks are Tertiary volcanics with smaller areas of Precambrian metamorphics and granitic rocks. The volcanics are primarily of intermediate to felsic composition (andesites to rhyolites), and they have been intruded by quartz monzonites and granites. The hydrothermally altered tuffs often contain pyrite mineralization (generally 1-3 percent).

Minerals in subsurface samples collected and described during mineral exploration and mining are biotite, calcite, chalcopyrite, fluorite, galena, molybdenite, pyrite, quartz, rhodocrosite, and sphalerite. Mining activities produced approximately 328 million tons of rock overburden in Capulin Canyon, along the north slope of the Red River, and in Goathill, Sulphur and Spring Gulches (Steffen Robertson & Kirsten, 1995). The abundant minerals in waste-rock samples include chlorite, gypsum, illite, illite-smectite, jarosite, kaolinite, and muscovite (Gale and Thompson, 2001).

Surface Water

The Red River originates at Wheeler Peak at an elevation of 4,098 m, flows about 13 km north to the town of Red River, and continues for 34 km west to the town of Questa where it ultimately discharges to the Rio Grande. The drainage area upstream from the Questa Ranger Station is 293 km^2. Streamflow usually peaks from late May to mid-June; snowmelt-related flows begin to increase in late March through mid-April. Summer thunderstorms are prevalent in July and August. The mean annual discharge of the Red River at the Questa Ranger Station ranged from 12.8 to 103 cfs between 1930 and 2001, and the average daily discharge ranged from 2.5 to 557 cfs between 1965 and 2001 (U.S. Geological Survey, 2002).

The main drainages in the vicinity of the mine site are Capulin Canyon, Goathill Gulch, and Sulphur Gulch on the north side of the Red River (fig. 1). Upstream from the mine site, Little Hansen, Hansen, Straight, and Hottentot Creeks drain scar areas, and Mallette and Bitter Creeks drain non-scar areas on the north side of the Red River. Bear, Columbine, Pioneer, and Placer Creeks drain largely unmineralized land on the south side of the river.

Seeps and shallow alluvial ground water discharge to the Red River, rendering it a gaining stream over much of its length (Smolka and Tague, 1989). About 60 ephemeral seeps and springs arise along the banks of the Red River between the Questa Ranger Station and the town of Red River (South Pass Resources, Inc., 1994, 1995b; Steffen Robertson & Kirsten, 1995; Slifer, 1996; Robertson GeoConsultants, Inc., 2000a, 2001a). The majority of seeps and springs can run acidic (pH 2-4) with high specific conductance, high total dissolved solids (TDS), and elevated metal and sulfate concentrations. Springs downgradient from scar and mined areas on the north side of the Red River often have a milky aluminum hydroxide precipitate that affects the color and turbidity of the river (Vail Engineering, Inc., 1989).

Ground Water

Ground water is influenced by the climate, geology, and anthropogenic activities in the Red River Valley. Three major types of water-bearing units are present: fractured bedrock, waste-rock piles, and soil and alluvium, all of which contain variable amounts of acid- and metal-generating minerals (Kirk Vincent, U.S. Geological Survey, written commun., 2003). Bedrock constitutes the largest aquifer in the study area in terms of rock mass but probably contains only small amounts of ground water because of low porosity and hydraulic conductivity that are controlled by fractures. Waste-rock piles and scars with associated debris fans are geochemically reactive, have high porosity, and have a fast rate of infiltration.

Alluvial aquifers are restricted in area and thickness compared with bedrock aquifers and have variable compositions. Streamflow and hillslope processes have been eroding the mountainous study area throughout the late Cenozoic age; deposits of unconsolidated sediments are found in only specific locations and are relatively small in volume. Rock outcrops are relatively rare, and hillslope soils are thin and composed of materials eroded from immediately upslope. Debris fans are located at the mouths of most tributaries and are composed of sediments shed from their tributary watersheds. Where the tributary watersheds contain alteration scars, the debris fans are large, active and contain both coarse- and fine-grained debris-flow sediments. The chemistry of these sediments likely reflects the chemistry of their rapidly eroding and altered erosion scars. Sediments deposited by the Red River, in contrast, generally consist of well-washed sandy gravel and are composed of a mix of the lithologies found in the entire Red River watershed. The largest debris fans caused the aggradation of the riverbed behind the fans during the Quaternary age. Thus, water flowing in the shallow alluvial aquifers likely passes alternately through Red River alluvium and debris-fan alluvium. Both the Red River alluvium and debris-fan alluvium are less than several hundred meters wide and less than 60 m thick (Kirk Vincent, written commun., 2003).

Alluvial ground water is calcium-sulfate water, whereas bedrock ground water is generally calcium-magnesium-sulfate water. Ground water downgradient from the waste-rock dumps and scars has acidic pH values and elevated metal concentrations compared with ground water upgradient from the altered areas. Most wells developed in the Red River Valley were installed to monitor water quality downgradient from mining operations (waste-rock dumps and tailings piles) and (or) scar areas.

Mine History and Ground-Water Development

A pair of prospectors first discovered molybdenite in Sulphur Gulch in 1914. Small-scale underground mining took place until 1956 when a “large tonnage, low-grade ore body” was discovered in Sulphur and Goat Hill Gulches (URS, 2001), at which time operations switched to exploration and development of an open-pit mine.

In 1962, the first mining-related wells were installed. Designed to produce water for mill operations, Mill Wells #1 and 1A were dug less than 500 ft north of the Red River at the mill site. Rock overburden of Sulphur Gulch first was removed for open-pit operations in 1964, and molybdenite was extracted from the open pit within a year.

During 1965, production wells were installed in Columbine Park to supply cleaner water to the mill site than that produced at the mill wells. The mill was soon expanded to process 10,000 tons of rock per day. A pipeline was constructed to transport tailings slurries about 23 km off site to an area west of the town of Questa in the Rio Grande Valley. The increased activity at the Questa mine spurred Federal regulatory agencies to begin inspecting the site in 1966 through baseline and surface-water surveys (Slifer, 1996).

In 1983, open-pit mining ceased and operations in the new phase of underground mining were initiated, which effectively halted the dumping of waste rock in the valley. An estimated 328 million tons of overburden were deposited in Capulin Canyon, along the north slope of the Red River, and in Goathill, Sulphur, and Spring Gulches between 1964 and 1983 (Steffen Robertson & Kirsten, 1995).

NMED requested that the mine operator submit discharge-plan applications in 1992 for (1) the mine waste-rock piles and (2) the reintroduction of ground water into the mine (S. McKitrick, written commun., 2000). The discharge permit preparation served as the impetus for the installation of monitoring wells on the mine site (Slifer, 1996). In 1994, Molycorp installed 12 monitoring wells on the mine site to characterize and compare water quality between scar areas (hydrothermally altered zones) and areas affected by mining activities (South Pass Resources, Inc., 1995b). The U.S. Environmental Protection Agency (USEPA) and the mine operator conducted an expanded site inspection in 1994. Sample splits were collected from the wells and sent to three different laboratories. Because trace metals were discovered in the ground water in concentrations exceeding New Mexico standards, the mine operator continued to sample the wells.

A discharge permit, DP-1055, was issued for the mine site in November 2000. Quarterly sampling of wells commenced in June 2001 when the USEPA defined the appropriate methods for sample collection and analysis in the Standard Operating Procedures (SOP) and Remedial Investigation and Feasibility Study (U.S. Environmental Protection Agency, 2002).

Acknowledgments

This report would not have been possible without the helpful assistance of Molycorp's employees. We thank Bruce Walker and Anne Wagner (Molycorp) for providing information and requested documents. We appreciate the assistance of Armando Martinez (Molycorp) for answering our numerous inquiries. We also are grateful for the cooperation of the New Mexico Environment Department, U.S. Forest Service, and the Town of Red River AWWT facility. Mike Reed (NMED), Lisa Goodman (USFS), and Russell Church (AWWT) were especially helpful in providing documents and site information and in clarifying explanations. Blaine McCleskey and Jim Ball (USGS) helped with the WATEQ4F code operation and provided helpful hints on Excel. Kirk Vincent and Philip Verplanck (USGS) helped with the geology and ground-water background information. Michael Sharp (Fuzzy Dog Media) donated his time to help import the compiled data from scores of Excel tables into an Access database. This work also would not have been possible without the support of the USGS National Research Program.

GROUND-WATER QUALITY DATABASE

To create a complete database of historical ground-water quality data, the USGS accessed the Molycorp archives, requested pertinent information from the USFS and NMED, and searched GeoRef, Chemical Abstracts, and USEPA Storage and Retrieval (STORET) databases. The gathered reports were then organized into a bibliography, and water-quality information was extracted and entered into a new database. Information related to sample collection, handling, preservation, laboratory, and methodology were compiled for each data source (table 2). Specific well information, including geographic location, aquifer type, completion date, and well type, can be found in table 3. A subset of the complete database (table 6, on CD) contains selected analyses that were used for geochemical modeling and evaluation in this report.

Table 2. Original source and analytical information

[ACZ, New Mexico State Laboratory; Alk, alkalinity; CD, compact disc; CEP, Controls for Environmental Pollution; COD, chemical oxygen demand; commun., communication; DB, database; ETC, Molycorp laboratory; GW, ground water; ID, identification; MC, Molycorp, Inc.; µm, micrometer; MMW, mine monitoring well; NMED, New Mexico Environment Department; no., number; PWS, public water supply; RGC, Robertson GeoConsultants, Inc.; SAP, sampling and analysis plan; SLD, Scientific Laboratory Division; SMA, Souder Miller and Associates; SOP, standard operating procedure; specific conductance; SWOK, southwestern Oklahoma; TAL, target analyte list; TDS, total dissolved solids; Temp, Temperature; TKN, nitrogen Kjedahl; TSS, total suspended solids; USEPA, U.S. Environmental Protection Agency; wkst, worksheet; ---, no data; <, less than]

Source ID [1]	Source	Prepared for	Sample events-collection dates	Collection methods	Filtered
Kent 1995	Kent, S., 1995, Expanded site inspection report on Molycorp Inc., Oct. 20, 36 p.	USEPA, Superfund	Nov-94	In accordance with SOP's for NMED GW Quality Bureau	Yes
MC CD	Molycorp, Inc., CD, written commun., 2002, Official database in compliance with DP-1055	NMED	2001-2002	Followed recommendation of SRK from July 13, 1999, until USEPA SAP-SOP July 2001; field blanks, field rinsate blanks, field duplicates taken twice/quarter for GW. Trip blanks taken only for volatile/semi-volatile organic compounds	0.45-µm pore size
MC DB	URS, written commun.	MC, URS Comp-rehensive Hydrologic report	Sole-data source for data from 7/16/94, 10/29/96, 1/27/97, 6/12/97, 7/9/97, 11/10/97, 5/11/98, 3/23/00	---	---
MMW wkst	Molycorp, Inc., written commun., in-house unofficial monitoring	NMED	Nov-94, Jun-95, Apr-96, Aug-96, Jan-97, Jan-00, Feb-00	Not officially reported; SMA observed on July 1997 "no written protocol"	Yes
NMED	ACZ Contract Lab, written commun.	NMED	Jun-97 - Jun-98, May-00	MC and NMED collected samples but did not report methodology; post Jan-00 used 0.45-µm filter, HNO_3 or H_2SO_4 preservation	Yes

[1] Refers to Source ID in table 6

[2] Anions refer to alk, SO_4, F, Cl

[3] Used SPRI (1994) protocol

Table 2. Original source and analytical information

Source ID [1]	Source	Prepared for	Sample events-collection dates	Collection methods	Filtered
NMED	Scientific Laboratory Division, written commun.	NMED	Jun-98, Jan-00	---	---
Paragon lab sheet	Paragon Analytics, written commun.	AWWT	Mar-03	---	---
PWS	New Mexico Public Water System, 1999-2001	Public Water Record	May-99, Oct-01, Nov-01	---	Yes
RGC 8/10	Robertson GeoConsultants, 2000b, report no. 052008/10	MC, NMED	Original data (GW-8, 9, Private Cabin well)	---	Yes
RGC 8/12	Robertson GeoConsultants, 2001a, report no. 052008/12	MC, NMED	Original data (appendix A: electronic database Mar - Nov 2000)	---	0.45-µm pore size
Slifer 1996	Slifer, D., 1996, Red River GW investigation, March, 26 p.	NMED, USEPA	Nov-94	In accordance with SOP's for NMED GW Quality Bureau; see SPRI 1995 and WC 1996	0.45-µm pore size
SMA	Souder Miller and Associates, 1997, GW sampling recommended practices, July 17, 2 p.	MC	Jun-97 SMA observed sampling of two mine monitoring wells	Molycorp staff collected routine samples with undocumented protocol (SMA, 1997)	New filter per well
SPRI 1995 [3]	South Pass Resources, Inc., 1995b, Progress report on the geology, hydrology, and water quality of the mine area, April 21, 19 p.	MC, NMED	Nov-94	Micro purged 3-5 well volumes prior to sample collection	0.45-µm pore size

[1] Refers to Source ID in table 6

[2] Anions refer to alk, SO_4, F, Cl

[3] Used SPRI (1994) protocol

Table 2. Original source and analytical information

Source ID [1]	Source	Prepared for	Sample events-collection dates	Collection methods	Filtered
TRR	Town of Red River files and letters of compliance with NMED, 1984 - present	NMED	1984 - present biannually	Followed Standard Methods Water and Wastewater 16th ed. from 1984-1992; followed the 17th and 18th eds. from 1992 - present	Yes
USEPA memo	US Environmental Protection Agency, 1999	USEPA Region 6	Jun-99	---	---
USFS	Carson National Forest, written commun., 1991	Carson National Forest	May-91	---	No
USFS	US Department of Agriculture, Forest Service, 2001a, b, and 2002a, b	Carson National Forest	May-01, Jun-01	---	---
Vail	Vail Engineering, 2000, Interim report -Analysis of acid rock drainage in the middle reach of the Red River, July 4	MC, NMED	3/98, 4/98, 10/98, 2/99, 9/99, 10/99, 3/00, 9/00, 11/00	---	---
WC 1996 [3]	Woodward-Clyde Consultants, 1996, Final compilation of Molycorp's sample data from sample splits with NMED, September	MC, NMED	11/7-8/1994 above mine site (Forest service wells and AWWT well -GW 8-10) and below mine site (MMW- 3, 7, 10B, 11, and Mill No. 1)	SPRI collected with NMED protocol. For GW 8, 9: gloves, dedicated pump/tubing, de-ionized rinse before, between, after sampling; purged 3 well volumes, collected samples from well tap. For MMW's: gloves, depth to water, pump rate, pH, Spec Cond, Temp while millipurge; collect sample from dedicated tubing	0.45-μm pore size

[1] Refers to Source ID in table 6

[2] Anions refer to alk, SO_4, F, Cl

[3] Used SPRI (1994) protocol

Table 2. Original source and analytical information

Source ID [1]	Preservation	Field parameters	Lab parameters	Analytical methods	Lab
Kent 1995	Nitric acid to pH<2, on ice until arrival at lab	pH, Temp, Spec Cond	Total and dissolved metals, and anions[2]	**TDS**: EPA 160.1, **SO_4** & **Cl**: EPA 300.0, **pH & Alk**: EPA 310.1, **F**: EPA 340.2; **Al, Ba, Be, Ca, Cr, Co, Cu, Fe, Mg, Mn, Mo, N, K, Na, V, Zn** by EPA 200.7, 200.8; **Hg**: EPA 245.1; **As**: EPA 206.2; **Cd**: EPA 213.2; **Pb**: EPA 239.2; **Se**: 3500-Se C, AA-Hydride, **Si**: EPA 206.2; **Ag**: EPA 272.2	USEPA contract Laboratories ACZ, then SLD
MC CD	Nitric acid to pH <2; 4°C	pH, Eh, Temp, Spec Cond, water elevation	Organic, inorganic, dissolved metals, anions[2], and volatile organic compounds	Followed Methods for the Chemical Analysis of Waters and Wastes, May 1994 procedures. **TDS**: EPA 160.1; **Cl, NO_3 & SO_4**: EPA 300.0; **Alk**: EPA 310.1; **F**: EPA 340.2; **dissolved metals**: EPA 200.7; **Hg**: EPA 245.1	Paragon Analytics
MC DB	---	pH, Spec Cond, Temp	TDS, F, Al, Ca, Co, Cu, Fe, Mg, Mn, Ni, K, Na, Zn, Mo, Ba, Si, Be, Cd, Cr, As, Pb, Alk, SO_4, Cl	---	---
MMW wkst	---	pH, Spec Cond, Temp, depth to water and pump intake	Dissolved metals, anions[2], and TDS	---	---
NMED	Yes	---	Dissolved metals, anions[2], and TDS	1997-1998: **Alk**: EPA 2320B; **Cl**: EPA 325.2; **F**: EPA 340.2; **SO_4**: EPA 375.3; **TDS**: EPA 160.1; **Al, Ba, Be, Ca, Cr, Co, Cu, Fe, Mg, Mn, Mo, N, K, Na, V, Zn** by EPA 200.7, 200.8; **Hg**: EPA 245.1; **As**: EPA 206.2; **Cd**: EPA 213.2; **Pb**: EPA 239.2; **Se**: 3500-Se C, AA-Hydride, **Si**: EPA 206.2; **Ag**: EPA 272.2; May-00 same as SLD below	ACZ contract lab

[1] Refers to Source ID in table 6

[2] Anions refer to alk, SO_4, F, Cl

[3] Used SPRI (1994) protocol

Table 2. Original source and analytical information

Source ID [1]	Preservation	Field parameters	Lab parameters	Analytical methods	Lab
NMED	---	---	Cations, anions[2], TDS, and trace metals depending on request from NMED	**TDS**: EPA 160.1, **SO_4 & Cl**: EPA 300.0, **pH & Alk**: EPA 310.1, **F**: EPA 340.2; **Al, Ba, Be, Ca, Cr, Co, Cu, Fe, Mg, Mn, Mo, N, K, Na, V, Zn** by EPA 200.7, 200.8; **Hg**: EPA 245.1; **As**: EPA 206.2; **Cd**: EPA 213.2; **Pb**: EPA 239.2; **Se**: 3500-Se C, AA-Hydride, **Si**: EPA 206.2; **Ag**: EPA 272.2	SLD
Paragon lab sheet	---	---	---	**TDS**: EPA 160.1, **Cl & SO_4**: EPA 300.0, **Alk**: EPA 310.1, **F**: EPA 340.2, **Al, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Ni, K, Se, Ag, V, Zn, Mo, Si, Na** by EPA 200.7, **Hg**: EPA 245.1	Paragon Analytics
PWS	---	---	Dissolved metals	---	---
RGC 8/10	Yes	pH	TDS, SO_4, Fe, Mn, Cu, Zn, Al, Co, Mo, Ni, Cd, Cr, F, Pb	---	---
RGC 8/12	Yes	pH	Dissolved metals, anions[2], and TDS	post Jan-2000 ACZ: **Alk**: EPA 310.1; **Cl**: EPA 352.2; **F**: EPA 340.2; **SO_4**: EPA 375.4 & 300.0; **TDS**: EPA 160.1; **Al, Ba, Be, Ca, Cr, Co, Cu, Fe, Mg, Mn, Mo, N, K, Na, V, Zn** by EPA 200.7, 200.8; **Hg**: EPA 245.1; **As**: EPA 206.2; **Cd**: 213.2; **Pb**: 239.2; **Se**: 3500-Se C, AA-Hydride, **Si**: 206.2; **Ag**: 272.2	ACZ, Paragon Analytics
Slifer 1996	yes	See SPRI, 1995 and WC, 1996	See SPRI, 1995 and WC, 1996	See SPRI, 1995 and WC, 1996	ACZ, SLD
SMA	---	Spec Cond, pH, Temp	---	---	---
SPRI 1995 [3]	1 mL/L of nitric acid in polyethylene bottle for metals	Temp, Spec Cond, pH, well volume, weather conditions, well observations, and color and turbidity	pH, Spec Cond, TDS, TSS, cations, anions[2], and dissolved metals	**TDS**: EPA 160.1; **SO_4**: EPA 375.4; **Alk**: EPA 2320B; **Cl**: EPA 325.3; total and dissolved metals: CLP	ETC Northwest Laboratory in Renton, Wash.

[1] Refers to Source ID in table 6

[2] Anions refer to alk, SO_4, F, Cl

[3] Used SPRI (1994) protocol

Table 2. Original source and analytical information

Source ID [1]	Preservation	Field parameters	Lab parameters	Analytical methods	Lab
TRR	Yes	---	SO_4, TDS, Cl, TKN, NO_3	Samples analyzed following Methods for the Chemical Analysis of Waters and Wastes (MCAWW), May 1994 procedures; **TDS**: EPA 160.1, **SO_4 & Cl**: EPA 300.0, **Hg**: EPA 245.1, **metals**: EPA 200.2 & 200.7	In-house, Triple Point, Stewart Environmental Contractors, CEP, Paragon
USEPA memo	---	---	Inorganic - metals	Used ICP, method not reported	SWOK, Okla.
USFS	---	---	Total metals and F	---	CEP
USFS	---	No	TAL metals	Metals: SW6010B, Hg: 7470A	Ecology and Environment, Inc.; Analytical Services Center; N.Y.
Vail	---	pH, Spec Cond, NTU	Total and dissolved metals, anions, Spec Cond, and pH	---	CDS Labs, Durango Colo.
WC 1996 [3]	Nitric acid for dissolved TAL metal analysis and sulfuric acid for wet chemistry	First depth to water, then Temp, pH and Spec Cond measured periodically while purging	Total and dissolved TAL metals and dissolved wet chemistry parameters (Alk, NH_4, Cl, COD, NO_3, NO_3, PHO_4, P, SO_4, TDS)	**TDS**: EPA 160.1; **SO_4**: EPA 375.4; **Alk**: EPA 2320B; **Cl**: EPA 325.3; total and dissolved metals: CLP	ETC Northwest Laboratory in Renton, Wash.

[1] Refers to Source ID in table 6

[2] Anions refer to alk, SO_4, F, Cl

[3] Used SPRI (1994) protocol

Table 3. Well Information

[app., appendix; AWWT, Advanced Waste Water Treatment; BC, Bitter Creek; bgs, below ground surface; CD, Compact Disc; CG, Campground; GW, Ground Water; ID, Identification; m, meters; MMW, Mine Monitoring Well; NF, National Forest; NMED, New Mexico Environment Department; No., Number; OSE, Office of the State Engineer; RGC, Robertson GeoConsultants; RR, Red River; SC, Straight Creek; SMA, Souder Miller and Associates; SPRI, South Pass Resources, Inc.; USEPA, U.S. Environmental Protection Agency; USFS, U.S. Forest Service; WC, Woodward-Clyde Consultants; WWTP, waste water treatment plant; ---, no data]

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
AWWT-1	Straight Creek	Bedrock	Bedrock	4/13/82	66	58 - 64	Also known as GW 10, RRTP, RR WWTP, Red River Sewage Plant Well, facility well #1, monitoring well	Office of State Engineer	Monitoring
AWWT-2	Straight Creek	Alluvium	Mudflow from fan delta channel	7/15/91	---	---	Drilling logs and well record from the OSE	Office of State Engineer	Not completed
BC Ranch Well	Bitter Creek road	---	---	---	---	---	4 miles northeast of the town of Red River along Bitter Creek road	Robertson GeoConsultants, 2001a, app. A	Drinking water
BC-1	Bitter Creek watershed	---	---	---	---	---	Sampled by USFS for Hazardous Material Investigation reports on abandoned mines	U.S. Forest Service, 2001a	Private
BC-2	Bitter Creek watershed	---	---	---	---	---	Sampled by USFS for Hazardous Material Investigation reports on abandoned mines	U.S. Forest Service, 2001a	Private
Black Canyon 1	Red River headwaters	---	---	---	---	---	Sampled by USFS for Hazardous Material Investigation reports on abandoned mines	U.S. Forest Service, 2002a	Private

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
Black Canyon 2	Red River headwaters	---	---	---	---	---	Sampled by USFS for Hazardous Material Investigation reports on abandoned mines	U.S. Forest Service, 2002a	Private
Black Canyon 3	Red River headwaters	---	---	---	---	---	Sampled by USFS for Hazardous Material Investigation reports on abandoned mines	U.S. Forest Service, 2002a	Private
Columbine CG	Columbine CG	Alluvium	Alluvium	8/30/66	24	---	Owned by Carson NF	Kent, S., 1995, Slifer D., 1996, and Carson National Forest	Drinking water
Columbine No. 1	Columbine Park, Company's Cabin area	Alluvium	Alluvium	9/20/65	47	---	The State Engineer calls this Columbine Well No. 2; Permit Number: RG-12797-X; redrilled in 1971	South Pass Resources, Inc., 1995b and Molycorp Inc., CD	Production
Columbine No. 2	Columbine Park, Company's Cabin area	Alluvium	Alluvium	9/25/65	43	6.1 - 43	The State Engineer calls this Columbine Well No. 1; Permit Number: RG 12797	South Pass Resources, Inc., 1995b and Molycorp Inc., CD	Production
Davis Well	Bitter Creek	---	---	---	---	---	Sampled by NMED for Slifer (1996)	Slifer, D., 1996	Private
Douglas Well	Columbine Park	---	---	---	---	---	---	Molycorp Inc., CD	Drinking water
Fagerquist Well	Columbine Park	Alluvium	Alluvium	06/27/83	26	---	---	Office of State Engineer	Drinking water
Fawn Lakes CG	Fawn Lakes CG	Alluvium	---	04/09/65	---	---	---	Carson National Forest	Drinking water

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
GW-8	Junebug CG	Alluvium	Alluvium	06/11/91	28	---	Owned by Carson NF; sampled by Kent (1995), WC, and RGC	Carson National Forest	Drinking water
GW-9	Elephant Rock CG	Alluvium	Alluvium	06/11/91	12	---	Owned by Carson NF; sampled by Kent (1995), WC, and RGC	Carson National Forest	Drinking water
Harrison Well	Bitter Creek	---	---	---	---	---	Sampled by NMED for Slifer (1996)	Robertson GeoConsultants, 2001a, app. A	Private
Lab Well (New Mill Well)	Mill area	Bedrock	Bedrock	11/12/00	40	---	OSE records for RG-12935 indicate another well named Lab Well, which is no longer in use Although this well has been called the Lab Well, it is a different well than RG-12935	Souder Miller and Associates, 2002a and Molycorp, Inc., CD	Production
Lab Well (old)	Mill area	Bedrock	---	4/6/01	---	---	No analytical data found	Molycorp Inc., CD	Production
Mill Well No. 1	Mill area	Alluvium	Alluvium	2/24/62	58	0.6 - 46	Also called Lower Mill Well, Molycorp Mill Well	South Pass Resources, Inc., 1995b and Molycorp Inc., CD	Production
Mill Well No. 1A	Mill area	Alluvium	Alluvium	1962	54	---	Also called Upper Mill Well	South Pass Resources, Inc., 1995b and Molycorp Inc., CD	Production

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
Molycorp Cabin Well	Company's Cabin area	Alluvium	Alluvium	Fall 1979	31	---	Also called Company Cabin Well	Souder Miller and Associates, 2002a, Slifer, 1996, Steffen Robertson and Kirsten, 1995, and Molycorp, Inc., CD	Production
MMW-2	Capulin Canyon, Valley fill well	Colluvium	Mudflow, debris flow	8/28/94	21	12 - 18	---	Souder Miller and Associates, 2002a	Monitoring
MMW-3	Capulin Canyon Valley	Bedrock	Andesite	8/26/94	44	32 - 35	---	Souder Miller and Associates, 2002a	Monitoring
MMW-7	Mine Shaft #1 Facility	Bedrock	Andesite	8/13/94	49	27 - 48	---	Souder Miller and Associates, 2002a	Monitoring
MMW-8A	East of sewage pond	Bedrock	Andesite	8/17/94	49	40 - 46	---	Souder Miller and Associates, 2002a	Monitoring
MMW-8B	East of sewage pond	Alluvium-colluvium	Mudflow, debris flow	8/24/94	49	24 - 36	---	Souder Miller and Associates, 2002a	Monitoring
MMW-10A	Sugar Shack South, valley-fill well	Alluvium	Gravel/sand overlying quartz monzonite	7/20/94	44	24 - 40	---	South Pass Resources, Inc., 1995b	Monitoring
MMW-10B	Sugar Shack South	Mixed	Quartz monzonite, but the well seal was placed in alluvium	7/14/94	58	41 - 58	A potential pathway exists in well MMW-10B for alluvial water to mix with bedrock water (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-10C	Sugar Shack South, valley-fill well	Alluvium-colluvium	Mudflow, debris flow	7/26/94	15	9.6 - 15	---	Souder Miller and Associates, 2002a	Monitoring

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
MMW-11	Sugar Shack South	Mixed	Quartz monzonite, but water-level response indicate it is alluvial	7/17/94	56	44 - 56	A potential pathway exists in well MMW-11 for alluvial water to mix with bedrock water (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-11A	Sugar Shack South	Alluvium	Silty sand	8/11/99	32	26 - 32	---	Souder Miller and Associates, 2002a	Monitoring
MMW-13	Middle Dump, valley-fill well	Mixed	Sandy gravel overlying quartz monzonite	8/9/94	45	32 - 45	Well MMW-13 is screened across both alluvium and bedrock (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-14	Sulphur/Spring Gulch Dump, valley-fill well	Colluvium-dry	---	7/31/94	---	---	No analytical data found	Souder Miller and Associates, 2002a	Monitoring
MMW-16	Sulphur/Spring Gulch, valley-fill well	Colluvium	Sandy gravel overlying granite	7/28/94	30	15 - 27	---	Souder Miller and Associates, 2002a	Monitoring
MMW-17A	East of mill	Alluvium	Sandy gravel overlying granite	9/10/99	29	21 - 27	---	Souder Miller and Associates, 2002a	Monitoring
MMW-17B	East of mill	Bedrock	Andesite and rhyolite	10/16/99	42	37 - 42	---	Souder Miller and Associates, 2002a	Monitoring
MMW-18A	Sugar Shack South	Dry	---	8/23/99	---	---	No analytical data found	Souder Miller and Associates, 2002a	Monitoring

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
MMW-18B	Sugar Shack South	Bedrock	Granite	9/26/99	38	27 - 36	---	Souder Miller and Associates, 2002a	Monitoring
MMW-19A	Sugar Shack South	Alluvium	Gravel with silt and sand	8/10/99	30	24 - 30	---	Souder Miller and Associates, 2002a	Monitoring
MMW-19B	Sugar Shack South	Bedrock	fractured andesite porphyry	9/25/99	60	50 - 59	---	Souder Miller and Associates, 2002a	Monitoring
MMW-21	Mine Shaft facilities	Colluvium	Gravel, sand and silt	9/23/99	24	16 - 24	---	Souder Miller and Associates, 2002a	Monitoring
MMW-22	Mine Shaft facilities	Colluvium	Sand and gravel with silt, clay and cobbles	9/16/99	33	25 - 32	---	Souder Miller and Associates, 2002a	Monitoring
MMW-23A	Capulin Canyon	Colluvium	Sand and gravel	10/10/99	4.3	2.4 - 3.8	---	Souder Miller and Associates, 2002a	Monitoring
MMW-23B	Capulin Canyon	Bedrock	Welded tuff	10/10/99	30	20 - 30	---	Souder Miller and Associates, 2002a	Monitoring
MMW-24	Sulphur Gulch	Bedrock	Granite	10/1/99	43	26 - 43	---	Souder Miller and Associates, 2002a	Monitoring
MMW-25A	Middle Dump	Dry	Gravel with sand and silt	8/30/99	23	16 - 22	No analytical data found	Souder Miller and Associates, 2002a	Monitoring
MMW-25B	Middle Dump	Bedrock	Granite	10/1/99	43	24 - 42	---	Souder Miller and Associates, 2002a	Monitoring
MMW-26A	Sugar Shack South	Dry	Fractured andesite porphyry	8/12/99	---	---	No analytical data found	Souder Miller and Associates, 2002a	Monitoring

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
MMW-27A	Sugar Shack South	Colluvium	Gravel	8/27/99	33	27 - 33	---	Souder Miller and Associates, 2002a	Monitoring
MMW-28A	Mill area	Alluvium	Sand and gravel	12/2/00	25	11 - 24	A 14 m screen was installed due to the proximity to pumping wells and the resulting fluctuations in the water table - NMED approved (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-28B	Mill area	Bedrock	Granite	1/6/01	42	35 - 42	28B was re-drilled with 10 in. drive casing approximately 3 m from original location (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-29A	Middle/Sulphur Gulch	Alluvium	Sand and gravel	12/11/00	28	18 - 27	A 9 m screen was installed due to the proximity to pumping wells and the resulting fluctuations in the water table - NMED approved (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-29B	Middle/Sulphur Gulch	Bedrock	Andesite porphyry	2/1/01	55	48 - 54	---	Souder Miller and Associates, 2002a	Monitoring
MMW-30A	Middle Dump	Alluvium	Sand	12/13/00	12	9.1 - 12	---	Souder Miller and Associates, 2002a	Monitoring
MMW-30B	Middle Dump	Bedrock	Granite	12/14/00	43	37 - 43	---	Souder Miller and Associates, 2002a	Monitoring
MMW-31A	Sugar Shack South	Alluvium	Sand and gravel	1/11/01	30	19 - 25	---	Souder Miller and Associates, 2002a	Monitoring
MMW-31B	Sugar Shack South	Bedrock	Granite	2/19/01	25	---	---	Souder Miller and Associates, 2002a	Monitoring

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
MMW-32A	Sugar Shack South	Alluvium	Sand and gravel	1/10/01	28	22 - 28	---	Souder Miller and Associates, 2002a	Monitoring
MMW-32B	Sugar Shack South	Bedrock	Andesite and granite	2/3/01	41	34 - 41	---	Souder Miller and Associates, 2002a	Monitoring
MMW-33A	Columbine area	Alluvium	Sand and gravel	10/8/97	18	11 - 17	Originally named Columbine X	Souder Miller and Associates, 2002a	Monitoring
MMW-34A	Spring Gulch	Dry	---	3/16/01	---	---	No analytical data found	Souder Miller and Associates, 2002a	Monitoring
MMW-34B	Spring Gulch	Bedrock	Bedrock	3/14/01	41	34 - 40	---	Souder Miller and Associates, 2002a	Monitoring
MMW-35A	Blind Gulch/Sulphur Gulch North	Dry	---	2/6/01	---	---	No analytical data found	Souder Miller and Associates, 2002a	Monitoring
MMW-35B	Blind Gulch/Sulphur Gulch North	Bedrock	Aplite	2/5/01	47	40 - 46	---	Souder Miller and Associates, 2002a	Monitoring
MMW-36A	Sugar Shack West	Dry	---	4/3/01	---	---	No analytical data found	Souder Miller and Associates, 2002a	Monitoring
MMW-36B	Sugar Shack West	Bedrock	Bedrock	4/1/01	56	49 - 55	10 in. borehole to 22.5 m, borehole to 34 m, borehole to total depth (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-37A	Sugar Shack South	Dry	---	10/23/00	---	---	No analytical data found	Souder Miller and Associates, 2002a	Monitoring
MMW-38A	Middle Dump	Alluvium-colluvium	---	10/9/00	---	---	Originally named WRD-10 (SMA 2002a) No analytical data found	Souder Miller and Associates, 2002a	Monitoring

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
MMW-39A	Sulphur Gulch	Alluvium/ colluvium, waste rock	Waste rock alluvium/ colluvium	11/28/00	127	121 - 127	Originally named WRD-12 (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-40A	Spring Gulch	Bedrock	Bedrock	8/24/00	87	80 - 86	Originally named WRD-15 (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-41A	Blind Gulch	Dry	---	9/29/00	---	---	Originally named WRD-17 (SMA, 2002a) No analytical data found	Souder Miller and Associates, 2002a	Monitoring
MMW-42A	Goathill Gulch along access road to Administration Building	Alluvium	Alluvium	2/28/01	45	15 - 21	Originally named RV-1 (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
MMW-43A	Mill area	Alluvium	Alluvium	3/9/01	44	38 - 44	Originally named RV-2; drilled as a piezometer for monitoring water levels at the mill site (SMA, 2002a)	Souder Miller and Associates, 2002a	Monitoring
P-1	Columbine Park	Alluvium	Sand and gravel	---	39	8.5 - 36	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring
P-2	Columbine Park	Alluvium	Sand and gravel	---	20	4.9 - 11	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring
P-3	Columbine Park	Alluvium	Sand and gravel	---	31	13 - 31	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring
P-4A	Columbine Park	Alluvium	Sand and gravel	---	7.6	4.6 - 7.6	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring
P-4B	Columbine Park	Alluvium	Sand and gravel	---	25	23 - 25	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
P-5A	Columbine Park	Alluvium	Sand and gravel	---	11	5.8 - 7.3	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring
P-5B	Columbine Park	Alluvium	Sand and gravel	---	16	14 - 15	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring
P-5C	Columbine Park	Bedrock	Quartz monzonite	---	32	30 - 32	P-series monitoring well in Columbine Park	Molycorp, Inc., CD	Monitoring
Private Cabin Well	East of Hottentot Creek	---	---	---	---	---	Also known as the Red River Private Well, (PW-RR), and Cabin Well (Private)	Slifer, D., 1996 and Steffen Robertson and Kirsten, 1995, and Robertson GeoConsultants, 2001a	Private
RSTW	Questa Ranger Station	---	---	---	---	---	USGS streamflow-gaging station 08265000	Slifer, D., 1996 and Robertson GeoConsultants, 2001a	Irrigation
SC-1A	Straight Creek	Alluvium	Alluvium	1/23/02	23	17 - 23	No longer sampled	Souder Miller and Associates, 2002b	Monitoring
SC-1B	Straight Creek	Bedrock	Bedrock	2/3/02	45	36 - 43	---	Souder Miller and Associates, 2002b	Monitoring
SC-2B	Straight Creek	Mixed-bedrock	Mixed-bedrock	2/4/02	---	---	---	Souder Miller and Associates, 2002b	Monitoring
SC-3A	Straight Creek	Alluvium	Alluvium	2/7/02	34	25 - 34	---	Souder Miller and Associates, 2002b	Monitoring
SC-3B	Straight Creek	Bedrock	Bedrock	1/23/02	61	44 - 58	---	Souder Miller and Associates, 2002b	Monitoring
SC-4A	Straight Creek	Alluvium	Alluvium	1/20/02	---	---	---	Souder Miller and Associates, 2002b	Monitoring

Table 3. Well Information

Well ID	Geographic Location	Aquifer type	Completion material	Completion Date	Total well depth (m)	Screened interval (m)	Information	Source	Well Type
SC-5A	Straight Creek	Alluvium	Alluvium	2/15/02	60	52 - 57	---	Souder Miller and Associates, 2002b	Monitoring
SC-5B	Straight Creek	Mixed-bedrock	Mixed-bedrock	1/17/02	109	99 - 106	---	Souder Miller and Associates, 2002b	Monitoring
Well #1	Pioneer Creek near Ski Hill	---	---	---	---	---	---	Public Water Supply Facility Records	Drinking water
Well #2	Pioneer Creek near Ski Hill	---	---	---	---	---	---	Public Water Supply Facility Records	Drinking water
Well #3	Pioneer Creek near Ski Hill	---	---	---	---	---	---	Public Water Supply Facility Records	Drinking water
Well #4	Pioneer Creek near Ski Hill	---	---	---	---	---	---	Public Water Supply Facility Records	Drinking water
Well #5	Upstream from town of Red River	---	---	---	---	---	---	Public Water Supply Facility Records	Drinking water
Well 3	Capulin in old channel	---	---	---	---	---	Not shown on map; exact location unknown	U.S. Environmental Protection Agency memo	---
Well 4	Capulin on river	---	---	---	---	---	Not shown on map; exact location unknown	U.S. Environmental Protection Agency memo	---
Well 8	Hansen Creek on river	---	---	---	---	---	Not shown on map; exact location unknown	U.S. Environmental Protection Agency memo	---

Well Information

Eighty-five wells within the study area with water-quality information are shown in figures 2-4. An additional six wells with water-quality information (BC Ranch Well, BC-1, BC-2, Black Canyon 1, Black Canyon 2, and Black Canyon 3) lie outside the study area and are shown in figure 1. Three wells with water-quality information (Well 3, Well 4, and Well 8) included in the database are not shown on the maps because of unknown or questionable locations. Six wells (MMW-14, MMW-34A, MMW-35A, MMW-36A, MMW-37A, and MMW-41A) included in the database were installed as "dry" wells; because analytical data were never sampled, they are not identified on the maps. Two misidentified wells (Col 1&2 and P-4) are included in the database but not on the maps because they do not exist.

Wells 3, 4, and 8 were sampled for the USEPA as a check on the accuracy and consistency of various contract laboratories (U.S. Environmental Protection Agency, 1999). Location descriptions include "Capulin in old channel," "Capulin on river," and "Hansen Creek on river," respectively, but mapping coordinates were not available.

Water-quality data for two wells (Col 1&2 and P-4) are included in appendix 1 for historical ground-water reference, but the data were not used for modeling or evaluation. Well ID "Col 1&2" is inherently problematic because it describes both Columbine Well No. 1 and Columbine Well No. 2. Well P-4 also is problematic because the source identified its location within the "Red River," but the only "P-4" well exists in the tailings impoundments in Questa.

Compilation of Complete Database

A ground-water quality database was created from the information found in the documents listed in table 2. The complete data tables are in appendix 1. Field measurements and concentrations of major cations, anions, and trace metals were compiled into spreadsheets according to well name. Analytical numbers were entered into this database as they were reported in their original sources. When multiple sources reported results from one sampling event, the database was updated to reflect the value with the most complete data. When more results were encountered in another source than were reported by the original source, the omitted values were inserted into the database within parentheses. Table 4 lists and describes each symbol used in appendix 1 and table 6.

Values with four or more figures were changed to three significant figures. Unfiltered results, referred to as totals, were entered into the database within brackets. Some sources reported letters (UJ, J, b) following the number to qualify the reported values (explanations are found in table 4). Unevaluated constituents are represented as "---" in the results column. Any value reported as non-detectable was entered as the detection limit preceded by a "less than" symbol (<) if that limit was available or was entered as "ND" if unavailable.

Data on the Molycorp CD (MC CD) had the reporting limit as the detection limit rather than the instrument detection limit for maximum confidence in a value. A reporting limit is generally 3-10 times higher than the instrument detection limit. When a reported number in the MC CD was below the reporting limit yet above the instrument detection limit, it was entered into the complete database (app. 1) without a data qualifier. Results below the detection limit were entered with a "<" in the database and as a zero in the geochemical modeling code WATEQ4F.

Table 4. Symbols for table 6 and appendix 1.

[FAA, Flame atomic absorption; USEPA, U.S. Environmental Protection Agency; WATEQ4F, geochemical modeling code; <, less than]

	Symbols for table of selected values (table 6 on Compact Disc)
<	Analytical result below detection limits; entered as 0 value into the WATEQ4F program
( )	Estimated Eh, pH or temperature values for WATEQ4F in case of field parameters; complimentary results of sample splits in the case of chemical analyses
[ ]	Laboratory values in the case of pH or Specific conductance
*	Special attention flag; look below table for note
	Symbols for complete table (appendix 1 on Compact Disc)
<	Analytical result below detection limits; entered as 0 value into the WATEQ4F program
[ ]	Laboratory values in the case of pH or Specific conductance; total (unfiltered) value in the case of chemical analyses
*	Special attention flag; look in comments above analytical column for details
/	Scientific Laboratory Division (SLD) reported results/Slifer (1996) reported results: two different methods and results reported
	Additional symbols for Woodward Clyde (WC) results
J	Estimated concentration
UJ	Estimated as non-detect at the reporting limit given
	Additional symbols for USEPA results
<	Undetected at the laboratory instrument detection limit
J	Result is estimated due to outlying quality-control parameters, such as matrix spike, serial dilution, FAA spike recovery, and others
b	Low bias. Actual concentration may be higher than the concentration reported

In some samples, splits collected during one event were sent to different laboratories for the determination of different constituents. Various sources reported the disjunct results. The table of the complete analyses (app. 1) reports those results separately. The table of selected analyses (table 6) has the complementary results combined by sample collection date for geochemical modeling and evaluation. The additional values in the combined analyses are in parentheses.

In a limited number of samples, temperature, pH, and (or) Eh values that were not measured in the field were (1) estimated for WATEQ4F modeling based on results acquired at the same well on a different date or (2) created from relations between the measured concentrations of iron, calcium, and (or) sulfate based on geochemical and hydrological considerations. Those estimated field values were used to calculate charge imbalance (C.I.) values and to discriminate data points by pH. The estimated pH and (or) Eh values are shown within parentheses only in the table of selected values (table 6).

Accuracy of Data

The speciated C.I. was determined to evaluate the accuracy of the analyses. The C.I. was calculated after the speciation of dissolved constituents by the geochemical modeling program WATEQ4F (Ball and Nordstrom, 1991) using the formula:

$$\text{C.I. (percent)} = \frac{(\text{sum cations} - \text{sum anions})}{(\text{sum cations} + \text{sum anions})/2} \times 100 \qquad (1)$$

where sum cations is the sum of the cations, in milliequivalents per liter, and sum anions is the sum of the anions, in milliequivalents per liter. Equation (1) yields a C.I. that is twice the value that most analytical laboratories would report because the cation-anion difference is divided by the average of the cation-anion sums rather than the sum of ions (Ball and Nordstrom, 1991). Accurate analyses are generally within $\pm$10 percent. The cation sum (milliequivalents per liter), anion sum (milliequivalents per liter), and speciated C.I. values (percent) for analyses with calcium and sulfate values are included with the measured constituents in both the tables of complete and selected analyses (app. 1 and table 6, respectively).

The reported C.I. may be different from that calculated by hand using the reported cation and anion sums. This difference is a result of rounding. The reported ion sums and C.I. represent a number calculated to the thousandth decimal unit.

For the WATEQ4F code to accurately calculate the C.I., an analysis must have field parameters (pH, Eh, and temperature) in addition to values for all major cations (calcium, magnesium, sodium, potassium) and anions (sulfate, alkalinity, fluoride, chloride). Any constituent either (1) not analyzed or (2) measured below detection was exported from the database to WATEQ4F as a zero. If an analysis had major ions but lacked field parameters, pH, Eh, or temperature values were estimated as described in the previous section to enable geochemical modeling. However, no chemical constituents were estimated in the creation of this database.

The variety of parties involved in investigations at the mine site provided another check on the accuracy of water-quality analyses. In 1994 representatives of the mining company (SPRI and Woodward-Clyde (WC)) and NMED (Dennis Slifer) each collected samples from the monitoring wells and sent them to different laboratories [ETC and Scientific Laboratory Division, respectively] for analysis. On later dates, duplicate samples were periodically collected by Molycorp and NMED.

Quality Control on Database Entries

The accuracy of 25 percent of the values entered into the database were confirmed by double checking against the original consultant reports, laboratory sheets, field notes, and Molycorp in-house documents (MMW wksts). In addition, the database was directly evaluated against the electronic database created by URS for the sitewide comprehensive hydrologic report (URS, 2001). The discrepant results were verified against the original data sources when available. The current, unreported data from the MC CD created for compliance with DP-1055 were further confirmed through the direct comparison of every analyte in 26 of 75 wells among three versions of the database (MC CD; April, July, and September 2002).

As a quality-assurance check, the entire dataset (in Excel tables) was run through WATEQ4F before it was imported into an Access database. Once the dataset was imported, five wells and their complete chemical analyses were randomly chosen for comparison against the cited sources and the original data to evaluate the success of the importation process. The entire dataset from Access was then exported to WATEQ4F to confirm the accuracy of the transferred data. If values had been transposed, the C.I. values would have changed because of the precision built into the calculation. Finally, the output file of WATEQ4F from the Access version was compared with the previous output file from the Excel version of the database. Because fewer than 10 of 608 records had different outputs, the Access database was assumed to be free from transcription errors. The slight differences between the output versions were caused by changes in the number of significant figures. The Access database was used to create datasets of selected analyses and queries for plotting purposes in the quality-assurance check.

Compilation of Database for Selected Analyses

Selection for this table was based on five criteria: (1) the sample had to be filtered and preserved upon collection, (2) the sample had to have a C.I. within ± 20 percent, (3) the analysis had to have values for major cations and anions, (4) the results had to be consistent with other samples collected from the same well, and (5) no duplicative results from one well on a single date were entered. The range for acceptable C.I. was based on a normal error distribution according to the frequency distribution of all analyses that had a C.I. between -100 and +100 percent as shown in figure 5. A table of selected analyses (table 6) was extracted from the complete database for geochemical modeling and for calculating speciation and saturation indices. Complementary sample splits were combined to create complete analyses. Analyses that lacked field parameters (Eh, pH, temperature) were provided estimated numbers to satisfy modeling requirements. The estimated field parameters and the complementary values from sample splits are identified in parentheses in table 6.

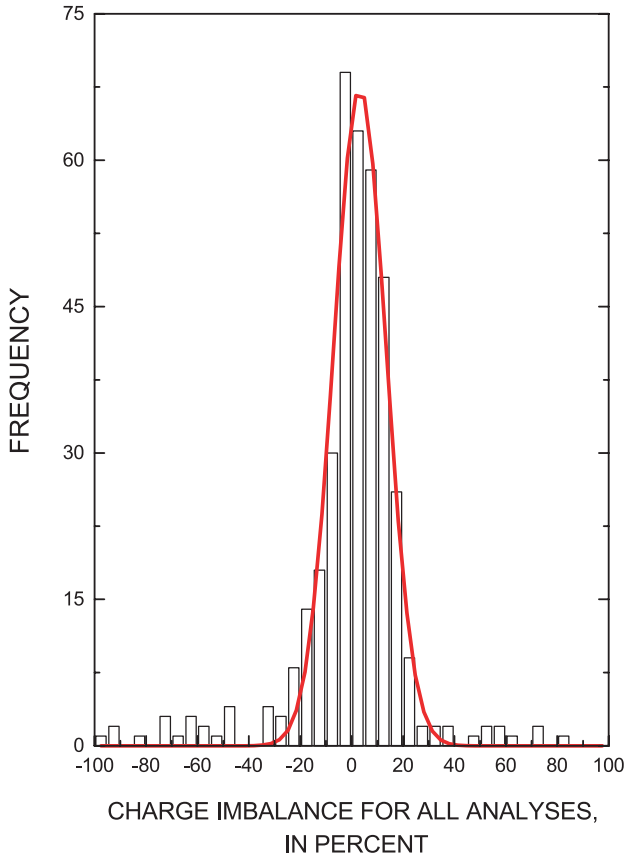

Figure 5. Frequency distribution of speciated charge imbalance.

The curve in figure 5 is the Gaussian distribution fit to show the degree of symmetry about zero-percent C.I. The mean value is 3.4 and the standard deviation is 10. A slight skewness is apparent because of incomplete analyses and replicate samples, but the frequency plot is a very good approximation of a normal error distribution.

HISTORICAL GROUND-WATER QUALITY

Two tables of ground-water quality analyses were compiled: a table of the complete database (app. 1) and a table of selected analyses (table 6). Appendix 1 lists 608 analyses and comments concerning discrepancies between reports and associated information on geographic location, field and lab conditions, analytical results, and a speciated C.I. value as determined by the WATEQ4F code. Table 6 has 324 analyses that represent probably the most accurate historical water-quality data for the study area.

Ground water in the Red River Valley is dominantly a Ca Mg SO_4 type. The dominance of cations by Ca and of anions by SO_4 is related to the common occurrence of the soluble mineral gypsum ($CaSO_4 \bullet 2H_2O$) throughout the hydrothermally altered areas of the watershed. Pyrite (FeS_2), another common mineral in the hydrothermally altered areas, contributes to the abundance of sulfate through the oxidation process. The relation between pyrite and gypsum seems interdependent because all the gypsum found in surface outcrops and sediments appears to be secondary from pyrite oxidation.

Calcium in the ground water may come from the weathering of a variety of minerals found in the Red River Valley, but an additional and potentially dominant source is the dissolution of calcite because it is a relatively ubiquitous hydrothermal mineral in the Red River Valley Basin. Consequently, the water chemistry may range from dominance by calcite dissolution (buffered waters of neutral to basic pH), to dominance by congruent gypsum dissolution (neutral to acid pH), to dominance by pyrite oxidation (acid pH).

Concentrations and Time-Series Relations

The complete database was used to create the concentration and time-series relations shown in figures 6-12. The analytical values have been divided into two groups according to pH. The values below pH 5 are represented with closed symbols, and those equal to or greater than pH 5 are plotted with open symbols. Analytical results for 12 wells typically lie outside general water-quality trends. These wells have been plotted with distinct symbols throughout the plots. Table 5 summarizes the location, lithology, and mean pH of wells that have the most anomalous concentrations of selected constituents.

Figures 6 and 7 illustrate the relation between Ca and SO_4 concentrations. The 1:1 diagonal line represents congruent gypsum dissolution, and the large red closed circle on the line is where the equilibrium solubility of gypsum lies in pure water plots. Most of the sample data plot near or below the gypsum dissolution line, indicating the dominance of gypsum and pyrite dissolution. Some samples plot above the line, indicating the greater influence of calcite dissolution (especially well MMW-35B located in Sulphur Gulch). The reason that several water samples, including those from well MMW-35B, are of higher concentration than the gypsum solubility in pure water is that the solubility of gypsum increases with added solutes. These samples mostly represent acid pH values from a distinct group that is more enriched in SO_4 than those of mostly higher pH. In these samples, SO_4 is contributed from both gypsum dissolution and pyrite oxidation.

Figure 6 includes all sample data. One trend stands out for wells MMW-21, MMW-22, MMW-36B, MMW-39A, and MMW-7: the Ca concentrations remain within a 10 to 15 mM range, whereas the SO_4 values extend from 30 to 110 mM. The constancy of Ca concentrations indicates a gypsum solubility control that will be demonstrated later in the “Saturation indices” section. In figure 7, the scale for SO_4 (x-axis) was shortened to focus on the relation in samples with SO_4 concentrations of 25 mM per liter or less.

Table 5. Characteristics of wells with water quality that generally lies outside trends in figures 6-15.

[ID, identification]

Well ID	Geographic Location	Well completion lithology	Mean pH of ground-water samples (1982-2002)
MMW-2	Capulin Canyon Valley	Mudflow-debris flow	4.83
MMW-7	Sugar Shack West, Mine Shaft facilities	Andesite bedrock	4.13
MMW-10B	Downgradient from Sugar Shack South waste-rock dump and old mine site	Quartz monzonite bedrock, but the well seal was placed in the alluvium	5.75
MMW-19A	Downgradient from Sugar Shack South waste-rock dump	Gravel, silt, and sand	4.22
MMW-21	Sugar Shack West Mine Shaft facilities	Gravel, sand, and silt	2.97
MMW-22	Sugar Shack West Mine Shaft facilities	Sand and gravel with silt, clay, and cobbles	3.4
MMW-23A	North Capulin Canyon downgradient fromCapulin waste-rock dump	Sand and gravel	5.27
MMW-23B	North Capulin Canyon downgradient from Capulin waste-rock dump	Welded tuff	7.64
MMW-34B	South end of Spring Gulch waste-rock dump	Bedrock	5.2
MMW-35B	Southwest of Blind/ Sulphur North waste-rock dump	Aplite	6.71
MMW-36B	Downgradient from Sugar Shack West waste-rock dump	Bedrock	4.06
MMW-39A	East side of Sulphur Gulch waste-rock dump	Alluvium-colluvium	4.08

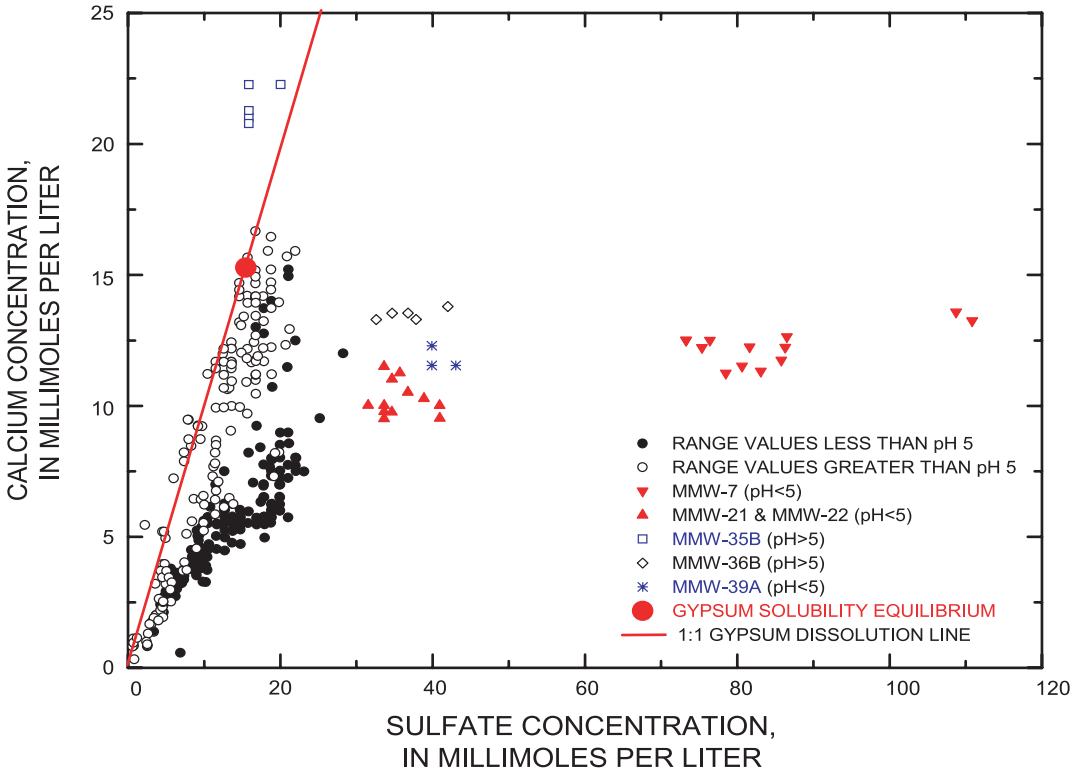

Figure 6. Calcium concentrations in relation to sulfate concentrations for all data.

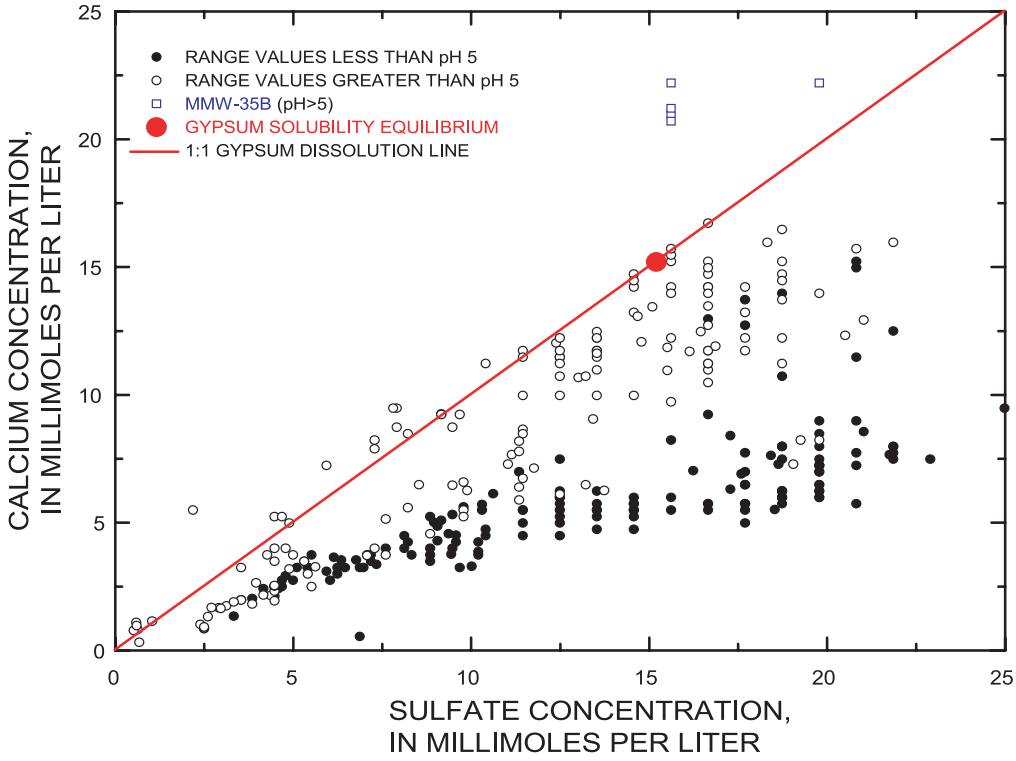

Figure 7. Calcium concentrations in relation to sulfate concentrations, 25 millimoles per liter or less.

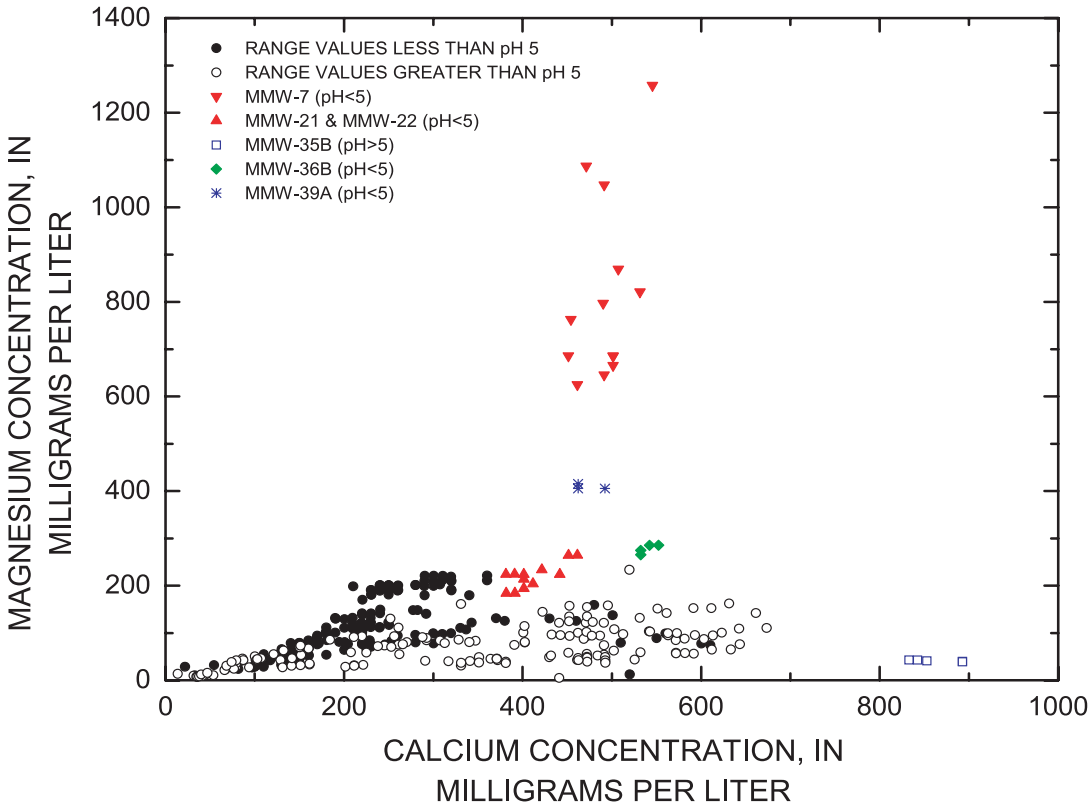

Figure 8. Magnesium concentrations in relation to calcium concentrations.

Figure 8 shows the high concentrations of Mg for most ground waters. Interestingly, the same wells with the highest concentrations of SO_4 (fig. 6) generally have the highest concentrations of Mg. Well MMW-7, located in Sugar Shack West mine shaft facilities (Mine Shaft #1), has the highest concentrations of SO_4 of any well and additionally has higher concentrations of Mg than Ca. For Mg concentrations to be higher than Ca concentrations in ground waters is very unusual.

The high Mg concentrations are likely related to the mafic (high iron, magnesium, and calcium) composition of the andesite. Magnesium-bearing primary minerals known to occur in the andesite include pyroxenes, amphiboles, biotite, and phlogopite, which alter under hydrothermal conditions to chlorite and clinochlore. These magnesium-rich phyllosilicates are common in the andesite in the Red River Valley and would readily leach magnesium under acidic weathering conditions. Therefore, the reason for the high Mg concentrations in well MMW-7 is likely the extreme leaching conditions and gypsum-solubility limitations on Ca concentrations.

Figure 9 shows time series for Mg, SO_4, and F concentrations in samples from well MMW-7. Concentrations of some constituents, such as Mg and SO_4, decrease dramatically over time; concentrations of Al, Mn, Cu, Zn, Co, and Ni decrease by more than half; and others stay nearly constant. Concentrations of F increased from about 1 to about 160 mg/L during 1996, indicating a laboratory analytical problem prior to 1996. This problem has been confirmed to be analytical for two reasons. First, the speciated C.I. (fig. 10) for these samples shows improvement after the F concentrations change to 160 mg/L. Second, the analytical problem has been traced to interference from Al and Fe complexation with F when the F ion-selective electrode method is used (W. Eaton, URS, oral commun., 2003). Increasing the dilution or adding more total ionic-strength adjustment buffer corrected the analytical problem. Therefore, the more accurate F concentration in water from well MMW-7 is about 160 mg/L.

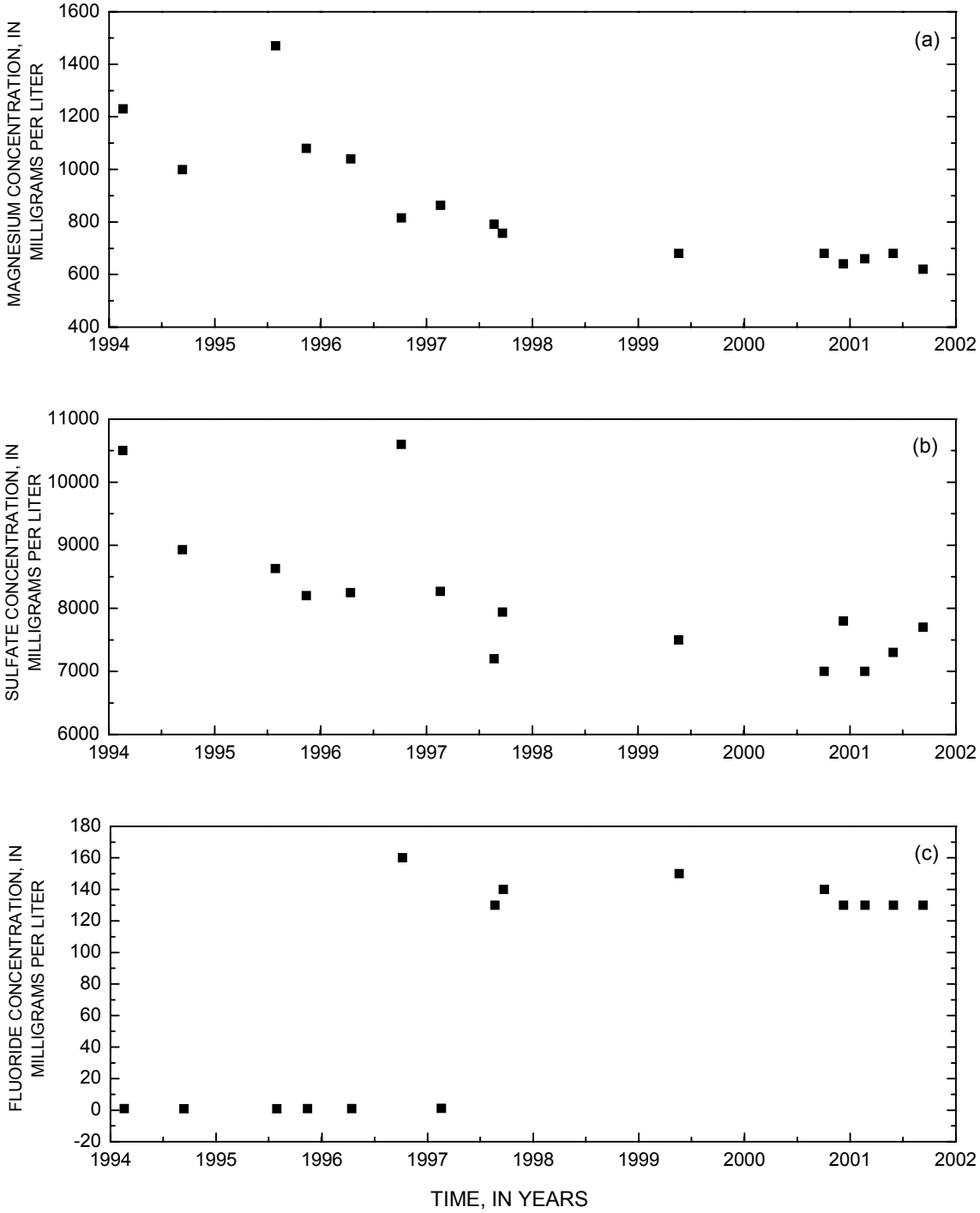

Figure 9. Selected major ions from well MMW-7 in relation to time for (a) magnesium concentrations, (b) sulfate concentrations, and (c) fluoride concentrations.

