AMENDMENT TO THE STAGE I ABATEMENT PLAN PROPOSAL FOR THE COPPER FLAT MINE

prepared by

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October 14, 2011

EXHIBIT
49

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AMENDMENT TO THE STAGE I ABATEMENT PLAN PROPOSAL FOR THE COPPER FLAT MINE

A. INTRODUCTION

New Mexico Copper Corporation (NMCC) submitted a Stage 1 Abatement Plan proposal for the Copper Flat Mine to the New Mexico Environment Department (NMED). A general location map of the Copper Flat Mine is shown as Figure 1. The proposed plan was prepared by INTERA on March 31, 2011 and titled *Stage 1 Abatement Plan for the Copper Flat Mine*. On June 23, 2011, the NMED requested additional information before approving the proposed plan.

NMCC contracted John Shomaker & Associates, Inc. (JSAI) to address NMED requests for additional information and to amend the proposed Stage 1 Abatement Plan for the Copper Flat Mine.

A.1 Proposed Amendments

The following amendments were made to the Stage 1 Abatement Plan proposal:

1. Identify the proposed Stage 1 Abatement Plan area of investigation. The area of investigation is the NMCC permit area plus a 1-mile buffer. Figure 2 shows the proposed Stage 1 Abatement Plan area of investigation.
2. Provide maps and illustrations that better define the extent of known vadose zone and groundwater contamination.
3. Revise Section 2.3 (hydrogeologic description of site).
4. Amended and supplemented Section 4 (ongoing investigation activities) with a revised monitoring plan specific to the proposed Stage 1 Abatement Plan area of investigation.
5. Amended and supplemented Section 5 (proposed characterization activities) with a revised investigation plan specific to the proposed Stage 1 Abatement Plan area of investigation.

There are components of the proposed Stage 1 Abatement Plan prepared by INTERA (2011) that are revised and replaced by this amendment. Table 1 is a list referencing which sections from the original Stage 1 Abatement proposal and this amendment report fulfill the requirements of NMAC 20.6.2.4106 C (Stage 1 Abatement Plan contents).

Table 1. References for final Stage 1 Abatement Plan proposal

SECTION (NMAC 20.6.2.4106 C)	REFERENCE	
	original INTERA proposal (March 31, 2011)	**JSAI amendments (October 4, 2011)**
C.(1) Description of Site	Sections 2.1, 2.2, and *2.3*	Section B amendment replaces INTERA Section 2.3)
C.(2) Site Investigation Workplan (a) Site Hydrogeology (b) Surface Water Hydrology	*Section 5.0*	Section C amendment replaces INTERA Section 5.0
C.(3) Monitoring Program	*Section 4.0*	Section D amendment replaces INTERA Section 4.0
C.(4) Quality Assurance Plan	Section 6.0	no amendments
C.(5) Site Health and Safety Plan	Section 7.0	no amendments
C.(6) Stage 1 Abatement Plan Schedule	Sections 8.0 and 9.0	Section D amendment replaces INTERA Sections 8.0 and 9.0
C.(1), (2), and (3)	*Tables 4.1 – 4.3 and Appendix B*	Appendix A Tables A-1 – A-3 replace INTERA Tables 4.1 – 4.3 and Appendix B

italic items listed were replaced with amendments

A summary of items removed from the original Stage 1 Abatement Plan proposal includes the following:

1. Groundwater and surface water monitoring outside of the proposed Stage 1 Abatement Plan area of investigation shown on Figure 2.
2. Geochemical modeling of pit lake system will be replaced by water-quality characterization.
3. Analysis of pit lake hydraulics: this task is already completed (see Section B).
4. Geologic block model of tailings impoundment: this task is completed and included as cross-sections presented in this amendment (Figs. 7 and 8).

A summary of items added to the proposed Stage 1 Abatement Plan includes the following:

1. Proposed monitoring well drilling and testing.
2. Proposed monitoring plan for each facility (pit, waste rock piles, and tailings impoundment).
3. Pit lake water balance and water-quality characterization.
4. Use data collected from the proposed monitoring plan to refine the hydrogeologic conceptual model for each facility. Rate of potential transport will be addressed in the refined conceptual model.

B. AMENDED SECTION 2.3 - HYDROLOGIC CONDITIONS

The hydrologic setting and hydrogeologic conditions at Copper Flat Mine have been described in detail by previous studies performed by Newcomer and Finch (1993), SRK (1996), Adrian-Brown Consultants (1996), and Raugust (2003). In addition, there are numerous geologic reports, such as Harley (1934), Hedlund (1975), and Dunn (1982) that provide good detail on the structure and subsurface geology. Previous studies were combined with the analysis of recent data collected by INTERA (2010 to current) and JSAI (2011) to amend Section 2.3 of the Copper Flat Mine Stage 1 Abatement Plan.

B.1 Area of Investigation

The area of investigation is defined as the area within a 1-mile buffer zone of the current Copper Flat Mine permit boundary (Fig. 2). The site map, shown as Figure 2, also shows the locations of monitoring points used for the Stage 1 Abatement Plan, existing mine facilities, and other geographic features. Figure 1 distinguishes the region from the area of investigation. The area of investigation includes all existing mine facilities, the potential area of impact, and adequate area of investigation upgradient and downgradient of the potential areas of impact. For the Copper Flat Mine property, potential areas of impact include tailings impoundment, waste rock piles, and pit lake.

B.2 Hydrogeologic Setting

The area of investigation is encompassed in the upper watershed of Grayback Arroyo (Fig. 2). There are two hydrogeologic regions shown on Figures 1 and 3, and described below:

1) Andesite volcano within the Animas Uplift. The center of the andesite volcano contains a monzonite intrusion, which is referred to as Copper Flat (Harley, 1934). The Copper Flat open pit was excavated in 1982 by Quintana Minerals. The associated waste rock facilities are placed on andesite rocks (Figs. 2 and 3).

2) The Palomas Basin contains the Santa Fe Group sediments. The Palomas (geologic) Basin is part of the sediment-filled down-dropped blocks formed by the Rio Grande Rift. The tailings impoundment facility is located on the western margin of the Palomas Basin.

The area of investigation contains three established surface-water monitoring points along Grayback Arroyo, pit-lake monitoring, and 47 wells (Fig. 2). The wells can be grouped into monitoring wells and water-supply wells (domestic, stock, mine supply, etc.). Table 2 is a list of wells and their specifics.

Table 2. Summary of wells and well data for the Stage 1 Abatement Plan area of investigation, Copper Flat Mine, Sierra County, New Mexico

well name	well type	facility area	year drilled	casing diameter (inches)	total depth (ft bmp)	screen interval (ft bgl)	measuring-point elevation (2011 survey) (ft amsl)	geologic unit	depth to water measurement date	depth to water (ft bmp)	water-level elevation (ft amsl)
GWQ-1	supply	background region	1972	12 + 14	401	na	5,195.24	Santa Fe Group	6/15/1981	72.00	5,123.24
GWQ-2	supply	background region	1932	8	500	na	5,227.44	Santa Fe Group	11/15/1982	60.00	5,167.44
GWQ-3	supply	waste rock pile	1932	40 x 43	33	na	5,252.60	alluvium/andesite	9/29/2011	18.71	5,233.89
GWQ-4	supply	background region	1948	5	150	na	5,565.85	andesite	11/10/1982	35.00	5,530.85
GWQ-5R	monitoring	waste rock pile	2011	4	120	in progress	*5,410.00*	andesite	9/29/2011	98.91	*5,311.09*
GWQ-6(N)	supply	background region			85		5,395.36	andesite	6/9/1981	26.95	5,368.41
GWQ-6(S)	supply	background region					5,382.77	andesite			
GWQ-7	supply	tailings impoundment	1932	8	500	na	5,181.60	Santa Fe Group	6/15/1981	77.00	5,104.60
GWQ-8	supply	background region	1931	8	157	na	5,216.94	Santa Fe Group	11/15/1982	68.00	5,148.94
GWQ-9	supply	tailings impoundment	1971	14 + 16	767	na	5,208.13	Santa Fe Group	4/15/1972	60.00	5,148.13
GWQ-10	monitoring	tailings impoundment	1981	3	120	na	5,213.29	Santa Fe Group	9/27/2010	23.19	5,190.10
GWQ-11	monitoring	tailings impoundment	1981	3	70	na	5,196.44	alluvium/Santa Fe Group	5/4/2011	20.02	5,176.42
GWQ-12	monitoring	tailings impoundment	1981	3	137	na	5,237.28	Santa Fe Group	5/4/2011	79.71	5,157.57
GWQ94-13	monitoring	tailings impoundment	1994	5	106	74 to 104.5	5,200.47	Santa Fe Group	5/4/2011	13.02	5,187.45
GWQ94-14	monitoring	tailings impoundment	1994	5	159	127.5 to 157.5	5,192.69	Santa Fe Group	5/4/2011	6.42	5,186.27
GWQ94-15	monitoring	tailings impoundment	1994	5	149	112 to 142	5,183.07	Santa Fe Group	5/4/2011	4.92	5,178.15
GWQ94-16	monitoring	tailings impoundment	1994	5	46	25 to 45	5,197.41	alluvium	5/4/2011	21.76	5,175.65
GWQ94-17	monitoring	tailings impoundment	1994	5	151	120 to 150	5,198.13	Santa Fe Group	9/27/2010	10.11	5,188.02
GWQ94-18	monitoring	tailings impoundment	1994	4	51	10 to 50	5,194.83	alluvium	10/15/1994	dry	
GWQ94-19	monitoring	tailings impoundment	1994	4	53	10 to 50	5,203.36	alluvium	9/27/2010	52.22	5,151.14
GWQ94-20	monitoring	tailings impoundment	1994	4	338	288 to 338	5,203.49	Santa Fe Group	1/27/2010	18.05	5,185.44
GWQ94-21A	monitoring	tailings impoundment	1996	2	263	213 to 263	5,192.71	Santa Fe Group	11/7/1994	4.58	5,188.13
GWQ94-21B	monitoring	tailings impoundment	1996	2	315	285 to 315	5,192.22	Santa Fe Group	11/7/1994	3.95	5,188.27
GWQ96-22A	monitoring	pit/waste rock pile	1996	2	244	174 to 244	5,596.17	andesite	8/28/2011	54.63	5,541.54
GWQ96-22B	monitoring	pit/waste rock pile	1996	2	380	340 to 380	5,595.95	andesite	8/28/2011	54.59	5,541.36
GWQ96-23A	monitoring	pit/waste rock pile	1996	2	101	50 to 100	5,489.84	monzonite	8/28/2011	40.71	5,449.13
GWQ96-23B	monitoring	pit/waste rock pile	1996	2	251	150 to 250	5,489.70	monzonite	8/28/2011	40.87	5,448.83
GWQ11-24A	monitoring	pit/waste rock pile	2011	2	90	60 to 90	*5,514.80*	andesite	8/28/2011	49.86	*5,464.94*
GWQ11-24B	monitoring	pit/waste rock pile	2011	2	250	230 to 250	*5,514.80*	andesite	8/28/2011	56.69	*5,458.11*
GWQ11-25A	monitoring	pit/waste rock pile	2011	2	100	70 to 100	*5,532.00*	monzonite	8/28/2011	50.91	*5,481.09*
GWQ11-25B	monitoring	pit/waste rock pile	2011	2	242	222 to 242	*5,532.00*	monzonite	8/28/2011	62.90	*5,469.10*
IW-1	monitoring	tailings impoundment	1982	4	49	__ to 49	5,198.99	alluvium	6/24/2010	dry	
IW-2	monitoring	tailings impoundment	1982	4	46	__ to 45	5,208.01	alluvium	5/4/2011	39.01	5,169.00
IW-3	monitoring	tailings impoundment	1982	4	45	__ to 45	5,213.17	alluvium	6/24/2010	dry	
NP-1	monitoring	tailings impoundment	1981	4	106	__ to 106	5,188.75	Santa Fe Group	5/4/2011	30.8	5,157.95
NP-2	monitoring	tailings impoundment	1981	4	110	__ to 110	5,192.54	Santa Fe Group	5/4/2011	32.92	5,159.62
NP-3	monitoring	tailings impoundment	1981	4	100	__ to 100	5,199.73	Santa Fe Group	5/4/2011	12.02	5,187.71
NP-4	monitoring	tailings impoundment	1981	4	117	__ to 117	5,225.73	Santa Fe Group	5/4/2011	35.22	5,190.51
NP-5	monitoring	tailings impoundment	1981	4	39	24 to 39	5,198.81	basalt	5/4/2011	22.63	5,176.18
MW-4	supply	background region	1975	6	1,500	123 to 1,500	*5,125.00*	Santa Fe Group	6/9/1981	123.27	5,001.73
Pague	supply	background region			26		5,550.81	andesite	5/4/2011	11.69	5,539.12
Dolores	supply	background region			56		5,397.51	andesite	11/10/1982	29.7	5,367.81
Paxton Well	supply	background region	1932	40 x 40	30		5,500.00	andesite	11/10/1982	7.6	5,492.40
LRG-4156	supply	background region	1956	6	150		5,431.06	andesite	1956	60	5,371.06
LRG-4158	supply	background region	1955	6	150	na	5,533.03	limestone	11/11/2010	47.01	5,486.02
McCravey-G	supply	background region	1931	8	500	na	5,201.53	Santa Fe Group	11/15/1982	40	5,161.53
LRG-4159	supply	background region	2002	6	200	5 to 200	5,719.70	andesite	11/4/2010	13.56	5,706.14

ft bmp - feet below measuring point
italic measuring-point elevations are estimated
ft bgl - feet below ground level
na - not available
ft amsl - feet above mean sea level

B.2.1 Surface Water and Recharge

Precipitation and evaporation in the study area are examined using data from regional meteorological stations. The station at Hillsboro, New Mexico has over 80 years of record and is located about 4 miles from the Copper Flat Mine pit. The Hillsboro station is also at a similar elevation (5,270 ft amsl) to the Copper Flat Mine site. The range of variability of annual precipitation between wet and dry climatic conditions ranges from about 5 to 20 inches per year (in./yr). The average annual precipitation is approximately 13 inches.

The frequency and magnitude of rainfall-runoff events is examined in the statistical distribution of daily precipitation at the Hillsboro station. Daily precipitation of 1 inch or more occurs, on average, twice per year. Storm events of magnitude 2 inches can be expected to occur every 5 years, and the 100-year storm event is about 3.5 inches. Daily precipitation data from the Hillsboro station is shown on Figure 4.

Evaporation has previously been estimated to range between 60 and 65 in./yr. NMCC has installed a weather station and Class A evaporation pan at the mine site. The data will be used to further understand frequency and magnitude of storm-water runoff and to develop water budgets for the mine site and associated facilities.

The area of investigation is within Grayback Arroyo watershed. Grayback Arroyo is an ephemeral stream channel that drains the andesite rock of the Hillsboro Hills and is the primary drainage for the Copper Flat Mine pit area (Fig. 2). Some alluvium can be found along Grayback Arroyo east of Copper Flat Mine pit (Fig. 3). Storm-water runoff from Grayback Arroyo infiltrates alluvium and Santa Fe Group sediments east of Copper Flat. A diversion channel was constructed to divert storm-water around the Copper Flat Mine pit (Fig. 2).

After mining, the pit partially filled with storm water and groundwater. From available water-level data and aerial photographs, it appears the Copper Flat Mine pit filled to its current water level within a few years after mining stopped. A significant portion of the pit filling was related to storm-water runoff and above-average precipitation. Details regarding the pit lake can be referenced from Newcomer and Finch (1993), Shomaker (1993), SRK (1997), and Raugust (2003).

Surface-water monitoring points within the area of investigation include SWQ-1, SWQ-2, SWQ-3, pit lake, and pit wall seepage (Fig. 2). Historical data have been collected from each of these surface-water monitoring points (see Appendix A). SWQ-1 is located upstream of the mine facilities in Grayback Arroyo. SWQ-2 and SWQ-3 are in Grayback Arroyo below the mine pit and waste rock facilities. The pit lake and pit wall seepage monitoring points are within the pit footprint.

B.2.2 Geologic Units and Structure

There are three hydrogeologic units within the Copper Flat Mine site area:

1. alluvium along Grayback Arroyo and colluvium
2. Santa Fe Group sediments
3. andesite and monzonite rocks of the Animas Uplift

A summary of the geologic units and their characteristics is presented in Table 3. The distribution of geologic units is shown on Figure 3, and the subsurface conditions are illustrated on the hydrogeologic cross-sections presented as Figures 5 through 8.

Table 3. Geologic units and their characteristics

geologic unit	description	thickness (ft)	range in estimated hydraulic conductivity (ft/day)
alluvium [1]	sand and gravel in Grayback Arroyo	< 50	10 to 100
colluvium [2]	fan deposits of poorly sorted angular sand and gravel	< 50	1 to 10
Santa Fe Group sediments [3]	highly stratified gravel, sand, silt, and clay	1 to 2,000	0.01 to 10
andesite [4]	fine-grained porphyritic rock with plagioclase phenocrysts	> 3,000	<0.01
monzonite [4]	quartz monzonite with fracture controlled sulfide mineralization; other common minerals include magnetite, fluorite, calcite, and apatite	> 3,000	0.01 to 0.1

[1] - Dunn (1982); Finch et al. (2008)
[2] - Hedlund (1975)
[3] - Seager et al. (1982); Hawley and Kennedy (2004)
[4] - Dunn (1982); SRK (1997); JSAI (work in progress)

The principal water-bearing sediments of the Palomas Basin are (1) alluvial-fan deposits, and fluvial sands and gravels of the Santa Fe Group, and (2) saturated alluvium in the principal drainages. Alluvium is found east of the Copper Flat Mine in Grayback arroyo, and primarily consists of sand and gravel. Thickness of the alluvium ranges between 5 and 50 ft. Alluvium may be locally and seasonally saturated north of the tailings impoundment, and downgradient of the waste rock piles along Grayback Arroyo. Colluvium overlies the andesite and Santa Fe Group sediments, but is only known to be locally saturated near the center of the tailings dam.

The sediments of the Santa Fe Group are stratified, contain a wide variety of grain sizes, and, in general, dip to the east. This distribution of fine-grained sand and clay and of coarser sand and gravel is reflected in the logs of wells in the tailings facility area. North-to-south and east-to-west hydrogeologic cross-sections of the tailings facility area were constructed (see Figs. 7 and 8). The Santa Fe Group sediments are over 500 ft thick beneath the tailings facility.

Hydrogeologic conditions beneath the tailings dam are complicated by varying thickness of colluviums, thick clay layers in the Santa Fe Group sediments, and basalt and volcaniclastics interbedded in the Santa Fe Group sediments (see Figs. 7 and 8). These varying lithologies and sediment grain sizes create preferential flow paths and barriers to groundwater flow. The preferential flow paths are primarily related to coarser-grained colluvium and Santa Fe Group sediments.

The hills surrounding Copper Flat Mine, referred to as Hillsboro Hills, consists of Cretaceous-age andesite flows, breccias, and volcaniclastic rocks that were erupted from an andesite volcano (McLemore, 2001; Raugust and McLemore, 2004). The andesite is a near circular body approximately 4 miles in diameter and over 3,000 ft in depth (Dunn, 1982). The Copper Flat Mine quartz monzonite porphyry intruded the vent of the volcano, and then dikes and mineralized veins intruded the monzonite porphyry and radiate outwards from the porphyry into fault and fracture zones in the andesite. The porphyry copper deposit is a low-grade deposit that is concentrated within a breccia pipe in the Copper Flats quartz monzonite stock and contains copper sulfide and oxide minerals. Distribution of the monzonite can be referenced from the geologic map (Fig. 3) and pit lake cross-sections (Figs. 5 and 6). The permeability of the andesite is extremely low, where as the permeability of the monzonite rocks averages 0.1 ft/day due to localized secondary porosity from fracturing (see Section B.2.4).

B.2.3 Groundwater Flow Direction

The direction of groundwater flow is from west to east, except in the vicinity of the Copper Flat pit lake where a hydrologic sink exists due to evaporative losses. Groundwater-elevation contours are shown on Figure 9, and data used to construct the water-level elevation contours are listed in Table 2. The groundwater-elevation contours indicate groundwater flow from the andesite to the alluvium and Santa Fe Group sediments. Groundwater contours around the pit lake and direction of groundwater flow are shown on Figure 10. Between June and September 2011, evaporative effects decreased the pit lake elevation from 5,443.80 to 5,442.74 ft amsl. The four nested piezometers around the pit provide the data needed to prove the pit lake is a hydrologic sink; two of the nested piezometers were drilled in 2011 (GWQ11-24(A,B) located south of the pit lake and GWQ11-25(A,B) north of the pit lake (Figs. 2 and 10)). There appears to be a hydraulic discontinuity east of the tailings impoundment dam (Figs. 8 and 9).

Depth to water varies significantly due to topography and geologic unit (see Fig. 11). Monitoring wells surrounding the pit lake and waste rock piles typically have a depth to water of 40 to 80 ft. Depth to water in the Grayback Arroyo is approximately 10 to 20 ft bgl, as indicated by GWQ-3, which is a 3.3 ft by 3.6 ft hand-dug concrete cistern (Figs. 2 and 16). Water levels beneath the tailings impoundment significantly rose during operation in 1983; see hydrograph for monitoring wells NP-1 through NP-5 presented as Figure 12. The water-level rise beneath the tailings impoundment is the result of a groundwater mound created by infiltration at the tailings dam and the north to south trending fault approximately 800 ft east of the tailings impoundment. The fault acts as a barrier to groundwater flow (Fig. 8).

B.2.4 Aquifer Characteristics

Source of aquifer test data come from 1) pumping and specific-capacity tests performed on supply wells, 2) injection and slug tests performed on Copper Flat Mine pit lake piezometers, and 3) pumping test performed by Adrian-Brown Consultants (1994) on monitoring wells below the tailings dam.

Hydraulic conductivity values were derived from slug tests performed on wells GWQ96-22 and GWQ96-23 (SRK, 1997). The slug test analysis estimated an extremely low range in hydraulic conductivity of 0.00003 to 0.003 ft/day for the unfractured andesite and quartz monzonite rocks. JSAI (in progress) has evaluated injection tests performed on GWQ-5R (Fig. 2), GWQ11-24, and GWQ11-25 (Figs. 2 and 10). A summary of the hydraulic conductivity estimates is presented as Table 4, and construction diagrams can be referenced from Appendix B.

Table 4. Summary of hydraulic conductivity (permeability) estimates from wells in the vicinity of the pit and waste rock piles

borehole and zone	depth interval (ft)	geologic unit	apparent permeability	
			(cm/sec)	(ft/day)
GWQ-5R, Zone 1	64-100	andesite	~0	~0
GWQ11-24, Zone 1	100-147	monzonite	7×10^{-6}	0.02
GWQ11-24, Zone 2	150-197	monzonite	3.0×10^{-5}	0.085
GWQ11-24, Zone 3	204-251	monzonite	4.9×10^{-5}	0.14
GWQ11-25, Zone 1	100-148	monzonite	~0	~0
GWQ11-25, Zone 2	150-198	monzonite	2.9×10^{-5}	0.081
GWQ11-25, Zone 3	207-251	monzonite	2.6×10^{-5}	0.074

cm/sec - centimeters per second

A representative range of effective bulk hydraulic conductivity for the fractured rock surrounding the pit lake is about 0.05 to 0.1 ft/day. The andesite rocks appear to have an order of magnitude lower hydraulic conductivity than the fractured monzonite as evidenced by the slow recovery of GWQ-5R, which was dry upon well completion on September 6, 2011, but has recovered to an elevation of 5,311 ft amsl on September 29, 2011 (or approximately 23 feet of recovery).

Pumping and specific capacity tests were performed on mine-supply wells MW-4 (Water Development Corporation, 1975), GWQ-1 (Water Development Corporation, 1980), GWQ-7 (W.K. Summers & Associates, 1981), GWQ-9 (Water Development Corporation, 1980). All of these wells are in the vicinity of the tailings facility (Fig. 2). A summary of the hydraulic properties derived from the wells tested in the tailings impoundment area is listed in Table 5.

Table 5. Summary of hydraulic properties estimated from wells in the vicinity of the tailings impoundment

well	pumping rate (gpm)	specific capacity (gpm/ft)	aquifer thickness tested (ft)	transmissivity (ft^2/day)	horizontal hydraulic conductivity (ft/day)
MW-4	60	0.24	1,377	80	0.06
GWQ-1	119	1.57	328	1,540	4.7
GWQ-7	21	2.33	423	440	1.0
GWQ-9	60	0.44	700	1,710	2.4
GWQ94-17	23	0.19	146	200	1.4

gpm - gallons per minute

Adrian-Brown Consultants (1994) performed a 76-hour constant-rate pumping test on GWQ94-17 located below the tailings impoundment (Fig. 2). Neighboring monitoring wells were used as observation wells during the pumping test. The pumping well, GWQ94-17 was pumped at a rate of 23 gallons per minute (gpm). The water levels in the pumping and observation wells never fully recovered to the pre-pumping level, indicating boundary effects from dewatering the groundwater mound observed beneath the tailings dam. Furthermore, the pumping test data confirmed the clay zones observed in the upper Santa Fe Group sediments (see Figs. 7 and 8) act as vertical barriers to groundwater flow.

B.2.5 Water-Quality Trends

Water-quality trends for the Copper Flat Mine area are best identified by changes in sulfate and total dissolved solids (TDS) concentrations. The primary areas of interest for water-quality trends include 1) the pit lake, 2) surface-water runoff in Grayback Arroyo, 3) alluvium and fractured rock along Grayback Arroyo downstream of the waste rock piles, and 4) downgradient of the tailings impoundment.

As shown by time-series graphs presented in Raugust (2003) and the Stage 1 Abatement Plan (INTERA, 2011), the sulfate and TDS concentrations in the pit lake have increased since the late 1980s. The increase in pit lake sulfate and TDS concentrations since the early 1990s is due to evaporation instead of pit wall seepage. Figure 13 is a plot of pit lake sulfate and chloride concentrations. The observed trend between sulfate and chloride increases linearly with respect to time. If the increasing sulfate concentrations were due to pit wall seepage, sulfate concentrations would increase without an increase in chloride (pit wall seepage has low chloride concentration; see Appendix A). Furthermore, if the increase in sulfate concentrations was due to pit wall seepage and evaporation, the trend on Figure 13 would show sulfate concentrations increasing at a rate greater than the chloride concentrations.

Surface water quality monitoring points SWQ-2 and SWQ-3 have shown increases in sulfate concentration over the last several decades. Figure 14 is a sulfate concentration time-series graph for SWQ-1, SWQ-2, SWQ-3, and GWQ-3. From Figure 14 it appears sulfate concentration has increased over time in Grayback Arroyo surface water downstream of the waste rock piles. However, an increase sulfate concentration is also observed in upgradient monitoring point SWQ-1.