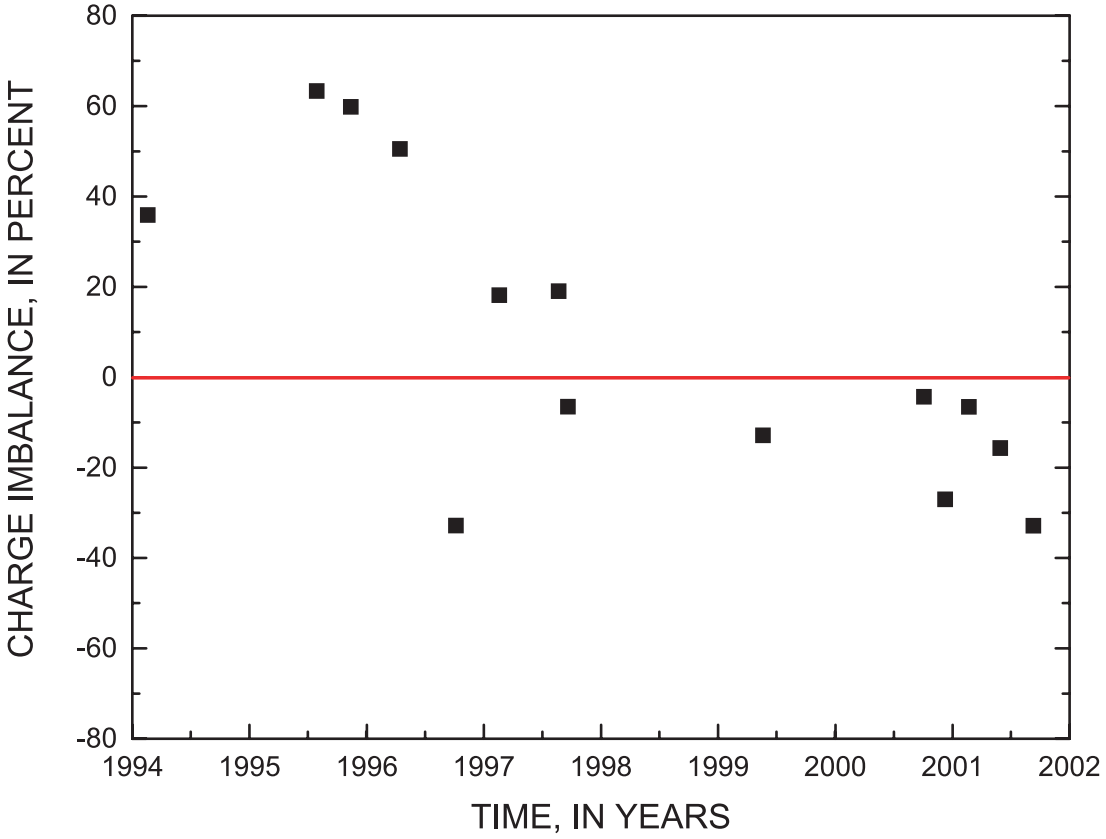

Figure 10. Graph showing speciated charge imbalance in relation to time at well MMW-7.

Figure 11 shows Be concentrations in relation to Al concentrations. Concentrations of Be in ground waters are typically very low (1-5 µg/L) because of the low abundance and low solubility of Be. At the mine site, however, ground water tends to have Be concentrations as high as 0.28 mg/L. Enrichment in Be is common for some types of mineral deposits, including the deposit in the Red River Valley. In minerals, Be substitutes for Al because of the similar ionic radii. Clearly divergent trends are apparent in the data plotted in figure 11. In one trend, Be concentrations increase to more than 0.10 mg/L with increasing Al concentrations in well MMW-7. Another trend shows Be concentrations increasing more sharply, to as much as 0.28 mg/L when Al concentrations are less than or equal to 200 mg/L. These two trends indicate either two sources of Be with very different abundances or two different processes mobilizing Be.

Figure 12 shows cadmium concentrations in relation to zinc concentrations. Cadmium and Zn have similar chemical and geochemical properties. Ratios of Cd/Zn in mine drainage waters are often constant for a given site because they are commonly derived from the same source and tend to be conservative during aqueous transport (Hem, 1972). The cadmium and zinc data plotted in figure 12 shows a coherent trend that is dramatically enriched in Cd relative to crustal abundance but is still within a typical range for sphalerites (ZnS), which are the main source of both Zn and Cd in many mineral deposits (Barnes, 1997). The general correlation is strong and independent of pH, but wells MMW-2, MMW-7, MMW-10B, MMW-18B, and MMW-23B markedly deviate from the trend. The dispersion of sample data could be a result of analytical error, but there is a potential geochemical explanation because the concentrations are high and the wells and values group together in clusters. MMW-7 and MMW-10B are enriched in Cd/Zn ratio relative to most well water, whereas MMW-2, MMW-23B, and MMW-18B are depleted in Cd/Zn ratio relative to most well water; hence, it seems likely that these differences in Cd/Zn ratios represent differences in composition of source material.

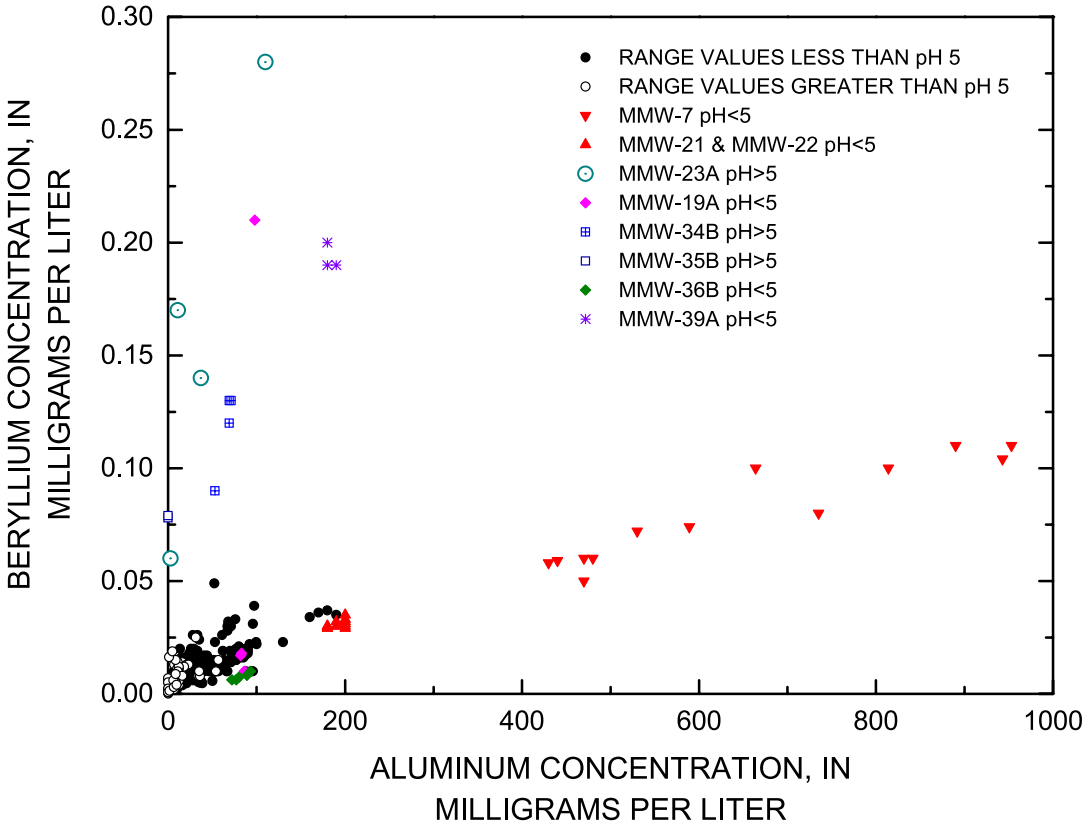

Figure 11. Beryllium concentrations in relation to aluminum concentrations.

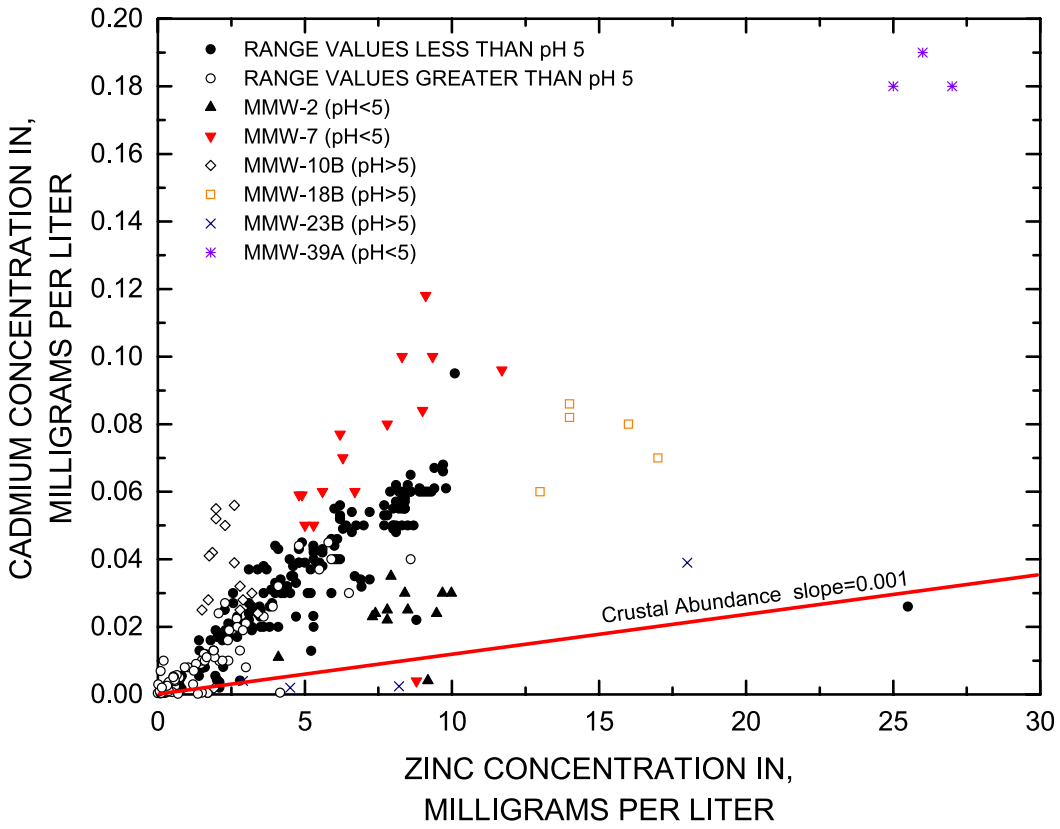

Figure 12. Cadmium concentrations in relation to zinc concentrations.

Saturation Indices

Fifty-three percent of the historical ground-water quality analyses qualified for inclusion in table 6 of selected analyses. These 324 relatively complete analyses were useful for modeling saturation indices because the data were selected for accuracy. For additional information concerning specific analyses, see appendix 1 for miscellaneous observations and comments.

This section describes saturation indices calculated by WATEQ4F from the data in table 6. The saturation index (SI) is defined as the logarithm of the degree of saturation, Ω, which is the ratio of the ion activity product (IAP) to the solubility product constant. The degree of saturation is unity at the equilibrium solubility, and the saturation index will be zero.

$$SI = \log \Omega = \log \left[\frac{IAP}{K_{sp}} \right] \quad (2)$$

An SI value greater than zero indicates that the ground water is supersaturated with respect to a given mineral, whereas a SI value less than zero indicates undersaturation (Nordstrom, 1999).

Figure 13 shows the relation between gypsum ($CaSO_4$) saturation indices and SO_4 concentrations. Most of the samples are undersaturated with respect to gypsum, but the samples that were highest in Ca and SO_4 concentrations in figures 6 and 7 have reached saturation. This result confirms the idea that gypsum solubility provides an upper limit to Ca concentrations in the samples with the highest solute concentrations.

Figure 14 is a plot of saturation indices for calcite. Saturation is reached for some wells only when the pH is greater than 6.5. Waters with acid pH values are 4-5 orders of magnitude undersaturated. Calcite saturation is expected for circumneutral pH ground waters because of the common occurrence of calcite gangue mineralization in the study area.

Figure 15 is a plot of saturation indices for fluorite (CaF_2) in relation to fluoride concentrations. Although fluorite is a fairly common gangue mineral in the hydrothermally altered areas, most of the ground waters, especially those with low pH, are undersaturated with respect to fluorite. Water from well MMW-34B is notably at saturation, but water from MMW-7 and MMW-39A, which have the highest fluoride concentrations, is undersaturated. This undersaturation results from Ca concentrations that are lower than those found in water from well MMW-34B. Gypsum solubility may keep the Ca concentration low enough to prevent water from reaching equilibrium fluorite solubility. Also, fluoride is complexed strongly as HF^o and AlF_{no} at low pH values, reducing the free fluoride ion concentration. Some waters of circumneutral pH are at or above fluorite solubility. These are probably at fluorite saturation, but uncertainty or error in the Ca concentrations may have caused apparent supersaturation in the calculations.

Gibbsite saturation indices are shown in figure 16. The zero saturation line represents solubility equilibrium for crystalline well-ordered gibbsite ($Al(OH)_3$). The upper solubility line is for amorphous $Al(OH)_3$. Gibbsite solubility is often considered a potential control on Al concentration in natural waters. Most of the saturation indices determined for the selected ground-water analyses fall in the range between the crystalline and amorphous solubility of gibbsite. A few waters are supersaturated with respect to amorphous $Al(OH)_3$ and probably reflect the passage of colloidal Al particles through filtration membranes during sample collection.

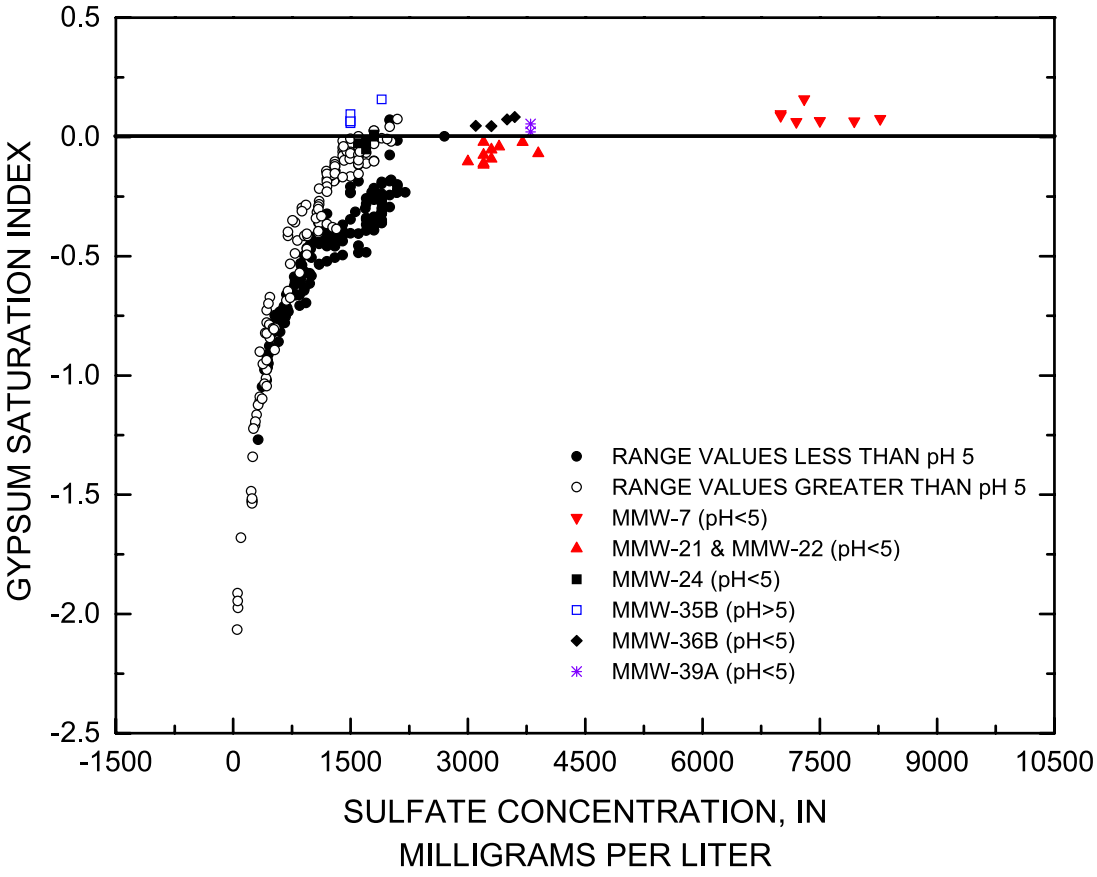

Figure 13. Saturation indices for gypsum in relation to sulfate concentrations.

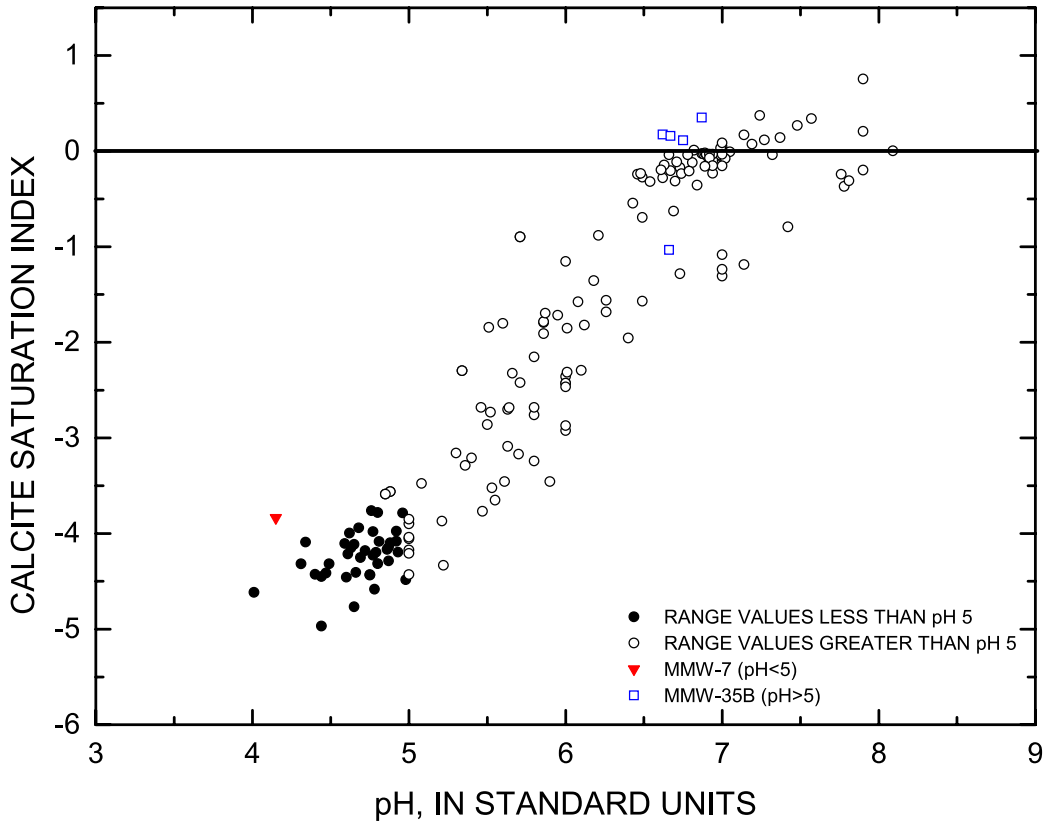

Figure 14. Saturation indices for calcite in relation to pH.

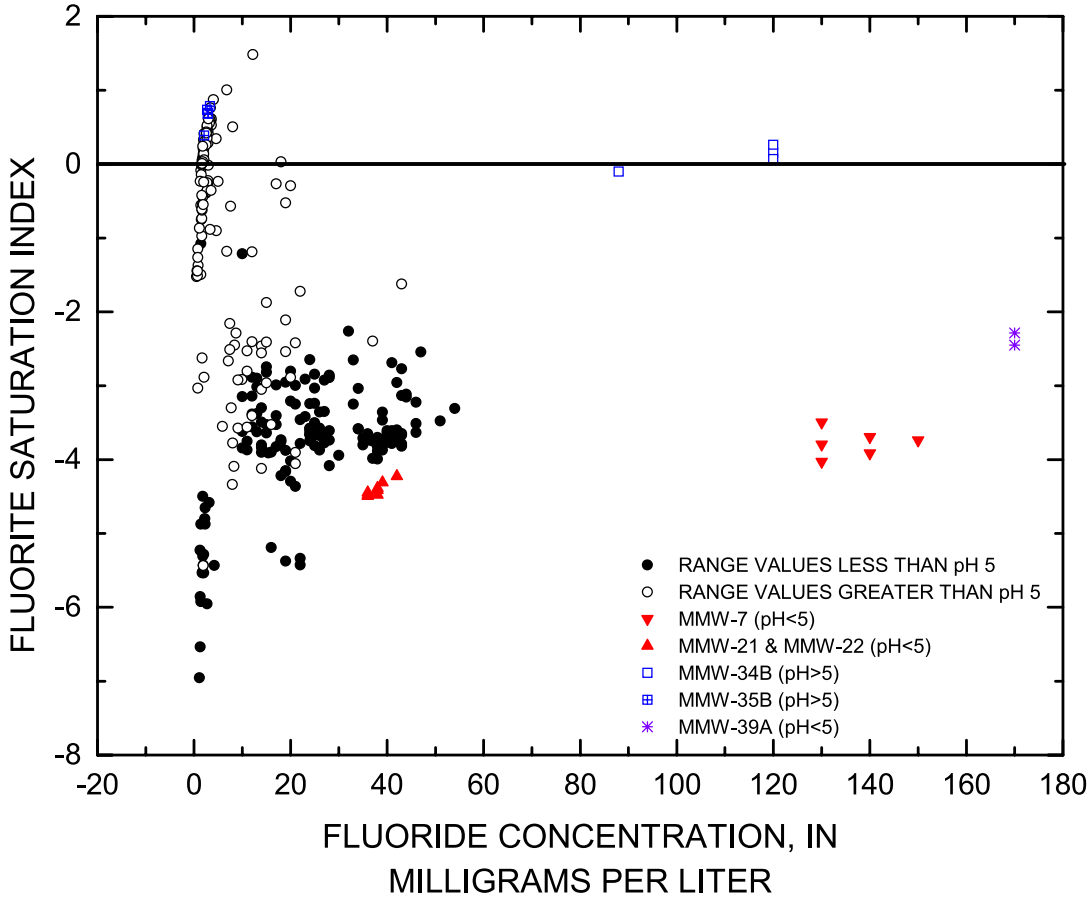

Figure 15. Fluorite saturation indices plotted in relation to fluoride concentrations.

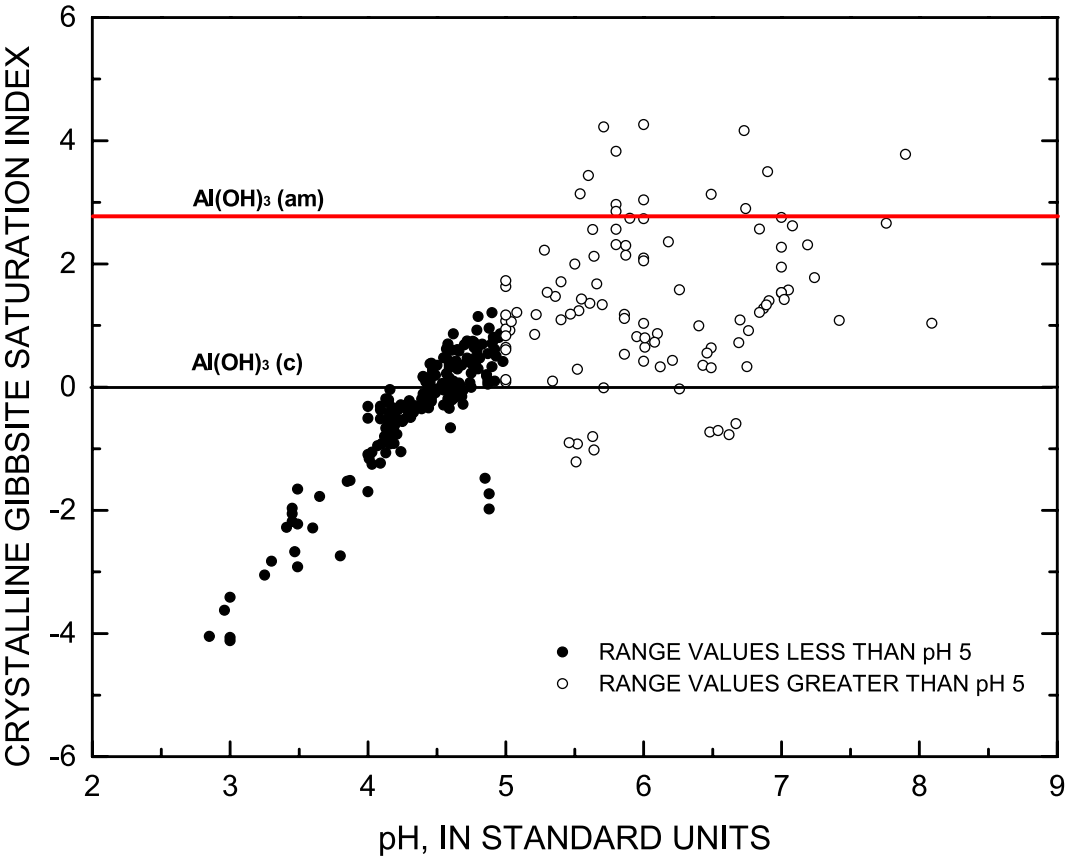

Figure 16. Gibbsite, amorphous (am) and crystalline (c), saturation indices plotted in relation to pH.

Manganese is a common constituent in the ground water. Possible mineral solubility controls for Mn include rhodocrosite ($MnCO_3$) and some oxidized form of Mn such as manganite (MnOOH). In figure 17, saturation is not reached for manganite solubility equilibrium. Consistent undersaturation for manganite may be realistic, but it also may be complicated by the inability to relate aqueous speciation modeling to mixed oxidation states of manganese (+2, +3, and +4) in both the aqueous and solid phases. For mixed oxide solid phases, the thermodynamic data in the WATEQ4F database are not adequate to quantitatively evaluate these reactions.

The plot of saturation indices for rhodocrosite ($MnCO_3$) in relation to pH (fig. 18) conforms well to a solubility control. An upper limit for several circumneutral well waters is reached in the vicinity of synthetic to crystalline rhodocrosite solubility. A few samples are supersaturated, which may be caused by some errors in the analytical data or the thermodynamic data in the WATEQ4F database. The generally good correspondence of saturation indices with rhodocrosite solubility suggests that the dissolved manganese is all reduced to the 2+ oxidation state and that mixed oxidation states are negligible.

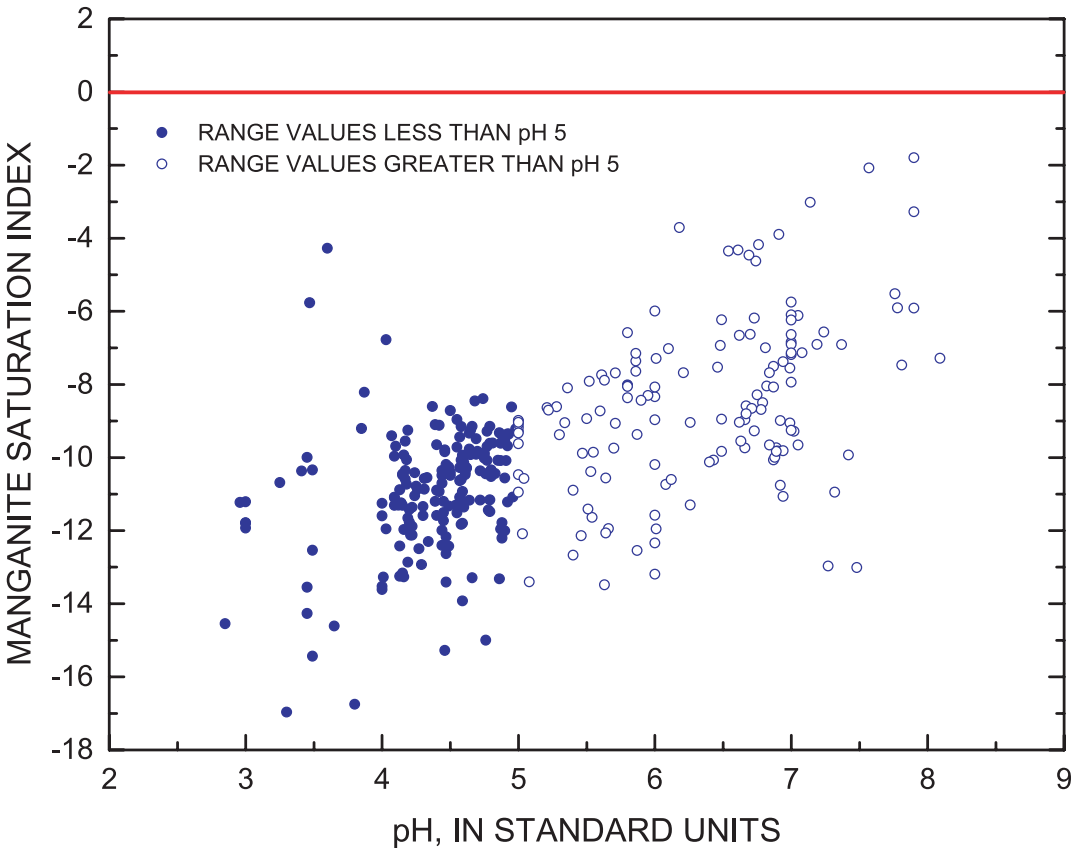

Figure 17. Saturation indices for manganite plotted in relation to pH.

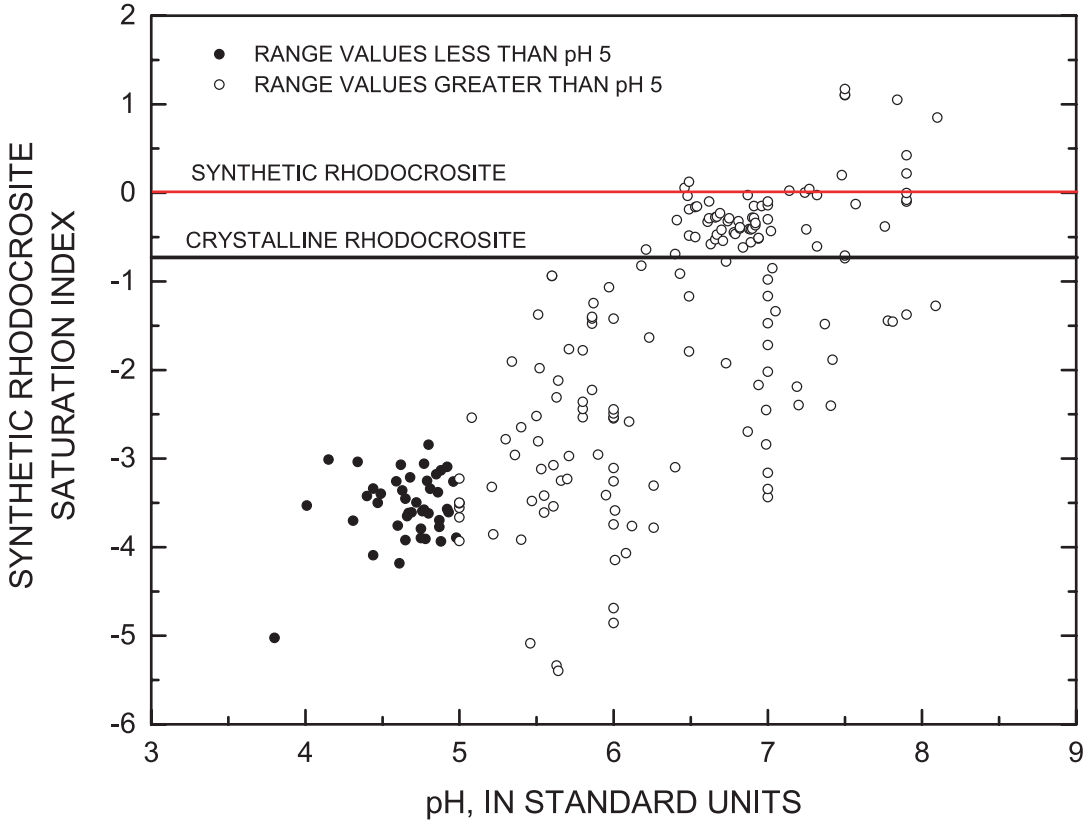

Figure 18. Rhodocrosite saturation indices plotted in relation to pH.

Problems and Assumptions

Problems and assumptions need to be noted concerning the complete database. For the most part, only wells with water-quality data were catalogued. Samples were assumed to be filtered and preserved if sample collection information was unobtainable. The first date of the month was used as the default sample date when only the month and year were reported. Sample splits were combined to create a complete analysis for the selected analyses in table 6.

Temperature, pH, and (or) Eh values were estimated for analyses without field parameters for admittance into the geochemical code. Results below detection were assumed to be zero for WATEQ4F modeling and evaluation purposes. For some analyses, it was unclear whether the total dissolved solids (TDS) value was obtained through calculation or measurement. When two sources reported different TDS values for one analysis, both numbers were entered into the database and separated by a semicolon.

Discrepancies exist between the analytical laboratory sheets, consultant reports, New Mexico State reports, Molycorp in-house documents, and previously compiled databases (MC DB and MC CD). Some of the major discrepancies are noted in the “Miscellaneous information” or “Comments” rows in the complete database (app. 1). A common source of confusion lies in the dates because the European style of date formats was used along with the American date format without distinction.

One inconsistency within the MC CD concerned wells MMW-34B and MMW-35B. The USGS determined that data for the major anions (SO_4, alkalinity, F, and Cl) were transposed between the wells for the sample collected on September 17, 2001. To rectify the problem, those values were switched within this database to reflect the most reasonable and correct results.

The sulfate determinations at the AWWT facility were subject to error. On certain occasions the sulfate values were low by a factor of 8 or 10, whereas on other occasions the values were an order of magnitude too high in comparison with historical data. The AWWT facility recognized this problem with their in-house determinations and tried to remedy it. Upon repeated failure to obtain accurate SO_4 numbers, AWWT personnel decided to send the samples to certified laboratories for analysis.

SUMMARY AND CONCLUSIONS

This report was prepared to compile all available water-quality data for the Red River Valley, New Mexico, in a single format with an indication of the accuracy of the analyses. Evaluation of 608 water-quality analyses of ground water from 23 sources has led to the following conclusions:

1. Ground water is primarily a Ca-Mg-SO_4 type.
2. Unusually high concentrations of Be, Co, F, and Ni were often observed.
3. Plots of Ca in relation to SO_4 concentrations demonstrate a dominant compositional control by gypsum dissolution and pyrite oxidation.
4. The widespread occurrence of low pH (less than 5) waters reflects the common occurrence of pyrite in the weathering zone.
5. The common occurrence of high magnesium concentrations reflects the abundance of magnesium-rich silicates exposed to weathering, especially chlorite.
6. A total of 324 analyses were found with C.I. values within ±20 percent that could be used for speciation computations to determine saturation indices.
7. Saturation indices confirm a dominant control on ground-water quality by gypsum dissolution, calcite dissolution, fluoride dissolution, and rhodocrosite dissolution.

The database will be used in a variety of ways to determine historical baseline conditions. Temporal and spatial plots can be used to illustrate changes in conserved and non-conserved elements over time. Historical ground-water quality data can be used to identify flaws in hydrologic and geomorphologic models. Further modeling can be done with the database to contribute to the understanding of the dynamic geochemical processes that have and continue to take place within the study area.

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Table 6. Selected historical ground-water quality analyses

[ACZ, New Mexico state lab; ETC, Molycorp lab; ft, feet; ID, Identification; m, meter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; µS/cm, microsemens per centimeter; MC CD, Molycorp database on compact disc; MC DB, Molycorp electronic database prior to DP-1055; MMW, Mine Monitoring Well; MMW wkst, Molycorp in-house document; ND, non-detectable; RGC, Robertson GeoConsultants; SLD, New Mexico state lab; Spec Cond, Specific Conductance; SPRI, South Pass Resources Investigations, Inc.; V, volts; [ ], lab value; ( ) estimated field value or complimentary results from split; ---, no data; <, less than; #, rounded down to 3 significant figures; *, special note in 'comments']

Capulin Canyon

Well ID	MMW-2	MMW-2	MMW-2	MMW-2	MMW-2
Sample Date	11/8/94	8/1/96	6/9/98	2/4/00	6/6/01
Comments	---	---	---	---	---
Source ID (see table 2)	SPRI 1995, SRK 1995, MC DB, MMW wkst	MMW wkst	MC DB, NMED	MMW wkst, RGC 8/10, MC DB	MC CD
Lab ID	ETC	---	ACZ RG70639	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in mudflow, debris flow				
Depth to Water (m)	9.66	---	10.6	10.6	---
Water Elevation (ft)	---	---	---	---	7,664
Field Temperature (^{o}C)	7.9	(10)	9.9	9.1	10
pH, field, [lab]	4.9	4.58	4.27	4.01	4.57
Eh (V)	(0.2)	(0.3)	(0.2)	(0.2)	0.280
Spec Cond (µS/cm) field, [lab]	3,680	3,010	2,920	2,540	2,370
TDS (mg/L)	3,400	---	2,780	2,600	2,500
Constituent, dissolved (mg/L)					
Ca	501	460	343	280	320
Mg	137	125	122	96	100
Ba	<0.01	<0.01	<0.01	<0.01	<0.01
Na	64.6	61	44.9	42	42
K	10.8	12	10.2	11	12
SO_4	2,100	2,000	2,020	1,700	1,800
Alkalinity (as HCO_3)	<1	---	<2	10	<5
F	24	---	28	20	19
Cl	6.8	7	7	7.1	5.3
SiO_2	43	51	64	68	62
Al	63.5	68	95.9	76	67
Fe	50.8	46.7	46	29	43
Mn	52.1	25.4	49.8	46	38
Cu	0.088	0.139	0.19	0.25	0.19
Zn	9.48	9.18	9.98	8.4	7.8
Mo	<0.02	0.02	<0.01	<0.1	<0.1
Cd	0.024	0.0041	0.03	0.03	0.025
Ag	<0.1	<0.05	<0.0005	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	<0.01	<0.01
Co	0.28	0.28	0.32	0.29	0.26
Ni	0.61	0.63	0.73	0.65	0.56
Pb	<0.002	---	0.003	<0.03	<0.015
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.015	0.032	0.031	0.033	0.03
V	<0.01	<0.01	<0.005	<0.01	<0.01
Se	<0.05	0.022	<0.001	0.026	0.014
As	<0.005	0.08	<0.001	0.055	0.036
Sum cations (meq/L)	34.2	31.3	28.5	23.6	24.4
Sum anions (meq/L)	28.9	26.4	28.3	24.8	26.1
Charge imbalance (percent)	16.7	16.8	0.62	-5.09	-6.49

Table 6. Selected historical ground-water quality analyses

Capulin Canyon

Well ID	MMW-2	MMW-2	MMW-2	MMW-2
Sample Date	8/27/01	10/26/01	2/21/02	6/3/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in mudflow, debris flow			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,666	7,664	7,666	7,665
Field Temperature (^{o}C)	17.7	15.1	9	21.1
pH, field, [lab]	5.87	4.45	4.18	4.09
Eh (V)	0.131	0.253	0.317	0.314
Spec Cond (µS/cm) field, [lab]	2,440	2,500	2,320	2,300
TDS (mg/L)	2,500	2,500	2,500	2,400
Constituent, dissolved (mg/L)				
Ca	490	310	300	260
Mg	72	98	100	95
Ba	0.01	0.0086	<0.01	0.0067
Na	71	46	43	37
K	12	12	12	11
SO_4	1,700	1,700	1,800	1,700
Alkalinity (as HCO_3)	50	<5	<5	<5
F	12	18	19	21
Cl	7.4	6.7	8.7	6.4
SiO_2	26	56	68	68
Al	8.4	61	67	71
Fe	19	43	39	41
Mn	21	38	41	40
Cu	0.049	0.14	0.17	0.18
Zn	4.1	7.3	8.5	7.4
Mo	<0.1	0.027	<0.1	<0.1
Cd	0.011	0.023	0.025	0.024
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	0.0015	0.0016	0.0068
Co	0.11	0.24	0.26	0.25
Ni	0.25	0.54	0.57	0.55
Pb	0.009	<0.015	<0.015	<0.015
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.015	0.026	0.028	0.03
V	<0.01	0.0013	0.0013	0.0011
Se	0.011	0.021	0.022	0.013
As	0.025	0.039	0.047	0.035
Sum cations (meq/L)	24.8	23.6	23.8	21.4
Sum anions (meq/L)	25.6	24.3	26.5	24.2
Charge imbalance (percent)	-3.09	-2.91	-10.4	-12.3

Table 6. Selected historical ground-water quality analyses

Capulin Canyon

Well ID	MMW-23A	MMW-23A	MMW-23A	MMW-23B	MMW-23B
Sample Date	6/12/01	9/19/01	4/11/02	1/18/00	6/12/01
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MMW wkst, RGC 8/10, MC DB	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel			Well completed in welded tuff	
Depth to Water (m)	---	---	---	4.8	---
Water Elevation (ft)	8,764	8,766	---	---	8,761
Field Temperature (^{o}C)	21.1	11.8	13.4	7.8	13.4
pH, field, [lab]	5.51	4.5	5.08	7.76	6.73
Eh (V)	0.073	0.362	0.012	(0.1)	0.098
Spec Cond (µS/cm) field, [lab]	1,820	3,330	2,310	811	743
TDS (mg/L)	1,800	4,000	2,300	500	470
Constituent, dissolved (mg/L)					
Ca	460	480	390	53	41
Mg	41	160	73	8.6	7.3
Ba	0.014	0.013	0.014	0.013	<0.01
Na	55	32	40	98	110
K	8.1	4.4	4.1	2.9	3.4
SO_4	1,200	2,700	1,500	250	230
Alkalinity (as HCO_3)	67	<5	7	120	120
F	8	46	37	3	2.9
Cl	7.3	6.2	6	1.1	1.2
SiO_2	21	64	47	13.1	13
Al	2.6	110	37	0.31	<0.05
Fe	0.37	2.4	0.5	0.13	<0.1
Mn	22	99	48	0.65	0.15
Cu	0.054	0.58	0.01	<0.01	<0.01
Zn	2.9	18	8.2	0.14	0.023
Mo	<0.1	<0.1	0.043	<0.1	<0.1
Cd	0.004	0.039	0.0024	<0.001	<0.001
Ag	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	<0.01	<0.01
Co	0.041	0.43	0.16	<0.01	<0.01
Ni	0.13	1.00	0.48	<0.02	<0.02
Pb	<0.009	0.03	0.016	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0002	---	<0.0002
Be	0.06	0.28	0.14	<0.004	<0.004
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.0087	0.037	0.022	<0.005	<0.005
As	0.008	0.08	0.13	<0.005	<0.005
Sum cations (meq/L)	21.8	33.9	22.5	7.18	7.09
Sum anions (meq/L)	18.4	37.5	22.6	6.81	6.50
Charge imbalance (percent)	17.0	-10.2	-0.01	5.20	8.58

Table 6. Selected historical ground-water quality analyses

Capulin Canyon

Well ID	MMW-23B	MMW-23B	MMW-23B	MMW-23B	MMW-23B
Sample Date	9/19/01	10/17/01	3/13/02	4/11/02	7/15/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in welded tuff				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,760	8,759	8,761	8,761	---
Field Temperature (^{o}C)	9.5	11.4	6	13	14.9
pH, field, [lab]	7.78	7.81	7.42	7.9	8.09
Eh (V)	0.138	0.049	-0.025	0.124	0.018
Spec Cond (µS/cm) field, [lab]	764	783	758	746	759
TDS (mg/L)	480	460	490	480	490
Constituent, dissolved (mg/L)					
Ca	35	35	34	35	37
Mg	6.6	5.9	5.9	6.3	6.6
Ba	<0.01	0.0068	0.0056	0.0058	0.0057
Na	120	120	120	120	110
K	1.6	1.7	1.8	1.9	2
SO_4	240	240	240	240	240
Alkalinity (as HCO_3)	120	120	120	120	110
F	2.8	2.5	2.7	2.6	2.7
Cl	1.2	1	1	<1	0.94
SiO_2	13	13	13	13	12
Al	<0.05	<0.05	0.0085	<0.05	0.035
Fe	<0.1	<0.1	0.029	<0.1	0.028
Mn	0.051	0.045	0.043	0.044	0.04
Cu	<0.01	<0.01	<0.01	<0.01	<0.01
Zn	<0.02	<0.02	<0.02	0.0039	0.00073
Mo	<0.1	<0.1	0.029	<0.1	<0.1
Cd	<0.001	<0.001	<0.001	<0.001	0.00034
Ag	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.0018	0.0011	0.0022
Co	<0.01	<0.01	<0.01	<0.01	0.0011
Ni	<0.02	0.00097	0.0047	0.0026	0.0015
Pb	<0.003	<0.003	<0.003	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	<0.004	<0.004	0.00069
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	<0.005	0.0029	<0.005	<0.005	<0.005
As	<0.005	0.0047	<0.005	<0.005	0.0036
Sum cations (meq/L)	7.16	7.11	7.09	7.13	6.79
Sum anions (meq/L)	6.75	6.73	6.77	6.70	6.54
Charge imbalance (percent)	5.86	5.40	4.58	6.29	3.89

Table 6. Selected historical ground-water quality analyses

Capulin Canyon

Well ID	MMW-3	MMW-3	MMW-3	MMW-3	MMW-3
Sample Date	11/7/94	6/25/97	11/7/97	6/9/98	2/4/00
Comments	---	---	---	---	---
Source ID (see table 2)	NMED, Slifer 1996	NMED, MC DB	URS 3/01, MC DB	NMED, MC DB	RGC 8/10, MMW wkst, MC DB
Lab ID	SLD WC 94-6427	ACZ RG46913	---	ACZ RG70640	Paragon Analytics
Aquifer	Well completed in andesite bedrock				
Depth to Water (m)	---	---	---	10.2	9.9
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	(11)	(10)	10.4	10.6	9.6
pH, field, [lab]	(7.5), [7.63]	(7)	6.91	6.7	6.21
Eh (V)	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)
Spec Cond (µS/cm) field, [lab]	[2,720]	-2,500	---	2,470	2,800
TDS (mg/L)	3,070	2030, 2070	2,130	2020, 2100	2,300
Constituent, dissolved (mg/L)					
Ca	498	482	428	430	500
Mg	112	53.1	49.1	52.7	63
Ba	---	0.032	0.029	0.035	0.026
Na	103	115	99.3	107	91
K	10	7	4.9	6.2	9.9
SO_4	1,760	1,190	1,250	1,270	1,300
Alkalinity (as HCO_3)	209	257	250	226	170
F	2.8	3	2.9	3	4.6
Cl	<5	3	5	5	5
SiO_2	(15.2)	35.1	15.2	16.0	19.5
Al	(0.7)	<0.2	0.16	0.28	1.4
Fe	(0.1)	<0.02	0.07	0.61	0.22
Mn	(37)	5.03	4.07	5.26	13
Cu	---	<0.1	<0.02	<0.01	0.021
Zn	(1.2)	0.12	0.07	0.17	0.1
Mo	---	<0.02	<0.02	0.01	<0.1
Cd	(0.003)	0.0005	<0.03	<0.0005	0.0069
Ag	---	<0.003	<0.01	<0.0005	<0.002
Cr	---	<0.2	<0.02	<0.01	<0.01
Co	(0.08)	<0.02	<0.02	0.01	0.047
Ni	(0.2)	<0.02	<0.02	0.02	0.091
Pb	---	<0.001	<0.08	<0.001	<0.006
Hg	---	<0.0002	<0.0002	<0.0002	<0.0002
Be	---	<0.004	<0.02	<0.002	<0.004
V	---	<0.01	<0.01	<0.005	<0.01
Se	---	<0.001	<0.002	<0.001	0.011
As	---	<0.001	<0.001	<0.001	0.0069
Sum cations (meq/L)	28.7	26.1	22.6	23.3	26.4
Sum anions (meq/L)	28.8	21.5	23.0	22.9	21.6
Charge imbalance (percent)	-0.01	19.2	-1.78	1.79	19.8

Table 6. Selected historical ground-water quality analyses

Capulin Canyon

Well ID	MMW-3	MMW-3	MMW-3	MMW-3	MMW-3
Sample Date	6/6/01	8/27/01	10/26/01	2/21/02	6/3/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in andesite bedrock				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,669	7,669	7,668	7,669	7,668
Field Temperature (^{o}C)	10.5	14.3	16.3	8.8	19.8
pH, field, [lab]	6.74	6.81	6.67	6.79	6.82
Eh (V)	0.278	0.141	0.078	0.061	0.091
Spec Cond (µS/cm) field, [lab]	2,330	2,280	2,400	2320	2,370
TDS (mg/L)	2,100	2,100	2,100	2,100	2,100
Constituent, dissolved (mg/L)					
Ca	470	460	470	470	490
Mg	56	47	50	48	49
Ba	0.026	0.026	0.027	0.025	0.025
Na	97	94	100	110	100
K	9.4	8.7	9	8.8	8.6
SO_4	1,300	1,300	1,300	1,300	1,300
Alkalinity (as HCO_3)	230	230	240	230	240
F	3.5	3.3	3.2	4	2.5
Cl	4.9	4.6	4.8	4.3	4.7
SiO_2	16.3	14.8	15.2	16.3	15.2
Al	1.7	<0.05	<0.05	<0.05	<0.05
Fe	0.63	<0.1	0.19	0.27	<0.1
Mn	6	4.7	4.2	4	3.3
Cu	<0.01	<0.01	<0.0005	<0.01	0.00083
Zn	0.35	0.19	0.16	0.14	0.13
Mo	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.002	0.001	0.00077	<0.001	0.00038
Ag	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	<0.01	<0.01
Co	0.016	<0.01	0.0088	0.0085	0.007
Ni	0.031	<0.02	0.018	0.015	0.014
Pb	<0.006	<0.003	<0.003	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	0.00059	0.0013	<0.004
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	<0.005	0.0059	<0.005	<0.005	0.0039
As	<0.005	<0.005	0.003	<0.005	<0.005
Sum cations (meq/L)	24.7	23.2	24.0	24.7	24.5
Sum anions (meq/L)	22.9	23.1	23.0	23.3	22.6
Charge imbalance (percent)	7.54	0.74	4.30	5.87	8.15

Table 6. Selected historical ground-water quality analyses

Access Road south of Goat Hill

Well ID	MMW-42A	MMW-42A	MMW-42A	MMW-42A
Sample Date	6/14/01	9/8/01	11/11/01	2/20/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in alluvium			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,647	7,643	7,641	7,642
Field Temperature (^{o}C)	10.5	17.8	13.0	11.6
pH, field, [lab]	3.65	3.49	3.45	3.41
Eh (V)	0.207	0.480	0.497	0.481
Spec Cond (µS/cm) field, [lab]	2,300	2,720	2,890	2,650
TDS (mg/L)	2,400	2,800	2,600	2,500
Constituent, dissolved (mg/L)				
Ca	230	220	220	230
Mg	69	76	75	74
Ba	<0.01	<0.01	0.0017	<0.01
Na	33	67	80	74
K	3.1	2.8	3.4	3.2
SO_4	1,600	1,700	1,600	1,600
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	16	22	22	19
Cl	76	260	350	310
SiO_2	64	86	90	94
Al	130	190	180	170
Fe	18	1.1	0.92	0.78
Mn	19	26	27	26
Cu	2	3.1	3.4	3.3
Zn	4.7	6.7	6.9	7.2
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.023	0.035	0.034	0.034
Ag	<0.002	<0.002	0.0017	<0.002
Cr	0.012	0.027	0.036	0.035
Co	0.23	0.32	0.31	0.3
Ni	0.45	0.67	0.65	0.64
Pb	<0.006	<0.009	<0.009	<0.009
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.023	0.035	0.037	0.036
V	<0.01	<0.01	<0.01	<0.01
Se	0.011	0.018	0.013	0.013
As	<0.005	<0.005	<0.005	0.0022
Sum cations (meq/L)	22.0	26.9	27.7	27.1
Sum anions (meq/L)	23.2	27.6	29.4	28.5
Charge imbalance (percent)	-5.62	-2.63	-5.99	-4.93

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	Mine Shaft Facility			
Well ID	MMW-21	MMW-21	MMW-21	MMW-21
Sample Date	1/14/00	6/23/01	8/28/01	11/10/01
Comments	---	---	---	---
Source ID (see table 2)	MMW wkst, MC DB	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in gravel, sand and silt			
Depth to Water (m)	23.2	---	---	---
Water Elevation (ft)	---	8,018	8,020	8,020
Field Temperature (^{o}C)	10.9	14.6	17.7	16.3
pH, field, [lab]	3.25	2.85	3	2.96
Eh (V)	(0.5)	0.354	0.527	0.527
Spec Cond (µS/cm) field, [lab]	3,970	3,810	3,870	4,130
TDS (mg/L)	4,700	4,500	4,300	4,100
Constituent, dissolved (mg/L)				
Ca	460	390	380	450
Mg	260	220	220	260
Ba	0.013	<0.01	<0.01	<0.01
Na	63	55	54	53
K	1.8	<0.5	<0.5	1.3
SO_4	3,200	3,300	3,200	3,400
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	42	38	38	38
Cl	36	37	33	36
SiO_2	94	98	98	98
Al	200	200	200	200
Fe	9.6	12	13	15
Mn	21	22	20	23
Cu	3.2	2.7	2.8	2.6
Zn	4.8	4	3.5	4.2
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.039	0.03	0.02	0.03
Ag	<0.002	<0.002	<0.002	<0.002
Cr	0.0036	0.03	0.07	0.05
Co	0.72	0.66	0.66	0.66
Ni	1.4	1.2	1.3	1.3
Pb	<0.009	<0.009	<0.009	<0.009
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.035	0.029	0.032	0.031
V	<0.01	<0.01	<0.01	<0.01
Se	0.014	0.009	<0.01	<0.01
As	0.0064	<0.005	<0.005	0.003
Sum cations (meq/L)	43.4	38.2	37.0	41.8
Sum anions (meq/L)	41.4	43.5	41.5	43.2
Charge imbalance (percent)	4.75	-12.9	-11.4	-3.34

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	Mine Shaft Facility			
Well ID	MMW-22	MMW-22	MMW-22	MMW-22
Sample Date	1/17/00	6/23/01	8/28/01	11/10/01
Comments	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel with silt, clay and cobbles			
Depth to Water (m)	26.4	---	---	---
Water Elevation (ft)	---	8,005	8,004	8,004
Field Temperature (^{o}C)	11.9	12.8	20	15.5
pH, field, [lab]	3.49	3.3	3.45	3.45
Eh (V)	(0.2)	0.147	0.326	0.276
Spec Cond (µS/cm) field, [lab]	3,890	4,190	3,650	3,880
TDS (mg/L)	4,500	4,500	4,400	4,600
Constituent, dissolved (mg/L)				
Ca	400	400	390	440
Mg	220	190	180	220
Ba	<0.01	<0.01	<0.01	0.0016
Na	61	52	50	52
K	6.7	7.3	6.5	7.7
SO_4	3,000	3,200	3,200	3,300
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	36	39	36	36
Cl	31	35	37	39
SiO_2	88	96	88	92
Al	200	190	190	200
Fe	180	160	180	180
Mn	15	15	14	16
Cu	1.2	1.2	1.2	1.2
Zn	3.8	3.6	3.2	3.8
Mo	<0.01	<0.1	<0.1	<0.1
Cd	0.026	0.02	0.020	0.020
Ag	<0.002	<0.002	<0.002	<0.002
Cr	0.011	<0.01	<0.01	<0.01
Co	0.75	0.63	0.62	0.65
Ni	1.4	1.1	1.1	1.1
Pb	<0.006	0.010	<0.006	<0.006
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.033	0.03	0.03	0.03
V	<0.01	<0.01	<0.01	0.0065
Se	0.016	<0.005	0.009	0.0064
As	<0.005	<0.005	<0.005	<0.005
Sum cations (meq/L)	43.6	39.4	37.5	43.0
Sum anions (meq/L)	38.0	42.5	41.5	42.0
Charge imbalance (percent)	13.7	-7.47	-10.1	2.32

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	Sugar Shack West			
Well ID	MMW-36B	MMW-36B	MMW-36B	MMW-36B
Sample Date	6/23/01	9/7/01	11/1/01	2/21/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in bedrock			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	8,362	8,359	8,359	8,358
Field Temperature (^{o}C)	13.1	19.5	15.3	11.7
pH, field, [lab]	4.21	4.47	4.44	3.49
Eh (V)	0.262	0.196	0.210	0.362
Spec Cond (µS/cm) field, [lab]	4,000	3,940	4,020	4,130
TDS (mg/L)	4,500	4,500	4,500	4,700
Constituent, dissolved (mg/L)				
Ca	530	540	540	530
Mg	270	280	280	260
Ba	<0.01	0.03	0.02	<0.01
Na	58	59	58	63
K	12	12	12	12
SO_4	3,100	3,300	3,500	3,600
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	44	43	44	46
Cl	43	45	53	45
SiO_2	56	53	53	62
Al	77	72	80	93
Fe	170	180	170	190
Mn	19	18	19	18
Cu	2.5	1.9	3.2	5.2
Zn	1.5	1.4	1.5	1.6
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.0078	0.0055	0.008	0.008
Ag	<0.002	<0.002	<0.002	0.003
Cr	<0.01	0.03	0.02	0.061
Co	0.35	0.34	0.41	0.53
Ni	0.62	0.62	0.69	0.78
Pb	<0.009	<0.006	<0.006	<0.006
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.0062	0.0062	0.0074	0.01
V	0.04	0.03	0.02	0.024
Se	0.0078	0.01	0.01	0.011
As	<0.005	<0.005	0.0032	0.0033
Sum cations (meq/L)	42.2	40.9	41.3	42.2
Sum anions (meq/L)	43.1	45.1	49.3	51.3
Charge imbalance (percent)	-2.30	-9.57	-17.7	-19.4

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	Mine Shaft Facility					
Well ID	MMW-7	MMW-7	MMW-7	MMW-7	MMW-7	MMW-7
Sample Date	5/11/98	6/9/98	2/7/00	6/23/01	11/10/01	2/16/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC DB	NMED, MC DB	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD
Lab ID	---	ACZ RG70641	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in andesite bedrock					
Depth to Water (m)	---	18.7	18.6	---	---	---
Water Elevation (ft)	---	---	---	8,029	8,029	8,029
Field Temperature (^{o}C)	(12)	12.2	11.3	12.7	14.9	3.8
pH, field, [lab]	(4)	4.13	4.15	4.15	4.16	4.29
Eh (V)	(0.2)	(0.2)	(0.2)	0.356	0.197	0.187
Spec Cond (µS/cm) field, [lab]	---	7,920	7,130	6,720	6,720	6,730
TDS (mg/L)	10,900	10300, 11100	12,000	9,700	9,400	9,700
Constituent, dissolved (mg/L)						
Ca	489	453	450	500	500	500
Mg	791	757	680	680	660	680
Ba	---	0.051	0.035	0.03	0.07	0.031
Na	138	130	120	120	120	130
K	10	9.8	14	14	14	14
SO_4	7,200	7,940	7,500	7,000	7,000	7,300
Alkalinity (as HCO_3)	ND	<2	52	<5	<5	<5
F	130	140	150	140	130	130
Cl	9	11	22	14	22	25
SiO_2	---	40	41	41	36	39
Al	592	589	530	470	470	430
Fe	279	247	260	260	250	260
Mn	39.4	39.5	41	38	37	35
Cu	0.7	0.75	3.5	1.1	1.2	0.89
Zn	6.7	6.29	6.2	5.6	5.3	4.9
Mo	ND	<0.01	<0.1	<0.1	<0.1	<0.1
Cd	0.06	0.07	0.077	0.06	0.05	0.059
Ag	---	0.0007	0.0025	<0.002	<0.002	<0.002
Cr	---	0.08	0.08	0.07	0.07	0.067
Co	3.1	2.77	2.6	2.4	2.3	2.2
Ni	6.7	5.92	5.8	5.3	5.1	4.8
Pb	---	0.012	0.015	<0.01	<0.01	0.015
Hg	---	<0.0002	0.0002	<0.0002	<0.0002	<0.0002
Be	---	0.074	0.072	0.06	0.05	0.058
V	---	0.13	0.11	0.12	0.12	0.11
Se	---	<0.001	<0.025	<0.02	<0.01	0.0099
As	---	<0.005	0.0082	0.01	0.01	0.0092
Sum cations (meq/L)	96.8	88.0	82.1	81.4	78.9	81.9
Sum anions (meq/L)	80.0	93.9	93.4	85.0	84.3	95.8
Charge imbalance (percent)	19.0	-6.52	-12.9	-4.32	-6.58	-15.7

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	East of Sewage Pond				
Well ID	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A
Sample Date	11/8/94	6/25/97	11/7/97	5/11/98	6/9/98
Comments	---	---	---	---	---
Source ID (see table 2)	SPRI '95, SRK '95, URS, MMW wkst, MC DB	NMED, MC DB	URS 3/01, MC DB	MC DB	NMED, MC DB
Lab ID	ETC	ACZ RG 46915	---	---	ACZ RG 70642
Aquifer	Well completed in andesite	Well completed in andesite bedrock			
Depth to Water (m)	29.5	---	---	---	29.2
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	8.4	(10)	11.2	(11)	11.7
pH, field, [lab]	7	(7)	6.94	(6)	6.84
Eh (V)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Spec Cond (µS/cm) field, [lab]	2,860	-2,400	---	---	2,580
TDS (mg/L)	2,200	2290, 2400	2,400	2,470	2190, 2330
Constituent, dissolved (mg/L)					
Ca	466	539	484	500	475
Mg	85.6	101	92	105	91.7
Ba	0.103	0.041	0.037	---	0.036
Na	41.5	40	34.8	42	38.3
K	3.8	5	3.6	4.3	4.1
SO_4	1,300	1,450	1,420	1,580	1,490
Alkalinity (as HCO_3)	165	186	143	151	137
F	2.72	3	2.6	2.3	2
Cl	8.7	5	7	8	7
SiO_2	24	65	28	---	29
Al	<0.05	<0.06	<0.06	ND	0.06
Fe	2.84	1.1	0.44	0.82	0.4
Mn	7.15	4.46	3.83	3.97	3.91
Cu	<0.010	<0.1	<0.02	0.01	<0.01
Zn	<0.05	<0.10	1.1	ND	<0.01
Mo	<0.02	<0.02	<0.02	ND	0.02
Cd	0.002	<0.0005	<0.006	ND	<0.0005
Ag	<0.1	<0.003	0.01	---	<0.0005
Cr	<0.01	<0.02	<0.02	---	<0.01
Co	<0.01	<0.02	<0.02	ND	<0.01
Ni	<0.02	<0.02	<0.02	ND	<0.01
Pb	<0.002	<0.001	<0.08	---	<0.001
Hg	<0.0002	<0.0002	<0.0002	---	<0.0002
Be	<0.004	<0.004	<0.02	---	<0.002
V	<0.01	<0.01	<0.01	---	<0.005
Se	<0.005	<0.001	<0.003	---	<0.001
As	<0.005	<0.005	<0.001	---	<0.001
Sum cations (meq/L)	24.1	27.2	24.1	25.3	23.6
Sum anions (meq/L)	21.7	23.5	22.9	25.3	24.0
Charge imbalance (percent)	10.5	14.8	5.42	-0.08	-1.65

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	East of Sewage Pond					
Well ID	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A
Sample Date	2/4/00	6/12/01	8/23/01	11/11/01	2/20/02	5/28/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in andesite bedrock					
Depth to Water (m)	29.1	---	---	---	---	---
Water Elevation (ft)	---	7,759	7,762	7,761	7,762	7,763
Field Temperature (^{o}C)	10.5	26.7	19.7	17.6	13.3	18.2
pH, field, [lab]	6.49	7.24	6.92	6.92	6.94	6.89
Eh (V)	(0.1)	0.099	0.010	-0.092	-0.035	-0.025
Spec Cond (µS/cm) field, [lab]	2,350	2,220	2,450	2,530	2,470	2,550
TDS (mg/L)	2,200	2,500	2,500	2,500	2,500	2,500
Constituent, dissolved (mg/L)						
Ca	440	570	560	560	540	510
Mg	93	97	92	96	100	94
Ba	0.029	0.03	0.04	0.04	0.033	0.032
Na	44	40	41	38	39	40
K	6.7	5.9	5.4	5.9	6	5.5
SO_4	1,300	1,600	1,500	1,600	1,600	1,600
Alkalinity (as HCO_3)	150	160	160	160	150	150
F	2.7	2.1	1.8	1.3	2.6	2.5
Cl	5	6.9	7.2	7	6.2	6.4
SiO_2	28	28	28	26	28	28
Al	0.17	0.12	<0.05	<0.05	<0.05	0.05
Fe	<0.1	1.3	1	1.1	0.79	0.71
Mn	2.2	4.6	4.6	4.6	3.6	3.3
Cu	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zn	<0.02	<0.02	<0.02	0.01	<0.02	<0.02
Mo	<0.1	<0.02	<0.1	<0.1	<0.1	<0.1
Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.03	<0.01	<0.01	0.00054
Co	<0.01	<0.01	<0.01	0.0068	0.0035	0.0039
Ni	<0.02	<0.02	<0.02	0.0073	0.0047	0.0042
Pb	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	<0.005	<0.005	<0.005	0.0051	0.0036	<0.005
As	<0.005	<0.005	<0.005	<0.005	0.0026	0.0038
Sum cations (meq/L)	23.4	26.3	26.6	26.4	26.2	24.3
Sum anions (meq/L)	21.4	24.0	23.1	24.8	25.1	25.1
Charge imbalance (percent)	8.88	9.10	14.1	6.46	4.29	-3.55

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	East of Sewage Pond				
Well ID	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B
Sample Date	11/8/94	6/25/97	11/7/97	5/11/98	6/9/98
Comments	---	---	---	---	---
Source ID (see table 2)	SPRI '95, SRK '95, MMW wkst, MC DB	NMED, MC DB	URS 3/01, MC DB	URS 3/01, MC DB	NMED, MC DB
Lab ID	ETC	ACZ RG 46916	---	---	ACZ RG 70643
Aquifer	Well completed in mudflow				
Depth to Water (m)	29.3	---	---	---	28.9
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	7.1	(10)	11.5	(11)	12
pH, field, [lab]	6.4	(7)	6.01	(6)	5.63
Eh (V)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Spec Cond (µS/cm) field, [lab]	1,780	-1,700	1,700	---	1,850
TDS (mg/L)	1,100	1370, 1450	1,520	1,760	1360, 1520
Constituent, dissolved (mg/L)					
Ca	206	259	251	286	264
Mg	55.5	71.4	66.6	87	71.8
Ba	0.016	0.008	0.009	---	0.011
Na	33.9	59.3	59.3	69.5	56.1
K	2.9	3	3	3.8	3.2
SO_4	730	910	950	1,130	940
Alkalinity (as HCO_3)	19	17	16	11	6
F	1.83	1.6	1.6	1.6	1.7
Cl	5.6	17	18	26	21
SiO_2	37	86	19	---	38
Al	0.44	0.38	0.65	0.51	0.48
Fe	<0.050	0.01	0.04	0.01	0.02
Mn	0.202	0.027	0.052	0.024	0.021
Cu	<0.01	<0.05	<0.01	ND	<0.01
Zn	0.211	0.32	0.017	0.38	0.32
Mo	<0.02	<0.01	<0.01	ND	<0.01
Cd	<0.0005	0.0029	0.003	0.0037	0.0026
Ag	<0.1	<0.0003	<0.005	---	<0.0005
Cr	---	<0.01	<0.01	---	<0.01
Co	<0.01	<0.01	0.01	ND	<0.01
Ni	0.059	0.07	0.06	0.08	0.07
Pb	<0.002	<0.001	<0.04	---	<0.001
Hg	<0.0002	<0.0002	<0.0002	---	<0.0002
Be	<0.004	<0.002	<0.01	---	<0.002
V	<0.01	<0.005	<0.005	---	<0.005
Se	<0.005	0.004	0.003	---	0.003
As	<0.005	<0.005	<0.001	---	<0.001
Sum cations (meq/L)	13.0	16.6	15.8	18.4	16.5
Sum anions (meq/L)	12.3	14.9	15.7	18.3	15.2
Charge imbalance (percent)	5.52	10.9	0.68	0.53	8.34

Table 6. Selected historical ground-water quality analyses

Sugar Shack West	East of Sewage Pond					
Well ID	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B
Sample Date	2/4/00	6/12/01	8/24/01	11/11/01	2/20/02	5/28/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in mudflow					
Depth to Water (m)	29.1	---	---	---	---	---
Water Elevation (ft)	---	7,765	7,764	7,763	7,763	7,764
Field Temperature (^{o}C)	10.2	19.8	17.9	14.2	13.4	21.1
pH, field, [lab]	5.66	6.49	5.71	5.52	5.64	5.46
Eh (V)	(0.1)	0.036	0.237	0.113	0.196	0.211
Spec Cond (µS/cm) field, [lab]	2,360	2,290	2,460	2,530	2,500	2,760
TDS (mg/L)	2,200	2,600	2,500	2,400	2,400	2,600
Constituent, dissolved (mg/L)						
Ca	400	470	420	450	470	450
Mg	110	150	140	130	130	120
Ba	<0.01	<0.01	0.03	0.0089	<0.01	0.0092
Na	95	110	98	89	98	110
K	6.9	11	7.9	6.7	6.8	6.6
SO_4	1,400	1,700	1,600	1,600	1,600	1,800
Alkalinity (as HCO_3)	27	16	15	12	10	13
F	1.7	7.6	5	1.6	2	1.9
Cl	27	31	34	31	31	28
SiO_2	39	41	39	36	41	39
Al	1.9	4.6	2.1	0.46	0.42	0.5
Fe	<0.1	<0.1	<0.1	<0.1	<0.1	0.039
Mn	0.66	4.4	1.8	<0.01	0.013	0.028
Cu	0.018	0.03	0.03	0.0009	<0.01	0.0015
Zn	0.65	2.7	1.6	0.55	0.58	0.53
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.0057	0.02	0.01	0.0052	0.0043	0.0051
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	<0.01	0.003	0.0025
Co	<0.01	<0.01	<0.01	<0.01	<0.01	0.00082
Ni	0.12	0.81	0.4	0.12	0.12	0.12
Pb	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.00092	0.0074	0.01	0.007	0.009	0.0058
As	<0.005	<0.005	<0.005	0.0033	0.0035	0.0029
Sum cations (meq/L)	24.9	29.2	26.4	26.7	28.0	25.6
Sum anions (meq/L)	21.8	24.5	23.9	23.9	23.8	26.8
Charge imbalance (percent)	13.5	17.4	10.1	11.1	16.3	-4.64

Table 6. Selected historical ground-water quality analyses

Columbine Park

Well ID	Columbine No. 1	Columbine No. 1	Columbine No. 2	Columbine No. 2	Columbine No. 2	Columbine No. 2	Columbine No. 2
Sample Date	9/9/97	3/19/02	9/9/97	8/7/01	3/19/02	8/7/01	3/19/02
Comments	* Ni: 0.15, <0.02 in DB	---	* Ni: 0.1, <0.02 in DB	---	---	---	---
Source ID (see table 2)	RGC 8/10, MC DB, Vail	MC CD	RGC 8/10, MC DB, Vail	MC CD	MC CD	MC CD	MC CD
Lab ID	---	Paragon Analytics	---	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Alluvial water supply well in the "cabin area" of Columbine Park						
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---
Field Temperature (^{o}C)	16.6	(9)	11.6	---	---	(8)	(8)
pH, field, [lab]	[6]	(5)	6.1, [6.2]	---	---	(6)	(6)
Eh (V)	(0.2)	(0.2)	---	---	---	(0.2)	(0.2)
Spec Cond (µS/cm) field, [lab]	646, [647]	---	577, [570]	---	---	---	---
TDS (mg/L)	495	1400	435	530	1,000	530	1,000
Constituent, dissolved (mg/L)							
Ca	79.2	220	67	79	160	79	160
Mg	25.5	90	20.2	32	64	32	64
Ba	<1	0.017	<1	0.017	0.026	0.017	0.026
Na	9.3	21	7.8	<10	15	<10	15
K	1.6	4	1.5	2.2	3.2	2.2	3.2
SO_4	340	940	280	340	700	340	700
Alkalinity (as HCO_3)	27	<5	33	10	7.2	10	7.2
F	4.64	19	3.32	8.4	12	8.4	12
Cl	<10	16	<10	5.3	12	5.3	12
SiO_2	29.3	11	27.8	16	19	7.7	8.7
Al	2.2	16	1.4	7	11	7	11
Fe	0.5	<0.1	0.4	1.2	0.15	1.2	0.15
Mn	0.8	8.7	0.5	2.6	5.8	2.6	5.8
Cu	<0.25	0.27	<0.25	0.07	0.13	0.07	0.13
Zn	1.04	5.9	0.74	1.9	3.6	1.9	3.6
Mo	<0.02	<0.1	<0.02	<0.1	<0.1	<0.1	<0.1
Cd	0.008	0.04	<0.005	0.01	0.023	0.013	0.023
Ag	---	<0.002	---	<0.002	<0.002	<0.002	<0.002
Cr	---	<0.01	---	<0.01	<0.01	<0.01	<0.01
Co	<0.02	0.00088	<0.02	<0.01	0.0035	<0.01	0.0035
Ni	0.15 *	0.85	0.1 *	0.3	0.41	0.3	0.41
Pb	<0.02	<0.003	<0.02	0.014	0.0043	0.014	0.0043
Hg	---	<0.0002	---	<0.0002	<0.0002	<0.0002	<0.0002
Be	---	0.014	---	0.013	0.014	0.013	0.014
V	---	0.00069	---	<0.01	<0.01	<0.01	<0.01
Se	---	0.011	---	<0.005	0.003	<0.005	0.003
As	<0.001	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005
Sum cations (meq/L)	5.50	15.8	4.60	6.02	11.7	6.02	11.7
Sum anions (meq/L)	6.40	15.1	5.60	6.25	11.9	6.25	11.9
Charge imbalance (percent)	-15.9	4.55	-18.5	-3.72	-1.15	-3.72	-1.15

Table 6. Selected historical ground-water quality analyses

Columbine Park

Well ID	Molycorp Cabin Well	Douglas Well	Douglas Well	Douglas Well	Douglas Well	Douglas Well	Douglas Well
Sample Date	3/19/02	6/10/98	6/7/01	9/6/01	11/8/01	3/19/02	6/13/02
Comments	+ approximate	---	---	*discrepancy in Fe between MC CD's	* Se: <0.005, 0.0027 in MC CD 9/18/02	*As: 0.0066, 0.0082 in MC CD 9/18/02	---
Source ID (see table 2)	MC CD	NMED	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	ACZ RG 70722	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Wells completed in alluvium						
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---
Field Temperature (^{o}C)	(10)	7.4	8.4	8.7	8.2	12	13.9
pH, field, [lab]	(7)	5.61	5.8	5.21	4.87	4.6	5.53
Eh (V)	---	(0.3)	0.211	0.306	0.174	0.249	0.164
Spec Cond (µS/cm) field, [lab]	---	640	975	796	1,010	1,080	823
TDS (mg/L)	120	436, 470	800	640	780	950	620
Constituent, dissolved (mg/L)							
Ca	39	69.9	100	86	130	130	87
Mg	7.2	25.3	47	42	61	66	39
Ba	---	0.031	0.032	0.028	0.032	0.031	0.024
Na	3.6	8.9	12	10	11	15	10
K	1.2	1.9	3.6	2.3	2.5	2.8	2.2
SO_4	58	300	530	420	520	670	400
Alkalinity (as HCO_3)	65	8	6.9	6.7	5.7	<5	5.8
F	0.79	8.7	14	11	12	15	7.4
Cl	1.4	5	7	10	11	12	7.4
SiO_2	8.3	---	18	17	17	18	14
Al	0.072	6.74	15	10	12	14	5.5
Fe	0.14	0.86	1.4	1.1 *	0.87	0.76	3.8
Mn	0.0047	2.3	7	4.2	5	7.3	3.2
Cu	<0.01	0.06	0.17	0.12	0.14	0.17	0.053
Zn	0.097	1.46	3	1.9	2.7	3.1	2.1
Mo	<0.1	---	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	<0.001	0.009	0.021	0.013	0.017	0.022	0.0099
Ag	<0.002	---	<0.002	<0.002	<0.002	0.0099	<0.002
Cr	0.00078	---	<0.01	<0.01	<0.01	<0.01	<0.01
Co	<0.01	---	0.013	<0.01	<0.01	0.014	0.0031
Ni	0.0072	0.15	0.32	0.22	0.3	0.36	0.16
Pb	<0.003	---	<0.003	0.004	0.0015	<0.003	<0.003
Hg	<0.0002	---	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	0.004	0.0076	0.006	0.0069	0.0069	0.0038
V	<0.01	---	<0.01	<0.01	<0.01	0.0013	<0.01
Se	<0.005	0.001	<0.005	<0.005	0.0027 *	0.0082	<0.005
As	<0.005	---	<0.005	<0.005	<0.005	0.0082 *	0.0059
Sum cations (meq/L)	2.60	5.56	8.75	7.50	10.7	10.8	7.06
Sum anions (meq/L)	2.21	5.61	9.31	7.61	8.87	11.3	7.10
Charge imbalance (percent)	16.1	-0.97	-6.29	-1.48	18.9	-4.00	-0.61

Table 6. Selected historical ground-water quality analyses

Columbine Park

Well ID	MMW-33A	MMW-33A	MMW-33A	MMW-33A	MMW-33A
Sample Date	6/12/01	9/5/01	11/27/01	1/30/02	5/13/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,843	7,834	7,828	7,826	7,829
Field Temperature (^{o}C)	11	9.2	5.5	7.5	18.3
pH, field, [lab]	4.66	4.37	4.68	4.39	4.24
Eh (V)	0.100	0.411	0.361	0.259	0.344
Spec Cond (µS/cm) field, [lab]	1,780	2,090	2,140	2,120	1,980
TDS (mg/L)	1,700	1,900	2,000	1,900	1,800
Constituent, dissolved (mg/L)					
Ca	180	230	240	220	190
Mg	110	140	140	140	130
Ba	<0.01	<0.01	0.03	0.0085	0.0083
Na	22	24	24	28	23
K	4.4	4.7	5	4.5	4.8
SO_4	1,200	1,400	1,500	1,400	1,400
Alkalinity (as HCO_3)	<5	<5	<5	<5	<5
F	25	28	27	27	26
Cl	18	23	24	22	20
SiO_2	24	24	24	26	24
Al	48	57	56	57	50
Fe	0.13	<0.1	<0.1	<0.1	0.11
Mn	28	29	31	31	28
Cu	0.71	0.8	0.83	0.83	0.75
Zn	5.1	6	6	5.6	5.6
Mo	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.03	0.04	0.04	0.043	0.038
Ag	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.002	0.019	0.022
Co	0.22	0.26	0.26	0.26	0.23
Ni	0.56	0.66	0.63	0.65	0.6
Pb	<0.009	<0.01	<0.01	0.015	<0.015
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.01	0.01	0.01	0.012	0.011
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.01	0.01	0.01	0.021	0.021
As	<0.005	0.007	<0.0037	0.0069	0.0072
Sum cations (meq/L)	17.6	21.8	22.2	21.8	18.3
Sum anions (meq/L)	18.7	21.2	23.2	21.4	21.2
Charge imbalance (percent)	-6.27	2.68	-4.65	1.76	-14.7

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-1	P-1	P-1	P-1	P-1
Sample Date	11/7/97	5/11/98	6/10/98	2/8/00	6/5/01
Comments	---	---	---	---	---
Source ID (see table 2)	URS, MC DB	URS, MC DB	NMED	MMW wkst, RGC 8/10, MC DB	MC CD
Lab ID	---	---	ACZ RG 70723	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel				
Depth to Water (m)	---	---	7.24	7.8	---
Water Elevation (ft)	---	---	---	---	7,811
Field Temperature (^{o}C)	7.9	(8)	8.1	8.3	10.1
pH, field, [lab]	4.87	(5)	4.98	4.68	5.03
Eh (V)	(0.3)	(0.3)	(0.3)	(0.3)	0.140
Spec Cond (µS/cm) field, [lab]	1,065	---	1,710	1,840	823
TDS (mg/L)	960	1,090	923	1,700	600
Constituent, dissolved (mg/L)					
Ca	142	149	142	220	78
Mg	60	64.7	57.2	100	37
Ba	0.025	---	0.018	0.03	<0.01
Na	15	15.7	15.2	23	11
K	2.8	2.6	2.6	4.2	2.4
SO_4	610	680	650	1,100	430
Alkalinity (as HCO_3)	4	5	2	11	<5
F	13	15	15	25	9.1
Cl	13	15	13	18	12
SiO_2	23.8	---	---	25.7	16.0
Al	13.4	16.1	15	28	11
Fe	0.09	0.05	---	<0.1	<0.1
Mn	6.34	7.28	7.49	16	4.9
Cu	0.23	0.19	0.18	0.31	0.15
Zn	3.48	3.91	3.89	6.1	2.2
Mo	<0.01	ND	---	<0.01	<0.1
Cd	0.023	0.026	0.027	0.046	0.01
Ag	<0.005	---	---	---	<0.002
Cr	<0.01	---	---	<0.01	<0.01
Co	<0.01	ND	---	0.018	<0.01
Ni	0.39	0.45	0.43	0.69	0.24
Pb	<0.04	---	---	<0.006	<0.003
Hg	<0.0002	---	---	---	<0.0002
Be	0.02	---	0.016	0.026	0.01
V	<0.005	---	---	---	<0.01
Se	<0.002	---	0.002	0.014	<0.005
As	<0.001	---	---	0.013	<0.005
Sum cations (meq/L)	11.2	11.8	11.0	17.2	6.97
Sum anions (meq/L)	10.4	11.6	11.1	17.9	7.77
Charge imbalance (percent)	7.38	2.24	-1.01	-3.72	-11.0

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-1	P-1	P-1	P-1
Sample Date	9/11/01	11/27/01	2/14/02	5/15/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,806	7,798	7,796	7,798
Field Temperature (^{o}C)	14.4	5.2	8.3	19.4
pH, field, [lab]	4.77	4.59	4.58	4.4
Eh (V)	0.296	0.305	0.202	0.259
Spec Cond (µS/cm) field, [lab]	1,083	1,620	1,840	1,850
TDS (mg/L)	850	1,400	1,600	1,800
Constituent, dissolved (mg/L)				
Ca	110	190	200	210
Mg	54	100	110	110
Ba	<0.01	<0.01	0.021	0.02
Na	13	18	22	22
K	2.9	4.6	4.7	4.5
SO_4	580	1,000	1,200	1,300
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	13	21	24	26
Cl	12	19	20	20
SiO_2	19.7	23.5	25.7	25.7
Al	15	29	33	35
Fe	<0.1	0.13	0.14	0.09
Mn	6.7	17	20	19
Cu	0.16	0.4	0.41	0.4
Zn	3.1	6.1	6.3	5.9
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.02	0.04	0.049	0.046
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	0.00055	0.015	0.009
Co	<0.01	0.02	0.032	0.035
Ni	0.35	0.65	0.73	0.71
Pb	<0.003	<0.006	<0.006	<0.006
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.01	0.02	0.026	0.024
V	<0.01	<0.01	<0.01	<0.01
Se	<0.005	0.0097	0.014	0.0078
As	<0.005	<0.005	0.011	0.0081
Sum cations (meq/L)	9.40	16.5	17.3	16.7
Sum anions (meq/L)	9.88	16.3	19.3	20.2
Charge imbalance (percent)	-5.04	1.52	-11.1	-19.2

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-2	P-2	P-2	P-2
Sample Date	11/7/97	5/11/98	6/10/98	2/8/00
Comments	---	---	---	---
Source ID (see table 2)	URS, MC DB	URS, MC DB	NMED	MMW wkst, RGC 8/10, MC DB
Lab ID	---	---	ACZ RG 70724	Paragon Analytics
Aquifer	Well completed in sand and gravel			
Depth to Water (m)	---	---	4.1	6.3
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	8.9	(8)	7.8	6.2
pH, field, [lab]	4.93	(5)	5.22	4.86
Eh (V)	(0.3)	(0.3)	(0.3)	(0.3)
Spec Cond (µS/cm) field, [lab]	1,030	---	880	1,440
TDS (mg/L)	910	930	616, 680	1,200
Constituent, dissolved (mg/L)				
Ca	146	131	101	160
Mg	59	57.6	38.2	77
Ba	0.027	---	0.021	0.022
Na	15	13.2	11.3	17
K	2.4	2.3	1.9	2.8
SO_4	590	540	430	780
Alkalinity (as HCO_3)	4	4	2	5.6
F	12	11	7.7	19
Cl	12	13	10	14
SiO_2	22	---	---	19
Al	13.7	15.3	8.78	21
Fe	0.01	0.05	---	<0.1
Mn	7.82	8.33	4.13	13
Cu	0.23	0.21	0.11	0.27
Zn	2.44	2.39	1.93	3.2
Mo	<0.01	ND	---	<0.1
Cd	0.017	0.016	0.011	0.025
Ag	<0.005	---	---	<0.002
Cr	0.01	---	---	<0.01
Co	0.03	0.04	0.01	0.71
Ni	0.31	0.29	0.2	0.39
Pb	<0.04	---	---	<0.006
Hg	<0.0002	---	---	<0.0002
Be	0.01	---	0.005	0.008
V	<0.005	---	---	<0.01
Se	<0.002	---	0.001	0.012
As	<0.001	---	---	0.0054
Sum cations (meq/L)	11.4	10.9	7.88	13.4
Sum anions (meq/L)	9.94	9.18	7.63	13.1
Charge imbalance (percent)	13.6	17.5	3.20	2.62

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-2	P-2	P-2	P-2
Sample Date	6/5/01	9/11/01	11/27/01	2/14/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,810	7,806	7,798	7,797
Field Temperature (^{o}C)	9.7	19.3	6.1	9.6
pH, field, [lab]	5.04	4.88	4.64	4.62
Eh (V)	0.216	0.320	0.333	0.283
Spec Cond (µS/cm) field, [lab]	1,290	1,190	1,450	1,600
TDS (mg/L)	1,000	960	1,200	1,400
Constituent, dissolved (mg/L)				
Ca	150	130	160	170
Mg	68	61	84	94
Ba	0.032	0.04	0.021	0.018
Na	16	16	16	20
K	3.2	3.1	4.3	4
SO_4	730	660	850	980
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	12	12	17	22
Cl	25	14	15	17
SiO_2	24	21	21	21
Al	16	14	26	32
Fe	0.47	<0.1	<0.1	0.062
Mn	7.6	7.7	15	19
Cu	0.23	0.25	0.41	0.47
Zn	2.9	3.2	4.3	4.1
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.019	0.019	0.03	0.031
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.0033	0.0056
Co	0.035	0.039	0.054	0.08
Ni	0.33	0.32	0.48	0.48
Pb	<0.003	<0.003	<0.006	<0.006
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.008	0.006	0.012	0.012
V	<0.01	<0.01	<0.01	<0.01
Se	0.0056	<0.005	0.0072	0.0068
As	<0.005	<0.005	0.003	0.0054
Sum cations (meq/L)	12.0	10.4	14.3	15.4
Sum anions (meq/L)	12.5	10.9	13.9	15.8
Charge imbalance (percent)	-4.05	-4.90	2.21	-2.65

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-3	P-3	P-3	P-3
Sample Date	11/7/97	6/10/98	2/8/00	6/5/01
Comments	---	---	---	---
Source ID (see table 2)	URS, MC DB	NMED	MMW wkst, RGC 8/10	MC CD
Lab ID	---	ACZ RG70645	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel			
Depth to Water (m)	---	8.5	10.6	---
Water Elevation (ft)	---	---	---	7,816
Field Temperature (^{o}C)	(3)	6.7	8.3	8.7
pH, field, [lab]	4.88	5.55	4.96	5.64
Eh (V)	(0.2)	(0.2)	(0.2)	0.131
Spec Cond (µS/cm) field, [lab]	800	843	1,440	707
TDS (mg/L)	690	389, 450	1,200	510
Constituent, dissolved (mg/L)				
Ca	101	67.3	170	73
Mg	43.2	25.1	76	33
Ba	0.046	0.023	0.041	0.015
Na	11.3	9.2	18	<10
K	2.1	1.5	3.7	2.3
SO_4	430	260	790	370
Alkalinity (as HCO_3)	9	6	9.3	<5
F	10	7.1	10	9.1
Cl	9	6	14	9
SiO_2	19.4	---	21.4	16
Al	6.42	6.04	16	8.5
Fe	0.01	---	<0.1	0.11
Mn	1.93	1.58	7.8	3.3
Cu	0.04	0.04	0.17	0.08
Zn	1.61	1.3	4.2	1.9
Mo	<0.05	---	<0.1	<0.1
Cd	0.012	0.009	0.032	0.013
Ag	<0.005	---	<0.002	<0.002
Cr	0.01	---	<0.01	<0.01
Co	<0.01	---	<0.01	<0.01
Ni	0.16	0.17	0.51	0.21
Pb	<0.04	---	<0.003	<0.003
Hg	<0.0002	---	---	<0.0002
Be	0.01	0.006	0.016	0.0088
V	<0.005	---	0.01	<0.01
Se	0.001	---	0.0065	<0.005
As	<0.001	---	<0.005	<0.005
Sum cations (meq/L)	7.96	5.47	13.4	5.86
Sum anions (meq/L)	7.84	4.89	13.1	6.75
Charge imbalance (percent)	1.47	11.3	2.37	-14.1

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-3	P-3	P-3	P-3
Sample Date	9/11/01	11/27/01	2/14/02	5/14/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,812	7,805	7,804	7,807
Field Temperature (^{o}C)	12.1	2.4	7.2	12.3
pH, field, [lab]	4.9	4.92	4.75	4.74
Eh (V)	0.312	0.281	0.290	0.390
Spec Cond (µS/cm) field, [lab]	821	1,250	1,520	1,360
TDS (mg/L)	630	980	1,200	1,200
Constituent, dissolved (mg/L)				
Ca	85	150	170	150
Mg	41	70	90	79
Ba	0.018	0.026	0.028	0.025
Na	11	13	19	14
K	2.5	3.7	4	3.8
SO_4	430	680	920	800
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	10	13	21	17
Cl	10	14	16	13
SiO_2	18	19	24	20
Al	10	15	24	18
Fe	<0.1	<0.1	<0.1	<0.1
Mn	4.3	6.7	13	8.9
Cu	0.1	0.18	0.3	0.23
Zn	2.2	3.4	4.6	4.5
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.016	0.024	0.035	0.03
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	0.0011	0.0015	0.0017
Co	<0.01	0.0055	0.02	0.0084
Ni	0.25	0.39	0.55	0.49
Pb	<0.003	<0.003	<0.006	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.0094	0.013	0.018	0.016
V	<0.01	<0.01	<0.01	<0.01
Se	<0.005	0.0057	0.0063	0.0055
As	<0.005	0.0026	0.0044	0.0029
Sum cations (meq/L)	7.38	12.3	14.6	12.4
Sum anions (meq/L)	7.62	11.6	15.2	13.2
Charge imbalance (percent)	-3.25	6.00	-3.78	-5.61

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-4A	P-4B	P-4B	P-4B
Sample Date	6/10/98	11/7/97	5/11/98	6/10/98
Comments	---	---	---	---
Source ID (see table 2)	NMED	URS, MC DB	URS, MC DB	NMED
Lab ID	ACZ RG70646	---	---	ACZ RG 70647
Aquifer	Sand and gravel	Well completed in sand and gravel		
Depth to Water (m)	6.4	---	---	6.4
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	6.4, 7.9	8.2	(9)	9.0
pH, field, [lab]	5.47	4.6	(5)	4.78
Eh (V)	(0.2)	(0.3)	(0.3)	(0.2)
Spec Cond (µS/cm) field, [lab]	883	1,390	---	1,610
TDS (mg/L)	571, 660	1,320	1,290	1250, 1340
Constituent, dissolved (mg/L)				
Ca	106	201	183	195
Mg	40.3	81	79.6	81.3
Ba	---	0.014	---	0.014
Na	11.4	19.7	17.9	20.3
K	1.8	3.1	2.8	2.9
SO_4	380	860	850	870
Alkalinity (as HCO_3)	4	4	3	2
F	7.4	17	16	20
Cl	11	16	17	16
SiO_2	---	25.5	---	---
Al	6.39	24.9	24.7	25.8
Fe	---	<0.01	0.06	---
Mn	2.8	13.7	12.7	12.6
Cu	0.07	0.41	0.37	0.37
Zn	1.23	4.18	4.1	4.54
Mo	---	<0.01	ND	---
Cd	0.007	0.034	0.032	0.035
Ag	---	<0.005	---	---
Cr	---	0.01	---	---
Co	0.01	0.08	0.09	0.07
Ni	0.14	0.5	0.53	0.58
Pb	---	<0.04	---	---
Hg	---	<0.0002	---	---
Be	0.003	0.01	---	0.011
V	---	<0.005	---	---
Se	---	0.002	---	0.002
As	---	<0.001	---	---
Sum cations (meq/L)	8.12	15.6	14.6	15.3
Sum anions (meq/L)	6.79	13.8	13.8	14.1
Charge imbalance (percent)	17.8	12.0	5.84	8.46

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-4B	P-4B	P-4B	P-4B	P-4B
Sample Date	2/8/00	6/5/01	11/26/01	2/14/02	5/15/02
Comments	---	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel				
Depth to Water (m)	8.5	---	---	---	---
Water Elevation (ft)	---	7,815	7,803	7,802	7,804
Field Temperature (^{o}C)	7.7	9.9	8.4	8.7	13.8
pH, field, [lab]	4.59	4.64	4.55	4.79	4.42
Eh (V)	(0.2)	0.226	0.321	0.286	0.385
Spec Cond (µS/cm) field, [lab]	1,910	1,860	1,880	1,890	1,960
TDS (mg/L)	1,900	1,700	1,700	1,700	1,800
Constituent, dissolved (mg/L)					
Ca	220	210	210	210	220
Mg	110	110	120	120	120
Ba	0.015	0.011	0.013	0.026	0.013
Na	25	22	21	24	24
K	4.4	4.4	4.8	4.6	4.6
SO_4	1,100	1,200	1,200	1,200	1,400
Alkalinity (as HCO_3)	9.5	<5	<5	5.1	<5
F	23	24	25	27	26
Cl	19	18	21	20	21
SiO_2	23.5	24	24	26	26
Al	36	41	41	40	44
Fe	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	21	24	24	25	24
Cu	0.5	0.6	0.59	0.58	0.6
Zn	5.3	5	6	5.6	5.3
Mo	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.043	0.039	0.044	0.042	0.042
Ag	<0.002	<0.002	<0.002	<0.002	0.002
Cr	<0.01	<0.01	0.0081	0.001	0.0039
Co	0.13	0.15	0.14	0.14	0.14
Ni	0.63	0.59	0.65	0.64	0.63
Pb	<0.009	<0.009	<0.009	<0.009	<0.009
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.015	0.014	0.017	0.016	0.017
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.015	0.0081	0.011	0.011	0.0099
As	0.0069	<0.005	0.0047	0.0055	0.0036
Sum cations (meq/L)	18.8	18.3	19.0	19.0	18.7
Sum anions (meq/L)	17.4	18.8	18.8	19.0	21.7
Charge imbalance (percent)	7.85	-2.75	0.99	0.22	-15.2

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-5A	P-5A	P-5B	P-5B	P-5B
Sample Date	6/10/98	8/27/01	11/7/97	5/11/98	6/10/98
Comments	---	---	---	---	---
Source ID (see table 2)	NMED	MC CD	URS, MC DB	URS, MC DB	NMED
Lab ID	ACZ RG 70648	Paragon Analytics	---	---	ACZ RG70649
Aquifer	Sand and gravel		Well completed in sand and gravel		
Depth to Water (m)	5.4	---	---	---	5.9
Water Elevation (ft)	---	7,821	---	---	---
Field Temperature (^{o}C)	8.9 [7.4]	13.3	8.2	(10)	8.9
pH, field, [lab]	5.9 [5.46]	4.79	4.44	(4.5)	4.65
Eh (V)	(0.2)	0.329	(0.3)	(0.3)	(0.3)
Spec Cond (µS/cm) field, [lab]	888	1,380	1,450	---	1,560
TDS (mg/L)	623, 760	1,200	1,400	1,370	1230, 1470
Constituent, dissolved (mg/L)					
Ca	102	150	183	181	172
Mg	38.8	77	90	84.4	77.4
Ba	0.03	0.025	0.014	---	0.012
Na	11.3	17	19.6	17.9	18.5
K	1.9	3.5	3.2	2.8	2.7
SO_4	430	850	900	920	870
Alkalinity (as HCO_3)	3	<5	2	ND	2
F	11	17	18	16	18
Cl	10	15	17	16	16
SiO_2	---	21	26.1	---	---
Al	9.66	29	32.7	31.7	31.3
Fe	---	0.39	<0.01	0.08	---
Mn	4.47	14	18.7	16.2	16.4
Cu	0.12	0.39	0.5	0.43	0.4
Zn	1.66	3.4	3.86	3.33	3.46
Mo	---	<0.1	<0.01	ND	---
Cd	0.011	0.025	0.031	0.025	0.026
Ag	---	<0.002	<0.005	---	---
Cr	---	0.018	<0.01	---	---
Co	0.02	0.089	0.15	0.14	0.14
Ni	0.18	0.43	0.4	0.4	0.37
Pb	---	<0.006	<0.04	---	---
Hg	---	<0.0002	<0.0002	---	---
Be	0.004	0.01	0.01	---	0.008
V	---	<0.01	<0.005	---	---
Se	0.001	0.0073	<0.002	---	0.001
As	---	0.0053	<0.001	---	---
Sum cations (meq/L)	7.90	13.2	16.1	15.2	14.6
Sum anions (meq/L)	7.66	13.7	14.3	14.6	14.1
Charge imbalance (percent)	3.10	-3.55	11.7	4.45	3.57

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-5B	P-5B	P-5B	P-5B	P-5B	P-5B
Sample Date	2/7/00	6/5/01	8/27/01	11/26/01	2/7/02	5/14/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, URS, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel					
Depth to Water (m)	7.5	---	---	---	---	---
Water Elevation (ft)	---	7,820	7,818	7,813	7,812	7,815
Field Temperature (^{o}C)	8.8	10.3	19.9	7.9	10.5	13
pH, field, [lab]	4.49	4.87	4.65	4.46	4.46	4.39
Eh (V)	(0.3)	0.257	0.354	0.329	0.330	0.387
Spec Cond (µS/cm) field, [lab]	2,090	1,720	1,840	1,950	1,980	2,000
TDS (mg/L)	2,000	1,400	1,800	1,800	1,900	1,900
Constituent, dissolved (mg/L)						
Ca	230	220	240	220	230	210
Mg	120	94	110	120	130	130
Ba	0.015	0.026	0.027	0.013	0.013	0.014
Na	26	20	22	22	28	22
K	4.5	4.3	4.8	4.6	4.8	4.9
SO_4	1,300	990	1,200	1,300	1,400	1,400
Alkalinity (as HCO_3)	7.2	<5	5.1	<5	<5	<5
F	24	23	25	24	28	26
Cl	21	16	19	23	22	20
SiO_2	23.5	26	26	24	26	24
Al	46	26	32	49	51	47
Fe	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	26	16	17	27	27	27
Cu	0.62	0.69	0.9	0.67	0.68	0.66
Zn	4.6	4.9	6	5.2	5.4	5.5
Mo	<0.1	<0.1	<0.1	<0.1	0.035	<0.1
Cd	0.038	0.045	0.055	0.037	0.039	0.039
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.0022	0.0069	0.0075
Co	0.2	0.015	0.018	0.21	0.22	0.21
Ni	0.56	0.75	0.95	0.56	0.59	0.59
Pb	<0.009	<0.006	0.0074	<0.009	<0.009	0.0056
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.011	0.015	0.019	0.011	0.012	0.012
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.021	<0.005	0.01	0.014	0.013	0.019
As	0.0059	<0.005	0.0079	0.006	0.0071	0.0027
Sum cations (meq/L)	20.1	16.8	17.9	19.8	20.7	19.2
Sum anions (meq/L)	20.2	15.7	18.3	20.2	21.5	21.6
Charge imbalance (percent)	-0.81	6.79	-2.03	-1.90	-3.91	-11.5

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-5C	P-5C	P-5C	P-5C	P-5C
Sample Date	11/7/97	5/11/98	6/10/98	2/7/00	6/5/01
Comments	---	---	---	---	---
Source ID (see table 2)	URS, MC DB	URS, MC DB	NMED	MMW wkst, RGC 8/10, MCDB	MC CD
Lab ID	---	---	ACZ RG 70650	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in quartz monzonite bedrock				
Depth to Water (m)	---	---	6.4	8	---
Water Elevation (ft)	---	---	---	---	7,824
Field Temperature (^{o}C)	8.6	(10)	9.7	8.6	10.3
pH, field, [lab]	4.69	(5)	4.92	4.63	4.57
Eh (V)	(0.3)	(0.3)	(0.3)	(0.3)	0.242
Spec Cond (µS/cm) field, [lab]	1,530	---	1,730	2,040	1,730
TDS (mg/L)	1,510	1,320	1390, 1540	1,900	1,500
Constituent, dissolved (mg/L)					
Ca	213	210	229	250	180
Mg	94	85	82.4	120	100
Ba	0.029	---	0.027	0.029	0.012
Na	23	19.5	21.2	26	21
K	3.3	3.1	3	4.7	4
SO_4	910	940	990	1,200	1,100
Alkalinity (as HCO_3)	5	6	4	6.9	<5
F	24	20	14	28	22
Cl	17	17	17	20	16
SiO_2	26.8	---	---	25.7	24
Al	24.2	22.2	20	33	41
Fe	<0.01	0.06	---	<0.1	<0.1
Mn	12.8	12.2	10.2	21	24
Cu	0.6	0.59	0.53	0.85	0.57
Zn	5.29	4.8	4.49	6.2	4.1
Mo	<0.01	ND	---	<0.1	<0.1
Cd	0.044	0.044	0.04	0.056	0.032
Ag	<0.005	---	---	<0.002	<0.002
Cr	0.01	---	---	<0.01	<0.01
Co	0.01	0.01	---	0.031	0.18
Ni	0.76	0.75	0.76	0.83	0.47
Pb	<0.04	---	---	0.015	<0.009
Hg	<0.0002	---	---	<0.0002	<0.0002
Be	0.01	---	0.011	0.019	0.01
V	<0.005	---	---	<0.01	<0.01
Se	0.002	---	0.003	0.014	0.0061
As	<0.001	---	---	0.011	<0.005
Sum cations (meq/L)	16.7	15.5	16.0	20.1	16.7
Sum anions (meq/L)	14.7	15.2	15.9	18.9	17.3
Charge imbalance (percent)	13.2	2.02	0.60	6.04	-3.92

Table 6. Selected historical ground water quality analyses

Columbine Park Cabin Area

Well ID	P-5C	P-5C	P-5C	P-5C
Sample Date	8/27/01	11/26/01	2/7/02	5/14/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in quartz monzonite bedrock			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,819	7,811	7,810	7,813
Field Temperature (^{o}C)	18.6	7.7	8.4	11.6
pH, field, [lab]	4.57	4.95	4.69	4.55
Eh (V)	0.348	0.319	0.316	0.372
Spec Cond (µS/cm) field, [lab]	1620	1,880	1,820	1,850
TDS (mg/L)	1,500	1,700	1,600	1,800
Constituent, dissolved (mg/L)				
Ca	180	240	230	230
Mg	96	110	110	120
Ba	0.048	0.028	0.025	0.026
Na	20	22	27	21
K	3.8	4.9	5	5.1
SO_4	1,000	1,200	1,200	1,200
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	19	25	28	27
Cl	16	20	18	19
SiO_2	24	26	28	26
Al	34	32	32	31
Fe	<0.1	<0.1	<0.1	<0.1
Mn	21	20	19	20
Cu	0.65	0.9	0.85	0.87
Zn	4.4	6.2	6.2	6.6
Mo	<0.1	0.039	<0.01	<0.1
Cd	0.032	0.053	0.052	0.054
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	0.0054	0.0056	0.0085
Co	0.17	0.023	0.024	0.026
Ni	0.49	0.86	0.85	0.86
Pb	<0.009	0.01	0.0082	0.014
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.0084	0.018	0.019	0.019
V	<0.01	<0.01	<0.01	<0.01
Se	0.0091	0.011	0.012	0.014
As	<0.005	0.011	0.0079	0.0069
Sum cations (meq/L)	15.7	18.8	18.5	18.7
Sum anions (meq/L)	15.3	19.0	19.1	18.8
Charge imbalance (percent)	2.06	-1.14	-3.27	-0.40

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-10A	MMW-10A	MMW-10A	MMW-10A	MMW-10A	MMW-10A	MMW-10A
Sample Date	11/8/94	11/19/94	8/1/96	6/25/97	11/7/97	5/11/98	6/11/98
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	SPRI 1995	MC DB	MMW wkst	NMED, MC DB	URS, MC DB	URS, MC DB	NMED, MC DB
Lab ID	ETC	ETC	---	ACZ RG 46917	---	---	ACZ RG 70725
Aquifer	Well completed in alluvial gravel/sand overlying quartz monzonite bedrock						
Depth to Water (m)	6.6	---	---	---	---	---	9.5
Water Elevation (ft)	---	---	---	7,915	---	---	---
Field Temperature (^{o}C)	7.8	(8)	(10)	(10)	9.3	(10)	9.4
pH, field, [lab]	5.8	(6)	4.42	(4.5)	4.44	(5)	4.59
Eh (V)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)
Spec Cond (µS/cm) field, [lab]	2,400	---	1,902	(1600)	1,640	---	2,550
TDS (mg/L)	1,700	1,700	---	1580, 1030	1,630	1,760	1330, 1500
Constituent, dissolved (mg/L)							
Ca	270	245	300	280	246	256	225
Mg	76.7	69.7	78	80.1	75.8	89	65.8
Ba	<0.01	---	<0.01	0.005	0.01	---	0.007
Na	26.4	25.6	33	30.5	25.3	29.7	24
K	2.5	3.7	3.6	3	2.6	3.1	2.7
SO_4	1,100	1,200	1,200	1,090	1,020	1,090	940
Alkalinity (as HCO_3)	<1	ND	---	<2	<2	ND	<2
F	7.96	8.28	---	14	14	14	14
Cl	26	26	24	6	21	22	18
SiO_2	30	---	30	67	30	---	31
Al	34.2	31.6	35	31.3	31.6	39.1	28.1
Fe	<0.05	0.086	0.097	0.01	0.01	0.11	<0.01
Mn	12.8	13.1	9.06	14	12.4	13.7	11.6
Cu	0.58	0.534	0.446	0.63	0.49	0.62	0.47
Zn	2.07	2.68	2.8	2.57	2.28	2.29	1.97
Mo	<0.02	ND	<0.02	<0.01	<0.01	<0.01	<0.01
Cd	0.024	0.0224	0.0041	0.027	0.025	0.027	0.019
Ag	<0.1	---	<0.01	<0.0003	<0.005	---	<0.0005
Cr	<0.01	---	<0.01	<0.01	<0.01	---	<0.01
Co	0.137	0.141	0.15	0.15	0.49	0.16	0.12
Ni	0.293	0.279	0.32	0.34	0.28	0.34	0.27
Pb	0.004	---	---	0.001	<0.04	---	0.003
Hg	<0.0002	---	<0.0002	<0.0002	<0.0002	---	<0.0002
Be	0.008	---	0.008	0.008	<0.01	---	0.006
V	<0.01	---	<0.01	<0.005	<0.005	---	<0.005
Se	<0.005	---	0.011	0.002	<0.002	---	0.003
As	<0.005	---	0.01	<0.005	<0.001	---	<0.001
Sum cations (meq/L)	18.2	16.1	19.2	18.8	17.2	18.9	15.6
Sum anions (meq/L)	17.2	19.5	17.6	16.3	16.0	16.6	15.0
Charge imbalance (percent)	5.64	-18.8	8.84	14.3	7.38	13.2	3.93

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-10A	MMW-10A	MMW-10A	MMW-10A	MMW-10A	MMW-10A
Sample Date	2/3/00	6/5/01	7/17/01	12/1/01	2/1/02	4/25/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in alluvial gravel/sand overlying quartz monzonite bedrock					
Depth to Water (m)	8.3	---	---	---	---	---
Water Elevation (ft)	---	7,916	7,917	7,913	7,910	7,911
Field Temperature (^{o}C)	8.5	10	9.9	9.2	3.9	9.5
pH, field, [lab]	4.31	4.72	4.45	4.19	4.24	4.16
Eh (V)	(0.3)	0.235	0.245	0.410	0.295	0.378
Spec Cond (µS/cm) field, [lab]	2,710	1,300	218	2,280	2,360	2,350
TDS (mg/L)	2,800	1,100	2,200	2,200	2,200	2,200
Constituent, dissolved (mg/L)						
Ca	430	180	330	330	330	370
Mg	130	53	110	110	110	130
Ba	<0.01	<0.01	<0.01	0.005	0.0072	0.0065
Na	34	18	28	29	30	29
K	0.48	3	4.3	4.5	4.5	5.3
SO_4	1,800	780	1,500	1,500	1,500	1,600
Alkalinity (as HCO_3)	6.7	<5	<5	<5	<5	<5
F	26	11	24	25	24	25
Cl	24	15	26	27	26	27
SiO_2	30	24	30	32	30	32
Al	64	21	52	52	53	57
Fe	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	24	8.4	20	24	24	24
Cu	0.88	0.33	0.76	0.76	0.79	0.81
Zn	4	1.4	3.4	3.7	3.6	4.1
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.044	0.016	0.037	0.037	0.038	0.043
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.002	0.011	0.013
Co	0.23	0.077	0.19	0.2	0.2	0.23
Ni	0.56	0.19	0.46	0.47	0.49	0.54
Pb	<0.009	<0.003	<0.009	<0.009	<0.009	<0.009
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.013	0.0052	0.01	0.0099	0.0098	0.011
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.015	<0.005	0.011	0.014	0.016	0.012
As	0.011	<0.005	0.0077	0.0053	0.0082	0.011
Sum cations (meq/L)	28.3	12.5	22.9	23.1	23.7	26.0
Sum anions (meq/L)	26.0	12.8	22.5	22.6	22.9	23.4
Charge imbalance (percent)	8.30	-2.54	1.41	2.16	3.07	10.8

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-10B	MMW-10B	MMW-10B	MMW-10B	MMW-10B	MMW-10B
Sample Date	11/7/94	8/1/96	6/25/97	11/7/97	5/11/98	6/11/98
Comments		no alkalinity value		---	---	---
Source ID (see table 2)	SPRI 1995, SRK 1995, MMW wkst, MC DB	MMW wkst	NMED, MC DB	URS, MC DB	MC DB	NMED, MC DB
Lab ID	ETC	---	ACZ RG 46918	---	---	ACZ RG 70726
Aquifer	Well completed in quartz monzonite bedrock, but well seal in the alluvium					
Depth to Water (m)	6.6	---	---	---	---	9.5
Water Elevation (ft)	---	---	7,915	---	---	---
Field Temperature (^{o}C)	10.1	(10)	(10)	9.5	(10)	(10)
pH, field, [lab]	7.9	5.28	(6)	5.36	(6)	(6)
Eh (V)	(0.2)	(0.3)	(0.2)	(0.3)	(0.2)	(0.2)
Spec Cond (µS/cm) field, [lab]	2,250	1,910	-2,000	1,740	---	2,640
TDS (mg/L)	1,800	---	1640, 1690	1,740	1,720	1580, 1690
Constituent, dissolved (mg/L)						
Ca	347	340	328	307	292	312
Mg	80.3	77.3	82.5	81.4	87.1	75.9
Ba	0.034	0.02	0.016	0.018	---	0.016
Na	25.8	32	30	27	29.5	26.4
K	3.5	4.3	4	3.2	3.7	3.3
SO_4	1,100	1,100	1,090	1,070	1,060	1,090
Alkalinity (as HCO_3)	76	---	8	7	14	10
F	12.2	---	14	15	14	15
Cl	28	26	26	26	26	25
SiO_2	27.4	30	74	33	---	31
Al	8.74	13	14.6	14.7	14.5	12.4
Fe	0.101	0.081	0.17	0.1	0.12	0.03
Mn	8.55	4.85	9.44	9.01	8.86	9.04
Cu	0.179	0.406	0.61	0.51	0.5	0.4
Zn	1.5	1.911	2.29	1.98	1.86	1.75
Mo	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01
Cd	0.025	0.0018	0.05	0.052	0.042	0.041
Ag	<0.1	<0.01	<0.0003	<0.005	---	<0.0005
Cr	<0.01	<0.01	<0.01	<0.01	---	<0.01
Co	0.074	0.1	0.11	0.1	0.11	0.09
Ni	0.201	0.24	0.26	0.23	0.25	0.21
Pb	0.021	---	0.048	0.05	---	0.031
Hg	<0.0002	<0.0002	<0.0002	<0.0002	---	<0.0002
Be	0.007	0.01	0.01	0.01	---	0.007
V	<0.01	<0.01	<0.005	<0.005	---	<0.03
Se	<0.005	<0.005	0.001	<0.002	---	<0.001
As	<0.005	0.011	<0.005	<0.001	---	<0.001
Sum cations (meq/L)	18.9	19.6	19.5	18.5	18.4	17.9
Sum anions (meq/L)	18.9	16.7	17.2	17.0	17.0	17.4
Charge imbalance (percent)	0.36	15.8	12.6	7.95	7.69	2.65

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-10B	MMW-10B	MMW-10B	MMW-10B	MMW-10B	MMW-10B
Sample Date	2/3/00	6/5/01	7/18/01	12/1/01	2/1/02	4/25/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in quartz monzonite bedrock, but well seal in the alluvium					
Depth to Water (m)	8.8	---	---	---	---	---
Water Elevation (ft)	---	7,914	7,917	7,912	7,910	7,910
Field Temperature (^{o}C)	8.7	10.1	13.7	7.8	(8)	11
pH, field, [lab]	5.3	5.63	5.8	5.86	(6)	5.86
Eh (V)	(0.2)	0.256	0.223	0.243	0.227	0.258
Spec Cond (µS/cm) field, [lab]	2,230	2,410	2,360	2,680	-2,700	2,700
TDS (mg/L)	2,100	2,300	2,400	2,600	2,500	2,600
Constituent, dissolved (mg/L)						
Ca	400	470	440	490	530	550
Mg	99	120	120	120	130	150
Ba	0.018	0.02	0.021	0.022	0.023	0.022
Na	33	31	31	32	34	34
K	5.3	5.4	5.5	5.6	6.2	6.8
SO_4	1,300	1,600	1,600	1,800	1,700	1,800
Alkalinity (as HCO_3)	9.3	11	25	44	52	47
F	19	21	22	19	18	20
Cl	24	26	23	26	25	26
SiO_2	32	32	28	24	24	24
Al	21	23	18	12	10	12
Fe	<0.1	0.13	<0.1	0.14	<0.1	0.12
Mn	13	16	15	18	18	18
Cu	0.76	0.56	0.46	0.22	0.19	0.22
Zn	2.6	2.6	2.8	2.8	2.9	3.2
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.056	0.039	0.032	0.025	0.028	0.03
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	<0.0011	0.00097	<0.01
Co	0.14	0.15	0.16	0.16	0.16	0.18
Ni	0.34	0.36	0.39	0.37	0.38	0.42
Pb	0.084	0.083	0.13	0.15	0.12	0.13
Hg	---	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.013	0.013	0.012	0.011	0.011	0.012
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.011	<0.005	0.0098	0.0099	0.013	0.01
As	0.012	0.0099	0.017	0.02	0.023	0.019
Sum cations (meq/L)	23.5	26.5	24.4	25.8	28.5	30.0
Sum anions (meq/L)	19.8	23.8	24.0	27.8	25.7	26.5
Charge imbalance (percent)	17.1	10.8	1.82	-7.37	10.2	12.5

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-10C	MMW-10C	MMW-10C	MMW-10C	MMW-10C
Sample Date	11/8/94	6/25/97	11/7/97	5/11/98	6/11/98
Comments	---	---	---	---	---
Source ID (see table 2)	SPRI 1995, SRK 1995, MC DB	NMED, MC DB	URS, MC DB	URS, MC DB	NMED, MC DB
Lab ID	ETC	ACZ RG46919	---	---	ACZ RG70727
Aquifer	Well completed in mudflow				
Depth to Water (m)	6.6	---	---	---	9.5
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	11.8	(10)	9	(9)	(10)
pH, field, [lab]	4.7	(5)	4.75	(4.8)	(5)
Eh (V)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)
Spec Cond (µS/cm) field, [lab]	2,000	-1,200	888	---	1,080
TDS (mg/L)	1,400	710, 760	780	850	455, 500
Constituent, dissolved (mg/L)					
Ca	204	128	117	124	76
Mg	75.2	41.2	40.6	52.1	22.9
Ba	0.014	0.008	0.016	---	0.007
Na	20.2	15	13.3	14.8	9.5
K	2.8	<8	2	2.2	1.5
SO_4	880	470	460	570	320
Alkalinity (as HCO_3)	<1	2	4	4	10
F	15.4	8	10	10	5.9
Cl	20	10	9	14	8
SiO_2	21	37	17	---	14
Al	31.1	12.2	13.6	16.2	6.87
Fe	<0.05	<0.01	0.02	0.01	<0.01
Mn	16.3	5.63	5.51	7.5	2.35
Cu	0.38	<0.3	0.16	0.2	0.09
Zn	3.2	1.57	1.42	1.56	0.74
Mo	<0.02	<0.01	<0.01	<0.01	<0.01
Cd	0.026	0.012	0.013	0.011	0.005
Ag	<0.1	<0.0005	<0.03	---	<0.0005
Cr	<0.01	<0.01	<0.01	---	<0.01
Co	0.106	0.03	0.04	0.05	0.01
Ni	0.0347	0.15	0.14	0.18	0.06
Pb	<0.002	<0.001	<0.04	---	<0.001
Hg	<0.0002	<0.0002	<0.0002	---	<0.0002
Be	0.007	0.004	0.01	---	0.002
V	<0.01	<0.005	<0.005	---	<0.005
Se	<0.005	<0.001	<0.002	---	<0.001
As	<0.005	<0.005	<0.001	---	<0.001
Sum cations (meq/L)	15.6	9.52	9.11	10.2	5.67
Sum anions (meq/L)	13.8	7.99	7.94	9.76	6.02
Charge imbalance (percent)	12.2	17.4	13.7	4.72	-5.97

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-10C	MMW-10C	MMW-10C	MMW-10C	MMW-10C	MMW-10C
Sample Date	2/3/00	6/5/01	7/18/01	12/1/01	2/1/02	4/25/02
Comments	* Alkalinity entered as 5 into WATEQ4F				---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in mudflow					
Depth to Water (m)	8.3	---	---	---	---	---
Water Elevation (ft)	---	7,911	7,917	7,910	7,910	7,910
Field Temperature (^{o}C)	8	9.3	17.8	9.0	6.6	14.2
pH, field, [lab]	4.81	4.91	4.72	4.66	4.8	4.77
Eh (V)	(0.3)	0.256	0.281	0.350	0.252	0.314
Spec Cond (µS/cm) field, [lab]	1,190	1,240	1,180	1,260	1,100	1,080
TDS (mg/L)	990	1,000	1,000	1,000	860	840
Constituent, dissolved (mg/L)						
Ca	130	160	150	140	130	120
Mg	54	67	69	65	57	50
Ba	0.011	0.011	<0.01	0.012	<0.01	0.0093
Na	15	16	17	17	17	15
K	2.8	3.1	3.3	3.1	3.2	2.7
SO_4	620	730	690	690	600	600
Alkalinity (as HCO_3)	8	<5 *	5.1	<5	<5 *	5.4
F	13	14	15	15	12	11
Cl	13	14	13	15	13	13
SiO_2	18	18	18	19	19	17
Al	19	20	21	21	17	16
Fe	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	9.8	11	11	11	8.7	7.8
Cu	0.24	0.27	0.28	0.28	0.22	0.21
Zn	2.2	2.4	2.7	2.5	2.2	1.8
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.018	0.021	0.023	0.02	0.018	0.016
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.0023	0.001	<0.01
Co	0.066	0.069	0.078	0.067	0.053	0.051
Ni	0.23	0.24	0.26	0.24	0.2	0.19
Pb	<0.006	<0.006	<0.006	<0.006	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0003	<0.0004	<0.0002	<0.0002
Be	0.0051	0.0049	0.0053	0.0047	0.0043	0.0038
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.0095	<0.005	0.008	0.012	0.0086	0.0055
As	<0.005	<0.005	<0.005	0.003	<0.005	<0.005
Sum cations (meq/L)	10.8	12.7	12.4	12.0	11.0	9.69
Sum anions (meq/L)	10.6	12.0	11.1	11.6	10.3	10.2
Charge imbalance (percent)	1.21	5.37	10.5	2.90	6.90	-5.58

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-11	MMW-11	MMW-11	MMW-11	MMW-11	MMW-11
Sample Date	11/7/94	8/1/96	6/25/97	11/7/97	5/11/98	6/9/98
Comments	---	no alkalinity value	---	---	---	---
Source ID (see table 2)	NMED, Slifer 1996	MMW wkst	NMED, URS 2001, MC DB	URS 2001, MC DB	MC DB, URS 2001	MMW wkst, MC DB, URS
Lab ID	SLD IC 94-0639	---	ACZ RG46920	---	---	ACZ RG70644
Aquifer	Well completed in quartz bedrock but water level response indicates alluvial well					
Depth to Water (m)	27.3	---	---	---	---	30.0
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	(10)	(10)	(10)	10	(10)	10.4
pH, field, [lab]	5.6	4.22	(5)	4.14	(4)	4.19
Eh (V)	(0.2)	(0.3)	(0.2)	(0.3)	(0.3)	(0.2)
Spec Cond (µS/cm) field, [lab]	1,490	1,990	(1,500)	2200	---	2,600
TDS (mg/L)	-2,100	---	1900, 1970	2,420	3,030	2460, 2530
Constituent, dissolved (mg/L)						
Ca	260	250	251	282	307	277
Mg	110	117	129	149	203	149
Ba	<0.1	0.01	0.013	0.019	---	0.016
Na	(34)	31	27.4	29.1	35	28.7
K	(20)	4	4	3.5	4	3.5
SO_4	1267	1,300	1,320	1,560	2,090	1,690
Alkalinity (as HCO_3)	(156)	---	<2	<2	ND	<2
F	(21)	---	21	30	37	35
Cl	(36)	20	22	25	24	25
SiO_2	25.7	28	67	28	---	29
Al	54	51	56.8	77.4	109	81.2
Fe	<0.1	<0.05	<0.01	<0.02	ND	<0.01
Mn	28	13.4	29.9	33.4	42.8	35.4
Cu	0.8	0.69	0.98	1.12	1.54	1.14
Zn	4.6	8.79	5.49	6.2	8.74	6.75
Mo	<0.01	<0.02	<0.01	<0.02	ND	<0.01
Cd	<0.10	0.022	0.037	0.052	ND	0.05
Ag	<0.01	<0.01	<0.0005	77.4	---	<0.0005
Cr	<0.1	<0.01	<0.01	<0.02	---	<0.01
Co	0.25	0.22	0.28	0.31	0.47	0.32
Ni	0.6	0.51	0.67	0.7	1.03	0.75
Pb	<0.1	---	0.011	<0.08	---	0.011
Hg	<0.0005	<0.0002	<0.0002	<0.0002	---	<0.0002
Be	0.01	0.013	0.015	<0.02	---	0.016
V	<0.05	<0.01	<0.005	<0.01	---	<0.03
Se	<0.005	0.016	0.002	0.003	---	0.003
As	<0.01	0.006	<0.005	<0.001	---	<0.001
Sum cations (meq/L)	22.0	20.8	22.3	25.6	30.9	25.2
Sum anions (meq/L)	22.0	18.3	19.5	22.5	29.2	24.8
Charge imbalance (percent)	-0.32	12.6	13.5	12.9	5.66	1.47

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-11	MMW-11	MMW-11	MMW-11	MMW-11
Sample Date	2/3/00	6/22/01	10/27/01	2/6/02	4/30/02
Comments	---	---	---	---	---
Source ID (see table 2)	MMW wkst, URS, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in quartz bedrock but water level response indicates alluvial well				
Depth to Water (m)	28.8	---	---	---	---
Water Elevation (ft)	---	7,916	7,913	7,908	7,908
Field Temperature (^{o}C)	9.4	11.1	14.0	10.7	16.4
pH, field, [lab]	4.34	4.22	4.58	4.77	4.4
Eh (V)	(0.2)	0.245	0.344	0.303	0.350
Spec Cond (µS/cm) field, [lab]	2,990	2,490	2,800	2,670	2,640
TDS (mg/L)	3,200	2,700	2,800	2,600	2,500
Constituent, dissolved (mg/L)					
Ca	320	320	300	340	290
Mg	190	210	200	180	180
Ba	0.017	0.014	0.036	0.027	0.016
Na	34	32	32	37	32
K	5.3	5.4	5.5	7.1	6.1
SO_4	2,100	1,900	1,900	1,900	1,900
Alkalinity (as HCO_3)	15	<5	<5	6.2	5
F	41	36	36	33	36
Cl	29	30	29	27	27
SiO_2	30	28	28	26	28
Al	90	83	77	54	71
Fe	<0.1	0.13	<0.1	<0.1	0.024
Mn	49	47	43	39	43
Cu	1.4	1.3	1.2	0.88	1.1
Zn	8.6	9.4	7.7	6.6	7.2
Mo	<0.1	<0.1	0.025	0.037	<0.1
Cd	0.06	0.061	0.056	0.048	0.054
Ag	<0.002	<0.002	<0.002	0.0012	<0.002
Cr	<0.01	<0.01	0.0066	0.0032	0.0032
Co	0.42	0.39	0.38	0.31	0.35
Ni	1	0.97	0.89	0.76	0.85
Pb	<0.03	<0.015	<0.015	<0.015	0.011
Hg	---	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.02	0.018	0.015	0.011	0.014
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.29	0.019	0.023	0.028	0.025
As	0.012	0.0064	0.0062	0.010	0.0057
Sum cations (meq/L)	29.4	30.7	28.3	27.4	25.9
Sum anions (meq/L)	30.9	26.9	27.2	28.3	27.6
Charge imbalance (percent)	-5.11	13.2	4.12	-3.24	-6.26

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-11A	MMW-11A	MMW-11A	MMW-11A	MMW-11A	MMW-11A
Sample Date	1/12/00	6/22/01	9/10/01	10/27/01	2/6/02	4/30/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	RGC 8/10, MMW wkst, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in silty sand					
Depth to Water (m)	28.4	---	---	---	---	---
Water Elevation (ft)	---	7,914	7,912	7,911	---	7,907
Field Temperature (^{o}C)	9.4	10.8	20.3	14.9	9.7	16.3
pH, field, [lab]	4.31	4.3	4.09	4.15	4.26	4.19
Eh (V)	(0.3)	0.247	0.323	0.342	0.295	0.269
Spec Cond (µS/cm) field, [lab]	2950	2,470	2,590	2,730	2,570	2,600
TDS (mg/L)	3,200	2,700	2,900	2,700	2,600	2,500
Constituent, dissolved (mg/L)						
Ca	300	290	250	240	250	230
Mg	210	210	190	200	200	190
Ba	0.014	0.014	<0.01	0.011	<0.01	0.011
Na	38	32	31	31	36	31
K	5.7	5.5	5.2	5.4	5.5	6
SO_4	2,100	1,900	1,900	1,900	1,800	1,800
Alkalinity (as HCO_3)	<5	<5	<5	<5	<5	<5
F	46	37	38	43	41	38
Cl	29	26	29	28	26	25
SiO_2	30	30	28	28	32	30
Al	100	84	90	90	84	83
Fe	<0.1	<0.1	<0.1	<0.1	<0.1	0.32
Mn	52	48	47	45	44	45
Cu	1.5	1.3	1.3	1.3	1.3	1.3
Zn	9.7	9.8	8.4	8.4	8.399	8.1
Mo	<0.1	<0.1	<0.1	<0.1	0.033	<0.1
Cd	0.066	0.061	0.058	0.057	0.055	0.057
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.0079	0.0069	0.032
Co	0.48	0.39	0.37	0.39	0.38	0.38
Ni	1.1	0.98	0.86	0.93	0.89	0.94
Pb	<0.003	<0.015	0.03	<0.015	<0.015	0.01
Hg	---	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Be	0.022	0.019	0.018	0.019	0.018	0.017
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.028	0.021	0.018	0.023	0.026	0.027
As	0.013	0.0067	0.0078	0.0088	0.0079	0.0058
Sum cations (meq/L)	30.9	29.7	26.1	26.8	28.0	25.6
Sum anions (meq/L)	30.3	27.1	26.7	27.4	26.3	25.8
Charge imbalance (percent)	1.80	9.10	-2.32	-2.26	5.98	-1.07

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-18B	MMW-18B	MMW-18B	MMW-18B	MMW-18B
Sample Date	1/13/00	9/9/01	11/1/01	2/4/02	5/13/02
Comments	---	---	---	---	---
Source ID (see table 2)	MMW wkst, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in granite				
Depth to Water (m)	26.0	---	---	---	---
Water Elevation (ft)	---	7,930	7,930	7,930	7,930
Field Temperature (^{o}C)	11.8	18.5	14.3	7.9	13.6
pH, field, [lab]	6.49	6.46	6.48	6.62	6.54
Eh (V)	(0.2)	0.14	0.172	0.164	0.315
Spec Cond (µS/cm) field, [lab]	3,550	3,190	3,100	3,110	3,080
TDS (mg/L)	3,600	3,100	3,000	3,000	2,900
Constituent, dissolved (mg/L)					
Ca	630	590	660	610	560
Mg	160	150	140	150	140
Ba	0.02	0.02	0.01	0.013	0.014
Na	99	96	83	91	73
K	8.6	8.4	8.3	9.5	8.8
SO_4	2,000	1,800	1,800	1,800	1,900
Alkalinity (as HCO_3)	330	310	310	270	270
F	4.1	4.4	6.5	7	6.8
Cl	50	14	5.9	5.8	4.5
SiO_2	23.5	23.5	21.2	21.4	19.3
Al	0.52	0.35	0.11	0.11	0.1
Fe	0.23	<0.1	<0.1	<0.1	<0.1
Mn	25	20	17	14	13
Cu	0.023	<0.01	<0.01	0.012	0.022
Zn	14	13	17	16	14
Mo	<0.1	<0.1	<0.1	0.035	0.1
Cd	0.082	0.06	0.07	0.08	0.086
Ag	0.0048	<0.002	<0.0012	<0.002	<0.002
Cr	<0.01	<0.01	<0.0014	0.0048	<0.01
Co	0.017	<0.01	<0.0063	0.0019	0.0022
Ni	0.073	0.04	0.04	0.047	0.032
Pb	0.03	0.006	<0.01	<0.01	0.013
Hg	---	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.0053	0.0048	0.0065	0.0069	0.0051
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.01	0.006	0.01	0.01	0.015
As	<0.005	<0.005	<0.0025	<0.005	<0.005
Sum cations (meq/L)	35.9	33.5	35.5	35.1	30.4
Sum anions (meq/L)	34.0	29.3	29.1	29.5	31.1
Charge imbalance (percent)	5.36	13.3	19.8	17.3	-2.27

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-19A	MMW-19A	MMW-19A	MMW-19A
Sample Date	1/13/00	6/22/01	9/10/01	11/1/01
Comments	---	---	---	---
Source ID (see table 2)	MMW wksts, RGC 8/10, MC DB	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in gravel with silt and sand			
Depth to Water (m)	26.5	---	---	---
Water Elevation (ft)	---	7,907	7,905	7,904
Field Temperature (^{o}C)	9.9	11.1	16.9	14.4
pH, field, [lab]	4.25	4.16	4.15	4.46
Eh (V)	(0.3)	0.250	0.297	0.291
Spec Cond (µS/cm) field, [lab]	2,940	2,630	2,580	2,490
TDS (mg/L)	3,200	2,700	2,800	2,600
Constituent, dissolved (mg/L)				
Ca	310	250	250	280
Mg	210	180	190	200
Ba	<0.01	<0.01	<0.01	0.03
Na	37	32	31	31
K	5.4	5.2	5.2	5.4
SO_4	2,100	1,900	1,900	1,900
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	51	43	39	38
Cl	29	28	29	32
SiO_2	27.8	27.8	27.8	27.8
Al	98	86	87	87
Fe	0.12	<0.1	<0.1	<0.1
Mn	50	48	45	47
Cu	4.5	1.3	1.3	1.5
Zn	9.4	8.1	8.3	9
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.067	0.05	0.05	0.06
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.0026
Co	0.47	0.37	0.37	0.38
Ni	1.1	0.88	0.85	0.95
Pb	<0.03	<0.01	0.03	0.0300
Hg	---	<0.0002	<0.0002	<0.0002
Be	0.21	0.01	0.01	0.01
V	---	<0.01	<0.01	<0.01
Se	0.027	0.02	0.02	0.02
As	0.012	0.008	0.008	0.01
Sum cations (meq/L)	31.0	26.2	26.1	28.3
Sum anions (meq/L)	30.5	28.3	27.2	27.1
Charge imbalance (percent)	1.77	-7.60	-4.11	4.46