Well GWQ-3 is downstream of SWQ-3 and the waste rock piles, and should be representative of groundwater along Grayback Arroyo. GWQ-3 sulfate concentrations resembled similar values to SWQ-2 in the early 1980s (Fig. 14), but there are no recent data to determine if sulfate concentrations have changed since the 1980s.

Monitoring well NP-3 is located directly downgradient of the tailings impoundment, and has good historical dataset for evaluating trends. Figure 15 is a sulfate and TDS concentration time-series plot for monitoring well NP-3. After the construction and operation of the tailings impoundment in 1983, sulfate and TDS concentrations increased in NP-3 (Fig. 15). As indicated by the 2010 and 2011 sampling events, sulfate and TDS concentrations have remained fairly constant in NP-3. The groundwater mound created by the tailings impoundment (Fig. 11) shows a similar pattern of stability. The lack of change in depth to water and sulfate concentrations are evidence that the sulfate-rich groundwater mound is relatively stable and has not moved.

B.3 Extent of Groundwater Impacts

The extent of groundwater impacts can be identified using data from the existing monitoring network. Available water-quality data for the wells surrounding the mine facilities are listed in Appendix A tables. Table A1 lists water-quality data from the pit lake, Table A2 lists surface-water-quality data, and Table A3 lists groundwater-quality data.

B.3.1 Pit Lake

The pit lake quality has been affected by minor influxes of pit wall seepage and concentration of dissolved constituents from evaporation. The pit lake has buffering capacity to maintain neutral pH (6.00 to 7.72), although high precipitation periods and subsequent pit wall seepage can temporarily exceed the pit lake buffering capacity (see 1990s data in Appendix A). Table 6 lists the constituents of concern (COC) identified from the pit lake chemistry data in Appendix A. The primary COCs are TDS, sulfate, and pH. Pit lake chemistry data from 2010 and 2011 demonstrate that the pit lake is not stratified, and that depth sampling is not necessary (see Appendix A).

Piezometer nests GWQ96-22(A,B) and GWQ96-23(A,B) provide adequate monitoring of upgradient (GWQ96-22(A,B)) and downgradient (GWQ96-23(A,B)) groundwater-quality conditions. Figures 5 and 6 show the distribution of 2011 sulfate concentrations, and, along with the water-level elevation contours (Fig. 10), indicate the pit lake is a hydraulic sink with no impacts to groundwater. Recently constructed nested piezometers GWQ11-24(A,B) and GWQ11-25(A,B) have not been sampled, so the groundwater quality north and south of the pit has not be characterized.

Table 6. Identified constituents of concern for the pit lake

constituent of concern	range in observed concentration (mg/L)
aluminum	0.13 to 5.5
cadmium	0.056 to 0.064
cobalt	0.34 to 0.39
copper	0.11 to 11.0
manganese	39 to 45
selenium	0.019 to 0.030
zinc	5.0 to 6.8
alkalinity	< 20 to 41
chloride	380 to 420
fluoride	15 to 18
sulfate	5,200 to 6,200
total dissolved solids (TDS)	7,770 to 8,700

mg/L - milligrams per liter

B.3.2 Waste Rock Pile(s)

Surface water quality sampling points SWQ-2 and SWQ-3 may provide an indication of water-quality impacts from the waste rock piles. A statistical analysis of the data would need to be performed to determine if a statistically significant increase in concentration has occurred and to determine the difference between pre- and post-mining concentrations from Copper Flat Mine. The primary COCs are sulfate, TDS, and pH. Metal concentrations in surface-water samples have been low or not detectable, and pH has been above neutral in the 7 to 8 range (see Appendix A).

Discharges to groundwater from potential waste rock pile leachate would occur via storm-water runoff. Figure 16 shows the current potential storm-water runoff and migration pathways for each waste rock pile and mill site fill. The pit footprint will capture runoff from nearby waste rock piles to the north and northwest, and Grayback Arroyo will receive runoff from the waste rock piles east of the pit capture area. GWQ-3 is located in Grayback Arroyo, and is the best location downstream of the waste rock pile for detecting discharges to groundwater from the waste rock piles. All of the available data from GWQ-3 were collected in the 1980s, and additional data are needed to determine if groundwater-quality conditions have changed. For future mining operations, the surface runoff from the waste rock piles will be controlled as shown in the Mine Plan of Operations submitted to the Bureau of Land Management (BLM) in June 2011 and currently under review by the NMED.

B.3.3 Tailings Impoundment

The groundwater monitoring network for the tailings impoundment has adequately defined the horizontal and vertical extent of groundwater impacts, except for the lateral extent on the east and downgradient side (see Figs. 7, 8, and 14). The eastern most monitoring wells, GWQ94-21A and GWQ94-21B are completed too deep to characterize the lateral extent of groundwater impacts.

B.4 Hydrogeologic Conceptual Model

The hydrogeologic conceptual model for the Stage 1 Abatement area of investigation can be divided into two segments 1) pit and waste rock piles area underlain by low permeability andesite and monzonite rocks, and 2) the tailings impoundment area underlain by alluvium and Santa Fe Group sediments.

The pit lake is a hydrologic sink with no discharges to groundwater. The andesite rocks acts as a hydraulic container for the more fractured monzonite rocks. Prior to the pit lake, groundwater discharged from the andesite and monzonite rocks due to the alluvium along Grayback Arroyo. The waste rock piles are more permeable than the underlying rock, and infiltrated precipitation will drain off at the waste rock-bedrock interface. The runoff from the waste rock piles will be intercepted by the mine pit and the mill site fill to Grayback Arroyo. As a result, the waste rock and mill site fill may be contributing to increased TDS in downgradient surface-water quality, but significant discharges to groundwater have not been adequately evaluated from the existing groundwater monitoring network (see data for GWQ-3 and GWQ-8 in Appendix A).

The tailings impoundment created a groundwater mound and discharges of increased sulfate and TDS to groundwater. Preferential pathways for the seepage include the alluvium, fractured basalt, and coarser-grained Santa Fe Group sediments. Clay layers in the Santa Fe Group sediments act as vertical barriers to groundwater flow. The sulfate plume appears to be stable (the groundwater mound has not subsided) and downgradient migration is limited by a barrier boundary fault.

C. PROPOSED SITE INVESTIGATION WORKPLAN

A good portion of the proposed site investigation workplan has been completed in 2010 and 2011, such as the drilling and testing of piezometer nests in the pit lake area, collection of additional water-level and water-quality data in the area of investigation, and evaluation of current hydrogeologic conditions (such as Section B of this amendment report). The proposed site investigation workplan is designed to characterize potential water-quality issues and define extent of impacts related to the existing mine facilities (pit, waste rock piles, and tailings impoundment).

C.1 Pit Lake

In addition to the two existing piezometer nests, in 2011 NMCC had two more piezometer nests installed north and south of the pit lake (Fig. 2). The four piezometer nests (GWQ96-22(A,B), GWQ96-23(A,B), GWQ11-24(A,B), and GWQ11-25(A,B)) allow for monitoring upgradient, offgradient, and downgradient of the pit lake, as well as with respect to aquifer depth. No additional drilling is proposed for pit lake characterization.

The proposed pit lake investigation includes the following:

1. Collect four quarters of water-quality data from the pit lake, pit wall seepage, and surrounding piezometers.

2. Collect four quarters of water-level data from the pit lake and surrounding piezometer nests.

3. Develop a revised water balance for the pit lake using water-quality data, on-site climate data, and pit lake elevation data.

4. Perform an analysis of the pit lake chemistry to determine if there are past, current, and future issues with meeting the applicable surface water-quality standards.

C.2 Waste Rock Pile(s)

A preliminary waste rock pile characterization study was performed by Newcomer and Finch (1993), and more detailed evaluations of waste-rock characterization were performed by SRK (1998). Currently SRK is finishing where it left off in 1998 by performing material tests on 70 samples collected in 2010. Details of the SRK waste rock pile characterization can be referenced from appendix f in the proposed Stage 1 Abatement Plan (INTERA, 2011).

The proposed waste rock investigation plan includes the following:

1. Results from the waste rock characterization will be compared to water-quality results obtained from surface-water runoff samples SWQ-1, SWQ-2, SWQ-3, and groundwater sampled from the pit area piezometer nests and downgradient wells GWQ-1, GWQ-3, GWQ-5R, and GWQ-8.

2. The historical surface water quality data will be statistically evaluated for significant increases in concentrations of TDS and sulfate. Trend analysis and geochemical analysis of other water-quality parameters will be used to verify statistically significant increases in sulfate and TDS. The purpose of the investigation is to determine if the increases in sulfate and TDS in surface water and downgradient groundwater are attributed to the waste rock pile(s) or some other influence such as climate, salt build up in soils, etc. Characterization of background chemistry will be incorporated into the analysis.

3. Collect samples from GWQ-1, GWQ-3, GWQ-5R, and GWQ-8. The groundwater-quality data will help characterize the extent of lateral and vertical groundwater impacts if the leachate from the waste rock piles is determined to be associated with increases of sulfate and TDS in downgradient groundwater.

NMCC is currently working on BLM access for the wells GWQ-1 and GWQ-8. NMCC will also have to establish BLM access to GWQ-3, now that this report has identified it as potential aid in assessing and monitoring water quality downgradient of the mine site. NMCC will not be able to gauge or sample these wells until the BLM access has been granted and in the case of GWQ-8, a cultural resources evaluation completed.

C.3 Tailings Impoundment Facility

Proposed investigation for the tailings impoundment facility includes the drilling of one or two monitoring wells downgradient of the known extent of the sulfate plume. Downgradient monitoring wells GWQ94-14 and GWQ94-21 are too deep to assess the lateral extent of the sulfate plume (Fig. 7). Proposed monitoring well locations are shown on Figures 7 and 17; the actual locations may depend on land ownership and access, and may slightly vary from the proposed location.

The proposed tailings impoundment investigation plan includes:

1. Install the first monitoring well (proposed monitoring well A) located east of GWQ94-21, but west of the fault zone shown on Figure 7. If proposed monitoring well A does not define the eastward extent of the sulfate plume, proposed monitoring well B will be drilled east of the projected fault zone. A 60-ft screen interval is proposed for monitoring well A to accommodate the possibility of the groundwater mound lowered to the pre-tailings water-level elevation.

2. Data from existing and proposed monitoring wells will be used to assess the sulfate plume extent and stability. Known aquifer properties, water-level trends, and vertical head distribution will be used to assess the stability of the sulfate plume and potential tracer velocity under current conditions.

D. PROPOSED MONITORING PLAN

Sampling methods and protocol defined in the NMCC Sampling and Analysis Plan (SAP), prepared for baseline studies, will be employed. The proposed Stage 1 Abatement monitoring plan is based on the identified COCs, and the need for further characterization within the area of investigation.

D.1 Pit Lake

Monitoring plan includes collection of data from 1) pit lake, 2) surrounding piezometer nests, and 3) on site weather station. Four quarters of data are needed from the new wells GWQ11-24(A,B), GWQ11-25(A,B). The proposed pit lake monitoring plan includes sample analyses for pH, acidity, general chemistry, and the remaining constituents listed in Table 6. The proposed pit lake area monitoring plan is summarized in Table 7. Another 6 months of weather station data collection will help define the pit lake water balance.

Table 7. Proposed monitoring plan for Copper Flat pit lake area

monitoring point	4th QTR 2011	1st QTR 2012	2nd QTR 2012	3rd QTR 2012
GWQ96-22(A,B)	WL, WQ	WL	WL	WL
GWQ96-23(A,B)	WL, WQ	WL	WL	WL
GWQ11-24(A,B)	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ11-25(A,B)	WL, WQ	WL, WQ	WL, WQ	WL, WQ
pit lake	WL, WQ	WL, WQ	WL, WQ	WL, WQ
pit wall seepage (if present)	WQ	WQ	WQ	WQ

WQ - water-quality analysis (Table 6 constituents plus calcium, magnesium, sodium, potassium, and field parameters of temperature, specific conductance, and pH)
WL - water level

D.2 Waste Rock Pile(s)

Most of the proposed waste rock pile investigation will be based on existing data and results from studies already in progress by SRK. However, there is a need for current data from downgradient wells. Table 8 lists the proposed groundwater monitoring program for the waste rock pile investigation. Proposed data collected from the pit lake area (Table 7) would also be incorporated into the waste rock pile investigation.

NMCC also has automated samplers for collection of storm-water runoff from SWQ-1, SWQ-2, and SWQ-3. If events occur and are samples collected, the data will be incorporated into the investigation.

Table 8. Proposed monitoring plan for Copper Flat waste rock pile area

monitoring point	4th QTR 2011*	1st QTR 2012*	2nd QTR 2012*	3rd QTR 2012*
GWQ-5R	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ-3	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ-1	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ-8	WL, WQ	WL, WQ	WL, WQ	WL, WQ

* access and schedule dependent on land owner permission or BLM right-of-way permitting (including evaluation of cultural resource issues, etc.)
WQ - water-quality analysis (total dissolved solids (TDS), sulfate, chloride, alkalinity, calcium, magnesium, sodium, potassium, and field parameters of temperature, specific conductance, and pH)
WL - water level

D.3 Tailings Impoundment Facility

There are numerous monitoring wells in the vicinity of the tailings impoundment, and many of these are no longer needed for characterization and investigation of the sulfate plume. The proposed sampling plan for the tailings impoundment investigation includes the wells and parameters listed in Table 9. Several of the wells listed in Table 9 are currently dry, but data would be needed from these points if water were present. Access to MW-4 will depend on permitting from the land owner, and drilling, construction, and data collection from proposed monitoring well B is dependent on what is found at proposed monitoring well A.

Table 9. Proposed monitoring plan for Copper Flat Mine tailings impoundment area

monitoring point	4th QTR 2011*	1st QTR 2012*	2nd QTR 2012*	3rd QTR 2012*
IW-1	WL, WQ	WL, WQ	WL, WQ	WL, WQ
IW-2	WL, WQ	WL, WQ	WL, WQ	WL, WQ
IW-3	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-13	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-14	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-16	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-18	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-19	WL, WQ	WL, WQ	WL, WQ	WL, WQ
NP-3	WL, WQ	WL, WQ	WL, WQ	WL, WQ
MW-4	WL, WQ	WL, WQ	WL, WQ	WL, WQ
proposed MW-A	WL, WQ	WL, WQ	WL, WQ	WL, WQ
proposed MW-B	WL, WQ	WL, WQ	WL, WQ	WL, WQ

* access and schedule dependent on land owner permission or BLM right-of-way permitting (including evaluation of cultural resource issues, etc.)

WQ - water-quality analysis (total dissolved solids (TDS), sulfate, chloride, alkalinity, calcium, magnesium, sodium, potassium, and field parameters of temperature, specific conductance, and pH)

WL - water level

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ILLUSTRATIONS

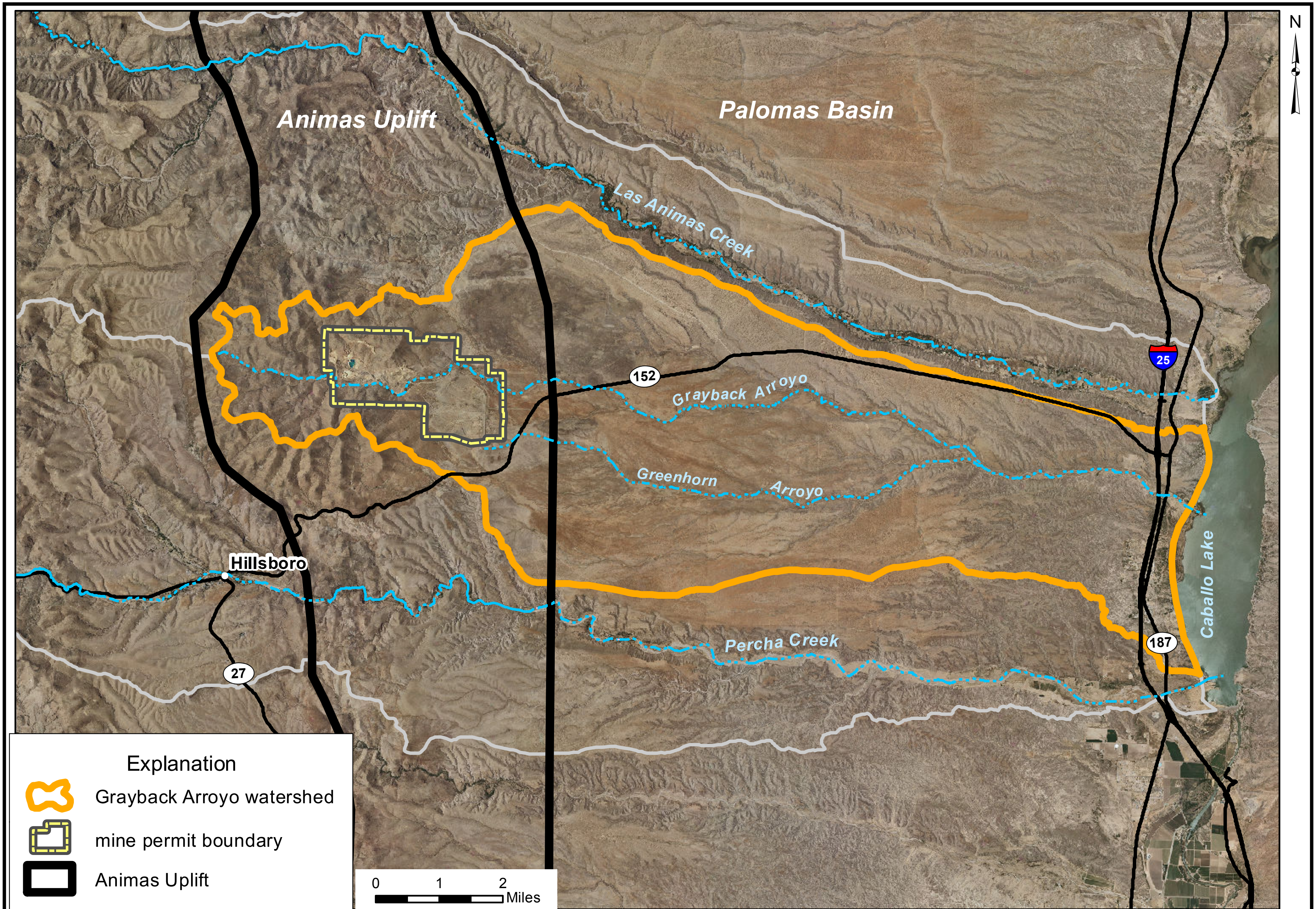

Figure 1. Regional map showing locations of Copper Flat Mine permit area, watersheds, and geographical features, Sierra County, New Mexico.

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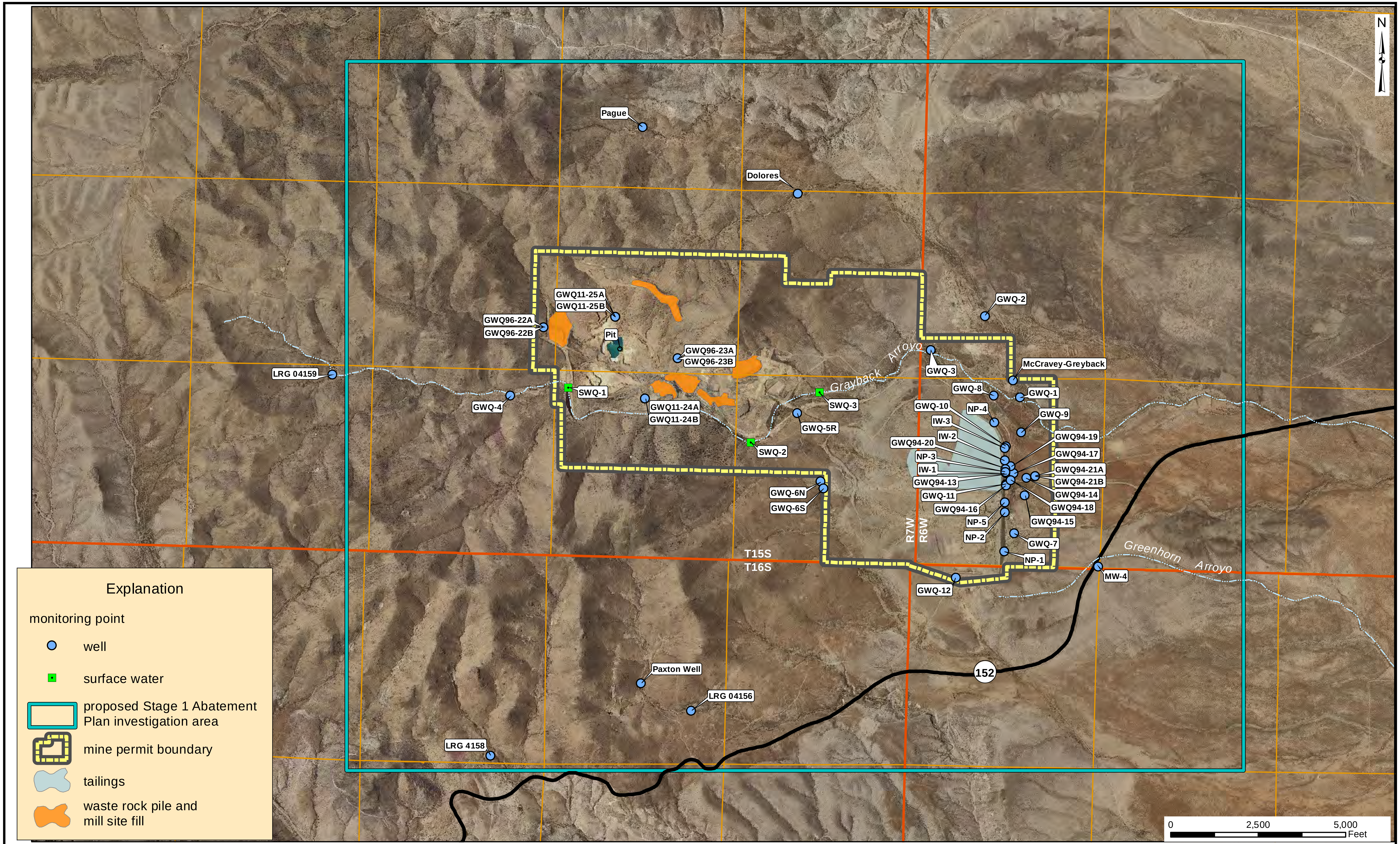

Figure 2. Map of proposed Stage 1 Abatement Plan area of investigation, Copper Flat Mine facilities, and monitoring point locations, Copper Flat Mine, Sierra County, New Mexico.

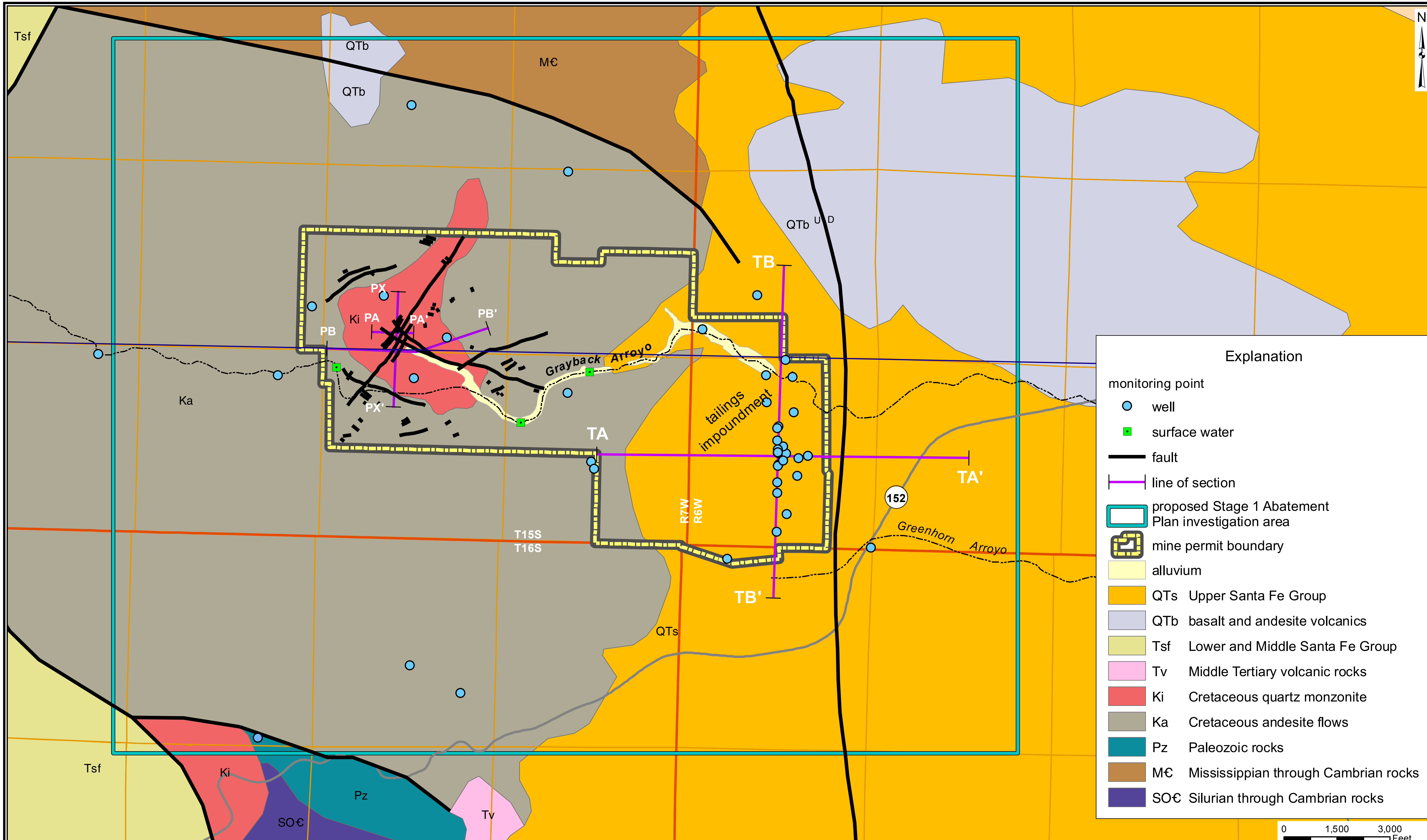

Figure 3. Geologic map showing distribution of hydrogeologic units within the area of investigation and lines of section for tailings impoundment area, Copper Flat Mine, Sierra County, New Mexico.