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-19A	MMW-19A	MMW-19B
Sample Date	2/6/02	4/30/02	1/20/00
Comments	---	---	---
Source ID (see table 2)	MC CD	MC CD	MMW wksts, RGC 8/10, MC DB
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in gravel with sand and silt		Fractured andesite porphyry
Depth to Water (m)	---	---	25.5
Water Elevation (ft)	7,900	7,900	---
Field Temperature (^{o}C)	10.9	11	9.7
pH, field, [lab]	4.17	4.1	7.14
Eh (V)	0.341	0.39	(0.3)
Spec Cond (µS/cm) field, [lab]	2,510	2,590	2,630
TDS (mg/L)	2,300	2,500	2,500
Constituent, dissolved (mg/L)			
Ca	250	240	570
Mg	200	200	89
Ba	<0.01	0.0075	0.039
Na	35	32	56
K	5.6	5.9	8.7
SO_4	1,800	1,800	1,500
Alkalinity (as HCO_3)	<5	<5	210
F	41	38	2.1
Cl	27	25	8.4
SiO_2	30.0	27.8	18.4
Al	83	82	<0.1
Fe	<0.1	0.021	3.4
Mn	43	44	6.3
Cu	1.3	1.3	<0.1
Zn	8.3	8.3	0.18
Mo	<0.1	<0.1	0.16
Cd	0.055	0.058	<0.001
Ag	<0.002	<0.002	0.0041
Cr	0.0053	0.0061	<0.01
Co	0.37	0.38	<0.1
Ni	0.89	0.93	<0.02
Pb	<0.015	<0.015	<0.006
Hg	<0.0002	<0.0002	<0.0002
Be	0.018	0.017	<0.004
V	<0.01	<0.01	<0.01
Se	0.023	0.029	<0.005
As	0.0066	0.0066	<0.005
Sum cations (meq/L)	27.7	27.2	28.4
Sum anions (meq/L)	26.3	26.2	24.6
Charge imbalance (percent)	5.29	3.62	14.1

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-27A	MMW-27A	MMW-27A	MMW-27A	MMW-27A	MMW-27A
Sample Date	1/12/00	6/18/01	9/9/01	10/28/01	2/6/02	5/13/02
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst, URS, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in gravel					
Depth to Water (m)	29.1	---	---	---	---	---
Water Elevation (ft)	---	7,916	7,912	7,910	7,910	7,907
Field Temperature (^{o}C)	9.8	11.1	13.4	11.7	14	17.4
pH, field, [lab]	4.33	4.22	4.17	4.12	4.2	4.14
Eh (V)	(0.3)	0.232	0.330	0.297	0.280	0.303
Spec Cond (µS/cm) field, [lab]	2,940	2,500	2,530	2,780	2,550	2,570
TDS (mg/L)	3,300	2,600	2,800	2,700	2,400	2,600
Constituent, dissolved (mg/L)						
Ca	320	290	260	260	260	240
Mg	220	200	190	200	200	190
Ba	0.014	<0.01	<0.01	<0.01	<0.01	0.011
Na	38	31	32	32	36	30
K	5.6	5.9	5.4	5.5	5.8	5.8
SO_4	2,100	1,900	1,900	1,900	1,900	1,800
Alkalinity (as HCO_3)	<5	<5	<5	<5	<5	<5
F	54	40	42	40	40	38
Cl	29	29	28	29	26	25
SiO_2	27.8	27.8	27.8	27.8	30.0	27.8
Al	92	88	88	88	81	74
Fe	0.1	0.16	0.11	0.1	0.15	0.14
Mn	49	46	45	44	43	43
Cu	1.5	1.5	1.3	1.3	1.3	1.2
Zn	9.7	8.6	8	8.5	8.2	8.4
Mo	<0.01	<0.1	<0.1	0.02	0.036	<0.1
Cd	0.068	0.060	0.050	0.05	0.055	0.055
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.0079	0.034	0.03
Co	0.47	0.4	0.35	0.39	0.37	0.35
Ni	1.1	0.97	0.88	0.95	0.9	0.9
Pb	<0.03	<0.03	<0.01	<0.01	0.015	0.0075
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.022	0.02	0.01	0.01	0.018	0.018
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.029	0.01	0.02	0.02	0.026	0.028
As	0.014	0.006	0.008	0.0085	0.0067	0.0043
Sum cations (meq/L)	31.5	29.1	27.0	27.9	27.2	25.1
Sum anions (meq/L)	30.6	27.3	27.6	27.5	27.5	26.0
Charge imbalance (percent)	3.07	6.55	-2.12	1.17	-0.95	-3.45

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-31A	MMW-31A	MMW-31A	MMW-31A	MMW-31A
Sample Date	6/20/01	9/6/01	12/3/01	1/30/02	4/23/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,919	7,918	7,915	7,912	7,912
Field Temperature (^{o}C)	12	17.1	12.4	8.9	15
pH, field, [lab]	4.2	4.18	4.17	4.59	4.13
Eh (V)	0.258	0.364	0.387	0.235	0.237
Spec Cond (µS/cm) field, [lab]	2,310	2,470	2,640	2,590	2,640
TDS (mg/L)	2,400	2,600	2,700	2,500	2,500
Constituent, dissolved (mg/L)					
Ca	260	250	260	230	240
Mg	190	200	200	180	200
Ba	<0.01	<0.01	<0.01	0.047	0.01
Na	28	30	32	34	34
K	6	5.6	5.9	5.7	5.9
SO_4	1,700	1,800	1,900	1,700	1,900
Alkalinity (as HCO_3)	<5	<5	<5	<5	<5
F	38	41	42	36	40
Cl	26	28	27	25	26
SiO_2	27.8	27.8	30.0	32.1	30.0
Al	77	83	80	73	80
Fe	<0.1	0.12	<0.1	<0.1	0.044
Mn	41	44	47	44	41
Cu	1.3	1.4	1.3	1.1	1.3
Zn	8.3	8.5	8.7	7.8	8.9
Mo	<0.1	<0.1	<0.1	0.028	<0.1
Cd	0.06	0.06	0.05	0.053	0.06
Ag	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	0.02	0.0054	0.0019	0.012
Co	0.37	0.36	0.36	0.38	0.38
Ni	0.92	0.99	0.94	0.91	0.98
Pb	<0.03	<0.03	<0.01	<0.015	0.018
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.02	0.02	0.02	0.017	0.021
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.01	0.01	0.02	0.029	0.026
As	<0.005	0.0056	0.0066	0.0091	0.0058
Sum cations (meq/L)	26.9	26.8	27.3	25.4	26.2
Sum anions (meq/L)	24.6	25.6	27.8	25.5	27.6
Charge imbalance (percent)	9.05	4.70	-1.84	-0.13	-5.53

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-31B	MMW-31B	MMW-31B	MMW-31B
Sample Date	6/20/01	9/6/01	12/3/01	1/30/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in granite			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,920	7,918	7,915	7,916
Field Temperature (^{o}C)	11.1	17.8	12.1	6.8
pH, field, [lab]	4.03	4.09	4.07	4.13
Eh (V)	0.272	0.383	0.412	0.311
Spec Cond (µS/cm) field, [lab]	2,750	2,530	2,840	2,780
TDS (mg/L)	2,900	3,000	2,800	2,700
Constituent, dissolved (mg/L)				
Ca	310	290	300	280
Mg	220	220	220	200
Ba	0.02	0.02	0.02	0.022
Na	31	31	33	36
K	6.3	5.5	5.9	5.8
SO_4	2,000	2,000	2,200	1,900
Alkalinity (as HCO_3)	<5	<5	<5	<5
F	42	43	43	40
Cl	30	29	33	27
SiO_2	27.8	27.8	32.1	32.1
Al	96	95	94	87
Fe	<0.1	<0.1	<0.1	<0.1
Mn	50	51	49	48
Cu	1.3	1.3	1.3	1.2
Zn	9.3	9.1	9.2	8.5
Mo	<0.1	<0.1	<0.02	<0.01
Cd	0.06	0.06	0.06	0.062
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.1	<0.1	<0.00095	0.0037
Co	0.45	0.42	0.41	0.42
Ni	1	1	0.99	0.97
Pb	0.09	0.1	0.08	0.11
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.01	0.01	0.01	0.017
V	<0.1	<0.1	<0.1	<0.01
Se	0.02	0.02	0.02	0.036
As	0.0085	0.0075	0.0077	0.015
Sum cations (meq/L)	31.6	29.8	30.1	29.5
Sum anions (meq/L)	28.2	27.6	31.7	27.9
Charge imbalance (percent)	11.4	7.84	-5.21	5.54

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-32A	MMW-32A	MMW-32A	MMW-32A	MMW-32A
Sample Date	6/18/01	9/9/01	11/2/01	2/2/02	4/24/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,872	7,867	7,865	7,859	7,860
Field Temperature (^{o}C)	11.7	18.7	14.1	7.3	9.1
pH, field, [lab]	4.55	4.62	4.8	4.64	4.44
Eh (V)	0.212	0.278	0.238	0.290	0.294
Spec Cond (µS/cm) field, [lab]	2,710	2,530	2,540	2,600	2,540
TDS (mg/L)	2,700	2,800	2,700	2,500	2,500
Constituent, dissolved (mg/L)					
Ca	360	320	360	320	240
Mg	220	190	210	210	190
Ba	<0.01	<0.01	0.0086	0.0072	0.0075
Na	34	37	34	36	31
K	6.4	5.5	6.1	6	5.5
SO_4	2,000	1,800	1,900	1,800	1,800
Alkalinity (as HCO_3)	<5	6.7	7.7	<5	6.5
F	36	39	39	34	35
Cl	27	29	30	26	25
SiO_2	30	30	28	28	30
Al	83	66	67	72	74
Fe	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	45	41	45	44	42
Cu	1.1	1	1.1	1.1	1.1
Zn	8.2	6.2	8	8	7
Mo	<0.1	<0.1	<0.1	0.044	<0.1
Cd	0.06	0.04	0.05	0.055	0.05
Ag	<0.002	<0.002	<0.002	<0.002	0.00086
Cr	<0.01	<0.01	0.0049	0.0062	0.013
Co	0.42	0.31	0.37	0.35	0.34
Ni	0.95	0.73	0.89	0.85	0.8
Pb	<0.03	<0.01	<0.01	0.015	<0.015
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.02	0.01	0.01	0.016	0.016
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.02	0.02	0.020	0.027	0.024
As	0.007	0.007	0.0064	0.0082	<0.0073
Sum cations (meq/L)	32.5	27.6	30.7	30.9	26.0
Sum anions (meq/L)	27.9	25.6	27.0	25.9	26.9
Charge imbalance (percent)	15.1	7.49	12.8	17.3	-3.62

Table 6. Selected historical ground-water quality analyses

Sugar Shack South

Well ID	MMW-32B	MMW-32B	MMW-32B
Sample Date	9/18/01	11/2/01	4/24/02
Comments	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in andesite and granite		
Depth to Water (m)	---	---	---
Water Elevation (ft)	7,888	7,887	7,885
Field Temperature (^{o}C)	17.9	12.3	9.5
pH, field, [lab]	6.66	6.63	6.71
Eh (V)	0.021	0.035	0.071
Spec Cond (µS/cm) field, [lab]	2,540	2,560	2,850
TDS (mg/L)	2,700	2,600	2,600
Constituent, dissolved (mg/L)			
Ca	610	590	600
Mg	94	95	86
Ba	<0.01	<0.01	0.011
Na	69	72	77
K	6.4	6.5	7
SO_4	1,600	1,600	1,600
Alkalinity (as HCO_3)	290	300	290
F	2.6	2.7	3.4
Cl	38	40	36
SiO_2	21	24	26
Al	<0.05	<0.05	<0.05
Fe	1.8	1.9	1.7
Mn	3.4	3.5	3.5
Cu	<0.01	0.001	<0.01
Zn	1.6	1.7	1.5
Mo	<0.1	<0.1	<0.1
Cd	<0.001	0.0004	0.00051
Ag	<0.002	0.001	0.0023
Cr	<0.01	0.002	0.0061
Co	<0.01	0.005	0.0036
Ni	<0.02	<0.01	0.018
Pb	<0.006	<0.006	<0.006
Hg	<0.0002	<0.0002	<0.0002
Be	0.0044	0.005	0.0049
V	<0.01	<0.01	<0.01
Se	<0.005	<0.0025	0.0042
As	<0.005	<0.005	<0.005
Sum cations (meq/L)	29.7	29.6	29.8
Sum anions (meq/L)	27.4	28.3	28.3
Charge imbalance (percent)	8.09	4.54	5.24

Table 6. Selected historical ground water quality analyses

	Sulphur/ Spring Gulch	Sulphur Gulch		
Well ID	MMW-16	MMW24	MMW-24	MMW-24
Sample Date	6/22/01	1/12/00	6/23/01	9/5/01
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MMW wkst, URS, RGC 8/10, MC	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Sand gravel over granite	Well completed in granite		
Depth to Water (m)	---	28.7	---	---
Water Elevation (ft)	---	---	8,060	8,066
Field Temperature (^{o}C)	15.3	10.1	15	18.5
pH, field, [lab]	4.57	4.79	5.4	5.52
Eh (V)	0.304	(0.2)	0.133	0.290
Spec Cond (µS/cm) field, [lab]	2,520	2,980	3,100	2,960
TDS (mg/L)	2,600	3,300	3,000	2,800
Constituent, dissolved (mg/L)				
Ca	550	560	580	570
Mg	88	100	86	83
Ba	<0.01	0.024	<0.01	<0.01
Na	37	77	67	69
K	15	13	15	18
SO_4	1,700	1,800	1,800	1,700
Alkalinity (as HCO_3)	<5	<5	9.3	35
F	20	41	43	17
Cl	24	44	31	28
SiO_2	43	38.5	28	20
Al	26	53	35	9.8
Fe	0.42	0.22	<0.1	<0.1
Mn	7.9	14	14	12
Cu	0.78	1.4	0.99	0.12
Zn	2.9	2.7	2.4	1.5
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.02	0.02	0.01	0.01
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	<0.01
Co	0.58	0.23	0.17	0.14
Ni	0.24	0.51	0.37	0.32
Pb	<0.006	<0.006	<0.006	0.009
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.02	0.023	0.01	0.0091
V	<0.01	<0.01	<0.01	<0.01
Se	0.008	0.01	0.01	0.008
As	<0.005	0.017	0.006	<0.005
Sum cations (meq/L)	27.3	32.1	29.5	27.7
Sum anions (meq/L)	24.4	26.6	26.4	25.0
Charge imbalance (percent)	11.3	18.9	11.0	10.2

Table 6. Selected historical ground water quality analyses

	Sulphur Gulch		Sulphur Gulch		Spring Gulch
Well ID	MMW-24	MMW-24	MMW-39A	MMW-39A	MMW-40A
Sample Date	1/26/02	4/17/02	12/17/01	3/28/02	6/4/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in granite		Alluvial-colluvial waste rock		Bedrock
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,046	8,055	---	---	8,800
Field Temperature (^{o}C)	12.6	16.8	(10)	11.7	16.2
pH, field, [lab]	4.83	4.67	(4)	4.09	6.26
Eh (V)	0.255	409	(0.3)	0.298	0.250
Spec Cond (µS/cm) field, [lab]	2,670	2,770	---	4,860	1,070
TDS (mg/L)	2,500	2,700	5,800	5,700	830
Constituent, dissolved (mg/L)					
Ca	520	510	490	460	140
Mg	13	80	400	400	45
Ba	0.013	0.017	0.0074	0.0088	0.026
Na	56	56	65	64	30
K	14	16	17	17	3.9
SO_4	1,600	1,700	3,800	3,800	510
Alkalinity (as HCO_3)	<5	5.4	<5	<5	47
F	33	32	170	170	1.4
Cl	19	18	79	74	11
SiO_2	36	16	49	54	39
Al	40	31	180	190	0.05
Fe	<0.1	<0.1	<0.1	0.11	<0.1
Mn	13	13	120	110	0.017
Cu	1	0.88	5.5	5.9	0.00071
Zn	2.3	2.1	26	27	0.066
Mo	<0.1	<0.1	0.05	0.062	<0.1
Cd	0.019	0.018	0.19	0.18	0.001
Ag	<0.002	<0.002	<0.002	0.00067	<0.002
Cr	0.015	0.0025	<0.01	0.0022	0.00077
Co	0.16	0.16	0.5	0.52	0.0061
Ni	0.39	0.36	2	2	<0.02
Pb	0.0042	<0.006	<0.06	0.022	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.016	0.013	0.19	0.19	<0.004
V	<0.01	<0.01	<0.01	0.00052	<0.01
Se	0.0130	0.015	0.06	0.062	0.0044
As	0.0099	0.0035	0.02	0.025	0.0017
Sum cations (meq/L)	23.6	26.2	51.1	50.1	9.75
Sum anions (meq/L)	24.3	24.9	55.2	54.8	9.42
Charge imbalance (percent)	-3.03	4.94	-7.67	-9.00	3.44

Table 6. Selected historical ground water quality analyses

	Spring Gulch			
Well ID	MMW-34B	MMW-34B	MMW-34B	MMW-34B
Sample Date	9/17/01	10/18/01	1/22/02	4/12/02
Comments	* values transposed from MMW-35B			
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in bedrock			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	8,508	8,508	8,506	8,505
Field Temperature (^{o}C)	16.5	18.1	10	12.4
pH, field, [lab]	5.71	5.34	4.88	4.85
Eh (V)	0.256	0.240	0.134	0.261
Spec Cond (µS/cm) field, [lab]	2,520	3,030	2,910	2,920
TDS (mg/L)	3,200	3,100	3,100	3,100
Constituent, dissolved (mg/L)				
Ca	630	640	600	610
Mg	64	75	76	73
Ba	0.02	0.05	0.0067	0.006
Na	53	52	48	50
K	22	17	16	16
SO_4	1,900 *	2,100	2,000	2,000
Alkalinity (as HCO_3)	22 *	35	7.4	6.8
F	88 *	120	120	120
Cl	6.4 *	4.7	4.6	4.9
SiO_2	53	73	71	36
Al	53	69	69	71
Fe	0.13	0.14	0.15	0.13
Mn	22	24	22	22
Cu	0.73	0.96	0.99	1
Zn	6.5	8.6	8.1	8
Mo	0.27	0.11	0.11	0.13
Cd	0.03	0.04	0.048	0.049
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.029	0.027
Co	<0.01	<0.01	0.0061	0.0062
Ni	0.11	0.14	0.14	0.14
Pb	0.04	0.02	0.019	0.0099
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.09	0.12	0.13	0.13
V	<0.01	<0.01	<0.01	<0.01
Se	0.01	0.02	0.023	0.023
As	0.0071	0.01	0.016	0.014
Sum cations (meq/L)	33.3	29.3	28.6	28.9
Sum anions (meq/L)	33.6	30.4	29.4	29.1
Charge imbalance (percent)	-0.82	-3.67	-2.57	-0.61

Table 6. Selected historical ground water quality analyses

	Blind/ Sulphur North				
Well ID	MMW-35B	MMW-35B	MMW-35B	MMW-35B	MMW-35B
Sample Date	6/19/01	9/17/01	10/18/01	1/22/02	4/12/02
Comments		* values transposed from MMW-34B			
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in aplite				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,489	8,494	8,494	8,494	8,490
Field Temperature (^{o}C)	16.2	17.2	17.9	6.3	15.2
pH, field, [lab]	6.87	6.66	6.62	6.75	6.67
Eh (V)	0.066	0.053	0.057	0.075	0.061
Spec Cond (µS/cm) field, [lab]	3,340	3,360	3,530	3,340	3,320
TDS (mg/L)	3,200	2,900	3,000	3,000	2,900
Constituent, dissolved (mg/L)					
Ca	840	890	890	830	850
Mg	39	36	35	39	37
Ba	0.03	0.02	0.02	0.021	0.024
Na	49	46	47	51	49
K	21	19	19	19	20
SO_4	1,500	1,500 *	1,500	1,500	1,500
Alkalinity (as HCO_3)	340	360 *	360	360	350
F	3.3	2.9 *	2.1	2.7	2.9
Cl	290	300 *	300	280	260
SiO_2	18	18	18	18	19
Al	<0.05	<0.05	<0.05	0.063	0.0053
Fe	3.1	0.28	0.25	0.42	0.37
Mn	6.2	5.2	5.5	5.3	5.5
Cu	<0.01	<0.01	<0.01	<0.01	0.01
Zn	0.23	0.34	0.42	0.49	0.38
Mo	<0.1	<0.1	<0.07	0.05	0.082
Cd	<0.001	<0.001	<0.00057	0.0007	0.001
Ag	0.0025	<0.002	<0.002	0.0011	0.002
Cr	<0.01	<0.01	0.0013	0.0058	0.01
Co	0.03	0.02	0.02	0.029	0.028
Ni	0.05	0.05	0.05	0.06	0.058
Pb	<0.006	<0.006	<0.009	<0.009	0.009
Hg	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Be	0.02	0.04	0.06	0.078	0.079
V	<0.01	<0.01	<0.01	<0.01	0.01
Se	<0.005	<0.005	0.0062	0.0026	0.005
As	<0.005	<0.005	<0.0032	<0.005	0.005
Sum cations (meq/L)	36.1	35.1	37.6	36.2	36.3
Sum anions (meq/L)	33.1	29.8	33.2	33.8	32.4
Charge imbalance (percent)	8.68	16.5	12.3	6.87	11.4

Table 6. Selected historical ground water quality analyses

	Middle Waste Rock Dump			
Well ID	MMW 13	MMW-13	MMW-13	MMW-13
Sample Date	11/8/94	6/25/97	5/11/98	6/11/98
Comments	---	---	---	---
Source ID (see table 2)	SPRI 1995, SRK 1995, MMW wkst	NMED, URS	URS, MC DB	NMED, MC DB
Lab ID	ETC	ACZ RG 46921	---	ACZ RG 70728
Aquifer	Well completed in sandy gravel overlying quartz monzonite			
Depth to Water (m)	32.3	---	---	39.0
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	8.9	(10)	(10)	(10)
pH, field, [lab]	7.9	(7)	(7)	(7)
Eh (V)	(0.2)	(0.2)	(0.2)	(0.2)
Spec Cond (µS/cm) field, [lab]	2,280	---	---	---
TDS (mg/L)	1,400	1360, 1450	1,570	1530, 1670
Constituent, dissolved (mg/L)				
Ca	316	340	371	370
Mg	38.7	39.3	40.4	44.3
Ba	0.036	0.023	---	0.008
Na	30	30.5	29.1	31.9
K	5.4	7	5.1	4.6
SO_4	700	790	880	930
Alkalinity (as HCO_3)	200	201	207	226
F	1.67	1.6	1.4	1.6
Cl	14	14	16	16
SiO_2	19	---	---	---
Al	<0.05	0.04	ND	0.04
Fe	0.198	0.16	ND	<0.01
Mn	1.02	0.706	0.13	0.061
Cu	<0.010	<0.01	ND	<0.01
Zn	0.222	0.36	0.05	0.04
Mo	0.05	0.05	0.04	0.05
Cd	<0.0005	0.0008	ND	<0.0005
Ag	<0.10	---	---	---
Cr	<0.010	---	---	---
Co	0.013	0.05	ND	---
Ni	<0.02	0.01	ND	---
Pb	<0.002	---	---	---
Hg	<0.0002	---	---	---
Be	<0.004	---	---	---
V	<0.010	---	---	---
Se	<0.005	0.002	---	---
As	<0.005	---	---	---
Sum cations (meq/L)	16.3	17.1	17.9	18.1
Sum anions (meq/L)	14.2	15.5	16.9	18.1
Charge imbalance (percent)	13.9	9.41	5.75	0.11

Table 6. Selected historical ground water quality analyses

	Middle Waste Rock Dump			
Well ID	MMW-13	MMW-13	MMW-13	MMW-25A
Sample Date	2/3/00	9/10/01	1/28/02	1/28/02
Comments	---	---	---	---
Source ID (see table 2)	MMW wkst, URS, RGC 8/10, MCDB	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sandy gravel			Gravel with sand/silt
Depth to Water (m)	37.1	---	---	---
Water Elevation (ft)	---	7,942	---	7,981
Field Temperature (^{o}C)	10.1	13.1	8.5	7.8
pH, field, [lab]	7.19	7.05	7.37	6.99
Eh (V)	(0.2)	0.015	0.132	0.133
Spec Cond (µS/cm) field, [lab]	1,590	1,870	1,630	2,440
TDS (mg/L)	1,400	1,600	1,400	2,300
Constituent, dissolved (mg/L)				
Ca	330	370	350	590
Mg	29	43	35	55
Ba	0.012	<0.01	0.02	0.012
Na	27	30	30	48
K	7.2	7.2	7	8.2
SO_4	700	880	760	1,400
Alkalinity (as HCO_3)	190	190	150	180
F	1.9	1.8	1.9	2.1
Cl	16	14	14	33
SiO_2	13.9	17	18	21.4
Al	0.13	<0.05	<0.05	<0.05
Fe	<0.1	0.14	<0.1	<0.1
Mn	0.029	0.28	0.13	0.014
Cu	<0.01	<0.01	0.0007	0.0017
Zn	0.044	0.06	0.03	0.25
Mo	<0.1	<0.1	0.043	0.028
Cd	<0.001	<0.001	<0.001	0.00039
Ag	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.00089
Co	<0.01	<0.01	0.0078	<0.01
Ni	<0.02	<0.02	0.0033	0.005
Pb	<0.003	<0.003	<0.003	<0.006
Hg	<0.0005	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	<0.004	<0.004
V	<0.01	<0.01	<0.01	<0.01
Se	<0.005	<0.005	0.0034	0.0049
As	<0.005	<0.005	0.002	<0.005
Sum cations (meq/L)	16.1	18.1	17.3	26.9
Sum anions (meq/L)	14.1	16.5	14.3	23.7
Charge imbalance (percent)	13.2	9.18	19.4	12.4

Table 6. Selected historical ground water quality analyses

	Middle Waste Rock Dump				
Well ID	MMW-25B	MMW-25B	MMW-25B	MMW-25B	MMW-25B
Sample Date	1/12/00	6/20/01	9/8/01	12/4/01	4/19/02
Comments	---	---	---	---	---
Source ID (see table 2)	MMW wkst, URS, RGC 8/10, MC DB	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in granite				
Depth to Water (m)	30.1	---	---	---	---
Water Elevation (ft)	---	7,980	7,982	7,980	7,980
Field Temperature (^{o}C)	12.9	18.1	16.9	13.5	15.2
pH, field, [lab]	7	6.73	6.87	6.99	6.94
Eh (V)	(0.2)	0.220	0.092	0.203	-0.006
Spec Cond (µS/cm) field, [lab]	2,600	2,410	2,450	2,490	2,500
TDS (mg/L)	2,500	2,300	2,400	2,300	2,300
Constituent, dissolved (mg/L)					
Ca	570	610	570	580	530
Mg	57	64	56	57	59
Ba	0.027	<0.01	<0.01	0.0093	0.013
Na	55	45	45	49	47
K	8.4	8.4	8.4	8.7	8.9
SO_4	1,600	1,500	1,400	1,400	1,400
Alkalinity (as HCO_3)	200	180	190	180	180
F	1.9	1.4	2.1	2.1	1.6
Cl	33	30	32	34	29
SiO_2	20.1	19	19	21	21
Al	0.1	5.2	<0.05	<0.05	<0.05
Fe	0.13	<0.1	<0.1	<0.1	0.22
Mn	0.27	2.5	0.02	0.03	0.062
Cu	<0.01	0.06	<0.01	0.0018	<0.01
Zn	0.14	0.59	0.27	0.28	0.21
Mo	<0.1	<0.1	<0.1	0.03	0.035
Cd	<0.001	0.0039	<0.001	<0.001	0.00054
Ag	0.003	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	<0.0011	<0.01
Co	<0.01	0.02	<0.01	<0.00099	0.0015
Ni	0.053	0.06	<0.02	0.01	0.13
Pb	<0.006	<0.006	<0.006	<0.006	<0.006
Hg	<0.01	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	<0.004	0.00055	<0.004
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	<0.01	<0.0056	<0.0055	<0.0039	<0.005
As	<0.005	<0.005	<0.005	<0.005	<0.005
Sum cations (meq/L)	25.3	27.2	25.4	26.3	24.2
Sum anions (meq/L)	27.2	24.2	23.4	23.4	23.6
Charge imbalance (percent)	-7.09	11.8	8.03	11.4	2.49

Table 6. Selected historical ground water quality analyses

Middle Waste Rock/Sulphur Gulch

Well ID	MMW-29A	MMW-29A	MMW-29A	MMW-29A	MMW-29B	MMW-29B	MMW-29B
Sample Date	6/14/01	9/5/01	1/25/02	4/22/02	9/5/01	1/25/02	4/22/02
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel				Well completed in andesite porphyry		
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	7,940	7,939	7,927	7,929	7,940	7,928	7,929
Field Temperature (^{o}C)	9.4	20.8	8.1	16	18.4	7.8	14.6
pH, field, [lab]	4.92	4.6	4.61	4.54	7.27	7.32	7.48
Eh (V)	0.177	0.246	0.269	0.244	-0.279	-0.166	-0.313
Spec Cond (µS/cm) field, [lab]	1,900	1,740	2,170	2,040	1,100	1,120	1,130
TDS (mg/L)	1,800	1,500	2,000	1,900	850	870	850
Constituent, dissolved (mg/L)							
Ca	220	200	240	220	210	200	210
Mg	140	130	150	140	32	29	31
Ba	<0.01	<0.01	0.014	0.012	0.02	0.015	0.021
Na	27	24	31	29	22	18	19
K	6.9	6.4	7.4	7.5	3.5	2.7	3.3
SO_4	1,200	1,100	1,400	1,300	430	470	450
Alkalinity (as HCO_3)	5.9	<5	<5	<5	180	170	180
F	47	34	43	42	2.9	3.5	3.6
Cl	23	22	28	23	5.2	4.2	4.2
SiO_2	24	21	24	24	24	21	20
Al	46	37	48	47	<0.05	<0.05	<0.05
Fe	0.14	<0.1	<0.1	0.18	0.19	0.39	0.26
Mn	23	19	25	22	3.2	3.3	3.2
Cu	0.59	0.53	0.71	0.65	<0.01	<0.01	<0.01
Zn	7.9	6.4	8.6	8.1	<0.02	0.011	0.011
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.06	0.05	0.065	0.062	<0.001	<0.001	<0.001
Ag	<0.002	<0.002	<0.002	0.0019	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.0034	0.02	<0.01	0.001	0.0014
Co	0.15	0.12	0.16	0.14	<0.01	<0.01	0.00095
Ni	0.57	0.5	0.66	0.64	<0.02	0.0021	0.0018
Pb	<0.009	<0.009	<0.009	<0.009	<0.003	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.01	0.01	0.015	0.015	<0.004	0.0015	0.00098
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Se	0.01	0.01	0.017	0.017	<0.005	<0.005	0.0029
As	<0.005	<0.005	<0.005	0.0018	<0.005	<0.005	0.0036
Sum cations (meq/L)	20.9	18.3	22.3	20.3	11.8	11.0	11.6
Sum anions (meq/L)	19.0	16.7	22.1	20.0	9.73	10.6	10.2
Charge imbalance (percent)	9.50	9.40	1.10	1.90	19.3	4.42	13.3

Table 6. Selected historical ground water quality analyses

	Middle Waste Rock Dump			
Well ID	MMW-30A	MMW-30A	MMW-30A	MMW-30A
Sample Date	6/7/01	9/7/01	1/24/02	4/22/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand			
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	7,930	7,929	7,920	7,920
Field Temperature (^{o}C)	15.9	15.9	8	15.4
pH, field, [lab]	4.47	4.47	4.49	4.3
Eh (V)	0.138	0.201	0.170	0.273
Spec Cond (µS/cm) field, [lab]	1,930	1,930	2,260	2,450
TDS (mg/L)	1,300	1,800	2,100	2,300
Constituent, dissolved (mg/L)				
Ca	140	190	220	230
Mg	79	130	170	190
Ba	<0.01	<0.01	0.0097	0.01
Na	17	23	30	32
K	4	3.8	6.1	6.7
SO_4	850	1,300	1,500	1,700
Alkalinity (as HCO_3)	6.5	<5	<5	<5
F	20	27	34	40
Cl	25	24	24	26
SiO_2	20	21	26	28
Al	37	48	62	70
Fe	<0.1	<0.1	0.14	0.035
Mn	17	27	38	35
Cu	0.56	0.57	0.87	0.94
Zn	4.1	5.3	7.7	8.9
Mo	<0.1	<0.1	<0.1	<0.1
Cd	0.02	0.04	0.05	0.061
Ag	<0.002	<0.002	<0.002	0.0011
Cr	<0.01	<0.01	0.025	0.011
Co	0.13	0.2	0.3	0.3
Ni	0.39	0.59	0.82	0.85
Pb	<0.006	0.009	<0.015	<0.015
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Be	0.01	0.01	0.019	0.019
V	<0.01	<0.01	<0.01	<0.01
Se	0.010	0.01	0.023	0.03
As	<0.005	<0.005	0.0057	0.0093
Sum cations (meq/L)	13.5	18.9	24.1	24.9
Sum anions (meq/L)	13.9	20.3	22.7	25.0
Charge imbalance (percent)	-2.26	-7.09	5.73	-0.39

Table 6. Selected historical ground-water quality analyses

Mill Area Wells				East of Mill		
Well ID	Lab Well, New Mill Well	Mill Well No. 1	Mill Well No. 1A	MMW-17A	MMW-17A	MMW-17A
Sample Date	3/19/02	9/9/97	9/9/97	6/25/01	9/4/01	10/19/01
Comments		no alkalinity value		---	---	---
Source ID (see table 2)	MC CD	MC DB	MC DB	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	---	---	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Bedrock	Alluvium	Alluvium	Sand and boulders over fractured rock		
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	8,108	8,105	8,098
Field Temperature (^{o}C)	(10)	7.7	9.4	9.9	14.8	15
pH, field, [lab]	(7)	4.9	5.7	4.46	4.47	4.49
Eh (V)	(0.2)	(0.2)	(0.2)	0.082	0.372	0.304
Spec Cond (µS/cm) field, [lab]	---	675	535	719	765	837
TDS (mg/L)	180	555	400	560	610	610
Constituent, dissolved (mg/L)						
Ca	44	81.3	66	97	100	100
Mg	7	23.6	17.5	26	29	27
Ba	0.042	<1	<1	<0.01	<0.01	0.0071
Na	3.8	9.1	7.7	<10	<10	9
K	1.1	1.3	1.2	1.9	1.9	2.1
SO_4	57	370	285	400	430	450
Alkalinity (as HCO_3)	83	---	12	<5	<5	<5
F	0.51	1.24	0.81	2	2	1.8
Cl	1.6	<10	<10	6.4	5.8	6.2
SiO_2	10	4.2	34.2	26	28	28
Al	<0.05	5.1	0.7	8.9	11	10
Fe	<0.1	<0.2	<0.2	0.5	<0.1	<0.1
Mn	0.0058	1.1	0.8	1.7	1.8	1.8
Cu	0.048	<0.25	<0.25	0.05	0.04	0.04
Zn	0.029	0.38	<0.25	0.63	0.63	0.62
Mo	<0.1	<0.02	<0.02	<0.1	<0.1	<0.1
Cd	<0.001	<0.005	<0.005	0.0023	0.0026	0.0023
Ag	<0.002	---	---	<0.002	<0.002	<0.002
Cr	<0.01	---	---	<0.01	<0.01	0.0014
Co	<0.01	<0.02	<0.02	0.031	0.036	0.035
Ni	<0.02	<0.02	<0.02	0.089	0.098	0.09
Pb	<0.003	<0.02	<0.02	<0.003	<0.003	<0.003
Hg	<0.0002	---	---	<0.0002	<0.0002	<0.0002
Be	<0.004	---	---	<0.004	<0.004	0.0022
V	0.00078	---	---	<0.01	<0.01	<0.01
Se	<0.005	---	---	<0.005	<0.005	<0.005
As	<0.005	<0.001	<0.001	<0.005	<0.005	0.0021
Sum cations (meq/L)	2.82	5.71	4.38	6.40	6.71	6.84
Sum anions (meq/L)	2.47	6.43	5.34	6.85	7.16	7.59
Charge imbalance (percent)	13.2	-11.8	-19.9	-6.85	-6.48	-10.4

Table 6. Selected historical ground-water quality analyses

Mill Area Wells	East of Mill					
Well ID	MMW-17B	MMW-17B	MMW-17B	MMW-17B	MMW-17B	MMW-17B
Sample Date	1/12/00	6/25/01	9/4/01	10/19/01	1/23/02	4/15/02
Comments	---	---	---	---	*lowered by factor of 10	
Source ID (see table 2)	MMW wksts, RGC 8/10, URS, MCDB	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	SLD HM 2000 00063	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in andesite and rhyolite					
Depth to Water (m)	28.3	---	---	---	---	---
Water Elevation (ft)	---	8,109	8,105	8,098	8,078	8,089
Field Temperature (^oC)	10	11.5	17.7	13.6	9	14.4
pH, field, [lab]	4.76	5.54	4.4	4.44	4.79	4.45
Eh (V)	(0.3)	0.103	0.347	0.273	0.256	0.287
Spec Cond (µS/cm) field, [lab]	887	847	777	841	814 *	807
TDS (mg/L)	790	600	610	610	630	620
Constituent, dissolved (mg/L)						
Ca	110	93	100	110	100	97
Mg	30	25	29	27	28	26
Ba	0.019	<0.01	<0.01	0.0074	0.21	0.0085
Na	10	<10	<10	9.20	9.30	8.9
K	2	1.8	1.8	1.7	1.8	1.6
SO_4	480	430	430	450	440	440
Alkalinity (as HCO_3)	<5	<5	<5	<5	<5	<5
F	1.9	1.9	1.4	1.7	1.8	1.3
Cl	5.1	5.5	5.7	5.7	5.4	4.6
SiO_2	32	30	28	28	26	28
Al	11	12	11	10	8.8	10
Fe	<0.1	0.41	<0.1	<0.1	0.016	0.075
Mn	2	1.9	1.8	1.8	1.8	1.8
Cu	0.11	0.05	0.048	0.04	0.057	0.044
Zn	0.74	0.59	0.62	0.61	0.6	0.57
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	0.0028	0.0023	0.0026	0.0024	0.0022	0.0019
Ag	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	<0.01	0.0019	<0.01	0.012
Co	0.04	0.035	0.036	0.03	0.035	0.034
Ni	0.11	0.092	0.11	0.09	0.094	0.11
Pb	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Hg	---	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	<0.004	0.0022	0.0019	0.0025
V	---	<0.01	<0.01	<0.01	<0.01	<0.01
Se	<0.005	<0.005	<0.005	<0.005	0.0053	<0.005
As	<0.005	<0.005	<0.005	0.0023	<0.005	<0.005
Sum cations (meq/L)	7.58	6.21	6.66	7.29	6.95	6.66
Sum anions (meq/L)	8.04	7.36	7.07	7.51	7.53	7.37
Charge imbalance (percent)	-5.85	-16.9	-5.97	-3.02	-8.03	-10.1

Table 6. Selected historical ground-water quality analyses

Mill Area Wells

Well ID	MMW-28A	MMW-28A	MMW-28A	MMW-28A	MMW-28A
Sample Date	6/25/01	9/4/01	10/23/01	1/24/02	4/17/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in sand and gravel				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,076	8,075	8,062	8,046	8,059
Field Temperature (^{o}C)	10.4	19.8	11.7	5.3	11.3
pH, field, [lab]	6.26	5.95	6.08	6.12	6.01
Eh (V)	0.095	0.322	0.201	0.170	0.366
Spec Cond (µS/cm) field, [lab]	936	966	1,007	7,910	943
TDS (mg/L)	740	730	730	570	710
Constituent, dissolved (mg/L)					
Ca	160	160	150	130	140
Mg	33	35	32	28	31
Ba	0.013	0.014	0.017	0.012	0.015
Na	16	17	17	14	16
K	2.9	3	3.4	2.5	2.4
SO_4	430	460	410	340	430
Alkalinity (as HCO_3)	63	67	93	66	63
F	0.72	0.83	0.6	0.77	0.71
Cl	11	11	12	10	9.2
SiO_2	16	17	18	16	18
Al	0.27	0.23	0.14	0.17	0.21
Fe	<0.1	<0.1	<0.1	0.072	<0.1
Mn	0.042	0.052	0.0073	0.021	0.038
Cu	<0.01	<0.01	0.0025	0.0016	<0.01
Zn	0.15	0.15	0.1	0.12	0.13
Mo	<0.1	<0.1	0.027	<0.1	<0.1
Cd	<0.001	<0.001	0.0003	0.00062	<0.001
Ag	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.0011	0.0024	<0.01
Co	<0.01	<0.01	<0.01	0.00069	<0.01
Ni	<0.02	<0.02	0.01	0.012	0.013
Pb	<0.003	<0.003	<0.003	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	0.00007	0.0006	0.0006
V	<0.01	<0.01	<0.01	0.0026	<0.01
Se	<0.005	<0.005	<0.005	0.002	<0.005
As	<0.005	<0.005	<0.005	0.0028	<0.005
Sum cations (meq/L)	9.52	9.42	9.10	8.13	8.48
Sum anions (meq/L)	8.35	8.73	8.57	7.10	8.43
Charge imbalance (percent)	13.1	7.54	6.04	13.6	0.50

Table 6. Selected historical ground-water quality analyses

Mill Area Wells

Well ID	MMW-28B	MMW-28B	MMW-28B	MMW-28B	MMW-28B
Sample Date	6/25/01	9/4/01	10/23/01	1/24/02	4/17/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in granite				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,075	8,074	8,062	8,046	8,059
Field Temperature (^{o}C)	10.6	21.6	16.1	3.6	12.5
pH, field, [lab]	4.76	4.61	4.59	4.86	4.58
Eh (V)	0.035	0.338	0.134	0.120	0.323
Spec Cond (µS/cm) field, [lab]	977	956	990	928	973
TDS (mg/L)	780	740	770	690	760
Constituent, dissolved (mg/L)					
Ca	150	140	130	130	130
Mg	38	38	35	32	33
Ba	<0.01	0.02	0.011	0.011	0.01
Na	16	16	16	16	16
K	2.4	2.6	2.5	2.5	2.1
SO_4	530	510	520	490	520
Alkalinity (as HCO_3)	14	5.1	<5	<5	<5
F	2.3	3.1	2.3	1.8	2.2
Cl	12	9.1	8.9	10	7.8
SiO_2	20	21	21	18	21
Al	7.2	7.8	7.8	5.1	7.3
Fe	0.16	<0.1	<0.1	0.094	0.023
Mn	3.1	2.4	2.3	1.9	2.2
Cu	0.031	0.078	0.023	<0.01	<0.01
Zn	0.79	0.82	0.76	0.62	0.7
Mo	<0.1	<0.1	0.023	<0.1	<0.1
Cd	0.0052	0.0055	0.0046	0.004	0.0042
Ag	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	<0.01	<0.01	0.0023	0.0067	0.0027
Co	0.033	0.03	0.033	0.026	0.026
Ni	0.086	0.092	0.088	0.073	0.086
Pb	<0.003	<0.003	<0.003	<0.003	<0.003
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	0.0017	0.0018	0.002
V	<0.01	<0.01	<0.01	<0.01	<0.01
Se	<0.005	<0.005	<0.005	<0.005	<0.005
As	<0.005	<0.005	0.003	<0.005	<0.005
Sum cations (meq/L)	9.74	9.16	8.61	8.53	8.50
Sum anions (meq/L)	9.13	8.40	8.68	8.56	8.77
Charge imbalance (percent)	6.46	8.70	-0.77	-0.27	-3.05

Table 6. Selected historical ground-water quality analyses

Mill Area Wells

Well ID	MMW-43A	MMW-43A	MMW-43A	MMW-43A	MMW-43A
Sample Date	6/14/01	9/7/01	10/23/01	1/30/02	4/15/02
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in alluvium				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,098	8,097	8,084	---	8,078
Field Temperature (^{o}C)	9.7	14.2	15.6	7.7	17.6
pH, field, [lab]	6.43	6.88	6.89	7.02	6.9
Eh (V)	0.039	-0.032	-0.017	-0.013	-0.024
Spec Cond (µS/cm) field, [lab]	2,170	2,180	2,320	2,050	2,140
TDS (mg/L)	2,000	2,000	2,000	1,800	1,900
Constituent, dissolved (mg/L)					
Ca	470	450	430	400	400
Mg	92	92	95	78	79
Ba	0.037	0.042	0.055	0.033	0.044
Na	33	32	34	34	33
K	5.2	5.5	5.2	4.9	5
SO_4	1,200	1,200	1,200	1,100	1,200
Alkalinity (as HCO_3)	230	240	240	210	230
F	1.9	1.7	1.5	2	1.5
Cl	14	14	14	13	13
SiO_2	24	24	24	26	30
Al	0.13	<0.05	<0.05	0.052	1.6
Fe	3.2	3	2.9	2.5	5.7
Mn	3.1	3.1	2.9	2.7	2.9
Cu	<0.01	<0.01	<0.01	<0.01	0.0034
Zn	0.093	0.069	0.098	0.11	0.17
Mo	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	<0.001	<0.001	<0.001	<0.001	<0.001
Ag	<0.002	<0.002	<0.002	0.0011	<0.002
Cr	<0.01	<0.01	<0.01	0.0016	0.012
Co	<0.01	<0.01	0.0032	0.0034	0.0035
Ni	<0.02	<0.02	<0.0071	0.013	0.022
Pb	<0.003	<0.003	<0.003	<0.003	0.0014
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Be	<0.004	<0.004	0.00027	0.00074	0.0014
V	<0.01	<0.01	<0.01	<0.01	0.0017
Se	<0.005	<0.005	<0.005	<0.005	<0.005
As	<0.005	<0.005	0.0025	<0.005	<0.005
Sum cations (meq/L)	24.7	23.5	22.9	21.3	20.5
Sum anions (meq/L)	21.1	21.1	21.1	20.0	21.3
Charge imbalance (percent)	15.7	10.7	7.80	6.71	-3.86

Table 6. Selected historical ground water quality analyses

	Bitter Creek	Ranger Station Well	Junebug Camp-ground	Elephant Rock Campground
Well ID	BC Ranch Well	RSTW	GW-8	GW-9
Sample Date	6/17/00	5/17/00	11/8/94	11/8/94
Comments	---	---	no F value	no F value
Source ID (see table 2)	RGC 8-12	RGC 8-12	WC '96	WC '96
Lab ID	Paragon Analytics	Paragon Analytics	ETC	ETC
Aquifer	---	---	Alluvium	Alluvium
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^oC)	(10)	(10)	(10)	(10)
pH, field, [lab]	[3.8]	7.14	(7)	(7)
Eh (V)	(0.1)	(0.1)	(0.1)	(0.1)
Spec Cond (µS/cm) field, [lab]	[680]	[332]	---	---
TDS (mg/L)	490	220	---	---
Constituent, dissolved (mg/L)				
Ca	54	46	32.9	31.3
Mg	31	10	6.74	6.12
Ba	0.010	0.029	0.0309	0.0278
Na	16.0	<10	3.95	3.62
K	3	1.1	0.676	0.655
SO_4	320	100	60.6	50
Alkalinity (as HCO_3)	5	48	57	59
F	1.40	1.1	---	---
Cl	1.70	3.6	<5	<5
SiO_2	---	---	---	---
Al	3.30	<0.1	0.0621	<0.0543
Fe	0.87	<0.1	0.124	<0.0542
Mn	2.5	<0.01	0.0713	0.0017
Cu	0.04	<0.01	<0.008	<0.008
Zn	0.81	0.58	0.247	0.0952
Mo	0.10	<0.1	<0.02	<0.02
Cd	0.0017	<0.001	<0.0024	<0.0024
Ag	0.002	<0.002	<0.061	<0.0061
Cr	0.01	<0.01	<0.0029	<0.0029
Co	0.037	<0.01	<0.0042	<0.0042
Ni	0.062	<0.02	<0.0053	<0.0053
Pb	0.003	<0.003	<0.0019	<0.0019
Hg	---	---	<0.0001	<0.0001
Be	0.004	<0.004	<0.0002	<0.0002
V	0.01	<0.01	<0.002	<0.002
Se	0.005	<0.005	0.0026	<0.0025
As	0.005	<0.005	<0.0024	<0.0024
Sum cations (meq/L)	5.63	2.91	2.27	2.14
Sum anions (meq/L)	5.77	2.77	2.07	1.90
Charge imbalance (percent)	-2.36	4.80	9.44	11.6

Table 6. Selected historical ground water quality analyses

Straight Creek

Well ID	AWWT-1	AWWT-1	AWWT-1	AWWT-1	AWWT-1
Sample Date	11/11/82	11/8/94	4/13/00	3/1/02	3/27/02
Comments	MC DB 45.1	MCDB 92.5	MCDB 0.0055	---	---
Source ID (see table 2)	Culp/Wesner/ Culp, Russell Church	WC '96, MC DB	RGC 8/13, RGC 8/10, MCDB	Lab sheet	MC CD
Lab ID	Industrial Lab Co.	ETC	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Well completed in bedrock				
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	(10)	(10)	(10)	(10)	(10)
pH, field, [lab]	(4)	3.9	(4)	(4)	(4)
Eh (V)	(0.5)	(0.5)	(0.5)	(0.5)	(0.6)
Spec Cond (µS/cm) field, [lab]	---	---	---	---	(1,400)
TDS (mg/L)	985	1,410	---	---	1300, 1350
Constituent, dissolved (mg/L)					
Ca	135	151	160	160	155
Mg	48	48.8	51	52	53.9
Ba	0.4	0.0034	0.016	0.013	0.005
Na	32	14.7	15	16	16.1
K	3.0	2.55	2.6	3.7	2.9
SO_4	705	907	910	910	980
Alkalinity (as HCO_3)	<3.0	<5	---	---	<10
F	1.4	---	---	---	2.7
Cl	4.3	6	5.5	0.51	5
SiO_2	---	---	64.2	64.2	---
Al	---	37.5	34	36	38.7
Fe	60	32	36	37	34.4
Mn	3.9	5.91	5.6	5.7	5.63
Cu	---	0.0451 [1]	<0.01	<0.01	0.0014
Zn	---	1.96	2.1	2.1	2.03
Mo	---	0.033	<0.1	<0.1	<0.0005
Cd	<0.01	0.0055	0.002	0.0036	0.0041
Ag	<0.01	<0.0061	<0.002	<0.002	<0.0005
Cr	<0.01	0.0114	0.24	0.099	0.083
Co	---	0.0925 [2]	0.1	0.11	0.0872
Ni	---	0.223	0.27	0.28	0.27
Pb	0.02	<0.0019	<0.003	0.003	0.0001
Hg	<0.001	<0.0001	---	0.000054	<0.001
Be	---	0.0056 [3]	0.0053	0.0049	0.0047
V	---	<0.002	<0.01	0.002	<0.03
Se	<0.01	<0.0025	<0.005	0.0067	<0.005
As	<0.01	<0.0024	<0.005	0.0022	<0.003
Sum cations (meq/L)	12.6	12.5	14.0	14.3	13.1
Sum anions (meq/L)	11.6	13.5	13.5	13.2	14.8
Charge imbalance (percent)	8.34	-7.91	3.70	8.20	-12.4

Table 6. Selected historical ground water quality analyses

	Straight Creek			
Well ID	SC-1B	SC-2B	SC-3A	SC-3B
Sample Date	3/26/02	3/25/02	3/25/02	3/26/02
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Bedrock	Mixed/Bedrock	Alluvium	Bedrock
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	(8)	(7)	(7)	(7)
pH, field, [lab]	(7)	(7)	(4)	(6)
Eh (V)	(0.3)	(0.3)	(0.8)	(0.4)
Spec Cond (µS/cm) field, [lab]	(3,300)	(2,600)	(2,300)	(3,000)
TDS (mg/L)	3,230	2,380	2,300	2800
Constituent, dissolved (mg/L)				
Ca	518	477	306	494
Mg	227	117	90.9	152
Ba	0.014	0.007	<0.02	0.006
Na	61.7	21.2	15.5	31.6
K	13.7	3.8	1.1	2.5
SO_4	2,020	1,620	1,770	1,970
Alkalinity (as HCO_3)	405	129	<10	83
F	1.7	6.8	1.1	6.8
Cl	14	5	10	5
SiO_2	---	---	---	---
Al	<0.3	1.02	85	4.85
Fe	3	34.7	0.53	54.1
Mn	6.08	16.8	14.9	23
Cu	0.004	0.0071	0.799	0.0022
Zn	0.69	1.37	5.29	4.16
Mo	0.004	0.0006	0.0004	0.0001
Cd	0.0002	0.0002	0.0232	0.0005
Ag	<0.0005	<0.0005	<0.003	<0.001
Cr	0.0015	0.0006	0.012	0.0007
Co	0.00695	0.156	0.205	0.204
Ni	<0.1	0.46	0.52	0.43
Pb	<0.0005	0.0003	0.0006	0.0417
Hg	<0.001	<0.001	<0.001	<0.001
Be	0.0003	0.0163	0.016	0.0188
V	<0.05	<0.05	<0.05	<0.05
Se	<0.005	<0.005	<0.005	<0.005
As	0.0005	0.0005	<0.03	0.0006
Sum cations (meq/L)	33.9	25.9	21.4	28.9
Sum anions (meq/L)	35.1	25.8	24.5	29.9
Charge imbalance (percent)	-3.52	0.51	-13.6	-3.12

Table 6. Selected historical ground water quality analyses

	Straight Creek		
Well ID	SC-4A	SC-5A	SC-5B
Sample Date	3/25/02	3/27/02	3/27/02
Comments	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD
Lab ID	Paragon Analytics	Paragon Analytics	Paragon Analytics
Aquifer	Alluvial	Alluvium	Mixed/Bedrock
Depth to Water (m)	---	---	---
Water Elevation (ft)	---	---	---
Field Temperature (^{o}C)	(7)	(7)	(8)
pH, field, [lab]	(4)	(4)	(8)
Eh (V)	(0.6)	(0.8)	(0.3)
Spec Cond (µS/cm) field, [lab]	(2,500)	(1,600)	(2,400)
TDS (mg/L)	2,390	1,210	2,260
Constituent, dissolved (mg/L)			
Ca	292	130	524
Mg	138	50.8	38
Ba	<0.02	<0.01	0.029
Na	25.6	14	42.7
K	2.9	1.8	4.7
SO_4	1,790	930	1,410
Alkalinity (as HCO_3)	<10	<10	130
F	4.2	<2.4	1.8
Cl	4	5	8
SiO_2	---	---	---
Al	57.5	50.1	<0.3
Fe	50.9	0.41	4.3
Mn	18.7	5.66	2.66
Cu	0.072	0.162	0.0026
Zn	5.22	2.23	<0.1
Mo	<0.0005	<0.0005	0.005
Cd	0.0129	0.0081	<0.0005
Ag	<0.001	<0.0005	<0.0005
Cr	0.0022	0.0042	<0.0007
Co	0.216	0.0971	0.00725
Ni	0.54	0.25	<0.1
Pb	<0.0005	<0.0005	<0.0005
Hg	<0.001	<0.001	<0.001
Be	0.0146	0.0057	<0.001
V	<0.05	<0.03	<0.05
Se	<0.005	<0.005	<0.005
As	<0.01	<0.003	<0.003
Sum cations (meq/L)	24.2	11.9	22.7
Sum anions (meq/L)	25.5	13.7	23.1
Charge imbalance (percent)	-5.26	-14.3	-1.79

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

[ACZ, New Mexico state lab; b, low bias; C.I., Charge Imbalance; ETC, Molycorp lab; ft, feet; ID, Identification; J, estimated concentration; m, meter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; µS/cm, microsemens per centimeter; MC CD, Molycorp database on compact disc; MC DB, Molycorp electronic database prior to DP-1055; MMW, Mine Monitoring Well; MMW wkst, Molycorp in-house document; ND, non-detectable; RGC, Robertson GeoConsultants; SLD, New Mexico state lab; Spec Cond, Specific Conductance; SPRI, South Pass Resources Investigations, Inc.; u, non-detect; V, volts; [ ], lab value or total value; ---, no data; <, less than; #, rounded down to 3 significant figures; *, special note]

Geographic Location	**Questa Ranger Station**		**Capulin Canyon Valley**		
Well ID	**RSTW**	**RSTW**	**MMW-2**	**MMW-2**	**MMW-2**
Sample Date	8/24/93	5/17/00	11/8/94	11/8/94	11/8/94
Miscellaneous information	unfiltered [total]	---	filtered, complimentary analyses	filtered, complimentary analyses	filtered
Comments	---	---	*1 Fe = 61 SLD results & Slifer / 46 SLD remarks	---	---
Source ID (see table 2)	Slifer 1996	RGC 8-12 Appendix A	Slifer 1996	Slifer 1996	SPRI '95, SRK '95, MC DB, MMW wkst
Lab ID (see table 2)	SLD	ACZ, Paragon	SLD IC 940669	SLD WC 946438	ETC
Depth to water (m)	---	---	9.66	9.66	9.66
Water elevation (ft)	---	---	---	---	---
Field temperature (^{o}C)	---	---	---	---	7.9
pH, field, [lab]	7.3	7.14	7.3, [3.86]	[3.86]	4.9
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	215	[332]	[3,140 #]	[3,140 #]	3,680
TDS (mg/L)	---	220	3,520 #	3520 #	3,400
Constituent, dissolved (mg/L)					
Ca	---	46	600	---	501
Mg	---	10	150	---	137
Ba	---	0.029	< 0.1	---	< 0.01
Na	---	< 10	---	81	64.6
K	---	1.1	---	28	10.8
SO_4	96	100	---	2,180 #	2,100
Alkalinity (as HCO_3)	---	48	< 3	< 3	< 1
F	---	1.1	---	28	24
Cl	---	3.6	---	< 5	6.8
SiO_2	---	---	49.2	---	43
Al	[< 0.1]	< 0.1	68	---	63.5
Fe	[< 0.1]	< 0.1	46 *1	---	50.8
Mn	[< 0.05]	< 0.01	53	---	52.1
Cu	[< 0.05]	< 0.01	< 0.1	---	0.088
Zn	[0.09]	0.58	10	---	9.48
Mo	[< 0.1]	< 0.1	< 0.01	---	< 0.02
Cd	[0.001]	< 0.001	0.02	---	0.024
Ag	---	< 0.002	< 0.01	---	< 0.1
Cr	---	< 0.01	< 0.01	---	< 0.01
Co	[< 0.05]	< 0.01	0.33	---	0.28
Ni	[< 0.1]	< 0.02	0.7	---	0.61
Pb	[0.018]	< 0.003	< 0.01	---	< 0.002
Hg	---	---	< 0.0005	---	< 0.0002
Be	---	< 0.004	0.03	---	0.015
V	---	< 0.01	< 0.01	---	< 0.01
Se	---	< 0.005	< 0.05	---	< 0.05
As	---	< 0.005	0.02	---	< 0.005
Sum cations (meq/L)	---	2.91	---	---	34.2
Sum anions (meq/L)	---	2.77	---	---	28.9
Charge imbalance (percent)	---	4.80	---	---	16.7

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon Valley**					
Well ID	MMW-2	MMW-2	MMW-2	MMW-2	MMW-2	MMW-2
Sample Date	6/1/95	4/17/96	8/1/96	1/1/97	6/25/97	11/7/97
Miscellaneous information	filtered	filtered	filtered	pumped dry	filtered	MC DB sited reference FM from M3.000
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	MMW wkst	MMW wkst	MMW wkst	NMED: ACZ lab sheet, MC DB	MC DB
Lab ID (see table 2)	---	---	---	---	ACZ RG 46912	---
Depth to Water (m)	---	10.5	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	9.7	---	9.2	---	10.6
pH, field, [lab]	4.92	5.29	4.58	5.16	---	3.74
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	2,980	3,010	3,010	2,560	[2,500]	---
TDS (mg/L)	---	3,480 #	---	---	2440, 2600	---
Constituent, dissolved (mg/L)						
Ca	---	---	460	---	337	---
Mg	---	166 #	125 #	---	107	---
Ba	---	< 0.1	< 0.01	---	< 0.006	---
Na	---	72	61	---	43	---
K	---	---	12	---	8	---
SO_4	2,210 #	2,220 #	2,000	---	1,660	---
Alkalinity (as HCO_3)	---	< 1	---	---	< 2	---
F	25.2	21.9	---	---	17	---
Cl	---	---	7	---	6	---
SiO_2	---	---	51	---	180	---
Al	17.9	31.2 #	68	---	97.2	---
Fe	23.3	27	46.7 #	---	23.8	---
Mn	37.8	38.8	25.4	---	47.9	---
Cu	0.07	0.114	0.139	---	0.38	---
Zn	7.8	7.93	9.18	---	9.68	---
Mo	< 0.02	< 0.02	0.02	---	< 0.02	---
Cd	0.022	0.035	0.0041	---	0.03	---
Ag	---	< 0.01	< 0.05	---	< 0.003	---
Cr	---	< 0.01	< 0.01	---	< 0.02	---
Co	---	0.24	0.28	---	0.32	---
Ni	---	0.53	0.63	---	0.7	---
Pb	< 0.1	< 0.005	---	---	0.004	---
Hg	---	< 0.0002	< 0.0002	---	< 0.0002	---
Be	---	0.025	0.032	---	0.039	---
V	---	< 0.01	< 0.01	---	< 0.01	---
Se	---	0.012	0.022	---	< 0.001	---
As	---	0.07	0.08	---	< 0.005	---
Sum cations (meq/L)	---	---	31.3	---	28.0	---
Sum anions (meq/L)	---	---	26.4	---	22.0	---
Charge imbalance (percent)	---	---	16.8	---	23.9	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon Valley**			
Well ID	MMW-2	MMW-2	MMW-2	MMW-2
Sample Date	6/9/98	6/9/98	6/9/98	2/4/00
Miscellaneous information	filtered	filtered	filtered	filtered
Comments	---	---	*1 Cl one order of mag too high, plotted as 6.68	---
Source ID (see table 2)	NMED: ACZ lab sheet, MC DB	NMED: SLD lab sheet	NMED: SLD lab sheet	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	ACZ RG 70639	SLD HM 98-01017	SLD WC-98 02507	Paragon Analytics
Depth to Water (m)	10.7	---	10.7	10.6
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	9.9	9.9	9.9	9.1
pH, field, [lab]	4.27	4.27	4.27	4.01
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	2,920	---	2,920	2,540
TDS (mg/L)	2780, 3080	---	2,960	2,600
Constituent, dissolved (mg/L)				
Ca	343	---	337	280
Mg	122	54	118	96
Ba	< 0.01	---	---	< 0.01
Na	44.9	---	40.5	42
K	10.2	---	9.62	11
SO_4	2,020	---	2,070	1,700
Alkalinity (as HCO_3)	< 2	---	---	10
F	28	---	---	20
Cl	7	---	66.8 *1	7.1
SiO_2	64	---	---	68
Al	95.9	85	---	76
Fe	46	52	---	29
Mn	49.8	---	---	46
Cu	0.19	< 0.5	---	0.25
Zn	9.98	9.4	---	8.4
Mo	< 0.01	< 0.05	---	< 0.1
Cd	0.03	0.03	---	0.03
Ag	< 0.0005	< 0.05	---	< 0.002
Cr	< 0.01	< 0.05	---	< 0.01
Co	0.32	---	---	0.29
Ni	0.73	0.79	---	0.65
Pb	0.003	< 0.01	---	< 0.03
Hg	< 0.0002	---	---	< 0.0002
Be	0.031	---	---	0.033
V	< 0.005	---	---	< 0.01
Se	< 0.001	< 0.05	---	0.026
As	< 0.001	< 0.05	---	0.055
Sum cations (meq/L)	28.5	---	18.5	23.6
Sum anions (meq/L)	28.3	---	33.2	24.8
Charge imbalance (percent)	0.62	---	-56.9	-5.09

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon Valley**				
Well ID	MMW-2	MMW-2	MMW-2	MMW-2	MMW-2
Sample Date	6/6/01	8/27/01	10/26/01	2/21/02	6/3/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytic
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,664	7,666	7,664	7,666	7,665
Field Temperature (^{o}C)	10	17.7	15.1	9	21.1
pH, field, [lab]	4.57	5.87	4.45	4.18	4.09
Eh (V)	0.28	0.131	0.253	0.317	0.314
Spec Cond (µS/cm) field, [lab]	2,370	2,440	2,500	2,320	2,300
TDS (mg/L)	2,500	2,500	2,500	2,500	2,400
Constituent, dissolved (mg/L)					
Ca	320	490	310	300	260
Mg	100	72	98	100	95
Ba	< 0.01	0.01	0.0086	< 0.01	0.0067
Na	42	71	46	43	37
K	12	12	12	12	11
SO_4	1,800	1,700	1,700	1,800	1,700
Alkalinity (as HCO_3)	< 5	50	< 5	< 5	< 5
F	19	12	18	19	21
Cl	5.3	7.4	6.7	8.7	6.4
SiO_2	62	26	56	68	68
Al	67	8.4	61	67	71
Fe	43	19	43	39	41
Mn	38	21	38	41	40
Cu	0.19	0.049	0.14	0.17	0.18
Zn	7.8	4.1	7.3	8.5	7.4
Mo	< 0.1	< 0.1	0.027	< 0.1	< 0.1
Cd	0.025	0.011	0.023	0.025	0.024
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	0.0015	0.0016	0.0068
Co	0.26	0.11	0.24	0.26	0.25
Ni	0.56	0.25	0.54	0.57	0.55
Pb	< 0.015	0.009	< 0.015	< 0.015	< 0.015
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.03	0.015	0.026	0.028	0.03
V	< 0.01	< 0.01	0.0013	0.0013	0.0011
Se	0.014	0.011	0.021	0.022	0.013
As	0.036	0.025	0.039	0.047	0.035
Sum cations (meq/L)	24.4	24.8	23.6	23.8	21.4
Sum anions (meq/L)	26.1	25.6	24.3	26.5	24.2
Charge imbalance (percent)	-6.49	-3.09	-2.91	-10.4	-12.3

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon Valley**			
Well ID	MMW-3	MMW-3	MMW-3	MMW-3
Sample Date	11/7/94	11/7/94	11/7/94	11/7/94
Miscellaneous information	filtered	discrepency below: SLD results/SLD remarks	filtered and unfiltered [Total]	filtered
Comments	---	*1 Al=1.0 /0.7, *2 Mn= 33/37, *3 Zn= 1.3/1.2, *4 Co= 0.07 /0.08	---	difference in MC DB: Ca= 659, Mg= 108; and MMW wkst: Al= 0.63
Source ID (see table 2)	Slifer 1996	Slifer 1996	WC 96	SPRI '95, WC 96, SRK '95, MC DB, MMW wkst
Lab ID (see table 2)	SLD WC 94-6427	SLD IC 94-0658	ETC	ETC
Depth to Water (m)	---	8.5	---	8.46
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	---	---	10.9
pH, field, [lab]	[7.63]	7.5	7.5	7.5
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	[2,720 #]	2,050	3,970	3,970
TDS (mg/L)	3,070	3,070	2,990	2,900
Constituent, dissolved (mg/L)				
Ca	498	640	571 [589]	567
Mg	112	110	94.7 [95.3]	96.2
Ba	---	< 0.1	0.0524 J [0.0502 J]	0.047
Na	103	---	107 J [107]	103
K	10	---	6.37 [6.37]	7.5
SO_4	1,760 #	---	17.4 J	1,700
Alkalinity (as HCO_3)	209	---	240	222
F	2.8	---	---	2.59
Cl	< 5	---	6	5.8
SiO_2	---	15.2	---	16.3
Al	---	0.7 *1	1.42 [4.53]	0.75
Fe	---	0.1	0.126 [0.472]	0.076
Mn	---	37 *2	29.6 [30.5]	34.5
Cu	---	< 0.1	< 0.008 [<0.008]	< 0.01
Zn	---	1.2 *3	1.14 [1.13]	1.36
Mo	---	< 0.01	0.039 J [0.0406 J]	< 0.02
Cd	---	0.003	0.0027 J [0.0024 U]	0.0024
Ag	---	< 0.01	< 0.0061 [<0.0061]	< 0.1
Cr	---	< 0.01	0.0047 J [0.0061]	< 0.01
Co	---	0.08 *4	0.0697 [0.0688]	0.089
Ni	---	0.2	0.195 [0.196]	0.236
Pb	---	< 0.1	< 0.0019 UJ [0.0026 J]	< 0.002
Hg	---	< 0.0005	< 0.0001 [<0.0001]	< 0.0002
Be	---	< 0.01	0.0025 J [0.0035 J]	< 0.004
V	---	< 0.01	< 0.002 [<0.002]	< 0.01
Se	---	< 0.05	< 0.0025 UJ [<0.0025 UJ]	< 0.005
As	---	< 0.01	< 0.0024 [<0.0024]	< 0.005
Sum cations (meq/L)	28.7	---	41.6	30.5
Sum anions (meq/L)	28.8	---	3.77	27.7
Charge imbalance (percent)	-0.10	---	167	9.86

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon Valley**					
Well ID	MMW-3	MMW-3	MMW-3	MMW-3	MMW-3	MMW-3
Sample Date	11/8/94	6/1/95	4/17/96	8/1/96	1/1/97	6/25/97
Miscellaneous information	SRK is the source from MC DB	filtered	filtered	filtered	filtered	---
Comments	Accuracy of this data NOT verified	---	---	---	---	---
Source ID (see table 2)	MC DB	MMW wkst	MMW wkst	MMW wkst	MMW wkst	NMED: ACZ lab sheet, MC DB
Lab ID (see table 2)	ETC	---	---	---	---	ACZ RG 46913
Depth to Water (m)	---	---	9.76	---	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	10.2	---	9.9	---
pH, field, [lab]	4.9	6.51	6.91	6.86	6.76	---
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	2,570 #	2,400	2,340	2,160	[2,500]
TDS (mg/L)	3,400	---	---	---	---	2030, 2070
Constituent, dissolved (mg/L)						
Ca	---	---	---	460	439	482
Mg	---	---	157 #	101 #	5.33	53.1
Ba	---	---	< 0.1	0.03	0.038	0.032
Na	---	---	110	110	106	115
K	---	---	---	7	5.9	7
SO_4	---	1,300 #	1,380 #	1,200	1,490 #	1,190
Alkalinity (as HCO_3)	---	---	233	---	---	257
F	---	3.21	2.9	---	3.58	3
Cl	---	---	---	ND	---	3
SiO_2	---	---	---	15	34	35.1
Al	---	0.3	0.396	0.2	0.26	< 0.2
Fe	50.8	1.1	< 0.05	0.083	0.46	< 0.02
Mn	52.1	14.9	6.08	3.11	5.33	5.03
Cu	0.088	0.02	0.009	< 0.01	< 0.01	< 0.1
Zn	9.48	0.24	< 0.5	0.092	0.07	0.12
Mo	---	< 0.02	< 0.2	< 0.02	< 0.02	< 0.02
Cd	---	< 0.005	< 0.01	< 0.0005	< 0.0005	0.0005
Ag	---	---	< 0.01	< 0.01	< 0.0002	< 0.003
Cr	---	---	< 0.01	< 0.01	0.01	< 0.2
Co	---	---	< 0.01	< 0.01	< 0.01	< 0.02
Ni	---	---	< 0.02	< 0.02	0.02	< 0.02
Pb	---	< 0.1	< 0.005	---	< 0.001	< 0.001
Hg	---	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	---	---	< 0.005	< 0.004	0.0011	< 0.004
V	---	---	< 0.01	< 0.01	< 0.005	< 0.01
Se	---	---	< 0.005	0.005	< 0.001	< 0.001
As	---	---	< 0.01	0.007	< 0.001	< 0.001
Sum cations (meq/L)	---	---	---	28.3	19.7	26.1
Sum anions (meq/L)	---	---	---	16.9	23.6	21.5
Charge imbalance (percent)	---	---	---	50.4	-17.9	19.2

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon Valley**				
Well ID	MMW-3	MMW-3	MMW-3	MMW-3	MMW-3
Sample Date	11/7/97	6/9/98	6/9/98	2/4/00	6/6/01
Miscellaneous information	---	filtered	filtered	filtered	filtered
Comments	curious Mg=Mn and no Alk.	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	NMED: ACZ lab sheet, MC DB	NMED: SLD lab sheet	MC DB, MMW wkst, RGC 8/10	MC CD
Lab ID (see table 2)	---	ACZ RG 70640	SLD WC-98 02500	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	10.2	10.2	9.86	---
Water Elevation (ft)	---	---	---	---	7,669
Field Temperature (^{o}C)	10.4	10.6	10.6	9.6	10.5
pH, field, [lab]	6.91	6.7	6.7, [7.97]	6.21	6.74
Eh (V)	---	---	---	---	0.278
Spec Cond (µS/cm) field, [lab]	---	2,470	2,470	2,800	2,330
TDS (mg/L)	2,130	2020, 2100	2,090	2,300	2,100
Constituent, dissolved (mg/L)					
Ca	428	430	405	500	470
Mg	49.1	52.7	47.1	63	56
Ba	0.029	0.035	---	0.026	0.026
Na	99.3	107	95.6	91	97
K	4.9	6.2	6.35	9.9	9.4
SO_4	1,250	1,270	1,230	1,300	1,300
Alkalinity (as HCO_3)	250	226	232	170	230
F	2.9	3	---	4.6	3.5
Cl	5	5	< 10	5	4.9
SiO_2	15.2	16	---	19.5	16.3
Al	0.16	0.28	---	1.4	1.7
Fe	0.07	0.61	---	0.22	0.63
Mn	4.07	5.26	---	13	6
Cu	< 0.02	< 0.01	---	0.021	< 0.01
Zn	0.07	0.17	---	0.1	0.35
Mo	< 0.02	0.01	---	< 0.1	< 0.1
Cd	< 0.03	< 0.0005	---	0.0069	0.002
Ag	< 0.01	< 0.0005	---	< 0.002	< 0.002
Cr	< 0.02	< 0.01	---	< 0.01	< 0.01
Co	< 0.02	0.01	---	0.047	0.016
Ni	< 0.02	0.02	---	0.091	0.031
Pb	< 0.08	< 0.001	---	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	---	< 0.0002	< 0.0002
Be	< 0.02	< 0.002	---	< 0.004	< 0.004
V	< 0.01	< 0.005	---	< 0.01	< 0.01
Se	< 0.002	< 0.001	---	0.011	< 0.005
As	< 0.001	< 0.001	---	0.0069	< 0.005
Sum cations (meq/L)	22.6	23.3	21.4	26.4	24.7
Sum anions (meq/L)	23.0	22.9	22.4	21.6	22.9
Charge imbalance (percent)	-1.78	1.79	-4.61	19.8	7.54

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon Valley**				
Well ID	MMW-3	MMW-3	MMW-3	MMW-3	MMW-3
Sample Date	8/27/01	10/26/01	2/21/02	6/3/02	6/3/02
Miscellaneous information	filtered	filtered	filtered	filtered + duplicate	filtered
Comments	---	---	---	---	see EPA symbol key
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,669	7,668	7,669	7,668	7,668
Field Temperature (^{o}C)	14.3	16.3	8.8	19.8	19.8
pH, field, [lab]	6.81	6.67	6.79	6.82	6.82
Eh (V)	0.141	0.078	0.061	0.091	0.091
Spec Cond (µS/cm) field, [lab]	2,280	2,400	2,320	2,370	2,370
TDS (mg/L)	2,100	2,100	2,100	2,100	2,100
Constituent, dissolved (mg/L)					
Ca	460	470	470	490	490
Mg	47	50	48	49	49
Ba	0.026	0.027	0.025	0.026	0.025
Na	94	100	110	110	100
K	8.7	9	8.8	8.7	8.6
SO_4	1,300	1,300	1,300	1,300	1,300
Alkalinity (as HCO_3)	230	240	230	240	240
F	3.3	3.2	4	2.5	2.5
Cl	4.6	4.8	4.3	5.2	4.7
SiO_2	14.8	15.2	16.3	16.1	15.2
Al	< 0.05	< 0.05	< 0.05	0.019	< 0.05
Fe	< 0.1	0.19	0.27	< 0.1	< 0.1
Mn	4.7	4.2	4	3.4	3.3
Cu	< 0.01	< 0.0005	0	0.0011	0.00083
Zn	0.19	0.16	0.14	0.13	0.13
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.001	0.00077	< 0.001	0.00048	0.00038
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Co	< 0.01	0.0088	0.0085	0.0074	0.007
Ni	< 0.02	0.018	0.015	0.015	0.014
Pb	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	< 0.004	0.00059	0.0013	< 0.004	< 0.004
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.0059	< 0.005	< 0.005	0.0038	0.0039
As	< 0.005	0.003	< 0.005	0.0019	< 0.003
Sum cations (meq/L)	23.2	24.0	24.7	24.9	24.5
Sum anions (meq/L)	23.1	23.0	23.3	22.6	22.6
Charge imbalance (percent)	0.74	4.30	5.87	9.87	8.15

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon**			
Well ID	MMW-23A	MMW-23A	MMW-23A	MMW-23A
Sample Date	1/18/00	6/12/01	9/19/01	4/11/02
Miscellaneous information	filtered	filtered	filtered	filtered
Comments	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	3.1	---	---	---
Water Elevation (ft)	---	8,764	8,766	---
Field Temperature (^{o}C)	6	21.1	11.8	13.4
pH, field, [lab]	5.97	5.51	4.5	5.08
Eh (V)	---	0.073	0.362	0.012
Spec Cond (µS/cm) field, [lab]	2,250	1,820 #	3,330	2,310
TDS (mg/L)	2,000	1,800	4,000	2,300
Constituent, dissolved (mg/L)				
Ca	490	460	480	390
Mg	52	41	160	73
Ba	0.013	0.014	0.013	0.014
Na	52	55	32	40
K	5.9	8.1	4.4	4.1
SO_4	1,300	1,200	2,700	1,500
Alkalinity (as HCO_3)	45	67	< 5	7
F	20	8	46	37
Cl	6.2	7.3	6.2	6
SiO_2	36.4	21	64	47
Al	11	2.6	110	37
Fe	2.8	0.37	2.4	0.5
Mn	33	22	99	48
Cu	< 0.01	0.054	0.58	0.01
Zn	4.5	2.9	18	8.2
Mo	< 0.1	< 0.1	< 0.1	0.043
Cd	0.002	0.004	0.039	0.0024
Ag	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	< 0.01
Co	0.077	0.041	0.43	0.16
Ni	0.22	0.13	1	0.48
Pb	< 0.012	< 0.009	0.03	0.016
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.17	0.06	0.28	0.14
V	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.019	0.0087	0.037	0.022
As	< 0.005	0.008	0.08	0.13
Sum cations (meq/L)	24.7	21.8	33.9	22.5
Sum anions (meq/L)	19.9	18.4	37.5	22.6
Charge imbalance (percent)	21.5	17.0	-10.2	-0.01

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon**			
Well ID	MMW-23B	MMW-23B	MMW-23B	MMW-23B
Sample Date	1/18/00	6/12/01	9/19/01	10/17/01
Miscellaneous information	filtered	filtered	filtered	filtered
Comments	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	4.8	---	---	---
Water Elevation (ft)	---	8,761	8,760	8,759
Field Temperature (^{o}C)	7.8	13.4	9.5	11.4
pH, field, [lab]	7.76	6.73	7.78	7.81
Eh (V)	---	0.098	0.138	0.049
Spec Cond (µS/cm) field, [lab]	811	743	764	783
TDS (mg/L)	500	470	480	460
Constituent, dissolved (mg/L)				
Ca	53	41	35	35
Mg	8.6	7.3	6.6	5.9
Ba	0.013	< 0.01	< 0.01	0.0068
Na	98	110	120	120
K	2.9	3.4	1.6	1.7
SO_4	250	230	240	240
Alkalinity (as HCO_3)	120	120	120	120
F	3	2.9	2.8	2.5
Cl	1.1	1.2	1.2	1
SiO_2	13.1	13	13	13
Al	0.31	< 0.05	< 0.05	< 0.05
Fe	0.13	< 0.1	< 0.1	< 0.1
Mn	0.65	0.15	0.051	0.045
Cu	< 0.01	< 0.01	< 0.01	< 0.01
Zn	0.14	0.023	< 0.02	< 0.02
Mo	< 0.1	< 0.1	< 0.1	< 0.1
Cd	< 0.001	< 0.001	< 0.001	< 0.001
Ag	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	< 0.01
Co	< 0.01	< 0.01	< 0.01	< 0.01
Ni	< 0.02	< 0.02	< 0.02	0.00097
Pb	< 0.003	< 0.003	< 0.003	< 0.003
Hg	---	< 0.0002	< 0.0002	< 0.0002
Be	< 0.004	< 0.004	< 0.004	< 0.004
V	< 0.01	< 0.01	< 0.01	< 0.01
Se	< 0.005	< 0.005	< 0.005	0.0029
As	< 0.005	< 0.005	< 0.005	0.0047
Sum cations (meq/L)	7.18	7.09	7.16	7.11
Sum anions (meq/L)	6.81	6.50	6.75	6.73
Charge imbalance (percent)	5.20	8.58	5.86	5.40

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin Canyon**		
Well ID	MMW-23B	MMW-23B	MMW-23B
Sample Date	3/13/02	4/11/02	7/15/02
Miscellaneous information	filtered	filtered	filtered
Comments	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---
Water Elevation (ft)	8,761	8,761	---
Field Temperature (^{o}C)	6	13	14.9
pH, field, [lab]	7.42	7.9	8.09
Eh (V)	-0.025	0.124	0.018
Spec Cond (µS/cm) field, [lab]	758	746	759
TDS (mg/L)	490	480	490
Constituent, dissolved (mg/L)			
Ca	34	35	37
Mg	5.9	6.3	6.6
Ba	0.0056	0.0058	0.0057
Na	120	120	110
K	1.8	1.9	2
SO_4	240	240	240
Alkalinity (as HCO_3)	120	120	110
F	2.7	2.6	2.7
Cl	1	< 1	0.94
SiO_2	13	13	12
Al	0.0085	< 0.05	0.035
Fe	0.029	< 0.1	0.028
Mn	0.043	0.044	0.04
Cu	< 0.01	< 0.01	< 0.01
Zn	< 0.02	0.0039	0.00073
Mo	0.029	< 0.1	< 0.1
Cd	< 0.001	< 0.001	0.00034
Ag	< 0.002	< 0.002	< 0.002
Cr	0.0018	0.0011	0.0022
Co	< 0.01	< 0.01	0.0011
Ni	0.0047	0.0026	0.0015
Pb	< 0.003	< 0.003	< 0.003
Hg	< 0.0002	< 0.0002	< 0.0002
Be	< 0.004	< 0.004	0.00069
V	< 0.01	< 0.01	< 0.01
Se	< 0.005	< 0.005	< 0.005
As	< 0.005	< 0.005	0.0036
Sum cations (meq/L)	7.09	7.13	6.79
Sum anions (meq/L)	6.77	6.70	6.54
Charge imbalance (percent)	4.58	6.29	3.89

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Capulin, in old channel**	**Capulin on River**
Well ID	Well 3	Well 4
Sample Date	6/1/99	6/1/99
Miscellaneous information	J ="estimated values" (field duplicates inconsistent)	J ="estimated values" (field duplicates inconsistent)
Comments	see EPA symbol key	see EPA symbol key
Source ID (see table 2)	EPA memo	EPA memo
Lab ID (see table 2)	EPA Lab ID: SWOK	EPA Lab ID: SWOK
Depth to Water (m)	---	---
Water Elevation (ft)	---	---
Field Temperature (^{o}C)	---	---
pH, field, [lab]	---	---
Eh (V)	---	---
Spec Cond (µS/cm) field, [lab]	---	---
TDS (mg/L)	---	---
Constituent, dissolved (mg/L)		
Ca	205	239
Mg	60.9	66.9
Ba	0.0064	0.0174
Na	27.4	27.1
K	3.98	4.76
SO_4	---	---
Alkalinity (as HCO_3)	---	---
F	---	---
Cl	---	---
SiO_2	---	---
Al	112	141
Fe	18.6 J	2.67 J
Mn	18.7	18.8
Cu	1.08	1.21
Zn	4.61	4.85
Mo	---	---
Cd	0.0198	0.0201
Ag	< 0.001	< 0.001
Cr	0.0015 J	0.0031 J
Co	0.214	0.242
Ni	0.435	0.483
Pb	0.0029 J	0.0063 J
Hg	0.00031 Jb	< 0.0001
Be	0.0239	0.0254
V	< 0.001	< 0.001
Se	< 0.003	< 0.003
As	< 0.003	0.0041
Sum cations (meq/L)	---	---
Sum anions (meq/L)	---	---
Charge imbalance (percent)	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Goat Hill Gulch along Access Road**					
Well ID	MMW-42A	MMW-42A	MMW-42A	MMW-42A	MMW-42A	MMW-42A
Sample Date	6/14/01	9/8/01	11/11/01	2/20/02	5/28/02	8/6/02
Miscellaneous information	SC potentially factor of 100 low	filtered	filtered	filtered	filtered	---
Comments	Fe, Cl, and Na drastically different	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	7,647	7,643	7,641	7,642	7,643	---
Field Temperature (^{o}C)	10.5	17.8	13	11.6	15.9	14.4
pH, field, [lab]	3.65	3.49	3.45	3.41	3.4	3.33
Eh (V)	0.207	0.48	0.497	0.481	0.509	0.455
Spec Cond (µS/cm) field, [lab]	230	2,720	2,890	2,650	2,740	2,590
TDS (mg/L)	2,400	2,800	2,600	2,500	2,500	---
Constituent, dissolved (mg/L)						
Ca	230	220	220	230	200	---
Mg	69	76	75	74	63	---
Ba	< 0.01	< 0.01	0.0017	< 0.01	0.0012	---
Na	33	67	80	74	68	---
K	3.1	2.8	3.4	3.2	2.8	---
SO_4	1,600	1,700	1,600	1,600	1,700	---
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5	---
F	16	22	22	19	20	---
Cl	76	260	350	310	300	---
SiO_2	64	86	90	94	88	---
Al	130	190	180	170	160	---
Fe	18	1.1	0.92	0.78	0.75	---
Mn	19	26	27	26	24	---
Cu	2	3.1	3.4	3.3	3.2	---
Zn	4.7	6.7	6.9	7.2	5.9	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	0.023	0.035	0.034	0.034	0.03	---
Ag	< 0.002	< 0.002	0.0017	< 0.002	< 0.002	---
Cr	0.012	0.027	0.036	0.035	0.031	---
Co	0.23	0.32	0.31	0.3	0.27	---
Ni	0.45	0.67	0.65	0.64	0.59	---
Pb	< 0.006	< 0.009	< 0.009	< 0.009	< 0.009	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.023	0.035	0.037	0.036	0.034	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	0.011	0.018	0.013	0.013	0.0059	---
As	< 0.005	< 0.005	< 0.005	0.0022	0.0028	---
Sum cations (meq/L)	22.0	26.9	27.7	27.1	23.4	---
Sum anions (meq/L)	23.2	27.6	29.4	28.5	30.5	---
Charge imbalance (percent)	-5.62	-2.63	-5.99	-4.93	-26.4	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West Mine Shaft**			
Well ID	MMW-7	MMW-7	MMW-7	MMW-7
Sample Date	11/7/94	11/7/94	11/7/94	11/7/94
Miscellaneous information	filtered	filtered; duplicate	filtered	filtered; below demonstrates inconsistency of NMED in value selection
Comments	---	lab sheet not supplied to USGS	---	*1 Mn 67 SLD results/ 69 SLD remarks & Slifer, *2 Zn 9.7 SLD results & Slifer / 9.6 SLD remarks, *3 Co =4.2 SLD results/ 4.3 SLD remarks & Slifer
Source ID (see table 2)	SPRI 1995	Slifer 1996	SPRI 1995, SRK 1995, MC DB,	Slifer 1996
Lab ID (see table 2)	ETC	SLD 940640	ETC	SLD IC 940641
Depth to Water (m)	18.6	18.62	18.6	18.6
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	17.2	17.2	17.2	17.2
pH, field, [lab]	4.4	4.4	4.4	4.4
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	9,490	7,100	9,490	7,100
TDS (mg/L)	16,000	16500 #	16,000	15300 #
Constituent, dissolved (mg/L)				
Ca	534	540	544	550
Mg	1230	1150	1250	1290
Ba	0.074	< 0.1	0.108	0.1
Na	178	---	175	---
K	12.1	---	12	---
SO_4	10,500	9,070 #	10,400	9,370 #
Alkalinity (as HCO_3)	< 1	---	< 1	---
F	0.98	---	1.12	---
Cl	21	---	21	---
SiO_2	48	32	43	41
Al	961	890	943	950
Fe	375	380	384	420
Mn	73.3	72	72.1	67 *1
Cu	5.04	4.5	4.84	4.5
Zn	11.9	9.8	11.7	9.6 *2
Mo	< 0.1	< 0.1	< 0.10	< 0.1
Cd	0.092	0.11	0.096	0.11
Ag	< 0.5	< 0.1	< 0.5	< 0.1
Cr	0.17	0.2	0.193	0.2
Co	4.99	3.9	4.91	4.2 *3
Ni	10.7	8.6	10.5	9.5
Pb	0.06	0.8	0.1	1
Hg	< 0.0002	< 0.0005	< 0.0002	< 0.0005
Be	0.122	0.1	0.104	0.1
V	0.106	0.1	0.104	< 1.0
Se	< 0.025	< 0.025	< 0.05	---
As	< 0.05	< 0.1	< 0.05	0.1
Sum cations (meq/L)	135	127	136	141
Sum anions (meq/L)	93.8	77.5	92.7	77.4
Charge imbalance (percent)	35.9	48.2	38.0	58.0

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West Mine Shaft**					
Well ID	MMW-7	MMW-7	MMW-7	MMW-7	MMW-7	MMW-7
Sample Date	11/7/94	6/1/95	4/17/96	8/1/96	1/1/97	6/25/97
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	---
Comments	*1 Al dissolved > Al total, *2 Se Rejected	---	---	---	---	---
Source ID (see table 2)	WC 96	MMW wkst	MMW wkst	MMW wkst	MMW wkst	NMED: ACZ lab sheet, MC DB
Lab ID (see table 2)	ETC	---	---	---	---	ACZ RG 46914
Depth to Water (m)	18.6	---	18.7	---	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	12.8	---	11.4	---	11.7	---
pH, field, [lab]	5.2	3.9	4.24	4.12	4.13	---
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	8,860	8,410	9,330	9,150	7,990	[7,900]
TDS (mg/L)	19,400	---	16,400 #	---	---	13400, 13800
Constituent, dissolved (mg/L)						
Ca	532 [535]	---	---	470	490	530
Mg	1200 [1190]	---	1,470 #	1080 #	1040	815
Ba	0.113 J [0.111 J]	---	< 0.1	0.09	0.09	0.04
Na	159	---	140	150	132	137
K	103 [101]	---	---	15	11	20
SO_4	10100 J	8,930 #	8,630 #	8,200 #	8,250 #	10,600
Alkalinity (as HCO_3)	< 5	---	< 1	---	---	< 2
F	---	0.849	0.88	1.02	1.02	160
Cl	21	---	---	18	---	15
SiO_2	---	---	---	60	137	118
Al	954 *1 [945]	490	953	890	814	735
Fe	399 [394]	0.422	326	355.4	344	259
Mn	68.2 [67.5]	57.2	59.5	31.8	57.3	46.9
Cu	4.91 [4.94]	2.1	1.91	1.64	1.72	1.6
Zn	10.8 [11.4]	9	9.11	8.79	9.34	7.8
Mo	< 0.002 [0.0272 J]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.1
Cd	0.0825 [0.0834]	0.084	0.118	0.0039	0.1	0.08
Ag	< 0.0061 [<0.0061]	---	< 0.01	< 0.01	< 0.001	< 0.005
Cr	0.17 [0.168]	---	0.18	0.17	0.18	0.1
Co	4.63 [4.64]	---	3.8	3.9	4.1	3.4
Ni	10.7 [10.8]	---	8.5	8.5	8.9	7.5
Pb	0.0103 J [0.0082 J]	< 0.10	< 0.005	0.022	0.022	0.014
Hg	< 0.0001 [<0.0001]	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.107 [0.105]	---	0.11	0.11	0.1	0.08
V	0.137 [0.135]	---	0.21	0.21	0.19	0.13
Se	*2	---	< 0.025	0.027	< 0.001	< 0.001
As	0.0168 J [<0.012]	---	0.02	< 0.025	< 0.05	< 0.03
Sum cations (meq/L)	140	---	---	135	125	93.2
Sum anions (meq/L)	93.1	---	---	72.9	74.7	130
Charge imbalance (percent)	40.3	---	---	59.8	50.5	-32.8

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West Mine Shaft Facilities**				
Well ID	MMW-7	MMW-7	MMW-7	MMW-7	MMW-7
Sample Date	11/7/97	5/11/98	6/9/98	6/9/98	2/7/00
Miscellaneous information	---	Could be 11/5/98	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB	NMED, MC DB	NMED: SLD lab sheet	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	---	---	ACZ RG70641	SLD WC-98 02502	Paragon Analytics
Depth to Water (m)	---	---	18.7	18.7	18.7
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	12.2	---	12.2	12.2	11.3
pH, field, [lab]	[6.98]	---	4.13	4.13	4.15
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	7,920	7,920	7,130
TDS (mg/L)	12,800	10,900	10300, 11100	10,600	12,000
Constituent, dissolved (mg/L)					
Ca	506	489	453	506	450
Mg	863	791	757	812	680
Ba	0.06	---	0.051	---	0.035
Na	125	138	130	131	120
K	8	10	9.8	13	14
SO_4	8,270	7,200	7,940	7,810	7,500
Alkalinity (as HCO_3)	< 2	ND	< 2	---	52
F	1.1	130	140	---	150
Cl	17	9	11	155	22
SiO_2	54	---	40	---	41
Al	664	592	589	---	530
Fe	305	279	247	---	260
Mn	48.9	39.4	39.5	---	41
Cu	1	0.7	0.75	---	3.5
Zn	8.3	6.7	6.29	---	6.2
Mo	0.2	ND	< 0.01	---	< 0.1
Cd	0.1	0.06	0.07	---	0.077
Ag	< 0.05	---	0.0007	---	0.0025
Cr	< 0.1	---	0.08	---	0.08
Co	3.5	3.1	2.77	---	2.6
Ni	7.4	6.7	5.92	---	5.8
Pb	< 0.04	---	0.012	---	0.015
Hg	< 0.0002	---	< 0.0002	---	---
Be	0.1	---	0.074	---	0.072
V	0.13	---	0.13	---	0.11
Se	< 0.002	---	< 0.001	---	< 0.025
As	0.02	---	< 0.005	---	0.0082
Sum cations (meq/L)	100	96.8	88.0	94.2	82.1
Sum anions (meq/L)	83.4	80.0	93.9	94.1	93.4
Charge imbalance (percent)	18.2	19.0	-6.52	0.10	-12.9

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West Mine Shaft Facilities**				
Well ID	MMW-7	MMW-7	MMW-7	MMW-7	MMW-7
Sample Date	6/23/01	8/28/01	11/10/01	2/16/02	5/30/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon	Paragon
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,029	8,030	8,029	8,029	8,029
Field Temperature (^{o}C)	12.7	15.7	14.9	3.8	12.8
pH, field, [lab]	4.15	4.16	4.16	4.29	4.07
Eh (V)	0.356	0.215	0.197	0.187	0.21
Spec Cond (µS/cm) field, [lab]	6,720	6,500	6,720	6,730	6,790
TDS (mg/L)	9,700	9,800	9,400	9,700	9,700
Constituent, dissolved (mg/L)					
Ca	500	490	500	500	460
Mg	680	640	660	680	620
Ba	0.03	0.05	0.07	0.031	0.03
Na	120	120	120	130	130
K	14	14	14	14	14
SO_4	7,000	7,800	7,000	7,300	7,700
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5
F	140	130	130	130	130
Cl	14	17	22	25	15
SiO_2	41	39	36	39	39
Al	470	480	470	430	440
Fe	260	250	250	260	250
Mn	38	34	37	35	33
Cu	1.1	1.1	1.2	0.89	0.93
Zn	5.6	5	5.3	4.9	4.8
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.06	0.05	0.05	0.059	0.059
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	0.07	0.07	0.07	0.067	0.068
Co	2.4	2.3	2.3	2.2	2.1
Ni	5.3	5	5.1	4.8	4.9
Pb	< 0.01	< 0.01	< 0.01	0.015	0.0095
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.06	0.06	0.05	0.058	0.059
V	0.12	0.12	0.12	0.11	0.12
Se	< 0.02	< 0.02	< 0.01	0.0099	< 0.025
As	0.01	0.01	0.01	0.0092	0.0091
Sum cations (meq/L)	81.4	74.3	78.9	81.9	71.8
Sum anions (meq/L)	85.0	97.5	84.3	95.8	100
Charge imbalance (percent)	-4.32	-27.0	-6.58	-15.7	-32.9

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West "East of Sewage Pond"**				
Well ID	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A
Sample Date	11/8/94	11/8/94	11/8/94	6/1/95	4/17/96
Miscellaneous information	filtered	filtered, estimated values	filtered	filtered	filtered
Comments	---	---	*1Mn= 0.23 SLD results & Slifer / 0.21 SLD remarks, *2 Ni <	---	---
Source ID (see table 2)	Slifer 1996	SPRI 1995, SRK 1995, MC DB, MMW	Slifer 1996	MMW wkst	MMW wkst
Lab ID (see table 2)	SLD WC 94-6419	ETC	SLD IC-94-0650	---	---
Depth to Water (m)	29.5	29.5	29.5	---	29.4
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	8.4	8.4	8.4	---	12.2
pH, field, [lab]	[5.99]	7	6, [5.99]	6.56	7.25
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,326	2,860	1,330 #	1090 #	1,770
TDS (mg/L)	1,280 #	2,200	1,280 #	---	---
Constituent, dissolved (mg/L)					
Ca	184 #	466	230	---	---
Mg	54.7	85.6	64	---	146 #
Ba	---	0.103	< 0.1	---	< 0.01
Na	33	41.5	---	---	36
K	5	3.8	---	---	---
SO_4	716	1,300	---	528	1,030 #
Alkalinity (as HCO_3)	10	165	---	---	87
F	1.9	2.72	---	2.76	2.8
Cl	< 5	8.7	---	---	---
SiO_2	---	24	41	---	---
Al	---	< 0.05	0.43	0.3	0.27
Fe	---	2.84	< 0.1	1	< 0.5
Mn	---	7.15	0.21 *1	0.85	3.19
Cu	---	< 0.010	< 0.01	< 0.010	0.009
Zn	---	< 0.05	0.2	0.03	< 0.5
Mo	---	< 0.02	< 0.001	< 0.02	< 0.02
Cd	---	0.002	< 0.005	< 0.0005	0.01
Ag	---	< 0.1	< 0.001	---	< 0.01
Cr	---	< 0.01	< 0.005	---	< 0.01
Co	---	< 0.01	0.003	---	< 0.01
Ni	---	< 0.02	0.06 *2	---	< 0.02
Pb	---	< 0.002	< 0.001	< 0.1	< 0.005
Hg	---	< 0.0002	< 0.005	---	< 0.0002
Be	---	< 0.004	< 0.001	---	< 0.005
V	---	< 0.01	< 0.005	---	< 0.01
Se	---	< 0.005	0.025	---	< 0.005
As	---	< 0.005	< 0.001	---	< 0.01
Sum cations (meq/L)	12.0	24.1	---	---	---
Sum anions (meq/L)	11.9	21.7	---	---	---
Charge imbalance (percent)	0.82	10.5	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West "East of Sewage Pond"**					
Well ID	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A
Sample Date	8/1/96	1/1/97	6/25/97	11/7/97	5/11/98	6/9/98
Miscellaneous information	filtered	filtered	---	---	---	9/6/98 in MCDB
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	MMW wkst	NMED:ACZ lab sheet, MC DB	MC DB, URS 3/01	MC DB	NMED: ACZ lab sheet, MC DB
Lab ID (see table 2)	---	---	ACZ RG 46915	---	---	ACZ RG 70642
Depth to Water (m)	---	---	---	---	---	29.2
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	11.1	---	11.2	---	11.7
pH, field, [lab]	7.08	6.87	---	6.94	---	6.84
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	2,480	2,250	[2,400]	---	---	2,580
TDS (mg/L)	---	---	2290, 2400	2,400	2,470	2190, 2330
Constituent, dissolved (mg/L)						
Ca	450	469	539	484	500	475
Mg	155 #	99.6	101	92	105	91.7
Ba	0.04	0.042	0.041	0.037	---	0.036
Na	44	35.6	40	34.8	42	38.3
K	5.4	4	5	3.6	4.3	4.1
SO_4	1,600	1,550	1,450	1,420	1,580	1,490
Alkalinity (as HCO_3)	---	---	186	143	151	137
F	---	2.4	3	2.6	2.3	2
Cl	5	---	5	7	8	7
SiO_2	28	63	65	28	---	29
Al	0.1	0.09	< 0.06	< 0.06	ND	0.06
Fe	0.725	1.1	1.1	0.44	0.82	0.4
Mn	2.43	4.37	4.46	3.83	3.97	3.91
Cu	0.01	< 0.01	< 0.1	< 0.02	0.01	< 0.01
Zn	< 0.05	0.01	< 0.10	1.1	ND	< 0.01
Mo	< 0.02	< 0.02	< 0.02	< 0.02	ND	0.02
Cd	< 0.0005	< 0.0005	< 0.0005	< 0.006	ND	< 0.0005
Ag	< 0.01	< 0.0002	< 0.003	0.01	---	< 0.0005
Cr	< 0.01	< 0.01	< 0.02	< 0.02	---	< 0.01
Co	< 0.01	0.01	< 0.02	< 0.02	ND	< 0.01
Ni	< 0.02	< 0.01	< 0.02	< 0.02	ND	< 0.01
Pb	---	< 0.001	< 0.001	< 0.08	---	< 0.001
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	< 0.0002
Be	< 0.004	< 0.0005	< 0.004	< 0.02	---	< 0.002
V	< 0.01	< 0.005	< 0.01	< 0.01	---	< 0.005
Se	< 0.005	< 0.001	< 0.001	< 0.003	---	< 0.001
As	< 0.005	< 0.001	< 0.005	< 0.001	---	< 0.001
Sum cations (meq/L)	26.7	23.6	27.2	24.1	25.3	23.6
Sum anions (meq/L)	22.7	22.5	23.5	22.9	25.3	24.0
Charge imbalance (percent)	15.9	4.59	14.8	5.42	-0.07	-1.65

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West "East of Sewage Pond"**					
Well ID	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A	MMW-8A
Sample Date	2/4/00	6/12/01	8/23/01	11/11/01	2/20/02	5/28/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	29.1	---	---	---	---	---
Water Elevation (ft)	---	7,759	7,762	7,761	7,762	7,763
Field Temperature (^{o}C)	10.5	26.7	19.7	17.6	13.3	18.2
pH, field, [lab]	6.49	7.24	6.92	6.92	6.94	6.89
Eh (V)	---	0.099	0.01	-0.092	-0.035	-0.025
Spec Cond (µS/cm) field, [lab]	2,350	2,220	2,450	2,530	2,470	2,550
TDS (mg/L)	2,200	2,500	2,500	2,500	2,500	2,500
Constituent, dissolved (mg/L)						
Ca	440	570	560	560	540	510
Mg	93	97	92	96	100	94
Ba	0.029	0.03	0.04	0.04	0.033	0.032
Na	44	40	41	38	39	40
K	6.7	5.9	5.4	5.9	6	5.5
SO_4	1,300	1,600	1,500	1,600	1,600	1,600
Alkalinity (as HCO_3)	150	160	160	160	150	150
F	2.7	2.1	1.8	1.3	2.6	2.5
Cl	5	6.9	7.2	7	6.2	6.4
SiO_2	28	28	28	26	28	28
Al	0.17	0.12	< 0.05	< 0.05	< 0.05	0.05
Fe	< 0.1	1.3	1	1.1	0.79	0.71
Mn	2.2	4.6	4.6	4.6	3.6	3.3
Cu	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zn	< 0.02	< 0.02	< 0.02	0.01	< 0.02	< 0.02
Mo	< 0.1	< 0.02	< 0.1	< 0.1	< 0.1	< 0.1
Cd	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	0.03	< 0.01	< 0.01	0.00054
Co	< 0.01	< 0.01	< 0.01	0.0068	0.0035	0.0039
Ni	< 0.02	< 0.02	< 0.02	0.0073	0.0047	0.0042
Pb	< 0.006	< 0.006	< 0.006	< 0.006	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	< 0.005	< 0.005	< 0.005	0.0051	0.0036	< 0.005
As	< 0.005	< 0.005	< 0.005	< 0.005	0.0026	0.0038
Sum cations (meq/L)	23.4	26.3	26.6	26.4	26.2	24.3
Sum anions (meq/L)	21.4	24.0	23.1	24.8	25.1	25.1
Charge imbalance (percent)	8.88	9.10	14.1	6.46	4.29	-3.55

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West "East of Sewage Pond"**				
Well ID	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B
Sample Date	11/8/94	11/8/94	11/8/94	6/1/95	4/17/96
Miscellaneous information	filtered	filtered, estimated values	filtered	filtered	filtered
Comments	---	---	*1 Fe=3 SLD results/ 2.3 SLD remarks & Slifer, *2 Cd < 0.1	---	---
Source ID (see table 2)	SPRI '95, SRK '95, MC DB, MMW wkst	Slifer 1996	Slifer 1996	MMW wkst	MMW wkst
Lab ID (see table 2)	ETC	SLD WC 94-6431	SLD IC-94-0662	---	---
Depth to Water (m)	29.3	29.3	29.3	---	29.1
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	7.1	---	---	---	11.6
pH, field, [lab]	6.4	[8.07]	8.1	5.44	5.94
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,780	2,280 #	2,280 #	1,260	1,470
TDS (mg/L)	1,100	2,290	2,290 #	---	1,810 #
Constituent, dissolved (mg/L)					
Ca	206	407	580	---	---
Mg	55.5	103 #	110	---	110
Ba	0.016	---	0.1	---	< 0.01
Na	33.9	41	---	---	40
K	2.9	7	---	---	---
SO_4	730	1,280 #	---	724	958
Alkalinity (as HCO_3)	19	154	---	---	12
F	1.83	2.6	---	1.9	1.7
Cl	5.6	5	---	---	---
SiO_2	37	---	28	---	---
Al	0.44	---	0.2	0.3	0.57
Fe	< 0.050	---	2.3 *1	0.9	< 0.5
Mn	0.202	---	7.8	0.096	< 0.5
Cu	< 0.01	---	< 0.02	< 0.010	0.005
Zn	0.211	---	< 0.02	0.2	< 0.5
Mo	< 0.02	0.01	0.01	< 0.02	< 0.02
Cd	< 0.0005	---	< 0.002 *2	0.01	0.01
Ag	< 0.1	---	< 0.002	---	< 0.01
Cr	---	---	< 0.1	---	< 0.01
Co	< 0.01	---	0.003	---	< 0.01
Ni	0.059	---	< 0.02 *3	---	0.06
Pb	< 0.002	---	< 0.002	< 0.1	< 0.005
Hg	< 0.0002	---	< 0.0005	---	< 0.0002
Be	< 0.004	---	< 0.002	---	< 0.005
V	< 0.01	---	< 0.002	---	< 0.01
Se	< 0.005	---	< 0.025	---	< 0.005
As	< 0.005	---	0.003	---	< 0.01
Sum cations (meq/L)	13.0	23.1	---	---	---
Sum anions (meq/L)	12.3	21.3	---	---	---
Charge imbalance (percent)	5.52	8.11	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West "East of Sewage Pond"**					
Well ID	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B
Sample Date	8/1/96	1/1/97	6/25/97	11/7/97	5/11/98	6/9/98
Miscellaneous information	filtered; Mg reported as 516.5 but changed to 51.65	filtered	---	---	Could be 11/5/98	---
Comments	Cation sum was 50.2 before Mg changed	---	---	---	---	---
Source ID (see table 2)	MMW wkst	MMW wkst	NMED: ACZ lab sheet, MC DB	MC DB, URS 3/01	MC DB, URS 3/01	NMED, MC DB
Lab ID (see table 2)	---	---	ACZ RG 46916	---	---	ACZ RG
Depth to Water (m)	---	---	---	---	---	29
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	11	---	11.5	---	12
pH, field, [lab]	5.87	6.84	---	6.01	---	5.63
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,510 #	1,460 #	[1,700]	1,700	---	1,850
TDS (mg/L)	---	---	1370, 1450	1,520	1,760	1360, 1520
Constituent, dissolved (mg/L)						
Ca	260	236	259	251	286	264
Mg	51.7 #	68.1	71.4	66.6	87	71.8
Ba	0.01	0.019	0.008	0.009	---	0.011
Na	51	46.9	59.3	59.3	69.5	56.1
K	3.9	3.1	3	3	3.8	3.2
SO_4	820	1,090 #	910	950	1,130	940
Alkalinity (as HCO_3)	---	---	17	16	11	6
F	---	1.79	1.6	1.6	1.6	1.7
Cl	11	---	17	18	26	21
SiO_2	36	85	86	19	---	38
Al	0.3	0.49	0.38	0.65	0.51	0.48
Fe	< 0.05	0.01	0.01	0.04	0.01	0.02
Mn	0.033	0.034	0.027	0.052	0.024	0.021
Cu	< 0.01	< 0.01	< 0.05	< 0.01	ND	< 0.01
Zn	0.203	0.32	0.32	0.017	0.38	0.32
Mo	< 0.02	< 0.02	< 0.01	< 0.01	ND	< 0.01
Cd	< 0.0005	0.0029	0.0029	0.003	0.0037	0.0026
Ag	< 0.01	< 0.0002	< 0.0003	< 0.005	---	< 0.0005
Cr	< 0.01	0.01	< 0.01	< 0.01	---	< 0.01
Co	< 0.01	0.01	< 0.01	0.01	ND	< 0.01
Ni	0.06	0.07	0.07	0.06	0.08	0.07
Pb	---	< 0.001	< 0.001	< 0.04	---	< 0.001
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	< 0.0002
Be	< 0.004	< 0.0005	< 0.002	< 0.01	---	< 0.002
V	< 0.01	< 0.005	< 0.005	< 0.005	---	< 0.005
Se	0.005	0.004	0.004	0.003	---	0.003
As	< 0.005	< 0.001	< 0.005	< 0.001	---	< 0.001
Sum cations (meq/L)	15.3	14.3	16.6	15.8	18.4	16.5
Sum anions (meq/L)	13.1	17.5	14.9	15.7	18.3	15.2
Charge imbalance (percent)	15.6	-20.3	10.9	0.68	0.53	8.34

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West "East of Sewage Pond"**					
Well ID	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B	MMW-8B
Sample Date	2/4/00	6/12/01	8/24/01	11/11/01	2/20/02	5/28/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	29.1	---	---	---	---	---
Water Elevation (ft)	---	7,765	7,764	7,763	7,763	7,764
Field Temperature (^{o}C)	10.2	19.8	17.9	14.2	13.4	21.1
pH, field, [lab]	5.66	6.49	5.71	5.52	5.64	5.46
Eh (V)	---	0.036	0.237	0.113	0.196	0.211
Spec Cond (µS/cm) field, [lab]	2,360	2,290	2,460	2,530	2,500	2,760
TDS (mg/L)	2,200	2,600	2,500	2,400	2,400	2,600
Constituent, dissolved (mg/L)						
Ca	400	470	420	450	470	450
Mg	110	150	140	130	130	120
Ba	< 0.01	< 0.01	0.03	0.0089	< 0.01	0.0092
Na	95	110	98	89	98	110
K	6.9	11	7.9	6.7	6.8	6.6
SO_4	1,400	1,700	1,600	1,600	1,600	1,800
Alkalinity (as HCO_3)	27	16	15	12	10	13
F	1.7	7.6	5	1.6	2	1.9
Cl	27	31	34	31	31	28
SiO_2	39	41	39	36	41	39
Al	1.9	4.6	2.1	0.46	0.42	0.5
Fe	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.039
Mn	0.66	4.4	1.8	< 0.01	0.013	0.028
Cu	0.018	0.03	0.03	0.0009	< 0.01	0.0015
Zn	0.65	2.7	1.6	0.55	0.58	0.53
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.0057	0.02	0.01	0.0052	0.0043	0.0051
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	< 0.01	0.003	0.0025
Co	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.00082
Ni	0.12	0.81	0.4	0.12	0.12	0.12
Pb	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.00092	0.0074	0.01	0.007	0.009	0.0058
As	< 0.005	< 0.005	< 0.005	0.0033	0.0035	0.0029
Sum cations (meq/L)	24.9	29.2	26.4	26.7	28.0	25.6
Sum anions (meq/L)	21.8	24.5	23.9	23.9	23.8	26.8
Charge imbalance (percent)	13.5	17.4	10.1	11.1	16.3	-4.6

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West Mine Shaft Facilities**					
Well ID	MMW-21	MMW-21	MMW-21	MMW-21	MMW-21	MMW-21
Sample Date	1/14/00	6/23/01	8/28/01	11/10/01	2/16/02	5/30/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	filtered
Comments	*1 Zn=4.5 in RGC 8/10, *2 Cr =0.038 in RGC 8/10	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	23.2	---	---	---	---	---
Water Elevation (ft)	---	8,018	8,020	8,020	---	---
Field Temperature (^{o}C)	10.9	14.6	17.7	16.3	12.5	18.9
pH, field, [lab]	3.25	2.85	3	2.96	2.89	2.89
Eh (V)	---	0.354	0.527	0.527	0.525	0.521
Spec Cond (µS/cm) field, [lab]	3,970	3,810	3,870	4,130	4,090	4,040
TDS (mg/L)	4,700	4,500	4,300	4,100	4,500	4,500
Constituent, dissolved (mg/L)						
Ca	460	390	380	450	420	400
Mg	260	220	220	260	230	210
Ba	0.013	< 0.01	< 0.01	< 0.01	0.00088	0.00035
Na	63	55	54	53	60	58
K	1.8	< 0.5	< 0.5	1.3	0.52	< 0.53
SO_4	3,200	3,300	3,200	3,400	3,500	3,900
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5	< 5
F	42	38	38	38	36	36
Cl	36	37	33	36	36	34
SiO_2	94	98	98	98	105	105
Al	200	200	200	200	180	180
Fe	9.6	12	13	15	13	13
Mn	21	22	20	23	23	21
Cu	3.2	2.7	2.8	2.6	2.5	2.4
Zn	4.8 *1	4	3.5	4.2	4	3.6
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.039	0.03	0.02	0.03	0.033	0.03
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	0.036 *2	0.03	0.07	0.05	0.046	0.047
Co	0.72	0.66	0.66	0.66	0.63	0.57
Ni	1.4	1.2	1.3	1.3	1.2	1.1
Pb	< 0.009	< 0.009	< 0.009	< 0.009	< 0.009	< 0.009
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.035	0.029	0.032	0.031	0.03	0.029
V	< 0.01	< 0.01	< 0.01	< 0.01	0.00096	< 0.01
Se	0.014	0.009	< 0.01	< 0.01	0.012	0.0088
As	0.0064	< 0.005	< 0.005	0.003	0.004	0.0021
Sum cations (meq/L)	43.4	38.2	37.0	41.8	38.4	34.1
Sum anions (meq/L)	41.4	43.5	41.5	43.3	47.5	54.1
Charge imbalance (percent)	4.75	-12.9	-11.4	-3.58	-21.2	-45.3

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West Mine Shaft Facilities**					
Well ID	MMW-22	MMW-22	MMW-22	MMW-22	MMW-22	MMW-22
Sample Date	1/17/00	6/23/01	8/28/01	11/10/01	2/16/02	5/30/02
Miscellaneous information	filtered; *1 Na reported 61 and 81	filtered	filtered	filtered	filtered	filtered
Comments	*1 61 chosen by comparison of CI results	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	26.4	---	---	---	---	---
Water Elevation (ft)	---	8,005	8,004	8,004	---	---
Field Temperature (^{o}C)	11.9	12.8	20	15.5	10.2	20.1
pH, field, [lab]	3.49	3.3	3.45	3.45	3.35	3.33
Eh (V)	---	0.147	0.326	0.276	0.362	0.355
Spec Cond (µS/cm) field, [lab]	3,890	4,190	3,650	3,880	3,870	3,800
TDS (mg/L)	4,500	4,500	4,400	4,600	4,800	4,800
Constituent, dissolved (mg/L)						
Ca	400	400	390	440	410	380
Mg	220	190	180	220	200	180
Ba	< 0.01	< 0.01	< 0.01	0.0016	0.0015	0.0012
Na	61 *1	52	50	52	54	55
K	6.7	7.3	6.5	7.7	7.2	6.5
SO_4	3,000	3,200	3,200	3,300	3,700	3,900
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5	< 5
F	36	39	36	36	37	37
Cl	31	35	37	39	35	34
SiO_2	88	96	88	92	92	92
Al	200	190	190	200	190	180
Fe	180	160	180	180	190	170
Mn	15	15	14	16	16	15
Cu	1.2	1.2	1.2	1.2	1.2	1.1
Zn	3.8	3.6	3.2	3.8	3.5	3.1
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.026	0.02	0.02	0.02	0.025	0.027
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	0.011	< 0.01	< 0.01	< 0.01	0.019	0.015
Co	0.75	0.63	0.62	0.65	0.64	0.56
Ni	1.4	1.1	1.1	1.1	1.1	1
Pb	< 0.006	0.01	< 0.006	< 0.006	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.033	0.03	0.03	0.03	0.032	0.03
V	< 0.01	< 0.01	< 0.01	0.0065	0.0055	0.0064
Se	0.016	< 0.005	0.009	0.0064	0.012	0.0094
As	< 0.005	< 0.005	< 0.005	< 0.005	0.0023	< 0.005
Sum cations (meq/L)	43.7	39.4	37.5	43.0	39.8	34.2
Sum anions (meq/L)	38.0	42.5	41.5	42.0	50.8	54.2
Charge imbalance (percent)	14.0	-7.47	-10.1	2.31	-24.2	-45.2

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack West**					
Well ID	MMW-36B	MMW-36B	MMW-36B	MMW-36B	MMW-36B	MMW-36B
Sample Date	6/23/01	9/7/01	11/1/01	2/21/02	2/21/02	6/3/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered, duplicate	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	8,362	8,359	8,359	8,358	8,358	8,358
Field Temperature (^{o}C)	13.1	19.5	15.3	11.7	11.7	15.6
pH, field, [lab]	4.21	4.47	4.44	3.49	3.49	3.69
Eh (V)	0.262	0.196	0.21	0.362	0.362	0.347
Spec Cond (µS/cm) field, [lab]	4,000	3,940	4,020	4,130	4,130	4,250
TDS (mg/L)	4,500	4,500	4,500	4,600	4,700	4,600
Constituent, dissolved (mg/L)						
Ca	530	540	540	520	530	550
Mg	270	280	280	260	260	280
Ba	< 0.01	0.03	0.02	< 0.01	< 0.01	0.0057
Na	58	59	58	62	63	61
K	12	12	12	12	12	12
SO_4	3,100	3,300	3,500	3,700	3,600	4,000
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5	< 5
F	44	43	44	47	46	44
Cl	43	45	53	46	45	44
SiO_2	56	53	53	62	62	60
Al	77	72	80	94	93	89
Fe	170	180	170	190	190	180
Mn	19	18	19	17	18	20
Cu	2.5	1.9	3.2	5.2	5.2	3.6
Zn	1.5	1.4	1.5	1.6	1.6	1.5
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.0078	0.0055	0.008	0.007	0.008	0.0083
Ag	< 0.002	< 0.002	< 0.002	< 0.002	0.003	< 0.002
Cr	< 0.01	0.03	0.02	0.052	0.061	0.043
Co	0.35	0.34	0.41	0.53	0.53	0.42
Ni	0.62	0.62	0.69	0.78	0.78	0.68
Pb	< 0.009	< 0.006	< 0.006	< 0.006	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.0062	0.0062	0.0074	0.01	0.01	0.0082
V	0.04	0.03	0.02	0.023	0.024	0.021
Se	0.0078	0.01	0.01	0.012	0.011	0.011
As	< 0.005	< 0.005	0.0032	0.0042	0.0033	< 0.005
Sum cations (meq/L)	42.2	40.9	41.3	41.5	42.2	41.0
Sum anions (meq/L)	43.1	45.1	49.3	53.2	51.3	56.8
Charge imbalance (percent)	-2.30	-9.57	-17.7	-24.7	-19.4	-32.2

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Campground**		**Columbine Park**		
Well ID	Columbine CG	Columbine CG	COL #1 & 2	Columbine Well No. 1	Columbine Well No. 1
Sample Date	8/24/93	6/12/01	7/16/94	7/25/94	10/29/96
Miscellaneous information	Unfiltered, all values TOTAL	from lab sheet; GW/A/1	MC DB: Location MINE, author unknown, Ref ID	MC DB: Location MINE, author unknown, Ref ID	MC DB: Location MINE, author unknown, Ref ID
Comments	Slifer reports field pH 6.6 and Spec Cond 120		This data was not used for plotting or modeling purposes.	*1 Cu=0.083 in SRK, but 0.23 in MC DB	---
Source ID (see table 2)	Slifer 1996, Kent 1995, MC DB	USFS	MC DB	MC DB, SRK 1995	MC DB
Lab ID (see table 2)	---	Ecology &	---	---	---
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	7.51 *	---	6.3	5.4	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	169 *	---	---	---	---
TDS (mg/L)	---	---	408	1,450	---
Constituent, dissolved (mg/L)					
Ca	[26]	24.8	---	---	---
Mg	[3]	2.51	---	---	---
Ba	[< 0.1]	0.036	---	---	---
Na	[3]	2.16	---	---	---
K	[2]	0.787	---	---	---
SO_4	10	---	223	756	779
Alkalinity (as HCO_3)	---	---	---	---	---
F	---	---	---	---	---
Cl	---	---	---	---	---
SiO_2	---	---	---	---	---
Al	[< 0.1]	<0.2	---	5.5	---
Fe	[< 0.1]	0.274	9.52	0.554	---
Mn	[< 0.05]	0.00752 J	0.22	1.8	---
Cu	[< 0.05]	0.00386 J	0.05	0.083 *1	---
Zn	[1.6]	1.05	0.16	2.8	---
Mo	---	---	---	< 0.03	---
Cd	[< 0.001]	<0.005	---	0.013	---
Ag	[< 0.1]	<0.01	---	---	---
Cr	[< 0.005]	<0.01	---	---	---
Co	[< 0.05]	<0.02	---	---	---
Ni	[< 0.1]	0.02	---	---	---
Pb	[0.01]	0.00735	---	< 0.1	---
Hg	[< 0.0005]	<0.0002	---	---	---
Be	[< 0.1]	<0.005	---	---	---
V	[< 0.1]	<0.02	---	---	---
Se	[< 0.005]	<0.02	---	---	---
As	[< 0.005]	<0.025	---	---	---
Sum cations (meq/L)	---	---	---	---	---
Sum anions (meq/L)	---	---	---	---	---
Charge imbalance (percent)	---	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**				
Well ID	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1
Sample Date	1/27/97	7/9/97	9/9/97	3/9/98	4/30/98
Miscellaneous information	MC DB: Location MINE, author unknown, Ref ID M2.000	MC DB: Location MINE, author unknown, Ref ID	Author Vail Engineering "according to MC DB"	---	---
Comments	---	---	*1 Ni=0.15, < 0.02 DB	---	---
Source ID (see table 2)	MC DB	MC DB	MC DB, RGC 8/10	Vail	Vail
Lab ID (see table 2)	---	---	---	---	---
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	16.6	---	---
pH, field, [lab]	---	5.56	[6]	5.7	5.6
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	646, [647]	1,120 #	1,180
TDS (mg/L)	---	---	495	---	---
Constituent, dissolved (mg/L)					
Ca	---	---	79.2	---	---
Mg	---	---	25.5	53.9	---
Ba	---	---	< 1	---	---
Na	---	---	9.3	---	---
K	---	---	1.6	---	---
SO_4	440	---	340	640	700
Alkalinity (as HCO_3)	---	---	27	---	---
F	---	---	4.64	8	10.1
Cl	---	---	< 10	---	---
SiO_2	---	---	29.3	---	---
Al	5.23	---	2.2	6.3	---
Fe	0.02	---	0.5	---	---
Mn	1.78	---	0.8	2.3	3.1
Cu	0.08	---	< 0.25	---	---
Zn	2.03	---	1.04	2.24	2.88
Mo	---	---	< 0.02	---	---
Cd	0.014	---	0.008	---	---
Ag	---	---	---	---	---
Cr	---	---	---	---	---
Co	---	---	< 0.02	---	---
Ni	---	---	0.15 *1	---	---
Pb	---	---	< 0.02	---	---
Hg	---	---	---	---	---
Be	---	---	---	---	---
V	---	---	---	---	---
Se	---	---	---	---	---
As	---	---	< 0.001	---	---
Sum cations (meq/L)	---	---	5.45	---	---
Sum anions (meq/L)	---	---	6.40	---	---
Charge imbalance (percent)	---	---	-15.9	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**						
Well ID	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1	Columbine Well No. 1
Sample Date	9/27/99	10/13/99	3/23/00	11/3/00	3/19/02	6/6/02	6/6/02
Miscellaneous information	---	off	Location mine, author unknown	---	filtered	filtered	filtered
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	Vail	Vail	MC DB	Vail	MC CD	MC CD	MC CD
Lab ID (see table 2)	---	---	---	---	Paragon	Paragon	Paragon
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---	4.84	8.5
pH, field, [lab]	---	5.33	5.1	---	---	---	4.84
Eh (V)	---	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	908	1,100 #	---	1,240 #	---	1,730 #	1,730 #
TDS (mg/L)	---	---	---	---	1,400	---	---
Constituent, dissolved (mg/L)							
Ca	---	---	---	---	220	---	---
Mg	---	65	---	---	90	---	---
Ba	---	---	---	---	0.017	---	---
Na	---	---	---	---	21	---	---
K	---	---	---	---	4	---	---
SO_4	---	780	---	1,100	940	---	---
Alkalinity (as HCO_3)	---	---	---	---	< 5	---	---
F	---	14.5	---	---	19	---	---
Cl	---	---	---	---	16	---	---
SiO_2	---	---	---	---	24	---	---
Al	---	10	---	5.3 [4.7]	16	---	---
Fe	---	---	---	---	< 0.1	---	---
Mn	---	4	---	14	8.7	---	---
Cu	---	---	---	---	0.27	---	---
Zn	---	4	---	---	5.9	---	---
Mo	---	---	---	---	< 0.1	---	---
Cd	---	---	---	---	0.04	---	---
Ag	---	---	---	---	< 0.002	---	---
Cr	---	---	---	---	< 0.01	---	---
Co	---	---	---	---	0.00088	---	---
Ni	---	---	---	---	0.85	---	---
Pb	---	---	---	---	< 0.003	---	---
Hg	---	---	---	---	< 0.0002	---	---
Be	---	---	---	---	0.014	---	---
V	---	---	---	---	0.00069	---	---
Se	---	---	---	---	0.011	---	---
As	---	---	---	---	< 0.005	---	---
Sum cations (meq/L)	---	---	---	---	15.8	---	---
Sum anions (meq/L)	---	---	---	---	15.1	---	---
Charge imbalance (percent)	---	---	---	---	4.54	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**					
Well ID	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2
Sample Date	3/9/96	6/12/97	7/9/97	9/9/97	3/9/98	4/30/98
Miscellaneous information	Location MINE, author unknown, Ref ID M2.000	MC DB: Location MINE, author	MC DB: Location MINE, author	MC DB: Author Vail Engineering	problem with Screened Interval, 15858	---
Comments	SPRI reports data as Spring 1994	---	---	*1 Ni=0.1, < 0.02 DB	---	---
Source ID (see table 2)	MC DB, SPRI 1995, Slifer 1996	MC DB	MC DB	MC DB, RGC 8/10	Vail	Vail
Lab ID (see table 2)	---	---	---	---	---	---
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	11.6	---	---
pH, field, [lab]	5.9	---	6.58	6.1, [6.2]	4.9	6.4
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	577, [570]	935	883
TDS (mg/L)	848	---	---	435	---	---
Constituent, dissolved (mg/L)						
Ca	---	---	---	67	---	---
Mg	0.01	---	---	20.2	40.7	---
Ba	---	---	---	< 1	---	---
Na	---	---	---	7.8	---	---
K	---	---	---	1.5	---	---
SO_4	536	400	528	280	460	450
Alkalinity (as HCO_3)	---	---	---	33	---	---
F	2	---	---	3.32	4.6	4.29
Cl	---	---	---	< 10	---	---
SiO_2	---	---	---	27.8	---	---
Al	---	2.83	---	1.4	3	---
Fe	< 0.05	0.2	---	0.4	---	---
Mn	0.01	1.3	---	0.5	0.8	1
Cu	< 0.01	0.03	---	< 0.25	---	---
Zn	0.69	1.36	---	0.74	1.36	14.7
Mo	< 0.02	---	---	< 0.02	---	---
Cd	< 0.01	0.008	---	< 0.005	---	---
Ag	---	---	---	---	---	---
Cr	---	---	---	---	---	---
Co	---	---	---	< 0.02	---	---
Ni	---	---	---	0.1 *1	---	---
Pb	< 0.05	0.002	---	< 0.02	---	---
Hg	---	---	---	---	---	---
Be	---	---	---	---	---	---
V	---	---	---	---	---	---
Se	---	---	---	---	---	---
As	---	---	---	< 0.001	---	---
Sum cations (meq/L)	---	---	---	4.64	---	---
Sum anions (meq/L)	---	---	---	5.59	---	---
Charge imbalance (percent)	---	---	---	-19	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**						
Well ID	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2	Columbine Well No. 2
Sample Date	9/27/99	10/13/99	9/6/00	11/3/00	8/7/01	3/19/02	6/6/02
Miscellaneous information	---	---	---	---	filtered	filtered	filtered
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	Vail	Vail	Vail	Vail	MC CD	MC CD	MC CD
Lab ID (see table 2)	---	---	---	---	Paragon	Paragon	Paragon
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---	---	7.7
pH, field, [lab]	---	6.06	---	---	---	---	5.38
Eh (V)	---	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	700	755	1,020	954	---	---	---
TDS (mg/L)	---	---	---	---	530	1,000	1,300 #
Constituent, dissolved (mg/L)							
Ca	---	---	---	---	79	160	---
Mg	---	---	2.7	---	32	64	---
Ba	---	---	---	---	0.017	0.026	---
Na	---	---	---	---	< 10	15	---
K	---	---	---	---	2.2	3.2	---
SO_4	---	440	700	620	340	700	---
Alkalinity (as HCO_3)	---	---	---	---	10	7.2	---
F	---	---	---	---	8.4	12	---
Cl	---	---	---	---	5.3	12	---
SiO_2	---	---	---	---	16	19	---
Al	---	---	6 [2.7]	6.2 [2.6]	7	11	---
Fe	---	---	---	---	1.2	0.15	---
Mn	---	---	6.5	6.8	2.6	5.8	---
Cu	---	---	---	---	0.07	0.13	---
Zn	---	---	---	---	1.9	3.6	---
Mo	---	---	---	---	< 0.1	< 0.1	---
Cd	---	---	---	---	0.013	0.023	---
Ag	---	---	---	---	< 0.002	< 0.002	---
Cr	---	---	---	---	< 0.01	< 0.01	---
Co	---	---	---	---	< 0.01	0.0035	---
Ni	---	---	---	---	0.3	0.41	---
Pb	---	---	---	---	0.014	0.0043	---
Hg	---	---	---	---	< 0.0002	< 0.0002	---
Be	---	---	---	---	0.013	0.014	---
V	---	---	---	---	< 0.01	< 0.01	---
Se	---	---	---	---	< 0.005	0.003	---
As	---	---	---	---	< 0.005	< 0.005	---
Sum cations (meq/L)	---	---	---	---	6.02	11.7	---
Sum anions (meq/L)	---	---	---	---	6.25	11.9	---
Charge imbalance (percent)	---	---	---	---	-3.72	-1.15	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**			
Well ID	Douglas Well	Douglas Well	Douglas Well	Douglas Well
Sample Date	6/10/98	6/10/98	6/7/01	9/6/01
Miscellaneous information	---	---	filtered	filtered
Comments	---	---	---	*1 Fe =1.1 "data for USGS?" 0.66 "MC CD 9/18/02
Source ID (see table 2)	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC CD	MC CD
Lab ID (see table 2)	SLD (WC 98 02511,	ACZ RG 70722	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	7.4	7.4	8.4	8.7
pH, field, [lab]	5.61	5.61	5.8	5.21
Eh (V)	---	---	0.211	0.306
Spec Cond (µS/cm) field, [lab]	640	640	975	796
TDS (mg/L)	481	436, 470	800	640
Constituent, dissolved (mg/L)				
Ca	71.6	69.9	100	86
Mg	24	25.3	47	42
Ba	---	0.031	0.032	0.028
Na	10.4	8.9	12	10
K	< 5	1.9	3.6	2.3
SO_4	294	300	530	420
Alkalinity (as HCO_3)	2.6	8	6.9	6.7
F	---	8.7	14	11
Cl	< 10	5	7	10
SiO_2	---	---	18	17
Al	6.4	6.74	15	10
Fe	1	0.86	1.4	0.66 *1
Mn	2.4	2.3	7	4.2
Cu	---	0.06	0.17	0.12
Zn	1.3	1.46	3	1.9
Mo	---	---	< 0.1	< 0.1
Cd	---	0.009	0.021	0.013
Ag	---	---	< 0.002	< 0.002
Cr	---	---	< 0.01	< 0.01
Co	---	---	0.013	< 0.01
Ni	0.1	0.15	0.32	0.22
Pb	---	---	< 0.003	0.004
Hg	---	---	< 0.0002	< 0.0002
Be	---	0.004	0.0076	0.006
V	---	---	< 0.01	< 0.01
Se	---	0.001	< 0.005	< 0.005
As	---	---	< 0.005	< 0.005
Sum cations (meq/L)	5.69	5.56	8.75	7.50
Sum anions (meq/L)	5.06	5.61	9.31	7.61
Charge imbalance (percent)	11.8	-0.97	-6.29	-1.48