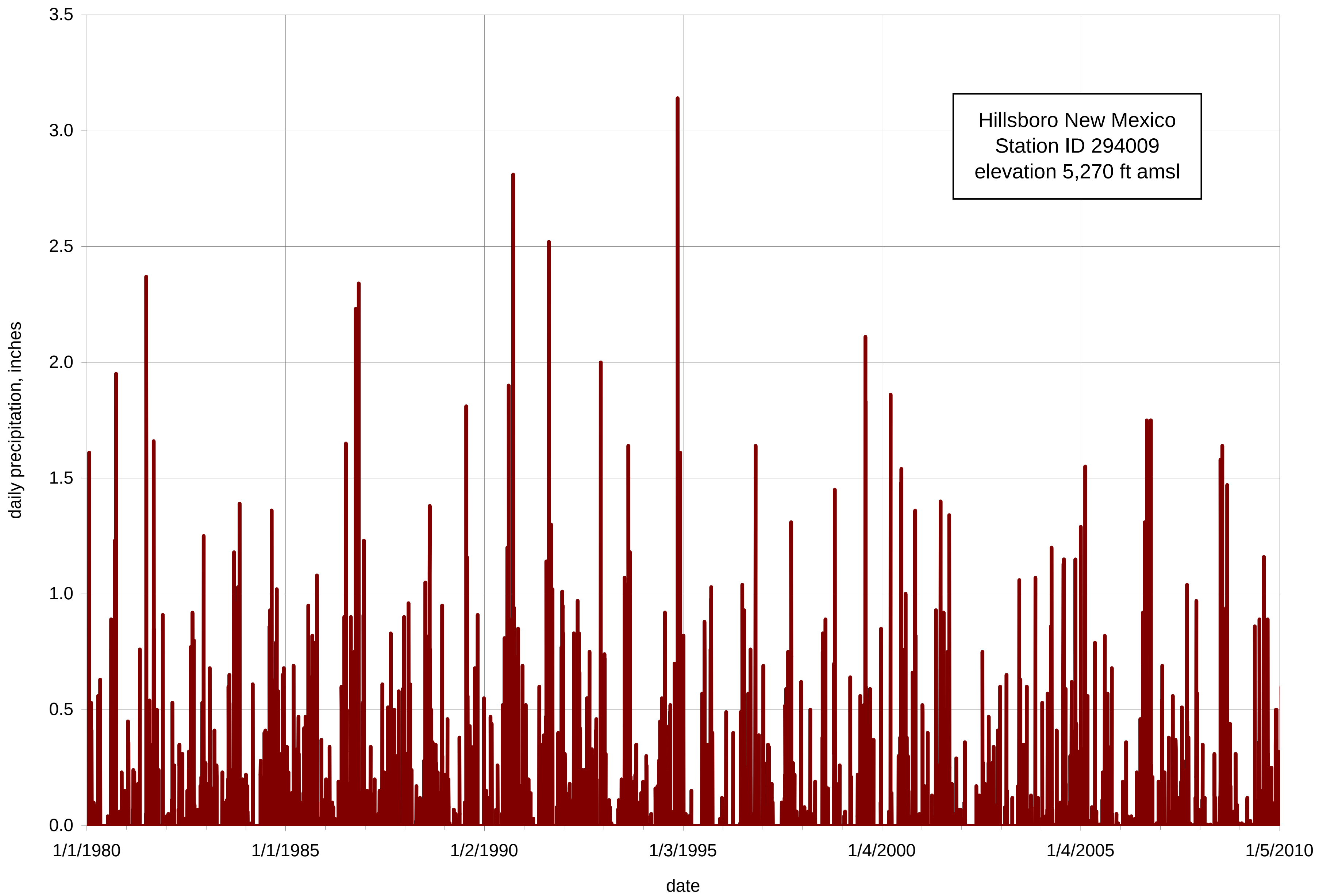

Figure 4. Graph of daily precipitation at Hillsboro, New Mexico for the time period 1980 to 2010.

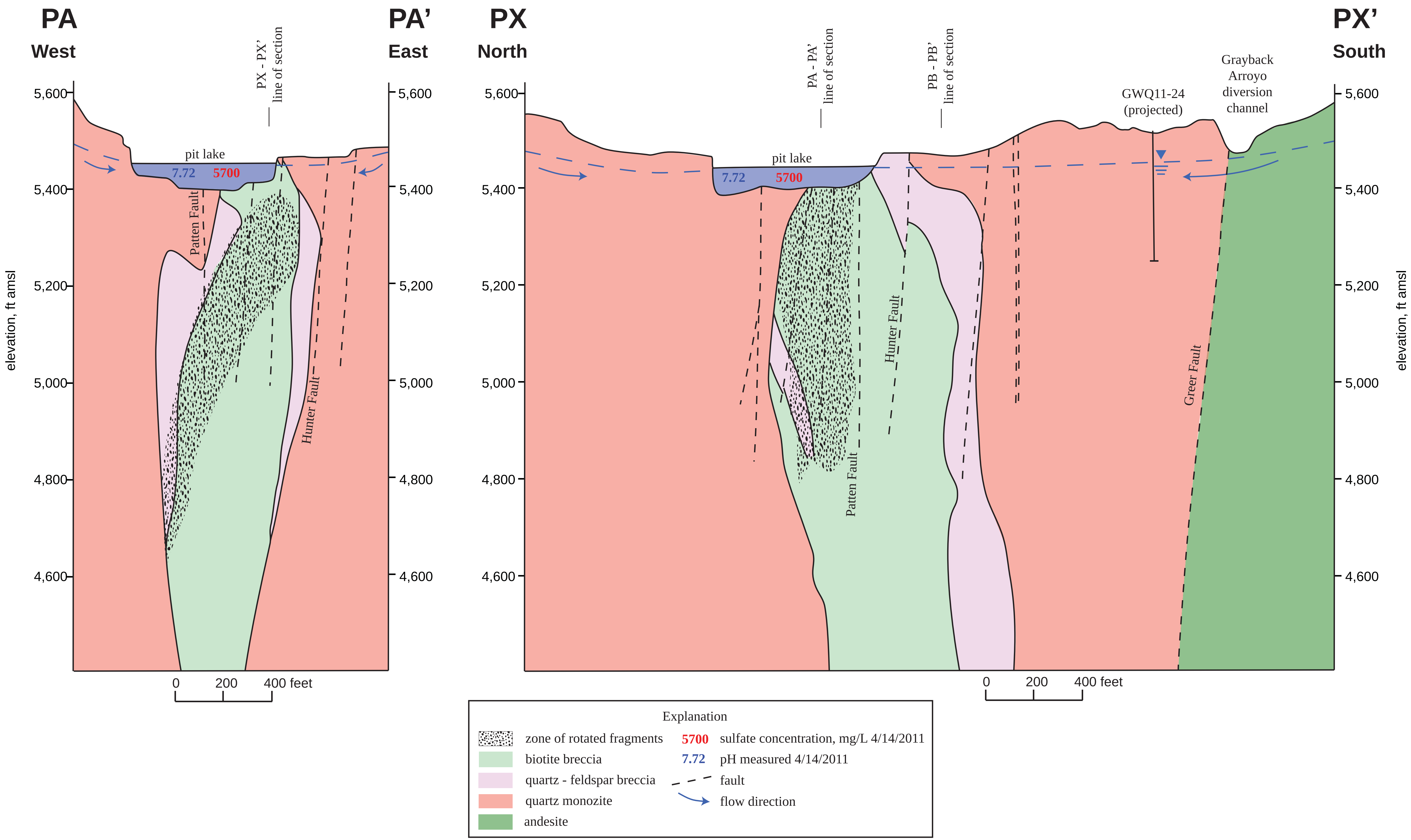

Figure 5. Hydrogeologic cross-sections PA-PA' and PX-PX', Copper Flat Mine pit lake area, Sierra County, New Mexico.

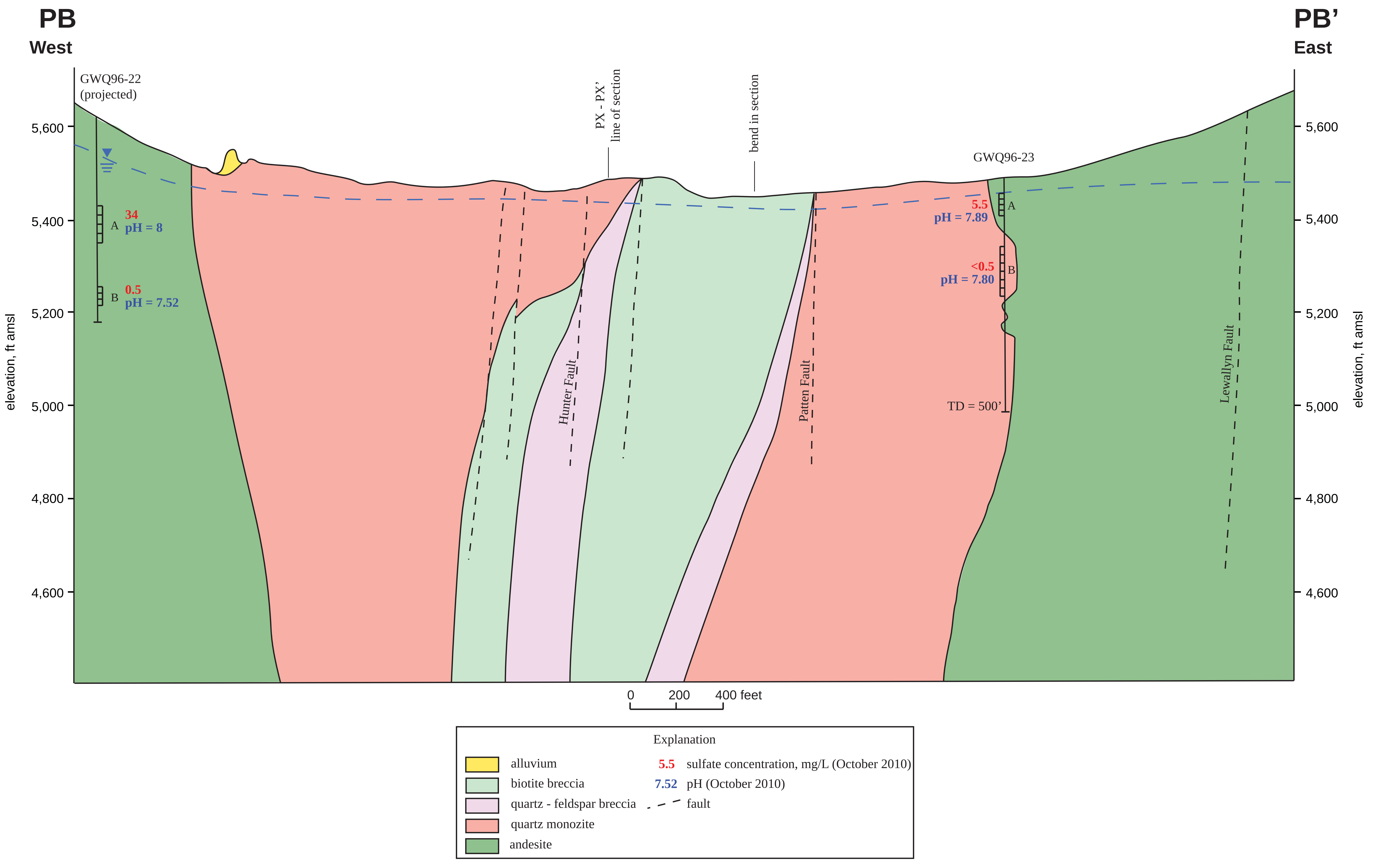

Figure 6. Hydrogeologic cross-section PB-PB', Copper Flat Mine pit lake area, Sierra County, New Mexico.

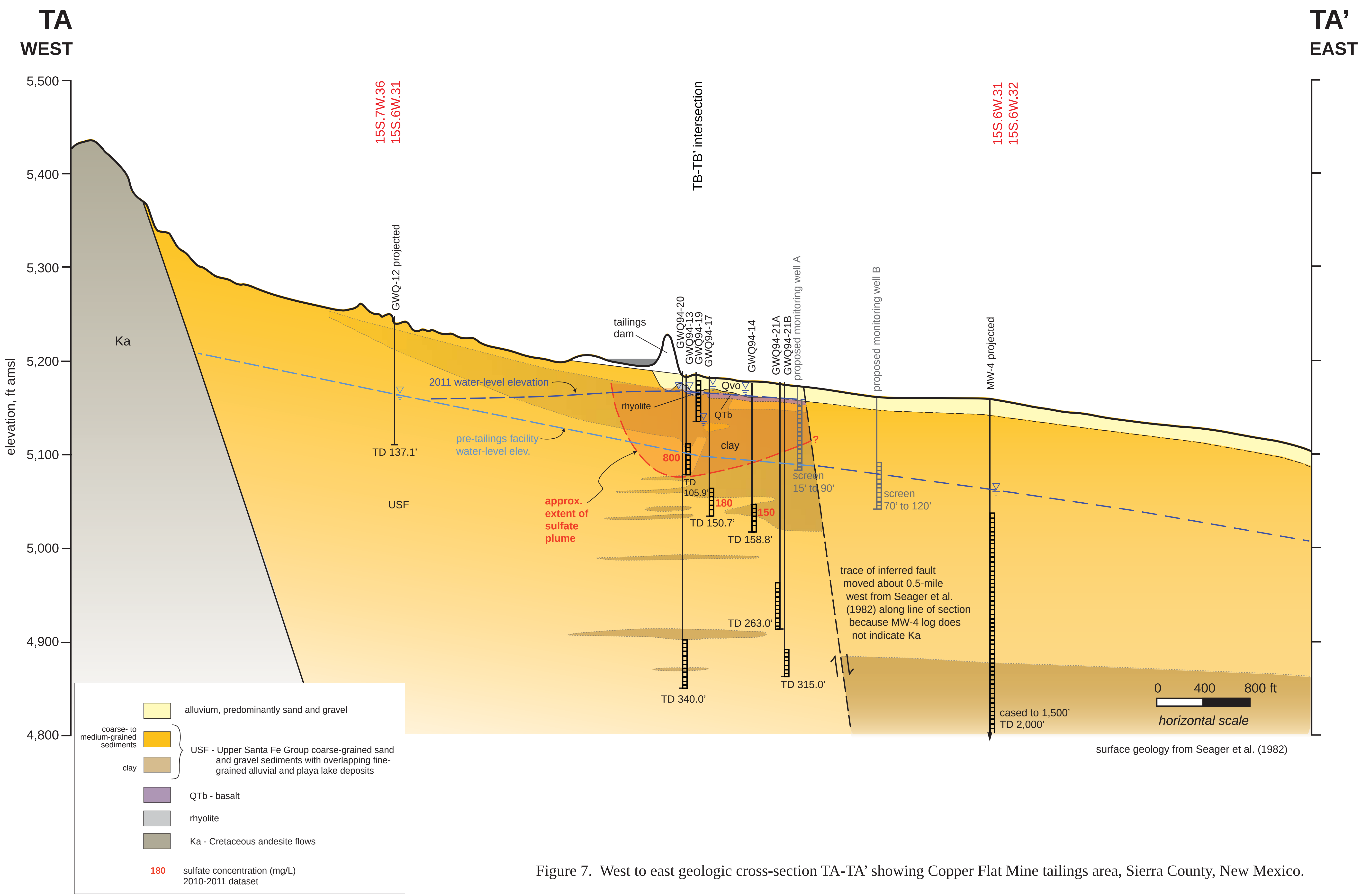

Figure 7. West to east geologic cross-section TA-TA' showing Copper Flat Mine tailings area, Sierra County, New Mexico.

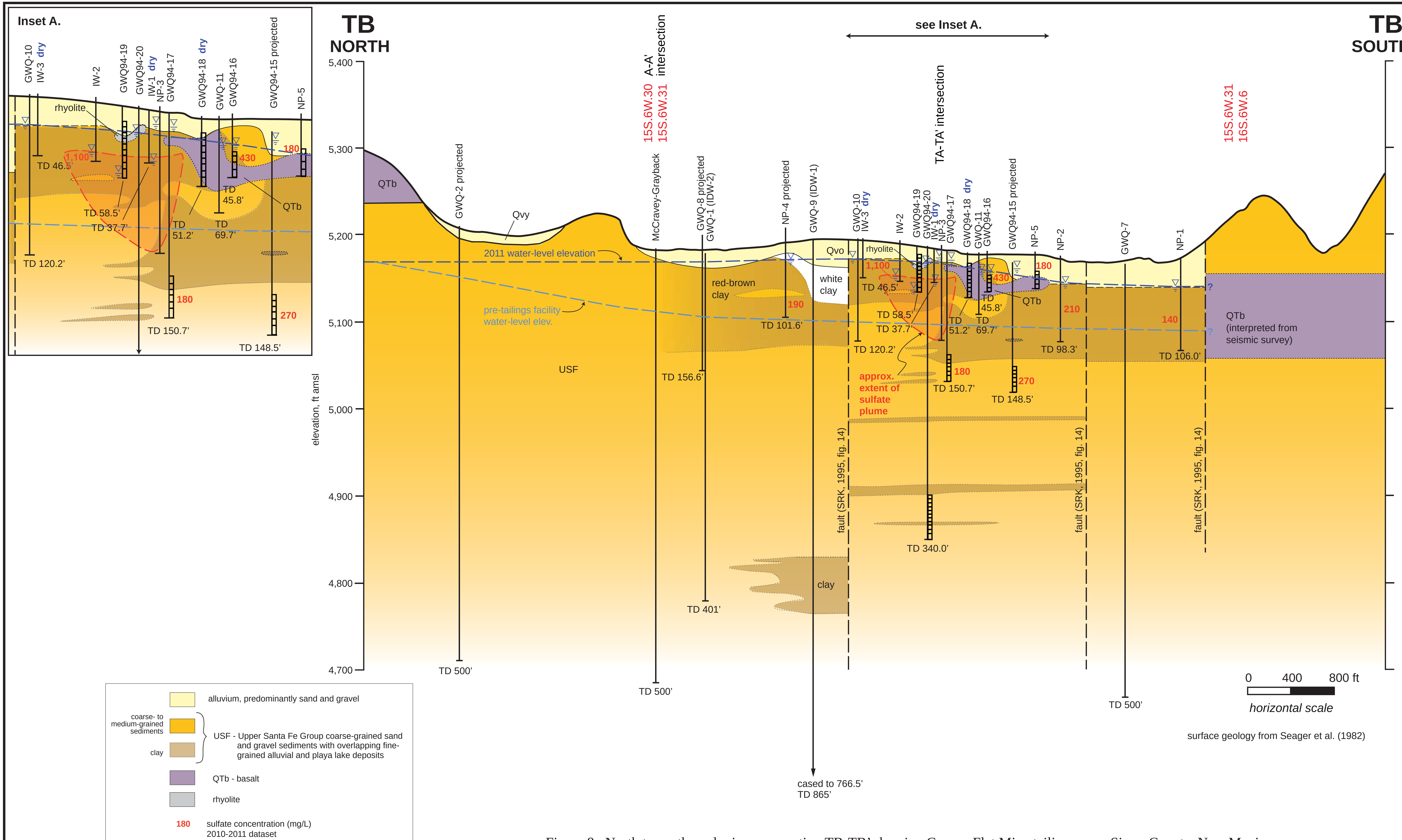

Figure 8. North to south geologic cross-section TB-TB' showing Copper Flat Mine tailings area, Sierra County, New Mexico.

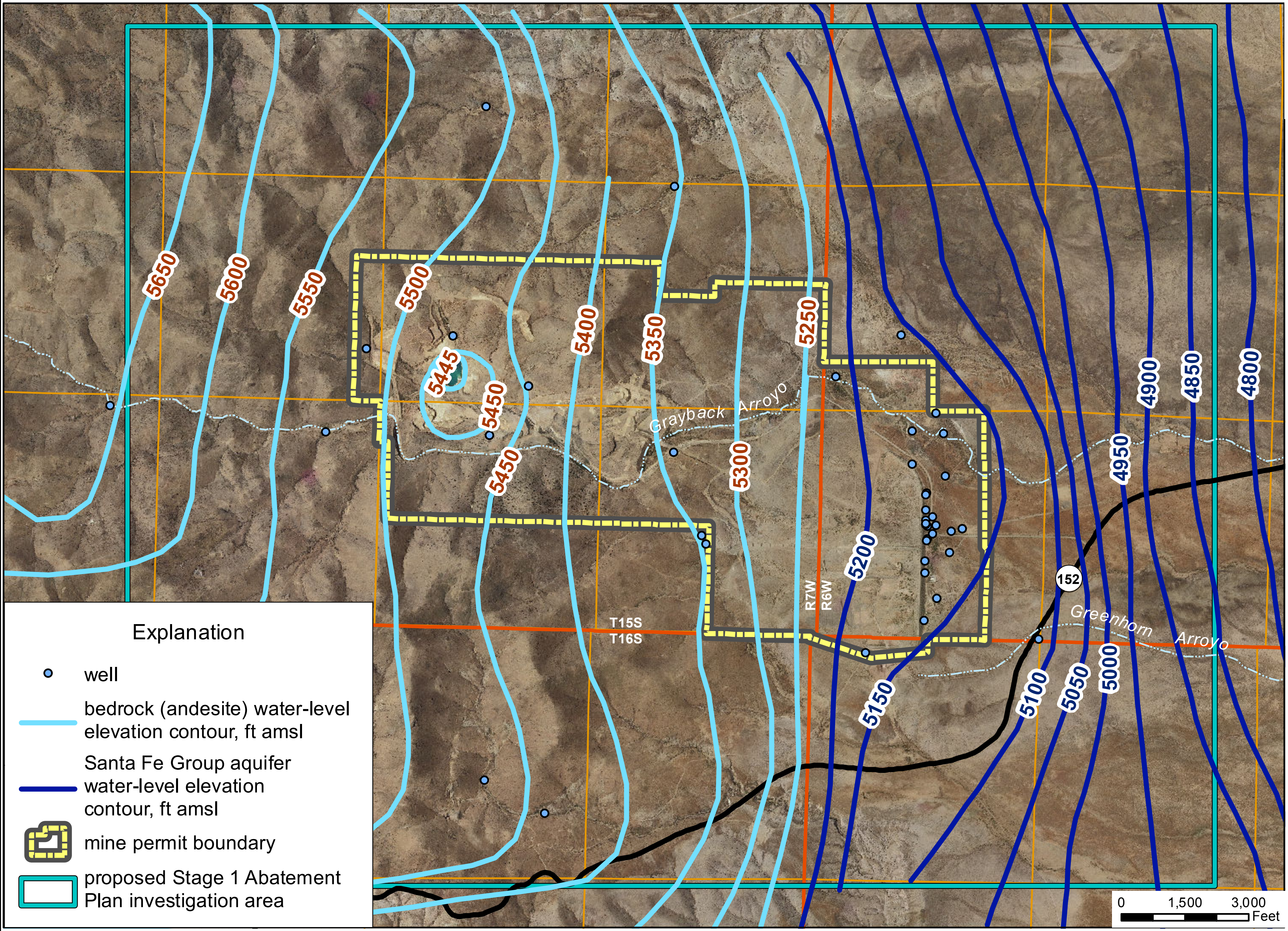

Figure 9. Water-level elevation contour map for Stage 1 Abatement Plan area of investigation, Copper Flat Mine, Sierra County, New Mexico.

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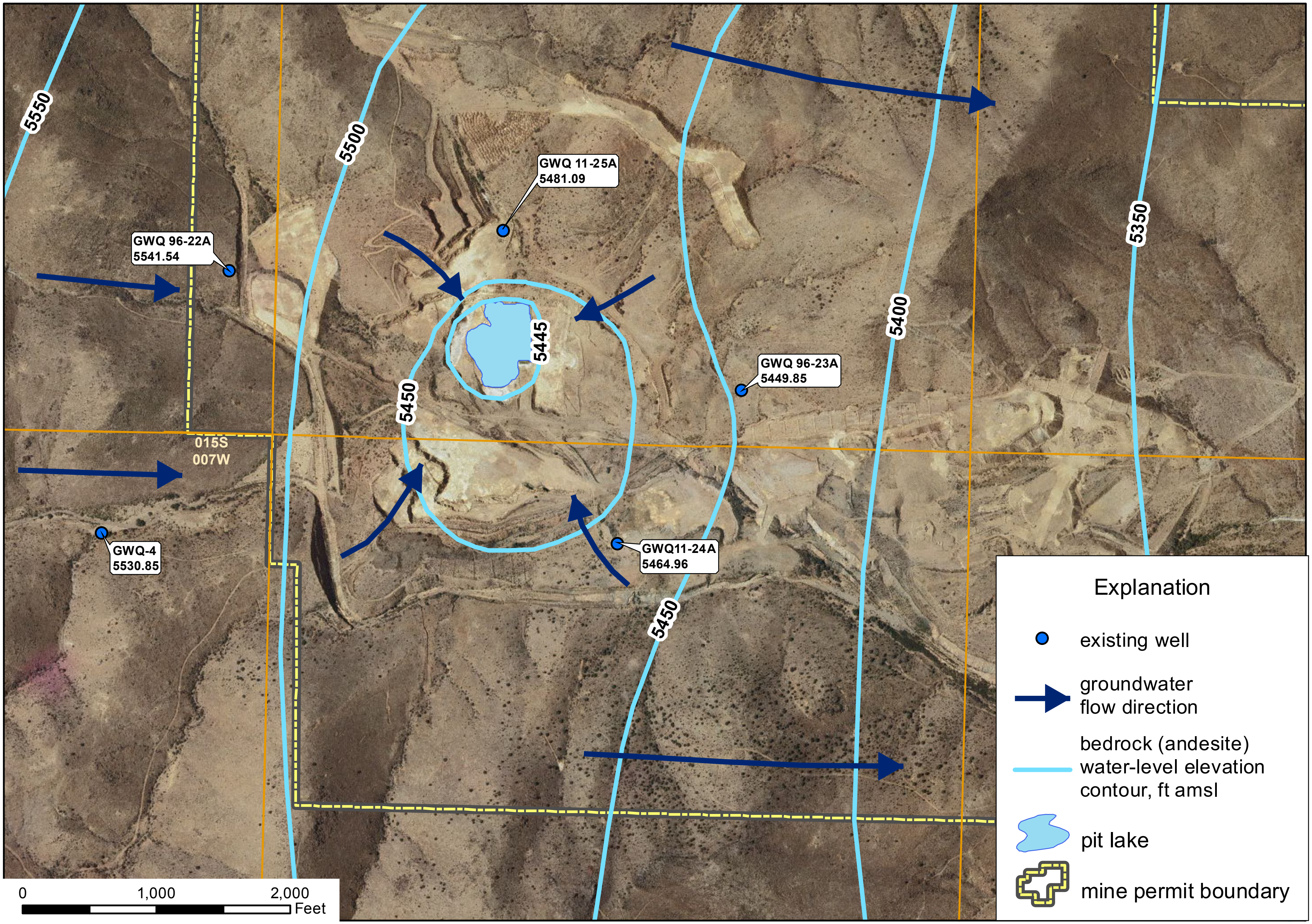

Figure 10. Aerial photograph showing water-level elevation contours and direction of groundwater flow for the Copper Flat Mine pit lake area, Sierra County, New Mexico.