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**				
Well ID	Douglas Well	Douglas Well	Douglas Well	Douglas Well	Douglas Well
Sample Date	11/8/01	3/19/02	3/19/02	6/13/02	6/13/02
Miscellaneous information	filtered	filtered dissolved	unfiltered total	filtered dissolved	unfiltered total
Comments	*1 Se < 0.005, 0.0027 "MC CD 9/18/02", *2 As < 0.005, 0.0027 "MC CD 9/18/02"	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	8.2	12	12	13.9	13.9
pH, field, [lab]	4.87	4.6	4.6	5.53	5.53
Eh (V)	0.174	0.249	0.249	0.164	0.164
Spec Cond (µS/cm) field, [lab]	1,010 #	1,080 #	1,080 #	823	823
TDS (mg/L)	780	950	950	620	620
Constituent, dissolved (mg/L)					
Ca	130	130	[130]	87	[87]
Mg	61	66	[65]	39	[39]
Ba	0.032	0.031	[0.032]	0.024	[0.024]
Na	11	15	[14]	10	[11]
K	2.5	2.8	[3]	2.2	[2]
SO_4	520	670	670	400	400
Alkalinity (as HCO_3)	5.7	< 5	< 5	5.8	5.8
F	12	15	[15]	7.4	[7.4]
Cl	11	12	[12]	7.4	[7.4]
SiO_2	17	18	18	14	[15]
Al	12	14	[15]	5.5	[5.6]
Fe	0.87	0.76	[11]	3.8	[4.6]
Mn	5	7.3	[7.3]	3.2	[3.2]
Cu	0.14	0.17	[0.2]	0.053	[0.066]
Zn	2.7	3.1	[3.1]	2.1	[2.1]
Mo	< 0.1	< 0.1	[< 0.1]	< 0.1	[< 0.1]
Cd	0.017	0.022	[0.022]	0.0099	[0.01]
Ag	< 0.002	0.0099	[< 0.002]	< 0.002	[< 0.002]
Cr	< 0.01	< 0.01	[< 0.01]	< 0.01	[< 0.01]
Co	< 0.01	0.014	[0.014]	0.031	[0.003]
Ni	0.3	0.36	[0.36]	0.16	[0.16]
Pb	0.0015	< 0.003	[< 0.003]	< 0.003	[0.0013]
Hg	< 0.0002	< 0.0002	[0.0002]	< 0.0002	[< 0.0002]
Be	0.0069	0.0069	---	0.0038	---
V	< 0.01	0.0013	---	< 0.01	[< 0.01]
Se	0.0027 *1	0.0082	[0.0062]	< 0.005	[< 0.005]
As	< 0.005 *2	0.0082	[<0.005]	0.0059	[0.0031]
Sum cations (meq/L)	10.7	10.8	10.3	7.06	6.55
Sum anions (meq/L)	8.87	11.3	11.2	7.10	7.11
Charge imbalance (percent)	18.9	-3.99	-8.91	-0.61	-8.20

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**	**Columbine Park Cabin Area**	
Well ID	Fagerquist well	Molycorp Cabin Well	Molycorp Cabin Well
Sample Date	9/9/93	9/1/94	3/19/02
Miscellaneous information	unfiltered Total; no results in MC DB	Company Cabin Well	Company Cabin Well
Comments	---	*1 SO_4=24 by SRK and 21 by Slifer	---
Source ID (see table 2)	Kent 1995, Slifer 1996, MC DB	Slifer 1996, SRK 1995, MC DB, URS 3/01	MC CD
Lab ID (see table 2)	---	---	Paragon Analytics
Depth to Water (m)	15.9	---	---
Water Elevation (ft)	---	---	---
Field Temperature (^oC)	---	---	---
pH, field, [lab]	8.15	7.6	---
Eh (V)	---	---	---
Spec Cond (µS/cm) field, [lab]	142	---	---
TDS (mg/L)	---	160	120
Constituent, dissolved (mg/L)			
Ca	24	---	39
Mg	2	---	7.2
Ba	< 0.1	---	---
Na	2	---	3.6
K	1	---	1.2
SO_4	---	24 *1	58
Alkalinity (as HCO_3)	---	---	65
F	---	ND	0.79
Cl	< 0.001	---	1.4
SiO_2	---	---	8.3
Al	< 0.1	ND	0.072
Fe	< 0.1	0.18	0.14
Mn	< 0.05	ND	0.0047
Cu	< 0.05	ND	< 0.01
Zn	< 0.05	0.1	0.097
Mo	---	---	< 0.1
Cd	---	ND	< 0.001
Ag	< 0.1	---	< 0.002
Cr	< 0.005	---	0.00078
Co	< 0.05	---	< 0.01
Ni	< 0.1	---	0.0072
Pb	< 0.005	---	< 0.003
Hg	< 0.0005	---	< 0.0002
Be	< 0.1	---	< 0.004
V	< 0.1	---	< 0.01
Se	< 0.005	---	< 0.005
As	< 0.005	---	< 0.005
Sum cations (meq/L)	---	---	2.60
Sum anions (meq/L)	---	---	2.21
Charge imbalance (percent)	---	---	16.0

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park**				
Well ID	MMW-33A	MMW-33A	MMW-33A	MMW-33A	MMW-33A
Sample Date	6/12/01	9/5/01	11/27/01	1/30/02	5/13/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,843	7,834	7,828	7,826	7,829
Field Temperature (^{o}C)	11	9.2	5.5	7.5	18.3
pH, field, [lab]	4.66	4.37	4.68	4.39	4.24
Eh (V)	0.1	0.411	0.361	0.259	0.344
Spec Cond (µS/cm) field, [lab]	1,780 #	2,090	2,140	2,120	1,980 #
TDS (mg/L)	1,700	1,900	2,000	1,900	1,800
Constituent, dissolved (mg/L)					
Ca	180	230	240	220	190
Mg	110	140	140	140	130
Ba	< 0.01	< 0.01	0.03	0.0085	0.0083
Na	22	24	24	28	23
K	4.4	4.7	5	4.5	4.8
SO_4	1,200	1,400	1,500	1,400	1,400
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5
F	25	28	27	27	26
Cl	18	23	24	22	20
SiO_2	24	24	24	26	24
Al	48	57	56	57	50
Fe	0.13	< 0.1	< 0.1	< 0.1	0.11
Mn	28	29	31	31	28
Cu	0.71	0.8	0.83	0.83	0.75
Zn	5.1	6	6	5.6	5.6
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.03	0.04	0.04	0.043	0.038
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	0.002	0.019	0.022
Co	0.22	0.26	0.26	0.26	0.23
Ni	0.56	0.66	0.63	0.65	0.6
Pb	< 0.009	< 0.01	< 0.01	0.015	< 0.015
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.01	0.01	0.01	0.012	0.011
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.01	0.01	0.01	0.021	0.021
As	< 0.005	0.007	< 0.0037	0.0069	0.0072
Sum cations (meq/L)	17.6	21.8	22.2	21.8	18.3
Sum anions (meq/L)	18.7	21.2	23.2	21.4	21.2
Charge imbalance (percent)	-6.27	2.66	-4.67	1.76	-14.66

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	P-1	P-1	P-1	P-1	P-1
Sample Date	11/7/97	5/13/98	6/10/98	6/10/98	2/8/00
Miscellaneous information	11/7/97 and 11/10/97 in MC DB, but compiled as one	MC DB: 5/11/98 &11/17/98	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	---	---	SLD WC 98 02503	ACZ RG 70723	Paragon Analytics
Depth to Water (m)	---	---	7.24	7.24	7.8
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	7.9	---	8.1	8.1	8.3
pH, field, [lab]	4.87	---	4.98	4.98	4.68
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,070 #	---	1,710 #	1,710 #	1,840
TDS (mg/L)	960	1,090	986	923	1,700
Constituent, dissolved (mg/L)					
Ca	142	149	136	142	220
Mg	60	64.7	53.8	57.2	100
Ba	0.025	---	---	0.018	0.03
Na	15	15.7	15.3	15.2	23
K	2.8	2.6	< 5	2.6	4.2
SO_4	610	680	643	650	1,100
Alkalinity (as HCO_3)	4	5	< 2.5	2	11
F	13	15	---	15	25
Cl	13	15	10.9	13	18
SiO_2	23.8	---	---	---	25.7
Al	13.4	16.1	---	15	28
Fe	0.09	0.05	---	---	< 0.1
Mn	6.34	7.28	---	7.49	16
Cu	0.23	0.19	---	0.18	0.31
Zn	3.48	3.91	---	3.89	6.1
Mo	< 0.01	ND	---	---	< 0.01
Cd	0.023	0.026	---	0.027	0.046
Ag	< 0.005	---	---	---	---
Cr	< 0.01	---	---	---	< 0.01
Co	< 0.01	ND	---	---	0.018
Ni	0.39	0.45	---	0.43	0.69
Pb	< 0.04	---	---	---	< 0.006
Hg	< 0.0002	---	---	---	---
Be	0.02	---	---	0.016	0.026
V	< 0.005	---	---	---	---
Se	< 0.002	---	---	0.002	0.014
As	< 0.001	---	---	---	0.013
Sum cations (meq/L)	11.2	11.8	9.27	11.0	17.2
Sum anions (meq/L)	10.4	11.6	11.1	11.1	17.9
Charge imbalance (percent)	7.38	2.24	-17.7	-1.01	-3.72

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	P-1	P-1	P-1	P-1	P-1
Sample Date	6/5/01	9/11/01	11/27/01	2/14/02	5/15/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,811	7,806	7,798	7,796	7,798
Field Temperature (^{o}C)	10.1	14.4	5.2	8.3	19.4
pH, field, [lab]	5.03	4.77	4.59	4.58	4.4
Eh (V)	0.14	0.296	0.305	0.202	0.259
Spec Cond (µS/cm) field, [lab]	823	1,083	1,620	1,840	1,850 #
TDS (mg/L)	600	850	1,400	1,600	1,800
Constituent, dissolved (mg/L)					
Ca	78	110	190	200	210
Mg	37	54	100	110	110
Ba	< 0.01	< 0.01	< 0.01	0.021	0.02
Na	11	13	18	22	22
K	2.4	2.9	4.6	4.7	4.5
SO_4	430	580	1,000	1,200	1,300
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5
F	9.1	13	21	24	26
Cl	12	12	19	20	20
SiO_2	16	19.7	23.5	25.7	25.7
Al	11	15	29	33	35
Fe	< 0.1	< 0.1	0.13	0.14	0.09
Mn	4.9	6.7	17	20	19
Cu	0.15	0.16	0.4	0.41	0.4
Zn	2.2	3.1	6.1	6.3	5.9
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.01	0.02	0.04	0.049	0.046
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	0.00055	0.015	0.009
Co	< 0.01	< 0.01	0.02	0.032	0.035
Ni	0.24	0.35	0.65	0.73	0.71
Pb	< 0.003	< 0.003	< 0.006	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.01	0.01	0.02	0.026	0.024
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	< 0.005	< 0.005	0.0097	0.014	0.0078
As	< 0.005	< 0.005	< 0.005	0.011	0.0081
Sum cations (meq/L)	6.96	9.40	16.5	17.3	16.7
Sum anions (meq/L)	7.77	9.88	16.3	19.3	20.2
Charge imbalance (percent)	-11.0	-5.04	1.52	-11.1	-19.2

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	P-2	P-2	P-2	P-2	P-2
Sample Date	11/7/97	5/11/98	6/10/98	6/10/98	2/8/00
Miscellaneous information	11/7 & 11/10 1997 accd to MC DB	---	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	---	---	SLD WC 98 02504	ACZ RG 70724	Paragon Analytics
Depth to Water (m)	---	---	4.1	4.1	6.31
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	8.9	---	7.8	7.8	6.2
pH, field, [lab]	4.93	---	5.22	5.22	4.86
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,030 #	---	880	880	1,440
TDS (mg/L)	910	930	672	616, 680	1,200
Constituent, dissolved (mg/L)					
Ca	146	131	93.6	101	160
Mg	59	57.6	35.7	38.2	77
Ba	0.027	---	---	0.021	0.022
Na	15	13.2	11.4	11.3	17
K	2.4	2.3	< 5	1.9	2.8
SO_4	590	540	432	430	780
Alkalinity (as HCO_3)	4	4	< 2.5	2	5.6
F	12	11	---	7.7	19
Cl	12	13	< 10	10	14
SiO_2	22	---	---	---	19
Al	13.7	15.3	---	8.78	21
Fe	0.01	0.05	---	---	< 0.1
Mn	7.82	8.33	---	4.13	13
Cu	0.23	0.21	---	0.11	0.27
Zn	2.44	2.39	---	1.93	3.2
Mo	< 0.01	ND	---	---	< 0.1
Cd	0.017	0.016	---	0.011	0.025
Ag	< 0.005	---	---	---	< 0.002
Cr	0.01	---	---	---	< 0.01
Co	0.03	0.04	---	0.01	0.71
Ni	0.31	0.29	---	0.2	0.39
Pb	< 0.04	---	---	---	< 0.006
Hg	< 0.0002	---	---	---	< 0.0002
Be	0.01	---	---	0.005	0.008
V	< 0.005	---	---	---	< 0.01
Se	< 0.002	---	---	0.001	0.012
As	< 0.001	---	---	---	0.0054
Sum cations (meq/L)	11.4	10.9	6.62	7.9	13.4
Sum anions (meq/L)	9.94	9.18	7.50	7.6	13.1
Charge imbalance (percent)	13.6	17.5	-12.5	3.20	2.62

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	P-2	P-2	P-2	P-2	P-2
Sample Date	6/5/01	9/11/01	11/27/01	2/14/02	5/15/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,810	7,806	7,798	7,797	7,799
Field Temperature (^{o}C)	9.7	19.3	6.1	9.6	17.4
pH, field, [lab]	5.04	4.88	4.64	4.62	4.62
Eh (V)	0.216	0.32	0.333	0.283	0.344
Spec Cond (µS/cm) field, [lab]	1,290 #	1,190 #	1,450 #	1,600 #	1,360 #
TDS (mg/L)	1,000	960	1,200	1,400	1,200
Constituent, dissolved (mg/L)					
Ca	150	130	160	170	150
Mg	68	61	84	94	79
Ba	0.032	0.04	0.021	0.018	0.02
Na	16	16	16	20	16
K	3.2	3.1	4.3	4	3.1
SO_4	730	660	850	980	980
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5
F	12	12	17	22	16
Cl	25	14	15	17	14
SiO_2	24	21	21	21	20
Al	16	14	26	32	23
Fe	0.47	< 0.1	< 0.1	0.062	< 0.1
Mn	7.6	7.7	15	19	13
Cu	0.23	0.25	0.41	0.47	0.3
Zn	2.9	3.2	4.3	4.1	3.1
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	0.019	0.019	0.03	0.031	0.024
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	0.0033	0.0056	0.0042
Co	0.035	0.039	0.054	0.08	0.068
Ni	0.33	0.32	0.48	0.48	0.4
Pb	< 0.003	< 0.003	< 0.006	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.008	0.006	0.012	0.012	0.0085
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.0056	< 0.005	0.0072	0.0068	< 0.005
As	< 0.005	< 0.005	0.003	0.0054	< 0.005
Sum cations (meq/L)	12.0	10.4	14.3	15.4	12.3
Sum anions (meq/L)	12.5	10.9	13.9	15.8	16.0
Charge imbalance (percent)	-4.04	-4.90	2.20	-2.66	-26.3

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	P-3	P-3	P-3	P-3	P-3
Sample Date	11/7/97	11/17/97	6/10/98	6/10/98	2/8/00
Miscellaneous information	---	11/17/98 in MD DB	filtered	filtered	filtered
Comments	---	---	---	---	*1 F=17 in URS
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC DB, MMW wkst, RGC 8/10, URS 3/01
Lab ID (see table 2)	---	---	SLD (WC 98 02505,	ACZ RG70645	Paragon Analytics
Depth to Water (m)	---	---	8.5	8.5	10.6
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	6.7	6.7	8.3
pH, field, [lab]	4.88	---	5.55	5.55	4.96
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	800	---	843	843	1,440
TDS (mg/L)	690	810	466	389, 450	1,200
Constituent, dissolved (mg/L)					
Ca	101	120	63.5	67.3	170
Mg	43.2	50.1	24.2	25.1	76
Ba	0.046	---	---	0.023	0.041
Na	11.3	12.5	9.1	9.2	18
K	2.1	2.3	< 5	1.5	3.7
SO_4	430	520	279	260	790
Alkalinity (as HCO_3)	9	7	3.8	6	9.3
F	10	9.9	---	7.1	10 *1
Cl	9	12	< 10	6	14
SiO_2	19.4	---	---	---	21.4
Al	6.42	10.3	5.4	6.04	16
Fe	0.01	0.02	---	---	< 0.1
Mn	1.93	3.74	1.6	1.58	7.8
Cu	0.04	0.11	---	0.04	0.17
Zn	1.61	2.43	1.1	1.3	4.2
Mo	< 0.05	ND	---	---	< 0.1
Cd	0.012	0.019	---	0.009	0.032
Ag	< 0.005	---	---	---	< 0.002
Cr	0.01	---	---	---	< 0.01
Co	< 0.01	ND	---	---	< 0.01
Ni	0.16	0.3	0.2	0.17	0.51
Pb	< 0.04	---	---	---	< 0.003
Hg	< 0.0002	---	---	---	---
Be	0.01	---	---	0.006	0.016
V	< 0.005	---	---	---	0.01
Se	0.001	---	---	---	0.0065
As	< 0.001	---	---	---	< 0.005
Sum cations (meq/L)	7.96	9.54	5.21	5.47	13.4
Sum anions (meq/L)	7.84	9.25	4.89	4.89	13.1
Charge imbalance (percent)	1.47	3.1	6.5	11.3	2.37

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**					
Well ID	P-3	P-3	P-3	P-3	P-3	P-3
Sample Date	6/5/01	9/11/01	11/27/01	2/14/02	5/14/02	8/1/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	7,816	7,812	7,805	7,804	7,807	---
Field Temperature (^{o}C)	8.7	12.1	2.4	7.2	12.3	23.7
pH, field, [lab]	5.64	4.9	4.92	4.75	4.74	4.49
Eh (V)	0.131	0.312	0.281	0.29	0.39	0.293
Spec Cond (µS/cm) field, [lab]	707	821	1,250 #	1,520 #	1,360 #	1,460 #
TDS (mg/L)	510	630	980	1,200	1,200	---
Constituent, dissolved (mg/L)						
Ca	73	85	150	170	150	---
Mg	33	41	70	90	79	---
Ba	0.015	0.018	0.026	0.028	0.025	---
Na	< 10	11	13	19	14	---
K	2.3	2.5	3.7	4	3.8	---
SO_4	370	430	680	920	800	---
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5	---
F	9.1	10	13	21	17	---
Cl	9	10	14	16	13	---
SiO_2	16	18	19	24	20	---
Al	8.5	10	15	24	18	---
Fe	0.11	< 0.1	< 0.1	< 0.1	< 0.1	---
Mn	3.3	4.3	6.7	13	8.9	---
Cu	0.08	0.1	0.18	0.3	0.23	---
Zn	1.9	2.2	3.4	4.6	4.5	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	0.013	0.016	0.024	0.035	0.03	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	< 0.01	0.0011	0.0015	0.0017	---
Co	< 0.01	< 0.01	0.0055	0.02	0.0084	---
Ni	0.21	0.25	0.39	0.55	0.49	---
Pb	< 0.003	< 0.003	< 0.003	< 0.006	< 0.003	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.0088	0.0094	0.013	0.018	0.016	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	< 0.005	< 0.005	0.0057	0.0063	0.0055	---
As	< 0.005	< 0.005	0.0026	0.0044	0.0029	---
Sum cations (meq/L)	5.86	7.38	12.3	14.6	12.4	---
Sum anions (meq/L)	6.75	7.62	11.6	15.2	13.2	---
Charge imbalance (percent)	-14.1	-3.24	6.00	-3.78	-5.61	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	**P-4**	**P-4A**	**P-4A**	**P-4A**	**P-4A**
Sample Date	5/11/98	11/10/97	6/10/98	6/10/98	2/7/00
Miscellaneous information	P4 is separate from P4A or 4B, could be 4B or analysis from TAILINGS area	---	filtered	filtered	DRY
Comments	This data was not used for plotting or modeling purposes.	DRY: 11/7/97 - 11/10/97	---	---	2/7/00 in MMW wkst, RGC; 2/8/00 in MC DB
Source ID (see table 2)	MC DB	MC DB	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	---	---	SLD WC 98 02506,	ACZ RG 70646	---
Depth to Water (m)	---	---	6.4	6.4	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	6.4	6.4	---
pH, field, [lab]	---	---	5.47	5.47	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	883	883	---
TDS (mg/L)	1,290	---	664	660, 571	---
Constituent, dissolved (mg/L)					
Ca	183	---	98.1	106	---
Mg	79.6	---	37	40.3	---
Ba	---	---	---	---	---
Na	17.9	---	10.6	11.4	---
K	2.8	---	< 5	1.8	---
SO_4	850	---	422	380	---
Alkalinity (as HCO_3)	3	---	< 2.5	4	---
F	---	---	---	7.4	---
Cl	---	---	65.7	11	---
SiO_2	---	---	---	---	---
Al	---	---	5.6	6.39	---
Fe	0.06	---	---	---	---
Mn	12.7	---	2.9	2.8	---
Cu	0.37	---	---	0.07	---
Zn	4.1	---	1.1	1.23	---
Mo	ND	---	---	---	---
Cd	---	---	---	0.007	---
Ag	---	---	---	---	---
Cr	---	---	---	---	---
Co	0.08	---	---	0.01	---
Ni	0.53	---	0.1	0.14	---
Pb	---	---	---	---	---
Hg	---	---	---	---	---
Be	---	---	---	0.003	---
V	---	---	---	---	---
Se	---	---	---	---	---
As	---	---	---	---	---
Sum cations (meq/L)	13.0	---	7.44	8.14	---
Sum anions (meq/L)	13.6	---	8.95	6.81	---
Charge imbalance (percent)	-4.49	---	-18.4	17.8	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	**P-4B**	**P-4B**	**P-4B**	**P-4B**	**P-4B**
Sample Date	11/7/97	5/11/98	6/10/98	6/10/98	2/8/00
Miscellaneous information	---	---	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	---	---	SLD WC 98	ACZ RG 70647	Paragon Analytics
Depth to Water (m)	---	---	6.4	6.4	8.46
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	8.2	---	9	9	7.7
pH, field, [lab]	4.6	---	4.78	4.78	4.59
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,390 #	---	1,610 #	1,610 #	1,910
TDS (mg/L)	1,320	1,290	1,350	1250, 1340	1,900
Constituent, dissolved (mg/L)					
Ca	201	183	182	195	220
Mg	81	79.6	75.6	81.3	110
Ba	0.014	---	---	0.014	0.015
Na	19.7	17.9	18.4	20.3	25
K	3.1	2.8	< 5	2.9	4.4
SO_4	860	850	892	870	1,100
Alkalinity (as HCO_3)	4	3	< 2.5	2	9.5
F	17	16	---	20	23
Cl	16	17	69.9	16	19
SiO_2	25.5	---	---	---	23.5
Al	24.9	24.7	---	25.8	36
Fe	< 0.01	0.06	---	---	< 0.1
Mn	13.7	12.7	---	12.6	21
Cu	0.41	0.37	---	0.37	0.5
Zn	4.18	4.1	---	4.54	5.3
Mo	< 0.01	ND	---	---	< 0.1
Cd	0.034	0.032	---	0.035	0.043
Ag	< 0.005	---	---	---	< 0.002
Cr	0.01	---	---	---	< 0.01
Co	0.08	0.09	---	0.07	0.13
Ni	0.5	0.53	---	0.58	0.63
Pb	< 0.04	---	---	---	< 0.009
Hg	< 0.0002	---	---	---	< 0.0002
Be	0.01	---	---	0.011	0.015
V	< 0.005	---	---	---	< 0.01
Se	0.002	---	---	0.002	0.015
As	< 0.001	---	---	---	0.0069
Sum cations (meq/L)	15.6	14.6	12.1	15.3	18.8
Sum anions (meq/L)	13.8	13.8	16.5	14.1	17.4
Charge imbalance (percent)	12.0	5.84	-31.0	8.46	7.85

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	**P-4B**	**P-4B**	**P-4B**	**P-4B**	**P-4B**
Sample Date	6/5/01	11/26/01	2/14/02	5/15/02	8/6/02
Miscellaneous information	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,815	7,803	7,802	7,804	---
Field Temperature (^{o}C)	9.9	8.4	8.7	13.8	12.9
pH, field, [lab]	4.64	4.55	4.79	4.42	4.37
Eh (V)	0.226	0.321	0.286	0.385	0.303
Spec Cond (µS/cm) field, [lab]	1,860 #	1,880 #	1,890 #	1,960 #	1,910 #
TDS (mg/L)	1,700	1,700	1,700	1,800	---
Constituent, dissolved (mg/L)					
Ca	210	210	210	220	---
Mg	110	120	120	120	---
Ba	0.011	0.013	0.026	0.013	---
Na	22	21	24	24	---
K	4.4	4.8	4.6	4.6	---
SO_4	1,200	1,200	1,200	1,400	---
Alkalinity (as HCO_3)	< 5	< 5	5.1	0	---
F	24	25	27	26	---
Cl	18	21	20	21	---
SiO_2	24	24	26	26	---
Al	41	41	40	44	---
Fe	< 0.1	< 0.1	< 0.1	< 0.1	---
Mn	24	24	25	24	---
Cu	0.6	0.59	0.58	0.6	---
Zn	5	6	5.6	5.3	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	0.039	0.044	0.042	0.042	---
Ag	< 0.002	< 0.002	< 0.002	0.002	---
Cr	< 0.01	0.0081	0.001	0.0039	---
Co	0.15	0.14	0.14	0.14	---
Ni	0.59	0.65	0.64	0.63	---
Pb	< 0.009	< 0.009	< 0.009	< 0.009	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.014	0.017	0.016	0.017	---
V	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	0.0081	0.011	0.011	0.0099	---
As	< 0.005	0.0047	0.0055	0.0036	---
Sum cations (meq/L)	18.3	19.0	19.0	18.7	---
Sum anions (meq/L)	18.8	18.8	19.0	21.7	---
Charge imbalance (percent)	-2.75	0.99	0.22	-15.2	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	**P-5A**	**P-5A**	**P-5A**	**P-5A**	**P-5A**
Sample Date	11/7/97	6/10/98	6/10/98	2/8/00	8/27/01
Miscellaneous information	11/7/1997 - 11/10/97 MC DB	filtered	filtered	DRY	filtered
Comments	DRY	---	---	---	---
Source ID (see table 2)	MC DB	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC DB, MMW wkst, RGC 8/10	MC CD
Lab ID (see table 2)	---	SLD (WC-98 02509,	ACZ RG 70648	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	5.4	5.4	---	---
Water Elevation (ft)	---	---	---	---	7,821
Field Temperature (^{o}C)	---	8.9	8.9	---	13.3
pH, field, [lab]	---	5.9, [5.46]	5.9, [5.46]	---	4.79
Eh (V)	---	---	---	---	0.329
Spec Cond (µS/cm) field, [lab]	---	888	888	---	1,380 #
TDS (mg/L)	---	674	623, 760	---	1,200
Constituent, dissolved (mg/L)					
Ca	---	113	102	---	150
Mg	---	38.3	38.8	---	77
Ba	---	---	0.03	---	0.025
Na	---	12.2	11.3	---	17
K	---	< 5	1.9	---	3.5
SO_4	---	429	430	---	850
Alkalinity (as HCO_3)	---	< 2.5	3	---	< 5
F	---	---	11	---	17
Cl	---	65.5	10	---	15
SiO_2	---	---	---	---	21
Al	---	8.7	9.66	---	29
Fe	---	---	---	---	0.39
Mn	---	4.6	4.47	---	14
Cu	---	0.1	0.12	---	0.39
Zn	---	1.5	1.66	---	3.4
Mo	---	---	---	---	< 0.1
Cd	---	---	0.011	---	0.025
Ag	---	---	---	---	< 0.002
Cr	---	---	---	---	0.018
Co	---	---	0.02	---	0.089
Ni	---	0.2	0.18	---	0.43
Pb	---	---	---	---	< 0.006
Hg	---	---	---	---	< 0.0002
Be	---	---	0.004	---	0.01
V	---	---	---	---	< 0.01
Se	---	---	0.001	---	0.0073
As	---	---	---	---	0.0053
Sum cations (meq/L)	---	8.41	7.90	---	13.2
Sum anions (meq/L)	---	8.92	7.66	---	13.7
Charge imbalance (percent)	---	-5.79	3.10	---	-3.55

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	**P-5B**	**P-5B**	**P-5B**	**P-5B**	**P-5B**
Sample Date	11/7/97	5/11/98	6/10/98	6/10/98	2/7/00
Miscellaneous information	---	---	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	NMED: SLD lab sheet	NMED: ACZ lab sheet	MC DB, MMW wkst, RGC 8/10, URS 3/01
Lab ID (see table 2)	---	---	SLD (WC-98 02510,	ACZ RG 70649	Paragon Analytics
Depth to Water (m)	---	---	5.9	5.9	7.53
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	8.2	---	8.9	8.9	8.8
pH, field, [lab]	4.44	---	4.65	4.65	4.49
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,450 #	---	1,560 #	1,560 #	2,090
TDS (mg/L)	1,400	1,370	1,330	1230, 1470	2,000
Constituent, dissolved (mg/L)					
Ca	183	181	171	172	230
Mg	90	84.4	71.5	77.4	120
Ba	0.014	---	---	0.012	0.015
Na	19.6	17.9	18.3	18.5	26
K	3.2	2.8	< 5	2.7	4.5
SO_4	900	920	877	870	1,300
Alkalinity (as HCO_3)	2	ND	< 2.5	2	7.2
F	18	16	---	18	24
Cl	17	16	69.3	16	21
SiO_2	26.1	---	---	---	23.5
Al	32.7	31.7	30	31.3	46
Fe	< 0.01	0.08	---	---	< 0.1
Mn	18.7	16.2	17	16.4	26
Cu	0.5	0.43	0.4	0.4	0.62
Zn	3.86	3.33	3.1	3.46	4.6
Mo	< 0.01	ND	---	---	< 0.1
Cd	0.031	0.025	0.02	0.026	0.038
Ag	< 0.005	---	---	---	< 0.002
Cr	< 0.01	---	---	---	< 0.01
Co	0.15	0.14	---	0.14	0.2
Ni	0.4	0.4	0.4	0.37	0.56
Pb	< 0.04	---	---	---	< 0.009
Hg	< 0.0002	---	---	---	< 0.0002
Be	0.01	---	---	0.008	0.011
V	< 0.005	---	---	---	< 0.01
Se	< 0.002	---	---	0.001	0.021
As	< 0.001	---	---	---	0.0059
Sum cations (meq/L)	16.1	15.2	14.0	14.6	20.1
Sum anions (meq/L)	14.3	14.6	14.9	14.1	20.2
Charge imbalance (percent)	11.7	4.45	-6.38	3.57	-0.81

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**					
Well ID	**P-5B**	**P-5B**	**P-5B**	**P-5B**	**P-5B**	**P-5B**
Sample Date	6/5/01	8/27/01	11/26/01	2/7/02	5/14/02	7/30/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon	Paragon	Paragon	Paragon	Paragon	Paragon
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	7,820	7,818	7,813	7,812	7,815	---
Field Temperature (^{o}C)	10.3	19.9	7.9	10.5	13	23.1
pH, field, [lab]	4.87	4.65	4.46	4.46	4.39	4.27
Eh (V)	0.257	0.354	0.329	0.33	0.387	0.326
Spec Cond (µS/cm) field, [lab]	1,720 #	1,840 #	1,950 #	1,980 #	2,000	1,890 #
TDS (mg/L)	1,400	1,800	1,800	1,900	1,900	---
Constituent, dissolved (mg/L)						
Ca	220	240	220	230	210	---
Mg	94	110	120	130	130	---
Ba	0.026	0.027	0.013	0.013	0.014	---
Na	20	22	22	28	22	---
K	4.3	4.8	4.6	4.8	4.9	---
SO_4	990	1,200	1,300	1,400	1,400	---
Alkalinity (as HCO_3)	< 5	5.1	< 5	< 5	< 5	---
F	23	25	24	28	26	---
Cl	16	19	23	22	20	---
SiO_2	26	26	24	26	24	---
Al	26	32	49	51	47	---
Fe	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Mn	16	17	27	27	27	---
Cu	0.69	0.9	0.67	0.68	0.66	---
Zn	4.9	6	5.2	5.4	5.5	---
Mo	< 0.1	< 0.1	< 0.1	0.035	< 0.1	---
Cd	0.045	0.055	0.037	0.039	0.039	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	< 0.01	0.0022	0.0069	0.0075	---
Co	0.015	0.018	0.21	0.22	0.21	---
Ni	0.75	0.95	0.56	0.59	0.59	---
Pb	< 0.006	0.0074	< 0.009	< 0.009	0.0056	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.015	0.019	0.011	0.012	0.012	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	< 0.005	0.01	0.014	0.013	0.019	---
As	< 0.005	0.0079	0.006	0.0071	0.0027	---
Sum cations (meq/L)	16.8	17.9	19.8	20.7	19.2	---
Sum anions (meq/L)	15.7	18.3	20.2	21.5	21.6	---
Charge imbalance (percent)	6.79	-2.03	-1.9	-3.91	-11.5	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**					
Well ID	**P-5C**	**P-5C**	**P-5C**	**P-5C**	**P-5C**	**P-5C**
Sample Date	11/7/97	5/11/98	6/10/98	6/10/98	2/7/00	6/5/01
Miscellaneous information	11/7/97 - 11/10/97	---	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	NMED: ACZ lab sheet	NMED: SLD lab sheet	MC DB, MMW wkst, RGC 8/10	MC CD
Lab ID (see table 2)	---	---	ACZ RG 70650	SLD WC-98	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	6.4	6.4	8	---
Water Elevation (ft)	---	---	---	---	---	7,824
Field Temperature (^{o}C)	8.6	---	9.7	9.7	8.6	10.3
pH, field, [lab]	4.69	---	4.92	4.92	4.63	4.57
Eh (V)	---	---	---	---	---	0.242
Spec Cond (µS/cm) field, [lab]	1,530 #	---	1,730 #	1,730 #	2,040	1,730 #
TDS (mg/L)	1,510	1,320	1390, 1540	1,440	1,900	1,500
Constituent, dissolved (mg/L)						
Ca	213	210	229	228	250	180
Mg	94	85	82.4	79.8	120	100
Ba	0.029	---	0.027	---	0.029	0.012
Na	23	19.5	21.2	22.3	26	21
K	3.3	3.1	3	< 5	4.7	4
SO_4	910	940	990	964	1,200	1,100
Alkalinity (as HCO_3)	5	6	4	2.6	6.9	< 5
F	24	20	14	---	28	22
Cl	17	17	17	71.2	20	16
SiO_2	26.8	---	---	---	25.7	24
Al	24.2	22.2	20	---	33	41
Fe	< 0.01	0.06	---	---	< 0.1	< 0.1
Mn	12.8	12.2	10.2	---	21	24
Cu	0.6	0.59	0.53	---	0.85	0.57
Zn	5.29	4.8	4.49	---	6.2	4.1
Mo	< 0.01	ND	---	---	< 0.1	< 0.1
Cd	0.044	0.044	0.04	---	0.056	0.032
Ag	< 0.005	---	---	---	< 0.002	< 0.002
Cr	0.01	---	---	---	< 0.01	< 0.01
Co	0.01	0.01	---	---	0.031	0.18
Ni	0.76	0.75	0.76	---	0.83	0.47
Pb	< 0.04	---	---	---	0.015	< 0.009
Hg	< 0.0002	---	---	---	< 0.0002	< 0.0002
Be	0.01	---	0.011	---	0.019	0.01
V	< 0.005	---	---	---	< 0.01	< 0.01
Se	0.002	---	0.003	---	0.014	0.0061
As	< 0.001	---	---	---	0.011	< 0.005
Sum cations (meq/L)	16.7	15.5	16.0	14.1	20.1	16.7
Sum anions (meq/L)	14.7	15.2	15.9	17.3	18.9	17.3
Charge imbalance (percent)	13.2	2.02	0.60	-20.4	6.04	-3.92

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Columbine Park Cabin Area**				
Well ID	**P-5C**	**P-5C**	**P-5C**	**P-5C**	**P-5C**
Sample Date	8/27/01	11/26/01	2/7/02	5/14/02	7/30/02
Miscellaneous information	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,819	7,811	7,810	7,813	---
Field Temperature (^{o}C)	18.6	7.7	8.4	11.6	21.3
pH, field, [lab]	4.57	4.95	4.69	4.55	4.5
Eh (V)	0.348	0.319	0.316	0.372	0.262
Spec Cond (µS/cm) field, [lab]	1,620	1,880 #	1,820 #	1,850	1,760 #
TDS (mg/L)	1,500	1,700	1,600	1,800	---
Constituent, dissolved (mg/L)					
Ca	180	240	230	230	---
Mg	96	110	110	120	---
Ba	0.048	0.028	0.025	0.026	---
Na	20	22	27	21	---
K	3.8	4.9	5	5.1	---
SO_4	1,000	1,200	1,200	1,200	---
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	---
F	19	25	28	27	---
Cl	16	20	18	19	---
SiO_2	24	26	28	26	---
Al	34	32	32	31	---
Fe	< 0.1	< 0.1	< 0.1	< 0.1	---
Mn	21	20	19	20	---
Cu	0.65	0.9	0.85	0.87	---
Zn	4.4	6.2	6.2	6.6	---
Mo	< 0.1	0.039	< 0.01	< 0.1	---
Cd	0.032	0.053	0.052	0.054	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	0.0054	0.0056	0.0085	---
Co	0.17	0.023	0.024	0.026	---
Ni	0.49	0.86	0.85	0.86	---
Pb	< 0.009	0.01	0.0082	0.014	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.0084	0.018	0.019	0.019	---
V	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	0.0091	0.011	0.012	0.014	---
As	< 0.005	0.011	0.0079	0.0069	---
Sum cations (meq/L)	15.7	18.8	18.5	18.7	---
Sum anions (meq/L)	15.3	19.0	19.1	18.8	---
Charge imbalance (percent)	2.06	-1.14	-3.27	-0.40	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**
Sample Date	11/8/94	11/8/94	11/8/94	11/8/94	11/19/94	6/1/95
Miscellaneous information	filtered	filtered	filtered	filtered	filtered; correct date	---
Comments	---	---	*1 Zn =1.9 / 2.1	---	sampled after aquifer test	---
Source ID (see table 2)	Slifer 1996	SPRI 1995	Slifer 1996	SPRI 1995, SRK 1995, MC DB, MMW	SPRI 1995, MC DB	MMW wkst
Lab ID (see table 2)	SLD IC-94 6425	ETC	SLD IC-94 0656	ETC	ETC	---
Depth to Water (m)	6.61	6.61	6.61	6.61	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	7.8	---	7.8	---	---
pH, field, [lab]	5.9, [4.41]	5.8	5.9	5.8	---	4.65
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1210, [1,820	2,400	1,210	2,400	---	1,770
TDS (mg/L)	1,880 #	1,700	1,880	1,700	1,700	---
Constituent, dissolved (mg/L)						
Ca	232 #	270	290	275	245	---
Mg	90.7	76.7	83	77.9	69.7	---
Ba	---	< 0.01	< 0.1	< 0.01	---	---
Na	32	26.4	---	26.5	25.6	---
K	14	2.5	---	2.8	3.7	---
SO_4	1,030	1,100	---	1,100	1,200	1,200 #
Alkalinity (as HCO_3)	< 3	< 1	< 3	< 1	ND	---
F	8.3	7.96	---	11.2	8.28	11.5
Cl	21	26	---	27	26	---
SiO_2	---	30	30	31	---	---
Al	---	34.2	33	33.4	31.6	14.5
Fe	---	< 0.05	< 0.1	< 0.05	0.086	1.1
Mn	---	12.8	15	13.8	13.1	12.7
Cu	---	0.58	0.5	0.558	0.534	0.32
Zn	---	2.07	1.9 *1	2.29	2.68	2.92
Mo	---	< 0.02	< 0.01	< 0.02	ND	< 0.02
Cd	---	0.024	0.03	0.028	0.0224	0.021
Ag	---	< 0.1	< 0.01	< 0.1	---	---
Cr	---	< 0.01	< 0.01	< 0.01	---	---
Co	---	0.137	0.13	0.148	0.141	---
Ni	---	0.293	0.3	0.325	0.279	---
Pb	---	< 0.002	< 0.01	0.004	---	< 0.1
Hg	---	< 0.0002	< 0.005	< 0.0002	---	---
Be	---	0.008	< 0.01	0.008	---	---
V	---	< 0.01	< 0.01	< 0.01	---	---
Se	---	< 0.005	< 0.05	< 0.005	---	---
As	---	< 0.005	< 0.01	< 0.005	---	---
Sum cations (meq/L)	18.4	18.2	---	18.5	16.1	---
Sum anions (meq/L)	16.1	17.2	---	17.3	19.5	---
Charge imbalance (percent)	13.0	5.6	---	6.53	-18.8	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**						
Well ID	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**
Sample Date	4/17/96	8/1/96	1/31/97	6/25/97	11/7/97	5/11/98	6/11/98
Miscellaneous information	filtered	filtered	filtered	---	---	---	11/6/98 in MC DB
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	MMW wkst	MMW wkst	NMED: ACZ lab sheet, MC DB	MC DB, URS 3/01	MC DB, URS 3/01	NMED: ACZ lab sheet, MC DB
Lab ID (see table 2)	---	---	---	ACZ RG 46917	---	---	ACZ RG 70725
Depth to Water (m)	6.7	---	---	---	---	---	9.5
Water Elevation (ft)	---	---	---	7,915	---	---	---
Field Temperature (^{o}C)	10.1	---	8.8	---	9.3	---	9.4
pH, field, [lab]	4.95	4.42	4.64	---	4.44	---	4.59
Eh (V)	---	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,820	1,902	1,729	[1,600]	1,640 #	---	2,550
TDS (mg/L)	1,670 #	---	---	1580, 1030	1,630	1,760	1330, 1500
Constituent, dissolved (mg/L)							
Ca	---	300	253	280	246	256	225
Mg	113	78	83.6	80.1	75.8	89	65.8
Ba	< 0.1	< 0.01	0.015	0.005	0.01	---	0.007
Na	26	33	26.4	30.5	25.3	29.7	24
K	---	3.6	3	3	2.6	3.1	2.7
SO_4	1,260 #	1,200	1,660 #	1,090	1,020	1,090	940
Alkalinity (as HCO_3)	< 1	---	---	< 2	< 2	ND	< 2
F	9.1	---	8.93	14	14	14	14
Cl	---	24	---	6	21	22	18
SiO_2	---	30	67	67	30	---	31
Al	19.2	35	35.2	31.3	31.6	39.1	28.1
Fe	< 0.05	0.097	0.02	0.01	0.01	0.11	< 0.01
Mn	12.8 #	9.06	14.2	14	12.4	13.7	11.6
Cu	0.311	0.446	0.55	0.63	0.49	0.62	0.47
Zn	25.5	2.8	2.56	2.57	2.28	2.29	1.97
Mo	< 0.02	< 0.02	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01
Cd	0.026	0.0041	0.03	0.027	0.025	0.027	0.019
Ag	< 0.01	< 0.01	< 0.0002	< 0.0003	< 0.005	---	< 0.0005
Cr	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---	< 0.01
Co	0.13	0.15	0.15	0.15	0.49	0.16	0.12
Ni	0.28	0.32	0.33	0.34	0.28	0.34	0.27
Pb	< 0.005	---	0.006	0.001	< 0.04	---	0.003
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	< 0.0002
Be	0.007	0.008	0.008	0.008	< 0.01	---	0.006
V	< 0.01	< 0.01	< 0.005	< 0.005	< 0.005	---	< 0.005
Se	< 0.005	0.011	0.003	0.002	< 0.002	---	0.003
As	< 0.01	0.01	< 0.001	< 0.005	< 0.001	---	< 0.001
Sum cations (meq/L)	---	19.2	16.3	18.8	17.2	18.9	15.6
Sum anions (meq/L)	---	17.6	26.1	16.3	16.0	16.6	15.0
Charge imbalance (percent)	---	8.84	-46.0	14.3	7.38	13.2	3.93

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**						
Well ID	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**	**MMW-10A**
Sample Date	2/3/00	6/5/01	7/17/01	12/1/01	2/1/02	4/25/02	7/24/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	MCDB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	8.27	---	---	---	---	---	---
Water Elevation (ft)	---	7,916	7,917	7,913	7,910	7,911	---
Field Temperature (^{o}C)	8.5	---	9.9	9.2	3.9	9.5	17.6
pH, field, [lab]	4.31	4.72	4.45	4.19	4.24	4.16	4.15
Eh (V)	---	0.235	0.245	0.41	0.295	0.378	0.296
Spec Cond (µS/cm) field, [lab]	2,710	1,300	218	2,280	2,360	2,350	2,390
TDS (mg/L)	2,800	1,100	2,200	2,200	2,200	2,200	---
Constituent, dissolved (mg/L)							
Ca	430	180	330	330	330	370	---
Mg	130	53	110	110	110	130	---
Ba	< 0.01	< 0.01	< 0.01	0.005	0.0072	0.0065	---
Na	34	18	28	29	30	29	---
K	0.48	3	4.3	4.5	4.5	5.3	---
SO_4	1,800	780	1,500	1,500	1,500	1,600	---
Alkalinity (as HCO_3)	6.7	< 5	< 5	< 5	< 5	< 5	---
F	26	11	24	25	24	25	---
Cl	24	15	26	27	26	27	---
SiO_2	30	24	30	32	30	32	---
Al	64	21	52	52	53	57	---
Fe	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Mn	24	8.4	20	24	24	24	---
Cu	0.88	0.33	0.76	0.76	0.79	0.81	---
Zn	4	1.4	3.4	3.7	3.6	4.1	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	0.044	0.016	0.037	0.037	0.038	0.043	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	< 0.01	< 0.01	0.002	0.011	0.013	---
Co	0.23	0.077	0.19	0.2	0.2	0.23	---
Ni	0.56	0.19	0.46	0.47	0.49	0.54	---
Pb	< 0.009	< 0.003	< 0.009	< 0.009	< 0.009	< 0.009	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.013	0.0052	0.01	0.0099	0.0098	0.011	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	0.015	< 0.005	0.011	0.014	0.016	0.012	---
As	0.011	< 0.005	0.0077	0.0053	0.0082	0.011	---
Sum cations (meq/L)	28.3	12.5	22.9	23.1	23.7	26.0	---
Sum anions (meq/L)	26.0	12.8	22.5	22.6	22.9	23.4	---
Charge imbalance (percent)	8.30	-2.54	1.41	2.16	3.07	10.8	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**
Sample Date	11/7/94	11/7/94	11/7/94	11/7/94	6/1/95	4/17/96
Miscellaneous information	filtered	filtered	filtered	filtered	---	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	Slifer 1996	Slifer 1996	SPRI 1995, MMW wkst, SRK 1995, MC DD	WC 96	MMW wkst	MMW wkst
Lab ID (see table 2)	SLD IC 94 0659	SLD IC 94 6428	ETC	ETC	---	---
Depth to Water (m)	6.58	6.58	6.57	6.57	---	6.67
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	10.1	10.1	---	9.5
pH, field, [lab]	7.5, [6.19]	[6.19]	7.9	7.9	5.47	5.86
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	2050, [3060]	[3,060 #]	2,250	2,250	1,860	1,870 #
TDS (mg/L)	1,880 #	1,880 #	1,800	1,890	---	1,750
Constituent, dissolved (mg/L)						
Ca	410	321	347	363 [370]	---	---
Mg	88	95.1	80.3	79.4 [79.7]	---	123 #
Ba	< 0.1	---	0.034	0.0342 J [0.0357 J]	---	< 0.1
Na	---	26	25.8	26.3 J [26.2]	---	27
K	---	7	3.5	3.11 J [3.22]	---	---
SO_4	---	1,080	1,100	1,040 J	1,100 #	1,220 #
Alkalinity (as HCO_3)	---	18	76	52	---	14
F	---	13.2	12.2	---	10	9.8
Cl	---	22	28	29	---	---
SiO_2	27.8	---	27.4	---	---	---
Al	7.6	---	8.74	7.17 [9.72]	5.5	6.6
Fe	0.07	---	0.101	0.122 [0.895]	0.66	< 0.05
Mn	8.4	---	8.55	8.34 [8.52]	8.4	7.95
Cu	0.1	---	0.179	0.0984 [0.125]	0.25	0.214
Zn	1.2	---	1.5	1.13 [1.13]	3.4	1.72 #
Mo	< 0.01	---	< 0.02	0.0293 J [0.0324 J]	< 0.02	< 0.02
Cd	0.02	---	0.025	0.017 [0.0166]	0.024	0.028
Ag	< 0.01	---	< 0.1	< 0.0061 [<0.0061]	---	< 0.01
Cr	< 0.05	---	< 0.01	< 0.0029 [0.0038 J]	---	< 0.01
Co	0.06	---	0.074	0.0611 [0.062]	---	0.08
Ni	0.3	---	0.201	0.174 [0.176]	---	0.23
Pb	0.03	---	0.021	0.017 [0.0507]	< 0.1	< 0.005
Hg	< 0.0005	---	< 0.0002	< 0.0001 [<0.0001]	---	< 0.0002
Be	< 0.01	---	0.007	0.0063 J [0.0071]	---	0.008
V	< 0.01	---	< 0.01	< 0.002 [<0.002]	---	< 0.01
Se	< 0.05	---	< 0.005	< 0.0025 UJ [<0.0025 U]	---	< 0.005
As	< 0.01	---	< 0.005	< 0.0024 [<0.0024]	---	< 0.01
Sum cations (meq/L)	---	19.1	18.9	19.8	---	---
Sum anions (meq/L)	---	17.2	18.9	16.9	---	---
Charge imbalance (percent)	---	10.5	0.36	15.8	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**
Sample Date	8/1/96	1/1/97	6/25/97	11/7/97	5/11/98	6/11/98
Miscellaneous information	filtered	filtered	filtered	---	---	filtered; 11/6/98 in MC DB
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	MMW wkst	NMED: ACZ lab sheet, MC DB	MC DB, URS 3/01	MC DB	NMED: ACZ lab sheet, MC DB
Lab ID (see table 2)	---	---	ACZ RG 46918	---	---	ACZ RG 70726
Depth to Water (m)	---	---	---	---	---	9.5
Water Elevation (ft)	---	---	7,915	---	---	---
Field Temperature (^{o}C)	---	8.4	---	9.5	---	---
pH, field, [lab]	5.28	5.35	---	5.36	---	---
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,910 #	1,730	[2,000]	1,740	---	2,640
TDS (mg/L)	---	---	1640, 1690	1,740	1,720	1580, 1690
Constituent, dissolved (mg/L)						
Ca	340	292	328	307	292	312
Mg	77.3	81.2	82.5	81.4	87.1	75.9
Ba	0.02	0.049	0.016	0.018	---	0.016
Na	32	26.2	30	27	29.5	26.4
K	4.3	3.4	4	3.2	3.7	3.3
SO_4	1,100	1,830 #	1,090	1,070	1,060	1,090
Alkalinity (as HCO_3)	---	---	8	7	14	10
F	---	11.9	14	15	14	15
Cl	26	---	26	26	26	25
SiO_2	30	71	74	33	---	31
Al	13	14.4	14.6	14.7	14.5	12.4
Fe	0.081	0.01	0.17	0.1	0.12	0.03
Mn	4.85	9.24	9.44	9.01	8.86	9.04
Cu	0.406	0.56	0.61	0.51	0.5	0.4
Zn	1.91 #	1.98	2.29	1.98	1.86	1.75
Mo	< 0.02	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01
Cd	0.0018	0.055	0.05	0.052	0.042	0.041
Ag	< 0.01	< 0.0002	< 0.0003	< 0.005	---	< 0.0005
Cr	< 0.01	< 0.01	< 0.01	< 0.01	---	< 0.01
Co	0.1	0.1	0.11	0.1	0.11	0.09
Ni	0.24	0.24	0.26	0.23	0.25	0.21
Pb	---	0.074	0.048	0.05	---	0.031
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	< 0.0002
Be	0.01	0.01	0.01	0.01	---	0.007
V	< 0.01	< 0.005	< 0.005	< 0.005	---	< 0.03
Se	< 0.005	0.002	0.001	< 0.002	---	< 0.001
As	0.011	< 0.001	< 0.005	< 0.001	---	< 0.001
Sum cations (meq/L)	19.6	15.7	19.5	18.5	18.4	17.9
Sum anions (meq/L)	16.7	30.0	17.2	17.0	17.0	17.4
Charge imbalance (percent)	15.8	-62.4	12.6	7.95	7.69	2.65

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**						
Well ID	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**	**MMW-10B**
Sample Date	2/3/00	6/5/01	7/18/01	12/1/01	2/1/02	4/25/02	7/24/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	8.82	---	---	---	---	---	---
Water Elevation (ft)	---	7,914	7,917	7,912	7,910	7,910	---
Field Temperature (^{o}C)	8.7	10.1	13.7	7.8	---	11	16.7
pH, field, [lab]	5.3	5.63	5.8	5.86	---	5.86	5.71
Eh (V)	---	0.256	0.223	0.243	0.227	0.258	0.234
Spec Cond (µS/cm) field, [lab]	2,230	2,410	2,360	2,680	[2,680]	2,700	2,630
TDS (mg/L)	2,100	2,300	2,400	2,600	2,500	2,600	---
Constituent, dissolved (mg/L)							
Ca	400	470	440	490	530	550	---
Mg	99	120	120	120	130	150	---
Ba	0.018	0.02	0.021	0.022	0.023	0.022	---
Na	33	31	31	32	34	34	---
K	5.3	5.4	5.5	5.6	6.2	6.8	---
SO_4	1,300	1,600	1,600	1,800	1,700	1,800	---
Alkalinity (as HCO_3)	9.3	11	25	44	52	47	---
F	19	21	22	19	18	20	---
Cl	24	26	23	26	25	26	---
SiO_2	32	32	28	24	24	24	---
Al	21	23	18	12	10	12	---
Fe	< 0.1	0.13	< 0.1	0.14	< 0.1	0.12	---
Mn	13	16	15	18	18	18	---
Cu	0.76	0.56	0.46	0.22	0.19	0.22	---
Zn	2.6	2.6	2.8	2.8	2.9	3.2	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	0.056	0.039	0.032	0.025	0.028	0.03	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	< 0.01	< 0.01	< 0.0011	0.00097	< 0.01	---
Co	0.14	0.15	0.16	0.16	0.16	0.18	---
Ni	0.34	0.36	0.39	0.37	0.38	0.42	---
Pb	0.084	0.083	0.13	0.15	0.12	0.13	---
Hg	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.013	0.013	0.012	0.011	0.011	0.012	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	0.011	< 0.005	0.0098	0.0099	0.013	0.01	---
As	0.012	0.0099	0.017	0.02	0.023	0.019	---
Sum cations (meq/L)	23.5	26.5	24.4	25.8	28.5	30.0	---
Sum anions (meq/L)	19.8	23.8	24.0	27.8	25.7	26.5	---
Charge imbalance (percent)	17.1	10.8	1.80	-7.37	10.2	12.5	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**
Sample Date	11/8/94	11/8/94	11/8/94	6/1/95	4/17/96	8/1/96
Miscellaneous information	filtered	filtered	filtered	---	filtered	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	Slifer 1996	SPRI 1995, SRK 1995, MC DB, MMW	Slifer 1996	MMW wkst	MMW wkst	MMW wkst
Lab ID (see table 2)	SLD IC-94 0655	ETC	SLD IC-94 6424	---	---	---
Depth to Water (m)	6.64	6.64	6.64	---	6.84	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	11.8	---	---	9.4	---
pH, field, [lab]	4.7	4.7	[4.53]	4.27	4.9	4.56
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,020	2,000	[1,560 #]	1,730 #	1,640	1,530 #
TDS (mg/L)	1,690	1,400	1,690	---	1,520	---
Constituent, dissolved (mg/L)						
Ca	230	204	193 #	---	---	210
Mg	82	75.2	76.1	---	1190	197
Ba	< 0.1	0.014	---	---	< 0.1	0.01
Na	---	20.2	25	---	20	25
K	---	2.8	12	---	---	3.7
SO_4	---	880	849	962	1,090 #	850
Alkalinity (as HCO_3)	< 3	< 1	< 3	---	< 1	---
F	---	15.4	17.8	11.9	16.5	---
Cl	---	20	15	---	---	16
SiO_2	20	21	---	---	---	21.4
Al	30	31.1	---	27.3	29.3	30.9
Fe	< 0.1	< 0.05	---	0.9	< 0.05	< 0.05
Mn	15	16.3	---	17.2	15.8 #	8.96
Cu	0.37	0.38	---	0.46	0.386	0.228
Zn	2.6	3.2	---	5.2	3.1	2.01
Mo	< 0.01	< 0.02	---	< 0.02	< 0.02	< 0.02
Cd	0.025	0.026	---	0.03	0.037	0.0043
Ag	< 0.01	< 0.1	---	---	< 0.01	< 0.01
Cr	0.035	< 0.01	---	---	< 0.01	< 0.01
Co	0.09	0.106	---	---	0.09	0.09
Ni	0.31	0.0347	---	---	0.3	0.32
Pb	< 0.01	< 0.002	---	< 0.1	< 0.005	---
Hg	< 0.0005	< 0.0002	---	---	< 0.0002	< 0.0002
Be	< 0.01	0.007	---	---	0.008	0.007
V	< 0.05	< 0.01	---	---	< 0.01	< 0.01
Se	< 0.025	< 0.005	---	---	< 0.005	0.011
As	< 0.01	< 0.005	---	---	< 0.01	0.009
Sum cations (meq/L)	---	15.6	15.7	---	---	25.1
Sum anions (meq/L)	---	13.8	13.5	---	---	11.5
Charge imbalance (percent)	---	12.2	15.5	---	---	74.5

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**
Sample Date	1/1/97	6/25/97	11/7/97	5/11/98	6/11/98	2/3/00
Miscellaneous information	filtered	---	---	---	11/6/98 in MC DB	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	NMED: ACZ lab sheet, MC DB	MC DB, URS 3/01	MC DB, URS 3/01	NMED:ACZ lab sheet, MC DB	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	---	ACZ RG 46919	---	---	ACZ RG 70727	Paragon Analytics
Depth to Water (m)	---	---	---	---	9.5	8.32
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	9	---	---	8
pH, field, [lab]	4.98	---	4.75	---	---	4.81
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,040 #	[1,200]	888	---	1,080	1,190
TDS (mg/L)	---	710, 760	780	850	455, 500	990
Constituent, dissolved (mg/L)						
Ca	132	128	117	124	76	130
Mg	45.5	41.2	40.6	52.1	22.9	54
Ba	0.013	0.008	0.016	---	0.007	0.011
Na	14.9	15	13.3	14.8	9.5	15
K	2.5	< 8	2	2.2	1.5	2.8
SO_4	962	470	460	570	320	620
Alkalinity (as HCO_3)	---	2	4	4	10	8
F	9.6	8	10	10	5.9	13
Cl	---	10	9	14	8	13
SiO_2	41.1	37	17	---	14	18
Al	18.5	12.2	13.6	16.2	6.87	19
Fe	0.01	< 0.01	0.02	0.01	< 0.01	0.1
Mn	7.36	5.63	5.51	7.5	2.35	9.8
Cu	0.24	< 0.3	0.16	0.2	0.09	0.24
Zn	2.03	1.57	1.42	1.56	0.74	2.2
Mo	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.1
Cd	0.017	0.012	0.013	0.011	0.005	0.018
Ag	< 0.0002	< 0.0005	< 0.03	---	< 0.0005	< 0.002
Cr	0.01	< 0.01	< 0.01	---	< 0.01	< 0.01
Co	0.05	0.03	0.04	0.05	0.01	0.066
Ni	0.18	0.15	0.14	0.18	0.06	0.23
Pb	0.001	< 0.001	< 0.04	---	< 0.001	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	---	< 0.0002	< 0.0002
Be	0.0049	0.004	0.01	---	0.002	0.0051
V	< 0.005	< 0.005	< 0.005	---	< 0.005	< 0.01
Se	0.002	< 0.001	< 0.002	---	< 0.001	0.0095
As	< 0.001	< 0.005	< 0.001	---	< 0.001	< 0.005
Sum cations (meq/L)	9.30	9.52	9.11	10.2	5.67	10.8
Sum anions (meq/L)	16.4	7.99	7.94	9.76	6.02	10.6
Charge imbalance (percent)	-55.2	17.4	13.7	4.72	-5.97	1.24

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**	**MMW-10C**
Sample Date	6/5/01	7/18/01	12/1/01	2/1/02	4/25/02	7/24/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	---
Comments	*Alkalinity value probably near 5	---	*Alkalinity value probably near 5	*Alkalinity value probably near 5	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	7,911	7,917	7,910	7,910	7,910	---
Field Temperature (^{o}C)	9.3	17.8	9	6.6	14.2	20.6
pH, field, [lab]	4.91	4.72	4.66	4.8	4.77	4.57
Eh (V)	0.256	0.281	0.35	0.252	0.314	0.301
Spec Cond (µS/cm) field, [lab]	1,240 #	1,180 #	1,260 #	1,100 #	1,080 #	1,330 #
TDS (mg/L)	1,000	1,000	1,000	860	840	---
Constituent, dissolved (mg/L)						
Ca	160	150	140	130	120	---
Mg	67	69	65	57	50	---
Ba	0.011	< 0.01	0.012	< 0.01	0.0093	---
Na	16	17	17	17	15	---
K	3.1	3.3	3.1	3.2	2.7	---
SO_4	730	690	690	600	600	---
Alkalinity (as HCO_3)	< 5*	5.1	< 5 *	< 5 *	5.4	---
F	14	15	15	12	11	---
Cl	14	13	15	13	13	---
SiO_2	18	18	19	19	17	---
Al	20	21	21	17	16	---
Fe	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Mn	11	11	11	8.7	7.8	---
Cu	0.27	0.28	0.28	0.22	0.21	---
Zn	2.4	2.7	2.5	2.2	1.8	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	0.021	0.023	0.02	0.018	0.016	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	< 0.01	0.0023	0.001	< 0.01	---
Co	0.069	0.078	0.067	0.053	0.051	---
Ni	0.24	0.26	0.24	0.2	0.19	---
Pb	< 0.006	< 0.006	< 0.006	< 0.003	< 0.003	---
Hg	< 0.0002	< 0.0003	< 0.0004	< 0.0002	< 0.0002	---
Be	0.0049	0.0053	0.0047	0.0043	0.0038	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	< 0.005	0.008	0.012	0.0086	0.0055	---
As	< 0.005	< 0.005	0.003	< 0.005	< 0.005	---
Sum cations (meq/L)	12.7	12.4	12.0	11.0	9.69	---
Sum anions (meq/L)	12.0	11.1	11.6	10.3	10.2	---
Charge imbalance (percent)	5.38	10.5	2.93	6.85	-5.58	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**			
Well ID	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**
Sample Date	11/7/94	11/7/94	11/7/94	11/7/94
Miscellaneous information	filtered	filtered DUPLICATE	filtered	filtered
Comments	analyzed on 2/21/95	---	---	---
Source ID (see table 2)	Slilfer 1996	WC 96	SPRI '95, SRK '95, MC DB, MMW wkst, URS	WC 96
Lab ID (see table 2)	SLD WC-94 6440	ETC	ETC	ETC
Depth to Water (m)	27.3	26.4	26.4	26.4
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	9.4	15.7	9.4
pH, field, [lab]	[4.43]	5.6	5.6	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	[1,990 #]	2,110	2,450	2,110
TDS (mg/L)	2120 #	2,160	2,000	2,120
Constituent, dissolved (mg/L)				
Ca	229	252 [258]	276	255 [258]
Mg	105 #	117 [120]	133	117 [119]
Ba	---	0.0157 J [0.015 J]	0.016	0.0158 J [0.0149 J]
Na	34	26 J [26.5]	25.5	26.1 J [27]
K	20	3.22 J [3.36]	3.4	3.2 J [3.27]
SO_4	1270 #	1210 J	1,300	1180 J
Alkalinity (as HCO_3)	156	< 5	< 1	< 5
F	21	---	17.6	---
Cl	36	25	22	26
SiO_2	---	---	30	---
Al	---	55.9 [58.3]	56.3	56.8 [57.8]
Fe	---	0.0542 U [0.0631 J]	0.129	0.0603 J [0.0563 J]
Mn	---	27.6 [28.3]	31.7	27.9 [28.1]
Cu	---	0.824 [0.837]	0.919	0.825 [0.844]
Zn	---	4.36 [4.44]	5	4.36 [4.48]
Mo	---	0.0583 J [0.0633 J]	< 0.02	0.0615 J [0.0616 J]
Cd	---	0.0319 [0.0328]	0.036	0.0318 [0.0326]
Ag	---	< 0.0061 [<0.0061]	< 0.1	< 0.0061 [<0.0061]
Cr	---	0.0054 J [0.006 J]	0.036	0.0044 J [0.0053 J]
Co	---	0.238 [0.24]	0.266	0.235 [0.243]
Ni	---	0.539 [0.549]	0.593	0.54 [0.554]
Pb	[< 0.1]	0.0059 [0.0114]	0.086	0.0109 [0.0116]
Hg	---	< 0.0001 [<0.0001]	< 0.0002	< 0.0001 [<0.0001]
Be	---	0.0129 [0.0133]	0.013	0.0131 [0.0133]
V	---	< 0.002 [<0.002]	< 0.01	< 0.002 [<0.002]
Se	---	< 0.0025 UJ [<0.0025 UJ]	< 0.005	< 0.0025 UJ [<0.0025 UJ]
As	---	< 0.0024 [<0.0024]	< 0.005	< 0.0024 [<0.0024]
Sum cations (meq/L)	20.4	21.7	23.1	22.1
Sum anions (meq/L)	22.5	17.2	18.6	16.4
Charge imbalance (percent)	-9.39	22.9	21.2	29.7

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**
Sample Date	11/7/94	6/1/95	4/17/96	8/1/96	1/1/97	6/25/97
Miscellaneous information	filtered; analyzed 5/17/95	---	filtered	filtered	filtered	---
Comments	*1 SO4 =1267/ 1287, *2 Ag < 0.01/ 0.04	---	---	---	---	---
Source ID (see table 2)	Slilfer 1996	MMW wkst	MMW wkst	MMW wkst	MMW wkst	NMED: ACZ lab sheet, MC DB, URS
Lab ID (see table 2)	SLD IC-94 0639	---	---	---	---	ACZ RG 46920
Depth to Water (m)	27.3	---	27.3	---	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	11.4	---	9.7	---
pH, field, [lab]	5.6	4.26	4.38	4.22	4.56	---
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,490	2,120	9,330	1,990	1,840	[1,500]
TDS (mg/L)	2,120	---	2,190 #	---	---	1900, 1970
Constituent, dissolved (mg/L)						
Ca	260	---	---	250	221	251
Mg	110	---	126 #	117 #	110	129
Ba	< 0.1	---	< 0.1	0.01	0.015	0.013
Na	---	---	26	31	24.2	27.4
K	---	---	---	4	3.5	4
SO_4	1270 # *1	1280 #	1440 #	1,300	1780 #	1,320
Alkalinity (as HCO_3)	---	---	< 1	---	---	< 2
F	---	21.5	18.8	---	15.4	21
Cl	---	---	---	20	---	22
SiO_2	25.7	---	---	28	61	67
Al	54	35.4	51.8	51	51.1	56.8
Fe	< 0.1	0.3	< 0.05	< 0.05	0.01	< 0.01
Mn	28	29.1	29.7	13.4	11	29.9
Cu	0.8	0.9	0.88	0.69	0.81	0.98
Zn	4.6	4.7	4.8	8.79	4.8	5.49
Mo	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01
Cd	< 0.10	0.033	0.043	0.022	0.039	0.037
Ag	< 0.01 *2	---	< 0.01	< 0.01	< 0.002	< 0.0005
Cr	< 0.1	---	< 0.01	< 0.01	< 0.01	< 0.01
Co	0.25	---	0.23	0.22	0.23	0.28
Ni	0.6	---	0.52	0.51	0.53	0.67
Pb	< 0.1	< 0.1	< 0.005	---	0.011	0.011
Hg	< 0.0005	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.01	---	0.015	0.013	0.014	0.015
V	< 0.05	---	< 0.01	< 0.01	< 0.005	< 0.005
Se	< 0.005	---	0.012	0.016	0.003	0.002
As	< 0.01	---	< 0.01	0.006	< 0.001	< 0.005
Sum cations (meq/L)	22.0	---	---	20.8	17.3	22.3
Sum anions (meq/L)	22.1	---	---	18.3	27.7	19.5
Charge imbalance (percent)	-0.44	---	---	12.6	-46.1	13.5

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**				
Well ID	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**
Sample Date	11/7/97	5/11/98	6/9/98	2/3/00	6/22/01
Miscellaneous information	---	---	9/6/98 in MC DB	URS 3/01 calls this well MMW-11A (2/00)	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	NMED: ACZ lab sheet, MC DB, URS	MC DB, MMW wkst, RGC 8/10, URS	MC CD
Lab ID (see table 2)	---	---	ACZ RG 70644	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	30	28.8	---
Water Elevation (ft)	---	---	---	---	7,916
Field Temperature (^{o}C)	10	---	10.4	9.4	11.1
pH, field, [lab]	4.14	---	4.19	4.34	4.22
Eh (V)	---	---	---	---	0.245
Spec Cond (µS/cm) field, [lab]	2,200	---	2,600	2,990	2,490
TDS (mg/L)	2,420	3,030	2460, 2530	3,200	2,700
Constituent, dissolved (mg/L)					
Ca	282	307	277	320	320
Mg	149	203	149	190	210
Ba	0.019	---	0.016	0.017	0.014
Na	29.1	35	28.7	34	32
K	3.5	4	3.5	5.3	5.4
SO_4	1,560	2,090	1,690	2,100	1,900
Alkalinity (as HCO_3)	< 2	ND	< 2	15	< 5
F	30	37	35	41	36
Cl	25	24	25	29	30
SiO_2	28	---	29	30	28
Al	77.4	109	81.2	90	83
Fe	< 0.02	ND	< 0.01	< 0.1	0.13
Mn	33.4	42.8	35.4	49	47
Cu	1.12	1.54	1.14	1.4	1.3
Zn	6.2	8.74	6.75	8.6	9.4
Mo	< 0.02	ND	< 0.01	< 0.1	< 0.1
Cd	0.052	ND	0.05	0.06	0.061
Ag	---	---	< 0.0005	< 0.002	< 0.002
Cr	< 0.02	---	< 0.01	< 0.01	< 0.01
Co	0.31	0.47	0.32	0.42	0.39
Ni	0.7	1.03	0.75	1	0.97
Pb	< 0.08	---	0.011	< 0.03	< 0.015
Hg	< 0.0002	---	< 0.0002	---	< 0.0002
Be	< 0.02	---	0.016	0.02	0.018
V	< 0.01	---	< 0.03	< 0.01	< 0.01
Se	0.003	---	0.003	0.29	0.019
As	< 0.001	---	< 0.001	0.012	0.0064
Sum cations (meq/L)	25.6	30.9	25.2	29.4	30.7
Sum anions (meq/L)	22.5	29.2	24.8	30.9	26.9
Charge imbalance (percent)	12.9	5.66	1.47	-5.11	13.5

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**				
Well ID	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**	**MMW-11**
Sample Date	9/10/01	10/27/01	2/6/02	4/30/02	8/7/02
Miscellaneous information	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,914	7,913	7,908	7,908	---
Field Temperature (^{o}C)	20.8	14	10.7	16.4	18.9
pH, field, [lab]	5.64	4.58	4.77	4.4	6.52
Eh (V)	0.273	0.344	0.303	0.35	0.244
Spec Cond (µS/cm) field, [lab]	2,610	2,800	2,670	2,640	2,930
TDS (mg/L)	2,800	2,800	2,600	2,500	---
Constituent, dissolved (mg/L)					
Ca	330	300	340	290	---
Mg	160	200	180	180	---
Ba	0.03	0.036	0.027	0.016	---
Na	28	32	37	32	---
K	5.3	5.5	7.1	6.1	---
SO_4	1,900	1,900	1,900	1,900	---
Alkalinity (as HCO_3)	6.4	< 5	6.2	5	---
F	27	36	33	36	---
Cl	29	29	27	27	---
SiO_2	19	28	26	28	---
Al	36	77	54	71	---
Fe	0.1	< 0.1	< 0.1	0.024	---
Mn	37	43	39	43	---
Cu	0.7	1.2	0.88	1.1	---
Zn	5.8	7.7	6.6	7.2	---
Mo	< 0.1	0.025	0.037	< 0.1	---
Cd	0.045	0.056	0.048	0.054	---
Ag	< 0.002	< 0.002	0.0012	< 0.002	---
Cr	< 0.01	0.0066	0.0032	0.0032	---
Co	0.27	0.38	0.31	0.35	---
Ni	0.59	0.89	0.76	0.85	---
Pb	< 0.015	< 0.015	< 0.015	0.011	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	0.0078	0.015	0.011	0.014	---
V	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	0.018	0.023	0.028	0.025	---
As	0.007	0.0062	0.01	0.0057	---
Sum cations (meq/L)	22.8	28.3	27.4	25.9	---
Sum anions (meq/L)	28.4	27.2	28.3	27.6	---
Charge imbalance (percent)	-21.8	4.12	-3.24	-6.26	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**					
Well ID	**MMW-11A**	**MMW-11A**	**MMW-11A**	**MMW-11A**	**MMW-11A**	**MMW-11A**
Sample Date	1/12/00	6/22/01	9/10/01	10/27/01	2/6/02	4/30/02
Miscellaneous information	URS calls this MMW-11 (1/00)	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10, URS	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	28.4	---	---	---	---	---
Water Elevation (ft)	---	7,914	7,912	7,911	---	7,907
Field Temperature (^{o}C)	9.4	10.8	20.3	14.9	9.7	16.3
pH, field, [lab]	4.31	4.3	4.09	4.15	4.26	4.19
Eh (V)	---	0.247	0.323	0.342	0.295	0.269
Spec Cond (µS/cm) field, [lab]	2,950	2,470	2,590	2,730	2,570	2,600
TDS (mg/L)	3,200	2,700	2,900	2,700	2,600	2,500
Constituent, dissolved (mg/L)						
Ca	300	290	250	240	250	230
Mg	210	210	190	200	200	190
Ba	0.014	0.014	< 0.01	0.011	< 0.01	0.011
Na	38	32	31	31	36	31
K	5.7	5.5	5.2	5.4	5.5	6
SO_4	2,100	1,900	1,900	1,900	1,800	1,800
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5	< 5
F	46	37	38	43	41	38
Cl	29	26	29	28	26	25
SiO_2	30	30	28	28	32	30
Al	100	84	90	90	84	83
Fe	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.32
Mn	52	48	47	45	44	45
Cu	1.5	1.3	1.3	1.3	1.3	1.3
Zn	9.7	9.8	8.4	8.4	8.4 #	8.1
Mo	< 0.1	< 0.1	< 0.1	< 0.1	0.033	< 0.1
Cd	0.066	0.061	0.058	0.057	0.055	0.057
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	0.0079	0.0069	0.032
Co	0.48	0.39	0.37	0.39	0.38	0.38
Ni	1.1	0.98	0.86	0.93	0.89	0.94
Pb	< 0.03	< 0.015	0.03	< 0.015	< 0.015	0.01
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
Be	0.022	0.019	0.018	0.019	0.018	0.017
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.028	0.021	0.018	0.023	0.026	0.027
As	0.013	0.0067	0.0078	0.0088	0.0079	0.0058
Sum cations (meq/L)	30.9	29.7	26.1	26.8	28.0	25.6
Sum anions (meq/L)	30.3	27.1	26.7	27.4	26.3	25.8
Charge imbalance (percent)	1.80	9.10	-2.32	-2.26	5.98	-1.07

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**						
Well ID	**MMW-18A**	**MMW-18B**	**MMW-18B**	**MMW-18B**	**MMW-18B**	**MMW-18B**	**MMW-18B**
Sample Date	1/13/00	1/13/00	6/18/01	9/9/01	11/1/01	2/4/02	5/13/02
Miscellaneous information	DRY	filtered	---	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	---	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	26	---	---	---	---	---
Water Elevation (ft)	---	---	7,931	7,930	7,930	7,930	7,930
Field Temperature (^{o}C)	---	11.8	27.3	18.5	14.3	7.9	13.6
pH, field, [lab]	---	6.49	5.43	6.46	6.48	6.62	6.54
Eh (V)	---	---	0.246	0.14	0.172	0.164	0.315
Spec Cond (µS/cm) field, [lab]	---	3,550	2,860	3,190	3,100	3,110	3,080
TDS (mg/L)	---	3,600	---	3,100	3,000	3,000	2,900
Constituent, dissolved (mg/L)							
Ca	---	630	---	590	660	610	560
Mg	---	160	---	150	140	150	140
Ba	---	0.02	---	0.02	0.01	0.013	0.014
Na	---	99	---	96	83	91	73
K	---	8.6	---	8.4	8.3	9.5	8.8
SO_4	---	2,000	---	1,800	1,800	1,800	1,900
Alkalinity (as HCO_3)	---	330	---	310	310	270	270
F	---	4.1	---	4.4	6.5	7	6.8
Cl	---	50	---	14	5.9	5.8	4.5
SiO_2	---	23.5	---	23.5	21.2	21.4	19.3
Al	---	0.52	---	0.35	0.11	0.11	0.1
Fe	---	0.23	---	< 0.1	< 0.1	< 0.1	< 0.1
Mn	---	25	---	20	17	14	13
Cu	---	0.023	---	< 0.01	< 0.01	0.012	0.022
Zn	---	14	---	13	17	16	14
Mo	---	< 0.1	---	< 0.1	< 0.1	0.035	0.1
Cd	---	0.082	---	0.06	0.07	0.08	0.086
Ag	---	0.0048	---	< 0.002	< 0.0012	< 0.002	< 0.002
Cr	---	< 0.01	---	< 0.01	< 0.0014	0.0048	< 0.01
Co	---	0.017	---	< 0.01	0.006	0.0019	0.0022
Ni	---	0.073	---	0.04	0.04	0.047	0.032
Pb	---	0.03	---	0.006	< 0.01	< 0.01	0.013
Hg	---	---	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	---	0.0053	---	0.0048	0.0065	0.0069	0.0051
V	---	< 0.01	---	< 0.01	< 0.01	< 0.01	< 0.01
Se	---	0.01	---	0.006	0.01	0.01	0.015
As	---	< 0.005	---	< 0.005	< 0.0025	< 0.005	< 0.005
Sum cations (meq/L)	---	35.9	---	33.5	35.5	35.1	30.4
Sum anions (meq/L)	---	34.0	---	29.3	29.1	29.5	31.1
Charge imbalance (percent)	---	5.36	---	13.3	19.8	17.3	-2.3

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**						
Well ID	**MMW-19A**	**MMW-19A**	**MMW-19A**	**MMW-19A**	**MMW-19A**	**MMW-19A**	**MMW-19B**
Sample Date	1/13/00	6/22/01	9/10/01	11/1/01	2/6/02	4/30/02	1/20/00
Miscellaneous information	URS calls this MMW-11 (1-00)	filtered	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD	MC DB, MMW wkst, RGC 8/10
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	26.5	---	---	---	---	---	25.5
Water Elevation (ft)	---	7,907	7,905	7,904	7,900	7,900	---
Field Temperature (^{o}C)	9.9	11.1	16.9	14.4	10.9	11	9.7
pH, field, [lab]	4.25	4.16	4.15	4.46	4.17	4.1	7.14
Eh (V)	---	0.25	0.297	0.291	0.341	0.39	---
Spec Cond (µS/cm) field, [lab]	2,940	2,630	2,580	2,490	2,510	2,590	2,630
TDS (mg/L)	3,200	2,700	2,800	2,600	2,300	2,500	2,500
Constituent, dissolved (mg/L)							
Ca	310	250	250	280	250	240	570
Mg	210	180	190	200	200	200	89
Ba	< 0.01	< 0.01	< 0.01	0.03	< 0.01	0.0075	0.039
Na	37	32	31	31	35	32	56
K	5.4	5.2	5.2	5.4	5.6	5.9	8.7
SO_4	2,100	1,900	1,900	1,900	1,800	1,800	1,500
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5	< 5	210
F	51	43	39	38	41	38	2.1
Cl	29	28	29	32	27	25	8.4
SiO_2	27.8	27.8	27.8	27.8	30	27.8	18.4
Al	98	86	87	87	83	82	< 0.1
Fe	0.12	< 0.1	< 0.1	< 0.1	< 0.1	0.021	3.4
Mn	50	48	45	47	43	44	6.3
Cu	4.5	1.3	1.3	1.5	1.3	1.3	< 0.1
Zn	9.4	8.1	8.3	9	8.3	8.3	0.18
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.16
Cd	0.067	0.05	0.05	0.06	0.055	0.058	< 0.001
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.0041
Cr	< 0.01	< 0.01	< 0.01	0.0026	0.0053	0.0061	< 0.01
Co	0.47	0.37	0.37	0.38	0.37	0.38	< 0.1 [<0.1]
Ni	1.1	0.88	0.85	0.95	0.89	0.93	< 0.02
Pb	< 0.03	< 0.01	0.03	0.03	< 0.015	< 0.015	< 0.006
Hg	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.21	0.01	0.01	0.01	0.018	0.017	< 0.004
V	---	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.027	0.02	0.02	0.02	0.023	0.029	< 0.005
As	0.012	0.008	0.008	0.01	0.0066	0.0066	< 0.005
Sum cations (meq/L)	31.0	26.2	26.1	28.3	27.7	27.2	28.4
Sum anions (meq/L)	30.5	28.3	27.2	27.1	26.3	26.2	24.6
Charge imbalance (percent)	1.77	-7.60	-4.11	4.46	5.29	3.62	14.1

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**						
Well ID	**MMW-26A**	**MMW-27A**	**MMW-27A**	**MMW-27A**	**MMW-27A**	**MMW-27A**	**MMW-27A**
Sample Date	1/18/00	1/12/00	6/18/01	9/9/01	10/28/01	2/6/02	5/13/02
Miscellaneous information	DRY	MC DB sources S&M	filtered	filtered	filtered	filtered	filtered
Comments	no aquifer information	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	MCDB, MMW wkst, RGC 8/10	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	---	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	29.1	---	---	---	---	---
Water Elevation (ft)	---	---	7,916	7,912	7,910	7,910	7,907
Field Temperature (^{o}C)	---	9.8	11.1	13.4	11.7	14	17.4
pH, field, [lab]	---	4.33	4.22	4.17	4.12	4.2	4.14
Eh (V)	---	---	0.232	0.33	0.297	0.28	0.303
Spec Cond (µS/cm) field, [lab]	---	2,940	2,500	2,530	2,780	2,550	2,570
TDS (mg/L)	---	3,300	2,600	2,800	2,700	2,400	2,600
Constituent, dissolved (mg/L)							
Ca	---	320	290	260	260	260	240
Mg	---	220	200	190	200	200	190
Ba	---	0.014	< 0.01	< 0.01	< 0.01	< 0.01	0.011
Na	---	38	31	32	32	36	30
K	---	5.6	5.9	5.4	5.5	5.8	5.8
SO_4	---	2,100	1,900	1,900	1,900	1,900	1,800
Alkalinity (as HCO_3)	---	< 5	< 5	< 5	< 5	< 5	< 5
F	---	54	40	42	40	40	38
Cl	---	29	29	28	29	26	25
SiO_2	---	27.8	27.8	27.8	27.8	30	27.8
Al	---	92	88	88	88	81	74
Fe	---	0.1	0.16	0.11	0.1	0.15	0.14
Mn	---	49	46	45	44	43	43
Cu	---	1.5	1.5	1.3	1.3	1.3	1.2
Zn	---	9.7	8.6	8	8.5	8.2	8.4
Mo	---	< 0.01	< 0.1	< 0.1	0.02	0.036	< 0.1
Cd	---	0.068	0.06	0.05	0.05	0.055	0.055
Ag	---	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	---	< 0.01	< 0.01	< 0.01	0.0079	0.034	0.03
Co	---	0.47	0.4	0.35	0.39	0.37	0.35
Ni	---	1.1	0.97	0.88	0.95	0.9	0.9
Pb	---	< 0.03	< 0.03	< 0.01	< 0.01	0.015	0.0075
Hg	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	---	0.022	0.02	0.01	0.01	0.018	0.018
V	---	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	---	0.029	0.01	0.02	0.02	0.026	0.028
As	---	0.014	0.006	0.008	0.0085	0.0067	0.0043
Sum cations (meq/L)	---	31.5	29.1	27.0	27.9	27.2	25.1
Sum anions (meq/L)	---	30.6	27.3	27.6	27.5	27.5	26.0
Charge imbalance (percent)	---	3.07	6.55	-2.12	1.17	-0.95	-3.45

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South "Old Mine Site"**				
Well ID	**MMW-31A**	**MMW-31A**	**MMW-31A**	**MMW-31A**	**MMW-31A**
Sample Date	6/20/01	9/6/01	12/3/01	1/30/02	4/23/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,919	7,918	7,915	7,912	7,912
Field Temperature (^{o}C)	12	17.1	12.4	8.9	15
pH, field, [lab]	4.2	4.18	4.17	4.59	4.13
Eh (V)	0.258	0.364	0.387	0.235	0.237
Spec Cond (µS/cm) field, [lab]	2,310	2,470	2,640	2,590	2,640
TDS (mg/L)	2,400	2,600	2,700	2,500	2,500
Constituent, dissolved (mg/L)					
Ca	260	250	260	230	240
Mg	190	200	200	180	200
Ba	< 0.01	< 0.01	< 0.01	0.047	0.01
Na	28	30	32	34	34
K	6	5.6	5.9	5.7	5.9
SO_4	1,700	1,800	1,900	1,700	1,900
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5
F	38	41	42	36	40
Cl	26	28	27	25	26
SiO_2	27.8	27.8	30	32.1	30
Al	77	83	80	73	80
Fe	< 0.1	0.12	< 0.1	< 0.1	0.044
Mn	41	44	47	44	41
Cu	1.3	1.4	1.3	1.1	1.3
Zn	8.3	8.5	8.7	7.8	8.9
Mo	< 0.1	< 0.1	< 0.1	0.028	< 0.1
Cd	0.06	0.06	0.05	0.053	0.06
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	0.02	0.0054	0.0019	0.012
Co	0.37	0.36	0.36	0.38	0.38
Ni	0.92	0.99	0.94	0.91	0.98
Pb	< 0.03	< 0.03	< 0.01	< 0.015	0.018
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.02	0.02	0.02	0.017	0.021
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.01	0.01	0.02	0.029	0.026
As	< 0.005	0.0056	0.0066	0.0091	0.0058
Sum cations (meq/L)	26.9	26.8	27.3	25.4	26.2
Sum anions (meq/L)	24.6	25.6	27.8	25.5	27.6
Charge imbalance (percent)	9.05	4.70	-1.84	-0.13	-5.53

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South "Old Mine Site"**				
Well ID	**MMW-31B**	**MMW-31B**	**MMW-31B**	**MMW-31B**	**MMW-31B**
Sample Date	6/20/01	9/6/01	12/3/01	1/30/02	4/23/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,920	7,918	7,915	7,916	7,912
Field Temperature (^{o}C)	11.1	17.8	12.1	6.8	16.9
pH, field, [lab]	4.03	4.09	4.07	4.13	4.03
Eh (V)	0.272	0.383	0.412	0.311	0.284
Spec Cond (µS/cm) field, [lab]	2,750	2,530	2,840	2,780	2,720
TDS (mg/L)	2,900	3,000	2,800	2,700	2,700
Constituent, dissolved (mg/L)					
Ca	310	290	300	280	230
Mg	220	220	220	200	180
Ba	0.02	0.02	0.02	0.022	0.019
Na	31	31	33	36	33
K	6.3	5.5	5.9	5.8	5.2
SO_4	2,000	2,000	2,200	1,900	2,000
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	< 5
F	42	43	43	40	39
Cl	30	29	33	27	27
SiO_2	27.8	27.8	32.1	32.1	27.8
Al	96	95	94	87	77
Fe	< 0.1	< 0.1	< 0.1	< 0.1	0.041
Mn	50	51	49	48	44
Cu	1.3	1.3	1.3	1.2	1.1
Zn	9.3	9.1	9.2	8.5	7.7
Mo	< 0.1	< 0.1	< 0.02	< 0.01	< 0.1
Cd	0.06	0.06	0.06	0.062	0.053
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.1	< 0.1	< 0.00095	0.0037	0.006
Co	0.45	0.42	0.41	0.42	0.36
Ni	1	1	0.99	0.97	0.88
Pb	0.09	0.1	0.08	0.11	0.091
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.01	0.01	0.01	0.017	0.015
V	< 0.1	< 0.1	< 0.1	< 0.01	< 0.01
Se	0.02	0.02	0.02	0.036	0.026
As	0.0085	0.0075	0.0077	0.015	0.0073
Sum cations (meq/L)	31.6	29.8	30.1	29.5	23.8
Sum anions (meq/L)	28.2	27.6	31.7	27.9	29.8
Charge imbalance (percent)	11.4	7.83	-5.21	5.54	-22.4

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**				
Well ID	**MMW-32A**	**MMW-32A**	**MMW-32A**	**MMW-32A**	**MMW-32A**
Sample Date	6/18/01	9/9/01	11/2/01	2/2/02	4/24/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,872	7,867	7,865	7,859	7,860
Field Temperature (^{o}C)	11.7	18.7	14.1	7.3	9.1
pH, field, [lab]	4.55	4.62	4.8	4.64	4.44
Eh (V)	0.212	0.278	0.238	0.29	0.294
Spec Cond (µS/cm) field, [lab]	2,710	2,530	2,540	2,600	2,540
TDS (mg/L)	2,700	2,800	2,700	2,500	2,500
Constituent, dissolved (mg/L)					
Ca	360	320	360	320	240
Mg	220	190	210	210	190
Ba	< 0.01	< 0.01	0.0086	0.0072	0.0075
Na	34	37	34	36	31
K	6.4	5.5	6.1	6	5.5
SO_4	2,000	1,800	1,900	1,800	1,800
Alkalinity (as HCO_3)	< 5	6.7	7.7	< 5	6.5
F	36	39	39	34	35
Cl	27	29	30	26	25
SiO_2	30	30	28	28	30
Al	83	66	67	72	74
Fe	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Mn	45	41	45	44	42
Cu	1.1	1	1.1	1.1	1.1
Zn	8.2	6.2	8	8	7
Mo	< 0.1	< 0.1	< 0.1	0.044	< 0.1
Cd	0.06	0.04	0.05	0.055	0.05
Ag	< 0.002	< 0.002	< 0.002	< 0.002	0.00086
Cr	< 0.01	< 0.01	0.0049	0.0062	0.013
Co	0.42	0.31	0.37	0.35	0.34
Ni	0.95	0.73	0.89	0.85	0.8
Pb	< 0.03	< 0.01	< 0.01	0.015	< 0.015
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.02	0.01	0.01	0.016	0.016
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.02	0.02	0.02	0.027	0.024
As	0.007	0.007	0.0064	0.0082	< 0.0073
Sum cations (meq/L)	32.5	27.6	30.7	30.9	26.0
Sum anions (meq/L)	27.8	25.6	27.0	25.9	26.9
Charge imbalance (percent)	15.4	7.49	12.8	17.3	-3.61

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sugar Shack South**				
Well ID	**MMW-32B**	**MMW-32B**	**MMW-32B**	**MMW-32B**	**MMW-32B**
Sample Date	6/18/01	9/18/01	11/2/01	2/2/02	4/24/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,891	7,888	7,887	7,885	7,885
Field Temperature (^{o}C)	11.7	17.9	12.3	8.3	9.5
pH, field, [lab]	6.9	6.66	6.63	6.78	6.71
Eh (V)	0.071	0.021	0.035	0.055	0.071
Spec Cond (µS/cm) field, [lab]	2,820	2,540	2,560	281	2,850
TDS (mg/L)	2,700	2,700	2,600	2,600	2,600
Constituent, dissolved (mg/L)					
Ca	670	610	590	620	600
Mg	110	94	95	100	86
Ba	< 0.01	< 0.01	< 0.01	0.011	0.011
Na	76	69	72	81	77
K	7.2	6.4	6.5	7.4	7
SO_4	1,600	1,600	1,600	1,500	1,600
Alkalinity (as HCO_3)	300	290	300	290	290
F	4.2	2.6	2.7	2	3.4
Cl	38	38	40	37	36
SiO_2	24	21	24	26	26
Al	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fe	2.1	1.8	1.9	1.9	1.7
Mn	3.9	3.4	3.5	3.8	3.5
Cu	< 0.01	< 0.01	0.001	0.00097	< 0.01
Zn	1.9	1.6	1.7	1.7	1.5
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cd	< 0.001	< 0.001	0.0004	0.00047	0.00051
Ag	< 0.002	< 0.002	0.001	0.0025	0.0023
Cr	< 0.01	< 0.01	0.002	0.0036	0.0061
Co	< 0.01	< 0.01	0.005	0.004	0.0036
Ni	< 0.02	< 0.02	< 0.01	0.016	0.018
Pb	< 0.006	< 0.006	< 0.006	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.0057	0.0044	0.005	0.0052	0.0049
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	< 0.005	< 0.005	< 0.0025	< 0.005	0.0042
As	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sum cations (meq/L)	34.1	29.7	29.6	32.4	29.8
Sum anions (meq/L)	27.4	27.4	28.3	26.4	28.3
Charge imbalance (percent)	21.9	8.07	4.52	20.5	5.24

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump**					
Well ID	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**
Sample Date	11/8/94	11/8/94	11/8/94	6/1/95	4/17/96	8/1/96
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	Slifer 1996	SLD lab sheet, Slifer 1996	SPRI 1995, SRK 1995, MC DB, MMW	MMW wkst	MMW wkst	MMW wkst
Lab ID (see table 2)	SLD IC-94 0657	SLD WC-94 6426	ETC	---	---	---
Depth to Water (m)	33.3	39.6	32.3	---	33.3	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	8.9	---	9.1	---
pH, field, [lab]	---	[6.59]	7.9	7.07	7.32	7.15
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,480 #	[1,480 #]	2,280	1,470	1,500	1,480 #
TDS (mg/L)	1,440 #	1,440 #	1,400	---	1,290 #	---
Constituent, dissolved (mg/L)						
Ca	310	258	316	---	---	290
Mg	38	48.9	38.7	---	71	39.5
Ba	< 0.1	---	0.036	---	< 0.1	0.02
Na	---	32	30	---	21	25
K	---	7	5.4	---	---	5.9
SO_4	---	717	700	602	728	570
Alkalinity (as HCO_3)	178	146	200	---	160	---
F	---	1.8	1.67	7.49	2.1	---
Cl	---	13	14	---	---	13
SiO_2	18	---	19	---	---	11
Al	< 0.1	---	< 0.05	1.2	0.37	0.2
Fe	0.2	---	0.198	1.3	< 0.05	< 0.05
Mn	0.91	---	1.02	2	0.954	0.84
Cu	< 0.01	---	< 0.010	< 0.010	< 0.010	< 0.01
Zn	0.2 [0.0372]	---	0.222	0.012	< 0.5	0.061
Mo	0.051	---	0.05	< 0.02	< 0.02	0.03
Cd	< 0.001	---	< 0.0005	< 0.005	< 0.01	< 0.0005
Ag	< 0.001	---	< 0.10	---	< 0.01	< 0.01
Cr	< 0.001	---	< 0.010	---	< 0.01	< 0.01
Co	0.011	---	0.013	---	0.02	0.02
Ni	0.01	---	< 0.02	---	< 0.02	< 0.02
Pb	< 0.001	---	< 0.002	< 0.1	< 0.005	---
Hg	< 0.0002 [<0.001]	---	< 0.0002	---	< 0.0002	< 0.0002
Be	< 0.001	---	< 0.004	---	< 0.005	< 0.004
V	< 0.001	---	< 0.010	---	< 0.010	< 0.01
Se	< 0.05	---	< 0.005	---	< 0.005	< 0.005
As	< 0.001	---	< 0.005	---	< 0.01	< 0.005
Sum cations (meq/L)	---	14.6	16.3	---	---	15.6
Sum anions (meq/L)	---	13.9	14.2	---	---	8.88
Charge imbalance (percent)	---	5.08	13.9	---	---	55.1

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump**					
Well ID	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**
Sample Date	1/1/97	6/25/97	11/7/97	5/11/98	6/11/98	2/3/00
Miscellaneous information	filtered	---	11/6/97-11/7/97 in MC DB	--- 11/5/98	---	filtered
Comments	---	---	---	---	---	---
Source ID (see table 2)	MMW wkst	NMED: ACZ lab sheet, MC DB, URS	MC DB, URS 3/01	MC DB, URS 3/01	NMED: ACZ lab sheet, MC DB	MC DB, MMW wkst, RGC 8/10, URS
Lab ID (see table 2)	---	ACZ RG 46921	---	---	ACZ RG 70728	Paragon Analytics
Depth to Water (m)	---	---	---	---	39	37.1
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	10.3	---	---	10.1
pH, field, [lab]	7.05	---	7.1	---	---	7.19
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	7,060 #	---	1,680 #	---	---	1,590
TDS (mg/L)	---	1360, 1450	1,490	1,570	1530, 1670	1,400
Constituent, dissolved (mg/L)						
Ca	363	340	350	371	370	330
Mg	44.3	39.3	47.3	40.4	44.3	29
Ba	0.015	0.023	0.01	---	0.008	0.012
Na	31.6	30.5	30	29.1	31.9	27
K	5.1	7	3.9	5.1	4.6	7.2
SO_4	1,290 #	790	910	880	930	700
Alkalinity (as HCO_3)	---	201	---	207	226	190
F	1.74	1.6	1.8	1.4	1.6	1.9
Cl	---	14	14	16	16	16
SiO_2	50.7	---	26	---	---	13.9
Al	0.04	0.04	0.52	ND	0.04	0.13
Fe	0.03	0.16	0.02	ND	< 0.01	< 0.1
Mn	0.478	0.706	0.378	0.13	0.061	0.029
Cu	< 0.01	< 0.01	< 0.01	ND	< 0.01	< 0.01
Zn	0.03	0.36	0.17	0.05	0.04	0.044
Mo	< 0.02	0.05	< 0.05	0.04	0.05	< 0.1
Cd	< 0.0005	0.0008	< 0.003	ND	< 0.0005	< 0.001
Ag	< 0.002	---	< 0.005	---	---	< 0.002
Cr	0.01	---	0.01	---	---	< 0.01
Co	0.02	0.05	0.02	ND	---	< 0.01
Ni	0.01	0.01	< 0.05	ND	---	< 0.02
Pb	< 0.001	---	< 0.04	---	---	< 0.003
Hg	< 0.0002	---	< 0.0002	---	---	< 0.0005
Be	< 0.0005	---	< 0.01	---	---	< 0.004
V	< 0.005	---	< 0.005	---	---	< 0.01
Se	< 0.001	0.002	< 0.001	---	---	< 0.005
As	< 0.001	---	< 0.001	---	---	< 0.005
Sum cations (meq/L)	16.5	17.1	17.5	17.9	18.1	16.1
Sum anions (meq/L)	20.2	15.5	14.1	16.9	18.1	14.1
Charge imbalance (percent)	-20.0	9.41	21.4	5.75	0.11	13.1

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump**				
Well ID	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**	**MMW-13**
Sample Date	6/6/01	9/10/01	12/4/01	1/28/02	4/19/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,940	7,942	7,936	---	---
Field Temperature (^{o}C)	11.9	13.1	10	8.5	12
pH, field, [lab]	7.03	7.05	7.2	7.37	7.41
Eh (V)	0.276	0.015	0.169	0.132	0.343
Spec Cond (µS/cm) field, [lab]	1,910 #	1,870 #	1,660 #	1,630 #	1,630 #
TDS (mg/L)	1,700	1,600	1,400	1,400	1,300
Constituent, dissolved (mg/L)					
Ca	450	370	380	350	380
Mg	56	43	37	35	34
Ba	< 0.01	< 0.01	< 0.01	0.02	0.0096
Na	34	30	27	30	29
K	4.8	7.2	8.1	7	8.3
SO_4	1,000	880	760	760	750
Alkalinity (as HCO_3)	190	190	170	150	120
F	1.8	1.8	2.1	1.9	2
Cl	10	14	16	14	14
SiO_2	30	17	15	18	16
Al	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fe	0.57	0.14	< 0.1	< 0.1	< 0.1
Mn	0.97	0.28	0.02	0.13	0.016
Cu	< 0.01	< 0.01	< 0.0012	0.0007	< 0.01
Zn	< 0.02	0.06	0.06	0.03	0.021
Mo	< 0.1	< 0.1	0.03	0.043	0.035
Cd	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	< 0.01	0.00094
Co	< 0.01	< 0.01	0.009	0.0078	0.011
Ni	< 0.02	< 0.02	0.0035	0.0033	0.0035
Pb	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	< 0.004	< 0.004	< 0.004	< 0.004	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	< 0.005	< 0.005	0.007	0.0034	0.0068
As	< 0.005	< 0.005	< 0.005	0.002	< 0.005
Sum cations (meq/L)	22.0	18.1	18.6	17.3	18.5
Sum anions (meq/L)	17.6	16.5	14.4	14.3	13.3
Charge imbalance (percent)	22.3	9.18	25.6	19.4	32.5

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump**			
Well ID	**MMW-25A**	**MMW-25A**	**MMW-25B**	**MMW-25B**
Sample Date	1/12/00	1/28/02	1/12/00	1/12/00
Miscellaneous information	DRY; DTW=23.01	filtered	filtered	filtered
Comments	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst	MC CD	MC DB, MMW wkst, RGC 8/10, URS 3/01	NMED: SLD lab sheet
Lab ID (see table 2)	---	Paragon Analytics	Paragon Analytics	SLD 2000 00108
Depth to Water (m)	---	---	30.1	30.1
Water Elevation (ft)	---	7,981	---	---
Field Temperature (^{o}C)	---	7.8	12.9	---
pH, field, [lab]	---	6.99	7	7.81
Eh (V)	---	0.133	---	---
Spec Cond (µS/cm) field, [lab]	---	2,440	2,600	---
TDS (mg/L)	---	2,300	2,500	2,130
Constituent, dissolved (mg/L)				
Ca	---	590	570	565
Mg	---	55	57	54.4
Ba	---	0.012	0.027	---
Na	---	48	55	51.4
K	---	8.2	8.4	6.07
SO_4	---	1,400	1,600	1,470
Alkalinity (as HCO_3)	---	180	200	152
F	---	2.1	1.9	---
Cl	---	33	33	30.5
SiO_2	---	21.4	20.1	---
Al	---	< 0.05	0.1	---
Fe	---	< 0.1	0.13	---
Mn	---	0.014	0.27	---
Cu	---	0.0017	< 0.01	---
Zn	---	0.25	0.14	---
Mo	---	0.028	< 0.1	---
Cd	---	0.00039	< 0.001	---
Ag	---	< 0.002	0.003	---
Cr	---	0.00089	< 0.01	---
Co	---	< 0.01	< 0.01	---
Ni	---	0.005	0.053	---
Pb	---	< 0.006	< 0.006	---
Hg	---	< 0.0002	< 0.01	---
Be	---	< 0.004	< 0.004	---
V	---	< 0.01	< 0.01	---
Se	---	0.0049	< 0.01	---
As	---	< 0.005	< 0.005	---
Sum cations (meq/L)	---	26.9	25.3	25.2
Sum anions (meq/L)	---	23.7	27.2	24.1
Charge imbalance (percent)	---	12.4	-7.09	4.48

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump**				
Well ID	**MMW-25B**	**MMW-25B**	**MMW-25B**	**MMW-25B**	**MMW-25B**
Sample Date	1/12/00	6/20/01	9/8/01	12/4/01	4/19/02
Miscellaneous information	filtered, Duplicate	filtered	filtered	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	NMED: SLD lab sheet	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	SLD HM 2000 0064	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	30.1	---	---	---	---
Water Elevation (ft)	---	7,980	7,982	7,980	7,980
Field Temperature (^{o}C)	---	18.1	16.9	13.5	15.2
pH, field, [lab]	---	6.73	6.87	6.99	6.94
Eh (V)	---	0.22	0.092	0.203	-0.006
Spec Cond (µS/cm) field, [lab]	---	2,410	2,450	2,490	2,500
TDS (mg/L)	---	2,300	2,400	2,300	2,300
Constituent, dissolved (mg/L)					
Ca	520	610	570	580	530
Mg	50	64	56	57	59
Ba	< 0.1	< 0.01	< 0.01	0.0093	0.013
Na	---	45	45	49	47
K	---	8.4	8.4	8.7	8.9
SO_4	---	1,500	1,400	1,400	1,400
Alkalinity (as HCO_3)	---	180	190	180	180
F	---	1.4	2.1	2.1	1.6
Cl	---	30	32	34	29
SiO_2	---	19	19	21	21
Al	0.2	5.2	< 0.05	< 0.05	< 0.05
Fe	0.1	< 0.1	< 0.1	< 0.1	0.22
Mn	0.26	2.5	0.02	0.03	0.062
Cu	< 0.1	0.06	< 0.01	0.0018	< 0.01
Zn	< 0.1	0.59	0.27	0.28	0.21
Mo	< 0.1	< 0.1	< 0.1	0.03	0.035
Cd	< 0.1	0.0039	< 0.001	< 0.001	0.00054
Ag	< 0.1	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.1	< 0.01	< 0.01	< 0.0011	< 0.01
Co	< 0.05	0.02	< 0.01	< 0.00099	0.0015
Ni	< 0.1	0.06	< 0.02	0.01	0.13
Pb	< 0.005	< 0.006	< 0.006	< 0.006	< 0.006
Hg	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	< 0.05	< 0.004	< 0.004	0.00055	---
V	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01
Se	< 0.005	< 0.0056	< 0.0055	< 0.0039	< 0.005
As	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sum cations (meq/L)	---	27.2	25.4	26.3	24.2
Sum anions (meq/L)	---	24.2	23.4	23.4	23.6
Charge imbalance (percent)	---	11.8	8.03	11.4	2.49

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump/Sulphur Gulch**				
Well ID	**MMW-29A**	**MMW-29A**	**MMW-29A**	**MMW-29A**	**MMW-29A**
Sample Date	6/14/01	9/5/01	12/9/01	1/25/02	4/22/02
Miscellaneous information	filtered	filtered	---	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,940	7,939	7,932	7,927	7,929
Field Temperature (^{o}C)	9.4	20.8	10.1	8.1	16
pH, field, [lab]	4.92	4.6	4.67	4.61	4.54
Eh (V)	0.177	0.246	0.194	0.269	0.244
Spec Cond (µS/cm) field, [lab]	1,900	1,740 #	1,980 #	2,170	2,040
TDS (mg/L)	1,800	1,500	---	2,000	1,900
Constituent, dissolved (mg/L)					
Ca	220	200	---	240	220
Mg	140	130	---	150	140
Ba	< 0.01	< 0.01	---	0.014	0.012
Na	27	24	---	31	29
K	6.9	6.4	---	7.4	7.5
SO_4	1,200	1,100	---	1,400	1,300
Alkalinity (as HCO_3)	5.9	< 5	---	< 5	< 5
F	47	34	---	43	42
Cl	23	22	---	28	23
SiO_2	24	21	---	24	24
Al	46	37	---	48	47
Fe	0.14	< 0.1	---	< 0.1	0.18
Mn	23	19	---	25	22
Cu	0.59	0.53	---	0.71	0.65
Zn	7.9	6.4	---	8.6	8.1
Mo	< 0.1	< 0.1	---	< 0.1	< 0.1
Cd	0.06	0.05	---	0.065	0.062
Ag	< 0.002	< 0.002	---	< 0.002	0.0019
Cr	< 0.01	< 0.01	---	0.0034	0.02
Co	0.15	0.12	---	0.16	0.14
Ni	0.57	0.5	---	0.66	0.64
Pb	< 0.009	< 0.009	---	< 0.009	< 0.009
Hg	< 0.0002	< 0.0002	---	< 0.0002	< 0.0002
Be	0.01	0.01	---	0.015	0.015
V	< 0.01	< 0.01	---	< 0.01	< 0.01
Se	0.01	0.01	---	0.017	0.017
As	< 0.005	< 0.005	---	< 0.005	0.0018
Sum cations (meq/L)	20.9	18.3	---	22.3	20.3
Sum anions (meq/L)	19.0	16.7	---	22.1	20.0
Charge imbalance (percent)	9.50	9.37	---	1.08	1.91

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump/Sulphur Gulch**				
Well ID	**MMW-29B**	**MMW-29B**	**MMW-29B**	**MMW-29B**	**MMW-29B**
Sample Date	6/14/01	9/5/01	12/9/01	1/25/02	4/22/02
Miscellaneous information	filtered	filtered	---	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,941	7,940	7,933	7,928	7,929
Field Temperature (^{o}C)	14.3	18.4	9.7	7.8	14.6
pH, field, [lab]	6.96	7.27	7.24	7.32	7.48
Eh (V)	-0.144	-0.279	-0.242	-0.166	-0.313
Spec Cond (µS/cm) field, [lab]	1,120 #	1,100 #	1,120 #	1,120 #	1,130 #
TDS (mg/L)	850	850	---	870	850
Constituent, dissolved (mg/L)					
Ca	220	210	---	200	210
Mg	33	32	---	29	31
Ba	< 0.01	0.02	---	0.015	0.021
Na	24	22	---	18	19
K	4.5	3.5	---	2.7	3.3
SO_4	210	430	---	470	450
Alkalinity (as HCO_3)	200	180	---	170	180
F	3.4	2.9	---	3.5	3.6
Cl	2.1	5.2	---	4.2	4.2
SiO_2	24	24	---	21	20
Al	4.2	< 0.05	---	< 0.05	< 0.05
Fe	0.74	0.19	---	0.39	0.26
Mn	3.8	3.2	---	3.3	3.2
Cu	0.02	< 0.01	---	< 0.01	< 0.01
Zn	0.19	< 0.02	---	0.011	0.011
Mo	< 0.1	< 0.1	---	< 0.1	< 0.1
Cd	< 0.001	< 0.001	---	< 0.001	< 0.001
Ag	< 0.002	< 0.002	---	< 0.002	< 0.002
Cr	< 0.01	< 0.01	---	0.001	0.0014
Co	< 0.01	< 0.01	---	< 0.01	0.00095
Ni	< 0.02	< 0.02	---	0.0021	0.0018
Pb	< 0.003	< 0.003	---	< 0.003	< 0.003
Hg	< 0.0002	< 0.0002	---	< 0.0002	< 0.0002
Be	< 0.004	< 0.004	---	0.0015	0.00098
V	< 0.01	< 0.01	---	< 0.01	< 0.01
Se	< 0.005	< 0.005	---	< 0.005	0.0029
As	< 0.005	< 0.005	---	< 0.005	0.0036
Sum cations (meq/L)	13.7	11.8	---	11.0	11.6
Sum anions (meq/L)	6.35	9.73	---	10.6	10.2
Charge imbalance (percent)	73.2	19.3	---	4.42	13.3

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump**				
Well ID	**MMW-30A**	**MMW-30A**	**MMW-30A**	**MMW-30A**	**MMW-30A**
Sample Date	6/7/01	9/7/01	12/9/01	1/24/02	4/22/02
Miscellaneous information	filtered	filtered	---	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,930	7,929	7,924	7,920	7,920
Field Temperature (^{o}C)	15.9	15.9	12	8	15.4
pH, field, [lab]	4.47	4.47	4.36	4.49	4.3
Eh (V)	0.138	0.201	0.195	0.17	0.273
Spec Cond (µS/cm) field, [lab]	1,930 #	1,930 #	2,500	2,260	2,450
TDS (mg/L)	1,300	1,800	---	2,100	2,300
Constituent, dissolved (mg/L)					
Ca	140	190	---	220	230
Mg	79	130	---	170	190
Ba	< 0.01	< 0.01	---	0.0097	0.01
Na	17	23	---	30	32
K	4	3.8	---	6.1	6.7
SO_4	850	1,300	---	1,500	1,700
Alkalinity (as HCO_3)	6.5	< 5	---	< 5	< 5
F	20	27	---	34	40
Cl	25	24	---	24	26
SiO_2	20	21	---	26	28
Al	37	48	---	62	70
Fe	< 0.1	< 0.1	---	0.14	0.035
Mn	17	27	---	38	35
Cu	0.56	0.57	---	0.87	0.94
Zn	4.1	5.3	---	7.7	8.9
Mo	< 0.1	< 0.1	---	< 0.1	< 0.1
Cd	0.02	0.04	---	0.05	0.061
Ag	< 0.002	< 0.002	---	< 0.002	0.0011
Cr	< 0.01	< 0.01	---	0.025	0.011
Co	0.13	0.2	---	0.3	0.3
Ni	0.39	0.59	---	0.82	0.85
Pb	< 0.006	0.009	---	< 0.015	< 0.015
Hg	< 0.0002	< 0.0002	---	< 0.0002	< 0.0002
Be	0.01	0.01	---	0.019	0.019
V	< 0.01	< 0.01	---	< 0.01	< 0.01
Se	0.01	0.01	---	0.023	0.03
As	< 0.005	< 0.005	---	0.0057	0.0093
Sum cations (meq/L)	13.5	18.6	---	24.1	24.9
Sum anions (meq/L)	13.9	19.9	---	22.7	25.0
Charge imbalance (percent)	-2.29	-6.91	---	5.73	-0.39

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Middle Waste Rock Dump**				
Well ID	**MMW-30B**	**MMW-30B**	**MMW-30B**	**MMW-30B**	**MMW-30B**
Sample Date	6/7/01	9/7/01	12/9/01	1/24/02	4/23/02
Miscellaneous information	filtered	filtered	---	filtered	filtered
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	7,929	7,929	7,924	7,921	7,921
Field Temperature (^{o}C)	17.1	14.9	8.7	9.3	13.3
pH, field, [lab]	7.84	6.41	6.5	6.53	6.49
Eh (V)	-0.141	-0.284	-0.28	-0.307	-0.298
Spec Cond (µS/cm) field, [lab]	3,120	3,520	3,500	3,400	3,330
TDS (mg/L)	3,200	3,900	---	3,500	3,300
Constituent, dissolved (mg/L)					
Ca	490	470	---	490	460
Mg	42	39	---	37	42
Ba	0.04	0.03	---	0.066	0.058
Na	410	500	---	390	340
K	13	12	---	9.9	10
SO_4	1,500	1,100	---	1,200	1,100
Alkalinity (as HCO_3)	430	860	---	450	470
F	3	2.8	---	1.5	1.9
Cl	16	35	---	26	29
SiO_2	26	28	---	30	32
Al	0.16	0.14	---	0.099	0.073
Fe	0.61	< 0.1	---	0.053	0.18
Mn	8.2	4.2	---	3.8	3.7
Cu	< 0.01	< 0.01	---	< 0.01	< 0.01
Zn	< 0.02	< 0.02	---	0.013	0.01
Mo	< 0.1	< 0.1	---	< 0.1	< 0.1
Cd	< 0.001	< 0.001	---	< 0.001	< 0.001
Ag	< 0.002	< 0.002	---	< 0.002	0.00099
Cr	< 0.01	< 0.01	---	< 0.01	0.02
Co	< 0.01	< 0.01	---	< 0.01	0.0012
Ni	< 0.02	< 0.02	---	0.0046	0.0069
Pb	< 0.006	< 0.003	---	< 0.006	< 0.006
Hg	< 0.0002	< 0.0002	---	< 0.0002	---
Be	< 0.004	< 0.004	---	0.002	0.0023
V	< 0.01	< 0.01	---	0.012	0.012
Se	< 0.005	< 0.005	---	0.0019	0.0059
As	0.006	0.03	---	0.019	0.017
Sum cations (meq/L)	37.2	41.8	---	37.5	34.7
Sum anions (meq/L)	29.6	31.0	---	25.8	24.5
Charge imbalance (percent)	22.5	29.6	---	37.0	34.2

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sulphur Gulch/ Spring Valley**			
Well ID	**MMW-16**	**MMW-16**	**MMW-16**	**MMW-16**
Sample Date	6/1/95	4/17/96	1/1/97	6/22/01
Miscellaneous information	filtered	filtered	Pumped Dry	filtered
Comments	---	---	---	---
Source ID (see table 2)	MMW wkst	MMW wkst	MMW wkst; MC DB	MC CD
Lab ID (see table 2)	---	---	---	Paragon Analytics
Depth to Water (m)	---	25.3	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	8.7	---	15.3
pH, field, [lab]	4.34	4.96	---	4.57
Eh (V)	---	---	---	0.304
Spec Cond (µS/cm) field, [lab]	2,740	3,140	---	2,520
TDS (mg/L)	---	3,410 #	---	2,600
Constituent, dissolved (mg/L)				
Ca	---	---	---	550
Mg	---	211 #	---	88
Ba	---	< 0.1	---	< 0.01
Na	---	53	---	37
K	---	---	---	15
SO_4	1,690 #	2,870 #	---	1,700
Alkalinity (as HCO_3)	---	< 1	---	< 5
F	20.4	58.5	---	20
Cl	---	---	---	24
SiO_2	---	---	---	43
Al	21.8	52.4	---	26
Fe	0.66	0.6	---	0.42
Mn	10.4	30.1 #	---	7.9
Cu	0.9	1.16	---	0.78
Zn	5.3	10.1 #	---	2.9
Mo	< 0.02	< 0.02	---	< 0.1
Cd	0.02	0.095	---	0.02
Ag	---	< 0.01	---	< 0.002
Cr	---	< 0.01	---	< 0.01
Co	---	0.16	---	0.58
Ni	---	0.65	---	0.24
Pb	< 0.1	< 0.005	---	< 0.006
Hg	---	< 0.0002	---	< 0.0002
Be	---	0.049	---	0.02
V	---	< 0.01	---	< 0.01
Se	---	0.017	---	0.008
As	---	< 0.01	---	< 0.005
Sum cations (meq/L)	---	---	---	27.3
Sum anions (meq/L)	---	---	---	24.4
Charge imbalance (percent)	---	---	---	11.3

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sulphur Gulch**			
Well ID	**MMW-24**	**MMW-24**	**MMW-24**	**MMW-24**
Sample Date	1/12/00	1/12/00	1/12/00	6/23/01
Miscellaneous information	duplicate	filtered, duplicate	duplicate	filtered
Comments	---	---	---	---
Source ID (see table 2)	NMED: SLD lab sheet	MC DB, MMW wkst, RGC 8/10, URS 3/01	NMED: SLD lab sheet	MC CD
Lab ID (see table 2)	SLD HM-2000 00107	Paragon Analytics	SLD HM-2000 00062	Paragon Analytics
Depth to Water (m)	28.7	28.7	---	---
Water Elevation (ft)	---	---	---	8,060
Field Temperature (^{o}C)	---	10.1	---	15
pH, field, [lab]	4.78	4.79	---	5.4
Eh (V)	---	---	---	0.133
Spec Cond (µS/cm) field, [lab]	---	2,980	---	3,100
TDS (mg/L)	2,720	3,300	---	3,000
Constituent, dissolved (mg/L)				
Ca	565	560	550	580
Mg	92.5	100	90	86
Ba	---	0.024	---	< 0.01
Na	64.5	77	---	67
K	9.2	13	---	15
SO_4	1,680	1,800	---	1,800
Alkalinity (as HCO_3)	2.8	< 5	---	9.3
F	---	41	---	43
Cl	34.6	44	---	31
SiO_2	---	38.5	---	28
Al	---	53	46	35
Fe	---	0.22	0.4	< 0.1
Mn	---	14	12	14
Cu	---	1.4	1.4	0.99
Zn	---	2.7	2.2	2.4
Mo	---	< 0.1	---	< 0.1
Cd	---	0.02	---	0.01
Ag	---	< 0.002	---	< 0.002
Cr	---	< 0.01	---	< 0.01
Co	---	0.23	0.16	0.17
Ni	---	0.51	0.4	0.37
Pb	---	< 0.006	---	< 0.006
Hg	---	< 0.0002	---	< 0.0002
Be	---	0.023	---	0.01
V	---	< 0.01	---	< 0.01
Se	---	0.01	---	0.01
As	---	0.017	---	0.006
Sum cations (meq/L)	27.8	32.1	---	29.5
Sum anions (meq/L)	24.9	26.6	---	26.4
Charge imbalance (percent)	10.9	18.9	---	11.0

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location				
Well ID	**MMW-24**	**MMW-24**	**MMW-24**	**MMW-24**
Sample Date	9/5/01	12/7/01	1/26/02	4/17/02
Miscellaneous information	filtered	filtered	filtered	filtered
Comments	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	8,066	8,050	8,046	8,055
Field Temperature (^{o}C)	18.5	6.6	12.6	16.8
pH, field, [lab]	5.52	5.51	4.83	4.67
Eh (V)	0.29	0.288	0.255	409
Spec Cond (µS/cm) field, [lab]	2,960	2,150	2,670	2,770
TDS (mg/L)	2,800	1,500	2,500	2,700
Constituent, dissolved (mg/L)				
Ca	570	330	520	510
Mg	83	35	13	80
Ba	< 0.01	< 0.01	0.013	0.017
Na	69	100	56	56
K	18	24	14	16
SO_4	1,700	1,850	1,600	1,700
Alkalinity (as HCO_3)	35	15	< 5	5.4
F	17	16	33	32
Cl	28	24	19	18
SiO_2	20	14	36	16
Al	9.8	12	40	31
Fe	< 0.1	< 0.1	< 0.1	< 0.1
Mn	12	5.6	13	13
Cu	0.12	0.32	1	0.88
Zn	1.5	0.92	2.3	2.1
Mo	< 0.1	0.02	< 0.1	< 0.1
Cd	0.01	0.008	0.019	0.018
Ag	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	0.02	0.015	0.0025
Co	0.14	0.06	0.16	0.16
Ni	0.32	0.15	0.39	0.36
Pb	0.009	< 0.003	0.0042	< 0.006
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.0091	0.0056	0.016	0.013
V	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.008	0.008	0.013	0.015
As	< 0.005	< 0.005	0.0099	0.0035
Sum cations (meq/L)	27.7	17.7	23.6	26.2
Sum anions (meq/L)	25.0	32.1	24.3	24.9
Charge imbalance (percent)	10.2	-57.9	-3.03	4.94

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Spring Gulch**			
Well ID	**MMW-34B**	**MMW-34B**	**MMW-34B**	**MMW-34B**
Sample Date	9/17/01	10/18/01	1/22/02	4/12/02
Miscellaneous information	* reported as MMW-35B (MC CD 9-18-02)	filtered	filtered	filtered
Comments	but determined to be MMW 34B so switched here	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	8,508	8,508	8,506	8,505
Field Temperature (^{o}C)	16.5	18.1	10	12.4
pH, field, [lab]	5.71	5.34	4.88	4.85
Eh (V)	0.256	0.24	0.134	0.261
Spec Cond (µS/cm) field, [lab]	2,520	3,030	2,910	2,920
TDS (mg/L)	3,200	3,100	3,100	3,100
Constituent, dissolved (mg/L)				
Ca	630	640	600	610
Mg	64	75	76	73
Ba	0.02	0.05	0.0067	0.006
Na	53	52	48	50
K	22	17	16	16
SO_4	1900 *	2,100	2,000	2,000
Alkalinity (as HCO_3)	22 *	35	7.4	6.8
F	88 *	120	120	120
Cl	6.4 *	4.7	4.6	4.9
SiO_2	53	73	71	36
Al	53	69	69	71
Fe	0.13	0.14	0.15	0.13
Mn	22	24	22	22
Cu	0.73	0.96	0.99	1
Zn	6.5	8.6	8.1	8
Mo	0.27	0.11	0.11	0.13
Cd	0.03	0.04	0.048	0.049
Ag	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	0.029	0.027
Co	< 0.01	< 0.01	0.0061	0.0062
Ni	0.11	0.14	0.14	0.14
Pb	0.04	0.02	0.019	0.0099
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.09	0.12	0.13	0.13
V	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.01	0.02	0.023	0.023
As	0.0071	0.01	0.016	0.014
Sum cations (meq/L)	33.3	29.3	28.6	28.9
Sum anions (meq/L)	33.6	30.4	29.4	29.1
Charge imbalance (percent)	-0.82	-3.67	-2.57	-0.61

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Blind/ Sulphur North**				
Well ID	**MMW-35B**	**MMW-35B**	**MMW-35B**	**MMW-35B**	**MMW-35B**
Sample Date	6/19/01	9/17/01	10/18/01	1/22/02	4/12/02
Miscellaneous information	filtered	* reported as MMW-34B (MC CD 9-18-02)	filtered	filtered	filtered
Comments	---	but determined to be MMW 35B so switched here	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,489	8,494	8,494	8,494	8,490
Field Temperature (^{o}C)	16.2	17.2	17.9	6.3	15.2
pH, field, [lab]	6.87	6.66	6.62	6.75	6.67
Eh (V)	0.066	0.053	0.057	0.075	0.061
Spec Cond (µS/cm) field, [lab]	3,340	3,360	3,530	3,340	3,320
TDS (mg/L)	3,200	2,900	3,000	3,000	2,900
Constituent, dissolved (mg/L)					
Ca	840	890	890	830	850
Mg	39	36	35	39	37
Ba	0.03	0.02	0.02	0.021	0.024
Na	49	46	47	51	49
K	21	19	19	19	20
SO_4	1,500	1,500 *	1,500	1,500	1,500
Alkalinity (as HCO_3)	340	360 *	360	360	350
F	3.3	2.9 *	2.1	2.7	2.9
Cl	290	300 *	300	280	260
SiO_2	18	18	18	18	19
Al	< 0.05	< 0.05	< 0.05	0.063	0.0053
Fe	3.1	0.28	0.25	0.42	0.37
Mn	6.2	5.2	5.5	5.3	5.5
Cu	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Zn	0.23	0.34	0.42	0.49	0.38
Mo	< 0.1	< 0.1	< 0.07	0.05	0.082
Cd	< 0.001	< 0.001	< 0.00057	0.0007	0.001
Ag	0.0025	< 0.002	< 0.002	0.0011	0.002
Cr	< 0.01	< 0.01	0.0013	0.0058	0.01
Co	0.03	0.02	0.02	0.029	0.028
Ni	0.05	0.05	0.05	0.06	0.058
Pb	< 0.006	< 0.006	< 0.009	< 0.009	0.009
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
Be	0.02	0.04	0.06	0.078	0.079
V	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Se	< 0.005	< 0.005	0.0062	0.0026	0.005
As	< 0.005	< 0.005	< 0.0032	< 0.005	0.005
Sum cations (meq/L)	36.1	35.1	37.6	36.2	36.3
Sum anions (meq/L)	33.1	29.8	33.2	33.8	32.4
Charge imbalance (percent)	8.7	16.5	12.3	6.9	11.4

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Sulphur Gulch**			**Spring Gulch**	
Well ID	**MMW-39A**	**MMW-39A**	**MMW-39A**	**MMW-40A**	**MMW-40A**
Sample Date	12/17/01	3/28/02	6/5/02	6/19/01	6/4/02
Miscellaneous information	filtered	filtered	filtered	checked for field parameters in MC CD	filtered
Comments	checked for field parameters	Ni values confirmed	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	8,115	---	8,800
Field Temperature (^{o}C)	---	11.7	13.3	19.4	16.2
pH, field, [lab]	---	4.09	4.16	6.23	6.26
Eh (V)	---	0.298	0.254	0.336	0.25
Spec Cond (µS/cm) field, [lab]	---	4,860	4,760	1,020 #	1,070 #
TDS (mg/L)	5,800	5,700	5,600	810	830
Constituent, dissolved (mg/L)					
Ca	490	460	460	150	140
Mg	400	400	410	52	45
Ba	0.0074	0.0088	0.0066	0.02	0.026
Na	65	64	65	30	30
K	17	17	16	4.2	3.9
SO_4	3,800	3,800	4,100	480	510
Alkalinity (as HCO_3)	< 5	< 5	< 5	51	47
F	170	170	180	1.6	1.4
Cl	79	74	72	11	11
SiO_2	49	54	51	36	39
Al	180	190	180	5.2	0.05
Fe	< 0.1	0.11	< 0.1	< 0.1	< 0.1
Mn	120	110	100	2.3	0.017
Cu	5.5	5.9	5.9	0.11	0.00071
Zn	26	27	25	0.54	0.066
Mo	0.05	0.062	0.038	< 0.1	< 0.1
Cd	0.19	0.18	0.18	0.0053	0.001
Ag	< 0.002	0.00067	< 0.002	< 0.002	< 0.002
Cr	< 0.01	0.0022	0.0039	< 0.01	0.00077
Co	0.5	0.52	0.49	0.02	0.0061
Ni	2.0	2.0	2.0	0.06	< 0.02
Pb	< 0.06	0.022	< 0.06	< 0.003	< 0.003
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Be	0.19	0.19	0.2	< 0.004	< 0.004
V	< 0.01	0.00052	< 0.01	< 0.01	< 0.01
Se	0.06	0.062	0.039	< 0.005	0.0044
As	0.02	0.025	0.02	< 0.005	0.0017
Sum cations (meq/L)	51.1	50.1	47.7	11.0	9.75
Sum anions (meq/L)	55.2	54.8	59.9	8.65	9.42
Charge imbalance (percent)	-7.67	-9.00	-22.7	23.9	3.44

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area East of Mill**				
Well ID	**MMW-17A**	**MMW-17A**	**MMW-17A**	**MMW-17A**	**MMW-17A**
Sample Date	1/12/00	6/25/01	9/4/01	10/19/01	7/17/02
Miscellaneous information	DRY	filtered	filtered	filtered	---
Comments	---	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	---	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	8,108	8,105	8,098	---
Field Temperature (^{o}C)	---	9.9	14.8	15	17.5
pH, field, [lab]	---	4.46	4.47	4.49	4.4
Eh (V)	---	0.082	0.372	0.304	0.245
Spec Cond (µS/cm) field, [lab]	---	719	765	837	788
TDS (mg/L)	---	560	610	610	---
Constituent, dissolved (mg/L)					
Ca	---	97	100	100	---
Mg	---	26	29	27	---
Ba	---	< 0.01	< 0.01	0.0071	---
Na	---	< 10	< 10	9	---
K	---	1.9	1.9	2.1	---
SO_4	---	400	430	450	---
Alkalinity (as HCO_3)	---	< 5	< 5	< 5	---
F	---	2	2	1.8	---
Cl	---	6.4	5.8	6.2	---
SiO_2	---	26	28	28	---
Al	---	8.9	11	10	---
Fe	---	0.5	< 0.1	< 0.1	---
Mn	---	1.7	1.8	1.8	---
Cu	---	0.05	0.04	0.04	---
Zn	---	0.63	0.63	0.62	---
Mo	---	< 0.1	< 0.1	< 0.1	---
Cd	---	0.0023	0.0026	0.0023	---
Ag	---	< 0.002	< 0.002	< 0.002	---
Cr	---	< 0.01	< 0.01	0.0014	---
Co	---	0.031	0.036	0.035	---
Ni	---	0.089	0.098	0.09	---
Pb	---	< 0.003	< 0.003	< 0.003	---
Hg	---	< 0.0002	< 0.0002	< 0.0002	---
Be	---	< 0.004	< 0.004	0.0022	---
V	---	< 0.01	< 0.01	< 0.01	---
Se	---	< 0.005	< 0.005	< 0.005	---
As	---	< 0.005	< 0.005	0.0021	---
Sum cations (meq/L)	---	6.40	6.71	6.84	---
Sum anions (meq/L)	---	6.85	7.16	7.59	---
Charge imbalance (percent)	---	-6.85	-6.48	-10.4	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area East of Mill**			
Well ID	**MMW-17B**	**MMW-17B**	**MMW-17B**	**MMW-17B**
Sample Date	1/12/00	1/12/00	1/12/00	6/25/01
Miscellaneous information	wkst uses Paragon results	---	filtered	filtered
Comments	---	---	---	---
Source ID (see table 2)	MC DB, MMW wkst, RGC 8/10, URS 3/01	NMED: SLD lab sheet	NMED: SLD lab sheet, MC DB, MMW wkst	MC CD
Lab ID (see table 2)	Paragon Analytics	SLD WC 2000 00106	SLD HM 2000 00063	Paragon Analytics
Depth to Water (m)	28.3	28.3	28.3	---
Water Elevation (ft)	---	---	---	8,109
Field Temperature (^{o}C)	10	---	10	11.5
pH, field, [lab]	4.76	4.68	4.76	5.54
Eh (V)	---	---	---	0.103
Spec Cond (µS/cm) field, [lab]	887	---	887	847
TDS (mg/L)	790	662	790	600
Constituent, dissolved (mg/L)				
Ca	110	115	110	93
Mg	30	29.6	32	25
Ba	0.019	---	< 0.1	< 0.01
Na	10	9.32	10	< 10
K	2	< 5	2	1.8
SO_4	480	443	480	430
Alkalinity (as HCO_3)	< 5	< 2.5	< 5	< 5
F	1.9	---	1.9	1.9
Cl	5.1	< 10	5.1	5.5
SiO_2	27.8	---	27.8	30
Al	11	---	11	12
Fe	< 0.1	---	< 0.1	0.41
Mn	2	---	2	1.9
Cu	0.11	---	0.11	0.05
Zn	0.74	---	0.74	0.59
Mo	< 0.1	---	< 0.1	< 0.1
Cd	0.0028	---	< 0.1	0.0023
Ag	< 0.002	---	< 0.1	< 0.002
Cr	< 0.01	---	< 0.1	< 0.01
Co	0.04	---	< 0.05	0.035
Ni	0.11	---	0.11	0.092
Pb	< 0.003	---	< 0.005	< 0.003
Hg	< 0.0002	---	---	< 0.0002
Be	< 0.004	---	< 0.05	< 0.004
V	< 0.01	---	< 0.1	< 0.01
Se	< 0.005	---	< 0.005	< 0.005
As	< 0.005	---	< 0.005	< 0.005
Sum cations (meq/L)	7.58	7.79	7.74	6.21
Sum anions (meq/L)	8.04	7.20	8.01	7.36
Charge imbalance (percent)	-5.85	7.93	-3.52	-16.9