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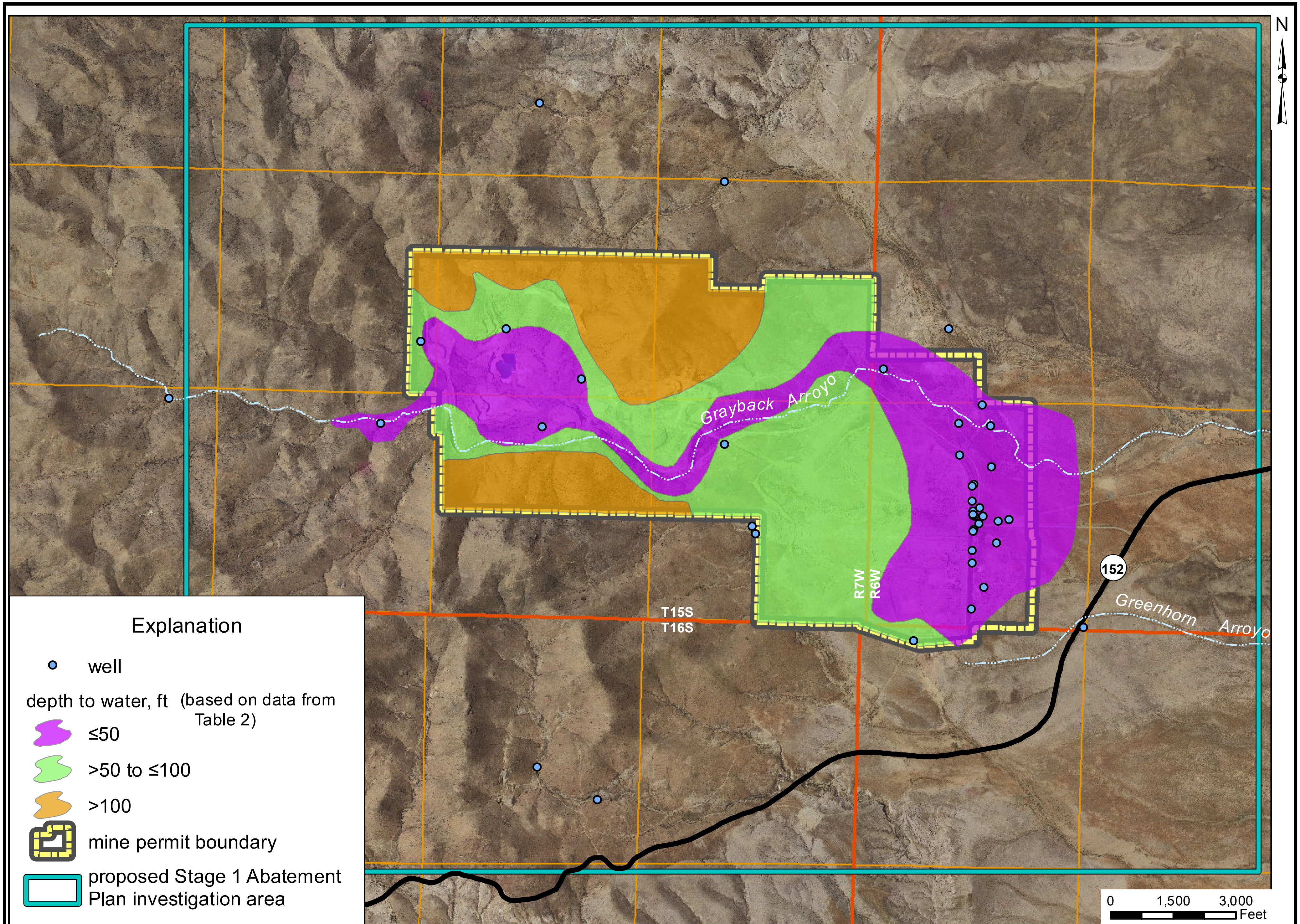

Figure 11. Map showing depth to water in the Copper Flat Mine permit boundary facilities, Sierra County, New Mexico.

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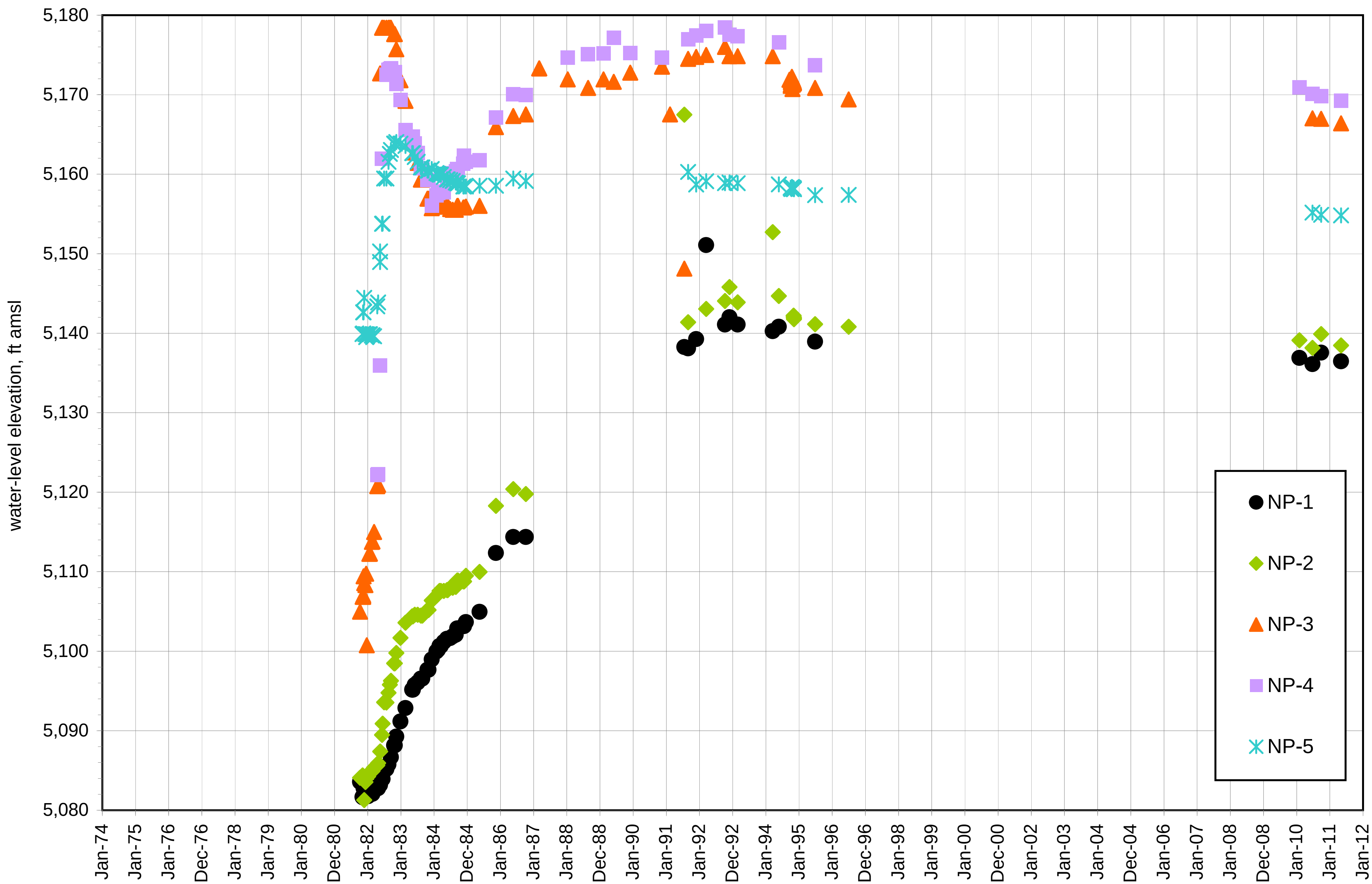

Figure 12. Graph showing historical water levels for monitoring wells NP-1 through NP-5, Copper Flat Mine tailings facility, Sierra County, New Mexico.

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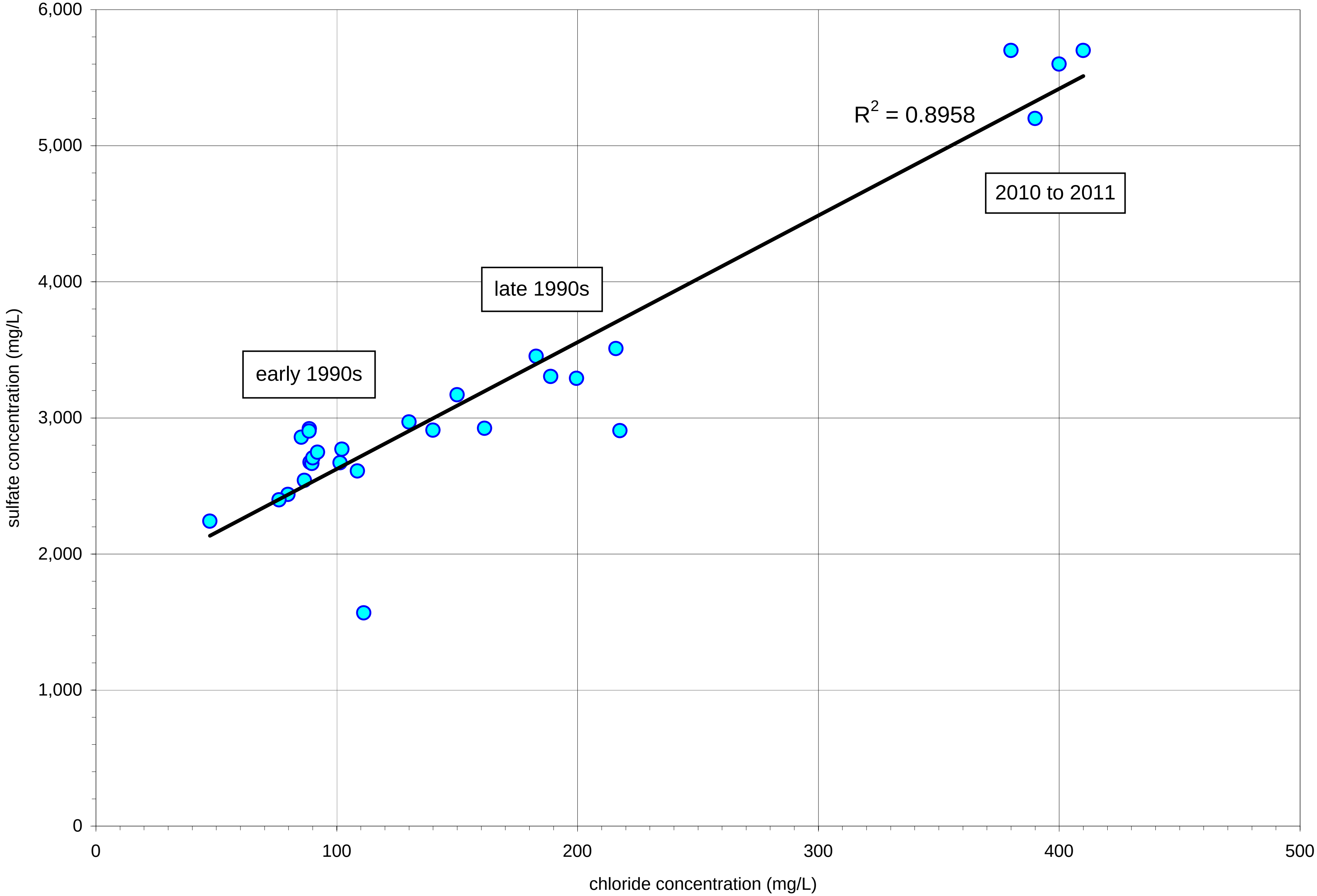

Figure 13. Graph of sulfate versus chloride concentrations for Copper Flat Mine pit lake, Sierra County, New Mexico.

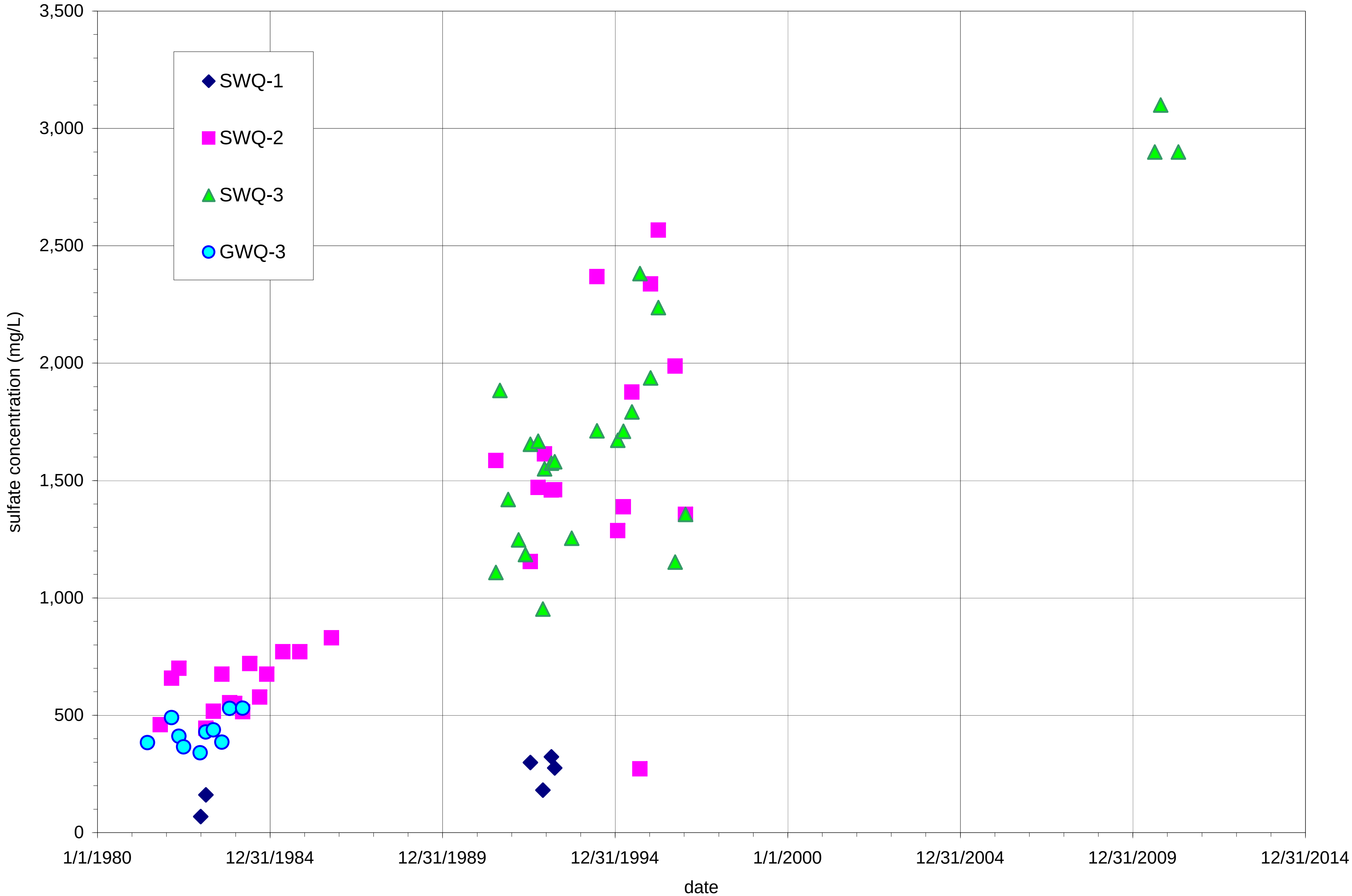

Figure 14. Time-series sulfate concentration plot for SWQ-1, SWQ-2, SWQ-3, and GWQ-3, Copper Flat Mine, Sierra County, New Mexico.

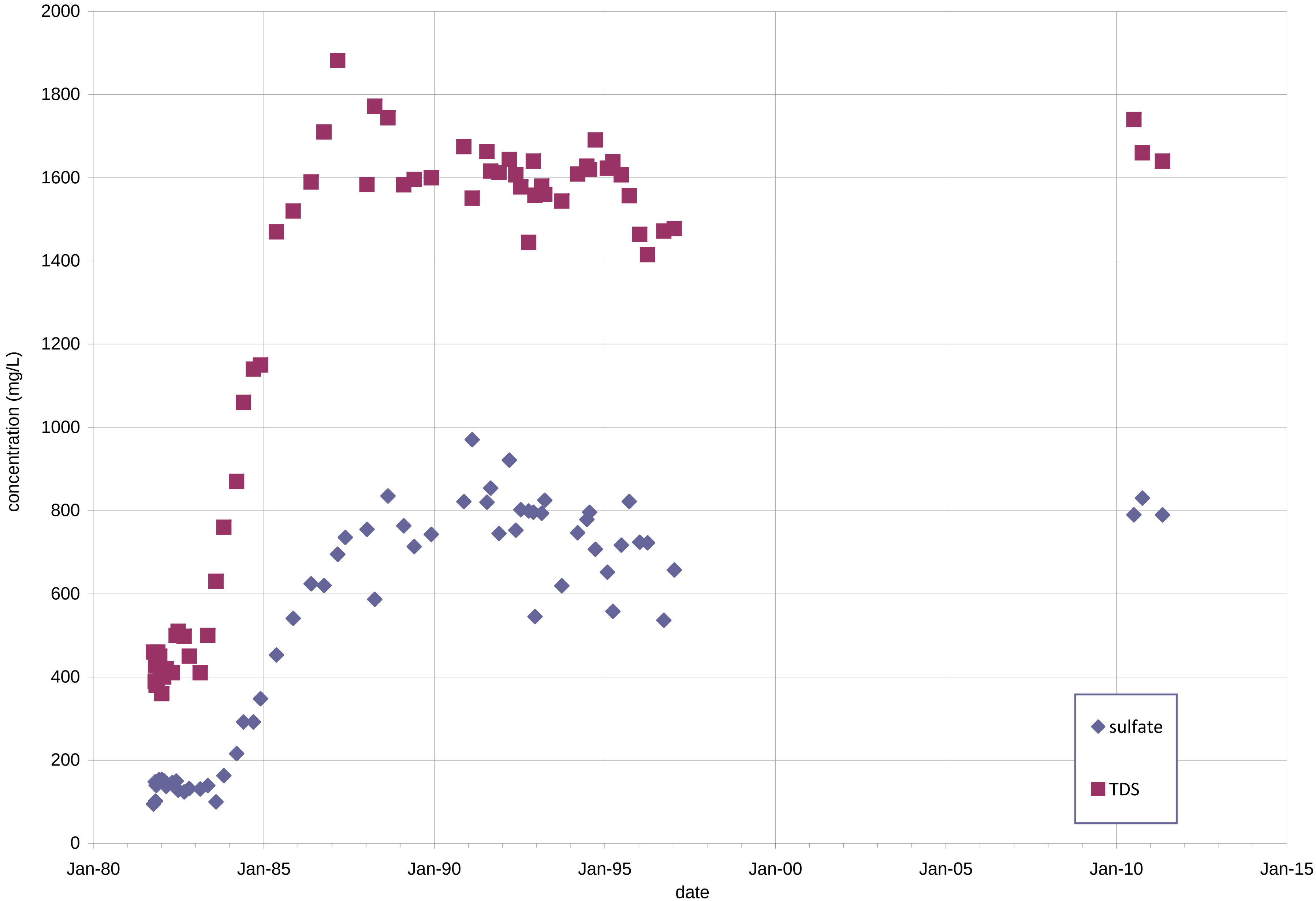

Figure 15. Time-series sulfate and total dissolved solids (TDS) concentrations plot for monitoring well NP-3, Copper Flat Mine tailings impoundment area, Sierra County, New Mexico.

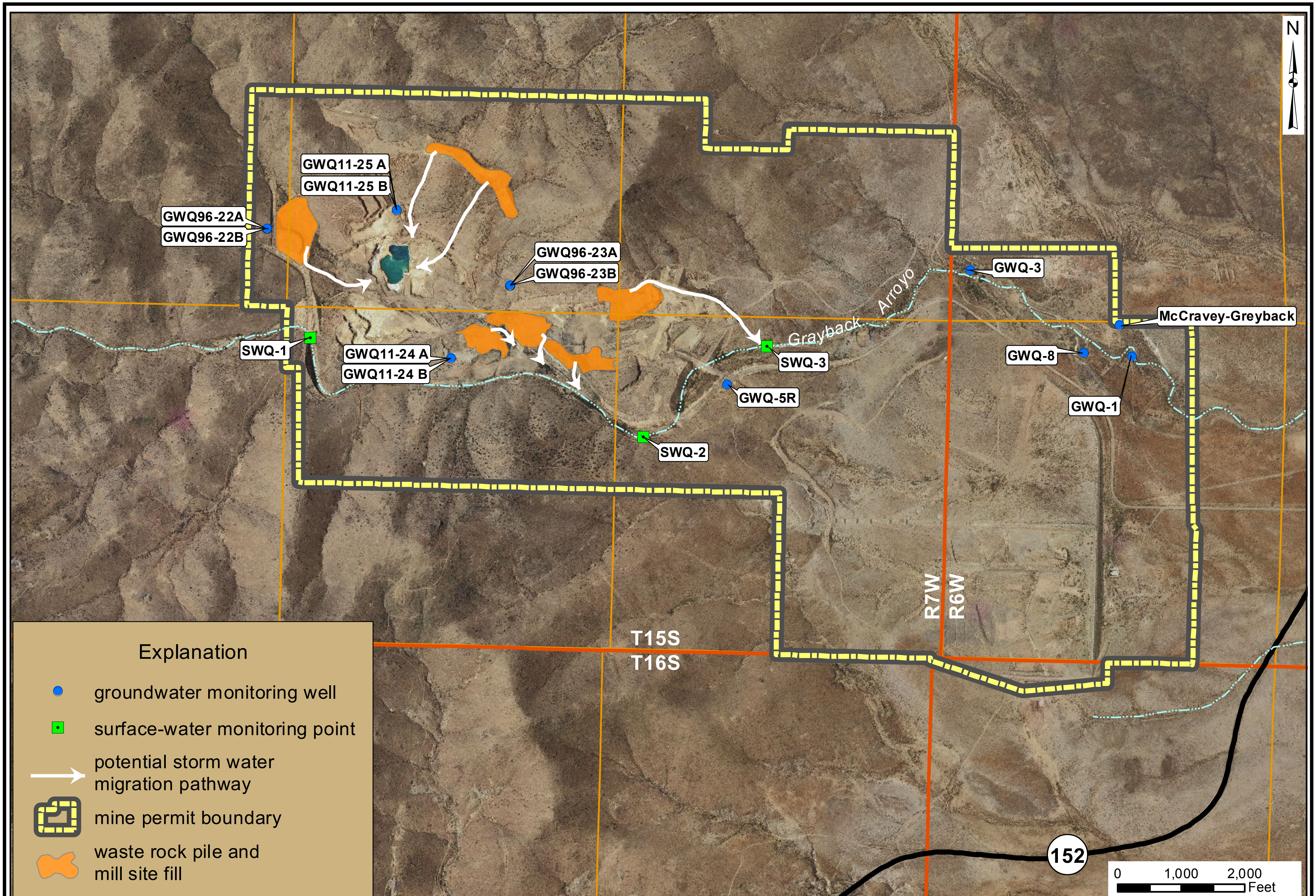

Figure 16. Map showing locations of waste-rock piles, surface-water and groundwater monitoring points, and potential waste-rock leachate migration pathways, Copper Flat Mine, Sierra County, New Mexico.

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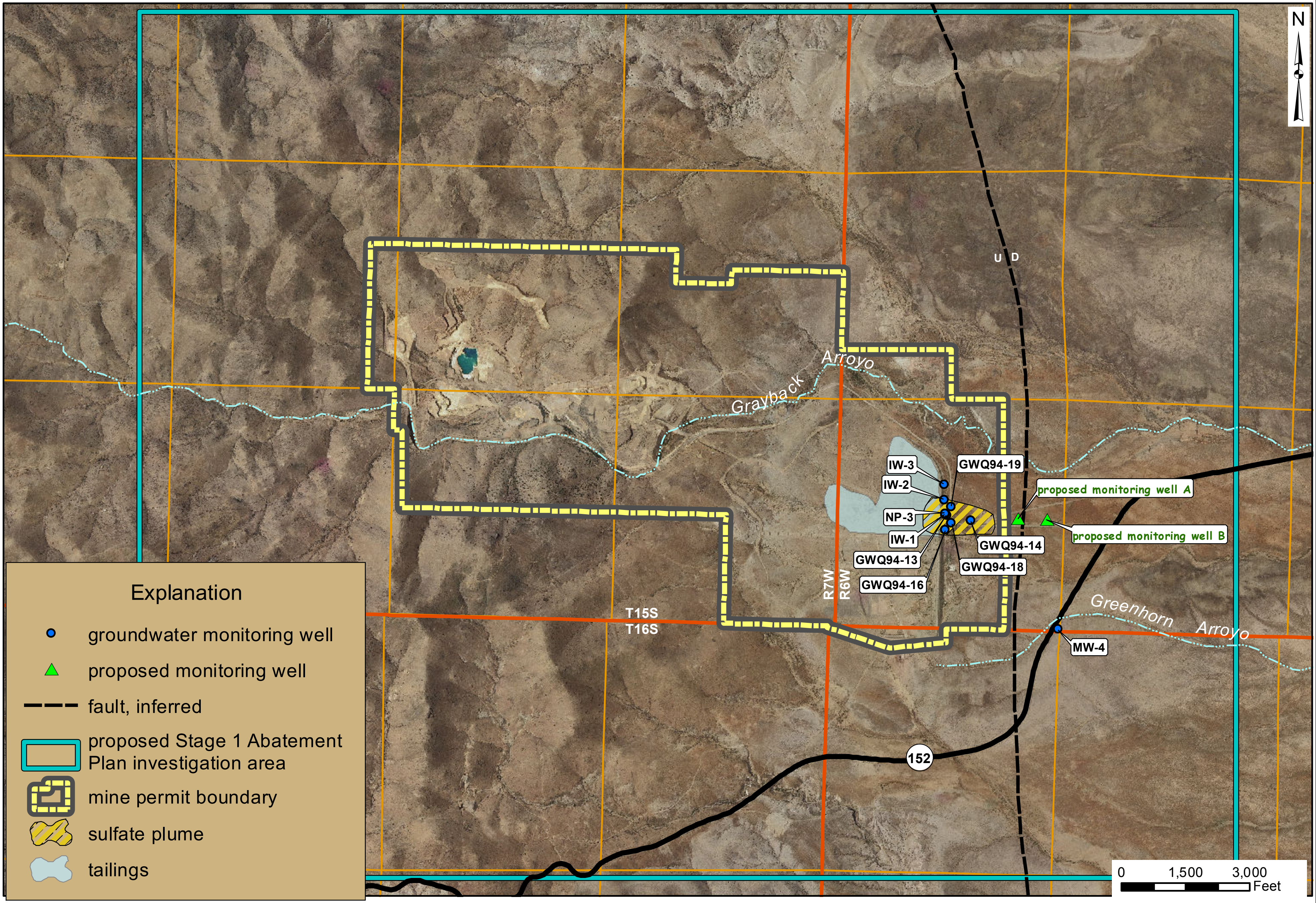


Figure 17. Map showing lateral extent of sulfate plume associated with Copper Flat Mine tailings impoundment facility and proposed monitoring wells, Sierra County, New Mexico.

APPENDICES

Appendix A.

Revised tables from Stage 1 Abatement Plan dated March 31, 2011 (INTERA, 2011)
Table A-1. Pit lake water-quality data
Table A-2. Surface-water-quality data
Table A-3. Groundwater-quality data

Appendix A.
Table A-1. Pit lake water-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)
PL-WQ	4/3/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		1.10	<0.1	<0.1	<0.1			
PL-WQ	11/14/1990																			
PL-WQ	2/11/1991	0.03		<0.001	<0.01			0.035		0.06		0.18	0.0004	1.84			0.006		<0.001	
PL-WQ	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02		0.27	<0.0002	2.03			<0.005		<0.001	
PL-WQ	8/29/1991										0.64									
PL-WQ	11/26/1991										0.08									
PL-WQ	3/15/1992																			
PL-WQ	5/25/1992																			
PL-WQ	7/16/1992																			
PL-WQ	10/8/1992																			
PL-WQ	11/27/1992																			
PL-WQ	12/15/1992										3.21									
PL-WQ	2/25/1993																			
PL-WQ	9/23/1993										0.00			0.02						
PL-WQ	3/17/1994	<0.02									0.09			4.43						
PL-WQ	9/22/1994																			
PL-WQ	12/12/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	0.017	<0.05	<0.025	0.03	<0.05	<0.001	3.60	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
PL-WQ	12/19/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	0.017	<0.05	<0.025	0.03	<0.05	<0.001	3.40	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
PL-WQ	1/29/1995																			
PL-WQ	3/29/1995																			
PL-WQ	6/27/1995																			
PL-WQ	9/21/1995	<0.025	0.13	<0.005	<0.05	<0.002	<0.1	0.014	<0.05	<0.025	<0.025	<0.05	<0.001	3.00	<0.05	<0.05	<0.005	<0.005	<0.25	<0.005
PL-WQ	1/10/1996																			
PL-WQ	4/3/1996																			
PL-WQ	9/25/1996																			
PL-WQ	1/15/1997																			
PL-NW	6/20/2008																			
PL-E	6/20/2008																			
PL-WQ (0 ft)	1/30/2010	<0.025	5.50	0.006	<0.010	0.017	<0.20	0.056	0.37	<0.030	11.00	1.30	<0.00020	41.00	<0.040	0.067	<0.025	<0.0025	0.031	<0.0050
PL-WQ-03 (3 ft)	9/10/2010	<0.005	1.70	<0.001	0.012	0.016	0.13	0.063	0.34	<0.006	2.00	0.03	<0.0002	45.00	0.015	0.067	<0.005	<0.001	0.021	<0.005
PL-WQ-01 (28 ft)	9/10/2010	<0.0050	1.60	<0.001	0.012	0.016	0.13	0.064	0.35	<0.006	1.90	0.03	<0.0002	44.00	0.015	0.068	0.0054	<0.001	0.022	<0.001
PL-WQ-04 (comp)	9/10/2010	<0.005	1.60	<0.001	0.011	0.015	0.13	0.061	0.33	<0.006	1.90	0.02	<0.0002	43.00	0.015	0.065	0.0056	<0.001	0.023	<0.005
PL-WQ-05 (7ft)	1/20/2011	<0.025	0.48	<0.001	0.010	0.016	<0.2	0.062	0.39	<0.03	0.61	<0.1	<0.0002	42.00	<0.04	0.069	<0.025	<0.001	0.025	<0.001
PL-WQ-06 (17 ft)	1/20/2011	<0.025	0.51	<0.001	0.011	0.016	<0.2	0.062	0.38	<0.03	0.59	<0.1	<0.0002	44.00	<0.04	0.066	<0.025	<0.001	0.025	<0.005
PL-WQ-07 (26 ft)	1/20/2011	<0.025	0.54	<0.005	0.012	0.016	<0.2	0.061	0.39	<0.03	0.64	<0.1	<0.0002	39.00	<0.04	0.068	0.026	<0.005	0.031	<0.005
PL-WQ-08 (comp)	1/20/2011	<0.025	0.48	<0.005	0.010	0.015	<0.2	0.060	0.37	<0.03	0.59	<0.1	<0.0002	44.00	<0.04	0.066	<0.025	<0.005	0.030	<0.005
PL-WQ-09 (1 ft)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.059	0.34	< 0.006	0.11	< 0.020	< 0.00020	44.00	0.025	0.061	< 0.0050	< 0.0010	0.019	< 0.0010
PL-WQ-10 (3 ft)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.057	0.33	< 0.0060	0.11	< 0.020	< 0.00020	41.00	0.023	0.058	< 0.0050	< 0.0010	0.019	< 0.0010
PL-WQ-11 (16 ft)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.058	0.34	< 0.0060	0.12	< 0.020	< 0.00020	41.00	0.024	0.059	0.0055	< 0.0010	0.020	< 0.0010
PL-WQ-12 (comp)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.059	0.34	< 0.0060	0.12	< 0.020	< 0.00020	42.00	0.024	0.060	< 0.0050	< 0.0010	0.023	< 0.0010
pit wall seepage	2/25/1993		3720.00								684.00	375.00		142.00						
pit wall seepage	8/19/2010	<0.25	540.00	0.0016	<0.1	0.140	<0.2	0.140	1.50	<0.3	80.00	1600.00	<0.001	24.00	<0.4	<0.5	<0.25	<0.01	0.086	<0.0010

Notes: no data are available for blank cells (not analyzed)
outlier values in gray shading

Appendix A.
Table A-1. Pit lake water-quality data

sample location	analysis date	uranium (mg/L)	vadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbote (mg/L)	bicarbote (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	ammonia (mg/L)	total suspended solids	comments
PL-WQ	4/3/1989			0.4			3,546				640	129	165	11		96	47	2,240				
PL-WQ	11/14/1990						4,064										102	2,770				
PL-WQ	2/11/1991				7.20	3,980	2,711		0.1		600	157.3	224	16.4	0	55	80	2,437	4.8			
PL-WQ	7/19/1991				7.76	6,340	4,520		0.03		684	209.1	248	20.3	0	88	89	2,920	6.3			
PL-WQ	8/29/1991				7.61		4,384										89	2,674				
PL-WQ	11/26/1991				7.61		4,175										87	2,540				
PL-WQ	3/15/1992				4.88		3,819										85	2,857				
PL-WQ	5/25/1992				4.82		3,846										90	2,665				
PL-WQ	7/16/1992				4.36		4,229										76	2,397				
PL-WQ	10/8/1992				4.85		4,258										90	2,706				
PL-WQ	11/27/1992				6.26		3,900										731	2,500				
PL-WQ	12/15/1992				6.04		4,151										89	2,902				
PL-WQ	2/25/1993				6.29		3,951										92	2,748				
PL-WQ	9/23/1993			0.0	6.71		4,468										111	1,566				
PL-WQ	3/17/1994			1.0	7.46		3,179										101	2,670				
PL-WQ	9/22/1994				8.04		5,124										141					
PL-WQ	12/12/1994			0.1	7.71	4,720	4,600		<5		580	250	350	17	0	102	140	2,910	8.1			
PL-WQ	12/19/1994			0.1	7.52	4,690	4,380		<5		550	250	320	18	0	104	130	2,970	8.1			
PL-WQ	1/29/1995				7.69		4,675										218	2,906				
PL-WQ	3/29/1995				7.53		4,891										109	2,610				
PL-WQ	6/27/1995						5,640										161	2,924				
PL-WQ	9/21/1995			0.1	8.31	5,230	5,230		<5		620	300	430	21	0	122	150	3,170	10.0			
PL-WQ	1/10/1996				7.90		5,398										183	3,452				
PL-WQ	4/3/1996				7.95		5,378										189	3,304				
PL-WQ	9/25/1996				8.26		6,041										200	3,290				
PL-WQ	1/15/1997				8.05		5,772										216	3,509				
PL-NW	6/20/2008				4.43		7,540	<2.5			504	485	624	23	<2.5	<3	259	4,520				NMED
PL-E	6/20/2008				4.43		7,950	<2.5			508	495	638	24	<2.5	<3	230	4,460				NMED
PL-WQ (0 ft)	1/30/2010			6.4	6.00	5,700	7,770	<20	<2.0		540	570	690	25	<2.0	<20	390	5,200	18.0			
PL-WQ-03 (3 ft)	9/10/2010	0.12	<0.05	6.8	6.71	6,700	8,390	<20	<1.0		580	640	760	26	<2	<20	400	5,600	17.0		<10	
PL-WQ-01 (28 ft)	9/10/2010	0.12	<0.05	6.7	6.67	6,600	8,400	<20	<1.0		570	630	750	26	<2	<20	400	6,200	18.0		<10	
PL-WQ-04 (comp)	9/10/2010	0.11	<0.05	6.6	6.70	6,700	8,340	<20	<1.0		560	610	730	26	<2	<20	380	6,000	15.0		<10	
PL-WQ-05 (7ft)	1/20/2011	0.11	<0.25	5.8	7.17	7,900	8,170	31	<0.1		570	640	740	29	<2	31	380	5,700	15.0	<1	<10	
PL-WQ-06 (17 ft)	1/20/2011	0.11	<0.25	5.7	7.19	8,000	8,120	31	<0.1		570	640	740	29	<2	31	380	5,600	16.0	<1	12	
PL-WQ-07 (26 ft)	1/20/2011	0.11	<0.25	6.0	7.18	8,000	8,210	30	<0.1		590	660	760	29	<2	30	400	5,900	16.0	<1	<10	
PL-WQ-08 (comp)	1/20/2011	0.11	<0.25	5.3	7.23	8,000	7,780	30	<0.1		520	590	680	28	<2	30	380	5,500	16.0	<1	14	
PL-WQ-09 (1 ft)	4/14/2011	0.11	< 0.050	5.2	7.62	7,800	8,590	41	< 0.10		610	680	800	32	< 2.0	41	420	5,600	17.0	< 1.0	< 10	
PL-WQ-10 (3 ft)	4/14/2011	0.12	< 0.050	5.0	7.68	7,800	8,700	41	< 0.10		600	670	790	32	< 2.0	41	420	5,800	16.0	< 1.0	< 10	
PL-WQ-11 (16 ft)	4/14/2011	0.12	< 0.050	5.1	7.69	7,800	8,600	41	< 0.10		590	660	770	32	< 2.0	41	400	5,700	16.0	< 1.0		
PL-WQ-12 (comp)	4/14/2011	0.11	< 0.050	5.0	7.72	7,800	8,390	41	0.1		600	670	780	32	< 2.0	41	410	5,700	16.0	< 1.0	< 10	
pit wall seepage	2/25/1993			51.0	1.90				0.9		446	236	93	3.1		<1	35	10,000	11.1			
pit wall seepage	8/19/2010	1.40	<2.5	12.0	2.00	6,500	13,900	<20	<1.0	<0.005	470	190	<50	<50	<2	<20	21	11,000	51.0			

Notes: no data are available for blank cells (not analyzed)
outlier values in gray shading

Appendix A.
Table A-2. Surface-water-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	original order
SWQ-1	12/28/1982							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.00		250		0.90	<0.01							10.0	68	0.3	1
SWQ-1	2/21/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.00		470		4.40	<0.01							20.0	161	0.3	2
SWQ-1	7/16/1992																							7.37		965										47.2	298		3
SWQ-1	11/27/1992																							8.31		545										16.7	181		4
SWQ-1	2/25/1993																							8.34		844										28.9	323		5
SWQ-1	4/1/1993	<0.01	<0.1	<0.005	<0.5		0.02	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				<0.01	8.30	1,150	782	360	0.00	<0.01	109	36	107	1.8	0	430	27.0	276	0.5	6
SWQ-2	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.05	0.004	<0.05	<0.05		<0.02		<0.005					8.70		1,060		6.60	<0.01	175						46.0	460	0.8	7
SWQ-2	2/25/1982							<0.005			<0.05	0.13	<0.001	<0.05	<0.05				<0.005					8.10		1,360		4.20	<0.01							80.0	658	0.7	8
SWQ-2	5/12/1982							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					7.90		1,380		3.00	<0.01							108.0	700	0.7	9
SWQ-2	2/21/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.40		990		0.80	<0.01							68.0	445	0.7	10
SWQ-2	5/13/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.40		1,120		0.30	<0.01							84.0	517	0.8	11
SWQ-2	8/9/1983							<0.005			<0.05	<0.01	<0.001	0.06	<0.05				<0.005					8.00		1,620		<0.20	<0.01							142.0	675	0.7	12
SWQ-2	11/1/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.20		1,170		0.30	<0.01							72.0	553	0.8	13
SWQ-2	12/23/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.00		1,180		11.20	<0.01							82.0	550	0.5	14
SWQ-2	3/16/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.30		1,140		5.30	<0.01							68.0	515	0.8	15
SWQ-2	5/30/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.10		1,420		0.40	<0.01							94.0	720	0.8	16
SWQ-2	9/12/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.10		1,190		0.40	<0.01							80.0	577	0.9	17
SWQ-2	11/27/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.20		1,360		<0.20	<0.01							88.0	675	0.8	18
SWQ-2	5/17/1985																							8.00		1,640										102.0	770		19
SWQ-2	11/13/1985																							7.90		1,590										94.0	770		20
SWQ-2	10/13/1986																							7.90		1,840										136.0	830		21
SWQ-2	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02		<0.05	<0.0002	<0.02			<0.005		<0.001					7.57	4,310	3,019		12.74		561	129	264	10.9	0	362	216.7	1,586	0.6	22
SWQ-2	7/16/1992																							7.57		2,305										93.4	1,155		23
SWQ-2	10/8/1992																							7.53		2,685										130.7	1,471		24
SWQ-2	12/15/1992																							7.61		3,108										192.5	1,613		25
SWQ-2	2/25/1993																							7.58		2,713										135.9	1,459		26
SWQ-2	3/31/1993	<0.01	<0.1	<0.005	<0.5		0.08	<0.002	<0.05	<0.02	0.01	<0.05	<0.001	0.03	<0.02	<0.01	<0.02		0.008				0.01	7.70	3,150	2,720	300	14.50	<0.01	436	83	279	2.1	0	376	123.0	1,460	0.6	27
SWQ-2	6/23/1994																							8.87		3,958										197.3	2,369		28
SWQ-2	1/29/1995																							7.64		2,653										89.2	1,286		29
SWQ-2	3/29/1995																							7.83		2,866										83.9	1,388		30
SWQ-2	6/27/1995																							7.74		3,235										127.3	1,877		31
SWQ-2	9/21/1995																							7.58		500										31.1	271		32
SWQ-2	1/10/1996																							7.37		3,991										167.2	2,337		33
SWQ-2	4/3/1996																							8.06		4,464										222.6	2,566		34
SWQ-2	9/25/1996																							7.66		3,997										143.7	1,987		35
SWQ-2	1/15/1997																							7.43		3,436										148.0	1,356		36
SWQ-2	8/25/2010	<0.005	1.5	<0.001	0.010	<0.002	<0.04	<0.002	<0.006	<0.006	0.09	0.67	<0.0002		<0.008	<0.01	<0.005	<0.001	<0.001	<0.001	<0.001	<0.05	<0.01	7.42	89	78	21	<1.00	<0.01	6.5		3.3	1.9	<2	21	0.7	11	0.6	37
SWQ-2	4/28/2011	<0.005	<0.02	<0.001	0.019	<0.002	<0.04	<0.002	<0.006	<0.006	0.01	<0.02	<0.0002		0.008	<0.01	<0.005	<0.001	0.002	<0.001	<0.001	<0.05	<0.01							79		41	2.9						38
SWQ-2	5/4/2011																												<0.01										39
SWQ-2A	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.01	<0.005	<0.02	<0.01	<0.05	<0.05	<0.001	<0.05	<0.05		<0.02		<0.005					8.20		830		0.30	<0.01	107						46.0	360	0.6	40
SWQ-2A	2/25/1982							<0.005			<0.05	0.10	<0.001	<0.05	<0.05				<0.005					8.40		800		0.20	<0.01							50.0	320	0.7	41
SWQ-3	7/19/1991	<0.02		<0.002	0.030			<0.005		<0.02		0.14	<0.0002	<0.02			<0.005		<0.001					7.52	3,120	2,191		1.39		334	85	190	7.4	0		143.9	1,108	0.7	42
SWQ-3	8/29/1991										0.02													7.82		3,596								0		231.3	1,884		43
SWQ-3	11/26/1991										0.00													7.71		2,857										141.1	1,419		44
SWQ-3	3/15/1992																							8.08		2,393										99.2	1,248		45
SWQ-3	5/25/1992																							8.07		2,380										102.9	1,185		46
SWQ-3	7/16/1992																							7.66		3,364										128.7	1,654		47

Appendix A.
Table A-2. Surface-water-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	original order
SWQ-3	10/8/1992																							7.49		3,611										174.4	1,667		48
SWQ-3	11/27/1992																							8.35		1,866										160.5	952		49
SWQ-3	12/15/1992																							8.15		3,436										221.6	1,549		50
SWQ-3	2/25/1993																							8.01		2,974										150.7	1,574		51
SWQ-3	3/31/1993	<0.01	<0.1	<0.005	<0.5		0.06	<0.002	<0.05	<0.02	0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				<0.01	8.10	3,330	2,950	310	6.90	<0.01	445	109	271	2.2	0	409	135.0	1,580	1.0	52
SWQ-3	9/28/1993																							8.13		4,432										226.9	1,254		53
SWQ-3	6/23/1994																							8.37		2,934										157.4	1,712		54
SWQ-3	1/29/1995																							7.93		3,185										237.6	1,672		55
SWQ-3	3/29/1995																							8.23		3,216										100.6	1,710		56
SWQ-3	6/27/1995																							7.51		3,393										200.3	1,792		57
SWQ-3	9/21/1995																							8.73		3,741										178.5	2,382		58
SWQ-3	1/10/1996																							7.78		3,666										112.0	1,937		59
SWQ-3	4/3/1996																									3,635										157.0	2,236		60
SWQ-3	9/25/1996																							7.64		2,568										96.7	1,153		61
SWQ-3	1/15/1997																							8.13		3,436										148.0	1,356		62
SWQ-3	8/19/2010	<0.005	<0.02	<0.001	0.062	<0.002	0.14	<0.002	<0.006	<0.006	0.06	0.06	<0.0002	0.14	0.05	<0.01	<0.005	<0.001	0.013	<0.001	0.029	<0.05	0.02	8.00	4,100	4,500	250	<1.00	<0.005	530	190	490	5.7	<2	250	130.0	2,900	1.5	64
SWQ-3	10/21/2010	<0.005	<0.02	<0.005	0.053	<0.002	0.09	<0.002	<0.006	<0.006	0.02	0.05	<0.0002	0.03	0.03	<0.01	<0.005	<0.001	0.016	<0.001	0.027	<0.05	0.48	7.99	4,600	5,080	530	<1.00		630	260	520	4.3	<2	530	93.0	3,100	1.3	65
SWQ-3	1/27/2011																							7.81	3,868														63
SWQ-3	4/27/2011	<0.005	0.079	<0.001	0.032	<0.002	0.08	<0.002	<0.006	<0.006	0.01	0.03	<0.033	0.03	0.02	<0.01	<0.005	<0.001	0.007	<0.001	0.012	<0.05	0.03	7.92	4,400	4,590	430	0.15	<0.01	610	210	410	3.8	<2	430	74.0	2,900	1.4	66

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)
GWQ-1	2/2/1981											1.70						
GWQ-1	3/27/1981			<0.01							<0.05						<0.02	
GWQ-1	6/11/1981	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005
GWQ-1	6/15/1981	<0.02	<0.25	<0.002	<0.2		0.076	<0.005	<0.05	<0.05	<0.02	<0.05	<0.001	<0.02	<0.1	<0.05	<0.02	
GWQ-1	2/25/1982							<0.005			<0.05	0.14	<0.001	0.063	<0.05			
GWQ-1	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1	
GWQ-1	7/19/1991	<0.02		0.003	0.01			<0.005		<0.02	<0.02	<0.05	<0.0002	<0.02			<0.005	
GWQ-1	3/31/1993	<0.01	<0.01	<0.005	<0.5		0.03	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02	
GWQ-1	5/25/1994	<0.025	0.025	<0.005	<0.1			<0.0005		<0.025	<0.025	<0.05	<0.001	<0.03		<0.05	<0.005	<0.005
GWQ-1	7/21/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.0052
GWQ-3	3/27/1981			<0.01							<0.05						<0.02	
GWQ-3	6/15/1981	<0.02	<0.01	0.004	<0.2		0.108	<0.005	<0.05	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	0.073	
GWQ-3	2/25/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-3	5/12/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-3	6/30/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-3	12/23/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-3	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-3	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	0.11			
GWQ-3	8/9/1983							<0.005			<0.05	0.11	<0.001	<0.05	<0.05			
GWQ-3	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-3	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-6	6/15/1981	<0.02	<0.01	<0.01	<0.2		0.135	<0.005	<0.05	<0.01	<0.02	<0.1	<0.001	0.11	<0.05	<0.05	<0.02	
GWQ-6	2/25/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-6	4/1/1993	<0.01	<0.1	<0.005	0.6		0.09	<0.002	<0.05	<0.02	0.03	5.05	<0.001	0.36	<0.02	<0.01	<0.02	
GWQ-7	2/2/1981											3.80						
GWQ-7	3/27/1981			<0.01							<0.05						<0.02	
GWQ-7	4/6/1981			0.003							<0.05						<0.01	
GWQ-7	6/15/1981	<0.02	<0.01	<0.002	<0.2		<0.1	<0.005	<0.05	<0.01	<0.02	<0.05	<0.001	<0.02	<0.05	<0.05	<0.05	
GWQ-7	8/7/1981											0.02						
GWQ-7	8/10/1981			<0.01							<0.05	1.70					<0.02	
GWQ-7	10/23/1981	<0.02	<0.01	<0.01	<0.02		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	<0.001	<0.05	<0.05	<0.05	<0.02	
GWQ-7	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02	
GWQ-7	2/25/1982							<0.005			<0.05	0.17	<0.001	<0.05	<0.05			
GWQ-7	12/28/1982							<0.005			<0.05	0.26	<0.001	0.16	<0.05			
GWQ-7	2/21/1983							<0.005			<0.05	<0.1	<0.001	0.27	<0.05			
GWQ-7	3/16/1983													<0.05				
GWQ-7	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-7	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-7	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-7	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	0.08			
GWQ-7	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-7	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-7	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05			
GWQ-7	5/17/1985																	
GWQ-7	11/13/1985																	
GWQ-7	5/23/1986																	
GWQ-7	10/8/1986																	
GWQ-7	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1	
GWQ-7	3/30/1993	<0.01	<0.1	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02	
GWQ-7	5/25/1994	<0.025	0.25	<0.005	<0.1			0.00058		<0.025	0.11	0.72	<0.001	1.1		<0.05	<0.005	<0.005
GWQ-7	7/21/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	1.20	<0.001	0.21	<0.05	<0.05	<0.005	<0.005
GWQ-8	6/4/1976						<0.1					0.00		0.003				
GWQ-8	2/2/1981											1.70						
GWQ-8	8/19/1981	<0.02	<0.25	<0.004	<1		0.076	<0.01	<0.05	<0.05	<0.05	<0.1	<1	0.047	<0.1	<0.05	<0.05	