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area East of Mill**				
Well ID	**MMW-17B**	**MMW-17B**	**MMW-17B**	**MMW-17B**	**MMW-17B**
Sample Date	9/4/01	10/19/01	1/23/02	4/15/02	7/18/02
Miscellaneous information	filtered	filtered	filtered	filtered	---
Comments	---	---	* factor of 10 too high	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	8,105	8,098	8,078	8,089	---
Field Temperature (^{o}C)	17.7	13.6	9	14.4	16.1
pH, field, [lab]	4.4	4.44	4.79	4.45	4.47
Eh (V)	0.347	0.273	0.256	0.287	0.258
Spec Cond (µS/cm) field, [lab]	777	841	814 *	807	786
TDS (mg/L)	610	610	630	620	---
Constituent, dissolved (mg/L)					
Ca	100	110	100	97	---
Mg	29	27	28	26	---
Ba	< 0.01	0.0074	0.21	0.0085	---
Na	< 10	9.2	9.3	8.9	---
K	1.8	1.7	1.8	1.6	---
SO_4	430	450	440	440	---
Alkalinity (as HCO_3)	< 5	< 5	< 5	< 5	---
F	1.4	1.7	1.8	1.3	---
Cl	5.7	5.7	5.4	4.6	---
SiO_2	28	28	26	28	---
Al	11	10	8.8	10	---
Fe	< 0.1	< 0.1	0.016	0.075	---
Mn	1.8	1.8	1.8	1.8	---
Cu	0.048	0.04	0.057	0.044	---
Zn	0.62	0.61	0.6	0.57	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	0.0026	0.0024	0.0022	0.0019	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	0.0019	< 0.01	0.012	---
Co	0.036	0.03	0.035	0.034	---
Ni	0.11	0.09	0.094	0.11	---
Pb	< 0.003	< 0.003	< 0.003	< 0.003	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	< 0.004	0.0022	0.0019	0.0025	---
V	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	< 0.005	< 0.005	0.0053	< 0.005	---
As	< 0.005	0.0023	< 0.005	< 0.005	---
Sum cations (meq/L)	6.66	7.29	6.95	6.66	---
Sum anions (meq/L)	7.07	7.51	7.53	7.37	---
Charge imbalance (percent)	-5.97	-3.02	-8.03	-10.1	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area "Old Mill Well Area"**						
Well ID	**MMW-28A**	**MMW-28A**	**MMW-28A**	**MMW-28A**	**MMW-28A**	**MMW-28A**	**MMW-28A**
Sample Date	---	6/25/01	9/4/01	10/23/01	1/24/02	4/17/02	7/18/02
Miscellaneous information	URS reference: "Molycorp Correspondence"	filtered	filtered	filtered	filtered	filtered	---
Comments	date not listed	---	---	---	---	---	---
Source ID (see table 2)	URS 3/01	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	---	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	8,076	8,075	8,062	8,046	8,059	---
Field Temperature (^{o}C)	---	10.4	19.8	11.7	5.3	11.3	19.1
pH, field, [lab]	5.7	6.26	5.95	6.08	6.12	6.01	6.03
Eh (V)	---	0.095	0.322	0.201	0.17	0.366	0.201
Spec Cond (µS/cm) field, [lab]	820	936	966	1,010 #	7,910	943	904
TDS (mg/L)	540	740	730	730	570	710	---
Constituent, dissolved (mg/L)							
Ca	---	160	160	150	130	140	---
Mg	---	33	35	32	28	31	---
Ba	---	0.013	0.014	0.017	0.012	0.015	---
Na	---	16	17	17	14	16	---
K	---	2.9	3	3.4	2.5	2.4	---
SO_4	370	430	460	410	340	430	---
Alkalinity (as HCO_3)	---	63	67	93	66	63	---
F	0.65	0.72	0.83	0.6	0.77	0.71	---
Cl	---	11	11	12	10	9.2	---
SiO_2	---	16	17	18	16	18	---
Al	---	0.27	0.23	0.14	0.17	0.21	---
Fe	---	< 0.1	< 0.1	< 0.1	0.072	< 0.1	---
Mn	---	0.042	0.052	0.0073	0.021	0.038	---
Cu	---	< 0.01	< 0.01	0.0025	0.0016	< 0.01	---
Zn	---	0.15	0.15	0.1	0.12	0.13	---
Mo	---	< 0.1	< 0.1	0.027	< 0.1	< 0.1	---
Cd	---	< 0.001	< 0.001	0.0003	0.00062	< 0.001	---
Ag	---	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	---	< 0.01	< 0.01	0.0011	0.0024	< 0.01	---
Co	---	< 0.01	< 0.01	< 0.01	0.00069	< 0.01	---
Ni	---	< 0.02	< 0.02	0.01	0.012	0.013	---
Pb	---	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	---
Hg	---	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	---	< 0.004	< 0.004	0.00007	0.0006	0.0006	---
V	---	< 0.01	< 0.01	< 0.01	0.0026	< 0.01	---
Se	---	< 0.005	< 0.005	< 0.005	0.002	< 0.005	---
As	---	< 0.005	< 0.005	< 0.005	0.0028	< 0.005	---
Sum cations (meq/L)	---	9.52	9.42	9.10	8.11	8.48	---
Sum anions (meq/L)	---	8.34	8.73	8.57	7.10	8.43	---
Charge imbalance (percent)	---	13.1	7.54	6.05	13.3	0.50	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area "Old Mill Well Area"**					
Well ID	**MMW-28B**	**MMW-28B**	**MMW-28B**	**MMW-28B**	**MMW-28B**	**MMW-28B**
Sample Date	6/25/01	9/4/01	10/23/01	1/24/02	4/17/02	7/18/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	8,075	8,074	8,062	8,046	8,059	---
Field Temperature (^{o}C)	10.6	21.6	16.1	3.6	12.5	11.9
pH, field, [lab]	4.76	4.61	4.59	4.86	4.58	4.5
Eh (V)	0.035	0.338	0.134	0.12	0.323	0.226
Spec Cond (µS/cm) field, [lab]	977	956	990	928	973	949
TDS (mg/L)	780	740	770	690	760	---
Constituent, dissolved (mg/L)						
Ca	150	140	130	130	130	---
Mg	38	38	35	32	33	---
Ba	< 0.01	0.02	0.011	0.011	0.01	---
Na	16	16	16	16	16	---
K	2.4	2.6	2.5	2.5	2.1	---
SO_4	530	510	520	490	520	---
Alkalinity (as HCO_3)	14	5.1	< 5	< 5	< 5	---
F	2.3	3.1	2.3	1.8	2.2	---
Cl	12	9.1	8.9	10	7.8	---
SiO_2	20	21	21	18	21	---
Al	7.2	7.8	7.8	5.1	7.3	---
Fe	0.16	< 0.1	< 0.1	0.094	0.023	---
Mn	3.1	2.4	2.3	1.9	2.2	---
Cu	0.031	0.078	0.023	< 0.01	< 0.01	---
Zn	0.79	0.82	0.76	0.62	0.7	---
Mo	< 0.1	< 0.1	0.023	< 0.1	< 0.1	---
Cd	0.0052	0.0055	0.0046	0.004	0.0042	---
Ag	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---
Cr	< 0.01	< 0.01	0.0023	0.0067	0.0027	---
Co	0.033	0.03	0.033	0.026	0.026	---
Ni	0.086	0.092	0.088	0.073	0.086	---
Pb	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	< 0.004	< 0.004	0.0017	0.0018	0.002	---
V	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	---
Se	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---
As	< 0.005	< 0.005	0.003	< 0.005	< 0.005	---
Sum cations (meq/L)	9.74	9.16	8.61	8.53	8.50	---
Sum anions (meq/L)	9.13	8.40	8.68	8.56	8.77	---
Charge imbalance (percent)	6.46	8.70	-0.76	-0.27	-3.05	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area**					
Well ID	**MMW-43A**	**MMW-43A**	**MMW-43A**	**MMW-43A**	**MMW-43A**	**MMW-43A**
Sample Date	6/14/01	9/7/01	10/23/01	1/30/02	4/15/02	7/17/02
Miscellaneous information	filtered	filtered	filtered	filtered	filtered	---
Comments	---	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	8,098	8,097	8,084	---	8,078	---
Field Temperature (^{o}C)	9.7	14.2	15.6	7.7	17.6	23
pH, field, [lab]	6.43	6.88	6.89	7.02	6.9	6.84
Eh (V)	0.039	-0.032	-0.017	-0.013	-0.024	-0.053
Spec Cond (µS/cm) field, [lab]	2,170	2,180	2,320	2,050	2,140	2,160
TDS (mg/L)	2,000	2,000	2,000	1,800	1,900	---
Constituent, dissolved (mg/L)						
Ca	470	450	430	400	400	---
Mg	92	92	95	78	79	---
Ba	0.037	0.042	0.055	0.033	0.044	---
Na	33	32	34	34	33	---
K	5.2	5.5	5.2	4.9	5	---
SO_4	1,200	1,200	1,200	1,100	1,200	---
Alkalinity (as HCO_3)	230	240	240	210	230	---
F	1.9	1.7	1.5	2	1.5	---
Cl	14	14	14	13	13	---
SiO_2	24	24	24	26	30	---
Al	0.13	< 0.05	< 0.05	0.052	1.6	---
Fe	3.2	3	2.9	2.5	5.7	---
Mn	3.1	3.1	2.9	2.7	2.9	---
Cu	< 0.01	< 0.01	< 0.01	< 0.01	0.0034	---
Zn	0.093	0.069	0.098	0.11	0.17	---
Mo	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	---
Cd	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---
Ag	< 0.002	< 0.002	< 0.002	0.0011	< 0.002	---
Cr	< 0.01	< 0.01	< 0.01	0.0016	0.012	---
Co	< 0.01	< 0.01	0.0032	0.0034	0.0035	---
Ni	< 0.02	< 0.02	< 0.0071	0.013	0.022	---
Pb	< 0.003	< 0.003	< 0.003	< 0.003	0.0014	---
Hg	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---
Be	< 0.004	< 0.004	0.00027	0.00074	0.0014	---
V	< 0.01	< 0.01	< 0.01	< 0.01	0.0017	---
Se	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---
As	< 0.005	< 0.005	0.0025	< 0.005	< 0.005	---
Sum cations (meq/L)	24.7	23.5	22.9	21.3	20.5	---
Sum anions (meq/L)	21.1	21.1	21.1	20.0	21.3	---
Charge imbalance (percent)	15.7	10.7	7.78	6.62	-3.86	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area**				
Well ID	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**
Sample Date	3/12/92	4/23/94	7/25/94	11/8/94	11/8/94
Miscellaneous information	URS sites RGC 2001	URS sites RGC 2001	---	MFQ270 & MFQ265	filtered, Dissolved and Total
Comments	---	---	---	"Molycorp Mill Well" Molycorp general well	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	SRK 1995, Slifer 1996, MC DB	Kent 1995, Slifer 1996	WC 96, MC DB
Lab ID (see table 2)	---	---	---	SLD/ACZ	ETC
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	6	6.3
pH, field, [lab]	6.7	5.9	6.6	6	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	202	335
TDS (mg/L)	226	440	204	---	[245]
Constituent, dissolved (mg/L)					
Ca	---	---	---	43.7 [45.7]	42.1 [42]
Mg	---	---	---	8.88 [9.19]	8.64 [8.57]
Ba	---	---	---	0.021 [0.0222]	0.0167 [0.0168]
Na	---	---	---	5.14 [4.81]	4.74 [4.71]
K	---	---	---	0.771 [0.941]	0.728 [0.724]
SO_4	95	218	104	---	93.8 J
Alkalinity (as HCO_3)	---	---	---	---	57
F	---	---	---	---	---
Cl	---	---	---	---	< 5
SiO_2	---	---	---	---	---
Al	---	---	< 0.5	0.144 [0.716]	0.214 [0.727]
Fe	< 0.05	0.07	0.138	ND [0.273]	0.0542 U [0.15]
Mn	0.11	0.46	0.05	0.11 [0.108]	0.105 [0.0993]
Cu	< 0.01	---	< 0.01	0.0049 [0.0216]	< 0.008 [0.0087 J]
Zn	0.03	0.22	0.035	0.041 [0.0461]	0.039 [0.0372]
Mo	< 0.02	0.01	< 0.03	---	< 0.002 [<0.002]
Cd	< 0.01	---	< 0.005	ND	< 0.0024 [<0.0024]
Ag	---	---	---	ND	< 0.0061 [0.0061]
Cr	---	---	---	ND	0.0034 J [<0.0029]
Co	---	---	---	ND	< 0.0042 [<0.0042]
Ni	---	---	---	ND	< 0.0053 [<0.0053]
Pb	< 0.05	---	---	ND [0.0031 J]	< 0.0019 [<0.0019]
Hg	---	---	---	ND	< 0.0001 [<0.0001]
Be	---	---	---	ND	< 0.0002 [<0.002]
V	---	---	---	ND	< 0.002 [<0.002]
Se	---	---	---	ND	0.0025 UJ [0.0025UJ]
As	---	---	---	ND	0.0024 UJ [0.0024 UJ]
Sum cations (meq/L)	---	---	---	---	2.85
Sum anions (meq/L)	---	---	---	---	2.67
Charge imbalance (percent)	---	---	---	---	6.27

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area**						
Well ID	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**
Sample Date	10/29/96	9/1/97	9/9/97	3/9/98	4/30/98	10/20/98	2/25/99
Miscellaneous information	---	---	---	---	---	---	---
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	MC DB	RGC 8/10	MC DB	Vail	Vail	Vail	Vail
Lab ID (see table 2)	---	---	---	---	---	---	---
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	7.7	---	---	---	---
pH, field, [lab]	---	5.7	4.9	5.2	5.2	5.6	5.6
Eh (V)	---	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	675	609	636	558	597
TDS (mg/L)	---	400	555	---	---	---	---
Constituent, dissolved (mg/L)							
Ca	---	---	81.3	---	---	---	---
Mg	---	---	23.6	20.1	---	---	---
Ba	---	---	< 1	---	---	---	---
Na	---	---	9.1	---	---	---	---
K	---	---	1.3	---	---	---	---
SO_4	236	285	370	290	330	285	---
Alkalinity (as HCO_3)	---	---	---	---	---	---	---
F	---	0.8	1.24	0.9	1.18	0.78	---
Cl	---	---	< 10	---	---	---	---
SiO_2	---	---	4.2	---	---	---	---
Al	---	0.7	5.1	3.9	---	4.4	---
Fe	---	< 0.2	< 0.2	---	---	---	---
Mn	---	0.8	1.1	0.9	1	---	---
Cu	---	< 0.25	< 0.25	---	---	< 0.25	---
Zn	---	< 0.25	0.38	0.3	0.31	0.26	---
Mo	---	< 0.02	< 0.02	---	---	< 0.1	---
Cd	---	< 0.005	< 0.005	---	---	---	---
Ag	---	---	---	---	---	---	---
Cr	---	---	---	---	---	---	---
Co	---	0.02	< 0.02	---	---	---	---
Ni	---	0.04	< 0.02	---	---	---	---
Pb	---	< 0.02	< 0.02	---	---	---	---
Hg	---	---	---	---	---	---	---
Be	---	---	---	---	---	---	---
V	---	---	---	---	---	---	---
Se	---	---	---	---	---	---	---
As	---	---	< 0.001	---	---	---	---
Sum cations (meq/L)	---	---	5.71	---	---	---	---
Sum anions (meq/L)	---	---	6.43	---	---	---	---
Charge imbalance (percent)	---	---	-11.8	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area**					
Well ID	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**	**Mill Well No. 1**
Sample Date	10/13/99	3/15/00	3/23/00	9/6/00	11/3/00	6/6/02
Miscellaneous information	---	---	---	---	---	No analytical info
Comments	---	---	---	---	---	---
Source ID (see table 2)	Vail	Vail	MC DB	Vail	Vail	MC CD
Lab ID (see table 2)	---	---	---	---	---	Paragon Analytics
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---	9
pH, field, [lab]	6.52	6.4	6.03	---	---	5.77
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	355	428	---	519	522	570
TDS (mg/L)	---	---	---	---	---	---
Constituent, dissolved (mg/L)						
Ca	---	---	---	---	---	---
Mg	---	14	---	0.56	---	---
Ba	---	---	---	---	---	---
Na	---	---	---	---	---	---
K	---	---	---	---	---	---
SO_4	145	190	---	275	270	---
Alkalinity (as HCO_3)	---	---	---	---	---	---
F	---	---	---	---	---	---
Cl	---	---	---	---	---	---
SiO_2	---	---	---	---	---	---
Al	---	< 0.1	---	7.8 [0.2]	6.9 [0.18]	---
Fe	---	---	---	---	---	---
Mn	---	0.37	---	2.4	2.3	---
Cu	---	---	---	---	---	---
Zn	---	0.14	---	---	---	---
Mo	---	2.2	---	---	---	---
Cd	---	---	---	---	---	---
Ag	---	---	---	---	---	---
Cr	---	---	---	---	---	---
Co	---	---	---	---	---	---
Ni	---	---	---	---	---	---
Pb	---	---	---	---	---	---
Hg	---	---	---	---	---	---
Be	---	---	---	---	---	---
V	---	---	---	---	---	---
Se	---	---	---	---	---	---
As	---	---	---	---	---	---
Sum cations (meq/L)	---	---	---	---	---	---
Sum anions (meq/L)	---	---	---	---	---	---
Charge imbalance (percent)	---	---	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area**							
Well ID	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**
Sample Date	3/12/92	4/16/94	9/1/97	9/9/97	3/9/98	10/20/98	2/25/99	9/27/99
Miscellaneous information	URS sites RGC 2001	---	---	---	---	---	---	---
Comments	---	---	---	---	---	---	---	---
Source ID (see table 2)	MC DB, URS 3/01	MC DB, URS 3/01	RGC 8/10	MC DB	Vail	Vail	Vail	Vail
Lab ID (see table 2)	---	---	---	---	---	---	---	---
Depth to Water (m)	---	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	9.4	---	---	---	---
pH, field, [lab]	4.9	5.2	4.6	5.7	5.1	4.8	5.5	---
Eh (V)	---	---	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	535	841	672	605	554
TDS (mg/L)	593	500	555	400	---	---	---	---
Constituent, dissolved (mg/L)								
Ca	---	---	---	66	---	---	---	---
Mg	---	---	---	17.5	30.8	---	---	---
Ba	---	---	---	< 1	---	---	---	---
Na	---	---	---	7.7	---	---	---	---
K	---	---	---	1.2	---	---	---	---
SO_4	406	238	370	285	440	370	---	---
Alkalinity (as HCO_3)	---	---	---	12	---	---	---	---
F	1	1	1.2	0.81	1.3	1.09	---	---
Cl	---	---	---	< 10	---	---	---	---
SiO_2	---	---	---	34.2	---	---	---	---
Al	---	---	5.1	0.7	[8.5]	[5.5]	---	---
Fe	0.05	0.17	< 0.2	< 0.2	---	---	---	---
Mn	1.11	1.1	1.1	0.8	1.4	---	---	---
Cu	< 0.01	---	< 0.25	< 0.25	---	< 0.25	---	---
Zn	0.35	0.36	0.4	< 0.25	0.53	0.44	---	---
Mo	< 0.02	0.01	< 0.02	< 0.02	---	< 0.1	---	---
Cd	< 0.01	---	< 0.005	< 0.005	---	---	---	---
Ag	---	---	---	---	---	---	---	---
Cr	---	---	---	---	---	---	---	---
Co	---	---	< 0.02	< 0.02	---	---	---	---
Ni	---	---	0.05	< 0.02	---	---	---	---
Pb	< 0.05	---	< 0.02	< 0.02	---	---	---	---
Hg	---	---	---	---	---	---	---	---
Be	---	---	---	---	---	---	---	---
V	---	---	---	---	---	---	---	---
Se	---	---	---	---	---	---	---	---
As	---	---	---	< 0.001	---	---	---	---
Sum cations (meq/L)	---	---	---	4.38	---	---	---	---
Sum anions (meq/L)	---	---	---	5.34	---	---	---	---
Charge imbalance (percent)	---	---	---	-19.9	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Mill Area**						**Mill Area**
Well ID	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Mill Well No. 1A**	**Lab Well**
Sample Date	10/13/99	3/15/00	3/23/00	9/6/00	11/3/00	6/6/02	3/19/02
Miscellaneous information	---	---	---	off	---	filtered	Lab Well (New Mill Well)
Comments	---	---	---	---	---	---	---
Source ID (see table 2)	Vail	Vail	MC DB	Vail	Vail	MC CD	MC CD
Lab ID (see table 2)	---	---	---	---	---	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---	9.4	---
pH, field, [lab]	4.67	4.9	5.9	---	---	5.74	---
Eh (V)	---	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	551	613	---	---	597	561	---
TDS (mg/L)	---	---	---	---	---	---	180
Constituent, dissolved (mg/L)							
Ca	---	---	---	---	---	---	44
Mg	22	14	---	---	---	---	7
Ba	---	---	---	---	---	---	0.042
Na	---	---	---	---	---	---	3.8
K	---	---	---	---	---	---	1.1
SO_4	283	325	---	---	360	---	57
Alkalinity (as HCO_3)	---	---	---	---	---	---	83
F	1	---	---	---	---	---	0.51
Cl	---	---	---	---	---	---	1.6
SiO_2	---	---	---	---	---	---	10
Al	4.2	4.2 [4.6]	---	---	5.1 [0.37]	---	< 0.05
Fe	---	---	---	---	---	---	< 0.1
Mn	1	0.37	---	---	5.2	---	0.0058
Cu	---	---	---	---	---	---	0.048
Zn	0.45	0.14	---	---	---	---	0.029
Mo	---	0.9	---	---	---	---	< 0.1
Cd	---	---	---	---	---	---	< 0.001
Ag	---	---	---	---	---	---	< 0.002
Cr	---	---	---	---	---	---	< 0.01
Co	---	---	---	---	---	---	< 0.01
Ni	---	---	---	---	---	---	< 0.02
Pb	---	---	---	---	---	---	< 0.003
Hg	---	---	---	---	---	---	< 0.0002
Be	---	---	---	---	---	---	< 0.004
V	---	---	---	---	---	---	0.00078
Se	---	---	---	---	---	---	< 0.005
As	---	---	---	---	---	---	< 0.005
Sum cations (meq/L)	---	---	---	---	---	---	2.82
Sum anions (meq/L)	---	---	---	---	---	---	2.47
Charge imbalance (percent)	---	---	---	---	---	---	13.2

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Hansen Creek on River**	**Elephant Rock Campground**		
Well ID	**Well 8**	**GW-9**	**GW-9**	**GW-9**
Sample Date	6/1/99	5/17/91	8/24/93	11/8/94
Miscellaneous information	field duplicates inconsistent	---	unfiltered	filtered
Comments	see EPA symbol key	---	---	Fawn Lake CG "on SMA map directly east of Fawn Lakes in Elephant Rock CG"
Source ID (see table 2)	EPA memo	USFS	Slifer 1996	WC 96, MC DB, RGC 8/10
Lab ID (see table 2)	EPA Lab ID: SWOK	CEP	---	ETC
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	---	---	5.8
pH, field, [lab]	---	---	7.1	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	160	255
TDS (mg/L)	---	---	---	---
Constituent, dissolved (mg/L)				
Ca	114	---	---	31.3
Mg	35.6	---	---	6.12
Ba	0.0067	[0.03]	---	0.0278
Na	9.28	---	---	3.62
K	1.37	---	---	0.655
SO_4	---	---	60	50
Alkalinity (as HCO_3)	---	---	---	59
F	---	< 0.10	---	---
Cl	---	---	---	< 5
SiO_2	---	---	---	---
Al	18.1	---	[< 0.1]	0.0543
Fe	0.076 J	---	[0.1]	0.0542
Mn	2.67	---	[< 0.05]	0.0017
Cu	0.0708	---	[< 0.005]	< 0.008
Zn	0.723	---	[0.15]	0.0952
Mo	---	---	[< 1.0]	< 0.02
Cd	0.0029	[< 0.001]	[< 0.001]	< 0.0024
Ag	< 0.001	[<0.03]	---	< 0.0061
Cr	< 0.001	[<0.03]	---	< 0.0029
Co	0.0554	---	[<0.005]	< 0.0042
Ni	0.143	---	[< 0.1]	< 0.0053
Pb	< 0.0002	[<0.001]	[<0.005]	< 0.0019
Hg	0.00025 Jb	[<0.0004]	---	< 0.0001
Be	0.003	---	---	< 0.0002
V	< 0.001	---	---	< 0.002
Se	< 0.003	[<0.01]	---	< 0.0025
As	< 0.003	[<0.01]	---	< 0.0024
Sum cations (meq/L)	---	---	---	2.15
Sum anions (meq/L)	---	---	---	1.91
Charge imbalance (percent)	---	---	---	11.9

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Elephant Rock Campground**		**Fawn Lakes campground**	
Well ID	**GW-9**	**GW-9**	**Fawn Lakes CG**	**Fawn Lakes CG**
Sample Date	11/8/94	11/8/94	8/24/93	6/11/01
Miscellaneous information	"MFQ268"; Drinking Water Well at CG	filtered	unfiltered	from lab sheet; GW/A/1
Comments	filtered	Drinking Water Well at CG	---	Red River Headwaters - Fawn Lakes campground
Source ID (see table 2)	Kent 1995	RGC 8/10	Slifer 1996	USFS
Lab ID (see table 2)	SLD/ACZ	ETC	---	Ecology & Environment 0106128-25A
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	6	5.8	---	---
pH, field, [lab]	5.5	---	6.9	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	150	255	230	---
TDS (mg/L)	---	---	---	---
Constituent, dissolved (mg/L)				
Ca	33.9	---	---	39.1
Mg	6.6	---	---	7.88
Ba	0.0329	---	---	0.022
Na	3.87	---	---	4.54
K	0.792	---	---	1.03
SO_4	---	50	105	---
Alkalinity (as HCO_3)	---	---	---	---
F	---	---	---	---
Cl	---	---	---	---
SiO_2	---	---	---	---
Al	---	< 0.028	[< 0.1]	<0.2
Fe	0.0971	0.1	[0.1]	0.339
Mn	0.0056	0.01	[< 0.05]	0.0107
Cu	0.005	0.005	[< 0.005]	0.0137 J
Zn	0.107	0.11	[< 0.1]	0.131
Mo	---	< 0.02	[< 0.1]	---
Cd	---	< 0.0039	[< 0.001]	<0.005
Ag	---	---	---	<0.01
Cr	---	< 0.0037	---	<0.01
Co	---	< 0.0046	[<0.005]	<0.02
Ni	---	< 0.0167	[< 0.1]	0.00422 J
Pb	[0.0015]	< 0.0009	[<0.005]	0.00411 J
Hg	---	---	---	<0.0002
Be	---	---	---	<0.005
V	---	---	---	<0.02
Se	---	---	---	<0.02
As	---	---	---	<0.025
Sum cations (meq/L)	---	---	---	---
Sum anions (meq/L)	---	---	---	---
Charge imbalance (percent)	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**			
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	11/11/82	1/20/83	1/28/83	2/22/84
Miscellaneous information	Water bearing formation: fractured rock from 198 to 200ft	AWWT 1 "RR WWTP" Monitoring Well in Straight	sample represents untreated water	Chlorinated treated water
Comments	---	cations analyzed low	"Private Well" is AWWT-1 accd to Russell Church	SO_4 result "by difference"
Source ID (see table 2)	AWWT, Culp/ Wesner/ Culp, Russell Church	TRR	TRR	TRR
Lab ID (see table 2)	Industrial Laboratories Company	Culp Wesner & Culp	Culligan Water COND. Inc.	Culligan
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^oC)	---	---	---	---
pH, field, [lab]	---	---	3.5	3
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	1,180	1,380
TDS (mg/L)	985	1,000	750	920
Constituent, dissolved (mg/L)				
Ca	135	22	290	390
Mg	48	28	155	194
Ba	0.4	0.3	---	---
Na	32	10	30	37
K	3	2.5	4	4
SO_4	705	660	572	---
Alkalinity (as HCO_3)	< 3.0	< 1	---	---
F	1.4	1.4	---	---
Cl	4.3	4.5	4	10
SiO_2	---	---	72.8	98.4
Al	---	---	---	---
Fe	60	---	12	45
Mn	3.9	1	3.6	5.2
Cu	---	---	0.1	0.09
Zn	---	---	2	2
Mo	---	---	---	---
Cd	< 0.01	0.005	---	---
Ag	< 0.01	0.001	---	---
Cr	< 0.01	[0.002]	---	---
Co	---	---	---	---
Ni	---	---	---	---
Pb	0.02	0.002	---	---
Hg	< 0.001	< 0.001	---	---
Be	---	---	---	---
V	---	---	---	---
Se	< 0.01	0.01	---	---
As	< 0.01	0.03	---	---
Sum cations (meq/L)	12.6	4.10	25.4	---
Sum anions (meq/L)	11.6	12.7	7.78	---
Charge imbalance (percent)	8.34	999	106	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**				
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	2/22/84	2/22/84	1/6/85	7/22/85	1/16/86
Miscellaneous information	Filtered Water!!	Raw Untreated Water	AWWT 1 is MW; GW 10; "north of Hetentot" accd MC	---	---
Comments	~ SO4 result "by difference"	~ SO4 result "by difference"	---	---	---
Source ID (see table 2)	TRR	TRR	TRR	TRR	TRR
Lab ID (see table 2)	Culligan	Culligan	CEP	CEP	CEP
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	2.9	2.9	---	---	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	1,400	1,420	---	---	---
TDS (mg/L)	930	940	1,440	1,520	1,360
Constituent, dissolved (mg/L)					
Ca	350	340	---	---	---
Mg	190	186	---	---	---
Ba	---	---	---	---	---
Na	33	34	---	---	---
K	4	4	---	---	---
SO_4	---	---	640	880	730
Alkalinity (as HCO_3)	---	---	---	---	---
F	---	---	---	---	---
Cl	14	10	4	4	3
SiO_2	107	98.4	---	---	---
Al	---	---	---	---	---
Fe	39	41	---	---	---
Mn	5	4.8	---	---	---
Cu	0.39	0.31	---	---	---
Zn	1.9	1.8	---	---	---
Mo	---	---	---	---	---
Cd	---	---	---	---	---
Ag	---	---	---	---	---
Cr	---	---	---	---	---
Co	---	---	---	---	---
Ni	---	---	---	---	---
Pb	---	---	---	---	---
Hg	---	---	---	---	---
Be	---	---	---	---	---
V	---	---	---	---	---
Se	---	---	---	---	---
As	---	---	---	---	---
Sum cations (meq/L)	---	---	---	---	---
Sum anions (meq/L)	---	---	---	---	---
Charge imbalance (percent)	---	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**			
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	2/2/87	8/13/87	9/8/87	1/25/88
Miscellaneous information	---	samples collected 8/7_12_20/87, Sulfate reported here is a factor	Basement Tap of RRTP; Not Filtered, Not acidified	Samples collected 1/22_ 24_ 27/88
Comments	---	*TDS 1279 & SO_4 7802 mg/L but noted SO_4 a factor of 10 high - no	---	---
Source ID (see table 2)	TRR	TRR	NMED	TRR
Lab ID (see table 2)	in house AWWT Facility lab and "at other lab" by same technician	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^oC)	---	---	---	---
pH, field, [lab]	---	---	4.2	4
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---
TDS (mg/L)	1,100 #	1,280 #	1,330 #	1,220 #
Constituent, dissolved (mg/L)				
Ca	---	---	---	---
Mg	---	---	---	---
Ba	---	---	---	---
Na	---	---	---	---
K	---	---	---	---
SO_4	925	780 # *	810	758
Alkalinity (as HCO_3)	---	---	---	---
F	---	---	---	---
Cl	2.6	11.4	27.6	1.5
SiO_2	---	---	---	---
Al	---	---	---	---
Fe	---	---	---	---
Mn	---	---	---	---
Cu	---	---	---	---
Zn	---	---	---	---
Mo	---	---	---	---
Cd	---	---	---	---
Ag	---	---	---	---
Cr	---	---	---	---
Co	---	---	---	---
Ni	---	---	---	---
Pb	---	---	---	---
Hg	---	---	---	---
Be	---	---	---	---
V	---	---	---	---
Se	---	---	---	---
As	---	---	---	---
Sum cations (meq/L)	---	---	---	---
Sum anions (meq/L)	---	---	---	---
Charge imbalance (percent)	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**			
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	8/15/88	1/13/89	7/11/89	1/30/90
Miscellaneous information	Samples collected 8/6_ 17_ 19/88	Samples collected 1/5/_ 20_ 21/89	Samples collected 7/11/89 & 8/19_20/89	Samples collected 1/30/90_ 3/17_18/90, * SO_4
Comments	---	---	---	*1 SO4 reported at 110.0 mg/L by AWWT supervisor
Source ID (see table 2)	TRR	TRR	TRR	TRR
Lab ID (see table 2)	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^oC)	---	---	---	---
pH, field, [lab]	---	---	---	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---
TDS (mg/L)	1,420	1,310 #	1,540 #	1,370 #
Constituent, dissolved (mg/L)				
Ca	---	---	---	---
Mg	---	---	---	---
Ba	---	---	---	---
Na	---	---	---	---
K	---	---	---	---
SO_4	655	753	840	1,100 *1
Alkalinity (as HCO_3)	---	---	---	---
F	---	---	---	---
Cl	2.5	5.5	15	5.2
SiO_2	---	---	---	---
Al	---	---	---	---
Fe	---	---	---	---
Mn	---	---	---	---
Cu	---	---	---	---
Zn	---	---	---	---
Mo	---	---	---	---
Cd	---	---	---	---
Ag	---	---	---	---
Cr	---	---	---	---
Co	---	---	---	---
Ni	---	---	---	---
Pb	---	---	---	---
Hg	---	---	---	---
Be	---	---	---	---
V	---	---	---	---
Se	---	---	---	---
As	---	---	---	---
Sum cations (meq/L)	---	---	---	---
Sum anions (meq/L)	---	---	---	---
Charge imbalance (percent)	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**			
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	1/17/91	7/22/91	1/21/92	7/27/92
Miscellaneous information	Sample dates 1/7_ 8_ 28/91	Samples collected 7/17_ 26/91	Samples collected 1/16_ 27/92	Samples collected 7/24_ 30/92
Comments	pH field 3.9 - 4.03	pH field 3.9 - 4.0	*SO4 reported here is a factor of 10 lower than original report	*SO4 reported here is a factor of 10 lower than original report
Source ID (see table 2)	TRR	TRR	TRR	TRR
Lab ID (see table 2)	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---
pH, field, [lab]	3.9	3.9	---	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---
TDS (mg/L)	1,330 #	1,410 #	1,290 #	1,270 #
Constituent, dissolved (mg/L)				
Ca	---	---	---	---
Mg	---	---	---	---
Ba	---	---	---	---
Na	---	---	---	---
K	---	---	---	---
SO_4	808	873 #	852 # *	769 *
Alkalinity (as HCO_3)	---	---	---	---
F	---	---	---	---
Cl	2.02	4.5	4.6	5.52
SiO_2	---	---	---	---
Al	---	---	---	---
Fe	---	---	---	---
Mn	---	---	---	---
Cu	---	---	---	---
Zn	---	---	---	---
Mo	---	---	---	---
Cd	---	---	---	---
Ag	---	---	---	---
Cr	---	---	---	---
Co	---	---	---	---
Ni	---	---	---	---
Pb	---	---	---	---
Hg	---	---	---	---
Be	---	---	---	---
V	---	---	---	---
Se	---	---	---	---
As	---	---	---	---
Sum cations (meq/L)	---	---	---	---
Sum anions (meq/L)	---	---	---	---
Charge imbalance (percent)	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**			
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	1/26/93	7/22/91	1/19/94	7/18/94
Miscellaneous information	Samples collected 1/26_27/93	Samples collected 7/21 - 23/93	Samples collected 1/10_ 22_ 27/94	Samples collected 7/9_ 27/94
Comments	*SO4 reported here is a factor of 10 lower than original report	*SO4 reported here is a factor of 10 lower than original report	*SO4 reported here is a factor of 10 lower than original report	*SO4 reported here is a factor of 10 lower than original report
Source ID (see table 2)	TRR	TRR	TRR	TRR
Lab ID (see table 2)	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---
pH, field, [lab]	---	---	---	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---
TDS (mg/L)	1,350 #	1,330	1,290 #	1,430 #
Constituent, dissolved (mg/L)				
Ca	---	---	---	---
Mg	---	---	---	---
Ba	---	---	---	---
Na	---	---	---	---
K	---	---	---	---
SO_4	843 #	864 #	810 #	831 #
Alkalinity (as HCO_3)	---	---	---	---
F	---	---	---	---
Cl	4.17	7.33	5.72	4.2
SiO_2	---	---	---	---
Al	---	---	---	---
Fe	---	---	---	---
Mn	---	---	---	---
Cu	---	---	---	---
Zn	---	---	---	---
Mo	---	---	---	---
Cd	---	---	---	---
Ag	---	---	---	---
Cr	---	---	---	---
Co	---	---	---	---
Ni	---	---	---	---
Pb	---	---	---	---
Hg	---	---	---	---
Be	---	---	---	---
V	---	---	---	---
Se	---	---	---	---
As	---	---	---	---
Sum cations (meq/L)	---	---	---	---
Sum anions (meq/L)	---	---	---	---
Charge imbalance (percent)	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**		
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	11/8/94	11/8/94	11/8/94
Miscellaneous information	MFQ267; Filtered; Updated 1-24-03	filtered, Dissolved	Totals found in WQ for Red River (Vail, Oct 94) table D3 of SPRI
Comments	*1 NMED did not measure SO4 accd to Kent 1995	*1 Cu =0.0451, MC DB 45.1, *2 Co=0.0925 in WC, MC DB reports 92.5, *3 Be=0.0056, MC DB 0.0055	*1 Al susp. < 0.5 mg/L
Source ID (see table 2)	Kent 1995, Slifer 1996	WC 96, MC DB, RGC 8/13	SPRI 1995
Lab ID (see table 2)	SLD/ACZ	ETC	ETC
Depth to Water (m)	---	---	---
Water Elevation (ft)	---	---	---
Field Temperature (^{o}C)	11	9.6	9.6
pH, field, [lab]	3.85	3.85	3.85
Eh (V)	---	---	---
Spec Cond (µS/cm) field, [lab]	1,200	1,420 #	1,420 #
TDS (mg/L)	---	1,410	1,470 #
Constituent, dissolved (mg/L)			
Ca	151 [151]	151 [157]	---
Mg	51.5 [52]	48.8 [49]	---
Ba	0.0111 [0.0053]	0.0034 J [0.0019 J]	---
Na	15.1 [14.9]	14.7 [14.8]	---
K	2.54 [3]	2.55 J [3]	---
SO_4	* 1	907	788
Alkalinity (as HCO_3)	---	< 5	---
F	---	---	1.6
Cl	---	6	---
SiO_2	---	---	---
Al	36.5 [36.7]	37.5 [39.5]	36 *1
Fe	30.1 [30.2]	32 [33]	[4.6]
Mn	5.7 [5.72]	5.91 [6.19]	[5.2]
Cu	0.0583 [0.0608]	0.0451 *1 [0.0525]	[0.06]
Zn	2.09 [2.09]	1.96 [1.97]	[1.6]
Mo	---	0.033 J [0.035 J]	[< 0.1]
Cd	0.0061 J [0.0078 J]	0.0055 [0.0049 J]	[0.012]
Ag	ND	< 0.0061 [<0.0061]	---
Cr	0.0058 [0.0085]	0.0114 [0.0116]	---
Co	0.0974 [0.101]	0.0925 *2 [0.0953]	---
Ni	0.227 [0.232]	0.223 [0.224]	---
Pb	0.0037 J [0.0036 J]	< 0.0019 [<0.0019]	[< 0.1]
Hg	ND	< 0.0001 [<0.0001]	---
Be	0.0051	0.0055 *3	---
V	ND	< 0.002 [<0.002]	---
Se	ND	< 0.0025 [<0.0025]	---
As	ND	< 0.0024 [0.0024 UJ]	---
Sum cations (meq/L)	---	12.5	---
Sum anions (meq/L)	---	13.5	---
Charge imbalance (percent)	---	-7.7	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**			
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	1/15/95	7/15/95	1/19/96	7/20/96
Miscellaneous information	Samples collected 1/14_ 15_16/95	Samples collected 7/7_ 22_ 23/95	Samples collected 1/11_ 13_ 27/96	Samples collected 7/12_ 29/96
Comments	*SO4 reported here is a factor of 10 lower than original report	*SO4 reported here is a factor of 10 lower than original report	*SO4 reported here is a factor of 10 lower than original report	---
Source ID (see table 2)	TRR	TRR	TRR	TRR
Lab ID (see table 2)	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab	AWWT Facility Lab
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---
pH, field, [lab]	---	---	---	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---
TDS (mg/L)	1,310 #	1,420 #	1,210 #	1,400 #
Constituent, dissolved (mg/L)				
Ca	---	---	---	---
Mg	---	---	---	---
Ba	---	---	---	---
Na	---	---	---	---
K	---	---	---	---
SO_4	768 #	822 #	818 #	750
Alkalinity (as HCO_3)	---	---	---	---
F	---	---	---	---
Cl	4.58	15	5.4	6.1
SiO_2	---	---	---	---
Al	---	---	---	---
Fe	---	---	---	---
Mn	---	---	---	---
Cu	---	---	---	---
Zn	---	---	---	---
Mo	---	---	---	---
Cd	---	---	---	---
Ag	---	---	---	---
Cr	---	---	---	---
Co	---	---	---	---
Ni	---	---	---	---
Pb	---	---	---	---
Hg	---	---	---	---
Be	---	---	---	---
V	---	---	---	---
Se	---	---	---	---
As	---	---	---	---
Sum cations (meq/L)	---	---	---	---
Sum anions (meq/L)	---	---	---	---
Charge imbalance (percent)	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**				
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	10/8/96	1/5/97	7/26/97	11/3/97	1/30/98
Miscellaneous information	NON PRESERVED	Samples collected 1/3_ 7/97	7/22_ 30/97	---	**RC used outside different Lab instead of self to
Comments	NOT FILTERED	**RC used outside Lab instead of self to analyze	---	---	analyze from here on out
Source ID (see table 2)	NMED: SLD lab sheet	TRR	TRR	TRR	TRR, RGC 8/13
Lab ID (see table 2)	SLD WC 96 5767	AWWT Facility Lab	Triple Point Laboratories	Triple Point Laboratories	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---	---
TDS (mg/L)	1,310	1,360 #	1,280 #	1,400	1,210 #
Constituent, dissolved (mg/L)					
Ca	[171]	---	---	---	---
Mg	[57]	---	---	---	---
Ba	---	---	---	---	---
Na	[14]	---	---	---	---
K	[14]	---	---	---	---
SO_4	843	850 #	22	1,100	1,070 #
Alkalinity (as HCO_3)	ND	---	---	---	---
F	---	---	---	---	---
Cl	[7]	5.7	5.1	5.2	3.6
SiO_2	---	---	---	---	---
Al	---	---	---	---	---
Fe	---	---	---	---	---
Mn	---	---	---	---	---
Cu	---	---	---	---	---
Zn	---	---	---	---	---
Mo	---	---	---	---	---
Cd	---	---	---	---	---
Ag	---	---	---	---	---
Cr	---	---	---	---	---
Co	---	---	---	---	---
Ni	---	---	---	---	---
Pb	---	---	---	---	---
Hg	---	---	---	---	---
Be	---	---	---	---	---
V	---	---	---	---	---
Se	---	---	---	---	---
As	---	---	---	---	---
Sum cations (meq/L)	11.8	---	---	---	---
Sum anions (meq/L)	13.9	---	---	---	---
Charge imbalance (percent)	-16.4	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**					
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	7/20/98	1/27/99	7/27/99	1/19/00	4/13/00	9/6/00
Miscellaneous information	---	---	---	---	---	---
Comments	---	---	---	---	*1 Ba = 0.0016, 0.016, *2 Cu =0.01, < 0.01DB, *3 Pb	---
Source ID (see table 2)	TRR	TRR	TRR	TRR	MC DB, RGC 8/10, RGC 8/13	TRR
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---	---
Eh (V)	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---	---	---
TDS (mg/L)	1,200	1,300	1,600	1,300	1,300	1,300
Constituent, dissolved (mg/L)						
Ca	---	---	---	---	160	---
Mg	---	---	---	---	51	---
Ba	---	---	---	---	0.0016 * 1	---
Na	---	---	---	---	15	---
K	---	---	---	---	2.6	---
SO_4	940	1,000	1,200	870	910	1,000
Alkalinity (as HCO_3)	---	---	---	---	< 5	---
F	---	---	---	---	1.3	---
Cl	5.8	6.6	4.9	6.2	5.5	5.9
SiO_2	---	---	---	---	64.2	---
Al	---	---	---	---	34	---
Fe	---	---	---	---	36	---
Mn	---	---	---	---	5.6	---
Cu	---	---	---	---	< 0.01 *2	---
Zn	---	---	---	---	2.1	---
Mo	---	---	---	---	< 0.1	---
Cd	---	---	---	---	0.002	---
Ag	---	---	---	---	< 0.002	---
Cr	---	---	---	---	0.24	---
Co	---	---	---	---	0.1	---
Ni	---	---	---	---	0.27	---
Pb	---	---	---	---	< 0.003 *3	---
Hg	---	---	---	---	---	---
Be	---	---	---	---	0.0053	---
V	---	---	---	---	< 0.01	---
Se	---	---	---	---	< 0.005	---
As	---	---	---	---	< 0.005	---
Sum cations (meq/L)	---	---	---	---	14.0	---
Sum anions (meq/L)	---	---	---	---	13.5	---
Charge imbalance (percent)	---	---	---	---	3.7	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**				
Well ID	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**	**AWWT-1**
Sample Date	2/7/01	7/30/01	1/29/02	3/1/02	3/27/02
Miscellaneous information	---	---	---	Filtered	Dissolved
Comments	---	---	---	---	---
Source ID (see table 2)	TRR	TRR	TRR	Paragon Analytics lab sheet	MC CD
Lab ID (see table 2)	Paragon Analytics	Stewart Environmental Consultants	Stewart Environmental Consultants	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---	[1,390]
TDS (mg/L)	1,300	1,640 #	1,260	---	1300, [1,350]
Constituent, dissolved (mg/L)					
Ca	---	---	---	160	155
Mg	---	---	---	52	53.9
Ba	---	---	---	0.013	0.005
Na	---	---	---	16	16.1
K	---	---	---	3.7	2.9
SO_4	940	910	875	910	980
Alkalinity (as HCO_3)	---	---	---	---	< 10
F	---	---	---	---	2.7
Cl	5.9	12	9	0.51	5
SiO_2	---	---	---	64.2	---
Al	---	---	---	36	38.7
Fe	---	---	---	37	34.4
Mn	---	---	---	5.7	5.63
Cu	---	---	---	< 0.01	0.0014
Zn	---	---	---	2.1	2.03
Mo	---	---	---	< 0.1	< 0.0005
Cd	---	---	---	0.0036	0.0041
Ag	---	---	---	< 0.002	< 0.0005
Cr	---	---	---	0.099	0.083
Co	---	---	---	0.11	0.0872
Ni	---	---	---	0.28	0.27
Pb	---	---	---	0.003	0.0001
Hg	---	---	---	0.000054	< 0.001
Be	---	---	---	0.0049	0.0047
V	---	---	---	0.002	< 0.03
Se	---	---	---	0.0067	< 0.005
As	---	---	---	0.0022	< 0.003
Sum cations (meq/L)	---	---	---	14.3	13.1
Sum anions (meq/L)	---	---	---	13.2	14.8
Charge imbalance (percent)	---	---	---	8.23	-12.5

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**				
Well ID	**AWWT-2**	**SC-1A**	**SC-1A**	**SC-1B**	**SC-2B**
Sample Date	10/3/91	3/26/02	3/26/02	3/26/02	3/25/02
Miscellaneous information	well out behind the facility building; well not completed, but depth between 48.8 - 53.3	Dissolved	Dissolved	Dissolved	Dissolved
Comments	---	---	---	---	---
Source ID (see table 2)	TRR, RGC 8-13	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	CEP	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	[2,800]	[2,800]	[3,260]	[2,570]
TDS (mg/L)	3,070	3,050	3,090	3,230	2,380
Constituent, dissolved (mg/L)					
Ca	---	380	378	518	477
Mg	---	123	122	227	117
Ba	[< 0.03]	< 0.02	< 0.02	0.014	0.007
Na	[33.1]	13.9	13.7	61.7	21.2
K	---	0.7	0.9	13.7	3.8
SO_4	1,790	2,400	2,410	2,020	1,620
Alkalinity (as HCO_3)	---	< 10	< 10	405	129
F	6.6 [6.57]	2.2	2.9	1.7	6.8
Cl	[5.33]	3	3	14	5
SiO_2	---	---	---	---	---
Al	---	99.5	98.8	< 0.3	1.02
Fe	0.1 [0.08]	31	31	3	34.7
Mn	7.68 [7.68]	18.7	18.6	6.08	16.8
Cu	[0.03]	0.891	0.882	0.004	0.0071
Zn	0.56 [0.56]	6.93	6.92	0.69	1.37
Mo	---	< 0.0005	< 0.0005	0.004	0.0006
Cd	[< 0.001]	0.0319	0.0323	0.0002	0.0002
Ag	[< 0.01]	< 0.003	< 0.003	< 0.0005	< 0.0005
Cr	[< 0.03]	0.018	0.0181	0.0015	0.0006
Co	---	0.268	0.266	0.00695	0.156
Ni	---	0.68	0.69	< 0.1	0.46
Pb	[0.004]	0.0012	0.0012	< 0.0005	0.0003
Hg	[< 0.0004]	< 0.001	< 0.001	< 0.001	< 0.001
Be	---	0.023	0.023	0.0003	0.0163
V	---	< 0.05	< 0.05	< 0.05	< 0.05
Se	[< 0.01]	< 0.005	< 0.005	< 0.005	< 0.005
As	[< 0.01]	< 0.003	< 0.003	0.0005	0.0005
Sum cations (meq/L)	---	25.9	25.7	33.8	25.9
Sum anions (meq/L)	---	32.8	33.1	35.1	25.8
Charge imbalance (percent)	---	-23.6	-25.3	-3.72	0.49

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Straight Creek**				
Well ID	**SC-3A**	**SC-3B**	**SC-4A**	**SC-5A**	**SC-5B**
Sample Date	3/25/02	3/26/02	3/25/02	3/27/02	3/27/02
Miscellaneous information	Dissolved	Dissolved	Dissolved, USGS calls this SC-4A	Dissolved	Dissolved
Comments	---	---	---	---	---
Source ID (see table 2)	MC CD	MC CD	MC CD	MC CD	MC CD
Lab ID (see table 2)	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics	Paragon Analytics
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	[2,330]	[2,970]	[2,470]	[1,590]	[2,370]
TDS (mg/L)	2,300	2,800	2,390	1,210	2,260
Constituent, dissolved (mg/L)					
Ca	306	494	292	130	524
Mg	90.9	152	138	50.8	38
Ba	< 0.02	0.006	< 0.02	< 0.01	0.029
Na	15.5	31.6	25.6	14	42.7
K	1.1	2.5	2.9	1.8	4.7
SO_4	1,770	1,970	1,790	930	1,410
Alkalinity (as HCO_3)	< 10	83	< 10	< 10	130
F	1.1	6.8	4.2	< 2.4	1.8
Cl	10	5	4	5	8
SiO_2	---	---	---	---	---
Al	85	4.85	57.5	50.1	< 0.3
Fe	0.53	54.1	50.9	0.41	4.3
Mn	14.9	23	18.7	5.66	2.66
Cu	0.799	0.0022	0.072	0.162	0.0026
Zn	5.29	4.16	5.22	2.23	< 0.1
Mo	0.0004	0.0001	< 0.0005	< 0.0005	0.005
Cd	0.0232	0.0005	0.0129	0.0081	< 0.0005
Ag	< 0.003	< 0.001	< 0.001	< 0.0005	< 0.0005
Cr	0.012	0.0007	0.0022	0.0042	< 0.0007
Co	0.205	0.204	0.216	0.0971	0.00725
Ni	0.52	0.43	0.54	0.25	< 0.1
Pb	0.0006	0.0417	< 0.0005	< 0.0005	< 0.0005
Hg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Be	0.016	0.0188	0.0146	0.0057	< 0.001
V	< 0.05	< 0.05	< 0.05	< 0.03	< 0.05
Se	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
As	< 0.03	0.0006	< 0.01	< 0.003	< 0.003
Sum cations (meq/L)	21.4	28.9	24.1	11.9	22.7
Sum anions (meq/L)	24.5	29.9	25.4	13.7	23.1
Charge imbalance (percent)	-13.6	-3.13	-5.09	-14.3	-1.79

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Junebug Campground**			
Well ID	**GW-8**	**GW-8**	**GW-8**	**GW-8**
Sample Date	5/22/1991	8/24/1993	11/8/94	11/8/94
Miscellaneous information	---	unfiltered	"MFQ269"; Filtered	Filtered
Comments	---	---	Drinking Water Well at CG	Drinking Water Well at CG
Source ID (see table 2)	USFS	Slifer 1996	Kent 1995	WC 96, MC DB, RGC 8/10
Lab ID (see table 2)	CEP	---	SLD/ACZ	ETC
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	---	6	5.8
pH, field, [lab]	---	6.8	6	---
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	175	163	268
TDS (mg/L)	---	150	---	193
Constituent, dissolved (mg/L)				
Ca	---	---	34.2	32.9 [33]
Mg	---	---	6.92	6.74 [7]
Ba	[0.04]	---	0.0344	0.0309 [0.0331]
Na	---	---	4.18	3.95 [3.93]
K	---	---	0.732	0.676 [1]
SO_4	---	44	---	61
Alkalinity (as HCO_3)	---	---	---	57
F	[<0.10]	---	---	---
Cl	---	---	---	< 5
SiO_2	---	---	---	---
Al	---	[< 0.1]	---	0.0621 [0.0641]
Fe	---	[0.7]	0.128	0.124 [3.09]
Mn	---	[0.009]	0.0826	0.0713 [0.0713]
Cu	---	[< 0.005]	[0.00547]	< 0.008 [0.0324]
Zn	---	[8.6]	0.252	0.247 [0.328]
Mo	---	[< 0.1]	---	< 0.02
Cd	[< 0.001]	[< 0.001]	---	< 0.0024 [<0.0024]
Ag	[<0.03]	---	---	< 0.061 [<0.061]
Cr	[<0.03]	---	---	< 0.0029 [0.0031]
Co	---	[<0.005]	---	< 0.0042 [<0.0042]
Ni	---	[< 0.1]	---	< 0.0053 [<0.0053]
Pb	[<0.001]	[<0.005]	[0.0056]	< 0.0019 [0.0055]
Hg	[<0.0004]	---	---	< 0.0001 [<0.0001]
Be	---	---	---	< 0.0002 [<0.0002]
V	---	---	---	< 0.002 [<0.002]
Se	[<0.01]	---	---	0.0026 [0.0025]
As	[<0.01]	---	---	< 0.0024 [0.0024 UJ]
Sum cations (meq/L)	---	---	---	2.28
Sum anions (meq/L)	---	---	---	2.07
Charge imbalance (percent)	---	---	---	9.63

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Hottentot Creek east of Junebug Campground**	
Well ID	**Private Cabin Well**	**Private Cabin Well**
Sample Date	9/1/94	5/12/00
Miscellaneous information	Private Well along Hottentot Creek east of Junebug CG	Northeast of Junebug CG and Hottentot CK
Comments	---	RR Private Well "PWRR"
Source ID (see table 2)	Slifer 1996, SRK 1995, MC DB, URS 3/01	RGC 8/10
Lab ID (see table 2)	---	---
Depth to Water (m)	---	---
Water Elevation (ft)	---	---
Field Temperature (^{o}C)	---	---
pH, field, [lab]	6.1	6.5
Eh (V)	---	---
Spec Cond (µS/cm) field, [lab]	---	---
TDS (mg/L)	742	3,010
Constituent, dissolved (mg/L)		
Ca	---	---
Mg	---	---
Ba	---	---
Na	---	---
K	---	---
SO_4	276	1,270
Alkalinity (as HCO_3)	---	---
F	ND	1.9
Cl	---	---
SiO_2	---	---
Al	0	< 0.06
Fe	6.5	7.6
Mn	1.2	5
Cu	ND	7.6
Zn	3	0.3
Mo	---	0.01
Cd	0.008	< 0.0005
Ag	---	---
Cr	---	---
Co	---	0.04
Ni	---	0.1
Pb	---	---
Hg	---	---
Be	---	---
V	---	---
Se	---	---
As	---	---
Sum cations (meq/L)	---	---
Sum anions (meq/L)	---	---
Charge imbalance (percent)	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Pioneer Creek Watershed**						
Well ID	**well #1**	**well #1**	**well #2**	**well #2**	**well #3**	**well #3**	**well #3**
Sample Date	5/16/01	10/11/01	5/16/01	10/11/01	1/20/83	5/16/01	11/28/01
Miscellaneous information	Table PN-6; GW/A/4	Red River Water System	Table PN-6	Red River Water System	---	Table PN-6; GW/A/2	Red River Water System
Comments	Dyke Tunnel Prospect [PN/DTP]	"Code # 07129" Supply Wells	GW/A/3 PN/DTP	"Code # 07129" Supply Wells	Drinking water well	Dyke Tunnel Prospect [PN/DTP]	"Code # 07129" Supply Wells
Source ID (see table 2)	USFS	PWS	USFS	PWS	PWS	USFS	PWS
Lab ID (see table 2)	Ecology & Environment	---	Ecology & Environment	---	---	Ecology & Environment	---
Depth to Water (m)	---	---	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---	---	---
Eh (V)	---	---	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---	---	---	---
TDS (mg/L)	---	---	---	---	180	---	---
Constituent, dissolved (mg/L)							
Ca	47.0	---	51.8	---	13	52.1	---
Mg	6.23	---	7.3	---	8	7.48	---
Ba	0.0454	0.0405	0.0443	0.0343	0.15	0.041	0.0498
Na	3.5	---	3.88	---	7	3.82	---
K	0.841	---	0.894	---	0.8	0.838	---
SO_4	---	---	---	---	65	---	---
Alkalinity (as HCO_3)	---	---	---	---	55	---	---
F	---	0.2	---	0.22	0.6	---	0.18
Cl	---	---	---	---	0.5	---	---
SiO_2	---	---	---	---	---	---	---
Al	<0.0563	---	<0.0563	---	---	<0.0563	---
Fe	<0.0525	---	0.0527 J	---	---	0.315	---
Mn	<0.0027	---	<0.0027	---	0.8	<0.0027	---
Cu	0.00973 J	---	0.00977 J	---	---	0.0197 J	---
Zn	0.0263	---	0.0165	---	---	0.0205	---
Mo	---	---	---	---	---	---	---
Cd	<0.0015	< 0.0001	<0.0015	< 0.0001	0.004	<0.0015	0.0002
Ag	<0.0021	---	<0.0021	---	< 0.001	<0.0021	---
Cr	<0.0032	0.0007	<0.0032	0.0007	[< 0.001]	<0.0032	0.0022
Co	0.00331 J	---	<0.003	---	---	0.0244	---
Ni	0.0456	0.00313	<0.0036	0.00209	---	0.00556 J	0.00244
Pb	<0.0029	---	<0.0029	---	< 0.001	<0.0029	---
Hg	<0.000104	< 0.0002	<0.000104	< 0.0002	< 0.001	<0.000104	< 0.0002
Be	<0.0013	< 0.0002	<0.0013	< 0.0002	---	<0.0013	< 0.0002
V	<0.0029	---	<0.0029	---	---	<0.0029	---
Se	<0.0069	< 0.001	<0.0069	< 0.001	< 0.01	<0.0069	< 0.001
As	<0.0076	< 0.0003	<0.0076	< 0.0003	0.04	<0.0076	0.0003
Sum cations (meq/L)	---	---	---	---	1.58	---	---
Sum anions (meq/L)	---	---	---	---	2.21	---	---
Charge imbalance (percent)	---	---	---	---	-33.7	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Pioneer Creek Watershed**				**Upstream of Red River**
Well ID	**well #4**	**well #4**	**well #4**	**well #4**	**well #5**
Sample Date	5/12/99	5/16/01	5/16/01	10/11/01	10/11/01
Miscellaneous information	Red River Water System	Table PN-6; GW/A/1	Table PN-6; GW/C/1	Red River Water System	Red River Water System "Code # 07129" Supply Wells
Comments	"Code # 07129" Supply Wells	Dyke Tunnel Prospect [PN/DTP]	duplicate	"Code # 07129" Supply Wells	between Bitter and Placer creeks
Source ID (see table 2)	PWS	USFS	USFS	PWS	PWS
Lab ID (see table 2)	---	Ecology & Environment	Ecology & Environment	---	---
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---	---
TDS (mg/L)	---	---	---	---	---
Constituent, dissolved (mg/L)					
Ca	---	52.2	50.5	---	---
Mg	---	8.09	7.94	---	---
Ba	< 0.1	0.0425	0.0413	0.0457	0.0851
Na	---	3.94	3.69	---	---
K	---	0.885	0.789 J	---	---
SO_4	---	---	---	---	---
Alkalinity (as HCO_3)	---	---	---	---	---
F	0.14	---	---	0.15	0.07
Cl	---	---	---	---	---
SiO_2	---	---	---	---	---
Al	---	0.0639 J	<0.0563	---	---
Fe	---	1.04	0.633	---	---
Mn	---	0.0565	0.0536	---	---
Cu	---	0.0163 J	<0.0038	---	---
Zn	---	0.0581	0.0460	---	---
Mo	---	---	---	---	---
Cd	< 0.001	<0.0015	<0.0015	< 0.0001	< 0.0001
Ag	---	<0.0021	<0.0021	---	---
Cr	0.001	<0.0032	<0.0032	0.0007	0.0008
Co	---	0.0256	0.0227	---	---
Ni	< 0.01	0.00974 J	0.00633 J	0.00219	0.00151
Pb	---	<0.0029	<0.0029	---	---
Hg	< 0.0002	<0.000104	<0.000104	< 0.0002	< 0.0002
Be	< 0.001	<0.0013	<0.0013	< 0.0002	< 0.0002
V	---	<0.0029	<0.0029	---	---
Se	< 0.005	<0.0069	<0.0069	< 0.001	< 0.001
As	< 0.001	<0.0076	<0.0076	< 0.0003	< 0.0003
Sum cations (meq/L)	---	---	---	---	---
Sum anions (meq/L)	---	---	---	---	---
Charge imbalance (percent)	---	---	---	---	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Bitter Creek**	**Bitter Creek**	**Bitter Creek Ranch**	
Well ID	**Davis Well**	**Harrison Well**	**BC Ranch Well**	**BC Ranch Well**
Sample Date	8/24/93	8/24/93	6/17/00	6/17/00
Miscellaneous information	Unfiltered every value here is a TOTAL	Unfiltered	---	duplicate
Comments	---	---	---	---
Source ID (see table 2)	Slifer 1996	Slifer 1996	RGC 8-12 Appendix A	RGC 8-12 Appendix A
Lab ID (see table 2)	---	---	ACZ & Paragon Analytics	ACZ & Paragon Analytics
Depth to Water (m)	---	---	---	---
Water Elevation (ft)	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---
pH, field, [lab]	4.6	4.9	[3.8]	[3.79]
Eh (V)	---	---	---	---
Spec Cond (µS/cm) field, [lab]	195	420	[680]	[671]
TDS (mg/L)	---	---	490	---
Constituent, dissolved (mg/L)				
Ca	---	---	54	---
Mg	---	---	31	---
Ba	---	---	0.01	---
Na	---	---	16	---
K	---	---	3	---
SO_4	114	308	320	---
Alkalinity (as HCO_3)	---	---	5	---
F	---	---	1.4	---
Cl	---	---	1.7	---
SiO_2	---	---	---	---
Al	[2.9]	[9.9]	3.3	---
Fe	[1.7]	[1.6]	0.87	---
Mn	[0.8]	[2.61]	2.5	---
Cu	[0.32]	[0.79]	0.04	---
Zn	[0.22]	[2]	0.81	---
Mo	[< 0.2]	[< 0.1]	0.1	---
Cd	[0.003]	[0.01]	0.0017	---
Ag	---	---	0.002	---
Cr	---	---	0.01	---
Co	[< 0.05]	[0.06]	0.037	---
Ni	[< 0.1]	[< 0.1]	0.062	---
Pb	[< 0.005]	[< 0.005]	0.003	---
Hg	---	---	---	---
Be	---	---	0.004	---
V	---	---	0.01	---
Se	---	---	0.005	---
As	---	---	0.005	---
Sum cations (meq/L)	---	---	5.6	---
Sum anions (meq/L)	---	---	5.8	---
Charge imbalance (percent)	---	---	-2.4	---

Appendix 1. Complete historical ground-water quality database, Red River Valley, NM, 1982-2002

Geographic Location	**Bitter Creek Watershed**		**Red River Headwaters - Black Canyon Group Mine**		
Well ID	**BC-1**	**BC-2**	**Black Canyon 1**	**Black Canyon 2**	**Black Canyon 3**
Sample Date	6/9/01	6/9/01	5/17/01	5/17/01	5/17/01
Miscellaneous information	Table BC-21; GW/A/1	Table BC-21; GW/A/2	Table RR-1; GW/A/1	Table RR-1; GW/A/2	Table RR-1; GW/A/3
Comments	---	---	---	---	---
Source ID (see table 2)	USFS	USFS	USFS	USFS	USFS
Lab ID (see table 2)	Ecology & Environment, Inc.	Ecology & Environment	Ecology & Environment, Inc.	Ecology & Environment, Inc.	Ecology & Environment, Inc.
Depth to Water (m)	---	---	---	---	---
Water Elevation (ft)	---	---	---	---	---
Field Temperature (^{o}C)	---	---	---	---	---
pH, field, [lab]	---	---	---	---	---
Eh (V)	---	---	---	---	---
Spec Cond (µS/cm) field, [lab]	---	---	---	---	---
TDS (mg/L)	---	---	---	---	---
Constituent, dissolved (mg/L)					
Ca	54.8	85.3	15.3	44.5	48.3
Mg	30.7	41.4	6.93	12.2	9.21
Ba	<0.006	<0.006	0.1	0.339	0.0602
Na	17.7	20.5	10.8	20.6	11.8
K	2.9	3.4	0.947	2.0	0.988
SO_4	---	---	---	---	---
Alkalinity (as HCO_3)	---	---	---	---	---
F	---	---	---	---	---
Cl	---	---	---	---	---
SiO_2	---	---	---	---	---
Al	3.21	2.31	0.826	<0.0563	<0.0563
Fe	3.13	23.5	0.58	0.081.1 J	<0.0525
Mn	2.5	3.72	0.0105	0.0	0.0279
Cu	0.0475	0.0376	0.698	0.00667 J	0.0224
Zn	0.813	0.477	0.1230	0.0229	0.34
Mo	---	---	---	---	---
Cd	0.00183 J	<0.0015	<0.0015	<0.0015	<0.0015
Ag	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021
Cr	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032
Co	0.0517	0.0638	<0.003	<0.003	0.00364 J
Ni	0.0619	0.0712	<0.0036	<0.0036	<0.0036
Pb	0.00389 J	<0.0029	0.0094	<0.0029	<0.0029
Hg	0.00011 J	0.000116 J	<0.000104	<0.000104	<0.000104
Be	<0.0013	0.00136 J	<0.0013	<0.0013	<0.0013
V	<0.0029	0.0082 J	<0.0029	<0.0029	<0.0029
Se	<0.0069	<0.0069	<0.0069	<0.0069	<0.0069
As	<0.0076	<0.0076	<0.0076	<0.0076	<0.0076
Sum cations (meq/L)	---	---	---	---	---
Sum anions (meq/L)	---	---	---	---	---
Charge imbalance (percent)	---	---	---	---	---