sample location	analysis date	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-1	2/2/1981						7.90		520				74	20	60		0	276	20	156		
GWQ-1	3/27/1981					0.16					5.50	<0.01									0.6	
GWQ-1	6/11/1981	<0.005	<0.005			<0.05																
GWQ-1	6/15/1981	0.0022	<0.005			0.12	7.40	700	500		3.75	<0.01	81	12	49	3.06	0	251	22	117	0.5	
GWQ-1	2/25/1982	<0.005					7.90		410		0.20	<0.01							22	84	0.3	
GWQ-1	3/30/1989					<0.1			512				84	16	61	3		280	20	133		
GWQ-1	7/19/1991	<0.002					7.34	799	543		5.19		88	18	40	2.7	0	262	21	136	0.6	
GWQ-1	3/31/1993	<0.005				<0.01	7.70	822	536	230	4.90	<0.01	82	21	67	2.1	0	297	22	160	0.5	
GWQ-1	5/25/1994	<0.005				<0.05	7.90	760	614		4.30		80	18	55	2.7	0	270	22	150	0.5	
GWQ-1	7/21/1994	<0.005	<0.005			<0.05	7.97	861	558		4.20		95	19	66	2.7	0	278	25	162	0.5	
GWQ-3	3/27/1981					0.16					5.50	<0.01									0.6	
GWQ-3	6/15/1981	0.0037				0.32	7.00	1,100	868		0.10	<0.01	146	33	95	1.7	0	327	32	383	0.7	
GWQ-3	2/25/1982	<0.005					7.90		1,040		0.40	<0.01							56	490	0.6	
GWQ-3	5/12/1982	<0.005					7.90		930		0.20	<0.01							56	410	0.7	
GWQ-3	6/30/1982	<0.005					7.60		860		0.40	<0.01							48	365	0.7	
GWQ-3	12/23/1982	<0.005					8.50		990		0.20	<0.01							64	340	0.7	
GWQ-3	2/21/1983	<0.005					7.70		970		0.20	<0.01							68	428	0.7	
GWQ-3	5/13/1983	<0.005					8.00		980		0.30	<0.01							82	437	0.6	
GWQ-3	8/9/1983	<0.005					7.80		1,060		<0.2	<0.01							78	385	0.7	
GWQ-3	11/1/1983	<0.005					8.00		1,240		0.30	<0.01							90	529	0.7	
GWQ-3	3/16/1984	<0.005					8.20		1,190		3.40	<0.01							74	530	0.3	
GWQ-6	6/15/1981	0.0046				<0.025	7.30	600	400		3.30	<0.01	68	11	57	2.4	0	309	33	41	1.1	
GWQ-6	2/25/1982	<0.005					8.30		810		0.50	<0.01							102	220	1.1	
GWQ-6	4/1/1993	<0.005				0.03	7.70	597	304	310	1.10	<0.01	49	14	53	3.1	0	322	22	10	0.8	
GWQ-7	2/2/1981						7.90		530				74	27	51		0	278	20	156		
GWQ-7	3/27/1981					0.28					1.40	<0.01									0.6	
GWQ-7	4/6/1981					0.24					0.90	0.36									0.6	
GWQ-7	6/15/1981	<0.0005				0.38	7.20	700	496		1.10	<0.01	88	24	61	2.33	0	285	25	165	0.5	
GWQ-7	8/7/1981						7.40		475				80	19	139			268	100	150		
GWQ-7	8/10/1981					0.63	7.70		490		1.20	<0.01	68	21	48			229	24	162	0.6	
GWQ-7	10/23/1981	<0.005				0.41			500		1.30	<0.01	71						26	162	0.5	
GWQ-7	11/6/1981	<0.005				0.19	8.10		480		1.20	<0.01	71						24	158	0.8	
GWQ-7	2/25/1982	<0.005					8.00		510		0.80	<0.01							26	162	0.5	
GWQ-7	12/28/1982	<0.005					8.10		250		<0.2	<0.01							20	40	0.3	
GWQ-7	2/21/1983	<0.005					8.30		250		2.80	<0.01							22	47	0.4	
GWQ-7	3/16/1983																					
GWQ-7	5/13/1983	<0.005					8.10		470		1.20	<0.01							20	158	0.6	
GWQ-7	8/9/1983	<0.005					8.00		490		1.00	<0.01							22	130	0.6	
GWQ-7	11/1/1983	<0.005					8.10		500		1.80	<0.01							22	137	0.6	
GWQ-7	3/16/1984	<0.005					8.30		450		1.00	<0.01							20	140	0.8	
GWQ-7	5/30/1984	<0.005					7.70		470		0.90	0.02							20	154	0.6	
GWQ-7	9/12/1984	<0.005					8.00		500		1.40	<0.01							20	128	0.6	
GWQ-7	11/27/1984	<0.005					7.70		490		1.40	<0.01							18	144	0.6	
GWQ-7	5/17/1985						7.90		500										20	144		
GWQ-7	11/13/1985						7.80		450										18	137		
GWQ-7	5/23/1986						7.90		490										22	142		
GWQ-7	10/8/1986						7.40		460										22	116		
GWQ-7	3/30/1989					0.10			492				80	22	47	2		278	16	131		
GWQ-7	3/30/1993	<0.005				0.10	7.80	752	482	250	1.38	<0.01	68	31	52	1.6	0	298	21	138	0.6	
GWQ-7	5/25/1994	<0.005				<0.05	7.26	*2,630*	*2,420*		<1		490	51	80	14	0	480	20	*1,300*	2.1	
GWQ-7	7/21/1994	<0.005	<0.005			<0.05	7.72	660	224		<1		*14*	8	47	13	0	349	22	*<5*	16.0	
GWQ-8	6/4/1976						7.48	780	560		16.80		122	16	76	1.72		241	17	114	0.5	
GWQ-8	2/2/1981						7.90		520		60.00		74	20				276	20	156		
GWQ-8	8/19/1981	0.004				0.69	7.42		608		2.80	<0.05	73	12	84	4.2	<1	283	24	134	0.6	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-8	2/25/1982							<0.005			<0.05	<0.1	<0.001	0.17	<0.05				<0.005					7.60		380		0.30	<0.01							38	220	1.0	
GWQ-8	3/31/1993	<0.01	<0.05	<0.005	0.042		0.03	<0.0005	<0.01	<0.01	0.01	<0.05	<0.0002	<0.01	<0.02	<0.01	<0.002		<0.005				0.09	7.60	1,110	764	240	6.30	<0.01	132	18	94	1.8	0	298	38	283	0.5	
GWQ-8	5/25/1994	<0.025	<0.025	<0.005	<0.1		<0.1	<0.0005	<0.05	<0.025	<0.025	0.24	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005				<0.05	7.97	1,060	792		5.30		120	20	76	2.4	0	272	41	290	0.5	
GWQ-9	6/4/1976						<0.1					0.00		0.001										8.60	480	350		4.00		69	15	30	1.56		188	20	34	0.4	
GWQ-9	2/2/1981											1.80												7.90		510				73	24	49		0	273	20	156		
GWQ-9	3/27/1981			<0.01							<0.05						<0.02						0.16					1.40	<0.01									0.6	
GWQ-9	4/6/1981			0.002							<0.05						<0.01						0.13					1.20	0.15									0.6	
GWQ-9	8/7/1981											0.06												7.40		450				80	19	129			268	100	140		
GWQ-9	8/10/1981			<0.01							<0.05	0.49					0.033						0.96	8.00		470		1.40	<0.01	76	20	47			268	22	148	0.5	
GWQ-9	10/8/1981	<0.02	<0.25	<0.004	<1		0.044	<0.01	<0.05	<0.05	<0.05	<0.1	<1	<0.02	<0.1	<0.05	<0.05		<0.002				0.35	7.22		476		0.96	<0.05	52	17	71	3.3	<1	302	22	133	0.6	
GWQ-9	2/25/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.30		430		0.90	<0.01							26	160	0.5	
GWQ-9	12/28/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		480		1.00	<0.01							20	150	0.5	
GWQ-9	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		480		1.40	<0.01							20	161	0.5	
GWQ-9	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		460		1.10	<0.01							20	158	0.5	
GWQ-9	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		480		0.90	<0.01							20	135	0.5	
GWQ-9	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		460		0.80	<0.01							18	132	0.5	
GWQ-9	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		460		1.70	<0.01							18	132	0.7	
GWQ-9	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.60		450		0.90	<0.01							18	154	0.5	
GWQ-9	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		470		1.30	<0.01							20	132	0.5	
GWQ-9	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		1.50	<0.01							16	132	0.5	
GWQ-9	5/17/1985																							8.00		490										20	149		
GWQ-9	11/13/1985																							7.80		450										20	142		
GWQ-9	5/23/1986																							7.90		490										36	137		
GWQ-9	10/8/1986																							7.60		460										20	125		
GWQ-10	4/6/1981			0.002				<0.01			<0.05		<1				<0.01						0.12					4.60	0.02				8.25					0.5	
GWQ-10	8/10/1981	<0.02	10.2	<0.004	<1		0.016	<0.01	<0.05	<0.05	<0.05	2.31	<1	1.18	<0.1	<0.05	<0.05		<0.002				0.23	7.48		528		0.22	<0.05	74	11	59	8.32	<1	219	24	143	1.1	
GWQ-10	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.01	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.25	8.20		520		1.10	<0.01	68						22	168	0.6	
GWQ-10	10/30/1981	<0.02	<0.25	<0.005	<1		0.77	<0.01	<0.05	<0.05	<0.05	<1	<0.001	<0.02	<0.1	<0.02	<0.05		<0.002				0.24	8.10		588		0.66	<0.05	72						23	122	1.0	
GWQ-10	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.28	7.90		500		2.00	<0.01	84						22	162	0.7	
GWQ-10	11/13/1981	<0.001	0.37	<0.005	0.25		0.037	0.001		<0.005			<0.0005	0.5	<0.01	<0.05	<0.005		0.01	<0.005			0.90	7.75	700	509		1.80	0.001	70	17	39	2.34		276	23	141	0.6	
GWQ-10	11/17/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.28	7.90		500		1.80	<0.01	70						26	156	0.6	
GWQ-10	11/23/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.37	7.70		650		1.80	<0.01							26	161	0.6	
GWQ-10	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.87	8.20		490		1.80	<0.01	67						24	168	0.5	
GWQ-10	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.44	7.90		550		2.60	<0.01	89						24	181	0.7	
GWQ-10	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.35	8.10		480		2.50	<0.01	85						24	168	0.5	
GWQ-10	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.13	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.31	7.50		430		2.90	<0.01	80						22	174	0.6	
GWQ-10	1/26/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.1				<0.005					7.80		490		2.30	<0.01							24	162	0.6	
GWQ-10	2/22/1982							<0.005			<0.05	0.12	<0.001	<0.05	<0.05				<0.005					7.60		510		2.10	<0.01							24	161	0.6	
GWQ-10	4/26/1982							<0.005			<0.05	0.41	<0.001	<0.05	<0.05				<0.005					7.40		840		2.00	<0.01							20	168	0.6	
GWQ-10	5/17/1982							<0.005			<0.05	0.10	<0.001	<0.05	<0.05				<0.005					7.70		490		2.30	<0.01							28	175	0.6	
GWQ-10	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		500		2.20	<0.01							22	162	0.5	
GWQ-10	6/30/1982							<0.005			<0.05	0.62	<0.001	<0.05	<0.05				<0.005					8.00		510		3.30	<0.01							20	160	0.6	
GWQ-10	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.30	690	506		2.25		83	17	58	2.73		278	22	143	0.5	
GWQ-10	12/23/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.50		500		1.70	<0.01							26	138	0.6	
GWQ-10	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		2.40	<0.01							24	161	0.6	
GWQ-10	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		480		2.40	0.02							32	161	0.6	
GWQ-10	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		510		2.40	<0.01							36	142	0.6	
GWQ-10	11/1/1983							<0.005			<0.05	0.17	<0.001	<0.05	<0.05				<0.005					8.10		500		4.80	<0.01							34	125	0.6	
GWQ-10	3/16/1984							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					8.20		500		3.50	<0.01							42	128	0.5	
GWQ-10	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.50		530		3.30	<0.01							56	161	0.5	
GWQ-10	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		580		4.20								68	158	0.5	
GWQ-10	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		580		4.90	<0.01							64	163	0.6	
GWQ-10	5/17/1985																							7.80		570										52	163		
GWQ-10	11/13/1985																							7.70		500										42	149		

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-10	5/23/1986																							7.90		560										58	151		
GWQ-10	10/8/1986																							7.50		550										54	137		
GWQ-10	3/4/1987	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1	0.9					<0.1		740	568				90	21	74	2.34		256	59	150		
GWQ-10	5/25/1987																																				154		
GWQ-10	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						<0.1			648				116	24	64	3		243	79	173		
GWQ-10	4/4/1988																									552										65	171		
GWQ-10	8/23/1988																									692										63	179		
GWQ-10	2/9/1989																									618										76	181		
GWQ-10	6/1/1989																									604										68	163		
GWQ-10	11/30/1989																									620										72	162		
GWQ-10	11/14/1990																									635										93	178		
GWQ-10	2/11/1991			<0.001																						696										78	214		
GWQ-10	7/19/1991	<0.02		0.002	0.02			<0.005		<0.02		0.07	<0.0002	<0.02			<0.005		0.002					8.05	975	645		3.88		106	24	47	3.9	0	242	83	167	0.5	
GWQ-10	8/29/1991																							7.44		665										85	192		
GWQ-10	11/26/1991																							7.46		648										58	171		
GWQ-10	3/15/1992																							7.85		641										83	192		
GWQ-10	5/25/1992																							7.41		621										84	169		
GWQ-10	7/16/1992																							7.51		626										76	167		
GWQ-10	10/8/1992																							7.43		659										83	161		
GWQ-10	11/27/1992																							7.89		654										80	174		
GWQ-10	12/15/1992																							7.48		582										91	169		
GWQ-10	2/25/1993																							7.39		620										96	176		
GWQ-10	3/30/1993	<0.01	<0.1	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				0.11	7.80	1,020	642	200	3.90	<0.01	104	27	71	2.3	0	254	94	183	0.5	
GWQ-10	9/28/1993																							7.70		693										96	143		
GWQ-10	5/26/1994	<0.025	0.85	<0.005	<0.1			<0.0005		<0.025	0.026	1.10	<0.001	0.059		<0.05	<0.005	<0.005	<0.005				0.55	7.82	1,050	1,000		3.50		100	25	56	3.1	0	232	92	175	0.5	
GWQ-10	6/23/1994																							7.97		671										104	192		
GWQ-10	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.97	1,050	696		3.50		110	26	66	2.8	0	238	98	184	0.5	
GWQ-10	9/22/1994																							7.45		668										89	156		
GWQ-10	1/29/1995																							7.52		672										88	66		
GWQ-10	3/29/1995																							7.67		622										85	176		
GWQ-10	6/27/1995																							7.29		677										85	169		
GWQ-10	9/21/1995																							7.42		693										91	187		
GWQ-10	1/10/1996																							7.29		654										98	198		
GWQ-10	4/3/1996																							6.95		628										97	218		
GWQ-10	9/25/1996																							7.56		679										86	191		
GWQ-10	1/15/1997																							7.59		746										91	204		
GWQ-11	8/10/1981	<0.02	<0.25	<0.004	<1		0.092	<0.01	<0.05	<0.05	<0.05	1.14	<1	0.45	<0.1	<0.05	<0.05		0.006				<0.05	7.38		612		1.02	<0.05	68	14	48	7.88	<1	237	37	123	0.9	
GWQ-11	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.17	8.10		550		0.70	<0.01	72						36	183	1.0	
GWQ-11	10/30/1981	<0.02	<0.25	<0.005	<1		0.55	<0.01	<0.05	<0.05	<0.05	<0.1	<0.001	<0.02	<0.1	<0.02	<0.05		<0.011				0.23	8.40		536		0.61	<0.05							39	101	1.0	
GWQ-11	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.29	8.10		520		1.50	<0.01	67						36	168	1.0	
GWQ-11	11/13/1981	<0.001	<0.25	<0.005	0.2		0.041	0.001		<0.005			<0.0005	<0.05	0.12	<0.05	<0.005		0.023				0.79	7.70	700	544		1.33	<0.001	83	17	44	3.9		241	38	156	1.0	
GWQ-11	11/17/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.64	8.00		520		1.30	<0.01	71						36	165	1.0	
GWQ-11	11/23/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.53	7.80		570		1.70	<0.01	67						36	181	0.9	
GWQ-11	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	0.0064	<0.05	<0.05	<0.05	<0.02		<0.005				1.60	7.90		560		1.60	<0.01	57						56	184	0.9	
GWQ-11	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				1.10	7.90		570		1.50	<0.01	85						38	191	1.0	
GWQ-11	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.27	<0.001	0.093	<0.05	<0.05	<0.02		<0.005				0.42	8.00		530		1.90	<0.01	82						40	185	0.5	
GWQ-11	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.44	7.50		480		2.50	<0.01	79						40	174	1.0	
GWQ-11	1/26/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.1				<0.005					7.90		500		1.70	<0.01							40	168	1.0	
GWQ-11	2/22/1982							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					7.70		510		1.40	<0.01							38	168	0.9	
GWQ-11	4/26/1982							<0.005			<0.05	0.36	<0.001	<0.05	0.05				<0.005					7.60		510		1.30	<0.01							40	165	0.8	
GWQ-11	5/17/1982							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					7.80		510		1.90	<0.01							44	185	0.8	
GWQ-11	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		530		1.70	<0.01							44	185	0.8	
GWQ-11	6/30/1982							<0.005			<0.05	0.39	<0.001	<0.05	<0.05				<0.005					7.90		590		2.30	<0.01							44	198	0.8	
GWQ-11	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.30	940	700		1.94		111	28	58	3.51		226	52	248	0.8	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-11	12/23/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.50		650		1.60	<0.01							52	235	0.8	
GWQ-11	2/21/1983							<0.005			<0.05	0.38	<0.001	<0.05	<0.05				<0.005					8.00		600		1.70	<0.01							44	218	0.8	
GWQ-11	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		570		1.90	0.01							44	206	0.8	
GWQ-11	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		580		2.00	<0.01							46	168	0.8	
GWQ-11	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		580		4.80	<0.01							46	174	0.8	
GWQ-11	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.30		540		3.80	<0.01							52	184	0.6	
GWQ-11	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.50		550		1.90	<0.01							58	195	0.8	
GWQ-11	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		590		2.30	<0.01							60	181	0.8	
GWQ-11	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		570		2.30	<0.01							60	165	0.8	
GWQ-11	5/17/1985																							7.80		640										64	197		
GWQ-11	11/13/1985																							7.70		600										62	183		
GWQ-11	5/23/1986																							7.80		650										66	210		
GWQ-11	10/8/1986																							7.60		560										70	200		
GWQ-11	3/4/1987	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1	1.1					<0.1	6.70	820	696				108	26	62	3.51		220	69	200		
GWQ-11	5/25/1987																																				230		
GWQ-11	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						<0.1			718				128	31	63	4		214	77	253		
GWQ-11	4/4/1988																									694										75	278		
GWQ-11	8/23/1988																									772										73	294		
GWQ-11	2/9/1989																									730										77	258		
GWQ-11	6/1/1989																									708										70	238		
GWQ-11	11/30/1989																									732										80	254		
GWQ-11	11/14/1990																									746										104	257		
GWQ-11	2/11/1991			<0.001																						790										89	233		
GWQ-11	7/19/1991	<0.02		0.004	0.1			<0.005		<0.02		<0.05	<0.0002	<0.02			<0.002		0.002					7.36	1,100	785		3.93		123	34	40	3.9	0	221	90	210	0.7	
GWQ-11	8/29/1991																							7.46		771										93	279		
GWQ-11	11/26/1991																							7.29		770										89	241		
GWQ-11	3/15/1992																							7.91		765										65	260		
GWQ-11	5/25/1992																							7.45		761										96	258		
GWQ-11	10/8/1992																							7.42		755										96	227		
GWQ-11	11/27/1992																							7.85		763										96	248		
GWQ-11	12/15/1992										0.017													7.59		741										98	220		
GWQ-11	2/25/1993																							7.64		762										104	273		
GWQ-11	3/30/1993	<0.01	0.2	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	0.33	<0.001	0.03	<0.02	<0.01	<0.02		<0.005				0.03	7.70	1,170	776	180	4.10	<0.01	126	34	68	2.9	0	227	104	271	0.5	
GWQ-11	9/28/1993																							7.57		800										106	208		
GWQ-11	5/25/1994	<0.025	0.14	<0.005	<0.1			<0.0005		<0.025	<0.025	0.16	<0.001	<0.03		<0.05	<0.005	<0.005	<0.005				<0.05	7.88	1,130	820		3.80		120	34	55	3.5	0		110	260	0.7	
GWQ-11	6/23/1994																							7.42		802										117	275		
GWQ-11	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.0055	<0.005	<0.005			<0.05	7.70	1,210	808		3.80		140	37	66	3.4	0		116	272	0.7	
GWQ-11	9/22/1994																							7.37		816										112	235		
GWQ-11	1/29/1995																							7.60		861										200	159		
GWQ-11	3/29/1995																							7.96		793										99	137		
GWQ-11	6/27/1995																							7.67		835										102	279		
GWQ-11	9/21/1995																							7.58		865										112	290		
GWQ-11	1/10/1996																							7.36		777										121	288		
GWQ-11	4/3/1996																							7.38		767										119	277		
GWQ-11	9/25/1996																							7.78		835										116	230		
GWQ-11	1/15/1997																							7.68		860										127	304		
GWQ94-13	11/15/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	0.11	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.74	2,026	1,570		4.60		270	56	110	3.9	0	159	190	720	0.4	
GWQ94-13	7/1/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	0.0068	<0.001			<0.05	7.76	2,000	1,520		5.20		290	62	120	3.6	0	156	200	620	0.3	
GWQ94-13	7/2/2010	<0.005	<0.020	<0.001	0.04	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	0.00026	<0.002	<0.008	<0.01	<0.005	<0.001	0.024	<0.001	0.0016	<0.05	<0.01	8.00	2,200	1,730	120	5.90		320	62	110	3.4	<2	120	290	770	0.4	10
GWQ94-13	10/5/2010	<0.005	<0.02	<0.005	0.038	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.024	<0.001	0.0015	<0.05	<0.01	7.39	2,100	1,670	120	5.80		300	62	110	3.4	<2	120	280	760	0.3	<10
GWQ94-13	5/11/2011	<0.005	<0.02	0.0038	0.037	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.028	<0.001	0.0017	<0.05	0.04	7.66	2,100	1,670	130	6.50	<0.005	310	61	120	3.3	<2	130	290	800	0.3	<10
GWQ94-14	11/14/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.95	745	560		1.30		81	23	46	1.9	0	279	22	140	0.5	
GWQ94-14	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.44	641	520		1.50		87	23	51	1.9	5	261	26	140	0.5	
GWQ94-14	1/29/2010	<0.005	<0.02	0.0032	0.045	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.0025	0.0068	<0.0025			0.01	8.00	820	550	210	2.20	<0.005	96	26	49	2	<2	210	50	150	0.5	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ94-14	6/29/2010	<0.005	<0.020	0.0023	0.048	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0052	<0.001	0.0014	<0.05	<0.01	8.00	820	573	210	2.30		98	25	45	1.7	<2	210	49	150	0.5	<10
GWQ94-14	10/5/2010	<0.005	<0.02	0.0024	0.045	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0053	<0.001	0.0013	<0.05	<0.01	7.57	840	563	210	2.20		94	27	47	1.7	<2	210	50	150	0.5	<10
GWQ94-14	5/13/2011	<0.005	<0.02	0.0028	0.045	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0061	<0.001	0.0015	<0.05	0.05	7.84	840	570	210	2.20	0.012	97	27	49	1.8	<2	210	48	150	0.6	<10
GWQ94-15	11/14/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.74	1,058	790		2.10		110	29	68	2.5	0	265	110	180	0.5	
GWQ94-15	7/1/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.41	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	7.31	1,190	780		2.50		140	38	77	2.4	0	227	130	240	0.4	
GWQ94-15	1/29/2010	<0.005	<0.020	0.0042	0.058	<0.002	<0.040	<0.002	<0.0060	<0.0060	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.0025	0.021	<0.0025			0.02	7.00	1,500	1,080	160	4.10	<0.005	180	47	84	3	<2	160	170	420	0.3	
GWQ94-15	6/29/2010	<0.005	<0.020	<0.0010	0.059	<0.002	<0.040	<0.002	<0.0060	<0.0060	<0.006	<0.02	<0.0002	0.0049	<0.008	<0.01	<0.005	<0.001	0.0095	<0.001	0.0017	<0.05	<0.01	8.00	1,100	805	180	2.70		140	34	60	2.1	<2	180	110	260	0.4	<10
GWQ94-15	10/1/2010	<0.005	<0.02	<0.001	0.056	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0018	<0.05	<0.01	7.52	1,100	794	190	2.70	<0.01	130	37	65	2.2	<2	190	110	260	0.4	<10
GWQ94-15	5/13/2011	<0.005	<0.02	0.0036	0.056	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0018	<0.05	<0.01	7.74	1,200	808	190	2.80	<0.005	130	38	68	2.3	<2	190	120	270	0.4	<10
GWQ94-16	11/13/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.038	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.55	1,600	1,140		3.80		190	51	78	3.7	0	199	190	410	0.7	
GWQ94-16	7/1/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.22	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	7.95	1,620	1,160		3.70		200	54	80	3.4	0	193	200	500	0.6	
GWQ94-16	6/29/2010	<0.005	<0.02	0.0022	0.039	<0.002	0.048	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.011	<0.001	0.0025	<0.05	<0.01	8.00	1,600	1,190	180	3.70		210	50	74	3.1	<2	180	180	440	0.6	<10
GWQ94-16	9/30/2010	<0.005	<0.02	0.0024	0.038	<0.002	0.053	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.015	<0.001	0.0024	<0.05	<0.01	7.50	1,500	1,170	180	3.90	<0.01	200	51	78	3.1	<2	180	190	440	0.7	<10
GWQ94-16	5/10/2011	<0.005	<0.02	0.0026	0.038	<0.002	0.056	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0023	<0.05	0.01	7.58	1,600	1,150	180	4.00	<0.01	200	49	74	3.1	<2	180	190	430	0.6	<10
GWQ94-17	11/15/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.71	1,147	820		2.40		120	33	62	2.4	0	232	110	240	0.5	
GWQ94-17	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.06	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.56	925	690		2.00		120	28	61	2	7	227	81	190	0.5	
GWQ94-17	7/6/2010	<0.005	<0.02	0.0022	0.047	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0062	<0.001	0.0016	<0.05	<0.01	8.00	880	629	200	2.00		110	27	49	1.8	<2	200	68	180	0.5	61
GWQ94-20	11/15/1994	<0.025	<0.05	<0.005	<0.1	<0.002	0.11	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.42	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.66	588	370		1.00		48	10	67	3.2	0	296	19	40	0.4	
GWQ94-20	6/30/1996	<0.05	<0.025	<0.005	0.12	<0.002	0.086	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.79	597	390		<1		58	10	75	3.1	19	273	21	56	0.3	
GWQ94-21A	11/13/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.20	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.25	672	480		1.00		82	23	39	2.1	0	267	18	130	0.6	
GWQ94-21A	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.22	649	470		1.10		86	22	37	1.5	0	268	16	120	0.5	
GWQ94-21B	11/13/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.37	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.57	669	440		<1		71	18	56	2.6	0	255	19	130	0.4	
GWQ94-21B	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.60	648	470		1.10		87	22	40	1.7	10	256	17	120	0.5	
GWQ96-22A	7/13/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.08	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	7.50	1,040	700		<1		71	7	150	2.5	0	124	89	250	3.3	
GWQ96-22A	4/9/1997										<0.025	6.50	<0.001	2.80					<0.005					7.58	930	770										20	150	0.8	
GWQ96-22A	8/8/1997	<0.025	0.028	<0.005	0.057	<0.002	0.23	<0.002	<0.05	<0.025	<0.05	0.13		0.53	<0.05	<0.05	<0.005		<0.005	<0.001			<0.05	7.65	1,140	700		<1		73	8	170	6.2	0	177	89	230	2.2	
GWQ96-22A	1/30/2010	<0.005	<0.02	0.0029	0.094	<0.002	0.28	<0.002	<0.006	<0.006	<0.006	2.10	<0.0002	0.74	<0.008	<0.01	<0.005	<0.0025	<0.0025	<0.0025			<0.01	8.00	920	557	320	<1	<0.005	51	4	160	2.8	<2	320	81	44	2.6	
GWQ96-22A	7/1/2010	<0.005	<0.02	0.0035	0.079	<0.002	0.28	<0.002	<0.006	<0.006	<0.006	0.02	<0.0002	0.65	<0.008	<0.01	<0.005	<0.001	0.0011	<0.001	<0.001	<0.05	<0.01	8.00	920	573	310	<1		53	4	150	2.8	<2	310	70	52	2.7	19
GWQ96-22A	10/7/2010	<0.005	<0.02	0.0035	0.084	<0.002	0.28	<0.002	<0.006	<0.006	<0.006	0.32	<0.0002	0.49	<0.008	<0.01	<0.005	<0.001	<0.001	<0.001	<0.001	<0.05	<0.01	8.00	720	564	340	<1		49	4	150	2.8	<2	340	75	34	2.7	11
GWQ96-22B	7/13/1996	<0.05	<0.025	<0.005	0.096	<0.002	0.12	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.41	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	7.75	1,070	650		<1		66	10	130	10	0	141	210	79	1.8	
GWQ96-22B	10/7/2010	<0.005	<0.02	0.0057	0.11	<0.002	0.24	<0.002	<0.006	<0.006	<0.006	9.30	<0.0002	1.20	<0.008	<0.01	<0.005	<0.001	0.0011	<0.001	<0.001	<0.05	<0.01	7.52	1,200	730	480	2.10		72	6	200	3.6	<2	480	110	<0.5	3.0	25
GWQ96-23A	7/14/1996	<0.05	0.28	<0.005	0.064	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.26	<0.001	0.05	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	7.95	760	520		<1		59	18	98	4.2	0	280	22	140	0.8	
GWQ96-23A	4/9/1997										<0.025	0.10	<0.001	0.75					<0.005						850	580										16	170	1.4	
GWQ96-23A	8/8/1997	<0.025	0.036	<0.005	0.13	<0.002	0.067	<0.002	<0.05	<0.025	<0.025	0.82		1.60	<0.05	<0.05	<0.005		<0.005	<0.001			<0.05	7.68	1,310	920		<1		130	36	72	2.5	0	328	18	410	1.2	
GWQ96-23A	1/30/2010	<0.005	<0.02	0.0027	0.091	<0.002	0.074	<0.002	<0.006	<0.006	<0.006	0.66	<0.0002	0.63	<0.008	<0.01	<0.005	<0.0025	<0.0025	<0.0025			<0.01	8.00	1,100	689	640	<1		150	45	69	1.6	<2	640	12	6	1.7	
GWQ96-23A	7/1/2010	<0.005	<0.02	0.0011	0.13	<0.002	0.068	<0.002	<0.006	<0.006	<0.006	0.05	<0.0002	0.37	<0.008	<0.01	<0.005	<0.001	0.0014	<0.001	0.0025	<0.05	<0.01	8.00	1,200	804	510	<1		150	40	81	1.5	<2	510	14	140	1.5	13
GWQ96-23A	10/6/2010	<0.005	<0.02	<0.001	0.087	<0.002	0.08	<0.002	<0.006	<0.006	<0.006	0.31	<0.0002	0.41	<0.008	<0.01	<0.005	<0.001	0.0013	<0.001	0.0037	<0.05	<0.01	7.89	1,200	769	580	<1		140	45	80	1.3	<2	580	12	99	1.6	<10
GWQ96-23A	5/12/2011	<0.005	<0.02	<0.001	0.078	<0.002	0.071	<0.002	<0.006	<0.006	<0.006	0.04	<0.0002	0.29	<0.008	<0.01	<0.005	<0.001	0.0012	<0.001	0.003	<0.05	0.02	8.16	1,100	752	600	<0.1	<0.005	150	42	78	1.3	<2	600	13	74	1.7	<10
GWQ96-23B	7/14/1996	<0.05	7.4	<0.005	0.093	<0.002	0.058	<0.0005	<0.05	<0.025	<0.025	3.70	<0.001	0.13	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	8.15	780	550		<1		67	20	79	4	0	234	20	170	1.1	
GWQ96-23B	10/6/2010	<0.005	<0.02	<0.001	0.1	<0.002	0.14	<0.002	<0.006	<0.006	<0.006	1.40	<0.0002	0.36	<0.008	<0.01	<0.005	<0.001	0.0011	<0.001	<0.001	<0.05	<0.01	7.85	900	554	480	<1		78	22	110	1.6	<2	480	19	<0.5	2.1	<10
GWQ96-23B	5/12/2011	<0.005	<0.02	<0.001	0.11	<0.002	0.14	<0.002	<0.006	<0.006	<0.006	0.93	<0.0002	0.34	<0.008	<0.01	<0.005	<0.001	0.0014	<0.001	<0.001	<0.05	0.07	7.99	890	556	490	<0.1	<0.005	81	22	110	1.7	<2	490	17	<0.5	2.1	24
IW-1	3/4/1987																							6.60	3,950	3,802				564		274	3.12		193	575	1,901		
IW-1	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02	<0.02	<0.05	0.0005	<0.02			<0.005		0.015					7.87	6,460	4,235		9.06		636	182	375	7	0	222	633	1,985	0.7	
IW-1	8/29/1991																							7.13		4,120										642	1,918		
IW-1	11/26/1991																							7.53		3,979										615	1,634		
IW-1	3/15/1992																							7.88		4,026										611	2,201		
IW-1	5/25/1992																							7.09		4,155										598	2,203		
IW-1	7/16/1992																							7.12		4,297										585	1,775		
IW-1	10/8/1992																							6.96		3,996										617	1,727		
IW-1	11/27/1992																							7.71		4,004										605	1,717		
IW-1	12/15/1992																							7.40		3,969										609	1,415		
IW-1	9/28/1993																							7.12		3,661										521	1,150		
IW-1	3/17/1994																							7.00		3,684										405	1,569		
IW-1	5/24/1994	<0.025	0.94	<0.005	<0.1			<0.0005		<0.025	<0.025	1.00	<0.001	<0.03		<0.05	<0.005	<0.005	<0.005				0.05	7.84	3,920	3,500		5.80		550	170	250	2.9	0	248	470	1,500	0.7	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
IW-1	6/23/1994																							7.69		3,555										474	1,444		
IW-1	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	0.018	0.0063			<0.05	7.51	4,100	3,450		5.90		570	200	280	2.5	0	256	431	1,480	0.7	
IW-1	9/22/1994																							7.05		3,466										436	1,348		
IW-1	1/29/1995																							7.18		3,395										663	1,479		
IW-1	3/29/1995																							7.49		3,465										419	1,351		
IW-1	6/27/1995																							6.99		3,599										446	1,680		
IW-1	9/21/1995																							6.82		35										459	1,711		
IW-1	1/10/1996																							7.23		3,437										442	1,596		
IW-1	9/25/1996																							7.17		3,551										568	1,493		
IW-1	1/15/1997																							7.44		36										410	1,695		
IW-2	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.30	4,250	4,010		1.38		320	174	720	234		185	409	2,252	1.2	
IW-2	5/25/1994	<0.025	22	<0.005	0.12	<0.002		<0.0005		0.046	<0.025	16.00	<0.001	0.77		0.097	0.0073	<0.005	<0.005				0.08	7.75	2,890	2,400		1.50		430	94	290	3.2	0	534	340	1,000	0.7	
IW-2	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	0.15	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.036	<0.05	<0.05	<0.005	<0.005	0.014	0.0073			<0.05	7.78	3,400	2,390		<1		390	110	360	1.3	0	300	380	1,040	0.7	
IW-2	1/31/2010	<0.005	0.13	0.0092	0.024	<0.002	0.075	<0.002	0.0065	<0.006	<0.006	1.30	<0.0002	1.6	0.02	<0.01	<0.005	<0.0025	0.033	<0.0025			<0.01	8.00	3,200	2,770	260	<2	<0.005	390	120	290	1.6	<2	260	600	1,200	0.7	
IW-2	6/29/2010	<0.005	<0.02	<0.001	0.029	<0.002	0.061	<0.002	<0.006	<0.006	<0.006	0.87	0.00048	2.2	0.024	<0.01	<0.005	<0.001	0.029	<0.001	0.006	<0.05	<0.01	7.00	3,400	2,700	250	<2		390	110	260	1.8	<2	250	580	1,100	0.7	31,000
IW-2	9/30/2010	<0.005	0.044	<0.001	0.028	<0.002	0.073	<0.002	<0.006	<0.006	<0.006	0.41	<0.0002	2.2	0.02	<0.01	<0.005	<0.001	0.037	<0.001	0.0057	<0.05	0.02	7.36	3,000	2,280	250	<2	<0.01	360	110	270	1.6	<2	250	500	1,000	0.7	71,000
IW-2	5/9/2011	<0.005	<0.02	<0.001	0.037	<0.002	0.081	<0.002	0.017	<0.006	<0.006	0.36	<0.0002	3.6	0.021	<0.01	<0.005	0.0032	0.031	<0.001	0.0062	<0.05	0.02	7.31	3,200	2,360	240	1.70	<0.01	370	110	260	2.3	<2	240	520	1,100	0.6	20,000
IW-3	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.20	1,700	1,562		4.12		234	42	168	3.51		179	159	707	0.4	
IW-3	2/25/1993																							7.27		3,892										590	1,739		
IW-3	5/26/1994	<0.025	32	<0.005	0.2			<0.0005		0.059	6	22.00	<0.001	0.35		0.19	0.077	<0.005	<0.005				0.15	7.83	1,790	1,870		5.70		240	51	69	4	0	341	209	415	0.5	
IW-3	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	0.058	<0.05	<0.001	0.13	0.062	<0.05	<0.005	0.0055	0.011	<0.005			<0.05	7.76	1,860	1,300		5.00		200	66	89	3.5	0	255	206	437	0.5	
IW-3	4/3/1996																							7.04		3,364										433	1,566		
MW-4	6/13/1975																							7.90	620					46	10	73	4.4	0	226	15	110	0.6	
MW-4	7/20/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	8.34	408	256		<1		15	13	56	3.4	2	139	17	66	0.3	
NP-1	10/8/1981	<0.02	<0.25	<0.004	<1		<0.004	<0.01	<0.05	<0.05	<0.05	0.27	<1	0.92	<0.1	<0.05	<0.05		0.003				0.40	7.60		496		0.47	<0.05	56	14	62	8.25	<1	266	25	108	0.8	
NP-1	11/4/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.6	<0.05	<0.05	<0.02		<0.005				0.14	8.10		470		0.30	0.04	54						28	148	1.0	
NP-1	11/13/1981	<0.001	<0.25	<0.005	0.2		0.044	0.006		<0.005			<0.0005	1.34	0.011	<0.05	<0.005		0.029				0.44	7.65	625	470		0.09	0.001	72	19	39	5.85		274	24	131	0.8	
NP-1	11/17/1981	<0.02	<0.01	<0.005	0.24		<0.1	<0.005	<0.02	<0.01	0.069	<0.1	<0.001	1.4	0.06	<0.05	<0.02		<0.005				3.90	8.00		460		0.20	<0.01	59						24	154	0.8	
NP-1	11/23/1981	<0.02	<0.01	<0.01	0.02		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	1.2	<0.05	<0.05	<0.02		<0.005				4.10	7.70		530		0.20	<0.01	58						26	146	0.8	
NP-1	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1.2	<0.05	<0.05	<0.02		<0.005				5.10	7.30		490		0.20	<0.01	58						24	158	0.8	
NP-1	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1.2	<0.05	<0.05	<0.02		<0.005				5.30	7.80		480		<0.2	<0.01	68						24	151	0.8	
NP-1	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1	<0.05	<0.05	<0.02		<0.005				4.10	7.80		450		0.30	<0.01	66						22	149	0.8	
NP-1	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	0.0012	0.71	<0.05	<0.05	<0.02		<0.02				4.10	7.60		400		0.70	<0.01	67						22	163	0.8	
NP-1	1/26/1982							<0.005			<0.05	<0.1	<0.001	0.45	<0.1				<0.005					7.90		440		0.50	<0.01							22	154	0.7	
NP-1	2/22/1982							<0.005			0.48	0.83	<0.001	0.26	<0.05				<0.005					7.90		460		0.60	<0.01							24	158	0.7	
NP-1	4/26/1982							<0.005			<0.05	1.20	<0.001	0.16	<0.05				<0.005					7.90		440		0.70	<0.01							26	154	0.6	
NP-1	5/24/1982											<0.1		0.28																									
NP-1	5/28/1982											<0.1		0.22																									
NP-1	6/8/1982							<0.005			<0.05	<0.1	<0.001	0.25	<0.05				<0.005					7.50		500		1.10	<0.01							20	162	0.6	
NP-1	6/30/1982							<0.005			<0.05	<0.1	<0.001	0.18	<0.05				<0.005					7.70		500		1.10	<0.01							18	143	0.6	
NP-1	10/27/1982							<0.005			<0.05	0.45	<0.001	0.058	<0.05				<0.005					7.70		470		1.30	<0.01							20	151	0.7	
NP-1	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		490		1.30	<0.01							18	156	0.7	
NP-1	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		1.10	<0.01							24	149	0.6	
NP-1	8/9/1983							<0.005			<0.05	0.22	<0.001	<0.05	<0.05				<0.005					7.80		480		1.10	<0.01							22	130	0.6	
NP-1	11/1/1983							<0.005			<0.05	0.14	<0.001	<0.05	<0.05				<0.005					7.80		500		2.10	<0.01							18	125	0.6	
NP-1	3/16/1984							<0.005			<0.05	<0.1	0.0083	<0.05	<0.05				<0.005					8.20		480		1.80	<0.01							22	124	0.6	
NP-1	4/9/1984												<0.001																										
NP-1	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.50		510		0.70	<0.01							22	154	0.6	
NP-1	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		480		1.10	<0.01							22	137	0.6	
NP-1	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		480		1.10	<0.01							16	144	0.6	
NP-1	5/17/1985																							7.60		510										20	144		
NP-1	11/13/1985																							7.30		480										16	149		
NP-1	5/23/1986																							7.60		500										18	142		
NP-1	10/8/1986																							7.40		470										22	107		

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-1	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						2.60			492				88	23	46	3		279	15	137		
NP-1	7/19/1991	<0.02		0.003	0.02			<0.005		<0.02		0.59	<0.0002	<0.02			0.007		<0.002					8.04	761	530		0.99		81	24	31	2	0	256	22	133	0.6	
NP-1	8/29/1991																							7.69		501										21	141		
NP-1	11/26/1991																							7.12		1,484										23	137		
NP-1	3/15/1992																							7.80		510										22	146		
NP-1	5/25/1992																							7.49		608										29	128		
NP-1	7/16/1992																							7.50		487										22	142		
NP-1	10/8/1992																							7.35		517										22	129		
NP-1	11/27/1992																							7.85		498										21	142		
NP-1	12/15/1992																							7.58		502										24	125		
NP-1	2/25/1993																							7.42		510										23	138		
NP-1	3/30/1993	<0.01	<0.1	<0.005	<0.5		0.03	<0.002	<0.05	<0.02	<0.01	0.17	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				1.13	7.70	767	496	240	1.10	<0.01	79	27	52	1.8	0	306	22	145	0.6	
NP-1	9/28/1993																							7.48		508										36	110		
NP-1	3/17/1994																							7.30		516										24	134		
NP-1	5/24/1994	<0.025	0.83	0.005	<0.1			0.0096		<0.025	<0.025	9.50	<0.001	0.1		<0.05	0.016	<0.005	<0.005				5.70	7.53	680	510		1.10		79	23	48	2.5	0	263	22	130	0.6	
NP-1	6/23/1994																							7.50		453										40	142		
NP-1	7/21/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	0.05	<0.001	0.27	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			4.90	7.87	698	464		<1		71	23	47	2.2	0	249	23	133	0.7	
NP-1	9/22/1994																							7.49		488										24	119		
NP-1	1/29/1995																							7.94		407										26	125		
NP-1	3/29/1995																							7.98		392										23	86		
NP-1	6/27/1995																							8.02		385										24	114		
NP-1	9/21/1995																							7.96		373										27	145		
NP-1	1/10/1996																							7.73		277										26	109		
NP-1	4/3/1996																							7.89		300										26	123		
NP-1	9/25/1996																							8.22		320										24	94		
NP-1	1/15/1997																							8.42		318										26	109		
NP-1	1/31/2010	<0.005	<0.020	<0.0025	0.037	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.10	<0.0002	0.0088	<0.008	<0.01	<0.005	<0.0025	0.0055	<0.0025			0.38	8.00	780	514	220	1.40	<0.005	87	29	52	2	<2	220	38	140	0.6	
NP-1	6/28/2010	<0.005	<0.020	0.0034	0.043	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0045	<0.001	0.0019	<0.05	0.05	8.00	790	548	230	1.40		90	26	46	1.9	<2	230	37	150	0.6	<10
NP-1	10/5/2010	<0.005	0.14	0.0035	0.041	<0.002	0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0045	<0.001	0.0018	<0.05	0.06	7.63	800	537	220	4.90		86	28	50	1.9	<2	220	35	140	0.6	13
NP-2	10/8/1981	<0.02	<0.25	0.024	<1		0.08	<0.01	<0.05	<0.05	<0.05	<0.1	<1	0.62	<0.1	<0.05	<0.05		<0.002				0.31	7.39		476		0.23	<0.05	46	15	94	9.57	<1	159	45	198	1.8	
NP-2	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.39	0.21	<0.05	<0.02		<0.005				1.70	7.60		450		0.40	<0.01	53						35	164	1.4	
NP-2	11/13/1981	<0.001	<0.25	<0.005	<0.1		0.04	<0.001		<0.005			<0.0005	0.79	0.04	<0.01	<0.005		0.017				3.18	7.65	675	466		0.25	0.0026	65	19	60	3.9		221	31	162	1.1	
NP-2	11/23/1981	<0.02	<0.01	<0.01	0.02		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	0.54	0.06	<0.05	<0.02		<0.005				3.50	7.70		520		0.70	<0.01	57						30	156	0.9	
NP-2	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.54	0.06	<0.05	<0.02		<0.005				4.40	7.50		490		0.60	<0.01	53						30	160	0.8	
NP-2	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.52	0.072	<0.05	<0.02		<0.005				2.90	8.00		480		0.50	<0.01	62						32	161	0.9	
NP-2	12/22/1981	<0.02	<0.01	<0.01	0.21		<0.1	<0.005	<0.02	<0.01	<0.05	0.12	<0.001	0.51	0.053	<0.05	<0.02		<0.005				2.80	8.00		440		0.80	<0.01	73						32	161	0.6	
NP-2	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	<0.001	0.49	0.07	<0.05	<0.02		<0.02				3.20	7.60		400		0.90	<0.01	65						28	158	0.9	
NP-2	1/26/1982							<0.005			<0.05	<0.1	<0.001	0.34	<0.1				<0.005					8.00		450		1.10	<0.01							24	160	0.7	
NP-2	2/22/1982							<0.005			0.069	0.37	<0.001	0.3	<0.05				<0.005					8.00		440		0.80	<0.01							30	151	0.7	
NP-2	4/26/1982							<0.005			<0.05	1.20	<0.001	0.29	<0.05				<0.005					8.00		450		2.40	<0.01							42	149	1.0	
NP-2	5/18/1982							0.015			<0.05	0.68	<0.001	0.078	<0.05				<0.005					7.90		460		1.80	<0.01							34	128	0.6	
NP-2	5/24/1982											<0.1		<0.05																									
NP-2	5/28/1982											<0.1		<0.05																									
NP-2	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		490		0.90	<0.01							26	158	0.5	
NP-2	6/30/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		490		1.40	<0.01							26	133	0.6	
NP-2	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.40	650	468		1.66		74	18	58	1.95		316	26	127	0.5	
NP-2	10/27/1982							<0.005			<0.05	0.29	<0.001	<0.05	<0.05				<0.005					7.90		440		1.60	<0.01							26	120	0.6	
NP-2	2/21/1983							<0.005			<0.05	0.12	<0.001	<0.05	<0.05				<0.005					7.80		440		1.60	<0.01							24	127	0.6	
NP-2	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		460		1.50	<0.01							24	139	0.6	
NP-2	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		560		1.60	<0.01							36	148	0.6	
NP-2	11/1/1983							<0.005			<0.05	0.17	<0.001	<0.05	<0.05				<0.005					8.00		470		2.30	<0.01							24	111	0.6	
NP-2	3/16/1984							<0.005			<0.05	<0.1	0.001	<0.05	<0.05				<0.005					8.20		500		1.60	<0.01							30	146	0.8	
NP-2	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		520		1.40	<0.01							32	175	0.6	
NP-2	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		470		1.70	<0.01							22	134	0.6	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-2	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		1.70	<0.01							20	125	0.6	
NP-2	5/17/1985																							7.80		480										22	120		
NP-2	11/13/1985																							7.40		460										22	115		
NP-2	5/23/1986																							7.60		480										28	113		
NP-2	10/8/1986																							7.40		430										24	100		
NP-2	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		0.06	<0.1	<0.1	<0.1						0.50			376				52	18	65	3		183	29	124		
NP-2	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02	<0.02	<0.05	<0.0002	<0.02			<0.005		0.018					7.55	726	453		0.02		34	24	48	0.8	0	56	61	181	0.6	
NP-2	8/29/1991																							8.11		471										63	198		
NP-2	11/26/1991																							7.45		460										63	170		
NP-2	3/15/1992											<0.05												8.07		467										68	194		
NP-2	5/25/1992											<0.05												8.34		456										67	162		
NP-2	7/16/1992											<0.05												8.13		479										65	184		
NP-2	10/8/1992																							8.26		494										78	179		
NP-2	11/27/1992																							8.38		451										64	179		
NP-2	12/15/1992											<0.05												8.43		612										83	167		
NP-2	2/25/1993																							8.62		475										78	197		
NP-2	3/30/1993	<0.01	0.5	<0.005	0.6		0.1	<0.002	<0.05	<0.02	0.01	1.85	<0.001	0.07	<0.02	<0.01	<0.02		0.005				0.67	7.70	1,910	1,310	240	3.30	<0.01	163	61	163	0.9	0	289	239	436	1.3	
NP-2	9/28/1993																							7.92		1,170										207	300		
NP-2	3/17/1994																							7.65		971										118	301		
NP-2	5/24/1994	<0.025	4.6	<0.005	<0.1			0.00097		<0.025	<0.025	4.50	<0.001	0.19		<0.05	0.0079	<0.005	<0.005				4.10	8.03	1,250	878		<0.1		120	47	100	2.3	0	261	130	300	1.0	
NP-2	6/23/1994																							7.69		848										124	268		
NP-2	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.0059	<0.005	<0.005			1.20	7.88	1,360	878		1.50		120	43	120	1.3	0	270	128	299	0.9	
NP-2	9/22/1994																							7.55		963										124	253		
NP-2	1/29/1995																							7.57		791										94	121		
NP-2	3/29/1995																							7.69		1,164										91	229		
NP-2	6/27/1995																							7.93		778										96	247		
NP-2	9/21/1995																							7.36		722										87	212		
NP-2	1/10/1996																							7.10		632										79	173		
NP-2	4/3/1996																							7.23		603										77	169		
NP-2	9/25/1996																							7.68		598										57	118		
NP-2	1/15/1997																							7.44		536										56	148		
NP-2	1/31/2010	<0.005	<0.02	0.0032	0.058	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.09	<0.0002	0.19	<0.008	<0.01	<0.005	<0.0025	0.017	<0.0025			1.10	8.00	1,100	746	160	2.50	<0.005	120	35	75	2.4	<2	160	150	210	0.5	
NP-2	6/28/2010	<0.005	<0.02	<0.001	0.057	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	0.021	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0017	<0.05	0.26	7.00	1,200	846	170	2.70		130	35	71	2.2	<2	170	170	260	0.4	740
NP-3	10/8/1981	<0.02	<0.25	0.005	<1		0.188	<0.01	<0.05	<0.05	<0.05	<0.1	<1	0.81	<0.1	<0.05	<0.05		0.005				1.25	6.98		460		<0.05	<0.05	41	10	79	9.71	<1	211	29	95	1.6	
NP-3	10/27/1981	<0.02	<0.01	<0.01	0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.39	<0.001	1	0.16	<0.05	<0.02		<0.005				0.98	8.00		390		0.40	<0.01	41						28	148	1.9	
NP-3	10/30/1981	<0.02	<0.25	<0.005	<1		0.29	<0.01	<0.05	<0.05	<0.05	<0.1	<0.001	1.03	<0.1	<0.02	<0.05		<0.002				0.93	7.89		428		<0.05	<0.05							31	102	1.6	
NP-3	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.47	0.26	<0.05	<0.02		<0.005				1.10	7.90		380		0.20	<0.01	39						28	140	1.6	
NP-3	11/13/1981	0.023	<0.25	0.009	<0.1		0.034	<0.001		<0.005			<0.0005	1.01	0.065	<0.05	<0.005		0.023				1.59	7.60	600	446		0.16		55	13	44	5.85		190	27	141	1.4	
NP-3	11/17/1981	<0.02	<0.01	<0.01	0.24		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1	0.2	<0.05	<0.02		<0.005				1.20	8.10		390		<0.2	<0.01	44						26	144	1.4	
NP-3	11/23/1981	<0.01	<0.01	<0.01	0.02		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	0.96	0.15	<0.05	<0.02		<0.005				1.90	7.80		460		0.20	<0.01	47						26	144	1.2	
NP-3	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.78	0.13	<0.05	<0.02		<0.005				3.50	7.90		450		<0.2	<0.01	47						28	153	1.1	
NP-3	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.87	0.094	<0.05	<0.02		<0.005				2.50	7.80		450		0.20	<0.01	56						26	149	1.1	
NP-3	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.76	0.1	<0.05	<0.02		<0.005				2.10	7.90		410		0.20	<0.01	73						26	149	0.9	
NP-3	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.31	<0.001	0.72	0.01	<0.05	<0.02		<0.02				1.70	7.70		360		0.20	<0.01	56						26	154	1.1	
NP-3	1/26/1982							<0.005			<0.05	<0.1	<0.001	0.7	<0.1				<0.005					8.10		400		0.20	<0.01							30	151	1.0	
NP-3	2/22/1982							<0.005			<0.05	0.14	<0.001	0.66	<0.05				<0.005					8.00		420		<0.2	<0.01							28	137	0.9	
NP-3	4/26/1982							<0.005			<0.05	0.24	<0.001	0.4	<0.05				<0.005					7.90		410		<0.2	<0.01							28	146	0.8	
NP-3	5/24/1982											<0.1		0.053																									
NP-3	5/28/1982											<0.1		0.063																									
NP-3	6/8/1982							<0.005			<0.05	<0.1	<0.001	0.1	<0.05				<0.005					7.90		500		1.90	<0.01							30	150	0.5	
NP-3	6/30/1982							<0.005			<0.05	<0.1	<0.001	0.081	<0.05				<0.005					7.90		510		1.80	<0.01							26	128	0.5	
NP-3	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.50	750	498		1.94		77	15	64	3.9		308	28	124	0.5	
NP-3	10/27/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		450		1.60	<0.01							26	132	0.6	
NP-3	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		410		1.40	<0.01							26	131	0.5	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-3	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		500		2.10	<0.01							64	139	0.5	
NP-3	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		630		2.30	<0.01							114	100	0.5	
NP-3	11/1/1983							<0.005			<0.05	0.14	<0.001	<0.05	<0.05				<0.005					7.90		760		3.80	<0.01							162	163	0.5	
NP-3	3/16/1984							<0.005			<0.05	<0.1	0.001	<0.05	<0.05				<0.005					8.10		870		3.20	<0.01							228	216	0.6	
NP-3	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		1,060		2.90	<0.01							248	292	0.4	
NP-3	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		1,140		3.10	<0.01							270	292	0.4	
NP-3	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		1,150		3.50	<0.01							290	348	0.4	
NP-3	5/17/1985																							7.70		1,470										310	453		
NP-3	11/13/1985																							7.20		1,520										288	541		
NP-3	5/23/1986																							7.50		1,590										282	624		
NP-3	10/8/1986																							7.40		1,710										272	620		
NP-3	3/3/1987																																				695		
NP-3	3/4/1987																							6.80	1,850	1,882				320	67	117	4.29		188	283	695		
NP-3	5/25/1987																																				736		
NP-3	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		0.57	<0.1	<0.1	<0.1						1.10			1,584				268	57	142	38		30	359	755		
NP-3	4/4/1988																									1,772										254	587		
NP-3	8/23/1988																									1,744										251	835		
NP-3	2/9/1989																									1,583										254	763		
NP-3	6/1/1989																									1,596										241	714		
NP-3	11/30/1989																									1,600										159	743		
NP-3	11/14/1990																									1,675										229	822		
NP-3	2/11/1991			<0.001																						1,551										256	971		
NP-3	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02	<0.02	0.28	0.0002	0.08			<0.005		0.011					8.29	2,520	1,663		0.23		287	53	190	7	0	192	239	820	0.7	
NP-3	8/29/1991																							7.84		1,616										254	854		
NP-3	11/26/1991																							7.08		1,613										248	745		
NP-3	3/15/1992																							7.63		1,644										228	921		
NP-3	5/25/1992																							7.85		1,607										216	753		
NP-3	7/16/1992																							7.26		1,578										226	802		
NP-3	10/8/1992																							7.69		1,445										212	799		
NP-3	11/27/1992																							7.49		1,640										255	796		
NP-3	12/15/1992										0.01													7.75		1,558										223	545		
NP-3	2/25/1993																							7.65		1,580										219	794		
NP-3	3/30/1993	<0.01	0.1	<0.005	<0.5		0.02	<0.002	<0.05	<0.02	0.01	4.99	<0.001	0.32	<0.02	<0.01	<0.02		<0.005				6.98	7.40	2,070	1,560			<0.01	296	35	129	4.1	0	29	205	825	0.5	
NP-3	9/28/1993										<0.001	<0.05		0.24									1.04	7.88		1,544										210	619		
NP-3	3/17/1994										0.012	0.24		0.33									2.58	7.46		1,609										170	747		
NP-3	6/23/1994																							7.77		1,628										206	779		
NP-3	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.61	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			1.80	7.83	2,160	1,620		<1		320	73	120	4.5	0	118	194	796	0.3	
NP-3	9/22/1994																							7.65		1,691										196	707		
NP-3	1/29/1995																							7.45		1,623										*566*	652		
NP-3	3/29/1995																							7.48		1,639										186	558		
NP-3	6/27/1995																							7.38		1,607										203	717		
NP-3	9/21/1995																							7.50		1,557										208	822		
NP-3	1/10/1996																							7.32		1,464										209	724		
NP-3	4/3/1996																							7.29		1,415										208	723		
NP-3	9/25/1996																							7.72		1,472										191	537		
NP-3	1/15/1997																							7.51		1,478										207	657		
NP-3	7/8/2010	<0.005	<0.02	<0.0010	0.03	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.05	<0.0002	0.031	<0.008	<0.01	<0.005	<0.001	0.023	<0.001	0.0014	<0.05	0.44	8.00	2,100	1,740	120	6.80		310	60	120	3.6	<2	120	270	790	0.4	100
NP-3	10/7/2010	<0.005	<0.02	<0.005	0.031	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.10	<0.0002	0.015	<0.008	<0.01	<0.005	<0.001	0.023	<0.001	0.0015	<0.05	0.31	7.57	2,000	1,660	120	5.60		290	60	110	3.5	<2	120	290	830	0.3	97
NP-3	5/11/2011	<0.005	<0.02	0.0029	0.032	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.04	<0.0002	0.022	<0.008	<0.01	<0.005	<0.001	0.027	<0.001	0.0015	<0.05	0.24	7.69	2,100	1,640	130	6.20	<0.005	300	57	120	3.3	<2	130	270	790	0.3	400
NP-4	4/26/1982							<0.005			0.051	3.80	<0.001	0.6	0.07				<0.005					8.60		410		0.60	<0.01							46	132	1.5	
NP-4	5/17/1982							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					9.40		310		1.30	<0.01							46	138	1.0	
NP-4	5/24/1982											<0.1		<0.05																									
NP-4	5/28/1982											<0.1		<0.05																									
NP-4	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.40		420		4.50	<0.01							26	140	0.5	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-4	6/30/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					9.50		270		<0.2	<0.01							28	115	0.4	
NP-4	9/2/1982							<0.001						<0.05	<0.01				<0.005					8.50	410	252		0.03		7	4	71	3.9		63	29	107	0.4	
NP-4	10/27/1982							0.0061			<0.05	0.34	<0.001	<0.05	<0.05				<0.005					8.90		230		<0.2	<0.01							36	108	0.4	
NP-4	2/21/1983							<0.005			<0.05	0.28	0.001	<0.05	<0.05				<0.005					9.30		250		0.20	<0.01							48	115	0.4	
NP-4	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		340		<0.2	<0.01							76	134	0.4	
NP-4	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.80		430		<0.2	<0.01							94	156	0.3	
NP-4	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		530		0.60	<0.01							114	206	0.3	
NP-4	3/16/1984							<0.005			<0.05	<0.1	0.001	<0.05	<0.05				<0.005					8.00		540		0.20	<0.01							126	256	0.6	
NP-4	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		630		<0.2	<0.01							134	320	0.3	
NP-4	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		760		0.90	<0.01							134	339	0.3	
NP-4	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.50		740		0.20	<0.01							140	354	0.3	
NP-4	5/17/1985																							8.20		770										146	348		
NP-4	11/13/1985																							8.00		690										142	292		
NP-4	5/23/1986																							8.00		690										136	300		
NP-4	10/8/1986																							7.80		660										134	290		
NP-4	5/25/1987																																				279		
NP-4	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		0.06	<0.1	<0.1	<0.1						0.10			612				76	21	86	5		24	137	256		
NP-4	4/4/1988																									610										130	329		
NP-4	8/23/1988																									688										132	292		
NP-4	2/9/1989																									604										130	267		
NP-4	6/1/1989																									580										116	244		
NP-4	11/30/1989																									572										97	237		
NP-4	11/14/1990																									262										153	255		
NP-4	2/11/1991			<0.001																						676										126	289		
NP-4	7/19/1991	<0.02		<0.002	0.28			<0.005		<0.02		5.14	<0.0002	<0.02			<0.005		<0.002					7.81	802	532		0.07		63	21	67	3.1	0	55	112	199	0.4	
NP-4	8/29/1991																							8.37		532										111	232		
NP-4	11/26/1991																							8.54		522										99	194		
NP-4	3/15/1992																							8.85		465										103	217		
NP-4	5/25/1992																							8.62		439										106	171		
NP-4	7/16/1992																							7.64		458										94	177		
NP-4	10/8/1992																							9.01		535										103	183		
NP-4	11/27/1992																							8.12		495										98	202		
NP-4	12/15/1992																							9.52		424										84	151		
NP-4	2/25/1993																							9.85		349										77	151		
NP-4	3/31/1993	<0.01	0.3	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	0.01	0.62	0.009	0.84	<0.02	<0.01	<0.02		<0.005				2.41	7.60	813	504	230	3.70	<0.01	76	17	79	2.2	0	275	45	134	0.5	
NP-4	9/28/1993																							8.20		437										57	109		
NP-4	5/26/1994	<0.025	3.5	<0.005	<0.1			0.0034		<0.025	<0.025	15.00	<0.001	0.16		<0.05	0.018	<0.005	<0.005				12.00	8.10	800	666		4.30		73	15	62	3	0	320	39	131	0.5	
NP-4	6/23/1994																							8.13		498										49	134		
NP-4	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.01	<0.005	<0.005			0.51	7.90	828	536		4.60		88	16	72	2.5	0	279	34	120	0.5	
NP-4	9/22/1994																							7.73		547										37	111		
NP-4	1/29/1995																							7.88		447										35	111		
NP-4	3/29/1995																							7.86		494										34	122		
NP-4	6/27/1995																							7.37		487										33	134		
NP-4	9/21/1995																							7.51		509										35	132		
NP-4	1/10/1996																							7.35		483										35	123		
NP-4	4/3/1996																							7.19		475										26	123		
NP-4	9/25/1996																							7.75		504										32	126		
NP-4	1/15/1997																							7.43		2,651										98	1,113		
NP-4	1/31/2010	<0.005	<0.02	<0.0025	0.036	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.04	<0.0002	0.0098	<0.008	<0.01	<0.005	<0.0025	0.0057	<0.0025			1.30	8.00	900	626	210	7.40	<0.005	100	18	79	2.4	<2	210	40	190	0.5	
NP-4	7/2/2010	<0.005	<0.02	<0.001	0.039	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	0.002	<0.008	<0.01	<0.005	<0.001	0.0043	<0.001	0.0023	<0.05	0.82	8.00	910	640	210	7.50		110	18	70	2.1	<2	210	39	190	0.5	140
NP-5	11/4/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.1	<0.05	<0.05	<0.02		<0.005				0.14	8.00		570		4.10	<0.01	86						50	196	1.3	
NP-5	11/13/1981	<0.001	0.239	<0.005	0.218		0.07	<0.001		<0.005	<0.1		<0.0005	0.14	0.015	0.019	<0.005		0.014				<0.05	7.70	650	488		3.56	0.001	89	14	44	5.07		187	38	162	1.3	
NP-5	11/17/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.3	0.07	<0.05	<0.02		<0.005				0.19	8.00		500		2.70	<0.01	72						42	158	1.3	
NP-5	11/23/1981	<0.1	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	0.091	<0.05	<0.05	<0.02		<0.005				0.21	7.80		580		4.00	<0.01	73						36	161	1.2	

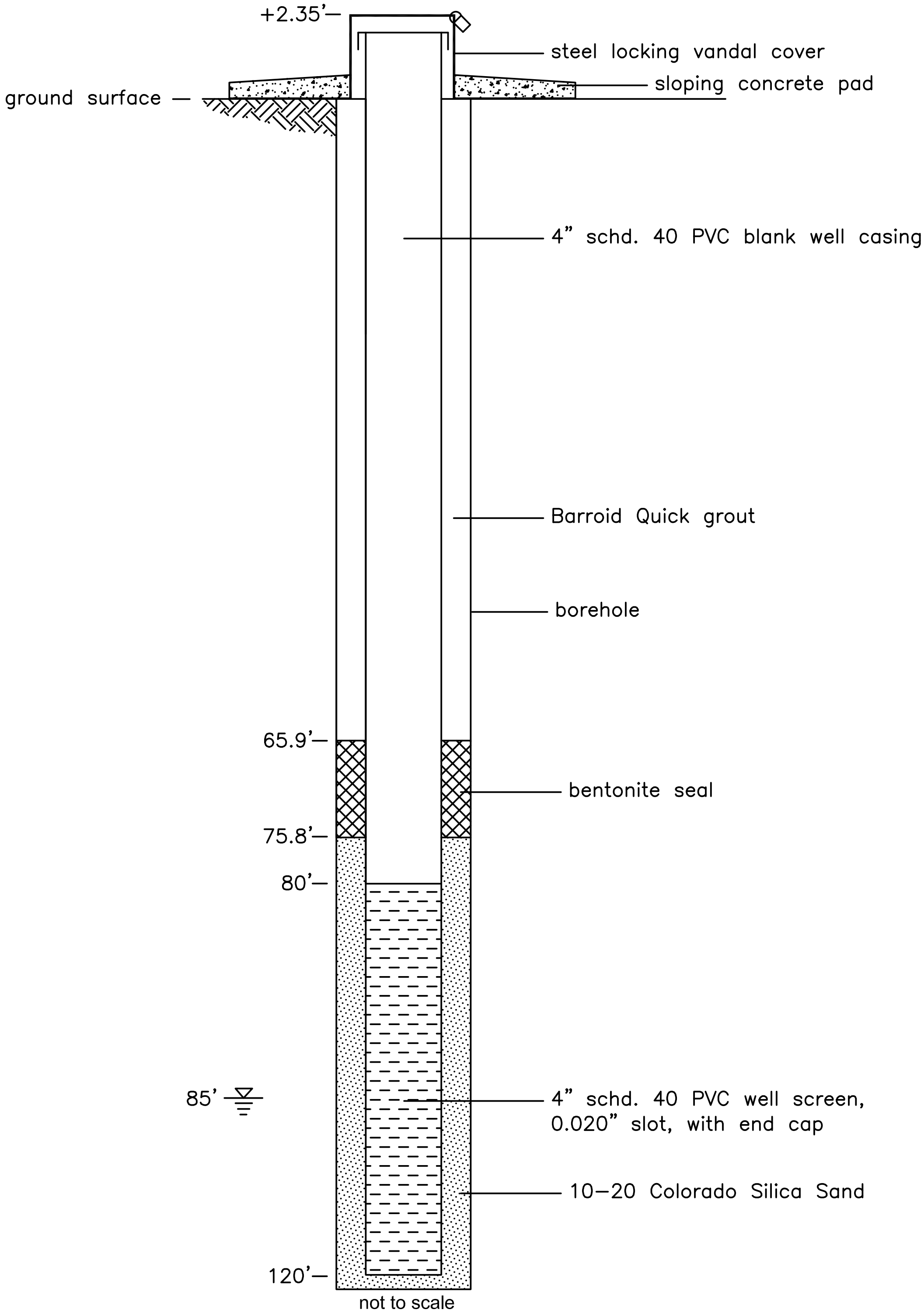
Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-5	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.24	7.90		510		3.10	<0.01	66						34	172	1.2	
NP-5	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.08	<0.05	<0.05	<0.02		<0.005				0.37	7.80		500		3.30	<0.01	90						36	168	1.2	
NP-5	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.32	7.90		460		3.80	<0.01	101						36	161	1.1	
NP-5	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.18	<0.001	<0.05	<0.05	<0.05	<0.02		<0.02				0.40	7.70		420		4.10	<0.01	87						34	163	1.1	
NP-5	1/26/1982							<0.005			<0.05	<0.01	<0.001	<0.05	<0.1				<0.005					8.00		440		2.90	<0.01							32	158	1.1	
NP-5	2/22/1982							<0.005			<0.05	0.12	<0.001	<0.05	<0.05				<0.005					8.00		450		2.00	<0.01							32	150	1.0	
NP-5	4/26/1982							<0.005			0.31	3.80	<0.001	6.9	<0.05				<0.005					7.90		450		1.10	0.04							30	154	1.1	
NP-5	5/17/1982							<0.005			<0.05	0.14	<0.001	<0.05	<0.05				<0.005					8.00		490		6.70	<0.01							36	165	1.1	
NP-5	5/24/1982											<0.1		<0.05																									
NP-5	5/28/1982											<0.1		<0.05																									
NP-5	6/8/1982							<0.005			<0.05	0.44	<0.001	<0.05	<0.05				<0.005					8.10		420		4.50	<0.01							30	150	0.9	
NP-5	6/30/1982							<0.005			<0.05	0.36	<0.001	<0.05	<0.05				<0.005					8.10		460		3.90	<0.01							28	133	0.9	
NP-5	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.60	650	472		4.20		73	22	46	3.9		206	34	137	0.8	
NP-5	10/27/1982							<0.005			<0.05	0.21	<0.001	<0.05	<0.05				<0.005					8.00		440		3.70	<0.01							34	139	0.8	
NP-5	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.30		420		1.30	<0.01							26	139	0.5	
NP-5	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.90		290		0.20	<0.01							70	134	0.4	
NP-5	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		460		3.70	<0.01							26	108	0.8	
NP-5	11/1/1983							<0.005			<0.05	0.10	<0.001	<0.05	<0.05				<0.005					8.20		440		5.20	<0.01							30	111	0.8	
NP-5	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		380		3.00	<0.01							26	130	0.4	
NP-5	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		400		2.90	<0.01							22	139	0.8	
NP-5	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		420		3.40	<0.01							28	125	0.8	
NP-5	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		420		3.20	<0.01							28	120	0.8	
NP-5	5/17/1985																							7.90		450										28	130		
NP-5	11/13/1985																							7.80		400										24	134		
NP-5	5/23/1986																							7.90		430										28	120		
NP-5	10/8/1986																							7.80		420										28	113		
NP-5	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						0.40			458				82	22	39	3		211	32	125		
NP-5	8/29/1991																							7.68		499										39	152		
NP-5	11/26/1991																							7.00		472										38	130		
NP-5	3/15/1992																							7.89		456										47	141		
NP-5	5/25/1992																							7.80		490										76	131		
NP-5	7/16/1992																							7.63		476										38	132		
NP-5	10/8/1992																							7.64		431										39	133		
NP-5	11/27/1992																							8.01		475										117	134		
NP-5	12/15/1992										0.025													7.80		402										40	104		
NP-5	2/25/1993																							7.65		487										41	141		
NP-5	3/30/1993	<0.01	0.2	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	0.29	<0.001	0.02	<0.02	<0.01	<0.02		<0.005				0.19	7.80	746	488	200	4.00	<0.01	76	26	43	2.5	0	221	39	146	0.8	
NP-5	9/28/1993																							7.79		518										48	109		
NP-5	5/24/1994	<0.025	1.1	<0.005	<0.1			<0.0005		<0.025	<0.025	1.20	<0.001	0.086		<0.05	0.0077	<0.005	<0.005				2.30	7.84	680	520		3.40		86	26	40	3.4	0	211	41	130	0.7	
NP-5	6/23/1994																							7.66		466										54	142		
NP-5	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.89	749	494		3.30		79	24	45	3.1	0	206	41	131	0.7	
NP-5	9/22/1994																							7.73		526										43	118		
NP-5	1/29/1995																							7.99		490										44	101		
NP-5	3/29/1995																							7.94		449										42	131		
NP-5	6/27/1995																							7.64		525										43	119		
NP-5	9/21/1995																							7.71		483										44	135		
NP-5	1/10/1996																							8.04		406										42	137		
NP-5	4/3/1996																							7.67		405										32	130		
NP-5	9/25/1996																							8.09		504										43	129		
NP-5	1/15/1997																							7.76		498										46	141		
NP-5	6/28/2010	<0.005	<0.02	0.0014	0.018	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0067	<0.001	0.0013	<0.05	0.29	8.00	900	623	160	3.90		100	31	44	2.9	<2	160	80	180	0.7	23
NP-5	9/30/2010	<0.005	<0.02	0.0015	0.018	<0.002	0.041	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	0.005	<0.008	<0.01	<0.005	<0.001	0.0079	<0.001	0.0013	<0.05	0.20	7.72	910	629	170	4.00	<0.01	99	33	46	2.8	<2	170	83	170	0.7	31
NP-5	5/10/2011	<0.005	<0.02	0.0018	0.019	<0.002	0.042	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0076	<0.001	0.0013	<0.05	0.26	7.76	940	636	160	4.10	<0.01	100	32	45	2.9	<2	160	79	180	0.6	130

Notes: outlier values in gray shading

Appendix B.

Construction diagrams for GWQ-5R, GWQ11-24(A,B), and GWQ11-25(A,B)



Well completion diagram for replacement monitoring well GWQ-5R.
LRG-15080 POD 3, completed September 1, 2011.

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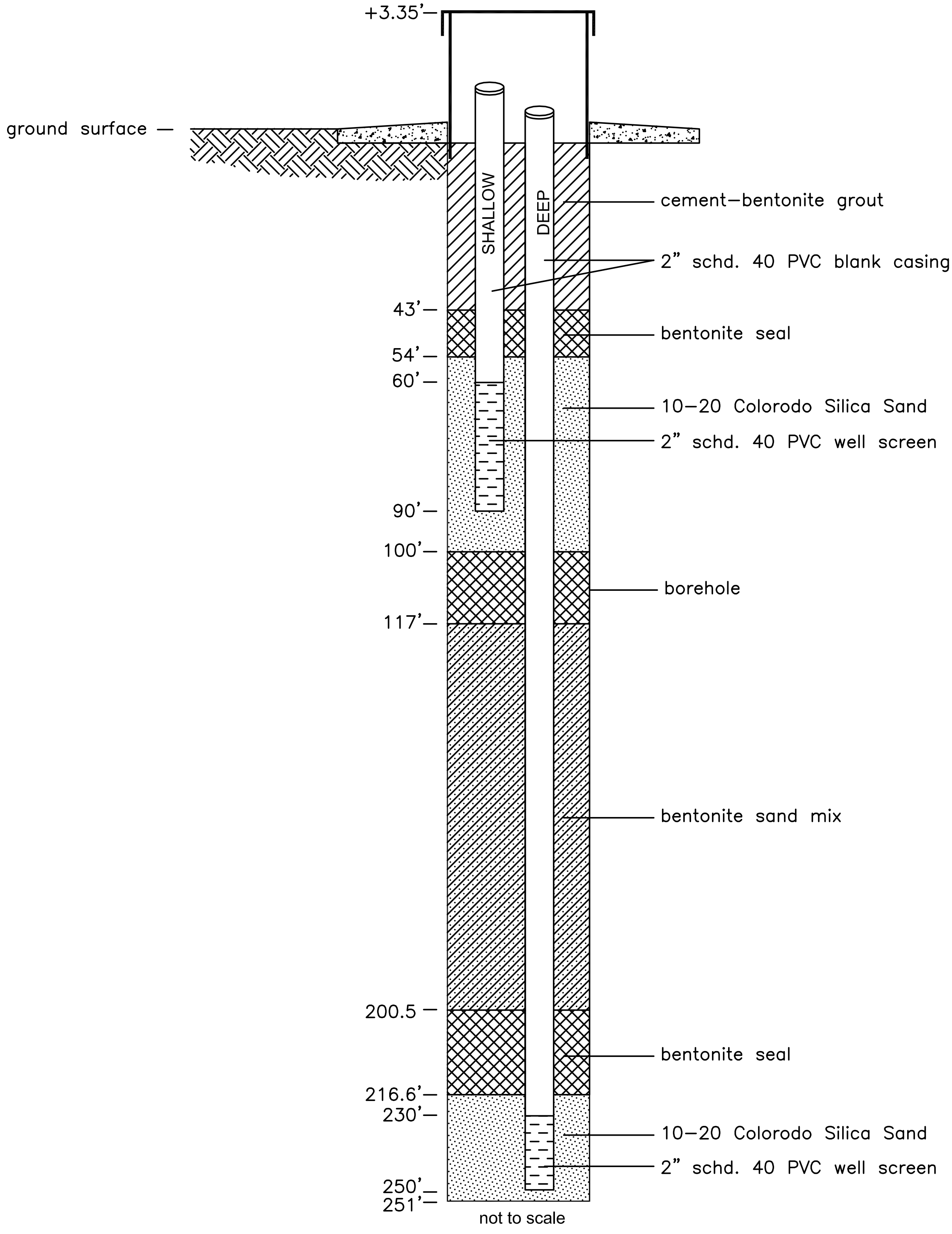
10/13/2011



Well completion diagram of nested piezometer GWQ11-24.
LRG-15080 POD 1, completed August 5, 2011.

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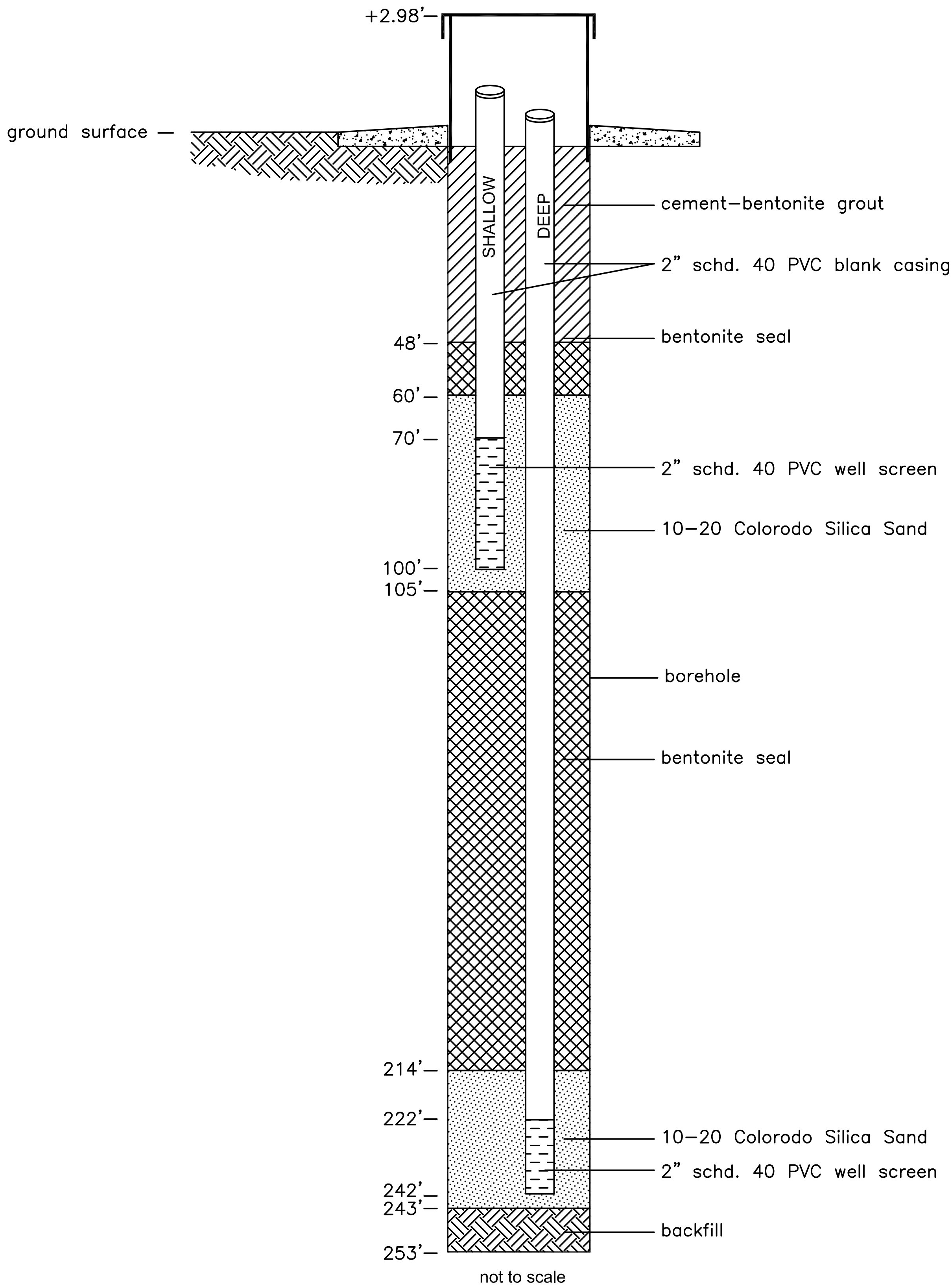
10/13/2011



Well completion diagram of nested piezometer GWQ11-25.
LRG-15080 POD 2, completed August 28, 2011.

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10/13/2011